

# **Effects of the Oil Export Price Increase on the Economy: Theoretical and Empirical Issues – A CGE Analysis of the Case of Kazakhstan**

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**vorgelegt von**

**Zhanna Kapsalyamova, MS  
aus Temirtau, Kazakhstan**

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Dekan:  
Prof. Dr. Thomas Lux

Erstberichterstattender:  
Prof. Dr. Johannes Broecker

Zweitberichterstattender:  
Prof. Dr. Katrin Rehdanz

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**To my dearest family, and especially to my father**

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## List of Abbreviations

ADB	Asian Development Bank
AIDS	almost ideal demand system
AKTU	Azerbaijan, Kazakhstan, Turkmenistan, and Uzbekistan
CES	constant elasticity of substitution
CET	constant elasticity of transformation
CGE	computable general equilibrium
c.i.f.	cost, insurance and freight
col	column
CPI	consumer price index
DPI	producer price index of domestic goods
EGW	electrical energy, gas and hot water supply
FAC	factor closure rule
FCU	foreign currency units
FDI	foreign direct investment
FISIM	financial intermediation services indirectly measured
f.o.b.	free on board
GDP	gross domestic product
GE	general equilibrium
GNP	gross national product
GTAP	Global Trade Analysis Project
IMF	International Monetary Fund
LCU	local currency units
LES	linear expenditure system
NFRK	National Fund of the Republic of Kazakhstan
n.i.c.	not included into other categories
NPISH	non-profit institutions serving households
REER	real effective exchange rate
ROW	rest of the world
SAM	social accounting matrix
TOT	terms of trade
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
VA	value-added



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# Chapter 1 Introduction

## 1.1 Introduction

The discovery of new oil fields in Kazakhstan in the last two decades coincided with high oil prices on the world markets. Soaring oil prices, in their turn, generated incentives for further exploration for oil fields and led to a massive attraction of foreign direct investments (FDI) into the crude oil and natural gas sector in Kazakhstan. By 2001, 75 percent of the inward FDI flows went into the crude oil and natural gas sector (Shiells, 2003, CASE, 2008), but later they dropped to 61 percent. Overall, the cumulative inward stocks of FDI in Kazakhstan constituted about 32,476 million dollars from 1990 to 2006, which amounts to 42 percent in terms of its GDP in 2006 (UNCTAD, 2007).

Overall, the discovery of new oil fields initiated a new phase in the development of the economy of Kazakhstan. During the era of the Soviet Union, Kazakhstan was to a large extent the location for several large heavy manufacturing enterprises, primarily in the ferrous and nonferrous metal industries. After the collapse of the Soviet Union, the role of the heavy manufacturing enterprises largely diminished given their inefficiency and large scale. After the new oil fields in Kazakhstan had been discovered, the oil sector gained priority, eventually outperforming the heavy manufacturing sector.

On the one hand, the discovery of the new oil fields and consequently the substantial revenues from oil exports offered new prospects for economic development in Kazakhstan. They provided the country a good opportunity to recover rapidly from the crisis of the 1990s, which was associated with the collapse of the Soviet Union and a good opportunity to restructure the economy in many respects. However, on the other hand, continuous dependence on the oil revenues and oil sector might pose certain risks for economic development in the future, i.e. the well known Dutch disease and the resource curse that many resource-rich countries have suffered from.

Since Kazakhstan has large endowments of the crude oil<sup>1</sup> and that it has begun to explore oil resources actively, it is critical to examine whether Kazakhstan might be vulnerable to the Dutch disease as well, and whether it already manifests symptoms of the Dutch disease. In order to examine this issue at a sectoral level, one has to apply an economy-wide model, which is the best tool available to address the issue in some detail. However, despite the topicality of the issue, the existing literature on it is far from complete. To the best of my knowledge there is no study available that examines the effects of an isolated boom in the crude oil and natural gas sector on the economy using an economy-wide model. The literature either consists of econometric studies (e.g., Kutan and Wyzan, 2005; Egert and Leonard,

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<sup>1</sup> According to the Ministry of Energy and Mineral Resources of the Republic of Kazakhstan (2008), Kazakhstan possesses about 3.2 percent of world recoverable reserves of crude oil, representing about 4.8 billion tones of crude oil. Major oil and gas fields and their recoverable oil reserves are Tengiz with 7 billion barrels (1.1. km<sup>3</sup>); Karachaganak with 8 billion barrels (1.3 km<sup>3</sup>) and 1350 km<sup>3</sup> of natural gas, and Kashagan with 7 to 9 billion barrels (1.1 to 1.4 km<sup>3</sup>) (Wikipedia).

2008), or does not focus exclusively on the effects of the boom in the crude oil and natural gas sector on the economy (IMF, 2004). Thus, to fill this gap in the literature, this study examines the effects of the boom in the crude oil and natural gas sector in Kazakhstan triggered by the oil export price increase using an economy-wide model. This kind of study would be of particular importance in showing how a boom in the crude oil and natural gas sector might affect the performance of other sectors and the overall performance of the economy, and in providing an in-depth understanding of the effects generated by the oil export price increase.

In this study I apply an economy-wide model, namely a static computable general equilibrium model, which requires that a macro closure rule<sup>2</sup> is defined. Although macro closure rules lie at the core of static general equilibrium models, they have not been investigated adequately. Applications of static general equilibrium models conventionally employ macro closure rules without even mentioning the rationale behind the choice of particular macro closure rule, although different macro closure rules might lead to different results. This is largely due to the fact that the literature on macro closure rules is centered on one-sector models that certainly fail to incorporate features relevant for two-sector and multisector models. Thus, to fill this gap in the literature, this study attempts to uncover the effects of employing alternative macro closure rules using two-sector and multisector models.

### 1.2 Aims of the Study

As already mentioned in the Introduction, this study aims to provide an extensive analysis of the effects of the oil export price increase on structural adjustments and the overall performance of the economy of Kazakhstan and to initiate a discussion on the possible effects of alternative macro closure rules, which are conventionally neglected in the literature. To achieve this aim, I:

- conduct a literature review on this issue;
- give an overview of the economic development of Kazakhstan and determine the dependence of its economy on oil;
- develop stylized models to uncover the effects engendered by the oil export price increase in general and develop a stylized model to uncover the effects of the oil export price increase under alternative macro closure rules;
- construct social accounting matrix (SAM) for Kazakhstan;
- simulate oil export price increase and examine its effect on the economy of Kazakhstan using a static general equilibrium model;
- test different macro closure rules and provide a comparative analysis of the effects of the different macro closure rules on the results.

### 1.3 Research Methodology and Data Sources

As is mentioned in the Introduction, I employ a static computable general equilibrium (hereafter CGE) model that enables to conduct the study in a detailed and coherent manner. To incorporate a large sectoral framework, I employ Lofgren et al.'s (2002) static CGE

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<sup>2</sup> By the definition, macro closure rules determine the rules for clearing the macroeconomic balances, i.e., how equilibrium is obtained in the balances for the government, the rest of the world and the savings-investment account (Lofgren et al., 2002)



model. I employ a static model because I am concerned with changes that are relevant for the medium run, and because I am concerned with the effects of the alternative macro closure rules on the results. I would have used dynamic CGE model if a longer horizon had been a primary concern. Given time and space constraints, I leave this research for the future.

For the CGE analysis, I require a social accounting matrix for Kazakhstan (hereafter SAM). However, at the time when I began the study, there was no SAM available. Therefore, I constructed the SAM. For this purpose, I needed to use different data, as national accounts, an input-output table, a household survey, and other relevant statistical information. Given that the latest input-output table available at the time of the generation of the SAM was for 2003, I used 2003 as a benchmark year for the SAM, which incorporates 55 production sectors and 55 commodities. The level of sectors' and commodities' disaggregation gives a detailed overview of the consumption patterns of sectors, households and government. Moreover, the detailed sectoral structure provides a deeper understanding of the response of sectoral outputs to the imposed oil export price increase. Overall, the constructed SAM provides a suitable framework to examine the effects of the oil export price increase on the economy of Kazakhstan.

#### 1.4 Outline of the Study

The study is organized as follows. Chapter 2 provides an overview of the theoretical literature on the Dutch disease and resource booms overall. Additionally, it provides an overview of the CGE literature on the resource booms and busts and the non-CGE studies on Kazakhstan that focus on the effects of the resource booms.

Chapter 3 provides a general overview of the economy of Kazakhstan. It discusses at length a micro- and a macroeconomic record that defines the extent of the dependence of the economy on oil. *Firstly*, it looks closely at the sectoral adjustments while checking to see whether there are already signs of absolute and relative deindustrialization. *Secondly*, looking through the macroeconomic prism, it examines the dependence of the economy on oil revenues and the overall performance of the economy. For this purpose, it looks at several indicators that determine the government's stance towards its revenues and expenditures, trade balance, foreign indebtedness, and the presence of the Dutch disease in the economy.

Chapter 4 discusses the effects of the increase in the world price of an export good in general using the 1-2-3 model of Devarajan et al. (1990) and it discusses the effects of the increase in the oil export price in particular using a stylized model that I have developed because the literature on the effects of the oil export price increase or the resource booms in general is limited, as it is either based on the Salter-Swan framework, which does not incorporate two-way trade, or it assumes the resource sector is an enclave.

This stylized model considers two sectors, oil and non-oil sectors, and employs two production factors, labor and capital. The model assumes that labor is perfectly mobile, whereas capital is sector-specific. The model is concerned with the effects of the oil export price increase assuming differentiation of oil across its domestic and foreign sales, and assuming differentiation of non-oil goods across imports and domestic sales. I use this model to determine to what extent different assumptions on differentiation of goods across different destinations and origins are relevant for the final results.

The analysis presented in Chapter 4 can also be applied to cases in which the booming sector is not of an extractive type. It can be any other sector that enjoys positive terms of trade in the world markets. This is because I am concerned with the medium-run effects of the boom in the oil sector on structural adjustments, rather than with the long-run effects, such as the depletion of the oil resources.

Chapter 5 initiates a discussion on the effects of alternative macro closure rules in static general equilibrium models when particular issue such as an oil export price increase is the focus of study. Although macro closure rules lie at the core of the static general equilibrium (GE) models and different macro closure rules might cause different results, there is hardly anything in the literature that tests the effects of different macro closure rules when the oil export price increase is considered. Conventionally, the static GE applications employ some type of macro closure rule without even mentioning the rationale behind their choice. This is partly due to the fact that the choice of a macro closure rule remains ad hoc and the literature on macro closure rules remains limited. Chapter 5 intends to fill this gap in the literature.

For this purpose, Chapter 5 develops a two-sector stylized model that differentiates between oil and non-oil sectors, assumes labor and capital used in production, and tests different macro closure rules. Labor is assumed to be perfectly mobile and capital is assumed to be sector-specific. Given these assumptions on factor mobility, the model considers structural adjustments in the economy over the middle run. Overall, the model represents a good attempt to close the gap in the literature on macro closure rules via testing alternative macro closure rules.

In addition, the model throws some light on the issue of the Dutch disease by incorporating some realistic features, such as a two-way trade<sup>3</sup>, and by providing scope for savings and investment.<sup>4</sup> Thus, the model represents another attempt to examine closely the issue of the Dutch disease and to identify the main effects responsible for the expansion of the oil sector and the contraction of the non-oil sector.

The analysis made in Chapter 5 can be used by the studies that are concerned with the effects of a price increase in a sector other than the oil sector, given the generality of the model and the middle-term prospects. This analysis can be employed to highlight the mechanisms that work behind static multisector CGE models focused on the effects of a price increase in this sector and to see clearly whether the results under alternative macro closure rules are different.

Chapter 6 presents the SAM constructed for Kazakhstan for 2003. It discusses the process of compiling this SAM and highlights the main features of the economy that are relevant for 2003. It provides an overview of the intermediate demand, investment demand, and private and public demand. It determines which sectors are traded and nontraded. It discusses the incomes and expenditures of institutions. By and large, it discusses the main features relevant to the economy for 2003.

Chapter 7 pursues three aims. The *first* aim is to examine the effects of the oil export price increase in general on the economy of Kazakhstan by applying Lofgren et al.'s (2002) model to the two-sector version of the SAM for Kazakhstan. I use a two-sector version of the SAM for the analysis here in order to quantify the effect of the oil export price increase on the oil

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<sup>3</sup> This addresses the limitation of the Corden and Neary's (1982) model, which assumes pure traded and pure nontraded goods.

<sup>4</sup> This addresses the limitation of the model developed in Chapter 4.

sector, on the one hand, and on the non-oil sector, on the other hand. The *second* aim is to test whether the main mechanisms that operate in the stylized model that was developed in Chapter 5 are valid for a large static general equilibrium model as well. For these purposes, I conduct a sensitivity analysis with respect to the selected set of parameters and discuss whether the results are valid in this model as well. This is another reason why I use a two-sector version of the SAM here. And finally, the *third* aim is to test the implications of the alternative macro and micro closure rules.

Chapter 8 pursues three aims as well. The *first* aim is to quantify the effects of the oil export price increase on the economy of Kazakhstan. In this chapter, I attempt to explain the mechanisms, through which an oil export price increase affects sectoral outputs, exports, imports, private consumption, investment, and real GDP using the intuition developed by the two-sector model developed in Chapter 5. The *second* aim is to analyze whether different macro closure rules lead to different results in a multisector model as well. The *third* aim is to conduct a systematic sensitivity analysis that determines the variation in outputs due to the variation in structural parameters.

Finally, Chapter 9 provides some final conclusions and discusses some directions for future research.

## **Chapter 2      Selected Review of the Literature on Resource Booms**

### **2.1      Introduction**

There is an ongoing debate on whether large endowments of natural resources are a “blessing” or a “curse” for an economy. On the one hand, large endowments of natural resources are a “blessing,” as they provide opportunities for economic development and may stimulate economic growth. However, on the other hand, inappropriate policies might turn natural resource wealth into a “curse,” as the economy of a country with such wealth might go off on a track of lopsided development, deindustrialization, large borrowing, and inefficient investment. It would naturally seem that the majority of resource-rich countries should have benefited from their large resource endowments and should have prospered. However, in reality, many natural resource-rich countries, due to their overambitious policies and the improper management of their resource rents, have fallen into the trap of deindustrialization that has come to be known as the Dutch disease.

The concept of the Dutch disease came into the existence after the discovery of natural gas deposits in the Netherlands in the 1960s, which engendered the real appreciation of the guilder and one-sided development of the economy. Although the Netherlands recovered relatively quickly from the Dutch disease in the mid-1960s, the label Dutch disease stuck (Gylfason, 2001). Gylfason (2001) lists some of the symptoms of the Dutch disease: overvalued currency, sudden booms and busts in the economy that are driven mainly by the largely volatile character of natural resource prices, a decrease in traditional exports and foreign investments, a decrease in the total level of exports, and higher wages and higher interests in the natural-resource-based industries than in other industries.

There are two primary strands of the literature that focus on the effects of resource booms. The first strand of the literature focuses largely on the political side of the issue, namely rent seeking behavior, inappropriate management of the resources, institutional background, etc. (Auty, 1985; Gelb, 1985; Auty, 1993; Sachs and Warner, 1997; Tornell and Lane, 1998; Robinson and Torvik, 2005; van der Ploeg, 2006; etc.). The second strand of the literature focuses on the deindustrialization as a result of the resource boom (Corden and Neary, 1982; Neary and van Wijnbergen, 1986; Ansari, 1989; Matsuyama, 1992). My study lies within the scope of the second strand of the literature.

Given the subject of this study, this chapter aims to provide an overview of the theory of the Dutch disease economics and to survey the CGE models that are used to study the effects of resource booms and busts. Some of the studies survey the CGE models that are used to examine the effects of tax and trade policies (Shoven and Whalley, 1984; De Melo, 1988; Pereira and Shoven, 1988; Bandara, 1991), agricultural and trade policies (Van Tongeren et al., 2001), energy policies (Bergman, 1988; Bhattacharyya, 1996), and regional policies (Partridge and Rickman, 1998). However, to the best of my knowledge there is no study available that surveys CGE models that are used to examine the effects of resource booms and busts. Hence, this chapter of the study attempts to fill this gap in the literature.

This chapter is by no means an exhaustive survey of all CGE models in this area of research given that this research is growing. Rather it aims to uncover the main characteristics of the models found in the literature and their main results. The chapter consists of the following sections. Section 2.2 presents the theory of the Dutch disease economics. Section 2.3 provides a general understanding of the CGE modeling. Section 2.4 reviews CGE models that examine the effects of the expansion (or contraction) of the natural resources sector, of aid, and of alternative configurations of stabilization funds on the economy of a resource-rich country. Section 2.5 reviews the non-CGE empirical literature on resource boom in Kazakhstan. Section 2.6 concludes.

### 2.2 Theory of Dutch Disease Economics

There is a vast literature on the Dutch disease economics. Its existence dates back to the works of Meade and Russel (1957), Corden and Neary (1982) and Corden (1984) whereby the latter two are the cornerstones of the literature on the Dutch disease engendered by a resource boom (Stijns, 2003). Given the significance of the study of Corden and Neary (1982) for the Dutch disease economics, I discuss the study in more detail here. Additionally, I review other important studies on the Dutch disease.

Corden and Neary (1982) are primarily concerned with the effects of an asymmetric productivity shock in the form of the Hicks neutral technological progress in the energy sector. The models they use apply the framework of Salter's model (1959) and consider a small, open economy that comprises three sectors: energy, manufacturing (in other words, a traditional traded sector), and services (in other words, a pure nontraded sector). They show that a boom in the energy sector gives rise to resource movement and spending effects that affect the profitability of the sectors and factor incomes. A boom in the energy sector raises the marginal products of the mobile factors employed in that sector and thus triggers the movement of mobile factors out of the other sectors and into the energy sector. This is a resource movement effect. On the other hand, an energy boom raises real income, which leads to increase in spending on nontraded goods, which in turn raises their price, or, in other words, causes a real appreciation of the domestic currency. This, in effect, leads to the factor movement from other sectors into the nontraded sector, leading to contraction of the non-booming traded sector. This is a spending effect. The dominating effect largely determines the final adjustments that take place in the economy.

Corden and Neary (1982) examine the effects of the resource movement and spending effects under alternative assumptions regarding intersectoral factor mobility. For this purpose, they devise three different models. The first model assumes that each sector employs a sector-specific factor and an intersectorally mobile factor. The second model assumes that the manufacturing and services sectors employ intersectorally mobile capital and labor, whereas the energy sector employs a sector-specific capital and an intersectorally mobile labor. And finally, the third model assumes all factors to be intersectorally mobile. Given that the factor mobility assumption corresponds to different time horizon, I label the first model a short-run model, the second model a medium-run model, and the third model a long-run model.

In the short-run model, both effects lead to deindustrialization and real appreciation of the exchange rate. However, the impact on the nontraded (services) sector is ambiguous: the resource movement effect decreases its output, whereas the spending effect tends to increase

it. In the medium-run model, the effects of the resource movement effect on the output of the manufacturing and services sectors and the functional income distribution strongly depend on the factor intensities of the sectors. Deindustrialization or real appreciation of the exchange rate is not a necessary outcome of this model. In certain cases, for instance, when the manufacturing sector is more capital intensive than the services sector, resource movement leads to pro-industrialization. However, the spending effect leads unambiguously to shrinkage of the manufacturing sector, expansion of the services sector, and real appreciation of the exchange rate. The long-run model gives ambiguous predictions with regard to deindustrialization and real appreciation of the exchange rate in the economy as a result of the boom in the energy sector. The results are sensitive to the factor intensities of these three sectors. Depending on parameter values, an economy may or may not experience deindustrialization and real appreciation of the exchange rate in the long run.

Corden and Neary (1982) review, in addition, the effects of other sources of booms in the energy sector as an increase in the energy price for instance. In addition to the resource movement and spending effect, an increase in the energy prices gives rise to a substitution effect. The substitution effect tends to raise the demand for services, provided that energy and services are net substitutes in consumption. The resource movement effect has the same effects under an energy price shock as under a productivity shock in the energy sector. However, the spending effect is different. Whether spending on services rises or falls depends on whether energy is an export or an import good. If energy is a net export good, the effect of the spending effect engendered by the energy price shock will be similar to the spending effect engendered by the productivity shock. If energy is not a net export good, the results will be reversed.

Neary and van Wijnbergen (1986) review several theoretical models related to the Dutch disease. They cover real static and intertemporal models, and monetary models that analyze the effects of large-scale exploitation of natural resource discoveries. Both types of models consider three sectors: a nontraded sector, a traded (non-resource) sector, and a resource (booming) sector that is a traded sector as well.

Neary and van Wijnbergen (1986) discuss three real static models. The first model assumes that the resource sector is an enclave. The second model relaxes this assumption and allows the booming sector to have an impact on domestic factor markets. The third model assumes rigid domestic wages and prices. In the first model, after the boom occurs, excess demand for nontraded commodities occurs, which drives the relative price of nontraded commodities up until equilibrium in the market is restored. The spending boom leads to deindustrialization and real appreciation in this model.

The second model is a model developed by Corden and Neary (1982) that assumes that each sector employs a sector-specific factor and intersectorally mobile labor. The third model introduces rigid wages and prices in the nontraded sector, whereas there is no rationing in the market for traded goods. The effects of the resource boom in the long run are similar to those of the models mentioned above; however, in the short run, the system behaves differently. Depending on the importance of the nontraded sector for demand relative to supply, the boom might cause a rise or a fall in the real consumption wage and thus might give rise to a labor shortage or unemployment in the short run.

Intertemporal models that are discussed by Neary and van Wijnbergen (1986) are two-period open economy three-sector models. The first model considers intertemporal adjustments without any market imperfections. For simplicity, it ignores the resource movement effect and

focuses solely on the spending effect. The effects of the boom are similar to those obtained in the framework of static models. The boom leads to deindustrialization and real appreciation. Neary and van Wijnbergen (1986) argue that the “real appreciation is an efficient response to the increase in oil revenues and in no sense a symptom of ‘disease,’” because this is a necessary process for efficient intersectoral allocation of the factors of production. It is a disease only when there is some market failure or immovable distortion requiring government intervention.

The second model differs from the others by employing a learning-by-doing effect in the traded goods sector, which is treated as external to the firm. The model delivers an answer to whether the optimal subsidy for the manufacturing sector should be increased after the boom occurs. If the learning-by-doing effect is larger than the intertemporal substitution effect, the optimal subsidy should be increased. Otherwise, it should be decreased. Additionally, the effect of the boom on the relative price changes is ambiguous. Whether the real exchange rate appreciates or depreciates depends on which of the above-mentioned effects dominates. If the learning-by-doing effect dominates, the real exchange rate will depreciate in the future and vice versa. Neary and van Wijnbergen (1986) argue that the term “Dutch disease” is applicable to this case, because the government intervention removes this distortion.

The third model analyzes the effects of the imperfect capital markets assumption for the models described above. In this model, the imperfect capital markets assumption takes the form of no access to perfect capital markets for households. The effects of this assumption in the first model lead to full adjustment in the real exchange rate in the first period, after the boom occurs, and returns it back to the previous level in the second period. Incorporation of the learning-by-doing effect along with the imperfect capital assumption leads to appealing results. As a result of the spending effect, the real exchange rate appreciates in the first period, but depreciates in the second period because of resource shifts in the nontraded sectors. A lower real exchange rate in the second period requires a higher optimal subsidy in the first period.

Corden (1984) reviews the literature on the theory of the Dutch disease. He aims “to consolidate the literature on booming sector economics and the Dutch disease.” Starting with Corden and Neary’s (1982) core model of the Dutch disease, he continues with the different extensions of this model found in the literature. These include the paradox model, which considers more than one intersectorally mobile factor; a model that considers the decomposition of the lagging sector; models that assume international capital mobility, immigration, endogenous terms of trade effects, a domestic absorption effect, classical unemployment, Keynesian unemployment, and the dynamics and protection of the lagging sector. The literature shows that shocks to the natural resources sector do not necessarily lead to expansion of the nontraded sector and contraction of the manufacturing sector.

The models applied in the Dutch disease literature discussed so far do not go beyond the Hecksher-Ohlin model or specific-factors model frameworks. They are highly stylized and hinge strongly upon the assumptions imposed. The large limitation of the models is that they ignore the two-way trade of commodities. The commodities considered are either purely traded or nontraded, whereas in the reality only few commodities are purely traded or nontraded. The majority of the commodities are imperfect substitutes that can be sold and demanded at different destinations.

Despite these limitations, the models provide very intuitive and clear explanations of the effects responsible for the expansion of the energy and nontraded sectors and for the

contraction of the traded sector. They offer a rigorous treatment of the issue at hand and provide a sound theoretical platform for analysis of the possible effects of a resource boom.

After discussing the main models of the Dutch disease, it is natural to ask whether a contraction of the traditional traded sectors and an expansion of the nontraded sectors as a result of a resource boom constitute a disease in a clear sense. Most of the studies argue that they are an equilibrium response of the economy to the shocks (e.g., Hirschman, 1958; Aoki and Edwards, 1983; Matsuyama, 1992; van Wijnbergen, 1994; Sachs and Warner, 1997). However, they can be a real disease if there is something special about the sources of growth in manufacturing, which could be “backward and forward linkages” (Hirschman, 1958) or learning by doing (Matsuyama, 1992; van Wijnbergen, 1994), for example.

### **2.3 CGE Modeling: General Approach**

Narrowly defined, the history of CGE modeling begins with Leif Johansen’s (1960) pathbreaking application that soon became known as the multisector growth model (MSG). Broadly defined, CGE modeling begins with Leontief’s (1936, 1941) input-output models and includes the economy-wide mathematical programming models of Sandee (1960), Manne (1963) and others developed in the 1950s and 1960s (Dixon, 2006). Given that this section represents a concise overview of CGE modeling, I focus on the narrow definition of the history of CGE modeling that is largely discussed in Dixon (2006).

Overall, Dixon (2006) distinguishes between three main stages in the development of CGE modeling. The first stage took place during the 1960s, beginning with Johansen’s (1960) study. Overall, this stage of development was a period of development in which theoretical propositions on the existence, uniqueness, optimality, and stability of the solutions to general equilibrium models were developed and refined. In general, there was little interest in CGE modeling in this early stage of development, as researchers were much more interested in developing large-scale, economy-wide econometric models.

The second stage took place during the 1970s and 1980s, during which interest in CGE modeling picked up. This happened for several reasons. The first one was associated with the failure of large-scale, economy-wide econometric models to simulate the effects of shocks that carried economies away from the established trends. The second one was associated with the increasing ability of CGE models to handle details, and, finally, the third one was associated with the development of numerical algorithms that aimed to enhance the computational task of solving large-scale CGE models. This stage gave rise to several prominent studies, such as Taylor et al.’s study (1980) on poverty and the distribution of income, Dervis et al.’s study (1982) on development issues, and Shoven and Whalley’s study (1984) on tax issues.

The third stage took place during the 1990s and 2000s, during which CGE modeling became an established field in applied economics. During this period, numerous monographs on CGE modeling were published (e.g., McKibbin and Sachs, 1991; Horridge et al., 1993), the GTAP project was established (Hertel et al., 1997a), and the whole school of applied general equilibrium in Australia, led by Peter Dixon was established. It is remarkable how influential and popular CGE modeling has become. CGE modeling has been used to examine a considerable variety of questions that cover the effects of changes in tax policies, tariff and nontariff barriers, environmental policies, technology, oil price shocks, etc.



However, despite the popularity, opponents of CGE modeling frequently criticized CGE modeling for relying on weak empirical foundations such as, *first*, the lack of model validation, *second*, the use of apparently arbitrary values for behavioral parameters, and *third*, the use of calibration instead of econometric estimation (e.g., Jorgenson, 1984; Singleton, 1988; Hoover, 1995; Hansen and Heckman, 1996; McKittrick, 1998).

As regards the first critique, the lack of model validation, proponents of CGE modeling in their turn argue that “to the extent that (a) the individual components of the system are based on plausible, perhaps even econometrically estimated, relationships, (b) the underlying social accounting matrix is accurate and reflects the best economy-wide data available, and (c) the equilibrium assumptions and macro-closure are plausible, then the assertion is that the results will indeed shed relevant light on what might actually happen if the proposed reforms were implemented” (e.g., Hertel, 1997b). There are some models (e.g., Kehoe et al., 1991; Gehlhar, 1997) that clearly demonstrated the validity of the models employing ex-post analysis frameworks.

As regards the second critique, proponents of CGE modeling argue that the problem of the use of apparently arbitrary values for behavioral parameters can be somehow lessened by applying piecemeal or systematic sensitivity analyses that examine the sensitivity of the results to varying parameters. Sensitivity analyses help to determine how different values for behavioral parameters might affect the final results.

As regards the third critique, proponents of CGE modeling argue that calibration remains popular over econometric estimation in CGE modeling due to some disadvantages of econometric estimation. For instance, the econometric estimation turns out to be infeasible in light of the problems with degrees of freedom and shortage of data and time (Lau, 1984; Mansur and Whalley, 1984; Thissen, 1999). Another disadvantage of econometric estimation is the identification of causality. If the direction of causality changes, it becomes difficult to link the figures of few years ago with the present situation (Taylor, 1990). Therefore in light of these issues, it might be preferable to use calibration over econometric estimation.

Although CGE modeling has certain weaknesses, it has strengths that make it more powerful than other methodologies. Several strengths of CGE modeling are worthy of emphasizing here. The first one is related to the solid microeconomic foundations that CGE modeling relies on. CGE modeling specifies the behavior of all economic agents on the basis of optimization and choice, integrating behavior of all agents in a systematic way. The second one is related to internal consistency. The essence of CGE modeling is that all markets are taken into account and all feedbacks are examined, making it possible to consider complex interrelationships in a coherent and consistent framework. The third one is related to the large dimension of the CGE models, which can have large sectoral and commodity disaggregation. This feature makes them useful for practitioners who prefer using the models that have something to do with reality. The fourth is related to recent numerical advancements in CGE modeling that have increased interest in CGE modeling and raised its popularity.

In sum, it appears that CGE modeling provides a powerful means of accurately addressing issues in an economy-wide framework. Given that I aim to examine the effects of an oil export price increase in an economy-wide setting and taking into account the strengths of CGE modeling, I apply it in this study.

## 2.4 Review of CGE Models of Resource Booms and Busts

The literature review presented in this section does not claim to be exhaustive. Rather, it is limited to the models focused on the effects of resource booms and busts in resource-rich countries.<sup>5</sup>

**Table 2.1 Review of some CGE applications**

No	Country	Nature of the Model	Author
1.	Australia	Static	Hogan and Naughten (1990)
2.	Bolivia	Recursively dynamic	Andersen, Farris (2002a)
3.	Bolivia	Recursively dynamic	Andersen, Farris (2002b)
4.	Cameroon	Static	Benjamin, Devarajan, Weiner (1989)
5.	Canada	Intertemporal	Dissou (2007)
6.	Chad	Static	Levy (2006)
7.	Indonesia	Static	Kim (1990)
8.	Iran	Intertemporal	Seddighi (1985)
9.	Kazakhstan	Static	IMF (2004)
10.	Kuwait	Recursively dynamic	Khorshid (1990)
11.	South Africa	Static	Ngandu (2006)
12.	Uganda	Recursively dynamic	Adam and Bevan (2003)
13.	United Kingdom	Intertemporal	Bruno and Sachs (1982)
14.	Venezuela	Recursively dynamic	Clemente, Faris, Puente (2002)

In what follows, I review fourteen CGE models (Table 2.1). For each of the models, the review focuses on:

- the structure of production, demand, and external trade being modeled;
- the type of macro closure rules incorporated and source of dynamization, if any;
- the main simulations and main results.

### *Production structure*

The models differ according to their disaggregation of activities (Table 2.2). Some models use a high level of disaggregation<sup>6</sup> (e.g., Australia), some a medium level<sup>7</sup> (e.g., Bolivia, Cameroon, Canada, Chad, Indonesia, Kazakhstan, South Africa) and some a low level<sup>8</sup> (e.g., Iran, Kuwait, United Kingdom, Venezuela). The majority of the models under consideration use a medium level. Models with a medium and high level of disaggregation correspond to national accounting classifications. Models with a low level of disaggregation correspond to economic breakdowns.<sup>9</sup> For instance, studies with a low level of disaggregation consider oil sector and non-oil sector (e.g., Kuwait), energy sector, non-oil traded sector, and nontraded sector (e.g., United Kingdom, Venezuela), and modern capitalist sector, agricultural sector,

<sup>5</sup> Organization of this section of the study was inspired from Decaluwe and Martens's (1988) study.

<sup>6</sup> They consider more than one hundred sectors.

<sup>7</sup> They consider from six to eighteen sectors.

<sup>8</sup> They consider less than or equal to three sectors.

<sup>9</sup> This definition is adapted from Decaluwe and Martens (1988).

and oil sector (e.g., Iran). Given that the studies focus on the effects of the expansion of fossil fuel, energy, or crude oil sectors on the economy, disaggregation necessarily entails these sectors.

Some studies, including the one on Kazakhstan, assume fixed production in the petroleum sector. They model it via assuming sector-specific factors in this sector. They do this to avoid the movement of factors into the expanding petroleum sector because it has primarily enclave features. They employ nested production functions that include intermediate inputs and factors. The nested production functions permit distinguishing between gross and net production prices, which are useful in simulations (Decaluwe, Martens, 1988).

### *Consumption structure*

The number of households used differs across models (Table 2.3). Some models do not explicitly state the number of households used (e.g., Australia and Cameroon). Various specifications are used for modeling consumption. It appears that the most popular is a constant elasticity of substitution (CES) specification. Although it is the most widely used specification in the models under review, it has certain limitations. The main limitation is that it assumes a unitary income elasticity of demand. The linear expenditure system (LES), for instance, provides more degrees of freedom in this respect, via assuming non-unitary income elasticity of demand.

### *External trade*

Imperfect substitutability between imports and domestically produced and domestically supplied commodities as well as imperfect transformability between exports and domestic sales is the most common assumption used in modeling external trade in the models considered (Table 2.4). Modeling this way has certain advantages, as it differentiates between prices in domestic and world markets.

### *Macro closure rules*

In the framework of static<sup>10</sup> and recursively dynamic models<sup>11</sup>, macro closure rules need to be specified. By the definition, macro closure rules determine the rules for clearing the macroeconomic balances, i.e., how equilibrium is obtained in the balances for the government, the rest of the world and the savings-investment account (Lofgren et al., 2002). Given the economic context of these models, it is fulfilled via referring to the existing schools of thought in economics such as the neoclassical, neo-Keynesian, Johansen, and the general theory schools of thought (Sen, 1963) or it can be fulfilled depending on the researcher's preferences and focus of the study.

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<sup>10</sup> The static CGE models consider only one period. They generate savings, investment, and demand for capital goods, where investment represents only a demand category and capital goods are not installed during the period (Mohora, 2006).

<sup>11</sup> A recursively dynamic model assumes that the model is solved for a sequence of static equilibria that are connected through a capital accumulation process. There are no intertemporal aspects of decision making, variables other than capital (e.g., population) are updated exogenously (Mohora, 2006).

It appears that most of the studies employ the neoclassical and foreign closure rules, while only few employ Johansen and neo-Keynesian rules (Table 2.5).<sup>12</sup> It also appears that most of the studies do not provide convincing arguments concerning their choice of macro closure rules, although the choice is very crucial, as different closure rules might lead to different results.

### *Sources of dynamization*

The source of the dynamization in the dynamic models stems from capital stock accumulation, adjustment costs in investment, population growth, labor supply growth, oil funds, and technological progress (Table 2.6). There are only three fully intertemporal models whereas the remaining dynamic models are recursively dynamic.

### *Main results and simulations*

The review presented in this section is limited to models considering the effects of expansion (or contraction) of the natural resources sector, the effects of aid, and the effects of alternative configurations of stabilization funds on the economy of a resource-rich country (Table 2.7). These effects are modeled, for instance, via increases in the outputs of gas or oil sales (e.g., Bolivia, 2002a; Kazakhstan, 2004) or changes in resource prices (e.g., Bolivia, 2002b; Canada, 2007; Indonesia, 1990; Kuwait, 1990; South Africa, 2006; Venezuela, 2002), increases in the flows of foreign earnings into an economy (e.g., Cameroon, 1989) and the distribution of oil revenues through investment across sectors (e.g., Chad, 2006; Iran, 1985) (Table 2.7). In general, it can be observed that as a result of the expansion of the resource sector, most of the nontraded sectors expand and the traded sectors contract. Real GDP, in general, increases as a result of positive shocks to the resource sector (e.g., Bolivia, 2002a; Canada, 2007). However, it might decrease in the short run (e.g., Canada, 2007).

In general, the effects found in the empirical literature as a result of the expansion of the resource sector are consistent with the theoretical literature, which predicts that expansion of resource sector would most likely lead to real exchange rate appreciation and expansion of the nontraded and contraction of the traded sectors.

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<sup>12</sup> The main difference between the neoclassical, foreign, and Johansen closure rules, on the one hand, and the neo-Keynesian closure rule, on the other hand, lies in their different treatment of the labor market. The neoclassical, foreign, and Johansen closure rules assume that the nominal wage is flexible and, hence, that the nominal wage adjusts to clear the labor market if it becomes distorted after a shock occurs, whereas the neo-Keynesian closure assumes that the nominal wage is fixed and hence that the labor market is in disequilibrium after a shock occurs. Given this differentiation between closure rules, I treat the neoclassical, foreign, and Johansen closure rules as equilibrium closure rules and the neo-Keynesian closure rule as a disequilibrium closure rule. The definitions of the neoclassical, foreign, and Johansen closure rules are given in Chapters 5 and 7.

Table 2.2 Production

Countries	Australia	Bolivia (2002a)	Bolivia (2002b)	Cameroon	Canada	Chad	Indonesia	Iran	Kazakhstan	Kuwait	South Africa	Uganda	United Kingdom	Venezuela
Study No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Number of activities	112	12	12	11	18	6	14	3	8	2	14	4	3	3
Fixed petroleum production		x	x <sup>a</sup>					x	x	x			x <sup>b</sup>	x
<b>Value-added (VA) components in other sectors<sup>c</sup>:</b>														
Labor	x	x	x <sup>d</sup>	x <sup>e</sup>	x	x	x <sup>f</sup>	x	x	x	x	x	x	x
Capital	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Energy					x									
Land	x							x				x		
Infrastructure												x		
<b>Inner nest: VA production function</b>														
CES	x				x <sup>g</sup>	x	x	x <sup>h</sup>		x	x		x	
Cobb-Douglas		x	x	x					x <sup>i</sup>			x		x
<b>Inner nest: intermediate inputs aggregation</b>														
CES													x	
Cobb-Douglas														
Leontief	x	x	x	x	x	x		x	x	x	x			x
<b>Outer nest: VA and intermediate aggregate</b>														
- CES		x	x			x <sup>j</sup>					x		x	x
- Leontief	x			x		x		x	x	x				

Notes:

<sup>a</sup> Refers to the fossil fuel sector.<sup>b</sup> Refers to the energy sector, which is treated as an enclave.<sup>c</sup> As long as the production of oil is exogenously given, the value-added in the other sectors determines the value-added in sectors other than oil production. However, if production of oil is endogenous, the value-added in other sectors is the value-added in all the sectors.<sup>d</sup> There are five types of labor: skilled, unskilled agricultural, unskilled non-agricultural, smallholder, and urban informal.<sup>e</sup> There are three labor groups differentiated according to the skills.<sup>f</sup> The model considers four different types of labor, which are combined in a Cobb-Douglas production function to form composite labor demand used in the production function of each sector.<sup>g</sup> The CES function of energy is combined further with capital in a CES fashion, which is further combined with labor to form a capital-labor-energy in CES fashion. For further details refer to Dissou (2006) and Dissou (2007).<sup>h</sup> The Iranian model treats production structure in non-oil sectors differently. It considers two non-oil sectors as capitalist sector and traditional agriculture sector. The capitalist sector employs labor and capital in a CES fashion that forms aggregate value-added. Aggregate value-added is further combined with the Leontief aggregate of intermediate inputs using the Leontief production function. The traditional agricultural sector employs labor and capital in a CES fashion. CES function of labor and capital is further combined with land in a Leontief fashion, forming aggregate value-added. Aggregate value-added is combined with aggregate intermediate inputs in a Leontief fashion.<sup>i</sup> The Cobb-Douglas production function refers to non-oil sectors only, whereas the oil sector production function is represented by the CES production function, for which the elasticity of substitution is set at 0.2, making capital and labor gross complements.<sup>j</sup> CES function of capital-labor-energy is combined with the CES function of materials to form an output in CES fashion. For further details refer to Dissou (2006) and Dissou (2007).

**Table 2.3 Consumption**

Countries	Australia	Bolivia (2002a)	Bolivia (2002b)	Cameroon	Canada	Chad	Indonesia	Iran	Kazakhstan	Kuwait	South Africa	Uganda	United Kingdom	Venezuela
Study No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>A. No of households</b>	... <sup>a</sup>	6	6	... <sup>b</sup>	1	2	8	2	1	2	14	3	2	4
<b>B. Demand system</b>														
Cobb-Douglas				x					x	x <sup>c</sup>				
CES		x	x		x <sup>d</sup>			x <sup>e</sup>					x	x
LES (Stone-Geary)	x					x					x			
CES-LES												x		
AIDS-LES							x							

Notes:

<sup>a</sup> Not specified in the paper.

<sup>b</sup> Not specified in the paper.

<sup>c</sup> Consumption is defined as a fixed share of income, given that households consume only non-oil goods.

<sup>d</sup> The instantaneous utility in the intertemporal utility function represents a logarithmic function that has a Cobb-Douglas formulation with an aggregate of the consumption index and leisure as arguments. Within each period, using a cost-minimizing rule, the household allocates consumption expenditures across goods and services subject to a nested CES utility function.

<sup>e</sup> The instantaneous utility in the intertemporal utility function is captured by a Cobb-Douglas function. Within each period the household allocates consumption expenditures across goods subject to a nested CES utility function.

Table 2.4 External trade

Countries	Australia	Bolivia (2002a)	Bolivia (2002b)	Cameroon	Canada	Chad	Indonesia	Iran	Kazakhstan	Kuwait	South Africa	Uganda	United Kingdom <sup>a</sup>	Venezuela
Study No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>A. Imports</b>														
Perfect substitution between domestic and imported products								x <sup>b</sup>						
Imports and domestic goods are complements								x <sup>c</sup>						
Armington assumption between imports and domestic sales	x	x	x	x	x	x	x		x	x <sup>d</sup>	x	x		x
<b>B. Exports</b>														
Exports and domestic goods sold and produced domestically are complements								x						
CET assumption between domestic sales and exports	x	x	x	x	x	x	x		x	x <sup>e</sup>	x	x		x

Notes:

<sup>a</sup> The two-way trade is not assumed here. The goods are purely traded or nontraded.<sup>b</sup> Refers to agricultural imports<sup>c</sup> Refers to non-agricultural imports<sup>d</sup> Refers to non-oil commodities only. There are no oil imports.<sup>e</sup> Refers to non-oil commodities only. Exports of oil are determined residually.

**Table 2.5 Closure rules**

Countries	Australia <sup>a</sup>	Bolivia (2002a)	Bolivia (2002b)	Cameroon	Canada	Chad	Indonesia	Iran	Kazakhstan	Kuwait	South Africa	Uganda	United Kingdom	Venezuela
Study No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Type of closure rule</b>														
Neoclassical <sup>b</sup>		x	x	x					x			x		x
Johansen <sup>c</sup>											x			
Foreign closure <sup>d</sup>						x			x	x				
Neo-Keynesian closure							x							

Notes:

<sup>a</sup> Considers four different closure rules. The *first closure rule* is the standard short-run ORANI environment, which assumes that real investment and real consumption expenditure are fixed, the balance of trade is endogenous, and real wages are exogenous, while employment is endogenous. The capital stock in each industry is fixed, while the industry rate of returns are endogenous. The nominal exchange rate is a numeraire. The *second closure rule* assumes the standard short-run environment, but with exogenous employment and endogenous real wages. The *third closure rule* is the standard short-run environment with the trade balance being exogenous and the real domestic expenditure being endogenous. “Endogenous changes in domestic expenditure are allocated to aggregate consumption, investment and government expenditure according to their base year shares”. The *fourth closure rule* is the same as the third closure rule except that employment is exogenous and fixed, while real wages are endogenous.

<sup>b</sup> The neoclassical closure rule assumes the private savings rates, government consumption rate and foreign savings are exogenous, but that investment rate is endogenous.

<sup>c</sup> The Johansen closure rule differs from the neoclassical closure rule in that it assumes that the private savings rates are endogenous, but that the investment rate is exogenous.

<sup>d</sup> The foreign closure rule assumes the private savings rates, the investment rate, and government consumption are exogenous, but that foreign savings are endogenous.



Table 2.6 Sources of dynamization

Countries	Australia	Bolivia (2002a)	Bolivia (2002b)	Cameroon	Canada	Chad	Indonesia	Iran	Kazakhstan	Kuwait	South Africa	Uganda	United Kingdom	Venezuela
Study No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>No dynamization</b>	x			x		x	x		x		x			
<b>Dynamic version</b>														
Capital stock accumulation		x	x		x			x		x <sup>a</sup>		x	x	x
Adjustment costs in investment					x								x	
Population size growth		x			x						x			
Labor supply growth								x						
Oil funds											x			
Technological progress		x			x									

Notes:

<sup>a</sup> Refers to the non-oil sector only.

**Table 2.7 Aims of the studies and main results**

Study	Country	Aim of the study and main simulations	Main results
1.	Australia	Simulate two different scenarios of fall in crude oil production. The first scenario is labeled resource depletion and the second foreign payment. The resource depletion scenario is modeled as a negative technical change in the oil industry, whereas the foreign payment scenario is modeled as an increase in net crude oil imports, which is treated as a foreign payment of capital the economy is obliged to make.	As a result of the decrease in the output of oil production, real GDP and real exchange rate decrease slightly. Outputs of the export and import-competing sectors other than the oil and services sectors to the mining sector rise. The output of the services sector does not change substantially.
2.	Bolivia (2002a)	Simulate increase in natural gas sales as foreign exchange infusion. Compare effects of expected increase in natural gas sales with scenario that holds natural gas exports constant at 1997 level.	Investment into the sectors tends to buffer the negative impact of real exchange rate appreciation, allowing most of them to grow in the long-run perspective. Authors find that an overall increase in natural gas sales has a positive effect on GDP, sectoral composition, and income distribution. They find that ‘‘unless the boost in fossil fuel production can bring about a substantial rise in investment and growth, the distributional implications become much more worrisome with the possible reduction in income for some of the poorest segments of the population.’’
3.	Bolivia (2002b)	Simulate temporary doubling of the oil price and temporary 50 percent drop in oil prices during the same period.	The stabilization fund is effective in smoothing volatility in government revenues and lessening the degree of the real exchange rate appreciation. Additionally, the study suggests that strict contingent rules should be enacted as regards the timing and size of the government deposits into and withdrawals from the stabilization fund, while leaving more discretionary power to the management of the portfolio.
4.	Cameroon	Simulate increased earnings from oil exports by injecting a specific amount of foreign earnings into the economy.	The simulation results show that the agricultural sector is most likely to be hurt, whereas some of the manufacturing sectors might benefit. In addition, if the assumption of imperfect substitutability between domestic and imported goods is incorporated, not all traded sectors will contract.
5.	Canada	Examine the permanent 20-percent increase in the world price of oil.	Aggregate real GDP at factor cost decreases in the first year by 0.3 percent, but increases later on and settles in the long run at a level that is 0.4 percent higher than in the base run. The consumption index rises, the real wage decreases, and the household supply decreases. Overall, household welfare increases. The real exchange rate appreciates. Real imports and real exports decline. Real investment increases.
6.	Chad	Simulate investment of half of the oil revenue in improving road and irrigation infrastructure	Fair allocation of oil windfalls to the development of irrigation and road infrastructure might lead to sustainable development, shown by an increase in the real GDP and improvement in household welfare.
7.	Indonesia	Simulate 18-percent oil price decrease among other counterfactual scenarios	The real GDP, government revenue, government savings, and the current account surplus decrease. Government borrowing increases. The real income of households is not affected.

Table 2.7 Continued

Study	Country	Aim of the paper and main simulations	Main results
8.	Iran	Simulate alternative terminal capital stocks in non-oil sectors to determine allocation of investment over time between the modern and agricultural sectors.	The study identifies the intertemporal optimal allocation of private consumption and investment over time between the modern and agricultural sectors. The model derives time path for investment, consumption, labor, and other variables assuming different variations of the terminal stock of capital in the modern and agricultural sectors. In general, the study finds that although investment in both sectors increases over time, domestic investment decreases. Consumption grows over time.
9.	Kazakhstan	Simulate projected 113 percent increase in oil output against the background of a benchmark projection of the economy, which assumes that GDP, labor force, capital stock, and employment increase.	Oil boom leads to real exchange rate appreciation and decline in the output of most tradable sectors. Reducing the degree of real exchange rate appreciation requires tight financial and monetary policies.
10.	Kuwait	Generate the most probable future changes in the development path of the economy assuming the continuation of the same policy instruments applied during the first part of the 1980s. To simulate the medium-term path of the economy, the model assumes that oil prices, oil production, FDI, investment, government expenditure, the labor supply, and government transfers increase. In addition, the study imposes a counterfactual scenario when oil prices decline relative to the reference path.	Continuation of the current trends and policies would lessen the growth rate of the main economic indicators. Current standards of living cannot be maintained. To attain a balance between sustained growth, better living standards, and population structure, the government has to re-evaluate its development strategy.
11.	South Africa	Simulate 30-percent increase in the price of minerals in three sectors: gold, coal, and other minerals.	GDP and employment increase slightly. There are structural shifts skewed in favor of nontraded sectors and against the manufacturing sector.
12.	Uganda	Simulate permanent 12.5 percent increase in the net (grant) aid inflow into the economy, equivalent to just 2 percent of GDP at baseline domestic prices, and compare different scenarios where aid invested into public infrastructure generates an inter-temporal productivity spillover for both tradable and nontradable production.	Productivity enhancements that are skewed towards the production of domestic goods produce the largest aggregate return to aid. However, productivity biases tend to exacerbate inequality across different socio-economic groups of households. Rural households tend to receive little benefit.
13.	United Kingdom	Simulate (1) alternative budgetary methods of redistributing the proceeds of oil revenue taxes to the public, under the assumption of continuous employment, (2) a rise in energy prices under contrasting assumptions of flexible and fixed wages, (3) the discovery of oil, assuming full employment conditions	(1) A shift from current-transfer policy to a constant-transfer policy leads to stimulation of production in the traded sector in the short run. However, in the long run, the traded sector shrinks and the nontraded sector expands. (2) In the short run, when the real wage is sluggish, the traded sector grows. It shrinks when the real wage is flexible. In the long run, the results are identical whether the real wage is sluggish or flexible; (3) Tradables production shrinks and nontradables production expands. The terms of trade improve.
14.	Venezuela	Use positive and negative oil price shocks scenarios to analyze alternative configurations of the oil stabilization fund. In addition, to the role of stabilization fund to cushion downturns in the international oil markets, examine the role of stabilization funds in reducing volatility.	Frequent shifts in oil prices prevent the economy from establishing proper comparative advantages. Additionally, expectations generated during boom periods may lead to unsustainable investment patterns and ambitious government social security programs. The authors find that alternative fund configurations tend to perform better in attenuating volatility than the current fund configuration. However, one of them tends to reduce volatility by accumulating larger resources, whereas the other achieves this aim through lower accumulation of resources.

## 2.5 Non-CGE Studies on the Effects of the Resource boom in Kazakhstan

Expansion of the crude oil and natural gas sector in Kazakhstan gave rise to a debate on whether the economy of Kazakhstan presents the symptoms of the Dutch disease. There are some studies that indicate that there are no symptoms of the Dutch disease in Kazakhstan (Kalyuzhnova et al., 2004, Oxford analytica ltd., 2006; UN, 2007; Egert and Leonard, 2008) and there are some that indicate that there are already signs of the Dutch disease in Kazakhstan (e.g., Kutan and Wyzan, 2005).

The Oxford analytica ltd. (2006) indicates that strong macroeconomic policies enabled the Kazakhstani economy to manage the Dutch disease. Egert and Leonard (2008) find that non-oil manufacturing was not hurt by the oil price increases from 1996 to 2005 and that the real exchange rate appreciated primarily on the back of the nominal exchange rate appreciation. They do not find any robust evidence that oil price increases had any large effect on investment and wages in non-oil manufacturing or on the relative prices in the economy.

Kalyuzhnova et al. (2004) also find no evidence that the Kazakhstani economy presents symptoms of the Dutch disease. They state that the strong decline in the output of manufacturing, compared to its level before the collapse of the Soviet Union, was more due to transition-related reasons<sup>13</sup> than to the consequences of the expansion of crude oil and natural gas sector. After the independence was acquired, a new course of development had to be set out, a course that caused the expansion of the mining sector due to the rising prices of mining products. Hence, the oil industry did not come into existence by replacing manufacturing and thus the decrease in manufacturing production cannot be treated as the outcome of the Dutch disease (Kalyuzhnova et al., 2004). Although Kalyuzhnova et al. (2004) do not find evidence of the Dutch disease in the data they used, they do not reject that it might occur in the future.

Contrary to the above-mentioned studies, Kutan and Wyzan (2005) find evidence that the Kazakhstani economy is vulnerable to the Dutch disease. They find that the improvement in the terms of trade (TOT) leads to real exchange rate appreciation. The TOT have a significant effect on the real exchange rate after 1996, providing evidence of the Dutch disease in the data. In addition to examining the vulnerability of Kazakhstani economy to the Dutch disease, Kutan and Wyzan (2005) look for the presence of Balassa-Samuelson effect<sup>14</sup> in the data. They suggest that the Balassa-Samuelson effect may be present in the economy through the movements in the real wage. They find that the increase in the real wage leads to real exchange rate appreciation, although its impact is small. In general, they conclude that real exchange rate appreciation might be a sign of both a productivity gain and a loss of competitiveness, undermined by improvement in the terms of trade.

Other studies examine whether political economy mechanisms could turn oil wealth into resource curse (e.g., Pomfret, 2006; Esanov, 2006). Pomfret (2006) points out that oil-

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<sup>13</sup> Transition-related reasons are associated with the fact that the manufacturing sector was overrepresented than the mining sector during the Soviet Union times, because the manufacturing largely served the needs of the Soviet Union as a whole and thus when the Soviet Union broke up and the demand of the former Soviet Union countries for manufacturing goods collapsed, most of the manufacturing enterprises bankrupted.

<sup>14</sup> The Balassa-Samuelson effect implies that if the traded goods sector's productivity grows and wages are the same across sectors, then prices and wages in the nontraded sectors should rise, hence, affecting the real exchange rate.

producing regions in Kazakhstan do not appear to have experienced any sustained employment growth, and poverty and inequality remain worse in oil-producing regions than in non-oil-producing regions. Although the story is still unfolding, the study shows that political and institutional developments during the decade after independence created a situation in which political economy mechanisms could turn oil wealth into a curse. The study finds uneven redistribution of oil benefits. The oil boom led to higher living standards in the metropolitan regions rather than in the oil-producing regions. Unofficial redistribution appears to be the core mechanism for the redistribution of the oil revenues.

Esanov et al. (2006) examine reform progress in the resource-rich CIS countries, namely Azerbaijan, Kazakhstan, Turkmenistan, and Uzbekistan (AKTU for short) and compare their development to the resource-poor CIS countries. They argue that the incentives for governments to implement reforms in resource-rich economies are reduced, as this would lead to a reduction in their ability to appropriate resource rents. “The larger are rents, the less likely are reforms” (Esanov et al., 2006). For instance, despite their accumulation of natural resource rents, the AKTU countries had lower expenditures on health and education, on average, than the relatively resource-poor countries in the CIS. Kyrgyzstan, for instance, spent as much on health and education as Kazakhstan, although it can be regarded as a resource-poor country.

However, as is pointed by Esanov et al. (2006), it would be an exaggeration to perceive resource wealth as being purely a curse for the AKTU countries. For instance, large resource wealth enabled Kazakhstan and Azerbaijan to attract large amount of FDI during the first years of their independence. This in turn enhanced a business friendly environment and reform progress. However, the authors remain skeptical about the future prospects for the development in these countries, unless they improve the business climate for private enterprises in order to provide a basis for economic diversification. If the countries fail to do so, they might fall a victim to the Dutch disease and the resource curse.

Although the above-discussed studies represent a good attempt at determining whether Kazakhstan presents symptoms of the Dutch disease and/or resource curse, they are limited in the sense that they do not examine structural adjustments and factor reallocation in some detail, which would be of critical importance for designing the policies required. In order to fill this gap in the literature, this study attempts to identify the effects of the oil export price increase on the economy as a whole using a multisector CGE model.

## 2.6 Conclusions

This chapter outlined the main features of the theoretical models built around the Dutch disease. In doing so, it outlined several CGE models. Further, it reviewed several non-CGE studies on the Kazakhstani economy with regard to the Dutch disease and the resource curse. It appears that CGE modeling provides good tool for analysis of the economy-wide issues associated with the expansion of a resource sector in resource-rich countries. Despite its drawbacks, it remains the best tool available in the economic literature for analysis of the economy-wide issues of a particular shock or policy.

CGE models reviewed have different designs and different features. Most of the models assume that production in a resource sector is fixed, by assuming sector-specific factors in this sector. They do this to avoid resource movement from other sectors into a resource

sector. Note that the study on Kazakhstan (IMF, 2004) treats the petroleum sector in a similar fashion. Although the study on Kazakhstan deserves certain interest for further policy analysis, it does not consider effects that are triggered by the resource boom alone. Instead, it simulates GDP growth, technological progress, and expansion of the resource sector simultaneously, which prevents from examining the effects of the resource boom in isolation.

The models considered are static, recursively dynamic, and fully dynamic, or intertemporal. There is no agreement on which of these models outperforms the other. Static and recursively dynamic models are limited in the sense that they involve the specification of macro closure rules, which put certain constraints on some of the macro variables that have to be kept exogenous in order to solve the model. Fully dynamic models, because of their large dimensionality, suffer from small sectoral breakdowns. Conventionally, they consider fewer sectors than static models because they require greater computational effort. In addition, it is questionable whether fully dynamic models are accurate enough in addressing the effects of resource booms in the resource-rich countries in transition. Hence, given this issue, the choice of the model design depends on the researcher's preferences and her vision of the structure of the economy at hand.

The CGE model applied to Kazakhstan in this study suffers from the drawbacks described above as well. However, this model has advantages over the other models in that it employs large sectoral disaggregation and alternative macro closure rules, which thus allows it to shed light on the response of the economy to the imposed oil export price increase under these macro closure rules.

## **Chapter 3      Sectoral Development and Oil Dependence of Kazakhstan: Overview of the Economy**

### **3.1 Introduction**

Largely as a result of the inflow of foreign direct investment into the mining sector<sup>15</sup> in Kazakhstan and favorable conditions in the world markets for crude oil and metals, the mining sector turned into the dominant sector across industrial sectors. Whereas in 1990 the share of mining sector in the GDP by industry constituted only 11.2 percent, in 2007 it grew to 56.9 percent. For comparison, the share of manufacturing in the GDP by industry fell from 81.8 percent in 1990 to 37.8 percent in 2007. Although other sectors including manufacturing started to recover and expanded in the recent decade, the role of the mining sector in the development of the economy of Kazakhstan is remarkable.

The expansion of the mining sector is largely attributable to the expansion of the crude oil and natural gas sector, which has gained great importance in the recent decades in many ways. First of all, the crude oil and natural gas sector attracted considerable amount of foreign direct investment.<sup>16</sup> Second, in 2006 exports of the crude oil and natural gas accounted for about 60 percent of total exports (Usui, 2007). Third, the crude oil and natural gas sector has also been an important source of tax revenues for the national government (IMF, 2004; Agency on Statistics of the Republic of Kazakhstan, 2008b). The crude oil and natural gas sector produced sizeable tax and royalty flows to the budget (about \$5 billion since 2000), of which a significant portion has been saved in the National Fund of the Republic of Kazakhstan (IMF, 2004).

The large role of the crude oil and natural gas sector for the economy is apparent. However, continuous dependence on the crude oil and natural gas sector and oil revenues in the future might pose certain risks for economic prosperity in the form of the Dutch disease and the dependence of fiscal policy on oil revenues. Before examining the effects of the expansion of the crude oil and natural gas sector on future development, it is crucial to examine the present situation in the economy. For this purpose, this chapter aims to answer two questions. The first question is whether sectoral development in the economy is due to the Dutch disease effects or transition effects or both. The second question is to what extent is the economy dependent on oil revenues. To answer this question, the chapter examines several indicators that determine the government's stance towards oil revenues and public expenditures.

The chapter is structured as follows. Section 3.2 discusses the microeconomic and macroeconomic performance of the economy. It describes overall sectoral development and employment patterns. It briefly reviews the sources of sectoral expansion and contraction. Additionally, it discusses the management of oil revenues. It studies expenditure patterns in

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<sup>15</sup> The cumulative inward stocks of FDI in Kazakhstan constituted about 32,476 million dollars from 1990 to 2006, which amounts to 42 percent of GDP in 2006 (UNCTAD, 2007). Kazakhstan has the second best result in the CIS, after Russia in attracting cumulative FDI inflows and in FDI per capita. By 2001, 75 percent of the inward FDI flows went into the crude oil and natural gas sector (Shiells, 2003), but later they fell to 61 percent.

<sup>16</sup> About 3–4 billion dollars per annum (IMF, 2004).

particular and provides an overview of the macroeconomic performance of the economy. Section 3.3 concludes.

### 3.2 Economic Record

#### 3.2.1 Real Economic Growth

The economy of Kazakhstan registered economic growth of above 9 percent starting from 2000. Sustained economic growth was essentially driven by high commodity prices, primarily for oil and metals, by net foreign direct investment, and by consistent growth in the domestic financial sector (Kazkommertsbank, 2007). Although the economy has been developing rapidly starting from 2000, during the first years of independence it faced a deep recession. Real GDP dropped by 9.3 percent interannually (i.a.) in 1993, and continued to drop in the following years (-12.6 percent in 1994 and -8.3 percent in 1995). In 1996, the situation changed (+0.5 percent) and with the exception of the slowdown in 1998 (-1.9 percent i.a.), the subsequent years have shown positive rates of growth (Figure 3.1). In 1998, the slowdown was a result of the Asian financial and Russian currency-financial crises. In 1999 as a result of the well-timed devaluation policy of the National Bank of Kazakhstan and favorable conditions at the world markets real GDP continued to grow.

Real GDP relative to 1990 is shown in Figure 3.1.<sup>17</sup> It decreases starting from 1991. In 1995, it reaches the lowest level relative to 1990 (61.4 percent). In the subsequent period, it declines less. And finally in 2004, it exceeds its 1990 level, indicating that the economy recovered from the crisis of 1990s.

Next consider the structure of GDP by expenditures. Over the period considered, the structure of GDP was characterized by a high share of private consumption (79.5 percent in 1990 and 56.2 percent in 2007), followed by fixed investment (35.9 percent in 2007), government consumption (11.1 percent in 2007), and net exports (6.9 percent in 2007) (Figure 3.1). The share of gross fixed investment declined from 1991 to 1998. However, in the subsequent period, as a result of the improvement in the investment climate and the attraction of FDI into the economy, the share of gross fixed investment in GDP started to grow and reached 35.9 percent in 2007. The share of public expenditures in GDP did not change substantially, leveling out at around 12 percent on average. Net export was negative during the early and mid 1990s. After 1999, it started to grow and increased from 2.3 percent in 1999 to 6.9 percent in 2007. Additionally, it appears that real investment and real government consumption were very volatile across the period considered, whereas real private consumption increased along its trend (Figure 3.1).

Considering the structure of GDP by sectors, it appears that the services sector made the largest contribution to GDP (Figure 3.1). Its share in GDP increased from 48.6 percent in 1993 to 55.6 percent in 2007. Industry, the second largest sector in the beginning of 1990s, became less important. The breakup of the Soviet Union and the subsequent fall in demand for Kazakhstani traditional heavy industry products caused a large contraction of the industrial sector. Not until 1997 did it start to recover, as a result of the surge of FDI inflows into the mining sector and favorable conditions in world markets for mineral products and metals. The next sector, the construction sector expanded steadily after 1997. The boom in

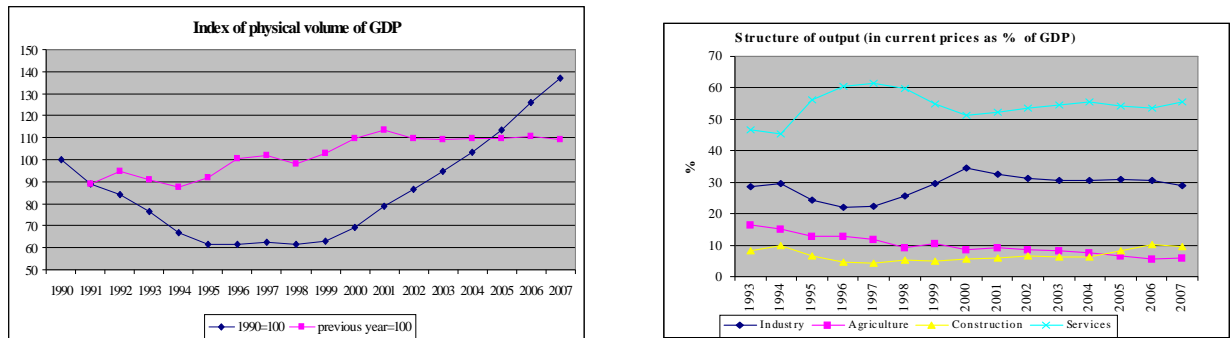
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<sup>17</sup> I show the real change in GDP relative to 1990, to compare growth rates of real GDP after 1990 with that in 1990 (pre-collapse of the Soviet Union).

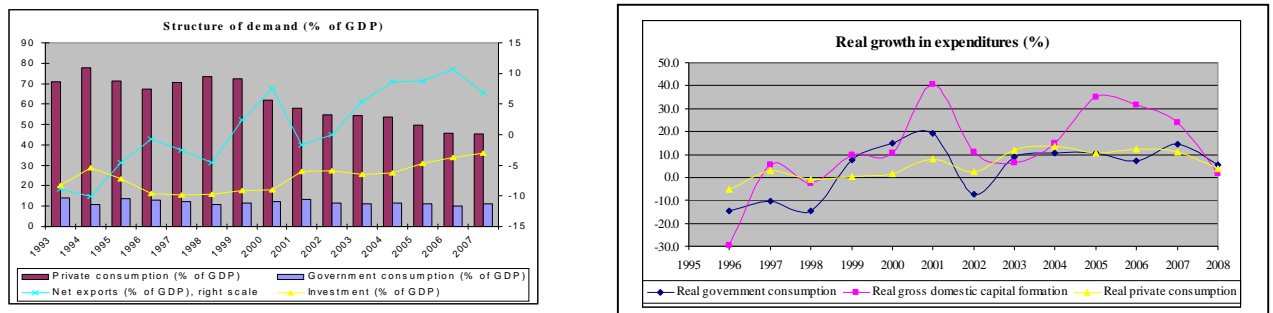


this sector was primarily triggered by the boom in the crude oil and natural gas sector and the housing bubble. And finally, the agricultural sector weakened substantially. In 2007, it contributed the least of all the sectors to GDP, namely only 5.8 percent of nominal GDP.

Figure 3.1 GDP Indicators



Source: Agency on Statistics of the Republic of Kazakhstan



Source: ADB

Note: The growth rate of real GDP is shown using an index of physical volume of GDP.

### 3.2.2 Sectoral development

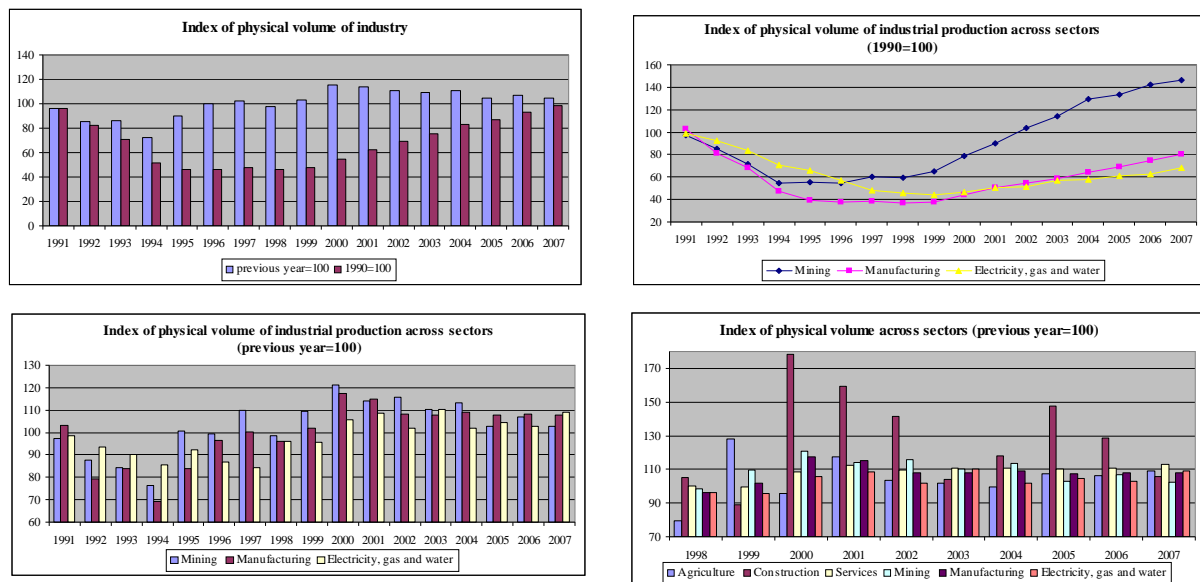
In what follows I examine sectoral development in some detail. It is crucial to examine the sectoral structure of GDP to determine whether there are signs of deindustrialization in the economy.

Industry started to recover from the crisis after 1996 and, except for 1998, it steadily increased its production (Figure 3.2). In 2007, the GDP by industry relative to the previous year grew by 5 percent, yet relative to 1990 it dropped by 1.9 percent. The sectoral composition of industry changed significantly after the 1990s. The share of manufacturing in the GDP by industry largely decreased, whereas the share of mining largely increased. If at the beginning of the 1990s the GDP by industry was overrepresented by manufacturing, which amounted to 82 percent of the GDP by industry, in 2007 the share of manufacturing in the GDP by industry fell to 41 percent (Agency on Statistics of the Republic of Kazakhstan, 2008c). The share of mining in the GDP by industry, on the other hand, increased from 32 percent in 1998

to 53 percent in 2007 (Table 3A.1 in Appendix 3A), with the crude petroleum and natural gas sector turning into the dominant sector.

In contrast to other industrial sectors, the mining sector surpassed its 1990 level. Although the manufacturing and electricity and gas and water (or utilities) sectors grew on a yearly basis, they lagged far behind, falling to 80.6 and 68.1 percent of their 1990 levels in 2007, respectively (Figure 3.2). This was primarily due to the collapse of the Soviet Union and hence the collapse of the Soviet Union’s demand for the products of the manufacturing and utilities sectors, which brought about a correction of their over-industrialization. Table 3A.2 in Appendix 3A shows the physical volume of GDP across industrial sectors relative to previous year. Overall, the mining, manufacturing, and utilities sectors expanded, although the mining sector outgrew the manufacturing and utilities sectors.

**Figure 3.2 Indicators of sectoral development**



Source: Agency on Statistics of the Republic of Kazakhstan

Agriculture started to recover slightly later than industry, starting in 1999 (Figure 3.2). The recovery in agriculture was largely driven by favorable weather conditions that yielded a bumper harvest, and by higher productivity that stemmed from investment made under the aegis of a 3-year state rural revival program (ADB, 2006). Although agriculture started to recover, its output in 2007 was only 91.7 percent of what it was in 1991 (Agency on Statistics of the Republic of Kazakhstan, 2008c). Despite the government incentives to boost it, it is still a laggard sector. There are two groups of factors that largely explain its laggardness. The first group of factors relates to a technological process of production in agriculture that is primarily associated with a persistent level of undercapitalization and a heavy dependence on manual labor. The second group of factors relates to the transitional changes in the economy that are primarily associated with market pricing, unsubsidized transport, loss of the Soviet market, and the necessity of making adjustments to institutional changes (Filin, 2006; Oxford analytica Ltd., 2006).

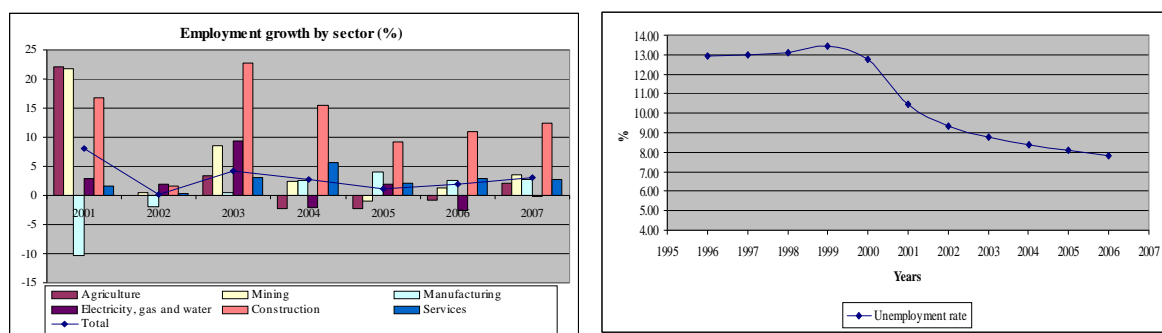
The services and construction sectors started to expand starting from 1999 and 2001, respectively (Figure 3.2). The increase in the output of the services and construction sectors

was primarily driven by the improvement in the living conditions and in the real wage overall, which in turn was caused by the increase in oil wealth and the expansion of banking sector. In the sectoral composition of services, the output of real estate services, services provided to households, computer-related services, transport services, telecommunication services, and trade services increased substantially (ADB, 2006). Overall, services and construction sectors played a large role in strengthening GDP.

Since the manufacturing and agricultural sectors have been growing in the recent decade, it appears that there are no clear signs of “absolute deindustrialization”<sup>18</sup> (negative manufacturing growth) and no absolute contraction of the agricultural sector. As was discussed above, the manufacturing and agricultural sectors have been steadily increasing their production since 1999. Negative growth in both sectors was observed only until the end of 90s, after which both sectors exhibited positive growth. Therefore, there is no evidence of contraction in the outputs of either sector in a clear sense. However, there was a decline in employment in manufacturing in 2001 and 2002 and in agriculture from 2004 to 2006 (Figure 3.3). But this trend can be the result of an increase in productivity in the manufacturing and agricultural sectors and does not necessarily signify a labor movement out of the manufacturing and agricultural sectors.

That there is no evidence of “absolute deindustrialization” and/or an absolute decline in the output of the agricultural sector does not necessarily reject the presence of the Dutch disease in the data. The theory of the Dutch disease addresses the effects of the boom in the mining sector under ceteris paribus assumption, which does not take into account other factors that have a positive effect on the non-mining traded sectors and that might offset the negative effect of the mining boom on these sectors. In light of this issue, the presence of the Dutch disease in the economy might be observed as slower growth in the manufacturing and agricultural sectors than in other sectors, i.e., as a “relative deindustrialization”<sup>19</sup> and a relative slowdown in the output of agricultural sector.

**Figure 3.3 Employment growth and unemployment rate**



Source: Agency on Statistics of the Republic of Kazakhstan, ADB

Starting from 2000, except for 2003 and 2007, growth in the construction sector outpaced not only growth in the manufacturing and agricultural sectors, but also growth in the mining

<sup>18</sup> The terminology is borrowed from the study of Oomes and Kalcheva (2007).

<sup>19</sup> The terminology is borrowed from the study of Oomes and Kalcheva (2007).

sector. Starting from 2005, growth in the services sector outpaced growth in the manufacturing, agricultural, and mining sectors. Given that the services and construction sectors might be treated as nontraded sectors in general, the relative expansion of these sectors signifies an increase in the relative size of the nontraded sectors. In addition, employment growth in the construction sector outweighed that in other sectors, including the mining sector starting from 2003 (Figure 3.3). This implies that the data might be consistent with a weaker version of the Dutch disease hypothesis.<sup>20</sup>

However, the “relative deindustrialization” and relative slowdown in the output of the agricultural sector cannot necessarily be regarded as symptoms of the Dutch disease. They might have occurred for other transition-related reasons. As was mentioned above, the manufacturing and agricultural sectors in Kazakhstan were highly subsidized during the Soviet times and were highly uncompetitive. The breakup of the Soviet Union and the collapse of the Soviet Union market effected a correction of the over-industrialization and overexpansion of the agricultural sector. Whereas the services sector was not much developed during Soviet times, it started to grow after independence was acquired. Thus, a “transition effect” can also be responsible for the “relative deindustrialization” in Kazakhstan.

Whether this “relative deindustrialization” is due to the transition-related reasons or presence of the Dutch disease remains an open question. As was mentioned in previous chapter, there are some studies that do find evidence of the presence of the Dutch disease (e.g., Kutan and Wyzan, 2005) and some do not (Egert and Leonard, 2008). To shed more light on this issue, further studies are necessary. Although the trends in the economy might be due to the transition-related reasons and/or the Dutch disease, certain measures urgently need to be taken that will diminish the economy’s dependence on the mining sector and that will diversify the economy. This would not be so problematic if the prices for oil and metals were constantly rising over time. In this case, it would be optimal for the economy to specialize on the production of mining products. However, in reality, the prices of mining products are highly volatile. Therefore, it would be optimal to diversify the economy away from the mining sector in order to decrease its losses resulting from adverse terms of trade shocks.

### 3.2.3 Macroeconomic Indicators

This section examines the dependence of the economy on oil revenues and overall performance of the economy of Kazakhstan through a macroeconomic prism. For this purpose, it looks at several indicators that determine the government’s stance towards its revenues and expenditures, its trade balance, its foreign indebtedness and the presence of the Dutch disease in the economy.

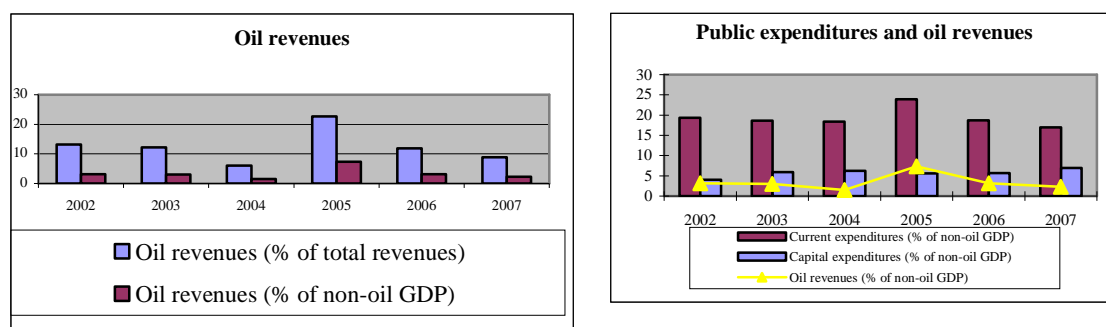
In general, the government maintained prudent policy with respect to its oil revenues and its public expenditures. In the recent decade, oil revenues that accrued to the public budget constituted less than 25 percent of total revenues (Figure 3.4). The largest portion of the oil revenues was not allocated for public consumption, but was saved in the National Fund of the Republic of Kazakhstan (hereafter NFRK). In 2009, the oil revenues saved in the NFRK amounted to 20.7 percent of GDP (Table 3B.1 in Appendix 3B). Government current and capital expenditures did not exceed 25 percent of non-oil GDP. For comparison, the government current expenditures and capital expenditures in Nigeria, also a large producer of

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<sup>20</sup> This is similar to what has been observed in Russia (Oomes and Kalcheva, 2007).

crude oil, were about 43 percent and 20 percent of non-oil GDP, respectively, in 2004. Obviously, this is much larger than current expenditures and capital expenditures in Kazakhstan. This shows that the Kazakhstani government pursued a conservative policy with respect to its oil revenues and expenditures and performed relatively well compared to other oil-rich countries in general.

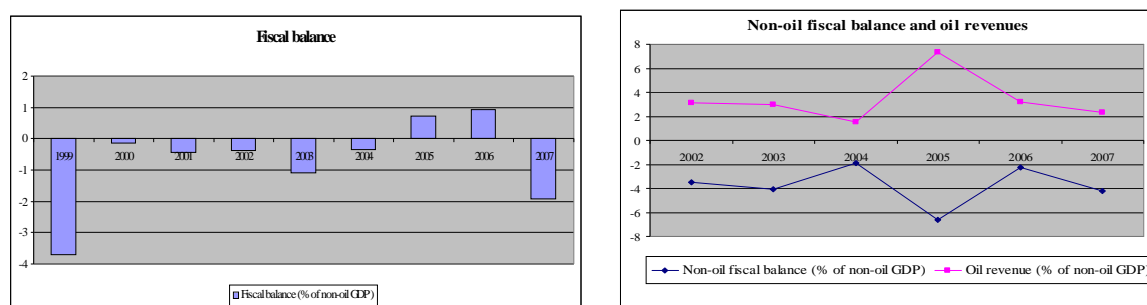
**Figure 3.4 Use of oil revenues**



Source: Agency on Statistics of the Republic of Kazakhstan

To examine the government's fiscal stance, it is crucial to decompose the overall budget balance into an oil and a non-oil balance (Barnett and Ossowski, 2002). For these reasons, I show the overall fiscal balance as percent of non-oil GDP and the non-oil fiscal balance<sup>21</sup> as percent of non-oil GDP (Figure 3.5).

**Figure 3.5 Fiscal balance indicators**



Source: Agency on Statistics of the Republic of Kazakhstan

The ratio of the fiscal balance to non-oil GDP has been manageable. The highest fiscal deficit was recorded in 1999, representing about 3.7 percent of non-oil GDP. In the subsequent years, the fiscal deficit was below 2 percent, except for 2005 and 2006, when the economy ended up

<sup>21</sup> Non-oil fiscal balance is defined as the difference between non-oil budget revenues and budget expenditures.

with a fiscal surplus. In 2007, the deficit was largely attributable to the financial support provided to the economy by the state because of the beginning financial crisis (Guskov and Dauranov, 2009). Overall, the fiscal balance has been kept within an admissible range, although there are some studies that show that the amount of revenues and fiscal expenditures were larger than optimal (Guskov and Dauranov, 2009).

The ratio of the non-oil fiscal deficit to non-oil GDP was within an admissible range as well. Throughout the period considered, it was below 7 percent (Figure 3.5). This is lower than the ratio for Nigeria, which was above 10 percent from 1981 to 2005 (Budina et al., 2007). To trace the dependence of the fiscal balance on oil revenues, I plot the non-oil fiscal balance versus oil revenues (Figure 3.5). It appears that the non-oil deficit is dependent on oil revenues, albeit not substantially. In periods when oil revenues increase (e.g., in 2005), the non-oil deficit increases. When oil revenues decrease, the government decreases its expenditures.

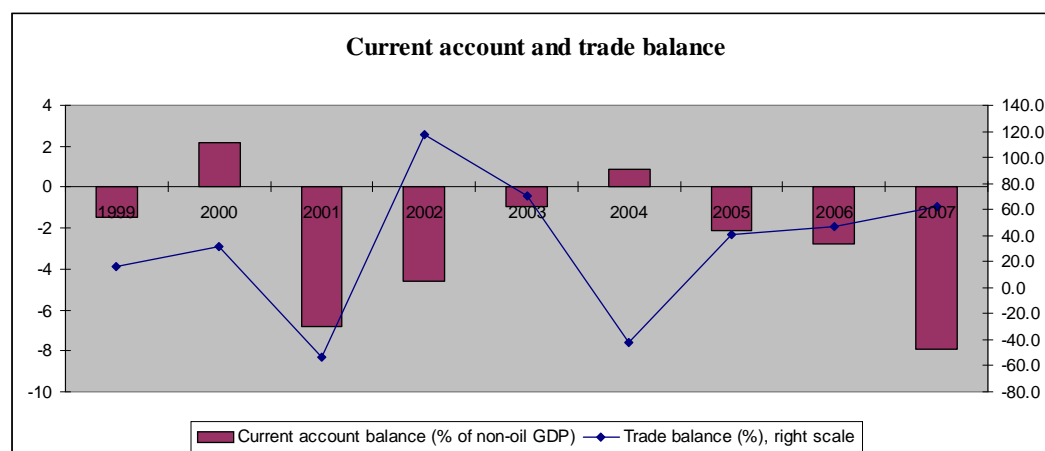
Usui (2007) attributes this relatively low dependence of the government expenditures on the oil revenues to the NFRK. The NFRK pursues a policy of stabilization and the accumulation of the oil revenues when oil prices rise above a predetermined level. As was emphasized by Usui (2007), although the NFRK is allowed to transfer funds to the budget, subject to the president's approval, it has never done so, which eventually caused a large amount of oil revenues to accumulate in the NFRK. In the coming years, the government aims to finance its budget expenditures solely from non-oil revenues, transferring all oil revenues to the NFRK. This is a timely and necessary step that would provide more incentives to develop the non-oil industries and diversify the economy away from the oil sector.

Next, I examine the trade balance and the current account balance. The trade balance has been always positive, except for 2001 and 2004, when it declined by 53.5 percent and 42 percent, respectively, relative to previous years (Figure 3.6). In contrast, the current account has been negative, except for 2000 and 2004. The trade balance has been positive because exports have been higher overall than imports due to high commodity prices, in particular due to high prices for crude oil and metals. In 2001 and 2004, the trade balance declined, since imports soared in these two years due to strong demand and a strong domestic currency (Jyske bank, 2007). The negative current account balance was primarily driven by a large and rising deficit on the income balance. Kazakhstan has attracted large inflows of FDI into the economy, and therefore it is the payment of dividends to profit investors and payments by Kazakhstani banks<sup>22</sup> that have led to a deficit on the income balance (Jyske bank, 2007; Rabobank, 2007). In the light of this, it appears that the "voracity effect"<sup>23</sup>, a concept introduced by Tornell and Lane (1998) is not relevant for Kazakhstan. The negative current account balance was not driven by volatility in public spending, but rather by volatility in private consumption.

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<sup>22</sup> Kazakhstani commercial banks have largely borrowed from abroad. This trend is discussed in the text to follow.

<sup>23</sup> The voracity effect implies that "if a shock generates a windfall of  $x$  percent of GDP, then aggregate absorption increases by more than  $x$  percent – even if the shock is perceived to be temporary. As a result, current account deterioration takes place and a greater share of resources ends up used inefficiently. In other words, the windfall is a curse" (Tornell and Lane, 1998).

**Figure 3.6 Current account and trade balance**

Source: Agency on Statistics of the Republic of Kazakhstan and ADB

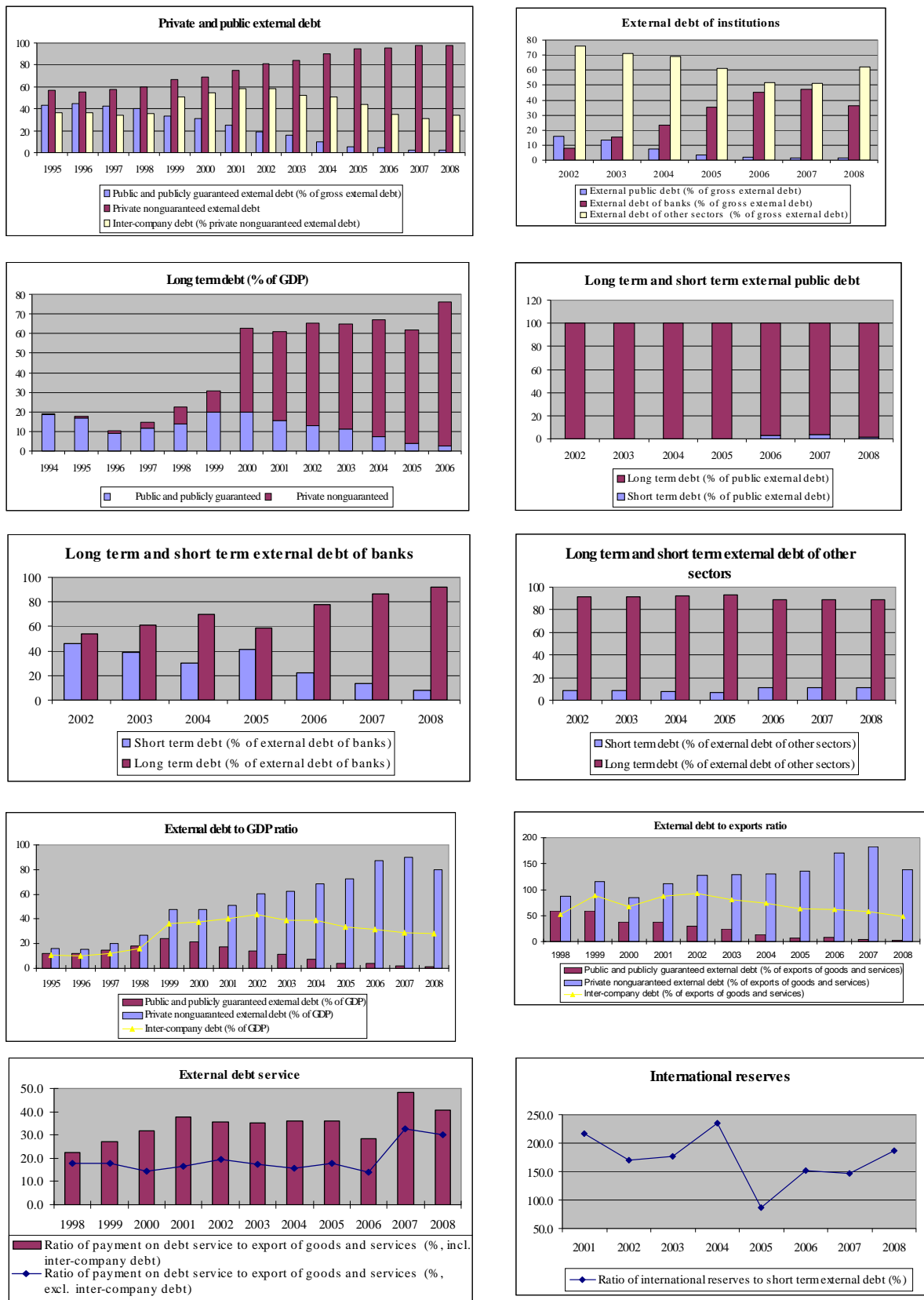
Next, I analyze the foreign indebtedness of Kazakhstan. The government of Kazakhstan pursued a tough and prudent policy with respect to its foreign indebtedness. External public and publicly guaranteed debt declined steadily from 43 percent of gross external debt in 1995 to 2 percent in 2008. External public and publicly guaranteed debt fell from 12.3 percent of GDP in 1995 to 1.6 percent in 2008 (Figure 3.7). This was primarily due to the fact that in 2000, the government of Kazakhstan completely repaid its debts to the IMF by paying back about 385 million dollars, seven years ahead of schedule, and the fact that, overall, the government of Kazakhstan pursued a conservative policy towards its foreign indebtedness. This is very important to emphasize given that some oil-rich countries went off on the wrong track by building up enormous debts during a bonanza period and then experienced severe problems in servicing them (e.g., Nigeria).

Although the government has performed well in general, private institutions have accumulated enormous external debt, which has worsened the external debt position of Kazakhstan overall. Private nonguaranteed debt escalated from 57 percent of total external debt in 1995 to 98 percent in 2008. Private nonguaranteed debt increased from 16.3 percent of GDP in 1995 to 79.9 percent in 2008. Private nonguaranteed debt is largely represented by intercompany debt, which amounts to about one-third of private borrowing in 2008 (Figure 3.7). Excluding intercompany debt from the total amount of external debt, total debt-to-GDP appears to be manageable. Improvement in the investment climate and the sovereign rating, as well as in the interest rate differential between foreign borrowing and domestic lending, boosted external borrowing by private institutions (ADB, 2006).

Public and publicly guaranteed debt maturity does not raise concern. It is primarily represented by long-term debt. However, the external debt of private banks was largely short-term until 2005 (e.g., it was 41 percent of the total external debt of banks). Not until 2005 did it start to decrease, falling to about 8 percent of the total external debt of banks in 2008.

Although the external debt is largely due to private non-guaranteed borrowing, it gave rise to concerns in the international community. Given this situation, Fitch Ratings downgraded its rating of the Kazakhstani assets in foreign currency from BBB (stable) in 10.2007 to BBB- (negative) in 11.2008.

Figure 3.7 Parameters of external debt

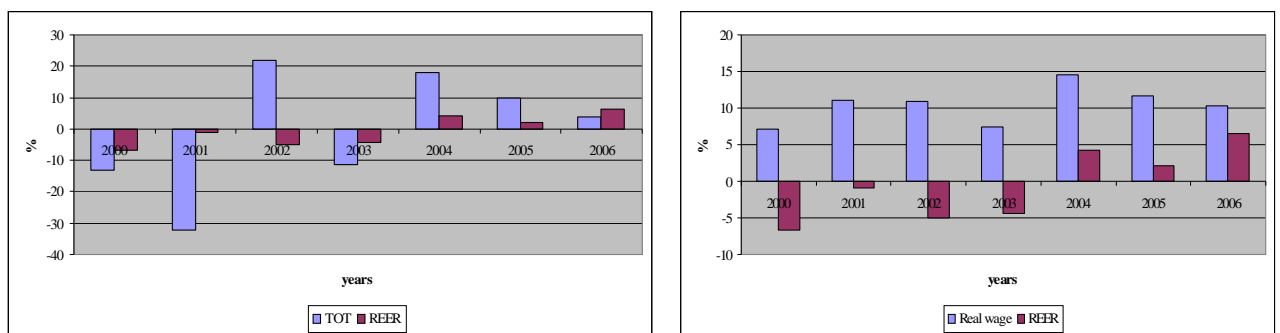


Source: National Bank of Kazakhstan, ADB



Now, I examine whether there is a link between the real effective exchange rate (REER) and the terms of trade (TOT) (Figure 3.8). Note that an increase in the REER is associated with real appreciation, and decrease in the REER with real depreciation. From 2000 to 2003, the REER had been depreciating, and as of 2004 it has been appreciating. The TOT worsened in 2000, 2001, and 2003, and improved in 2002 and from 2004 onwards. It appears that there is a link between the TOT and the REER, when the TOT improve the REER increases and when the TOT worsen the REER decreases. This relationship between these variables might represent a symptom of the Dutch disease. Although the extent of real exchange rate appreciation is small, it might increase in the future.

**Figure 3.8 REER versus terms of trade and real wage**



Source: National Bank of Kazakhstan and Agency on Statistics of the Republic of Kazakhstan

Note: Figures represent percentage changes with respect to the previous period. Terms of trade are calculated as a ratio of export price index over import price index. Increase in REER implies real appreciation and decrease in it real depreciation of the domestic currency

Additionally, Figure 3.8 provides a snapshot of the link between the real wage and the real effective exchange rate. The figure does not provide clear evidence of the presence of the Balassa-Samuelson effect, because the real wage index increases over time, whereas the REER appreciates in some periods and depreciates in some periods. But it might well be possible that the REER responds with a lag to changes in the real wage index, although this is difficult to determine here.

The presence of the Balassa-Samuelson effect is largely examined by Kutan and Wyzan (2005), although the studied period is different. Their study covers the period from 1994 to 2000. In their study, they find that the Balassa-Samuelson effect is present in the data, although the impact of the real wage on the REER is small. The question of whether the Balassa-Samuelson effect increases or remains small remains open. I leave this question to an interested reader to answer. In the chapters to follow, I focus on the effects of an increase in the oil export price for the economy, given that the link between the TOT and the REER and the growing importance of the crude oil and natural gas sector cannot be ignored.

### 3.3 Conclusions

The analysis in this chapter shows that the Kazakhstani economy has been performing well in terms of its micro and macro indicators. I do not find clear evidence of “absolute deindustrialization” or an absolute decline in the output of agriculture. Manufacturing and agriculture have been growing along with other sectors as well. However, I do observe “relative deindustrialization” and relative slowdown in the output of agriculture. But this need not necessarily be a symptom of the Dutch disease. It might well be due to the “transition effect,” which was brought about by the collapse of the demand of the Soviet Union for Kazakhstani manufacturing and agricultural products. But nevertheless, given the growing importance of the crude oil and natural gas sector that the Dutch disease problem might occur in the future cannot be ignored. Therefore, the effects of the expansion of the crude oil and natural gas sector should be studied in some detail.

Macroeconomic indicators that show the extent of the economy’s dependence on the oil sector verify that the economy has been performing well. Substantial oil funds have been accumulated, the dependence of public budget on oil revenues has been reduced and a diversification of the economy away from the crude oil and natural gas sector into non-oil sectors has been launched. These trends in the economy indicate that the stance of the government towards its expenditures and oil revenues is proper.

The overview presented in this chapter gives further incentives to analyze the effects of the expansion of the crude oil and natural gas sector as a result of the oil export price increase. The next chapters will discuss the effects of the oil export price increase in the framework of stylized models, which will be followed subsequently by the application of a CGE model to the Kazakhstani economy.

## Appendix 3A Indicators of development of industry

**Table 3A.1 Structure of industrial production (%)**

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<b>Industry</b>	100	100	100	100	100	100	100	100	100	100
<b>Mining</b>	32.4	37	40	37.3	41.2	41.6	46.5	53	54.6	53.2
Mining of fuel and energy producing minerals	19.3	25.3	31.2	28.9	33.1	33.7	39.1	46.8	48.5	47
--Mining of coal and lignite, extraction of peat	5.2	3.2	2.8	2.8	2.7	1.9	1.9	1.6	1.8	1.7
--Extraction of crude petroleum and natural gas; services incidental to petroleum and gas extraction	14.1	22.1	28.4	26.1	30.4	31.8	37.2	45.2	46.7	45.3
Mining industry, excluding mining of fuel and energy producing minerals	13.1	11.7	8.8	8.4	8.1	7.9	7.4	6.2	6.1	6.2
--Mining of metal ores	11.9	10.7	8	7.3	7.1	6.6	6.2	5.1	4.8	5.4
--Other branches of mining	1.2	1	0.8	1.1	1	1.3	1.2	1.1	1.3	0.8
<b>Manufacturing</b>	49.3	49.9	50.6	53.6	49.1	48.9	45.5	40.4	39.3	40.7
Processing of food products, including beverages and tobacco	16	17.2	13	13.4	12.5	12.5	10.2	9.1	7.7	8.1
Textile and sewing products	2.4	3.3	2.4	2.3	1.9	1.7	1.2	1	0.8	0.6
Manufacture of leather, products of leather and manufacture of footwear	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Processing of wood and manufacture of wood products	0.5	0.6	0.5	0.7	0.7	0.2	0.2	0.2	0.2	0.2
Manufacture of paper and paperboard; publishing	0.6	0.5	0.8	1	1.1	1.2	1.3	1.4	1.2	1.2
Manufacture of coke, refined petroleum products and nuclear materials	4.6	3.8	4.5	6.7	5.1	5	3.5	3.2	3	2.9
Chemical industry	1.2	1	0.9	1.4	1.4	1.4	1.1	0.9	0.8	1
Production of rubber and plastic products	0.2	0.3	0.2	0.3	0.3	0.4	0.5	0.5	0.5	0.6
Manufacture of other non-metallic mineral products	1.3	1.2	1	1.2	1.4	1.8	1.5	1.8	1.9	2.7
Metallurgy industry and manufacture of fabricated metal products	17.8	17.9	23.8	22.4	20.7	20.4	21.4	17.7	18.5	18.5
Machine-building	2.1	1.7	1.5	1.3	1.2	1.6	1.4	1.3	1.1	1.5
Manufacture of electrical equipment, electronic and optical devices.	1.1	0.9	0.7	0.8	0.8	0.9	0.9	0.8	0.8	0.8
Production of transport means and equipment	1	1	0.7	1.4	1.2	1.1	1.5	1.8	2	1.9
Other branches of manufacturing	0.3	0.3	0.4	0.5	0.6	0.6	0.7	0.6	0.7	0.6
<b>Production and distribution of electro energy, gas and water</b>	18.3	13.1	9.4	9.1	9.7	9.5	8	6.6	6.1	6.1
Min	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Max	17.8	22.1	28.4	26.1	30.4	31.8	37.2	45.2	46.7	45.3

Source: Agency on Statistics of the Republic of Kazakhstan

**Table 3A.2 Volume indices of production by types of economic activity (previous year=100)**

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<b>Industry</b>	97.6	102.7	115.5	113.8	110.5	109.1	110.4	104.8	107.2	105
<b>Mining</b>	98.5	109.6	121	114	115.9	110.2	113.4	102.7	107	102.6
Mining of fuel and energy producing minerals	101.2	109	118.3	115.3	116.9	110.3	114.9	104.2	106.4	103
--Mining of coal and lignite, extraction of peat	96	83.7	128.4	105.7	93.1	115	102.4	99.7	111.3	101.2
--Extraction of crude petroleum and natural gas; services incidental to petroleum and gas extraction	101.8	114.4	115.8	115.1	117.4	108.3	113.6	102.9	106.1	102.6
--Extraction of natural combustible gas	95.6	135	125	101.5	121.2	122.5	124.6	106.1	104.6	104.5
Mining industry, excluding mining of fuel and energy producing minerals	94.4	110.9	130.6	106.8	110.5	108.9	102.5	91.5	111.7	99.6
--Mining of metal ores	60.9	101.4	191.7	94.3	115.3	116	106.3	82.9	113.8	102.8
--Other branches of mining	106	117.1	117.5	106.2	108.3	104.5	98.2	93.1	104.6	95.5
<b>Manufacturing</b>	96	102	117.4	115	108.1	107.9	109.2	107.6	108.1	107.8
Processing of food products, including beverages	98.7	91.4	116.1	108.2	108.7	110.7	109.4	117	107.7	107.4
Tobacco products	90.2	86.3	102.8	110.9	109.6	109.6	109	107	102.8	102.2
Textile and sewing products	89.6	103.1	121.7	125.6	115.7	95.4	103.4	114	102.7	81.6
Manufacture of leather, products of leather and manufacture of footwear	98.8	103.1	173.9	286.3	134.9	127.8	122.2	92.3	110.5	167
Processing of wood and manufacture of wood products	88.8	102.9	133.8	120	124.7	119.6	91.8	114.4	91.3	109.1
Manufacture of paper and paperboard; publishing	93.6	86.7	109.6	140.4	124.4	105.1	117.6	131.4	115.8	106.7
Manufacture of coke, refined petroleum products and nuclear materials	90.8	88.6	117.1	119.4	108.6	113.3	104.3	116.2	104.7	109.2
-- Manufacture of petroleum products	92.6	71.2	103.8	123.7	109.8	113.4	104.9	118.6	104	108.3
Chemical industry	61	105.9	118.6	161.3	113.4	117.6	111.7	95.3	103.6	128.6
Production of rubber and plastic products	192.6	184.9	142.3	130.8	160.4	140.5	155.9	125.2	132.2	132.2
Manufacture of other non-metallic mineral products	106.8	96.1	138.6	146.1	117.5	128.8	129.3	135.5	119.6	124.4
Metallurgy industry and manufacture of fabricated	100.5	116.7	116.3	108.4	106.4	100.3	104.7	93.7	105.4	103
-- Ferrous metallurgy	87.5	134.9	118.9	101.8	107.9	107.6	105	89.2	101.4	111.5
-- Nonferrous metallurgy	110.6	103.7	113.9	113.6	105	93.1	103.1	96.1	106.3	98.3
Metal products	57.7	78.2	137.9	69	96.4	122.7	104.1	102	130.3	115.7
Machine-building	69.5	113.6	179.9	141.2	109.6	121.6	131.7	124.7	119.4	114.6
Other branches of manufacturing	68.2	70	164.3	150.2	115	153.8	140.2	123.2	100.1	117.4
<b>Production and distribution of electro energy, gas and water</b>	96.1	95.7	105.8	108.6	101.9	110.3	102	104.4	102.8	109.2
Max	192.6	184.9	191.7	286.3	160.4	153.8	155.9	135.5	132.2	167
Min	57.7	70	102.8	69	93.1	93.1	91.8	82.9	91.3	81.6

Source: Agency on Statistics of the Republic of Kazakhstan

## Appendix 3B Overview of the incomings and expenditures of the National Fund of the Republic of Kazakhstan

### Table 3B.1 Dynamics of the incomings and expenditures of the National fund of the Republic of Kazakhstan

Name	2003			2004			2005			2006			2007			2008			2009 year (reported on 15.04.)		
	mln. tenge	mln. \$	% of GDP	mln. tenge	mln. \$	% of GDP	mln. tenge	mln. \$	% of GDP	mln. tenge	mln. \$	% of GDP	mln. tenge	mln. \$	% of GDP	mln. tenge	mln. \$	% of GDP	mln. tenge	mln. \$	% of GDP
<b>Incomings to NFRK</b>	<b>229,551.3</b>	<b>1,535.5</b>	<b>5.0</b>	<b>139,313.0</b>	<b>1,024.4</b>	<b>2.4</b>	<b>413,713.7</b>	<b>3,113.4</b>	<b>5.5</b>	<b>774,306.7</b>	<b>6,140.9</b>	<b>7.6</b>	<b>1,139,270.3</b>	<b>9,292.6</b>	<b>8.9</b>	<b>1,652,527.3</b>	<b>13,736.7</b>	<b>10.4</b>	<b>424,622.9</b>	<b>2,830.8</b>	<b>2.5</b>
- from oil sector	123,615.3	826.9	2.7	120,792.9	888.2	2.1	343,635.4	2,586.1	4.5	672,113.9	5,330.4	6.6	1,037,942.2	8,466.1	8.1	1,717,153.7	14,273.9	10.8	424,518.6	2,830.1	2.5
- from privatization of state property, hold by the republican property and related to mining and manufacturing sectors	56,748.4	379.6	1.2	1,513.6	11.1	0.0	9,793.0	73.7	0.1	12,563.0	99.6	0.1	0.1	0.0	0.0				0.3	0.0	0.0
- from sales of soil by government to private property	22.5	0.2	0.0	1,415.8	10.4	0.0	2,172.1	16.3	0.0	3,976.0	31.5	0.0	5,407.1	44.1	0.0	1,611.1	13.4	0.0	104.0	0.7	0.0
10% of official transfers to the Fund	12,496.7	83.6	0.3	9,309.7	68.5	0.2	13,657.7	102.8	0.2	10,617.2	84.2	0.1									
- investment income from the management of the Fund	4,043.6	27.0	0.1	-13,526.5	-99.5	-0.2	44,455.5	334.6	0.6	75,035.6	595.1	0.7	95,921.0	782.4	0.7	-66,237.5	-550.6	-0.4			
- other incomes and incomings not forbidden by the legislature	32,624.7	218.2	0.7	19,807.5	145.6	0.3				0.9	0.0	0.0									
<b>Use of the incomings of the Fund</b>	<b>428.4</b>	<b>2.9</b>	<b>0.0</b>	<b>524.2</b>	<b>3.9</b>	<b>0.0</b>	<b>725.0</b>	<b>5.5</b>	<b>0.0</b>	<b>918.9</b>	<b>7.3</b>	<b>0.0</b>	<b>259,317.4</b>	<b>2,115.2</b>	<b>2.0</b>	<b>1,075,095.3</b>	<b>8,936.8</b>	<b>6.8</b>	<b>250,784.9</b>	<b>1,671.9</b>	<b>1.5</b>
- guaranteed transfer to the republican budget													258,000.0	2,104.4	2.0	461,400.0	3,835.4	2.9	250,000.0	1,666.7	1.5
<i>share (%) of assets of the National fund by the end of the financial year, preceding the year of devising republican budget</i>													23.9			24.9			9.1		
-attraction of not used part of guaranteed transfer from 2007																3,521.3	29.3	0.0			
- compensation of the budget losses																					
- expenditures, associated with the management of the Fund	428.4	2.9	0.0	524.2	3.9	0.0	725.0	5.5	0.0	918.9	7.3	0.0	1,317.4	10.7	0.0	2,674.0	22.2	0.0	784.9	5.2	0.0
Transfer according to the Decree of the President of Kazakhstan																607,500.0	5,049.9	3.8			
<b>Total revenues of National fund for the fiscal year</b>	<b>229,122.8</b>	<b>1,532.6</b>	<b>5.0</b>	<b>138,788.7</b>	<b>1,020.5</b>	<b>2.4</b>	<b>412,988.7</b>	<b>3,108.0</b>	<b>5.4</b>	<b>773,387.8</b>	<b>6,133.6</b>	<b>7.6</b>	<b>879,952.9</b>	<b>7,177.4</b>	<b>6.8</b>	<b>577,432.0</b>	<b>4,799.9</b>	<b>3.6</b>	<b>173,838.0</b>	<b>1,158.9</b>	<b>1.0</b>
<b>Revenues of the National Fund at the end of the fiscal year</b>	<b>528,233.4</b>	<b>3,533.3</b>	<b>11.5</b>	<b>667,022.2</b>	<b>4,904.6</b>	<b>11.4</b>	<b>1,080,011.0</b>	<b>8,127.7</b>	<b>14.2</b>	<b>1,853,398.4</b>	<b>14,699.0</b>	<b>18.1</b>	<b>2,733,351.3</b>	<b>22,294.9</b>	<b>21.3</b>	<b>3,310,783.3</b>	<b>27,521.1</b>	<b>20.8</b>	<b>3,484,621.3</b>	<b>23,230.8</b>	<b>20.7</b>
<i>Additionally:</i>																					
GDP, bln. tenge			4,612.0			5,870.0			7,590.6			10,213.7			12,850.0			15,907.0			16,865.2
Average annual exchange rate of tenge w.r.t. dollar			149.5			136			133			127.0			127.0			121.5			150.0

Source: National Bank of Kazakhstan

## Chapter 4 One-Sector and Two-Sector Stylized Model: Analysis of Export Prices Increases

### 4.1 Introduction

In this chapter, I apply the 1-2-3 model of Devarajan et al. (1990) and develop a stylized model to trace the effects of the increase in the world price of an export good in general and the increase in the oil export price<sup>24</sup> in particular. I use the 1-2-3 model of Devarajan et al. (1990) because it represents a consistent framework for the analysis of general types of shocks such as an increase in the world price of an export good, which is useful to examine before the effects of a particular type of shock such as an oil export price increase are considered.

I develop a stylized model that examines the effects of the oil export price increase because the literature in this area suffers from certain shortcomings. *Firstly*, it uses the Salter-Swan framework, which does not incorporate two-way trade<sup>25</sup> via assuming pure traded or nontraded sectors (e.g., Corden and Neary, 1982; Corden, 1984; Neary and van Wijnbergen, 1986). Incorporation of two-way trade in the model is important given that the extent of tradability of some good might be an important factor that determines the extent of the influence of an oil export price increase on the sector producing this good. Or *secondly*, even if the literature incorporates two-way trade, it considers the oil sector an enclave, and thus circumvents considering factor movement across the oil and non-oil sectors (e.g., Benjamin et al., 1989). Thus, to overcome the shortcomings in the literature, it is necessary to reassess the existing models via incorporating two-way trade and factor movement into the model.

For these purposes, I develop a stylized model that assumes two sectors: the oil sector and the non-oil sector, which employ labor and capital in production. I assume that labor is perfectly mobile, while capital is sector-specific, thus assuming only labor movement across sectors. The model assumes two oil goods, i.e. exported oil and domestic oil, and two non-oil goods, i.e. a domestic non-oil good and imported non-oil good. In this model two types of oil goods are transformable into each other and two types of non-oil goods are substitutable for each other.

There are a number of possible combinations of assumptions about the transformability and substitution between goods that might be considered and I have chosen to concentrate on this combination that appears to be the most appealing.<sup>26</sup> To summarize it again, the model

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<sup>24</sup> I consider an increase in the oil export price in foreign currency units. I refer to it to as the oil export price for brevity.

<sup>25</sup> The two-way trade is conventionally introduced in the model using the Armington approach, which assumes that there is a substitutability (transformability) between imported and domestic goods (between exported and domestically sold goods).

<sup>26</sup> I do not consider models that incorporate assumptions about transformability and substitutability for both the oil and non-oil goods because this might lead to a loss of tractability. To retain a simple framework and obtain analytical solutions, I concentrate on the combination incorporated in this model. The case when non-oil goods are both transformable and substitutable is considered in Chapter 5.

assumes transformability between oil goods and substitutability between non-oil goods. I perform this analysis to identify how the assumption of the two-way trade might affect the results.

The results of the two-sector stylized model shows that there are two effects generated by the oil export price increase, namely a *balance-of-trade effect* and an *import-competing effect*.<sup>27</sup> The *balance-of-trade effect* shows the response of the economy to the oil export price increase, depending on whether the economy runs a trade surplus or a trade deficit in the benchmark equilibrium, with the import-competing effect set equal to one. It shows conditions that cause changes in the producers' real costs. The *import-competing effect*, under the assumption that trade is balanced, shows the effect of the variation in the Armington elasticity of substitution between non-oil goods. It shows how competition between imported and domestic goods affects producers' real costs.

Similar to the analysis conducted by Corden and Neary (1982), the analysis conducted in this chapter can equally be applied to cases in which the booming sector is not of an extractive type. It can be any other sector that enjoys positive terms of trade. This is because I consider the medium-run effects of the boom in the oil sector on structural adjustments, rather than long-run issues such as the depletion of oil.

The chapter consists of four sections. Section 4.2 discusses the effects of an increase in the world price of export good using the 1-2-3 model of Devarajan et al. (1990). Section 4.3 describes the effects of an oil export price increase using the two-sector model. Section 4.4 concludes.

## 4.2 One-Sector Model

### 4.2.1 Overview of the One-Sector Model

This section discusses the effects of the increase in the world price of an export good in the framework of the 1-2-3 model of Devarajan et al. (1990). The 1-2-3 model of Devarajan et al. (1990) is a standard one-country, two-sector, and three-good model. Although, the model considers only one aggregate sector that produces two goods, an export good, which is sold abroad and not demanded domestically, and a domestic good, which is only sold domestically, it treats these two goods as goods produced by two different sectors. Since the stylized model that will be discussed in the next section incorporates two sectors, namely the oil and non-oil sectors, I label this model a one-sector model for the sake of consistency. The third good that the model assumes is an import good, which is not produced domestically.

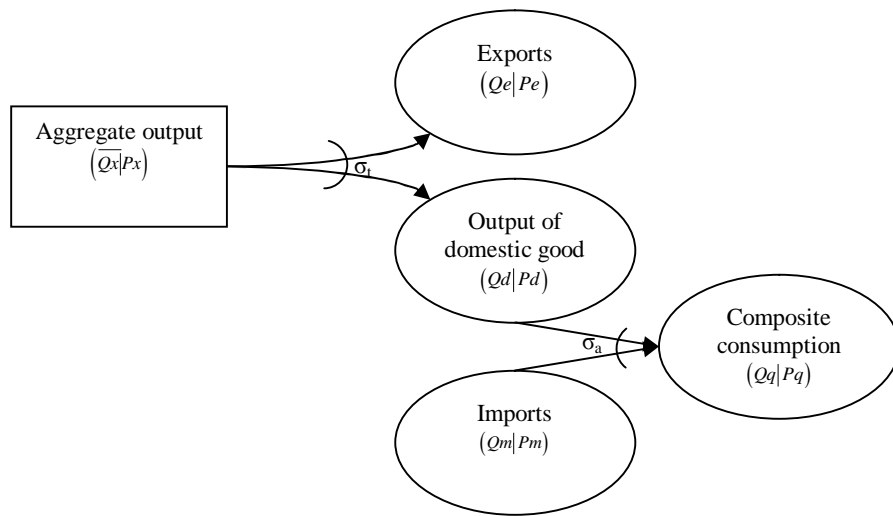
The model assumes aggregate output produced in the economy, or GDP, is fixed. Two-way trade is incorporated via assuming differentiation between a domestic and an export good and via assuming differentiation between an import good and a domestic good (or an import-

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<sup>27</sup> The term balance-of-trade effect was first introduced by Malakellis and Peter (1991) in their study on the effects of the aggregate demand on employment. In their study the balance-of-trade effect as in my study encompasses the role of a trade deficit/surplus. The term import-competing effect was first introduced by Benjamin et al. (1989) in their study on the effects of foreign capital inflows on the economy. In their study the import-competing effect shows the effect of the variation in the Armington elasticity of substitution between imported and domestically sold non-oil commodities. I use these terms to label the effects in my study respectively.

competing good). Differentiation between the domestic good and the export good is modeled using a CET<sup>28</sup> function with an elasticity of transformation ( $\sigma_t$ ). And differentiation between the import good and the domestic good is modeled using a CES<sup>29</sup> function with an Armington elasticity of substitution ( $\sigma_a$ ) (Figure 4.1). The mathematical notation used in the model is explained in Appendix 4A.1. The formulation of the model and its solution are presented in Appendix 4A.2.

**Figure 4.1 Flows of commodities in a one-sector model**



Note: Circles indicate commodities, boxes production processes. The bar over a variable indicates that this variable is exogenously given. Notation enclosed in brackets shows notation for quantities and prices. For a complete description of the notation, see Appendix 4A.1.

### 4.2.2 Graphical Analysis of the One-Sector Model

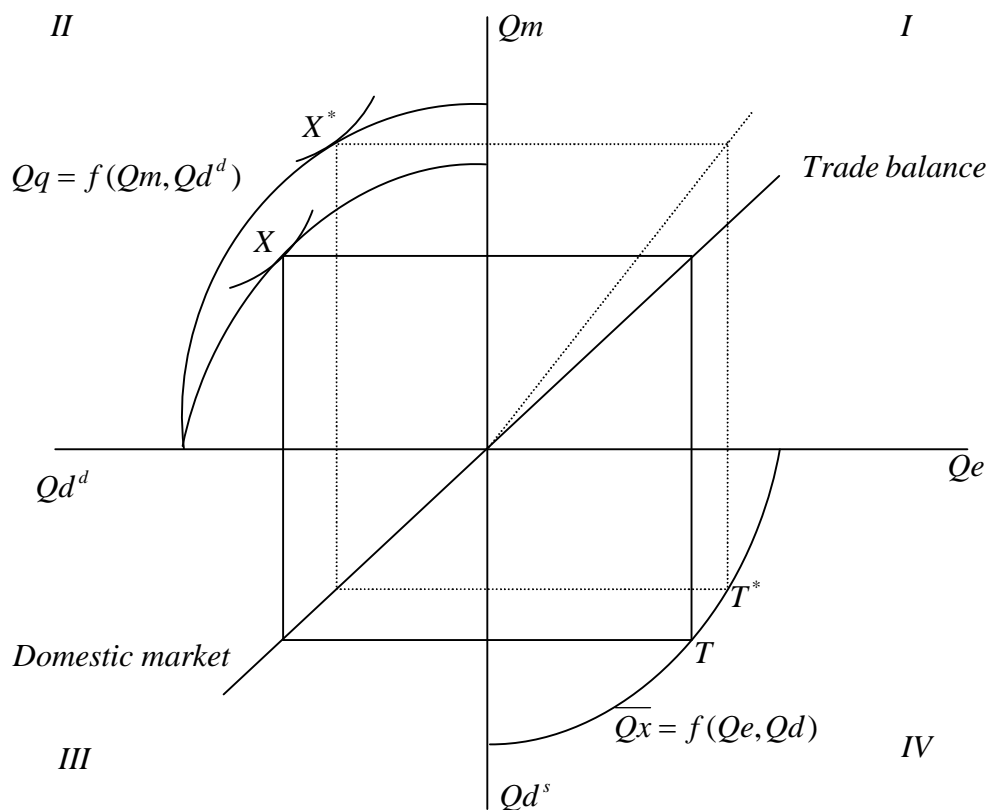
I show the effects of the world export price increase by means of a graphical tool used by Devarajan et al. (1990) (Figure 4.2). Analogously to their diagram, the first quadrant depicts balance of trade, which is assumed to be balanced here. The second quadrant depicts a “consumption possibilities frontier” that shows a set of amounts of the import and domestic goods a household can buy at the corresponding prices. The third quadrant depicts the equilibrium in the domestic market. And the fourth quadrant depicts the production possibilities frontier, or transformation curve, across the amounts of the export good and the domestic good given the corresponding prices. The diagram is drawn under the assumption that all prices are set initially equal to one. The points in the diagram, T and X, show the benchmark allocations of exports and the supply of the domestic good in the domestic markets, and imports and the demand for the domestic good, respectively.

<sup>28</sup> CET stands for constant elasticity of transformation.

<sup>29</sup> CES stands for constant elasticity of substitution.



Figure 4.2 Adjustments in the goods markets due to the world export price increase



Now, consider the effect of the world export price increase on the economy. Graphically, the direct effect of it is to shift the trade balance line counterclockwise. Now, for given exports, the household can buy more imports, which is achieved via real exchange rate appreciation. Note that imports increase unambiguously and the real exchange rate always appreciates except for the case when the import good and the domestic good are perfect substitutes, when no change in the real exchange rate occurs.

Further, the real exchange rate appreciation leads to adjustments in exports and the domestic supply of the domestic good. Whether exports or the domestic supply increase depends on the extent of the import-competing effect, defined as a variation in the Armington elasticity of substitution between the import good and the domestic good ( $\sigma_a$ ). If the domestic good and the import good are gross substitutes ( $\sigma_a > 1$ ), or, in other words, the import-competing effect is high, exports will rise and supply of the domestic good will fall, as shown in the diagram by point  $T^*$ . In the opposite case, when goods are gross complements ( $\sigma_a < 1$ ), or, in other words, the import-competing effect is low, the supply of the domestic good will rise and exports will fall. They will remain unchanged if  $\sigma_a = 1$ .

This is primarily driven by the fact that in light of the growing demand and adjustments in relative prices, the household tends to prefer the import good to the domestic good if they are gross substitutes, and it does not have strong preferences over any of them if they are gross complements. In the former case, demand for the domestic good decreases and, hence, the amount of the domestic good produced decreases, and in the latter case demand for the domestic good increases and, hence the amount of the domestic good produced increases.

Given that the export good and the domestic good are transformable and the aggregate output is exogenous, an increase in amount of one of them should necessarily decrease the amount of the other. Therefore, amounts of the export good and the domestic good move in the opposite directions in the wake of the world export price increase.

The results of the model can be briefly summarized as follows. *First*, the real exchange rate always appreciates, except for the case when  $\sigma_a \rightarrow \infty$ , when it remains unchanged. *Second*, imports unambiguously increase, whereas output of the domestic good and exports are ambiguous and tend to move in the opposite directions.

The model that I considered here is very general. Although the results are crucial, the model fails to capture intersectoral allocation, which would prove useful when studying the effects of a specific type of shock. Given that oil export price increase effects are a particular subject of this study, I extend the present model to two-sector model in what follows.

### 4.3 Stylized Two-Sector Model

In this section, I give an overview of the key features of the stylized two-sector model that I developed and proceed with an analysis of the main effects responsible for structural adjustments in the wake of the oil export price increase.

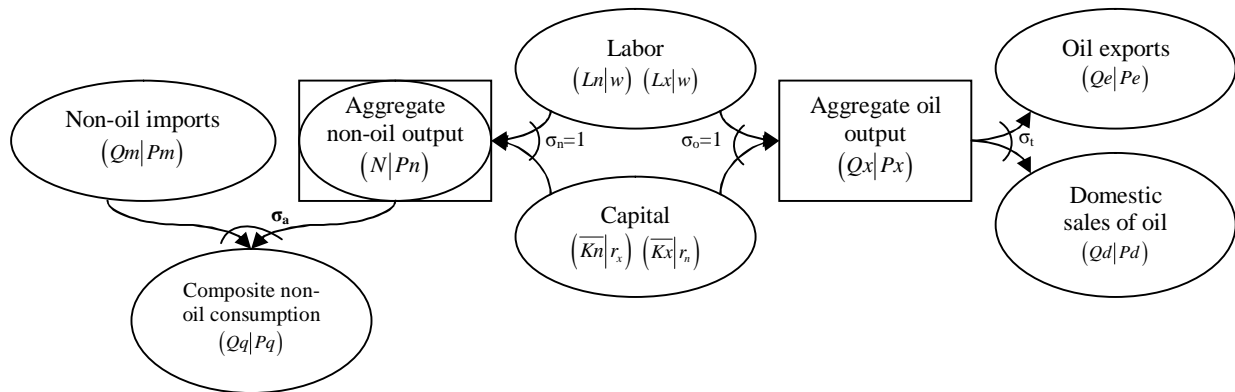
#### 4.3.1 Overview of the Two-Sector Model

This is a two-sector model, with two sectors being defined as an oil sector and a non-oil sector. The model considers two types of oil goods, exported oil, which is sold abroad and not demanded domestically, and domestic oil, which is only sold domestically, and two types of non-oil goods, a domestic non-oil good, which is only sold domestically and an imported non-oil good, which is not produced domestically.

The two-way trade is incorporated via assuming a differentiation between the domestic oil and the exported oil and between the imported non-oil good and the domestic non-oil good (or import-competing non-oil good). Namely, differentiation between the domestic oil and the exported oil is modeled using a CET function with an elasticity of transformation ( $\sigma_t$ ). And differentiation between the imported non-oil good and the domestic non-oil good is modeled using a CES function with an Armington elasticity of substitution ( $\sigma_a$ ).

Two sectors employ labor and capital in production. Capital is assumed to be sector-specific and labor is assumed to be perfectly mobile across sectors. It is a neoclassical world; hence, the wage is used to clear labor market so that full employment is achieved in the equilibrium. Figure 4.3 shows production technology and flows of commodities in this model.

Figure 4.3 Production technology and flows of commodities



Note: Circles indicate commodities, boxes production processes. Note that aggregate oil output is only a production process and not a commodity. It is transformable into  $Qe$  and  $Qd$ . However, aggregate non-oil output is both a production process and a commodity. Therefore, it is enclosed both in a circle and a box. The bar over a variable indicates that this variable is exogenously given. Notation enclosed in brackets shows quantities and prices. For a complete description of the notation, refer to Appendix 4B.1.

Further this model assumes two other representative agents: a household and the rest of the world. The household owns these two sectors and thus receives all the income accruing to the economy. The rest of the world supplies the non-oil good to the domestic economy and buys oil. The trade balance is assumed to be exogenous and exchange rate is assumed to be endogenous. The complete formulation of the model and its solution are given in appendices 4B.2.1 and 4B.2.2 respectively.

### 4.3.2 Analysis of the Two-Sector Model: Disaggregation of Effects

By and large, there are two key effects that explain the response of the economy in the model. The first effect is labeled a *balance-of-trade effect* and the second an *import-competing effect*. I examine the two effects in isolation.

The balance-of-trade effect shows the response of the economy to the oil export price increase, depending on whether the economy runs a trade surplus or a trade deficit in the benchmark equilibrium, with the import-competing effect set equal to one. The balance of trade effect shows the conditions that cause changes in the producers' real costs. The import-competing effect, under assumption that trade is balanced, shows the effect of the variation in the Armington elasticity of substitution between the imported non-oil good and the domestic non-oil good on the economy. It shows how competition between the imported and the domestic non-oil goods affects producers' real costs. In the subsections 4.4.2.1 and 4.4.2.2, the impact of each of the two effects is considered in isolation. The key results under each effect are shown in Table 4.1.

**Table 4.1** The effects of the oil export price increase

No	Variable	Balance-of-trade effect		Import-competing effect	
		Trade deficit	Trade surplus	$\sigma_a < 1$	$\sigma_a > 1$
1.	$Q_x$	↑	↓	↓	↑
2.	$N$	↓	↑	↑	↓
3.	$Q_e$	↑	↓	↓	↑
4.	$Q_m$	↑	↑	↑	↑
5.	$Q_d$	?	?	?	?
6.	$Q_q$	↑	↑	↑	↑
7.	$P_e$	↑	↓	↓	↑
8.	$P_d$	↓	↑	↑	↓
9.	$P_m$	↓	↓	↓	↓
10.	$P_x^{30}$	-	-	-	-
11.	$P_n$	↓	↑	↑	↓
12.	$P_q$	↓	?	↓	↓
13.	$w$	↓	↑	↑	↓
14.	$L_x$	↑	↓	↓	↑
15.	$L_n$	↓	↑	↑	↓
16.	$R$	↓	↓	↓	↓
17.	$Y$	↓	↑	↑	↓

Note: Arrows pointing up (down) indicate increase (decrease) in variables. A question mark indicates that the effect on the variable is ambiguous. The notation used here is explained in Appendix 4B.1.

#### 4.3.2.1 Balance-of-Trade Effect

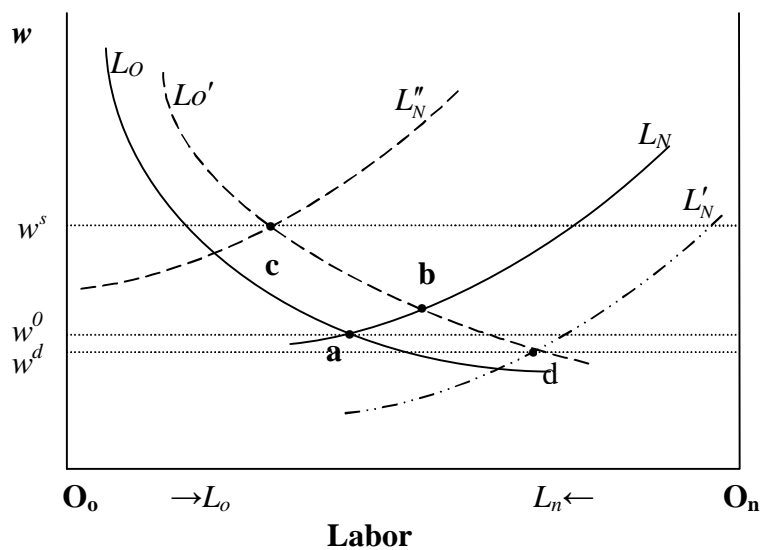
The balance-of-trade effect determines how a trade deficit or a trade surplus affects the economy if the Armington elasticity of substitution between non-oil goods is set equal to one. The analytical solution under this effect is presented in Appendix 4B.2.2.1.<sup>31</sup> To provide a clearer understanding of the effect, I supplement the analytical solution with an intuitive analysis here.

I begin the analysis by examining the labor market. Using Figure 4.4, I show the behavior of the labor market in the benchmark equilibrium and after the oil export price increases. On the horizontal axis, I depict the total labor supply and on the vertical axis the wage rate in terms of the aggregate price of oil. The amount of labor employed in the oil sector is measured starting from  $O_o$  and in the non-oil sector starting from  $O_n$ . Since the model assumes the labor supply is exogenous, full employment should always be maintained in the equilibrium. The labor demand schedules ( $L_o$  and  $L_n$ ) are drawn with negative slopes, implying that they are decreasing functions of the wage rate.

<sup>30</sup>  $P_x$  is a numeraire.

<sup>31</sup> Note that under the assumption that trade is balanced and the import competing effect is set equal to one, percentage changes in most of the variables in the model are equal to zero (see Appendix 4B.2.2.1).

**Figure 4.4 Effects of the oil export price increase on the adjustments in the labor market: balance-of-trade effect**



Note: The initial benchmark labor supply and demand schedules before an oil export price increase are shown using solid lines, whereas after an oil export price increase they are shown using dashed lines. The figure is similar to that used by Corden and Neary (1982).

An increase in the oil export price leads to an increase in the unit revenue of the oil producer ( $P_x$ ) relative to that of the non-oil producer ( $P_n$ ). This trend in turn causes an increase in the demand for labor in the oil sector, illustrated in Figure 4.4 by the shift of the labor demand schedule to the right, from  $L_o$  to  $L_o'$ , since, for a given wage rate in terms of the aggregate price of oil, the oil producer's marginal product rises. The economy reaches point  $b$ , at which the real wage increases and labor moves out of the non-oil sector into the oil sector. However, this is not a final outcome.

Given that the economy pursues the same pattern of foreign trade as in the benchmark scenario, which is implied by the exogenous balance of trade, an increase in exports should be accompanied by an increase in imports. This is achieved via appreciation of the real exchange rate.

The total income accruing to the economy ( $Y$ ), or, in other words GNP, depends largely on the net export income, which in turn depends on the pattern of foreign trade. Since by assumption the pattern of foreign trade remains the same, it is essential to distinguish between the cases when the economy runs a trade surplus (positive net export income) and when it runs a trade deficit (negative net export income). If the economy accumulates a trade surplus, GNP will increase, otherwise if the economy runs a trade deficit, GNP will decrease. Trade surplus generates additional revenue for the economy, as a result of which GNP increases, whereas with a trade deficit the opposite occurs.

I consider first the case when the economy accumulates a trade surplus in the benchmark. If the economy enjoys a trade surplus, its income will rise as a result of the oil export price increase. This trend leads to an increase in the demand for goods sold domestically, in particular for the non-oil good. This increase in demand causes the non-oil price to increase relative to the aggregate oil price. The increase in the relative non-oil price decreases the real

costs of labor of the non-oil producer relative to the oil producer, and hence leads to an increase in the employment in the non-oil sector. This effect is illustrated in Figure 4.4 by the shift of the labor demand schedule for the non-oil producer to the left, from  $L_N$  to  $L'_n$ . The new equilibrium is achieved at point  $c$ , which is associated with an increase in the wage in terms of the oil producer's aggregate price, a decrease in employment in the oil sector, and an increase in employment in the non-oil sector.

If the country runs a trade deficit, appreciation of the exchange rate will exert a downward pressure on total income. This in turn reduces demand for the domestic non-oil good and the relative non-oil price, which further leads to a decline in employment in the non-oil sector and thus causes its further contraction. Graphically, the trade deficit case is depicted by the shift of the labor demand schedule in the non-oil sector rightwards to  $L'_N$ . The new equilibrium is achieved at point  $d$ , which is associated with a decrease in wage in terms of the aggregate oil price, an increase in employment in the oil sector, and a decrease in employment in the non-oil sector.

With activity-specific capital and no intermediate goods in the model, the change in employment largely defines the equilibrium response of the aggregate oil and non-oil outputs to the oil export price increase. Since in the trade surplus case, employment in the oil sector decreases and employment in the non-oil sector increases, the aggregate output of the oil sector decreases and the output of the non-oil sector increases. In the trade deficit case the opposite occurs.

So far, I have largely discussed the effects of the oil export price increase on the employment in the sectors and outputs of the aggregate commodities. In what follows, I proceed with the effects of the oil export price increase on the amounts of disaggregated commodities.<sup>32</sup> The total effects of the oil export price increase on the amounts of the disaggregated commodities can be decomposed into the expansion and substitution effects. The expansion effect for the amounts of the domestic and exported oil corresponds to the percentage change in the output of the aggregate oil, whereas the expansion effect for the amount of the imported non-oil good corresponds to the percentage change in the consumption of the composite non-oil good. The substitution effects for the amounts of these commodities correspond to the percentage change in the corresponding relative prices weighted by the corresponding price elasticities.<sup>33</sup>

In the trade deficit case, the oil export price in local currency units ( $Pe$ ) relative to the aggregate oil price ( $Px$ ) rises and the domestic oil price ( $Pd$ ) relative to  $Px$  falls. Given that the aggregate output of oil ( $Qx$ ) increases, the amount of the exported oil rises unambiguously due to the positive expansion and substitution effects. However, the change in the amount of the domestic oil ( $Qd$ ) is ambiguous due to the positive expansion effect and the negative substitution effect. The amount of the imported non-oil good ( $Qm$ ) rises unambiguously.

In the trade surplus case, the amount of the exported oil ( $Qe$ ) falls unambiguously, but the change in the amount of the domestic oil ( $Qd$ ) is ambiguous due to the negative expansion effect and the positive substitution effect. The final change in the amount of the domestic oil depends on which of the effects dominates. The amount of the imported non-oil good ( $Qm$ ) rises unambiguously.

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<sup>32</sup> Disaggregated commodities here are the exported, domestic oil and imported non-oil good.

<sup>33</sup> Such a decomposition of total effect into the expansion and substitution effects was introduced by Horridge et al. (2003). I use their approach to decompose the total effect on the amounts of disaggregated commodities in what follows.

### 4.3.2.2 Import-Competing Effect

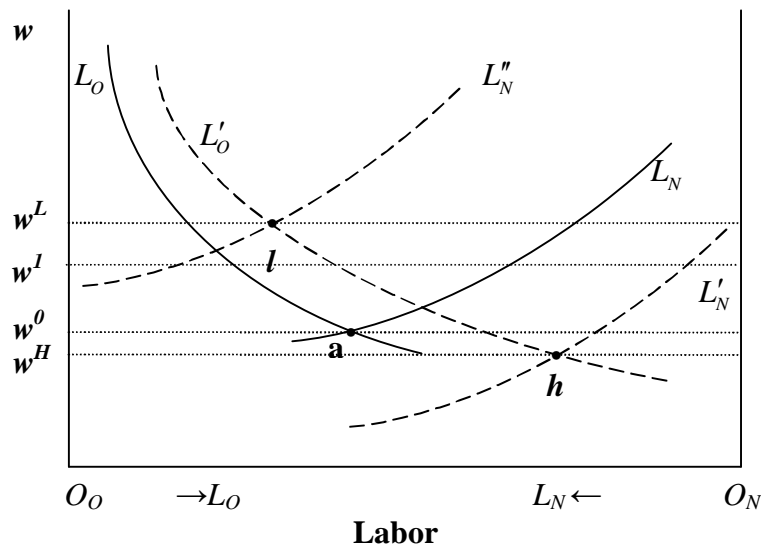
In this section, I discuss the effects of the import-competing effect when trade is balanced. In what follows, I discuss first the response of the economy under a low import-competing effect ( $\sigma_a < 1$ ) and further under a high import-competing effect ( $\sigma_a > 1$ ). The results are summarized in Table 4.1. The analytical solution is shown in Appendix 4B.2.2.2.

#### *Low import-competing effect*

In what follows, I consider a special case of the low import-competing effect ( $\sigma_a < 1$ ), a case in which there is no import-competing effect ( $\sigma_a = 0$ ), or, in other words, a case in which the imported non-oil good and the domestic non-oil good are pure complements. I consider this case because it is easier to understand and because it has tractability advantages. The results derived are valid for the low import-competing scenario overall.

The adjustments in the labor market are illustrated in Figure 4.5. After the oil export price increases, the unit revenue of the oil producer ( $P_x$ ) relative to that of the non-oil producer ( $P_n$ ) rises. This reduces the oil producer's costs and increases her labor demand. Graphically, it is illustrated via the shift of the labor demand schedule to the right, from  $L_O$  to  $L'_O$ . Given that the trade must be kept in balance, an increase in the value of oil exports engenders an increase in the amount of non-oil imports. This is achieved via real appreciation of the exchange rate.

**Figure 4.5 Effects of the oil export price increase on the labor market: import-competing effect**



Note: The benchmark labor supply and demand schedules before an oil export price increase are shown using solid lines, whereas after an oil price increase they are shown using dashed lines.

Since total income rises, the demand for commodities sold domestically rises, and since the domestic non-oil good and the imported non-oil good are complements, the aggregate price of non-oil good ( $P_n$ ) relative to the aggregate price of oil ( $P_x$ ) rises as well. This trend causes an increase in the demand for labor in the non-oil sector, illustrated by the shift of the non-oil sector's labor demand schedule to the left, from  $L_N$  to  $L''_N$ . Eventually, the wage in terms of the oil producer's unit of revenue increases. Hence, the equilibrium employment in the non-oil sector increases and the equilibrium employment in the oil sector decreases. As a result, the non-oil sector expands and the oil sector contracts.

The impact of the oil export price increase on the amounts of disaggregated commodities and their prices is illustrated in Figure 4.6. The upper part of the figure (Graphs 1.a and 1.b) demonstrates the effects of the oil export price increase under a low import-competing effect and the lower part (Graphs 2.a and 2.b) demonstrates effects of the oil export price increase under a high import-competing effect. The right-hand side of Graphs 1.a and 2.a shows the consumption possibility frontiers and the right-hand side of Graphs 1.b and 2.b shows the production possibility frontiers. In addition, the right-hand side of Graphs 1.a and 2.a shows income consumption curves (ICCs). Given that non-oil goods are assumed to be perfect complements in the upper part of the figure, the income consumption curve is drawn as a 45 degree ray through the origin (O). The lower part of Figure 4.6 assumes that the goods are gross substitutes, and hence the income consumption curve is drawn with a slope different from the forty-five degree line. The left-hand side of all the graphs depicts trade balance. The axes of the graphs show amounts of the exported oil ( $Q_e$ ), of the imported non-oil good ( $Q_m$ ), of the domestic oil ( $Q_d$ ), and of the domestic non-oil good ( $N$ ). Given that trade is balanced, with export prices set equal to one, the trade balance is represented by a 45 degree line that goes through the origin. Further, given the amount of imports and exports and their relative



prices, the amounts of the domestic non-oil good ( $N$ ) and the domestic oil ( $Qd$ ) can be seen in from the right-hand side of the graphs.

The oil export price increase in Graphs 1.a and 1.b is depicted by the shift of the trade balance line clockwise and counterclockwise, respectively, which implies that for a given amount of exports one can buy more imports. The shift in the trade balance automatically translates into an asymmetric shift of the consumption possibility frontier, with the maximum amount of non-oil demanded being unaffected, but with the increase in the maximum amount of imports by the amount equal to the increase in the imports per unit of exports after the oil export price increases.

Earlier in this section, I observed that when non-oil goods are gross complements, the non-oil sector expands and the oil sector contracts. Taking this into account, the production possibility frontier for the oil sector in Graph 1.b shifts inwards. As a result, oil exports decrease unambiguously because of the contraction of aggregate output of oil (negative expansion effect) and the real appreciation of the exchange rate (negative substitution effect). However, the effect of the oil export price increase on domestic sales of oil is ambiguous. Domestic sales of oil decrease as a result of the negative expansion effect and they increase as a result of the positive substitution effect. The dominating effect determines the ultimate change in the domestic sales of oil. Graph 1.b is drawn under the assumption that the negative expansion effect dominates and hence  $Qd$  declines. The new equilibrium is reached at point  $f$ .

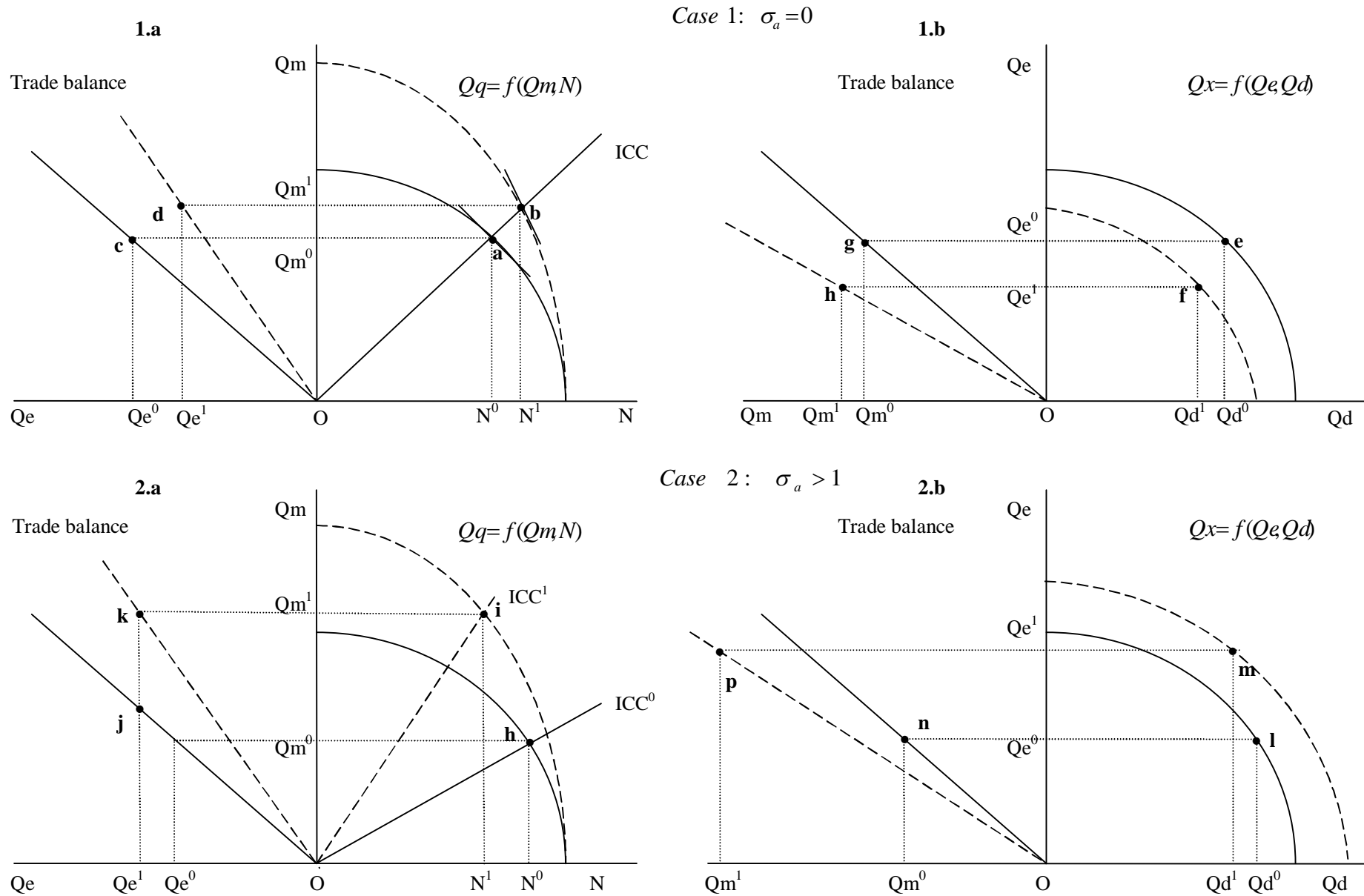
Increase in non-oil imports is unambiguous due to the increase in income and the appreciation of the real exchange rate. Given that the imported non-oil good and the domestic non-oil good are assumed to be complements, as depicted by the fixed income consumption curve, their amounts tend to rise as a result of the oil export price increase, as shown by the point  $b$  in Graph 1.a.

#### *High import-competing effect*

The high import-competing effect ( $\sigma_a > 1$ ) is illustrated in Figure 4.5 and Figure 4.6 (Graphs 2.a and 2.b). As before, I begin by analyzing the adjustments in labor market first. The labor demand schedule for the oil producer shifts rightwards as a result of the oil export price increase. Total income declines and hence demand for the non-oil good declines. This trend drives relative  $Pn$  down. As a result, employment in the oil sector increases and employment in the non-oil sector decreases. The oil sector expands and the non-oil sector contracts. In Figure 4.5, the equilibrium in the labor market is illustrated at point  $h$ , where two labor demand schedules ( $L'_O$  and  $L'_N$ ) intersect with each other.

In the non-oil goods markets, the high import-competing effect leads to high competition between the imported non-oil good and the domestic non-oil good. As a result of high competition, the decline in total income, and the real exchange rate appreciation, the domestic non-oil good becomes less attractive for the household than the relatively cheaper imported non-oil good. This in turn causes the amount of the domestic non-oil good produced to decline and the non-oil imports to increase. Diagrammatically, this trend is shown via the shift of the income consumption curve to the left, from  $ICC^0$  to  $ICC^1$ , with the new equilibrium quantities determined at point  $i$ , where the new income consumption curve intersects new consumption possibility curve.

Figure 4.6 Effects of the oil export price increase on the adjustments in the goods markets under different import-competing effects



Oil exports increase unambiguously due to the positive expansion and substitution effects, whereas the change in the amount of the domestic oil is ambiguous. If the positive expansion effect outweighs the negative substitution effect, the amount of the domestic oil will rise and if the opposite occurs, the amount of the domestic oil will decline. In Graph 2.b, the new equilibrium is achieved at point  $m$ , which is associated with the increase in oil exports and the decrease in amount of the domestic oil.

### 4.4 Conclusions

In this chapter, I highlighted the importance of the assumption of two-way trade and factor movement across sectors using the model that I have developed. I find that variation in the Armington elasticity of substitution between non-oil goods plays a role.<sup>34</sup>

In general, the model pointed towards two effects triggered by the oil export price increase: a balance-of-trade effect and an import-competing effect. Unlike the predictions of the core Dutch disease model (e.g., Corden and Neary, 1982), in the model that I develop the balance-of-trade effect and import-competing effect might either increase or decrease the outputs of the oil and non-oil sectors. For instance, unlike the predictions of the core Dutch disease model, I find that it is possible to expect that the non-oil sector expands and the oil sector contracts in the wake of an oil boom. Whether this is likely I attempt to answer in Chapter 7 by simulating an oil export price increase in a two-sector CGE model applied to Kazakhstani economy.

In general, I find that the model delivers quite intuitive and plausible results. However, reality is more complex and it incorporates other effects not captured by this model. In reality, there are more than two sectors, there is a room for savings and investment, etc. How would incorporating these features affect the results predicted by this model? The next chapter partly provides answers to these questions by adding one more representative agent, the public sector, by giving a scope for savings and investment, and assuming the trade balance is different from the initial benchmark scenario.

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<sup>34</sup> Benjamin et al. (1989) in their study on the effects of foreign capital inflows on the economy showed how the variation in the Armington elasticity of substitution between imported and domestically sold non-oil commodities might affect sectoral allocations. They find that when the Armington elasticity of substitution between these non-oil goods is low enough the oil sector might contract and the non-oil sector might expand. This is in line with the results from the model developed in this chapter.

## Appendix 4A Description and Solution of the One-Sector Model

### Appendix 4A.1 List of the Symbols Used in the One-Sector Model

Symbol	Definition	
<b><u>PARAMETERS</u></b>		
<b><u>Greek letters</u></b>		
$\alpha$	Value share of domestic sales in total output	$\alpha = \frac{Pd \times Qd}{Px \times Qx}$
$1 - \alpha$	Value share of exports in the total production	$1 - \alpha = \frac{Pe \times Qe}{Px \times Qx}$
$\beta$	Value share of demand for domestic good in the composite consumption	$\beta = \frac{Pd \times Qd}{Pq \times Qq}$
$1 - \beta$	Value share of imports in composite consumption	$1 - \beta = \frac{Pm \times Qm}{Pq \times Qq}$
$\delta_t$	CET function share parameter	
$\lambda$	A constant in the equation for optimal allocation of exports and domestic sales	
$\rho_t$	CET function exponent	
$\sigma_a$	Armington elasticity of substitution between imports and domestically consumed commodities	
$\sigma_t$	Elasticity of transformation between exported and domestically supplied commodities	
$U$	A constant in the equation for optimal allocation of domestic sales and imports	
<b><u>Latin letters</u></b>		
$n$	A CET function shift parameter	
<b><u>EXOGENOUS VARIABLES</u></b>		
$pwm$	Import price in foreign currency units	
$z$	Export price in foreign currency units	
$Qx$	Amount of total production or aggregate good	
$Pq$	Price of composite good	
<b><u>ENDOGENOUS VARIABLES</u></b> <b><u>(explicitly shown in the model)</u></b>		
<b><u>Outputs</u></b>		
$Qm$	Amount of imports	
$Qd$	Amount of domestically supplied and domestically demanded good or amount of import-competing good	
$Qe$	Amount of exports	
<b><u>Prices</u></b>		
$Pm$	Import price in local currency units	
$Pd$	Price of domestically produced and domestically supplied good	
$Pe$	Export price in local currency units	
$R$	Nominal exchange rate	
<b><u>ENDOGENOUS VARIABLES</u></b> <b><u>(implied by the model but not explicitly shown in it)</u></b>		
$Qq$	Amount of composite consumption	
$Px$	Price of aggregate good, or unit revenue of producer	

## Appendix 4A.2 Overview and Solution of the One-Sector Model

### 4A.2.1 Overview of the model

In addition to the nonlinear representation of the model, I derive a log-linearized version of the model. In what follows, I place the percentage change form equations to the right of the nonlinear equations. A circumflex ( $\hat{\phantom{x}}$ ) denotes percentage change in the corresponding variable.

Given that the model ignores factor markets, aggregate output level,  $\overline{Qx}$ , is exogenously given, and is defined as

$$(4A.1.a) \quad \overline{Qx} = n \times \left( \delta_t \times Qd^{\rho_t} + (1 - \delta_t) \times Qe^{\rho_t} \right)^{1/\rho_t}, \quad (4A.1.b) \quad \alpha \times \widehat{Qd} + (1 - \alpha) \times \widehat{Qe} = 0,$$

where  $n$  is a CET function shift parameter,  $\delta_t$  is a CET function share parameter,  $\rho_t$  is a CET function exponent and  $\alpha$  is the value share of domestic sales in the aggregate output.  $Qd$  is the amount of the good produced and supplied domestically (in what follows, I refer to it as a domestic good or import-competing good) and  $Qe$  is the amount of the exported good.

I assume that  $Qd$  and  $Qe$  are transformable, and the producer optimizes her production as follows:

$$(4A.2.a) \quad \frac{Qe}{Qd} = \lambda \times \left( \frac{Pe_c}{Pd_c} \right)^{\sigma_t}, \quad (4A.2.b) \quad \widehat{Qe} - \widehat{Qd} = \sigma_t \times (\widehat{Pe} - \widehat{Pd}),$$

where  $Pe$  (defined below) is the domestic-currency price of the exported good,  $Pd$  is the price of the domestic good,  $\lambda$  is a constant, and  $\sigma_t$  is the elasticity of transformation.

$$(4A.3.a) \quad Pe = z \times R, \quad (4A.3.b) \quad \widehat{Pe} = \hat{z} + \hat{R},$$

where  $R$  is the exchange rate and  $z$  is a world price of the export good.

The optimal allocation across the consumption of the domestic and imported commodities is given as

$$(4A.4.a) \quad \frac{Qm}{Qd} = \nu \times \left( \frac{Pd}{Pm} \right)^{\sigma_a}, \quad (4A.4.b) \quad \widehat{Qm} - \widehat{Qd} = \sigma_a \times (\widehat{Pd} - \widehat{Pm}),$$

where,  $Qm$  and  $Pm$  are the amount of the imported good and the import price in domestic currency respectively,  $U$  is a constant, and  $\sigma_a$  is the Armington elasticity of substitution.  $Pm$  is defined as

$$(4A.5.a) \quad Pm = pwm \times R,$$

$$(4A.5.b) \quad \widehat{Pm} = \widehat{R},$$

where  $pwm$  is the import price in foreign currency units.

I assume that foreign trade is balanced:

$$(4A.6.a) \quad pwm \times Qm = z \times Qe,$$

$$(4A.6.b) \quad \widehat{Qm} = \widehat{z} + \widehat{Qe}.$$

I use the price of a composite good,  $Pq$ , as a numeraire:

$$(4A.7.a) \quad \overline{Pq} = \beta \times Pd + (1 - \beta) \times Pm,$$

$$(4A.7.b) \quad \beta \times \widehat{Pd} + (1 - \beta) \times \widehat{Pm} = 0,$$

with  $\beta$  being the share of consumption of the domestic good in composite consumption.

By and large, the one-sector model is represented by seven equations with seven unknowns, i.e.,  $Qd$ ,  $Qe$ ,  $Qm$ ,  $Pd$ ,  $Pe$ ,  $Pm$ ,  $R$ . The remaining variables,  $pwm$ ,  $z$ ,  $Pq$ , and  $Qx$ , are exogenous. Given that the composite price is a numeraire,  $R$  serves as the real exchange rate as defined in the neoclassical trade theory, with its increase associated with real depreciation and decrease with real appreciation.

#### 4A.2.2 Solution of the model

The analytical solution of the model is derived by means of the logarithmical differentiation. The percentage changes in the variables with respect to the increase in the world price of the export good are as follows:

$$(4A.8) \quad \widehat{R} = -\frac{\beta \times (1 + \sigma_t)}{\sigma_a + \sigma_t} \times \widehat{z},$$

$$(4A.9) \quad \widehat{Pm} = -\frac{\beta \times (1 + \sigma_t)}{\sigma_a + \sigma_t} \times \widehat{z},$$

$$(4A.10) \quad \widehat{Qm} = \frac{(1 + \alpha \times \sigma_t) \times \sigma_a + (1 - \alpha) \times \sigma_t}{\sigma_a + \sigma_t} \times \widehat{z},$$

$$(4A.11) \quad \widehat{Pd} = \frac{(1 - \beta) \times (1 + \sigma_t)}{\sigma_a + \sigma_t} \times \widehat{z},$$

$$(4A.12) \quad \widehat{Qd} = \frac{(1 - \alpha) \times (1 - \sigma_a) \times \sigma_t}{\sigma_a + \sigma_t} \times \widehat{z},$$

$$(4A.13) \quad \widehat{Pe} = \left( 1 - \frac{\beta \times (1 + \sigma_t)}{\sigma_a + \sigma_t} \right) \times \widehat{z},$$

$$(4A.14) \quad \widehat{Qe} = \frac{\alpha \times (\sigma_a - 1) \times \sigma_t}{\sigma_a + \sigma_t} \times \widehat{z}.$$

## Appendix 4B Description and Solution of the Stylized Two-Sector Model

### Appendix 4B.1 List of the Symbols Used in the Stylized Two-Sector Model

Symbol	Definition	
<b><u>PARAMETERS</u></b>		
<b><u>Greek letters</u></b>		
$\alpha$	Value share of domestic sales of oil in the output of aggregate oil	$\alpha = \frac{Pd \times Qd}{Px \times Qx}$
$1 - \alpha$	Value share of exports of oil in the output of aggregate oil	$1 - \alpha = \frac{Pe \times Qe}{Px \times Qx}$
$\gamma$	Value share of non-oil imports in balance of trade in foreign currency units	$\gamma = \frac{pwm \times Qm}{Bal}$
$1 - \gamma$	Value share of oil exports in balance of trade in foreign currency units	$1 - \gamma = \frac{z \times Qe}{Bal}$
$\delta_q$	CES function share parameter	
$\delta_t$	CET function share parameter	
$\theta$	Constant in the equation for optimal allocation of exported oil and domestically sold oil	
$\lambda$	Share of labor employed in the oil sector	$\lambda = \frac{Lx}{L}$
$1 - \lambda$	Share of labor employed in the non-oil sector	$1 - \lambda = \frac{Ln}{L}$
$\pi$	Value share of labor employed in the aggregate oil output	$\pi = \frac{w \times Lx}{Px \times Qx}$
$1 - \pi$	Value share of capital employed in the aggregate oil output	$1 - \pi = \frac{r \times Kx}{Px \times Qx}$
$\rho$	Value share of aggregate non-oil output in total income	$\rho = \frac{Pn \times N}{Y}$
$\varphi$	Value share of aggregate oil output in total income	$\varphi = \frac{Px \times Qx}{Y}$
$1 - \varphi - \rho$	Share of the balance of trade in local currency units in total income	$1 - \varphi - \rho = \frac{R \times \overline{Bal}}{Y}$
$\rho_q$	CES function exponent	
$\rho_t$	CET function exponent	
$\sigma_a$	Armington elasticity of substitution between imported and import-competing non-oil goods	
$\sigma_t$	Elasticity of transformation between exported and domestically supplied oil goods	
$U$	Constant in the equation that determines optimal ratio of amount of import-competing non-oil good to non-oil imports	
$\chi$	Shift parameter in CES function	
$\psi_o$	Marginal propensity of consumption of oil	$\psi_o = \frac{Pd \times Qd}{Y}$

## Appendix 4B

$\psi_q$	Marginal propensity of consumption of composite non-oil good	$\psi_q = \frac{Pq \times Qq}{Y}$
$\omega$	Value share of labor employed in the aggregate non-oil output	$\omega = \frac{w \times Ln}{Pn \times N}$
$1 - \omega$	Value share of capital employed in the aggregate non-oil output	$1 - \omega = \frac{r \times Kn}{Pn \times N}$

### Latin letters

$a$	Value share of non-oil imports in composite consumption of non-oil	$a = \frac{Pm \times Qm}{Pq \times Qq}$
$1 - a$	Value share of demand for import-competing non-oil good in the composite consumption of non-oil good	$1 - a = \frac{Pn \times N}{Pq \times Qq}$
$k$	Constant in the aggregate oil production function	
$m$	Constant in the aggregate non-oil production function	
$n$	CET function shift parameter	

### EXOGENOUS VARIABLES

$pwm$	Import price of non-oil good in foreign currency units
$z$	Export price of oil in foreign currency units
$Bal$	Balance of trade or foreign savings
$Px$	Price of aggregate oil, or unit revenue of oil producer ( <i>Numeraire</i> )
$\bar{L}$	Total supply of labor

### ENDOGENOUS VARIABLES (explicitly shown in the model)

#### Factors

$Lx$	Amount of labor employed in the oil sector
$Ln$	Amount of labor employed in the non-oil sector
<u>Outputs</u>	
$Qx$	Amount of aggregate oil
$N$	Amount of aggregate non-oil good or import-competing non-oil good
$Qm$	Amount of non-oil imported
$Qd$	Amount of domestically supplied and domestically demanded oil
$Qe$	Amount of exports of oil
$Qq$	Amount of composite non-oil good

#### Prices

$w$	Economy-wide wage rate
$Pn$	Price of aggregate non-oil good, or unit revenue of non-oil producer
$Px$	Price of aggregate oil, or unit revenue of oil producer
$Pd$	Price of oil sold domestically
$Pe$	Price of exported oil in local currency units
$Pm$	Import price of non-oil good in local currency units
$R$	Nominal exchange rate
$Pq$	Price of composite non-oil good

### MACRO VARIABLES

$Y$	Total income
$walras$	Artificial variable used to ensure that the number of unknowns is equal to the number of equations

### EXOGENOUS VARIABLES (implied by the model but not explicitly shown in it)

$r_x$	Oil sector-specific price of capital
$r_n$	Non-oil sector-specific price of capital
$Kx$	Amount of oil sector-specific capital
$Kn$	Amount of non-oil sector-specific capital



## Appendix 4B.2 Overview and Solution of the Stylized Two-Sector Model

### 4B.2.1 Overview of the model

In addition to the nonlinear representation of the model, I derive a log-linearized version of this model. In what follows, I place the percentage change form equations to the right of the nonlinear equations. The bar over the variables indicates that these variables are exogenous and a circumflex ( $\hat{\phantom{x}}$ ) denotes percentage change in the corresponding variable.

I assume a standard Cobb-Douglas production function for both oil and non-oil sectors:

$$(4B.1.a) \quad Qx = k \times Lx^\pi, \quad (4B.1.b) \quad \widehat{Qx} = \pi \times \widehat{Lx},$$

$$(4B.2.a) \quad N = m \times Ln^\omega, \quad (4B.2.b) \quad \widehat{N} = \omega \times \widehat{Ln},$$

where  $Qx$  and  $N$  stand for the amounts of aggregate oil and non-oil goods produced.  $Lx$  and  $Ln$  are the amounts of labor employed in the oil and non-oil sectors, respectively.  $\pi$  and  $\omega$  represent the value share of the labor input in the outputs of aggregate oil and non-oil goods, respectively.  $k$  and  $m$  are constants.

The first-order conditions for employment are

$$(4B.3.a) \quad w = \frac{\pi \times Px \times Qx}{Lx}, \quad (4B.3.b) \quad \widehat{w} = \widehat{Px} + \widehat{Qx} - \widehat{Lx},$$

$$(4B.4.a) \quad w = \frac{\omega \times Pn \times N}{Ln}, \quad (4B.4.b) \quad \widehat{w} = \widehat{Pn} + \widehat{N} - \widehat{Ln},$$

where  $Px$  is the price of aggregate oil and  $Pn$  is the price of non-oil good.

I differentiate oil commodities by their source of destination and assume qualitative differences between exported and domestically supplied oil. The output of aggregate oil is transformed into exports ( $Qe$ ) and domestic sales ( $Qd$ ) of oil via a CET function as follows:

$$(4B.5.a) \quad Qx = n \times \left( \delta_t \times Qd^{\rho_t} + (1 - \delta_t) \times Qe^{\rho_t} \right)^{1/\rho_t}, \quad (4B.5.b) \quad \widehat{Qx} = \alpha \times \widehat{Qd} + (1 - \alpha) \times \widehat{Qe},$$

where  $n$  is a CET function shift parameter,  $\delta_t$  is a CET function share parameter,  $\rho_t$  is a CET function exponent, and  $\alpha$  is the value share of domestic sales of oil in the output of aggregate oil.

The optimal allocation of the aggregate oil production across the amounts of exported ( $Qe$ ) and domestically produced oil ( $Qd$ ) is given by

$$(4B.6.a) \quad \frac{Qe}{Qd} = \theta \times \left( \frac{Pe}{Pd} \right)^{\sigma_t}, \quad (4B.6.b) \quad \widehat{Qe} - \widehat{Qd} = \sigma_t \times (\widehat{Pe} - \widehat{Pd}),$$

where  $Pe$  is the price of exported oil in local currency units,  $Pd$  is the price of oil sold in the domestic market,  $\theta$  is a constant, and  $\sigma_t$  is the elasticity of transformation between the exported and domestically supplied oil goods.

Composite non-oil consumption ( $Qq$ ) is given by

$$(4B.7.a) \quad Qq = \chi \times \left( \delta_q \times N^{-\rho_q} + (1 - \delta_q) \times Qm^{-\rho_q} \right)^{-1/\rho_q}, \quad (4B.7.b) \quad \widehat{Qq} = a \times \widehat{Qm} + (1 - a) \times \widehat{N},$$

where  $Qm$  is the amount of the imported non-oil good,  $\chi$  is a shift parameter in CES function,  $\delta_q$  is a CES function share parameter,  $\rho_q$  is a CES function exponent, and  $a$  is the value share of non-oil imports in consumption of the composite non-oil good.

The optimal ratio of the amount of the import-competing non-oil good ( $N$ ) to the imported non-oil good ( $Qm$ ) is given by

$$(4B.8.a) \quad \frac{Qm}{N} = \upsilon \times \left( \frac{Pn}{Pm} \right)^{\sigma_a}, \quad (4B.8.b) \quad \widehat{Qm} - \widehat{N} = \sigma_a \times (\widehat{Pn} - \widehat{Pm}),$$

where  $Pm$  is the price of the imported non-oil good in local currency units,  $\upsilon$  is a constant and  $\sigma_a$  is the Armington elasticity of substitution between the imported and import-competing non-oil goods.

Demand functions of the representative household for the composite non-oil good and domestic oil are derived from maximizing household's Cobb-Douglas utility function subject to the income constraint. Respective demand functions are as follows:

$$(4B.9.a) \quad Qq = \frac{\psi_q \times Y}{Pq}, \quad (4B.9.b) \quad \widehat{Qq} = \hat{Y} - \widehat{Pq},$$

$$(4B.10.a) \quad Qd = \frac{\psi_o \times Y}{Pd}, \quad (4B.10.b) \quad \widehat{Qd} = \hat{Y} - \widehat{Pd},$$

where  $\psi_q + \psi_o = 1$  and  $\psi_q$  and  $\psi_o$  are marginal propensities of consumption of composite non-oil and oil, respectively.  $Y$  is total income and  $Pq$  is the price of composite non-oil good.

In addition to producers, the model assumes two other representative agents: a household and the rest of the world. The total income ( $Y$ ) accruing to the economy is received by the household:

$$(4B.11.a) \quad Y = Px \times Qx + Pn \times N + R \times \overline{Bal},$$

$$(4B.11.b) \quad \hat{Y} = \varphi \times (\widehat{Px} + \widehat{Qx}) + \rho \times (\widehat{Pn} + \widehat{N}) + (1 - \varphi - \rho) \times \hat{R},$$

where  $R$  denotes the exchange rate and  $\overline{Bal}$  the balance of trade, and  $\varphi$ ,  $\rho$  are the value shares of aggregate oil and non-oil outputs in the total income. Total income is composed of oil revenues, non-oil revenues, and the balance of trade in local currency units.

The value of the aggregate oil output is a sum of the values of exports and domestic sales of oil:

$$(4B.12.a) \quad Px \times Qx = Pe \times Qe + Pd \times Qd, \quad (4B.12.b) \quad \widehat{Px} = \alpha \times \widehat{Pd} + (1 - \alpha) \times \widehat{Pe},$$

where the price of the exported oil in local currency units ( $Pe$ ) is defined as

$$(4B.13.a) \quad Pe = z \times R, \quad (4B.13.b) \quad \widehat{Pe} = \hat{z} + \hat{R},$$

where  $z$  is the price of the exported oil in foreign currency units.

The value of the composite non-oil good ( $Qq$ ) is given by

$$(4B.14.a) \quad Pq \times Qq = Pm \times Qm + Pn \times N, \quad (4B.14.b) \quad \widehat{Pq} = a \times \hat{R} + (1 - a) \times \widehat{Pn},$$

where the price of the imported non-oil good is defined as

$$(4B.15.a) \quad Pm = pwm \times R, \quad (4B.15.b) \quad \widehat{Pm} = \hat{R},$$

where  $pwm$  is the price of the imported non-oil good in foreign currency units.

Given that the model captures only oil exports and non-oil imports, the balance-of-trade condition is formulated as follows:

$$(4B.16.a) \quad pwm \times Qm - z \times Qe = \overline{Bal},$$

$$(4B.16.b) \quad \gamma \times \widehat{Qm} = -(1 - \gamma) \times (\hat{z} + \widehat{Qe}).$$

Note that the balance of trade is exogenously given and the exchange rate is endogenous.

The equilibrium in the labor market is given as follows:

$$(4B.17.a) \quad Lx + Ln = \bar{L}, \quad (4B.17.b) \quad \lambda \times \widehat{Lx} + (1 - \lambda) \times \widehat{Ln} = 0,$$

where  $\lambda$  is the share of the labor employed in the oil sector and  $L$  is the total supply of labor.

$Px$  serves as a numeraire in the model:

$$(4B.18.a) \quad Px = 1 \quad (4B.18.b) \quad \widehat{Px} = 0$$

By and large, the model has eighteen equations and seventeen unknowns ( $Lx, Ln, N, Qx, Qq, Px, Pq, Pn, Qm, Qd, Qe, Pm, Pd, Pe, R, w, Y$ ). The exogenous variables are  $Bal, L, pwm$ , and  $z$ . To solve the model, I have to eliminate one equilibrium equation or add an additional variable. I use the second approach by adding the *walras* variable to the balance-of-trade equation.

4B.2.2 *Solution of the model*

The total effect of the model can be disaggregated into a balance-of-trade effect and an import-competing effect. First, I consider the effect of the balance-of-trade effect on the economy assuming that the import-competing effect is equal to unity ( $\sigma_a = 1$ ). Later, I consider the effect of the import-competing effect when trade is balanced.

4B.2.2.1 *Balance-of-trade effect*

The effect of the balance-of-trade effect on the economy is as follows:

$$(4B.19) \quad \widehat{w} = -\frac{(1-\alpha) \times (1-\lambda) \times (1-\pi) \times (1-\varphi-\rho) \times (1+\sigma_t)}{\zeta} \times \widehat{z},$$

$$(4B.20) \quad \widehat{Pn} = -\frac{(1-\alpha) \times (1-\lambda \times (\omega-\pi) - \pi) \times (1-\varphi-\rho) \times (1+\sigma_t)}{\zeta} \times \widehat{z},$$

$$(4B.21) \quad \widehat{Ln} = -\frac{(1-\alpha) \times \lambda \times (1-\varphi-\rho) \times (1+\sigma_t)}{\zeta} \times \widehat{z},$$

$$(4B.22) \quad \widehat{Lx} = \frac{(1-\alpha) \times (1-\lambda) \times (1-\varphi-\rho) \times (1+\sigma_t)}{\zeta} \times \widehat{z},$$

$$(4B.23) \quad \widehat{N} = -\frac{(1-\alpha) \times \lambda \times \omega \times (1-\varphi-\rho) \times (1+\sigma_t)}{\zeta} \times \widehat{z},$$

$$(4B.24) \quad \widehat{Qx} = \frac{(1-\alpha) \times (1-\lambda) \times \pi \times (1-\varphi-\rho) \times (1+\sigma_t)}{\zeta} \times \widehat{z},$$

$$(4B.25) \quad \widehat{Y} = -\frac{(1-\alpha) \times (1-\pi \times (1-\lambda)) \times (1-\varphi-\rho) \times (1+\sigma_t)}{\zeta} \times \widehat{z},$$

$$(4B.26) \quad \widehat{R} = -\frac{(1-\alpha) \times (1-\rho - (1-\lambda) \times \pi \times (1-\varphi-\rho)) \times (1+\sigma_t)}{\zeta} \times \widehat{z},$$

$$(4B.27)$$

$$\widehat{Pq} = \frac{(1-\alpha) \times (1+\sigma_t) \times \{-(1-\varphi-\rho) \times (1-\pi \times (1-\lambda)) - \lambda \times \omega \times (1-a)\} - a \times \varphi}{\zeta} \times \widehat{z},$$

$$(4B.28) \quad \widehat{Pd} = -\frac{(1-\alpha) \times (1-\varphi-\rho)}{\zeta} \times \widehat{z},$$

$$(4B.29) \quad \widehat{Pe} = \frac{\alpha \times (1-\varphi-\rho)}{\zeta} \times \widehat{z},$$

$$(4B.30) \quad \widehat{Qq} = \frac{(1-\alpha) \times o \times (1+\sigma_t)}{\zeta} \times \widehat{z},$$

where  $o = a \times \lambda \times \varphi + a \times (1-\lambda) \times (1-\pi) \times \varphi + \lambda \times \omega \times (1-\alpha) \times \varphi \times (1-a)$ ,

$$(4B.31) \quad \widehat{Qm} = \frac{(1-\alpha) \times \varphi \times (1+\sigma_t)}{\zeta} \times \widehat{z},$$

$$(4B.32) \quad \widehat{Qe} = \frac{(1-\varphi-\rho) \times (\alpha \times \sigma_t + (1-\alpha) \times (1-\lambda) \times \pi \times (\sigma_t + 1))}{\zeta} \times \widehat{z},$$

$$\text{or } \widehat{Qe} = \widehat{Qx} + \sigma_t \times \alpha \times \frac{(1-\varphi-\rho)}{\zeta} \times \widehat{z},$$

$$(4B.33) \quad \widehat{Qd} = \widehat{Qx} - \sigma_t \times (1-\alpha) \times \frac{(1-\varphi-\rho)}{\zeta} \times \widehat{z},$$

where

$$(4B.34)$$

$$\zeta = \frac{a}{1-a} \times \rho - (1-\alpha) \times (1-\lambda) \times \pi \times (1-\varphi-\rho) + \sigma_t \times (1-\alpha) \times \{1-\rho - (1-\lambda) \times \pi \times (1-\varphi-\rho)\} > 0$$

or

$$\zeta = (1-\varphi-\rho) \times (1-(1-\alpha) \times (1-\lambda) \times \pi) + \varphi \times (1-\alpha) + (1-\alpha) \times \sigma_t \times \{(1-\varphi-\rho) \times (1-(1-\lambda) \times \pi) + \varphi\} > 0$$

I derived an alternative expression for the denominator in order to show that it is positive for any set of parameter values.

Given that the balance of trade is fixed, it is important to determine whether the economy runs a trade deficit or a surplus in the benchmark. In what follows, I describe the conditions for the trade deficit and trade surplus.

The trade deficit implies that imports outweigh exports. Given that balance of trade is defined as the difference between imports and exports, with a trade deficit it should be positive. Using the model, it implies that the value share of imports ( $\gamma$ ) and exports ( $1-\gamma$ ) in the balance of trade is positive, where  $\gamma$  is larger than  $1-\gamma$ , and the share of balance of trade in total income ( $Y$ ) is positive as well:

- 1)  $\gamma > 1-\gamma$ ,
- 2)  $1-\varphi-\rho > 0$ .

When foreign trade is in surplus the signs are reversed:

- 1)  $\gamma < 1-\gamma$ ,
- 2)  $1-\varphi-\rho < 0$ .

When trade is balanced the following conditions should hold:

- 1)  $\gamma = 1-\gamma$ ,
- 2)  $1-\varphi-\rho = 0$ .

4B.2.2.2 *Import-competing effect*

The percentage changes in the variables with respect to the oil export price increase under the import-competing effect are derived under assumption that trade is balanced. The balanced trade conditions are as follows:

- 1)  $\gamma = 1 - \gamma$ ,
- 2)  $1 - \varphi - \rho = 0$ .

In what follows, I consider the effect of the import-competing effect on the economy when trade is balanced:

$$(4B.35) \hat{w} = \frac{a \times (1 - \alpha) \times (1 - \lambda) \times (1 - \pi) \times (1 - \sigma_a) \times (1 + \sigma_t)}{\Omega} \times \hat{z},$$

$$(4B.36) \hat{Pn} = \frac{a \times (1 - \alpha) \times (1 - \lambda \times (\omega - \pi) - \pi) \times (1 - \sigma_a) \times (1 + \sigma_t)}{\Omega} \times \hat{z},$$

$$(4B.37) \hat{Ln} = \frac{a \times (1 - \alpha) \times \lambda \times (1 - \sigma_a) \times (1 + \sigma_t)}{\Omega} \times \hat{z},$$

$$(4B.38) \hat{Lx} = \frac{a \times (1 - \alpha) \times (1 - \lambda) \times (\sigma_a - 1) \times (\sigma_t + 1)}{\Omega} \times \hat{z},$$

$$(4B.39) \hat{N} = \frac{a \times (1 - \alpha) \times \lambda \times \omega \times (1 - \sigma_a) \times (\sigma_t + 1)}{\Omega} \times \hat{z},$$

$$(4B.40) \hat{Qx} = \frac{a \times (1 - \alpha) \times (1 - \lambda) \times \pi \times (\sigma_a - 1) \times (\sigma_t + 1)}{\Omega} \times \hat{z},$$

$$(4B.41) \hat{Y} = \frac{a \times (1 - \alpha) \times (1 - (1 - \lambda) \times \pi - \varphi) \times (1 - \sigma_a) \times (1 + \sigma_t)}{\Omega} \times \hat{z},$$

$$(4B.42) \hat{R} = - \frac{(1 - \alpha) \times (\varphi - a + a \times (\lambda \times (\omega - \pi) + \pi) + \sigma_a \times a \times (1 - \lambda \times (\omega - \pi) - \pi)) \times (1 + \sigma_t)}{\Omega} \times \hat{z},$$

$$(4B.43) \hat{Pq} = \frac{a \times (1 - \alpha) \times (-\varphi + (1 - \sigma_a) \times (1 - \lambda \times (\omega - \pi) - \pi)) \times (1 + \sigma_t)}{\Omega} \times \hat{z},$$

$$(4B.44) \hat{Pd} = \frac{a \times (1 - \alpha) \times (1 - \varphi) \times (1 - \sigma_a)}{\Omega} \times \hat{z},$$

$$(4B.45) \hat{Pe} = \frac{a \times \alpha \times (1 - \varphi) \times (\sigma_a - 1)}{\Omega} \times \hat{z},$$

$$(4B.46) \hat{Qq} = \frac{a \times (1 - \alpha) \times (\sigma_a \times (\varphi - \lambda \times \omega) + \lambda \times \omega) \times (1 + \sigma_t)}{\Omega} \times \hat{z},$$

$$(4B.47) \hat{Qm} = Qq + (1 - a) \times \sigma_a \times \frac{(1 - \alpha) \times \varphi \times (1 + \sigma_t)}{\Omega} \times \hat{z},$$

$$(4B.48) \hat{Qe} = \hat{Qx} + \sigma_t \times \alpha \times \frac{a \times (1 - \varphi) \times (\sigma_a - 1)}{\Omega} \times \hat{z},$$

$$(4B.49) \hat{Qd} = \hat{Qx} + \sigma_t \times (1 - \alpha) \times \frac{a \times (1 - \varphi) \times (1 - \sigma_a)}{\Omega} \times \hat{z},$$

where the denominator in the equations (4B.35) to (4B.49) is equal to  
(4B.50)

$$\begin{aligned} \Omega = & (1-\alpha) \times \sigma_t \times [\varphi - a + a \times (\pi + \lambda \times (\omega - \pi))] + \\ & + a \times \sigma_a \times [(1-\alpha) \times \sigma_t \times (1 - \lambda \times (\omega - \pi) - \pi) + 1 - \alpha \times \varphi - (1-\alpha) \times (\lambda \times (\omega - \pi) + \pi)] + \\ & + (1-\alpha) \times (\lambda \times (\omega - \pi) + \pi) \times a > 0 \end{aligned}$$

The denominator ( $\Omega$ ) is positive, since  $\varphi - a > 0$  and

$$1 - \alpha \times \varphi - (1-\alpha) \times (\lambda \times (\omega - \pi) + \pi) > 0$$

I assume prices are equal to unity.

Proof:

$$\begin{aligned} \varphi - a = & \frac{Qx}{Y} - \frac{Qm}{Qq} = \frac{Qx \times Qq - Qm \times Y}{Y \times Qq} = \frac{(Qd + Qe) \times Qq - Qm \times (Qd + Qq)}{Y \times Qq} \\ = & \frac{Qd \times Qq + Qe \times Qq - Qm \times Qq - Qm \times Qd}{Y \times Qq} = \frac{Qd \times N}{Y \times Qq} = \frac{Qd/Qx \times N}{Y/Qx \times Qq} = \alpha \times \varphi \times (1-a) > 0 \end{aligned}$$

## Chapter 5 Discussion on Macro Closure Rules in a Static General Equilibrium Framework

### 5.1 Introduction

Although macro closure rules<sup>35</sup> are basic to the static general equilibrium (GE) models and different macro closure rules might lead to different conclusions, there is hardly anything in the literature that tests the effects of different macro closure rules in detailed models. Conventionally, static GE models employ some type of macro closure rules without even mentioning the rationale behind their choice. In this chapter, I argue that it is essential to explain the rationale behind the macro closure rule selected and highlight the fact that different macro closure rules might lead to some extent to different results.

This neglect to state the rationale for choosing particular macro closure rules in static GE models is partly due to the fact that the deciding which macro closure rule to use is ad hoc and the literature on macro closure rules does not provide an adequate answer as to what type of macro closure rule to choose for a particular issue at hand. I find that in general the literature on macro closure rules suffers from two shortcomings. *First*, it remains very general, as it provides only general suggestions concerning the choice of macro closure rules. The possible bases for choosing macro closures are presented by Rattso (1982). He states that the bases can be defined theoretically referring to Sen's (1963) study, in which Sen suggests to use the neoclassical, the neo-Keynesian, Johansen, and general theory approaches. The bases can also be defined empirically. Taylor and Lysy (1979) stress the importance of specifying a macro closure rule that has an empirical basis, or, in other words, that is appropriate to the problem at hand. They argue that along with the considerations of the structure of the economy, the issue that is to be addressed should be reflected in the choice of the macro closure rule as well. As is also stated by Mohora (2006) "a particular set of closure rules should also be consistent, to the largest extent possible, with the institutional structure of the economy and with the purpose of the model."

*Second*, the literature on macro closure rules does not go beyond one-sector models (e.g., Taylor and Lysy, 1979; Rattso, 1982). To the best of my knowledge, the theoretical literature considers the effects of alternative macro closure rules in the framework of one-sector models only, whereas most of the static GE models conventionally employ more than two sectors. Obviously, one-sector models fail to incorporate fully the intricacies of real-life multisector planning models and therefore remain to some extent inadequate in addressing whether different macro closure rules might lead to different results (Rattso, 1982).

In this chapter, I attempt to overcome this later shortcoming by developing a two-sector stylized model that is used to determine the effects of alternative macro closure rules when a particular issue such as the oil export price increase is the focus of the study. The model assumes two sectors: the oil and non-oil sectors, which employ labor and capital in production. The labor is assumed to be perfectly mobile and capital to be sector-specific. Given these

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<sup>35</sup> By the definition, macro closure rules determine the rules for clearing the macroeconomic balances, i.e., how equilibrium is obtained in the balances for the government, the rest of the world and the savings-investment account (Lofgren et al., 2002).



assumptions, my model mimics the adjustments in the economy over middle run. Overall, the model provides an analytical solution that highlights the differences across macro closure rules in a clear sense.

In addition, the model throws some light on the issue of the Dutch disease by incorporating some realistic features such as two-way trade<sup>36</sup> and providing scope for savings and investment.<sup>37</sup> In this way, the model represents another attempt to examine closely the issue of the Dutch disease and to identify the main effects responsible for the expansion of the oil sector and the contraction of the non-oil sector in the wake of the oil export price increase.

The aim is therefore twofold. First, I aim to test different effects of the alternative macro closure rules by means of this stylized model, thus filling the gap in the literature on macro closure rules. Second, I aim to highlight the effects of the oil export price increase on an oil-exporting economy, thus contributing to the literature on the Dutch disease.

Specifically, I aim to answer the following questions. *First*, what is the prices' response? Will the real exchange rate always appreciate? What factors are responsible for real exchange rate appreciation under each particular macro closure rule? *Second*, what are the structural adjustments in the economy? What sector grows and what sector shrinks under which effect? *Third*, how does real income respond to the oil export price increase? What are the effects of the oil export price increase on government and household savings, investment, household and government demand under alternative macro closure rules?

Similar to the analysis made in the previous chapter and in Corden and Neary's (1982) study, the analysis presented in this chapter, can be equally applied to cases in which the booming sector is not of an extractive type. It can be any other sector that enjoys positive terms of trade. This is because I am concerned with the medium-run effects of the boom in the oil sector on sectoral adjustments, rather than with long-run effects such as the depletion of oil resources. The analysis presented in this chapter can be employed to highlight mechanisms through which an increase in export price of a good other than oil ripples through the economy, and to see clearly whether the results under alternative macro closure rules are different.

This chapter is structured as follows. Section 5.2 provides an overview of the model. Section 5.3 discusses possible macro closure rules and provides an analytical solution under two such macro closure rules, namely the neoclassical and  $f(1)$  closure rules. Section 5.4 provides a numerical solution under each macro closure rule discussed. Section 5.5 concludes.

## 5.2 Overview of the Model

I assume in the model two sectors: the oil sector and the non-oil sector. I do so in order to examine the factor allocation between one specific sector of the economy, namely the oil sector, and the rest of the economy aggregated into one sector, namely the non-oil sector. Naturally, one can extend the model by introducing several other sectors, by disaggregating the non-oil sector into several non-oil sectors, for instance, but this comes at the price of losing tractability. To preserve the tractability of the results, I maintain this simple stylized framework.

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<sup>36</sup> This addresses the limitation in Corden and Neary's (1982) model, which assumes pure traded and pure nontraded goods.

<sup>37</sup> This addresses the limitation in the model developed in Chapter 4.

Both the oil and non-oil sectors use capital and labor in production (Figure 5.1). To reflect the medium term, I assume capital is sector-specific and labor is perfectly mobile. I assume no rigidities in the labor market so that the economy-wide wage rate adjusts to clear the labor market.

The notable feature of this model is that it assumes only one type of oil good, produced by the oil sector, namely exported oil, which is sold abroad and not demanded domestically, and that the model assumes neither oil imports nor domestic sales of oil. This is natural to assume because most of the oil-rich countries are net oil exporters, with their oil exports being much larger than their oil imports and domestic sales of oil. Incorporating imports and domestic sales of oil into the model is possible, but would not add much to the model in the way of insights.<sup>38</sup> Further, doing so would additionally complicate the model and, more importantly, cause it to be less tractable. This is then another reason to ignore modeling imports and domestic sales of oil at this stage and assume oil sector is entirely export oriented.

Another important feature of this model is that it assumes two types of non-oil goods produced by the non-oil sector, an exported non-oil good, which is sold abroad and not demanded domestically, and a domestic non-oil good, which is only sold domestically. This is also a natural assumption because the non-oil sector represents an aggregate of the rest of the sectors, whose products are largely supplied both abroad and domestically. Moreover, I employ this assumption, since I am largely concerned with the impact of the oil export price increase on non-oil exports and domestic non-oil sales. It is quite essential to model non-oil exports and domestic non-oil sales separately given that they might respond differently to an oil export price increase. In addition, I assume that the economy imports a non-oil good (an imported non-oil good), which is not produced domestically.

The model assumes a differentiation between the domestic non-oil good and the exported non-oil good and between the imported non-oil good and the domestic non-oil good (or import-competing non-oil good). Namely, differentiation between the domestic non-oil good and the exported non-oil good is modeled using a CET function with an elasticity of transformation ( $\sigma_t$ ). And differentiation between the imported non-oil good and the domestic non-oil good is modeled using a CES function with an Armington elasticity of substitution ( $\sigma_a$ ).<sup>39</sup>

In addition to the oil and non-oil producers, the model considers three other representative agents: a household, the rest of the world, and the government. The household owns both sectors. Hence, its income is composed of revenues received from the sales of oil and non-oil goods. The consumption of the household is a fixed fraction of its disposable income, obtained after income tax is subtracted from its total income. The household savings constitute the rest of its disposable income after consumption is deducted. The rest of the world supplies the non-oil good to the domestic economy (an imported non-oil good), which jointly with the domestic non-oil good form one composite non-oil good, which is used for investment, household consumption, and government consumption. The difference between total imports and total exports constitutes foreign savings. The government receives its income from tax payments, part of which is used for government consumption and part of which is saved.

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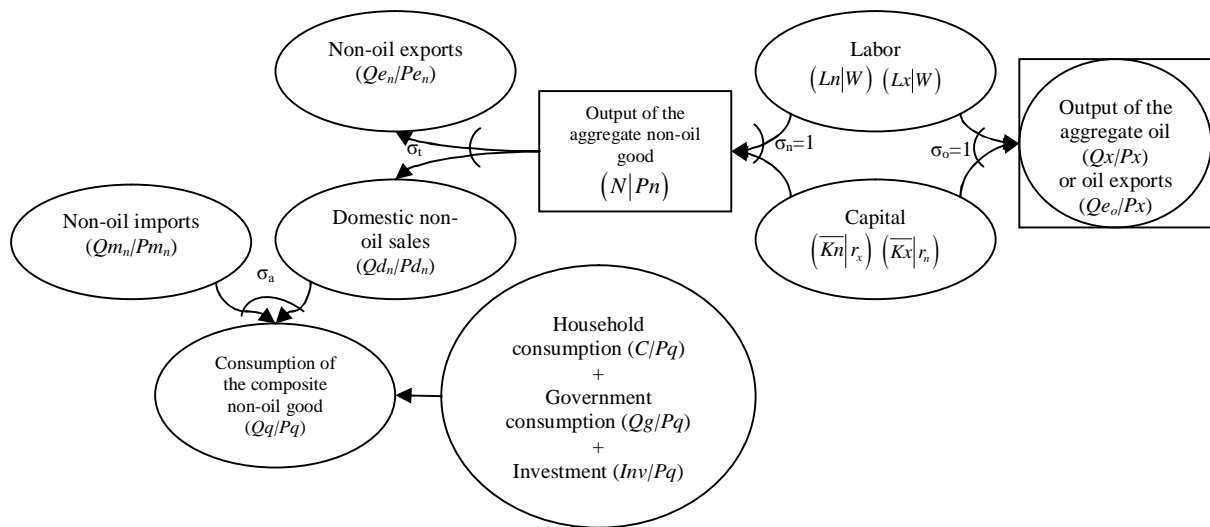
<sup>38</sup> This argument is based on the results obtained in Chapter 4.

<sup>39</sup> This is technically speaking how two-way trade is incorporated into the model.

Schematically, the main features of the model, namely production technology and flows of goods, are shown in Figure 5.1. The figure is self-explanatory and, therefore, to save space, it will not be discussed here.

A mathematical statement of the model is provided in Appendix 5B.1. In general, the model has 22 equations in 27 unknowns. Given that this model has more unknowns than equations, to solve the model, I need to specify some variables as exogenous, or in other words, to specify a closure rule.

**Figure 5.1 Production technology and flows of commodities**



Note: Circles indicate commodities, boxes production processes. Note that aggregate oil output is both a production process and a commodity. Therefore, it is enclosed both in a circle and a box. Notation enclosed in brackets shows quantities and prices. For a complete description of the notation, refer to Appendix 5A.

### 5.3 Discussion on Macro Closure Rules

In this chapter, I test two different groups of macro closure rules that I label exchange rate closure rule and foreign savings closure rule (Table 5.1). The first group, exchange rate closure rule group, consists of only one macro closure rule, a neoclassical closure rule, whereas the second group, foreign savings closure rules group, consists of three macro closure rules. Ideally, I should have considered Johansen closure rule<sup>40</sup> here as well, given that it belongs to the category of exchange rate closure rules. However, given the restrictive setup of the model, the results under the Johansen closure rule are similar to that under the neoclassical closure rule, except for the different results for investment and household savings. Therefore, I leave this analysis for ensuing chapters, where a more sophisticated model is considered.

I chose these labels for the groups because I treat the rest of the world two different ways, which is revealed in the different ways the groups treat foreign savings: the exchange rate closure rule group treats foreign savings as exogenous, whereas the foreign savings closure rules group treats foreign savings as endogenous. I limit the discussion to these two groups of macro closure rules for two reasons. First, it appears that some of these macro closure rules are

<sup>40</sup> The definition of the Johansen closure rule is provided in Section 7.2 of Chapter 7.

the most commonly used among the reviewed CGE models of resource booms<sup>41</sup> (e.g., Andersen and Farris, 2002; Benjamin et al., 1989; Clemente et al., 2002; IMF, 2004). Second, it is appealing to examine whether different treatment of the rest of the world on its own might trigger different results, given that I focus on the effects of the oil export price increase. In what follows, I begin by discussing a neoclassical closure rule and later on proceed to foreign savings closure rules.

The neoclassical closure rule implies a savings-driven economy, given that it treats the investment rate as endogenous, but savings rates of nongovernment institutions, such as households, as exogenous (see Table 5.1). Mohora (2006) notes that treating savings in this way is common when dealing with an economy in which savings form a “binding constraint.” It is supposed that the savings-investment identity is achieved via implicit adjustments in the interest rate, even though there is no explicit modeling of financial markets. For instance, the crowding-in of investment is assumed to be driven by implicit changes in the bond or the money market (Thurlow and van Seventer, 2002). This way of treating savings is considered in the literature to be a stylized illustration of a limited monetary policy (Roberts and Zolkiewski, 1996, Mohora, 2006).

**Table 5.1 Macro closure rules in the stylized model**

Variable	Description	Exchange rate closure rule	Foreign savings closure rules		
		Neoclassical	f(1)	f(2)	f(3)
$Q_g$	Government demand	Fixed	Fixed		Fixed
$tx$	Income tax rate for household	Fixed	Fixed	Fixed	
$S_g$	Government savings			Fixed	Fixed
$mpsh$	Household savings rate	Fixed	Fixed	Fixed	Fixed
$Inv$	Investment		Fixed	Fixed	Fixed
$Fsav$	Foreign savings	Fixed			
$R$	Exchange rate	Numeraire	Numeraire	Numeraire	Numeraire

Note: The notation used here is defined in Appendix 5A.

Robinson (2006) indicates that the neoclassical closure rule emphasizes the strong dichotomy between micro and macro issues. He finds that in the neoclassical framework macro-issues are only “compositional”, because they determine the composition of final demand, but have no or only a negligible effect on aggregate employment and hence GDP.

The second group of macro closure rules, the foreign savings closure rules group, consists of three closure rules labeled as f(1), f(2), and f(3) closure rules (Table 5.1). The common feature of all the foreign savings closure rules is that they keep the household savings rate and investment fixed. This group of closure rules does not treat savings-investment constraint either as savings-driven or investment-driven, via keeping either the household savings rate or investment as exogenous. Enabling this will prevent any adjustment in the government balance constraint, which is not feasible.

<sup>41</sup> They are the neoclassical closure rule and the foreign closure rule, which is labeled here as f(1).

The f(1) closure rule assumes that the income tax rate for household and government demand are fixed. It implies that government savings will adjust to ensure that benchmark government demand and income tax rate for household are maintained. Adjustments in the savings-investment relationship under this closure rule are made via a foreign savings-equilibrating mechanism (Robinson, 2006). When income rises, given a fixed household savings rate, household savings rise. Since government demand and the income tax rate for household are fixed, government savings rise as well, given that the government revenue rises. To bring savings-investment relationship into equilibrium, foreign savings have to adjust. Although the nominal exchange rate is fixed, this is achieved via adjustments in the real exchange rate, which serves as an equilibrating variable.

The f(2) closure rule allows government demand to vary, but fixes government savings and income tax rate for household. If government revenue increases, the government will tend to increase its demand for non-oil goods. The f(3) closure rule allows the income tax rate for household to vary, but fixes government savings and government demand. To maintain constant government savings and government demand, the government has to adjust income tax rate for household in order to have enough revenue or a large enough income tax base to keep government savings and government demand constant.

Adjustments in the savings-investment relationship under the f(2) and f(3) closure rules are also made via a foreign savings equilibrating mechanism, as under the f(1) closure rule. However, under the f(2) and f(3) closure rules, given that they treat government demand and the income tax rate for household differently, foreign savings might adjust differently to bring savings-investment relationship into equilibrium when the household income increases. As under the f(1) closure rule, the savings-investment identity is achieved via adjustments in the real exchange rate.

Among the exchange rate and foreign savings closure rules, only the f(1) can be regarded as the most prudent closure rule because it treats total absorption components, such as investment and government demand, as fixed, whereas the other three are expansionary: the neoclassical closure rule allows the investment to vary, the f(2) closure rule allows government demand to vary, and the f(3) closure rule allows the income tax rate for household to vary, which in its turn might affect household consumption.

In what follows, I provide analytical solutions for only the neoclassical and f(1) closure rules. Since it is difficult to clearly identify the effects under the f(2) and f(3) closure rules, I discuss them in some detail in the empirical section only.

### 5.3.1 Results under the Neoclassical Closure Rule

In this section, I discuss the effects of the oil export price increase under the neoclassical closure rule using percentage changes in the variables. I find that there are three main effects that are responsible for adjustments in the economy: an *import-competing effect*, a *transformability effect*, and a *demand effect*. The *import-competing effect* captures the impact of the variation in the Armington elasticity of substitution between the imported non-oil good and the domestic non-oil good. The *transformability effect* captures the impact of the variation in the elasticity of transformation between the exported non-oil good and the domestic non-oil good. The *demand effect* captures the impact of non-oil composite consumption.

I first consider the percentage change in the price of the domestic non-oil good ( $Pd_N$ ) with respect to the oil export price increase.  $Pd_N$  serves as the real exchange rate, given that the nominal exchange rate is taken as a numeraire. Hence, in what follows, I refer to  $Pd_N$  either as the price of the domestic non-oil good or the real exchange rate. An increase in  $Pd_N$  is associated with real exchange rate appreciation, whereas a decrease in it with real exchange rate depreciation. Equation (5.1) shows the effect on the real exchange rate of the increase in the oil export price in foreign currency units ( $z$ ), which is referred here as oil export price for short:

$$(5.1) \quad \widehat{Pd_N} = \frac{\eta}{\Lambda} \times \hat{z},$$

where  $\Lambda = [1 - \lambda(\omega - \pi) - \pi] \times (\sigma_a \times \gamma_m + \sigma_t \times (\gamma_m \times (1 - \alpha) + \gamma_e \times \alpha)) + \alpha \times \frac{\lambda \times \omega \times \gamma_m}{a} > 0$ ,

$$\eta = \gamma_x \times \left( \lambda \times (1 - \omega) + \lambda \times \omega \times \alpha \times \frac{1 - \varphi}{\varphi} + (1 - \lambda) \times (1 - \pi) \right) + \gamma_m \times \lambda \times \omega > 0.$$

The real exchange rate always appreciates, except for extreme cases when either the Armington elasticity of substitution or the elasticity of transformation or both of them tend to infinity. In the intermediate case, when both the Armington elasticity of substitution and the elasticity of transformation are smaller than infinity, the higher the Armington elasticity of substitution and/or the elasticity of transformation, the lower the real exchange rate appreciation, and vice versa (i.e., the lower the Armington elasticity of substitution and/or the elasticity of transformation the higher the real exchange rate appreciation). Or, in other words, using the terminology introduced above, the higher the import-competing and/or transformability effects, the lower the extent of the real exchange rate appreciation, and vice versa (i.e., the lower the import-competing and/or transformability effects, the higher the extent of the real exchange rate appreciation).

To show why this occurs, I use Figure 5.2, which clearly shows adjustments in the domestic market for the domestic non-oil good under alternative import-competing and transformability effects. Figure 5.2 consists of two parts: *a* and *b*. Figure 5.2.a shows adjustments under alternative import-competing effects, whereas Figure 5.2.b shows adjustments under alternative transformability effects.<sup>42</sup>

<sup>42</sup> Note that with the CES (CET) function, the Armington elasticity of substitution (elasticity of transformation) is proportional to the price elasticity of demand (price elasticity of supply). Hence, the high Armington elasticity of substitution (elasticity of transformation) case, or, in other words, a high import-competing effect (transformability effect), is likely to be associated with a high price elasticity of demand (price elasticity of supply), and a low Armington elasticity of substitution (elasticity of transformation), or, in other words, a low import-competing effect (transformability effect), with a low price elasticity of demand (price elasticity of supply).

**Figure 5.2 Adjustments in the market for domestically supplied and domestically consumed non-oil good: demand and supply-side views**

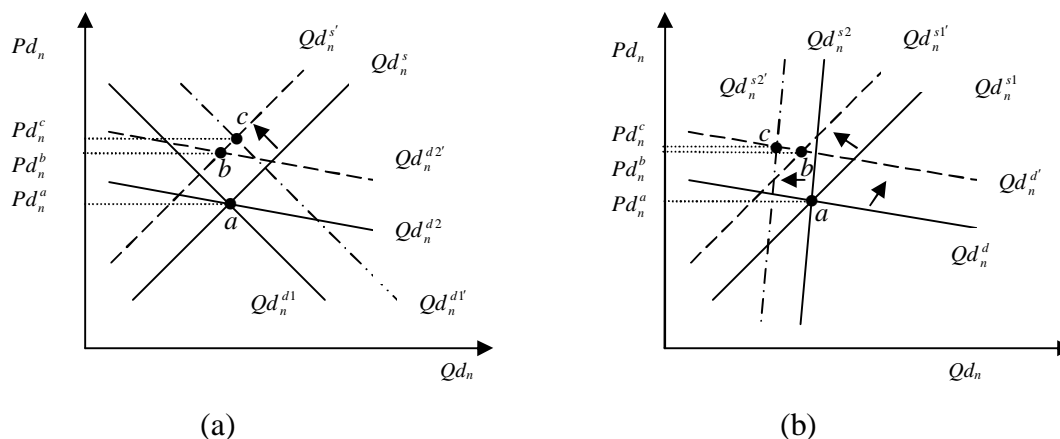


Figure 5.2.a. plots two alternative demand schedules along the common supply schedule. The benchmark demand schedule with the lower own price elasticity of demand or the lower import-competing effect is shown by the line  $Qd_n^{d1}$  and the benchmark demand schedule with the higher own price elasticity of demand or the higher import-competing effect<sup>43</sup> by the line  $Qd_n^{d2}$ . The benchmark supply schedule is shown by the line  $Qd_n^s$ . The benchmark equilibrium is achieved at point  $a$ , where the supply schedule intersects the alternative demand schedules.

Whether the oil export price increase eventually leads to an increase or a decrease in the output of the aggregate non-oil good and demand for the composite non-oil good is not the primary interest here. I leave the discussion for a later stage. Here, I assume that the output of the aggregate non-oil good decreases, but demand for the composite non-oil good increases. I follow this assumption, given that it is natural to expect that the output of the aggregate non-oil good would decrease and that demand for the composite non-oil good would increase in the wake of an oil export price increase.

Graphically, a decline in the output of the aggregate non-oil good causes a shift in the domestic non-oil good supply schedule to the left, from  $Qd_n^s$  to  $Qd_n^{s'}$ , and an increase in the demand for the composite non-oil good a shift of the domestic non-oil good demand schedule to the right, from  $Qd_n^{d1}$  to  $Qd_n^{d1'}$  for the lower own price elasticity of demand case and from  $Qd_n^{d2}$  to  $Qd_n^{d2'}$  for the higher own price elasticity of demand case. The new equilibrium is achieved at point  $c$  in the lower elasticity case and correspondingly at point  $b$  in the higher elasticity case.

Figure 5.2.a shows that the increase in  $Pd_n$  relative to its benchmark is smaller under the higher own price elasticity of demand case, or, in other words, under the higher import-competing effect, and is larger under the lower own price elasticity of demand case, or, in other words, under the lower import-competing effect ( $Pd_n^b < Pd_n^c$ ). Under the higher import-competing effect, competition between the imported and domestic non-oil goods is more intense than under the lower import-competing effect, which in its turn limits the extent of change in  $Pd_n$ , given a perfectly competitive market structure under which a producer has no control over prices and given that demand capacity is limited by the extent of change in real income.

Figure 5.2.b shows adjustments in the domestic market under alternative transformability effects. It plots two alternative supply schedules along a common demand schedule. The

<sup>43</sup> Note that comparisons “lower” and “higher” imply relative comparisons. Given that there are only two demand schedules, one of them has a lower and the other a higher own price elasticity of demand relative to each other.

benchmark supply schedule with the lower price elasticity of supply or lower transformability effect is shown by the line  $Qd_n^{s2}$  and the benchmark supply schedule with the higher price elasticity of supply or higher transformability effect by the line  $Qd_n^{s1}$ . The benchmark demand schedule is shown by the line  $Qd_n^d$ . The benchmark equilibrium is achieved at point  $a$ , where the supply schedules intersect the common demand schedule.

Here, I also assume that an increase in the oil export price leads to a decrease in the output of the aggregate non-oil good and an increase in the demand for the composite non-oil good, as a result of which the supply schedules shift to the left and the demand schedule shifts to the right. The new equilibrium under the higher price elasticity of supply case is achieved at point  $b$ , and under the lower price elasticity case at point  $c$ .  $Pd_n^b$  is the post-shock<sup>44</sup> price in the higher price elasticity of supply case, or under the higher transformability effect, and  $Pd_n^c$  is the post-shock price in the lower price elasticity case, or under the lower transformability effect.

Why does the higher transformability effect decrease the magnitude of change in  $Pd_n$  or lead to smaller real exchange rate appreciation? With the larger elasticity of transformation, the exported non-oil good and the domestic non-oil good are more transformable. When relative export price falls, it is more attractive for non-oil producers to supply non-oil good to domestic market. Given that producers in perfectly competitive markets do not have control over prices and given that the demand increase is limited, the increase in supply increases competition in the domestic market and, hence, decreases the magnitude of change in  $Pd_n$ , or leads to smaller real exchange rate appreciation. And in the other case, when the transformability effect is low, the real exchange rate appreciation is large due to smaller competition in the domestic market.

Given the analysis above, I may conclude that the import-competing and transformability effects serve the role of the effects that tend to increase the amount of supply in the domestic non-oil market and thus have a dampening effect on the extent of real exchange rate appreciation. Hence, if structural parameters in the economy are such that the Armington elasticity of substitution and the elasticity of transformation are large, competition in the domestic non-oil market will be large and real exchange rate appreciation will be small, but if they are small, competition will be small and real exchange rate appreciation will be large.

Next, consider the effects of the oil export price increase on producer prices. Equation (5.2) shows the effects of the oil export price increase on the aggregate non-oil price, or in other words, non-oil producer's unit revenue.

$$(5.2) \quad \widehat{Pn} = \frac{\alpha \times \eta}{\Lambda} \times \widehat{z}.$$

The larger the real exchange rate appreciation is, the larger the unit revenue of the non-oil producer is, and hence the lower non-oil producer costs are. Whether the non-oil sector expands or shrinks depends heavily on the relative producer prices. Equation (5.3) shows the percentage change in the unit revenue of the oil producer relative to that of the non-oil producer:

$$(5.3) \quad \widehat{Px} - \widehat{Pn} = \frac{(1 - \lambda \times (\omega - \pi) - \pi) \times \left\{ \sigma_a \times \gamma_m + \sigma_t \times (\gamma_m \times (1 - \alpha) + \gamma_e \times \alpha) - \alpha \times \gamma_x \right\}}{\Lambda} \times \widehat{z}$$

<sup>44</sup> Shock refers here to the oil export price increase.



The second bracketed expression in the numerator of the equation consists of three terms. The first term of the expression is a weighted Armington elasticity of substitution, the second is a weighted elasticity of transformation, and the third is the share of non-oil supplied domestically ( $\alpha$ ), corrected for the amount of oil produced ( $\gamma_x$ ). The first two terms tend to increase the percentage change in the unit revenue of the oil producer relative to that of the non-oil producer, whereas the latter term tends to decrease it. The first two terms are associated with the already familiar import-competing and transformability effects, and the third term is defined as the demand effect.<sup>45</sup>

If the import-competing and transformability effects dominate the demand effect, the relative oil producer's unit revenue will rise, which in its turn implies lower producer costs for the oil producer than for the non-oil producer. Eventually, it increases employment in the oil sector and decreases employment in the non-oil sector. Hence, the oil sector expands and the non-oil sector contracts. Equations (5.4) and (5.5) show the percentage changes in outputs of the non-oil and oil sectors, respectively:

$$(5.4) \quad \widehat{N} = -\frac{\lambda \times \omega \times \{\sigma_a \times \gamma_m + \sigma_t \times (\gamma_m \times (1 - \alpha) + \gamma_e \times \alpha) - \alpha \times \gamma_x\}}{\Lambda} \times \widehat{z}$$

$$(5.5) \quad \widehat{Q_x} = \frac{(1 - \lambda) \times \pi \times \{\sigma_a \times \gamma_m + \sigma_t \times (\gamma_m \times (1 - \alpha) + \gamma_e \times \alpha) - \alpha \times \gamma_x\}}{\Lambda} \times \widehat{z}$$

The import-competing and transformability effects favor oil production, since they tend to increase competition at the domestic non-oil market and thus causing an increase in the unit revenue of the oil producer relative to the unit revenue of the non-oil producer. Whereas the demand effect favors non-oil production because it increases the extent of non-oil absorption and, hence, induces an increase in the unit revenue of the non-oil producer relative to that of the oil producer. Theoretically, it is possible to expect that the demand effect outweighs the transformability and import-competing effects, although in reality it is almost unlikely. Taking into the account increasing globalization and the growing dependence of many resource-exporting countries on the rest of the world, it is natural to expect that the extent of the transformability and import-competing effects underlined by the elasticities of transformation and Armington elasticities of substitution are large. Thus, it is more likely to expect that the oil sector expands and the non-oil sector contracts as a result of the oil export price increase.

The equations (5.6) to (5.8) show the percentage changes in the amounts of the domestic ( $Qd_N$ ), exported ( $Qe_N$ ) and imported non-oil ( $Qm_N$ ) goods, respectively:

$$(5.6) \quad \widehat{Qd_N} = \widehat{N} + (1 - \alpha) \times \sigma_t \times \frac{\eta}{\Lambda} \times \widehat{z},$$

$$(5.7) \quad \widehat{Qe_N} = \widehat{N} - \alpha \times \sigma_t \times \frac{\eta}{\Lambda} \times \widehat{z},$$

$$(5.8) \quad \widehat{Qm_N} = \widehat{Qq} + (1 - a) \times \sigma_a \times \frac{\eta}{\Lambda} \times \widehat{z}.$$

<sup>45</sup> I label it the "demand effect" because, with the elasticities of substitution and transformation set to zero, the percentage change in consumption of the composite non-oil good is equal to that in the output of the aggregate non-oil good. In this case, the change in the output of the aggregate non-oil good is purely demand driven.

The total effect on  $Qd_N$ ,  $Qe_N$  and  $Qm_N$  is decomposed into constituting effects, namely the expansion and substitution effects. The expansion effect for  $Qd_N$  and  $Qe_N$  corresponds to the percentage change in the output of the aggregate non-oil good and the expansion effect for  $Qm_N$  corresponds to the percentage change in the consumption of the composite non-oil good, whereas the substitution effect corresponds to the percentage change in the corresponding relative prices, weighted by the corresponding price elasticities. Since the exchange rate is a numeraire and non-oil export and non-oil import prices in foreign currency units are given, the substitution effect is associated with the percentage change in  $Pd_N$ .

The effect of the oil export price increase on  $Qd_N$  is ambiguous.  $Qd_N$  might increase or decrease due to the expansion effect, but it increases unambiguously due to the substitution effect. The effect of the oil export price increase on  $Qe_N$  is ambiguous as well.  $Qe_N$  might increase or decrease due to the expansion effect, but it decreases unambiguously due to the substitution effect.  $Qm_N$  increases unambiguously as a result of the positive expansion and substitution effects.

Equations (5.9) to (5.13) show the effect of the oil export price increase on the household income, household consumption, total absorption, government savings, and investment:

$$(5.9) \quad \widehat{Yh} = \frac{(\varphi - \lambda \times \omega) \times (\sigma_a \times \gamma_m + \sigma_t \times (\gamma_m \times (1 - \alpha) + \alpha \times \gamma_e)) + \alpha \times \phi}{\Lambda} \times \widehat{z}$$

$$(5.10) \quad \widehat{C} = \frac{(\varphi - \lambda \times \omega) \times \{ \sigma_a \times \gamma_m + \sigma_t \times (\gamma_m \times (1 - \alpha) + \gamma_e \times \alpha) \} + \lambda \times \omega \times \{ (a - (1 - \alpha)) \times (\gamma_m - \gamma_e) + \gamma_x \times \alpha \times (1 - \varphi) \}}{\Lambda} \times \widehat{z} +$$

$$+ \frac{\gamma_x \times s_{fy} \times (1 - a) \times (\lambda \times (1 - \omega) + (1 - \lambda))}{\Lambda} \times \widehat{z}$$

$$(5.11) \quad \widehat{Qq} = \frac{\sigma_a \times \gamma_m \times \varphi \times (\lambda \times (1 - \omega) + (1 - \lambda) \times (1 - \pi)) \times (1 - a)}{\Lambda \times \alpha \times (1 - \varphi)} \times \widehat{z} +$$

$$+ \frac{\sigma_t \times \gamma_e \times \varphi \times (\lambda \times (1 - \omega) + (1 - \lambda) \times (1 - \pi))}{\Lambda \times (1 - \varphi)} \times \widehat{z} + \frac{\alpha \times \gamma_x \times \lambda \times \omega}{\Lambda} \times \widehat{z}$$

$$(5.12) \quad \widehat{S}_g = \left\{ \frac{d \times (\varphi - \lambda \times \omega) \times [\gamma_m \times \sigma_a + \sigma_t \times (\gamma_m \times (1 - \alpha) + \gamma_e \times \alpha)]}{\Lambda} + \left\{ \frac{\alpha \times d \times \phi}{\Lambda} - \frac{(1 - a) \times p \times \eta}{\Lambda} \right\} \right\} \times \widehat{z}$$

$$(5.13) \quad \widehat{Inv} = \frac{\widehat{Qq}}{(1 - s_{qg} - s_{qh})} - \frac{s_{qh} \times (\varphi - \lambda \times \omega) \times (\sigma_a \times \gamma_m + \sigma_t \times (\alpha \times \gamma_e + (1 - \alpha) \times \gamma_m))}{\Lambda \times (1 - s_{qg} - s_{qh})} \times \widehat{z}$$

$$- \frac{s_{qh} \times \{ \lambda \times \omega \times \{ (a - (1 - \alpha)) \times (\gamma_m - \gamma_e) + \gamma_x \times \alpha \times (1 - \varphi) \} \}}{\Lambda \times (1 - s_{qg} - s_{qh})} \times \widehat{z}$$

$$- \frac{s_{qh} \times \gamma_x \times s_{fy} \times (1 - a) \times (\lambda \times (1 - \omega) + (1 - \lambda))}{\Lambda \times (1 - s_{qg} - s_{qh})} \times \widehat{z}$$

There is an unambiguous increase in the household income, household consumption, and total absorption, but an ambiguous change in government savings and investment. It is obvious why the household income, household consumption, and total absorption increase. But what causes the ambiguous response in government savings and investment? This I answer in what follows.

Government savings increase with the increase in government revenues from the income tax, but might decrease if the increase in the consumption price deflator ( $Pq$ ) is sufficiently high. Since the extent of change in  $Pq$  largely depends on the extent of the import-competing and transformability effects, government savings will also depend on the extent of these effects. If these effects are high enough, which tend to reduce real appreciation of the exchange rate and, hence,  $Pq$ , government savings will likely increase. In the opposite case, if these effects are low enough, government savings will likely decrease.

Investment increases due to the increase in the demand for the composite non-oil good, or total absorption, but decreases as household consumption increases. As total absorption increases, investment, being a component of total absorption, increases as well. As household consumption increases, household savings decrease. Given that aggregate savings determine investment, the increase in consumption decreases the extent of change in investment.

Whether changes in macro variables are substantial largely depends on the extent of the import-competing and transformability effects. Larger import-competing and transformability effects tend to cause larger increases in government savings and household consumption, but tend to dampen investment, as it is inversely related to household consumption. In the economy dependent on the rest of the world, the oil export price increase most likely tends to boost household consumption and government savings and hence dampens the increase in investment demand, as household consumption tends to reduce it.

### 5.3.2 Results under the f(1) Closure Rule

In what follows, I discuss the effects of the oil export price increase under the f(1) closure rule using percentage changes in the variables.

Equation (5.14) shows the effect of the oil export price increase on the real exchange rate. The numerator is strictly greater than zero, but the denominator ( $\Theta$ ) can be of either sign. The denominator consists of three terms. The first two are strictly positive and the third, weighted by  $s_{qh}$ , can be of either sign. Its sign strongly depends on the parameter  $s_{fy}$ , which is the ratio of foreign savings to household income. It implies that if the economy accumulates a trade surplus in the benchmark equilibrium, which implies negative foreign savings, the denominator will be always positive. But if the economy runs a trade deficit, which implies positive foreign savings, the sign of the denominator will be ambiguous. If the import-competing and transformability effects are negligible, and the economy runs a trade deficit in the benchmark, the real exchange rate will not necessarily appreciate:

$$(5.14) \quad \widehat{Pd}_N = \frac{s_{qh} \times (\varphi - \lambda \times \omega) + \lambda \times \omega}{\Theta} \times \hat{z},$$

$$\text{where } \Theta = (1 - \pi - \lambda \times (\omega - \pi)) \times (\sigma_t \times (1 - \alpha) + \sigma_a \times a) + \alpha \times \lambda \times \omega - s_{qh} \times (1 - a) \times s_{fy} \times (\pi \times (1 - \omega) \times \lambda + (1 - \pi) \times \omega \times (1 - \lambda) + (1 - \pi) \times (1 - \omega)).$$

To simplify the analysis, I assume that foreign savings are negative. Hence, I assume that the real exchange rate always appreciates. As in the analysis presented in the previous section, the import-competing and transformability effects tend to reduce the appreciation of the real exchange rate ( $Pd_N$ ). This mainly occurs due to the increased competition in the domestic market, which in its turn reduces the extent of change in  $Pd_N$ .

Equations (5.15) to (5.18) show the percentage changes in outputs, relative producer prices, and consumption of the composite non-oil good with respect to the oil export price increase. They can be of either sign, depending on the magnitudes of the common term in the bracketed expression:

$$(5.15) \quad \hat{N} = -\frac{\lambda \times \omega \times \left( (a \times \sigma_a + (1-\alpha) \times \sigma_t) - s_{qh} \times (a - (1-\alpha)) \right)}{\Theta} \times \hat{z},$$

$$(5.16) \quad \hat{Q}_x = \frac{(1-\lambda) \times \pi \times \left( (a \times \sigma_a + (1-\alpha) \times \sigma_t) - s_{qh} \times (a - (1-\alpha)) \right)}{\Theta} \times \hat{z},$$

$$(5.17) \quad \hat{P}_x - \hat{P}_n = \frac{(1-\lambda \times (\omega - \pi) - \pi) \times \left( (a \times \sigma_a + (1-\alpha) \times \sigma_t) - s_{qh} \times (a - (1-\alpha)) \right)}{\Theta} \times \hat{z},$$

$$(5.18) \quad \hat{Q}_q = \frac{\left( (\varphi - \lambda \times \omega) \times (\sigma_a \times a + \sigma_t \times (1-\alpha)) + \lambda \times \omega \times (a - (1-\alpha)) \right) \times s_{qh}}{\Theta} \times \hat{z}.$$

The first term in the common bracketed expression (in eq. 5.15-5.18) is the Armington elasticity of substitution between the non-oil goods, corrected for the value share of the non-oil imports,  $(a \times \sigma_a)$ . The second term is the elasticity of transformation, corrected for the value share of the non-oil exports,  $(1-\alpha) \times \sigma_t$ . These are familiar *import-competing* and *transformability effects* respectively. And, finally, the third term is the difference between the value share of the non-oil imports in the composite non-oil consumption ( $a$ ) and the value share of the non-oil exports in the output of the aggregate non-oil good  $(1-\alpha)$ , corrected for the value share of the household consumption in consumption of the composite non-oil good ( $s_{qh}$ ). I refer to it as the *non-oil net export effect*<sup>46</sup> or *demand effect* interchangeably.

Similar to the import-competing and transformability effects under the neoclassical closure rule, the import-competing and transformability effects under the f(1) closure rule tend to favor the oil sector and undermine the non-oil sector. If structural parameters in the economy are such that the *import-competing* and *transformability* effects are large enough, the relative price of oil will rise. This causes oil output to increase and non-oil output to decrease. This trend is primarily due to the fact that the import-competing and transformability effects tend to reduce the extent of change in  $Pd_N$  and, hence, the unit revenue of the non-oil producer ( $Pn$ ).

However, the demand effect under the f(1) closure rule is different from the demand effect under the neoclassical closure rule. If the demand effect under the neoclassical closure rule favored the non-oil sector and undermined the oil sector unambiguously, the demand effect under the f(1) closure rule might increase or decrease the outputs of the non-oil and oil sectors. If the parameters are such that the non-oil imports are higher than the non-oil exports in the benchmark, which implies that  $a > 1-\alpha$  (or  $\alpha > 1-a$ ), the demand effect will be positive for the output of the non-oil sector and negative for that of the oil sector. In the opposite case, the

<sup>46</sup> I call this effect the non-oil net export effect because it shows how the difference between the value share of the non-oil import in the consumption of the composite non-oil good and the value share of the non-oil export in the output of the aggregate non-oil good affects the variables of interest.

demand effect will be negative for the output of the non-oil sector and positive for that of the oil sector. To explain what causes such a response consider changes in the unit revenue of the non-oil producer ( $Pn$ ), which is also a factor cost deflator of the aggregate non-oil output because the non-oil sector employs only two factors in production and the price of the composite non-oil good ( $Pq$ ), which is also a domestic expenditure deflator because domestic consumption is made up of the non-oil goods only. Since exchange rate is a numeraire in this model, the expressions for  $Pq$  and  $Pn$  reduce to

$$(5.19) \quad \widehat{Pq} = (1-a) \times \widehat{Pd}_N,$$

$$(5.20) \quad \widehat{Pn} = \alpha \times \widehat{Pd}_N.$$

If the non-oil imports are higher than the non-oil exports in the benchmark, implied by  $a > 1 - \alpha$  (or  $\alpha > 1 - a$ ), real exchange rate appreciation will cause the factor cost deflator to increase more than the expenditure deflator in the wake of the oil export price increase (eqs. 5.19 and 5.20). As a result, given a flexible economy-wide wage rate, a higher increase in the factor cost deflator relative to the expenditure deflator implies lower non-oil producer real wage costs, which in turn prompt an increase in employment in this sector and in its output. Moreover, given that I assume a two-sector economy, ceteris paribus, an increase in the output of one sector necessarily engenders a decrease in the output of the other sector. Hence, when the non-oil imports are higher than the non-oil exports in the benchmark and when the import-competing and transformability effects are negligible the aggregate non-oil output increases, but the oil output decreases.

Now, I discuss the effects of the oil export price increase on the amount of the domestic non-oil good ( $Qd_N$ ), exported non-oil good ( $Qe_N$ ), and imported non-oil good ( $Qm_N$ ). The total effect on the amounts of these goods is decomposed into the corresponding expansion and substitution effects. Equations (5.21) to (5.23) show the total effect of the oil export price increase on  $Qd_N$ ,  $Qe_N$  and  $Qm_N$  respectively:

$$(5.21) \quad \widehat{Qd}_N = \widehat{N} + \frac{(1-\alpha) \times \sigma_t \times (s_{qh} \times (\varphi - \lambda \times \omega) + \lambda \times \omega)}{\Theta} \times \widehat{z},$$

$$(5.22) \quad \widehat{Qe}_N = \widehat{N} - \frac{\alpha \times \sigma_t \times (s_{qh} \times (\varphi - \lambda \times \omega) + \lambda \times \omega)}{\Theta} \times \widehat{z},$$

$$(5.23) \quad \widehat{Qm}_N = \widehat{Qq} + \frac{(1-a) \times \sigma_a \times (s_{qh} \times (\varphi - \lambda \times \omega) + \lambda \times \omega)}{\Theta} \times \widehat{z}.$$

The *expansion effect* for  $Qd_N$  and  $Qe_N$  is equal to the percentage change in the output of the aggregate non-oil good ( $N$ ), whereas the *expansion effect* for  $Qm_N$  is equal to the percentage change in the consumption of the composite non-oil good ( $Qq$ ). The expansion effect for  $Qd_N$ ,  $Qe_N$ , and  $Qm_N$  are ambiguous, since the effect of the oil export price increase on  $N$  and  $Qq$  are ambiguous. The remaining term, a *substitution effect* for  $Qd_N$ ,  $Qe_N$ , and  $Qm_N$ , is equal to the weighted percentage change in the corresponding relative prices, or in other words the weighted percentage change in the real exchange rate, with weights being equal to the corresponding price elasticities. The substitution effect for  $Qd_N$  is positive, for  $Qe_N$  negative, and for  $Qm_N$  positive.

Further, consider the effects of the oil export price increase on macro variables. Equations (5.24) to (5.27) show the effect of the oil export price increase on the household nominal income, household real income, government savings, and household consumption respectively.

Since the income tax rate for household and the household savings rate (which I do not report here to save space) are fixed, household savings increase at the same rate as the household nominal income.

$$(5.24) \quad \widehat{Yh} = \frac{\left[ (\varphi - \lambda \times \omega) \times (\sigma_t \times (1 - \alpha) + a \times \sigma_a + s_{qh} \times (1 - a)) + \alpha \times \lambda \times \omega \right]}{\Theta} \times \widehat{z},$$

$$(5.25) \quad \widehat{Yh} - \widehat{Pq} = \frac{\left\{ (\varphi - \lambda \times \omega) \times (a \times \sigma_a + (1 - \alpha) \times \sigma_t) + \lambda \times \omega \times (a - (1 - \alpha)) \right\}}{\Theta} \times \widehat{z},$$

(5.26)

$$\widehat{S}_g = \frac{(\varphi - \lambda \times \omega) \times d \times (\sigma_t \times (1 - \alpha) + a \times \sigma_a) + \alpha \times d \times \lambda \times \omega + s_{qh} \times (1 - a) \times (\varphi - \lambda \times \omega) - \lambda \times \omega \times p \times (1 - a)}{\Theta} \times \widehat{z}$$

$$(5.27) \quad \widehat{C}_N = \frac{(\varphi - \lambda \times \omega) \times (\sigma_t \times (1 - \alpha) + \sigma_a \times a) + \lambda \times \omega \times (a - (1 - \alpha))}{\Theta} \times \widehat{z}.$$

I find that the household nominal income increases unambiguously, whereas whether the household real income increases is ambiguous. The ambiguity arises due to the fact that different effects engendered by the oil export price increase differently affect the household real income. The import-competing and transformability effects tend to decrease the extent of the real appreciation in the exchange rate and hence increase in  $Pq$ , as a result of which the household real income tends to increase. Whereas the demand effect has an ambiguous impact on the household real income. As was discussed previously the demand effect largely depends on whether the non-oil imports are higher than the non-oil exports in the benchmark. If the non-oil imports are higher than the non-oil exports in the benchmark, the demand effect on the real income will be positive and vice versa.

The household real income in its turn affects household consumption and government savings. If the household real income increases, household consumption and government savings will increase and vice versa.

Equation (5.28) shows the effect of the oil export price increase on foreign savings:

(5.28)

$$\begin{aligned} \dot{F}sav = & -\sigma_a \times \frac{\left\{ a \times \gamma_x \times (\lambda \times (1 - \omega) + (1 - \lambda) \times (1 - \pi)) - s_{qh} \times (\varphi - \lambda \times \omega) \times \gamma_m \right\}}{\Theta} \times \widehat{z} \\ & - \sigma_t \times \frac{\left\{ \gamma_x \times (1 - \alpha) \times (\lambda \times (1 - \omega) + (1 - \lambda) \times (1 - \pi)) - s_{qh} \times (\gamma_m \times (1 - \alpha) + \gamma_e \times \alpha) \times (\varphi - \lambda \times \omega) \right\}}{\Theta} \times \widehat{z} \\ & - s_{qh} \times (1 - a) \times \frac{\left\{ \gamma_x \times (\lambda \times (1 - \omega) + (1 - \lambda) \times (1 - \pi)) + \gamma_m \times \lambda \times \omega / a \right\}}{\Theta} \times \widehat{z} \\ & + s_{qh} \times \frac{\alpha \times \phi}{\Theta} \times \widehat{z} - \frac{\alpha \times \gamma_x \times \lambda \times \omega}{\Theta} \times \widehat{z} \end{aligned}$$

Oil export price increase affects foreign savings through the interaction of the import-competing, transformability, and demand effects. These three effects all have ambiguous effects on foreign savings. The import-competing effect can either decrease or increase foreign savings. Technically speaking, if the share of household consumption in total absorption ( $s_{qh}$ ) is large enough, the import-competing effect will increase foreign savings, and if it is small enough, it will decrease them (eq. 5.28). Intuitively, the import-competing effect increases the non-oil imports and decreases the non-oil exports, and, hence, increases foreign savings.

However, on the other hand, the import-competing effect favors oil sector and hence oil exports, and, hence, decreases foreign savings. Hence, whether foreign savings increase or decrease as a result of the import-competing effect is ambiguous.

The impact of the transformability effect on foreign savings is ambiguous as well. On the one hand, it decreases foreign savings because the output of oil increases. On the other hand, it increases foreign savings because the non-oil exports decrease and the non-oil imports increase.

The impact of the demand effect on foreign savings is also ambiguous. It is due to the fact that the demand effect has an ambiguous effect on non-oil imports, non-oil exports and oil exports.

Overall, whether foreign savings increase or decrease depends heavily on the structural characteristics of the economy. Yet, in general, under this closure rule, it is more likely that foreign savings decrease, given that most of the components of total absorption are kept fixed.

## 5.4 Empirical Analysis

In this section, I discuss the effects of the oil export price increase on the archetype economy. The artificial social accounting matrix (SAM)<sup>47</sup> and the parameters are shown in Tables 5.2 and 5.3 respectively.<sup>48</sup>

**Table 5.2 SAM for archetype economy**

	A_oil	A_non-oil	C_non-oil	LAB	CAP	H	Gov	S-I	ROW	TOTAL
A_oil									100.00	100.00
A_non-oil			696.00						104.00	800.00
C_non-oil						528.64	107.52	259.84		896.00
LAB	25.00	280.00								305.00
CAP	75.00	520.00								595.00
H				305.00	595.00					900.00
Gov						297.00				297.00
S-I						74.36	189.48		-4.00	259.84
ROW			200.00							200.00
TOTAL	100.00	800.00	896.00	305.00	595.00	900.00	297.00	259.84	200.00	

The SAM consists of the following accounts: activities, commodities, factors, representative agents, and savings-investment accounts. In particular, it includes two sectors (the oil sector (A\_oil) and the non-oil sector (A\_non-oil)), one type of good consumed at home (composite non-oil good (C\_non-oil)), two factors (labor (LAB) and capital (CAP)), three agents (household (H), government (Gov) and rest of the world (ROW)). I label the savings-investment account as S-I.

<sup>47</sup> More detailed definition of the SAM is provided in Chapter 6.

<sup>48</sup> The artificial SAM is constructed so that parameters in Table 5.3 to some extent resemble parameters relevant for the Kazakhstani economy.

**Table 5.3 Structural parameters**

Parameter	Value	Parameter	Value	Parameter	Value	Parameter	Value
$\pi$	0.25	$\gamma_m$	200.00	$\varphi$	0.11	$h_r$	-0.02
$\omega$	0.35	$\gamma_x$	100.00	$mps$	0.12	$h_g$	0.73
$\lambda$	0.08	$\gamma_e$	104.00	$\kappa$	0.14	$h_c$	0.29
$\alpha$	0.87	$a$	0.22	$s_{te}$	0.49	$d$	1.57
$\sigma_t$	5	$h_f$	0.004	$s_{qh}$	0.59	$p$	0.57
$\sigma_a$	3	$s_{fy}$	-0.004	$s_{qg}$	0.12		

Note: Symbols are defined in Appendix 5A.

The main features of the archetype economy are as follows:

- It is a small, open developing economy, strongly dependent on the rest of the world. This is shown by the Armington elasticity of substitution and the elasticity of transformation being larger than unity.<sup>49</sup>
- The non-oil sector is larger than the oil sector, given that the non-oil sector represents an aggregate of the non-oil sectors.
- There is a home bias in domestic consumption. This is revealed in the larger share of consumption of the domestic non-oil good compared to that of the imported non-oil good.
- Domestic sales of the non-oil good are larger than the exports of the non-oil good
- The economy accumulates a trade surplus in the benchmark.
- Non-oil imports are larger than non-oil exports.

Table 5.4 shows the effects of a 30-percent increase in the oil export price on the economy under alternative macro closure rules. I find that the real exchange rate appreciates, oil output increases and aggregate non-oil output decreases under all macro closure rules. This finding signifies that the import-competing and transformability effects dominate the demand effect, a result of which is that the unit revenue of the oil producer rises vis-à-vis the unit revenue of the non-oil producer, which in turn causes the output of oil to increase and output of the aggregate non-oil good to decrease. It appears that the effects of the oil export price increase on the amounts of aggregate commodities across the closure rules do not differ greatly, whereas those on  $Qd_N$ ,  $Qe_N$  and  $Qm_N$  differ to some extent. In what follows I discuss what causes these differences across different macro closure rules.

<sup>49</sup> The Armington elasticity of substitution and the elasticity of transformation have been borrowed from a study by Jensen and Tarr (2006), which is based on the Kazakhstani economy.



**Table 5.4 Implications of the 30-percent increase in the oil export price under alternative closure rules**

No	Variable	Neoclassical	$f(1)$	$f(2)$	$f(3)$
1.	$Q_x$	8.39	8.66	8.33	8.37
2.	$N$	-1.05	-1.08	-1.04	-1.05
3.	$Q_{eN}$	-15.54	<b>-11.12</b>	<b>-16.48</b>	-15.74
4.	$Q_{mN}$	11.11	<b>7.34</b>	<b>11.92</b>	11.28
5.	$Q_{dN}$	1.12	<b>0.42</b>	<b>1.27</b>	1.15
6.	$Q_{qN}$	3.35	1.96	<b>3.64</b>	3.41
7.	$P_{eN}$	-	-	-	-
8.	$P_{dN}$	3.33	<b>2.31</b>	<b>3.55</b>	3.38
9.	$P_{mN}$	-	-	-	-
10.	$P_x$	30.00	30.00	30.00	30.00
11.	$P_n$	2.90	2.01	3.09	2.94
12.	$P_x - P_n$	27.10	27.99	26.91	27.06
13.	$P_{qN}$	2.59	1.79	2.76	2.62
14.	$L_x$	33.54	34.64	33.31	33.49
15.	$L_n$	-2.99	-3.09	-2.97	-2.99
16.	$R$	-	-	-	--
17.	$Y_h$	5.91	5.12	<b>6.08</b>	5.95
18.	$C$	3.32	3.33	3.32	<b>5.78</b>
19.	$S_g$	7.79	7.00	-	-
20.	$Q_g$	-	-	14.03	-
21.	$F_{sav}$	-	<b>-1242.08</b>	264.46	56.76
22.	$Inv$	4.79	-	-	-
23.	$Y_h - P_{qN}$	3.32	3.33	3.32	3.32
24.	$w$	4.84	4.02	5.02	4.88
25.	$tx$	-	-	-	-5.00

Note: The figures in the table are given in percentage changes, apart from foreign savings, which are given in absolute changes.

I find that the main difference is in the different extent of the real exchange rate appreciation and hence different change in  $Q_{dN}$ ,  $Q_{eN}$  and  $Q_{mN}$ . I find that real exchange rate appreciation, decrease in  $Q_{eN}$ , increase in  $Q_{mN}$  and  $Q_{dN}$  are the lowest under the  $f(1)$  closure rule and the highest under the  $f(2)$  closure rule. Different results are due to the different macroeconomic responses embedded in different macro closure rules.

As compared to other macro closure rules, the  $f(1)$  closure rule appears to be the most restrictive scenario, as it assumes that government demand, investment, household savings rate and income tax rate for household are fixed at their benchmark levels. A restrictive scenario especially with respect to spending causes lower appreciation of the real exchange rate and hence leads to a lower drop in the non-oil exports. The  $f(2)$  closure rule appears to be the most expansionary scenario as it assumes that government consumption is endogenous, but investment, household savings rate and income tax rate for household are fixed at their benchmark levels. Such treatment of macro constraints induces higher real exchange rate appreciation and hence a higher drop in the non-oil exports. This fact was partly discussed in Usui (1997), which finds that “government budget stances during the oil boom play a crucial role in determining the degree of economic effect on economic structure implied in the Dutch disease theory.”

The other variable that exhibits different response under different macro closure rules is foreign savings. Foreign savings decrease under the f(1) closure rule and increase under the f(2) and f(3) closure rules. Under the f(1) closure rule government demand and the income tax rate for household are fixed, whereas government savings is allowed to vary. Given that household savings and government savings rise, foreign savings should fall to maintain investment at the benchmark level.

Under the f(2) closure rule, government demand is allowed to vary, yet government savings are fixed. When household savings increase and investment and government savings are fixed, foreign savings depend heavily on the extent of the real exchange rate appreciation. If appreciation offsets the increase in household savings, foreign savings will rise and fall in the opposite case. In this case, due to large real appreciation of the exchange rate, foreign savings will rise.

Under the f(3) closure rule, the income tax rate for household is flexible, but government demand and government savings are kept fixed. To keep government demand and government savings at the benchmark level, the income tax rate for household needs to fall. To bring the savings-investment account into equilibrium, foreign savings need to rise. Note that they rise less than under the f(2) closure rule.

In sum, the results under different macro closure rules do not differ largely but they differ. The main difference is in the amount of change in  $Qd_N$ ,  $Qe_N$ ,  $Qm_N$ , the real exchange rate, and foreign savings. As was discussed above, the different response in these variables is primarily due to the different modeling of the macroeconomic response revealed in different modeling of spending components.

Although the model is quite stylized and perhaps fails to capture many other important channels and mechanisms that hold in reality, it delivers plausible results, sheds some light on the mechanisms that operate in general equilibrium models and highlights the role of macro closure rules. Which type of macro closure rule to choose in a particular experiment depends on the modeler's choice and object of investigation. Yet, the final choice of the macro closure rule will have certain effects on the final results.

## 5.5 Conclusions

In this chapter, I tested several different macro closure rules: the neoclassical closure rule and three types of foreign savings closure rules labeled as f(1), f(2), and f(3). I applied the neoclassical closure rule and the f(1) closure rule because of their popularity among CGE modelers and the f(2) and f(3) closure rules because I aimed to test whether different treatment of the rest of the world on its own might lead to different results.

I find that the results under the neoclassical, f(2), and f(3) closure rules are similar, whereas the results under the f(1) closure rule differ to some extent. This implies that different treatment of the rest of the world on its own does not play much of a role here. What matters here is how demand components are modeled. This primarily explains why the results are different to some extent under the f(1) closure rule, which is the most restrictive closure rule of all the rules considered because it assumes investment, household savings rate, government demand, and the income tax rate for household as fixed. Note that the remaining macro closure rules as the neoclassical, f(2), and f(3) closure rules are more expansionary, given that for instance the

neoclassical closure rule treats investment as endogenous, the f(2) closure rule treats government demand as endogenous, and the f(3) closure rule treats income tax rate for household as endogenous.

Overall, the analysis made in this chapter clearly shows that the results under alternative macro closure rules are not too different, but they differ. The oil sector grows and the non-oil sector contracts at roughly similar rates across all macro closure rules. However, non-oil exports, non-oil imports, non-oil domestic sales, the real exchange rate, and foreign savings adjust differently.

Additionally, I find that there are three main effects that determine the structural adjustments in the economy. They are labeled as the import-competing, transformability, and demand effects. The first two effects tend to favor the oil production under the neoclassical and f(1) closure rules, whereas the latter favors the non-oil production under the neoclassical closure rule and has an ambiguous effect on the non-oil and oil production under the f(1) closure rule. This analysis shows clearly how important to incorporate two-way trade in the model and to address carefully institutional characteristics of the economy, which are to some extent underlined by the macro closure rules. In this sense the model represents another good attempt to examine the Dutch disease effects.

After a thorough analysis of the results under alternative macro closure rules, the natural question arises as to what type of macro closure rule to apply. Eventually, it is up to a modeler's choice that depends on her vision of the economy. If the government demand, investment, household savings rates and income tax rate for households do not change substantially it is suggested to use the f(1) closure rule. If they are subject to change one can use the neoclassical or one of the other foreign savings closure rules respectively. But, it is necessary to bear in mind that the results might be different under different macro closure rules. Therefore, the rationale for choosing a particular macro closure rule should be clearly stated. It is an important finding that is typically neglected in the static GE applications.

## Appendix 5A Definition of Symbols

Symbol	Definition	
<b><u>PARAMETERS</u></b>		
<b><u>Greek letters</u></b>		
$\alpha$	Value share of domestic non-oil sales in the output of aggregate non-oil good	$\alpha = \frac{Pd_N \times Qd_N}{Pn \times N}$
$1-\alpha$	Value share of non-oil exports in the output of aggregate non-oil good	$1-\alpha = \frac{Pe_N \times Qe_N}{Pn \times N}$
$\gamma_e$	Amount of exported non-oil good	$\gamma_e = Qe_N$
$\gamma_m$	Amount of imported non-oil good	$\gamma_m = Qm_N$
$\gamma_x$	Amount of exported or produced oil	$\gamma_x = Qe_o$
$\delta_q$	CES function share parameter	
$\delta_t$	CET function share parameter	
$\theta$	Constant in the equation for optimal allocation of non-oil exports and domestic non-oil sales	
$\kappa$	Household propensity to consume	$\kappa = \frac{mpsh}{1-mpsh}$
$\lambda$	Share of labor employed in oil production in the total labor supply	$\lambda = \frac{Lx}{L}$
$1-\lambda$	Share of labor employed in the non-oil production in the total labor supply	$1-\lambda = \frac{Ln}{L}$
$\pi$	Value share of labor in oil output	$\pi = \frac{w \times Lx}{Px \times Qx}$
$1-\pi$	Value share of capital in oil output	$1-\pi = \frac{r \times Kx}{Px \times Qx}$
$\rho_q$	CES function exponent	
$\rho_t$	CET function exponent	
$\sigma_a$	Armington elasticity of substitution	
$\sigma_t$	Elasticity of transformation	
$v$	Constant in the equation for optimal allocation of quantities of import-competing non-oil good and imported non-oil good	
$\varphi$	Value share of oil output in household income	$\varphi = \frac{Px \times Qx}{Yh}$
$1-\varphi$	Value share of non-oil output in household income	$1-\varphi = \frac{Pn \times Qn}{Yh}$
$\chi$	CES function shift parameter	
$\omega$	Value share of labor in the aggregate non-oil output	$\omega = \frac{w \times Ln}{Pn \times N}$
$1-\omega$	Value share of capital in the aggregate non-oil output	$1-\omega = \frac{r \times Kn}{Pn \times N}$
<b><u>Latin letters</u></b>		
$a$	Value share of non-oil imports in total non-oil absorption	$a = \frac{Pm_N \times Qm_N}{Pq \times Qq}$

## Appendix 5A

$1-a$	Value share of domestic non-oil sales in the total non-oil absorption	$1-a = \frac{Pd_N \times Qd_N}{Pq \times Qq}$
$d$	Ratio of government income to government savings	$d = \frac{tx \times Yh}{Sg}$
$h_c$	Ratio of household savings to investment	$h_c = \frac{mpsh \times (1-tx) \times Yh}{Inv}$
$h_f$	Ratio of exchange rate to investment	$h_f = \frac{R}{Inv}$
$h_g$	Ratio of government savings to investment	$h_g = \frac{S_g}{Inv}$
$h_r$	Ratio of foreign savings to investment	$h_f = \frac{R \times Fsav}{Inv}$
$k$	Constant in the oil production function	
$m$	Constant in the aggregate non-oil production function	
$mpsh$	Household savings rate	$mpsh = \frac{S_h}{(1-tx) \times Yh}$
$n$	CET function shift parameter	
$p$	Ratio of government expenditure to government savings	$p = \frac{Qg}{Sg}$
$s_{qg}$	Share of nominal non-oil government consumption in total non-oil absorption	$s_{qg} = \frac{Pq \times Qg}{Pq \times Qq}$
$s_{qh}$	Share of nominal non-oil household consumption in total non-oil absorption	$s_{qh} = \frac{Pq \times C}{Pq \times Qq}$
$s_{te}$	Parameter related to income tax rate for household	$s_{te} = \frac{tx}{1-tx}$
$1-s_{qh}-s_{qg}$	Share of nominal non-oil investment in total non-oil absorption	$1-s_{qh}-s_{qg} = \frac{Pq \times Inv}{Pq \times Qq}$
$s_{fy}$	Ratio of foreign savings to household income	$s_{fy} = \frac{R \times Fsav}{Yh}$
<b><u>EXOGENOUS VARIABLES</u></b>		
$\bar{L}$	Supply of labor	
$pwm_N$	Price of imported non-oil good in foreign currency units	
$pwe_N$	Price of exported non-oil good in foreign currency units	
$z$	Price of exported oil in foreign currency units	
<b><u>ENDOGENOUS VARIABLES</u></b>		
<b><u>Factors</u></b>		
$Lx$	Amount of labor demanded from oil sector	
$Ln$	Amount of labor demanded from non-oil sector	
<b><u>Outputs</u></b>		
$Qx$	Output of oil	
$N$	Output of aggregate non-oil good	
$Qq$	Amount of composite non-oil good or total absorption of non-oil good	
$Qm_N$	Amount of imported non-oil good	
$Qd_N$	Amount of domestic non-oil good or amount of import-competing non-oil good	

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$Qe_N$	Amount of exported non-oil good
$Qe_o$	Amount of exported oil
<b><u>Prices</u></b>	
$w$	Economy-wide wage rate
$P_x$	Price of oil in local currency units, or unit revenue of oil producer
$P_n$	Price of aggregate non-oil good, or unit revenue of non-oil producer, or non-oil factor cost deflator
$P_q$	Price of composite non-oil good or expenditure cost deflator
$Pm_N$	Price of imported non-oil good in local currency units
$Pd_N$	Price of domestic non-oil good
$Pe_N$	Price of exported non-oil good in local currency units
$R$	Exchange rate
<b><u>Macro-variables</u></b>	
$Y_h$	Household income
$Q_g$	Government demand, or government consumption
$C$	Household consumption
$S_g$	Government savings
$tx$	Income tax rate for household
$mpsh$	Household savings rate, or household marginal propensity to save
$Fsav$	Foreign savings or balance of trade
$Inv$	Amount of investment demand for composite non-oil good

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## 5B.1 Overview of the Model

In addition to the nonlinear representation of the model, I derive a log-linearized version of the model. In what follows, I place percentage change form equations to the right of the nonlinear equations. As before, a circumflex ( $\widehat{\phantom{x}}$ ) denotes percentage change in the corresponding variable. One variable,  $Fsav$ , can be of either sign. The dot over this variable denotes absolute change. The bar over the variables indicates that these variables are exogenous.

The production process is given by the following equations:

$$(5B.1.1.a) \quad Qx = k \times Lx^\pi, \quad (5B.1.1.b) \quad \widehat{Qx} = \pi \times \widehat{Lx},$$

$$(5B.1.2.a) \quad N = m \times Ln^\omega, \quad (5B.1.2.b) \quad \widehat{N} = \omega \times \widehat{Ln},$$

where,  $k$  and  $m$  are constants.

The first-order conditions for employment of labor are

$$(5B.1.3.a) \quad w = \frac{\pi \times Px \times Qx}{Lx}, \quad (5B.1.3.b) \quad \widehat{w} = \widehat{Px} + \widehat{Qx} - \widehat{Lx},$$

$$(5B.1.4.a) \quad w = \frac{\omega \times Pn \times N}{Ln}, \quad (5B.1.4.b) \quad \widehat{w} = \widehat{Pn} + \widehat{Qn} - \widehat{Ln}.$$

In this model, I assume that the amount of oil produced ( $Qx$ ) equals the amount of the exported oil ( $Qe_o$ ). Hence,

$$(5B.1.5.a) \quad Qx = Qe_o, \quad (5B.1.5.b) \quad \widehat{Qx} = \widehat{Qe_o}.$$

Whereas the aggregate non-oil good is supplied abroad and domestically according to

$$(5B.1.6.a) \quad N = n \times \left( \delta_t \times Qd_N^{\rho_t} + (1 - \delta_t) \times Qe_N^{\rho_t} \right)^{1/\rho_t},$$

$$(5B.1.6.b) \quad \widehat{N} = \alpha \times \widehat{Qd_N} + (1 - \alpha) \times \widehat{Qe_N},$$

where  $n$  is a CET function shift parameter,  $\delta_t$  is a CET function share parameter,  $\rho_t$  is a CET function exponent and  $\alpha$  is the value share of domestic sales of non-oil good in the output of the aggregate non-oil good.

The optimal allocation of the output of the aggregate non-oil good across the amount of the exported non-oil good ( $Qe_N$ ) and the amount of the domestic non-oil good ( $Qd_N$ ) is given by

$$(5B.1.7.a) \quad \frac{Qe_N}{Qd_N} = \theta \times \left( \frac{Pe_N}{Pd_N} \right)^{\sigma_t}, \quad (5B.1.7.b) \quad \widehat{Qe_N} - \widehat{Qd_N} = \sigma_t \times (\widehat{Pe_N} - \widehat{Pd_N}),$$

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where  $\theta$  is a constant and  $\sigma_t$  is the elasticity of transformation between the exported non-oil good and the domestic non-oil good.

Amount of the composite non-oil good ( $Qq$ ) is given by

$$(5B.1.8.a) \quad Qq = \chi \times \left( \delta_q \times Qd_N^{-\rho_q} + (1 - \delta_q) \times Qm_N^{-\rho_q} \right)^{1/\rho_q},$$

$$(5B.1.8.b) \quad \widehat{Qq} = a \times \widehat{Qm}_N + (1 - a) \times \widehat{Qd}_N,$$

where  $\chi$  is a shift parameter in the CES function,  $\delta_q$  is a CES function share parameter,  $\rho_q$  is a CES function exponent, and  $a$  is the value share of the non-oil imports in the consumption of the composite non-oil good.

The optimal ratio of the amount of the domestic non-oil good ( $Qd_N$ ) to the amount of the imported non-oil good ( $Qm_N$ ) is

$$(5B.1.9.a) \quad \frac{Qm_N}{Qd_N} = \nu \times \left( \frac{Pd_N}{Pm_N} \right)^{\sigma_a}, \quad (5B.1.9.b) \quad \widehat{Qm}_N - \widehat{Qd}_N = \sigma_a \times \left( \widehat{Pd}_N - \widehat{Pm}_N \right),$$

where  $Pm_N$  is the price of the imported non-oil good in local currency units,  $\nu$  is a constant,  $\sigma_a$  is the Armington elasticity of substitution between the imported non-oil good and the domestic non-oil good.

The model assumes that the household owns both oil and non-oil sectors. Thus, its income is a sum of the income made from producing oil and non-oil goods.

$$(5B.1.10.a) \quad Yh = Px \times Qx + Pn \times N,$$

$$(5B.1.10.b) \quad \hat{Y}h = \varphi \times \left( \widehat{Px} + \widehat{Qx} \right) + (1 - \varphi) \times \left( \widehat{Pn} + \widehat{N} \right).$$

Household demand ( $C$ ) is as follows:

$$(5B.1.11.a) \quad Pq \times C = (1 - mpsh) \times (1 - tx) \times Yh,$$

$$(5B.1.11.b) \quad \widehat{Pq} + \widehat{C} = -\kappa \times mpsh + \hat{Y} - s_{te} \times \widehat{tx},$$

where  $mpsh$  is the household savings rate,  $tx$  is the income tax rate for household and  $\kappa$  and  $s_{te}$  are parameters that show the elasticities of the household demand with respect to the savings rate and the tax rate correspondingly.

The government saves the rest of the revenues left from its revenue after allocating part of the revenue to public needs.

$$(5B.1.12.a) \quad S_g = tx \times Yh - Pq \times Qg,$$

$$(5B.1.12.b) \quad \hat{S}_g = d \times \left( \widehat{tx} + \widehat{Yh} \right) - p \times \left( \widehat{Pq} + \widehat{Qg} \right).$$

The corresponding savings-investment identity is as follows:



$$(5B.1.13.a) S_g + mpsh \times (1 - tx) \times Yh + Fsav \times R = Pq \times Inv ,$$

$$(5B.1.13.b) h_g \times \widehat{S}_g + h_c \times (\widehat{mpsh} + s_{te} \times \widehat{tx} + \widehat{Yh}) + h_f \times \widehat{Fsav} + h_r \times \widehat{R} = \widehat{Pq} + \widehat{Inv} ,$$

The value of the non-oil absorption ( $Qq$ ) is given by

$$(5B.1.14.a) Pn \times N = Pd_N \times Qd_N + Pe_N \times Qe_N , \quad (5B.1.14.b) \widehat{Pn} = \alpha \times \widehat{Pd}_N + (1 - \alpha) \times \widehat{Pe}_N ,$$

where the price of the exported non-oil good in local currency units ( $Pe_N$ ) is defined as

$$(5B.1.15.a) Pe_N = pwe_N \times R , \quad (5B.1.15.b) \widehat{Pe}_N = \widehat{R} .$$

The value of the composite non-oil good or non-oil absorption ( $Qq$ ) is given by

$$(5B.1.16.a) Pq \times Qq = Pd_N \times Qd_N + Pm_N \times Qm_N ,$$

$$(5B.1.16.b) \widehat{Pq} = a \times \widehat{Pm}_N + (1 - a) \times \widehat{Pd}_N .$$

where the price of the imported non-oil good measured in the local currency units ( $Pm_N$ ) is defined as

$$(5B.1.17.a) Pm_N = pwm_N \times R , \quad (5B.1.17.b) \widehat{Pm}_N = \widehat{R} .$$

The price of oil or unit revenue of the oil producer is given by

$$(5B.1.18.a) Px = z \times R , \quad (5B.1.18.a) \widehat{Px} = \widehat{z} + \widehat{R} .$$

In this model, I assume that exchange rate is a numeraire:

$$(5B.1.19.a) R = 1 , \quad (5B.1.19.b) \widehat{R} = 0 .$$

The equilibrium in the labor market is

$$(5B.1.20.a) Lx + Ln = \bar{L} , \quad (5B.1.20.b) \lambda \times \widehat{Lx} + (1 - \lambda) \times \widehat{Ln} = 0 .$$

The equilibrium in the non-oil composite good market is given by

$$(5B.1.21.a) Qq = C + Qg + Inv ,$$

$$(5B.1.21.b) \widehat{Qq} = s_{qh} \times \widehat{C} + s_{qg} \times \widehat{Qg} + (1 - s_{qh} - s_{qg}) \times \widehat{Inv} .$$

The balance of trade condition, or foreign savings, is formulated as follows:

$$(5B.1.22.a) Fsav = pwm_N \times Qm_N - z \times Qe_O - pwe_N \times Qe_N ,$$

$$(5B.1.22.b) \widehat{Fsav} = \gamma_m \times \widehat{Qm}_N - \gamma_x \times (\widehat{z} + \widehat{Qe}_O) - \gamma_e \times \widehat{Qe}_N .$$

Thus, the model has twenty-two equations in twenty-five unknowns ( $Lx, Ln, N, Qx, Qq, Px, Pq, Pn, Qm_N, Qd_N, Qe_N, Qe_O, Pm_N, Pd_N, Pe_N, R, w, Yh, C, Qg, Sg, tx, mpsh, Fsav, Inv$ ). The

exogenous variables are  $L$ ,  $pwm_N$ ,  $z$ . To solve the model, I have to eliminate one equilibrium equation or add an additional variable. I do the latter by adding the *walras* variable to the savings-investment equation. Thus, I end up with twenty-two equations in twenty-six unknowns, with four variables remaining that should be taken as exogenous. They are determined by the macro closure rules discussed in the text of this chapter. The model is solved by matrix inversion using Mathematica software.

### 5B.2 Solution under the neoclassical closure rule

The neoclassical closure rule assumes that government demand, the income tax rate for household, the household savings rate and foreign savings are exogenous. Solving the model using Mathematica software, I obtain the following results.

The denominator common to all variables is

$$(5B.2.1) \Lambda = [1 - \lambda(\omega - \pi) - \pi] \times (\sigma_a \times \gamma_m + \sigma_t \times (\gamma_m \times (1 - \alpha) + \gamma_e \times \alpha)) + \alpha \times \frac{\lambda \times \omega \times \gamma_m}{a} > 0.$$

Note, that it is strictly greater than zero.

The effect of the oil export price increase on the economy is given as follows:

$$(5B.2.2) \hat{N} = - \frac{\lambda \times \omega \times \{\sigma_a \times \gamma_m + \sigma_t \times (\gamma_m \times (1 - \alpha) + \gamma_e \times \alpha) - \alpha \times \gamma_x\}}{\Lambda} \times \hat{z},$$

$$(5B.2.3) \hat{Pn} = \frac{\alpha \times \eta}{\Lambda} \times \hat{z},$$

where  $\eta = \gamma_x \times \left( \lambda \times (1 - \omega) + \lambda \times \omega \times \alpha \times \frac{1 - \varphi}{\varphi} + (1 - \lambda) \times (1 - \pi) \right) + \gamma_m \times \lambda \times \omega$ ,

$$(5B.2.4) \hat{Px} - \hat{Pn} = \frac{(1 - \lambda \times (\omega - \pi) - \pi) \times \{\sigma_a \times \gamma_m + \sigma_t \times (\gamma_m \times (1 - \alpha) + \gamma_e \times \alpha) - \alpha \times \gamma_x\}}{\Lambda} \times \hat{z},$$

$$(5B.2.5) \hat{Qx} = \frac{(1 - \lambda) \times \pi \times \{\sigma_a \times \gamma_m + \sigma_t \times (\gamma_m \times (1 - \alpha) + \gamma_e \times \alpha) - \alpha \times \gamma_x\}}{\Lambda} \times \hat{z},$$

$$(5B.2.6) \hat{Pd}_N = \frac{\eta}{\Lambda} \times \hat{z},$$

$$(5B.2.7) \hat{Qd}_N = \hat{N} + (1 - \alpha) \times \sigma_t \times \frac{\eta}{\Lambda} \times \hat{z},$$

$$(5B.2.8) \hat{Qe}_N = \hat{N} - \alpha \times \sigma_t \times \frac{\eta}{\Lambda} \times \hat{z},$$

$$(5B.2.9) \hat{Qm}_N = \hat{Qq} + (1 - a) \times \sigma_a \times \frac{\eta}{\Lambda} \times \hat{z},$$

(5B.2.10)

$$\hat{C} = \frac{(\varphi - \lambda \times \omega) \times \{\sigma_a \times \gamma_m + \sigma_t \times (\gamma_m \times (1 - \alpha) + \gamma_e \times \alpha)\} + \lambda \times \omega \times ((a - (1 - \alpha)) \times (\gamma_m - \gamma_e) + \gamma_x \times \alpha \times (1 - \varphi))}{\Lambda} \times \hat{z} + \frac{\gamma_x \times s_{fy} \times (1 - a) \times (\lambda \times (1 - \omega) + (1 - \lambda))}{\Lambda} \times \hat{z},$$

$$(5B.2.11) \quad \widehat{S}_g = \frac{d \times (\varphi - \lambda \times \omega) \times [\gamma_m \times \sigma_a + \sigma_t \times (\gamma_m \times (1 - \alpha) + \gamma_e \times \alpha)]}{\Lambda} \times \widehat{z} + \left\{ \frac{\alpha \times d \times \phi}{\Lambda} - \frac{(1 - a) \times p \times \eta}{\Lambda} \right\} \times \widehat{z}$$

$$(5B.2.12) \quad \widehat{P}q = \frac{(1 - a) \times \eta}{\Lambda} \times \widehat{z},$$

$$(5B.2.13) \quad \widehat{Q}q = \frac{\sigma_a \times \gamma_m \times \varphi \times (\lambda \times (1 - \omega) + (1 - \lambda) \times (1 - \pi)) \times (1 - a)}{\Lambda \times \alpha \times (1 - \varphi)} \times \widehat{z} + \frac{\sigma_t \times \gamma_e \times \varphi \times (\lambda \times (1 - \omega) + (1 - \lambda) \times (1 - \pi))}{\Lambda \times (1 - \varphi)} \times \widehat{z} + \frac{\alpha \times \gamma_x \times \lambda \times \omega}{\Lambda} \times \widehat{z},$$

$$(5B.2.14) \quad Yh = \frac{\sigma_a \times \gamma_m \times (\varphi - \lambda \times \omega) + \sigma_t \times (\varphi - \lambda \times \omega) \times (\gamma_m \times (1 - \alpha) + \alpha \times \gamma_e) + \alpha \times \phi}{\Lambda} \times \widehat{z},$$

$$(5B.2.15) \quad \widehat{L}x = \frac{(1 - \lambda) \times (\sigma_a \times \gamma_m + \sigma_t \times (\gamma_m \times (1 - \alpha) + \gamma_e \times \alpha) - \alpha \times \gamma_x)}{\Lambda} \times \widehat{z},$$

$$(5B.2.16) \quad \widehat{L}n = -\frac{\lambda \times (\sigma_a \times \gamma_m + \sigma_t \times (\gamma_m \times (1 - \alpha) + \gamma_e \times \alpha) - \alpha \times \gamma_x)}{\Lambda} \times \widehat{z},$$

$$(5B.2.17) \quad \widehat{Inv} = \frac{\widehat{Q}q}{(1 - s_{qg} - s_{qh})} - \frac{s_{qh} \times (\varphi - \lambda \times \omega) \times (\sigma_a \times \gamma_m + \sigma_t \times (\alpha \times \gamma_e + (1 - \alpha) \times \gamma_m))}{\Lambda \times (1 - s_{qg} - s_{qh})} \times \widehat{z} - \frac{s_{qh} \times \left\{ \lambda \times \omega \times ((a - (1 - \alpha)) \times (\gamma_m - \gamma_e) + \gamma_x \times \alpha \times (1 - \varphi)) \right\}}{\Lambda \times (1 - s_{qg} - s_{qh})} \times \widehat{z} - \frac{s_{qh} \times \gamma_x \times s_{fy} \times (1 - a) \times (\lambda \times (1 - \omega) + (1 - \lambda))}{\Lambda \times (1 - s_{qg} - s_{qh})} \times \widehat{z},$$

where

$$\phi = (\gamma_m - \gamma_e) \times \lambda \times \omega + \gamma_x \times (1 - \varphi) = \gamma_e \times \varphi \times (\lambda \times (1 - \omega) + (1 - \lambda) \times (1 - \pi)) + \gamma_x \times (1 - \varphi) \times \alpha + \gamma_m \times \lambda \times \omega$$

### 5B.3 Solution of the model under the f(1) closure rule

In what follows, I present the results of the model under the f(1) closure rule.

Equation (B.3.1) shows the denominator that is common to all expressions below:

$$(5B.3.1) \quad \Theta = (1 - \pi - \lambda \times (\omega - \pi)) \times (\sigma_t \times (1 - \alpha) + \sigma_a \times a) + \alpha \times \lambda \times \omega - s_{qh} \times (1 - a) \times s_{fy} \times (\pi \times (1 - \omega) \times \lambda + (1 - \pi) \times \omega \times (1 - \lambda) + (1 - \pi) \times (1 - \omega))$$

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The denominator consists of three main terms. The first two are positive and the third, weighted by  $s_{qh}$ , can be of either sign. Its sign depends heavily on the parameter  $s_{fy}$ , which represents the ratio of foreign savings to the household income. It implies that if the economy accumulates a trade surplus in the benchmark equilibrium, which implies negative foreign savings, the denominator will be positive. But if the economy runs a trade deficit, which implies positive foreign savings, the sign of the denominator will be ambiguous.

After substitutions and rearrangements, the effect of the oil export price increase on the economy is as follows:

$$(5B.3.2) \quad \widehat{N} = -\frac{\lambda \times \omega \times (\sigma_a \times a + \sigma_t \times (1-\alpha) - s_{qh} \times (a - (1-\alpha)))}{\Theta} \times \widehat{z},$$

$$(5B.3.3) \quad \widehat{Pn} = \frac{\alpha \times (\varphi \times s_{qh} + \lambda \times \omega \times (1 - s_{qh}))}{\Theta} \times \widehat{z},$$

$$(5B.3.4) \quad \widehat{Px} - \widehat{Pn} = \frac{(1 - \pi - \lambda \times (\omega - \pi)) \times (\sigma_a \times a + \sigma_t \times (1-\alpha) - s_{qh} \times (a - (1-\alpha)))}{\Theta} \times \widehat{z},$$

$$(5B.3.5) \quad \widehat{Qx} = \frac{\pi \times (1 - \lambda) \times (\sigma_a \times a + \sigma_t \times (1-\alpha) - s_{qh} \times (a - (1-\alpha)))}{\Theta} \times \widehat{z},$$

$$(5B.3.6) \quad \widehat{Pd}_N = \frac{s_{qh} \times (\varphi - \lambda \times \omega) + \lambda \times \omega}{\Theta} \times \widehat{z},$$

$$(5B.3.7) \quad \widehat{Qd}_N = \widehat{N} + \frac{(1-\alpha) \times \sigma_t \times (s_{qh} \times (\varphi - \lambda \times \omega) + \lambda \times \omega)}{\Theta} \times \widehat{z},$$

$$(5B.3.8) \quad \widehat{Qe}_N = \widehat{N} - \frac{\alpha \times \sigma_t \times (s_{qh} \times (\varphi - \lambda \times \omega) + \lambda \times \omega)}{\Theta} \times \widehat{z},$$

$$(5B.3.9) \quad \widehat{Qm}_N = \widehat{Qq} + \frac{(1-a) \times \sigma_a \times (s_{qh} \times (\varphi - \lambda \times \omega) + \lambda \times \omega)}{\Theta} \times \widehat{z},$$

$$(5B.3.10) \quad \widehat{C} = \frac{(\varphi - \lambda \times \omega) \times (\sigma_t \times (1-\alpha) + \sigma_a \times a) + \lambda \times \omega \times (a - (1-\alpha))}{\Theta} \times \widehat{z},$$

$$(5B.3.11)$$

$$\widehat{S}_g = \frac{(\varphi - \lambda \times \omega) \times d \times (\sigma_t \times (1-\alpha) + \sigma_a \times a) + s_{qh} \times (1-a) \times (\varphi - \lambda \times \omega) + \lambda \times \omega \times (\alpha \times d - p \times (1-a))}{\Theta} \times \widehat{z}$$

,

$$(5B.3.12) \quad \widehat{Pq} = \frac{(1-a) \times (s_{qh} \times (\varphi - \lambda \times \omega) + \lambda \times \omega)}{\Theta} \times \widehat{z},$$

$$(5B.3.13) \quad \widehat{Qq} = \frac{((\varphi - \lambda \times \omega) \times (\sigma_a \times a + \sigma_t \times (1-\alpha)) + \lambda \times \omega \times (a - (1-\alpha))) \times s_{qh}}{\Theta} \times \widehat{z},$$

$$(5B.3.14) \quad \widehat{Yh} = \frac{[(\varphi - \lambda \times \omega) \times (\sigma_t \times (1-\alpha) + \sigma_a \times a + s_{qh} \times (1-a)) + \alpha \times \lambda \times \omega]}{\Theta} \times \widehat{z},$$

$$(5B.3.15) \quad \widehat{Lx} = \frac{(1-\lambda) \times (\sigma_a \times a + \sigma_t \times (1-\alpha) - s_{qh} \times (a - (1-\alpha)))}{\Theta} \times \widehat{z},$$

$$(5B.3.16) \quad \widehat{Ln} = -\frac{\lambda \times (\sigma_a \times a + \sigma_t \times (1-\alpha) - s_{qh} \times (a - (1-\alpha)))}{\Theta} \times \widehat{z},$$

(5B.3.17)

$$\begin{aligned}
 \dot{F}sav = & -\sigma_a \times \frac{\left\{ a \times \gamma_x \times (\lambda \times (1-\omega) + (1-\lambda) \times (1-\pi)) - s_{qh} \times (\varphi - \lambda \times \omega) \times \gamma_m \right\}}{\Theta} \times \hat{z} \\
 & - \sigma_t \times \frac{\left\{ \gamma_x \times (1-\alpha) \times (\lambda \times (1-\omega) + (1-\lambda) \times (1-\pi)) - s_{qh} \times (\gamma_m \times (1-\alpha) + \gamma_e \times \alpha) \times (\varphi - \lambda \times \omega) \right\}}{\Theta} \times \hat{z} \\
 & - s_{qh} \times (1-a) \times \frac{\left\{ \gamma_x \times (\lambda \times (1-\omega) + (1-\lambda) \times (1-\pi)) + \gamma_m \times \lambda \times \omega / a \right\}}{\Theta} \times \hat{z} \\
 & + s_{qh} \times \frac{\alpha \times \phi}{\Theta} \times \hat{z} - \frac{\alpha \times \gamma_x \times \lambda \times \omega}{\Theta} \times \hat{z}
 \end{aligned}$$

where

$$\phi = (\gamma_m - \gamma_e) \times \lambda \times \omega + \gamma_x \times (1-\varphi) = \gamma_e \times \varphi \times (\lambda \times (1-\omega) + (1-\lambda) \times (1-\pi)) + \gamma_x \times (1-\varphi) \times \alpha + \gamma_m \times \lambda \times \omega .$$

## Chapter 6      A Social Accounting Matrix for Kazakhstan, 2003

### 6.1 Introduction

A social accounting matrix (SAM) is a square table that represents transaction accounts: the rows indicate incomes and the columns indicate expenditures (Pyatt and Round, 1985). It provides a general overview of the nominal transactions and flows of goods and services between representative agents, usually represented by industries, households, enterprises, government, and rest of the world. The design of a SAM depends on the aim of the study and characteristics of the economy. Therefore, it does not have a permanent structure but, instead, it can vary from case to case. However, regardless of the focus of the study, a SAM should reflect the market clearance and income balance conditions captured by the equality of the totals of each column and a corresponding row in the SAM. This feature makes the SAM a suitable database for applied general equilibrium analyses, which can be used to analyze an array of issues related but not limited to income distribution, trade liberalization, and structural adjustments in the economy (Pyatt and Round, 1985; Reinert and Roland-Holst, 1997).

I constructed a SAM (a micro SAM and macro SAM) for Kazakhstan that uses 2003 as a benchmark year because this year was economically stable and because the most recent input-output table<sup>50</sup> available at the time when I began constructing the SAM was for 2003. The constructed SAM provides an overview of the economic situation in the corresponding year and provides benchmark data for the applied general equilibrium model I use. It has ten accounts overall. These accounts provide detailed information on output, value added, domestic absorption, institutional factor incomes, redistribution of primary incomes, savings, and investment. The sectoral structure has been adapted from the input-output table.

Data on total demand, value added, imports, and exports have been taken from the input-output table and household surveys. The remaining data on interinstitutional transactions have been adapted from national accounts, household surveys, and statistical information on enterprises. As a result of using various sources in the SAM building process, the micro SAM is unbalanced. To eliminate inconsistencies, I used the RAS procedure<sup>51</sup> to conduct the estimation, so that I could obtain a SAM consistent with the prior information. The SAM is denominated in millions of tenges.<sup>52</sup>

The chapter is organized as follows. Section 6.2 presents data sources and procedures for the compilation of the SAM. Section 6.3 provides an overview of the structure of production and demand. Section 6.4 discusses margins. Section 6.5 examines factor income distribution. Section 6.6 discusses institutional structure of the SAM. Section 6.7 examines savings and investment. Finally, Section 6.8 summarizes and presents conclusions.

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<sup>50</sup> Input-output table is a database that shows the flows of goods and services in the economy for a particular year.

<sup>51</sup> The RAS balancing procedure is an iterative biproportional scaling algorithm that adjusts the entries in the prior SAM so that the totals of each column and a corresponding row are equal. The RAS procedure was implemented using Matlab code developed by Broecker (2005).

<sup>52</sup> Tenge is the Kazakhstani national currency.

## **6.2 SAM Compilation**

A SAM can be constructed in a variety of ways depending on the focus of the study and data availability. The structure of the SAM that I have used for Kazakhstan is shown in Table 6.1. It differentiates between commodity and activity accounts, and it separates the tax account from the government account and breaks down the household account. I use this particular structure for the SAM because this study focuses on the effects of the oil export price increase on structural adjustments in the economy of Kazakhstan and on its overall performance, and because I aim to use Lofgren et al.'s (2002) static computable general equilibrium model, which requires a particular SAM structure. In general, the constructed SAM is suitable for analysis of a wide array of issues, such as structural adjustments in the economy, income distribution, and trade liberalization.

The SAM has three agricultural sectors, four mining sectors, twenty-six manufacturing sectors, and twenty-two service sectors taken from the input-output table, except for two sectors that were eliminated. These two sectors are (1) services provided by extraterritorial organizations and bodies, and (2) financial intermediation services indirectly measured (FISIM). The former sector was eliminated from the SAM because its total value of output and expenditures in the input-output table was zero. The latter sector was eliminated because it had only one entry. This entry was eliminated using the procedure suggested by Thiele and Piazzolo (2002): the sector's single entry capital costs were allocated to other sectors in proportion to their value added share of capital, assuming that those sectors with a higher share of capital in the value added demand more FISIM.

The data on output, intermediate demand, private final demand, public and investment demand, exports, imports, margins, components of value added, and the data on taxes on products and imports were taken from the 2003 input-output table<sup>53</sup>, supplemented by the data taken from the 2003 household survey<sup>54</sup> to facilitate the disaggregation of the household account. Private final demand in the input-output table is represented by the demand of a single representative household. Disaggregation of this account into two accounts, an urban household account and a rural household account, was accomplished via using the relevant shares of expenditures and incomes of the urban and rural households, obtained from the household survey. Since the classification of commodities in the household survey differs from that in the input-output table, I use a correspondence table<sup>55</sup> to match entries in the two classifications (Appendix 6A).

The data on the distribution of factor incomes across institutions, net factor incomes to the rest of the world, income taxes, interinstitutional transfers, savings, and net current transfers abroad were taken from the 2003 national accounts for Kazakhstan<sup>56</sup> and the above-mentioned sources. A detailed description of each entry in the SAM is provided in Appendix 6B.

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<sup>53</sup> Agency on Statistics of the Republic of Kazakhstan (2005c).

<sup>54</sup> Agency on Statistics of the Republic of Kazakhstan (2003).

<sup>55</sup> The correspondence table is constructed using the correspondence table of OECD (2001).

<sup>56</sup> Agency on Statistics of the Republic of Kazakhstan (2005a).

Table 6.1 Structure of the SAM

	Activities	Commodities	Margins	Factors	Taxes	Households	Enterprises	Government	Savings-Inv	ROW	TOTAL
<b>Activities</b>		Gross output									<b>Total production</b>
<b>Commodities</b>	Intermediate consumption		Margins			Household final consumption		Government final consumption	Investment demand	Exports of goods and services	<b>Total uses of goods and services</b>
<b>Margins</b>		Margins									<b>Total margins</b>
<b>Factors</b>	Value-added (net of taxes on production)										<b>Value-added</b>
<b>Taxes</b>	Taxes less subsidies on production	Net taxes on products and import				Income tax	Income tax				<b>Total taxes less subsidies</b>
<b>Households</b>				Household factor income			Net transfers	Net transfers			<b>Household Income</b>
<b>Enterprises</b>				Enterprises' factor income			Transfers				<b>Enterprises' Income</b>
<b>Government</b>				Government factor income	Taxes less subsidies		Net transfers			Net transfers from abroad	<b>Government Income</b>
<b>Savings - Inv</b>						Gross savings	Gross savings	Gross savings		Foreign savings	<b>Total Savings</b>
<b>ROW</b>		Import of goods and services		Factor income to ROW		Net transfers to ROW	Net transfers to ROW		Capital transfers to ROW		<b>Foreign receipts</b>
<b>TOTAL</b>	<b>Total costs of production</b>	<b>Total supply of goods and services</b>	<b>Total margins</b>	<b>Factor outlays</b>	<b>Total taxes less subsidies</b>	<b>Household outlays</b>	<b>Enterprises' outlays</b>	<b>Government outlays</b>	<b>Investment</b>	<b>Foreign outlays</b>	



The approach in constructing the SAM used in this chapter is different from the approach used in previous studies (e.g., Hausner, 1999; Nielsen, 2001). Specifically, I use the following order in constructing the SAM. First, I generate a micro SAM (disaggregated SAM); second, I balance the micro SAM using the RAS balancing procedure; and, third, I generate a macro SAM (highly aggregated SAM) upon the micro SAM. The previous studies, on the other hand, use the following order. First, they compile a macro SAM; second, they disaggregate the macro SAM using additional information such as an input-output table, national accounts, household surveys, etc., to obtain a micro SAM; and, third, they balance the resulting micro SAM using balancing procedures.

In general, the choice of the approach with which to construct a SAM depends on which data are supposed to be more precise. Conventionally, a macro SAM is compiled on the basis of national accounts, whereas most entries in a micro SAM are either disaggregated or compiled from an input-output table. The data in the input-output table for Kazakhstan differ slightly from the data in the national accounts. Since some entries in national accounts stem from the input-output table, I assume that the data in the input-output table are more precise and therefore proceed in the order described above.

The macro SAM generated upon the micro SAM (labeled as macro SAM 1) and the micro SAM are provided in Appendices 6C.1 and 6C.3 respectively. For a robustness check, I construct a macro SAM (labeled as macro SAM 2), which I generated using the national accounts data (Appendix 6C.2), and compare it with the macro SAM I generated upon the micro SAM. It appears that there are no large differences across the two macro SAMs. Thus, I may conclude that the micro SAM is consistently constructed or robust.

### 6.3 Production and Demand Structure

In this section I discuss the production and demand structure used in the constructed SAM. The production structure is shown in an activities account, whereas the demand structure is shown in a commodities account. Conventionally, the differentiation between activities and commodities accounts allows for production of multiple commodities by one sector and production of one type of commodities by different sectors. However, since in the constructed SAM there is a one-to-one correspondence between activities and commodities, there is only one type of commodity produced by each sector.

In the constructed SAM, receipts of activities are made up of sales of commodities to the commodities account (activities/commodities), valued in basic prices. Expenditures of activities are composed of expenditures on intermediate inputs (commodities/activities) valued in purchaser prices, factor costs, and other taxes on production. In what follows, I discuss shortly the main features of the activity and commodity accounts by first noting which sectors are the largest sectors and later proceeding with expenditures of activities account, compositional structure of demand (or commodities account), and sectoral content of trade.

Consistent with the findings in Chapter 3, I find that Kazakhstani production in 2003 was the highest in the crude petroleum and natural gas sector<sup>57</sup> (13.7 percent of total output), followed by the transport sector (11.9 percent), the trade services sector (10.7 percent), the agricultural sector (7 percent), the construction sector (6.5 percent), the other business services sector (6.2 percent), and the real estate services sector (4.3 percent). The relatively undiversified structure

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<sup>57</sup> See column 1 of Table 6.2.

of production, in which the crude petroleum and natural gas sector and some services sectors are dominant sectors and manufacturing is relatively underdeveloped might pose certain risks for further economic development of the country. Hence, to have sustainable development in the future, it is necessary to diversify the economy away from the crude petroleum and natural gas sector by developing a highly competitive manufacturing sector for instance.

Next, consider expenditures of activities account. They consist of labor costs, capital costs, intermediate inputs costs, and taxes on production. Table 6.2 shows that the highest labor costs are incurred by the services sectors<sup>58</sup>, (60.1 percent of total labor costs), followed by the manufacturing (14 percent), mining (10.7 percent), construction (7 percent), agriculture, fishing and forestry (4.6 percent), and electricity, gas, and water supply (EGW) (3.6 percent) sectors.<sup>59</sup> Within the services sectors, the highest labor costs are incurred by the trade and repair services sector (13.2 percent), followed by the transport sector (11.8 percent) and the education sector (8 percent).

The largest gross capital outlays are incurred by the services sectors<sup>60</sup> as well (53.2 percent), followed by the manufacturing (15.6 percent), mining (12 percent), agriculture, fishing and forestry (10.7 percent), construction (6.2 percent), and EGW (2.3 percent) sectors.

Table 6.2 additionally shows sectoral capital costs-labor costs ratios (column 2) and factor shares (columns 5 and 6) in each particular sector. The most capital-intensive sector is the activities auxiliary to financial intermediation and insurance and FISIM (aux). The crude petroleum and natural gas sector (apetr) has lower capital intensity across sectors, being lower than the average, although it has larger capital outlays in value added than labor costs (compare columns 5 and 6 in Table 6.2).

This analysis of the expenditures of sectors is useful, because it might help to understand why some sectors have been affected differently by different types of shocks, oil price shock for instance. This is due to the fact that in the short- or medium-runs sectors with higher labor intensity tend to be more sensitive to shocks than the remaining sectors since labor tends to be more mobile than capital in the short- or medium-runs.

Next, consider the compositional structure of demand across commodities groups (columns 5 to 10 of Table 6.3). I begin first by discussing the first commodity group, namely the products of agriculture, fishing, and forestry, and later proceed with other commodities groups. Intermediate demand for the first commodity group is large, within which the largest intermediate demand is for fish and fishing products (cfish). Private and public demand for this commodity group are comparatively low, with products of agriculture (cagr) being the most largely demanded. Investment demand for this commodity group is only for the products of agriculture (cagr).

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<sup>58</sup> See column 3 of Table 6.2.

<sup>59</sup> The highest actual employment is in services sector (47%), followed by manufacturing (7.0%), agriculture, fishing and forestry (36%), mining (2.7%), construction (4.9%), and EGW (2.4%) (Agency on Statistics of the Republic of Kazakhstan, 2004)

<sup>60</sup> See column 4 of Table 6.2.

Table 6.2 Structure of allocation of factor costs across activities

No	Sector	Factor intensity		Share in Factor Income		Share in Gross Value-added (TVA)			Check $\sum_a \frac{L_a + K_a + TVA_a}{QVA_a}$
		$\frac{PA_a \times QA_a}{\sum_a (PA_a \times QA_a)}$	$K_a/L_a$	$\frac{W_a \times L_a}{\sum_a (W_a \times L_a)}$	$\frac{r_a \times K_a}{\sum_a (r_a \times K_a)}$	$L_a/QVA_a$	$K_a/QVA_a$	$TVA_a/QVA_a$	
		1	2	3	4	5	6	7	8
<b>Agriculture, forestry and fishing</b>									
1	aagr	7.03	4.18	4.38	10.51	19.23	80.37	0.40	100.00
2	afor	0.06	0.79	0.13	0.06	54.08	42.92	3.01	100.00
3	afish	0.08	3.42	0.07	0.13	22.07	75.38	2.55	100.00
<b>Mining</b>									
4	amin	0.83	1.00	0.77	0.44	48.81	48.60	2.59	100.00
5	apetr	13.70	2.79	6.30	10.12	22.90	64.00	13.10	100.00
6	aore	2.24	0.81	2.79	1.30	48.70	39.39	11.91	100.00
7	aomin	0.83	0.28	0.83	0.13	73.93	20.48	5.59	100.00
<b>Manufacturing</b>									
8	afood	3.50	3.17	2.34	4.25	23.64	74.89	1.47	100.00
9	atob	0.38	1.84	0.29	0.31	32.99	60.69	6.32	100.00
10	atex	0.47	4.52	0.20	0.51	17.77	80.38	1.85	100.00
11	awear	0.12	2.31	0.10	0.13	30.07	69.30	0.63	100.00
12	aleat	0.03	1.85	0.03	0.03	34.70	64.07	1.23	100.00
13	awood	0.06	1.68	0.06	0.06	36.17	60.75	3.09	100.00
14	apulp	0.13	2.29	0.09	0.11	30.17	69.21	0.62	100.00
15	apubl	0.33	0.48	0.48	0.13	66.48	32.03	1.49	100.00
16	acoke	2.77	2.47	1.19	1.70	27.39	67.75	4.86	100.00
17	achem	0.58	1.08	0.56	0.35	46.92	50.82	2.26	100.00
18	arub	0.16	1.71	0.13	0.12	36.56	62.67	0.76	100.00
19	amnt	0.62	1.11	0.73	0.46	46.29	51.25	2.46	100.00
20	airon	7.35	1.90	5.56	6.05	33.52	63.56	2.92	100.00
21	afmet	0.47	1.79	0.38	0.39	35.60	63.68	0.72	100.00
22	amach	0.53	1.05	0.73	0.44	47.83	50.10	2.07	100.00
23	aofic	3.84E-03	1.75	0.003	0.003	36.34	63.66		100.00
24	aelmc	0.25	0.96	0.18	0.10	50.04	48.18	1.78	100.00
25	arad	0.06	1.81	0.04	0.04	35.46	64.16	0.38	100.00
26	amed	0.11	2.07	0.07	0.09	32.27	66.69	1.04	100.00
27	amvec	0.02	0.38	0.03	0.01	68.86	26.26	4.89	100.00
28	aotr	0.37	0.42	0.67	0.16	69.07	29.06	1.87	100.00
29	afurn	0.13	1.83	0.09	0.10	35.00	64.00	1.00	100.00
30	arec	0.16	1.47	0.11	0.09	39.50	58.08	2.42	100.00
<b>Electricity, hot gas and water</b>									
31	ael	2.78	1.06	3.11	1.90	44.14	46.92	8.94	100.00
32	awat	0.44	1.45	0.50	0.42	39.56	57.48	2.96	100.00
<b>Construction and services</b>									
33	acnst	6.48	1.54	6.96	6.16	38.77	59.83	1.40	100.00
34	atrd	10.68	1.61	13.15	12.17	37.86	61.03	1.11	100.00
35	ahot	0.30	1.12	0.51	0.33	46.11	51.62	2.27	100.00
36	aretr	0.18	1.02	0.26	0.15	49.44	50.27	0.29	100.00
37	acant	0.23	1.02	0.45	0.26	49.53	50.34	0.13	100.00
38	atrms	11.92	1.62	11.84	11.03	36.78	59.66	3.56	100.00
39	acom	1.41	0.64	2.86	1.05	58.80	37.37	3.83	100.00
40	afini	1.67	2.18	1.98	2.48	29.17	63.46	7.37	100.00
41	ains	0.13	0.73	0.30	0.13	57.65	42.10	0.25	100.00
42	aux	0.52	284.76	0.01	1.21	0.35	99.57	0.08	100.00
43	aest	4.31	6.01	1.63	5.64	14.18	85.29	0.52	100.00
44	arent	0.11	2.06	0.13	0.16	32.57	67.19	0.24	100.00
45	acom	0.31	0.57	0.58	0.19	63.65	36.03	0.33	100.00
46	ares	0.38	0.47	0.85	0.23	67.44	31.89	0.68	100.00
47	aobus	6.22	3.09	7.07	12.54	24.40	75.33	0.27	100.00
48	apa	2.14	0.34	4.29	0.83	74.71	25.22	0.07	100.00
49	aeduc	2.55	0.31	7.98	1.43	76.05	23.71	0.24	100.00
50	ahelt	1.90	0.74	3.10	1.33	57.15	42.54	0.30	100.00
51	asew	0.79	2.53	0.56	0.81	28.18	71.25	0.56	100.00
52	amemb	0.43	0.72	0.93	0.38	57.55	41.16	1.28	100.00
53	arecr	0.80	0.80	1.11	0.51	55.12	44.07	0.81	100.00
54	aoser	0.23	0.85	0.42	0.21	53.95	45.98	0.07	100.00
55	ahh	0.09	2.85	0.11	0.17	25.68	73.22	1.10	100.00
	Total	100.00	-	100.00	100.00	-	-	-	
	Average	1.82	6.79	1.82	1.82	42.20	55.54	2.30	
	Max	13.70	284.76	13.15	12.54	76.05	99.57	13.10	
	Min	3.84E-03	0.28	0.003	0.003	0.35	20.48	0.07	

Source: Own calculations based on the balanced SAM.

Note: Column 1 shows the output share of a particular sector in total output produced by all sectors. Column 2 shows capital costs-labor costs ratios in each sector. Column 3 presents the shares of labor costs of each sector in the total costs of labor, and column 4 presents the shares of capital costs of each sector in the total costs of capital. Columns 5, 6, and 7 present shares of labor, capital, and value-added tax in gross value added. The figures in columns 1 and 3 to 7 are given in percent.

Table 6.3 Structure of demand in 2003 (%)

No	Sector	QINT/TQINT 1	QH/TQH 2	QG/TQG 3	QINV/TQINV 4	QINTc/QQ 5	QH/QQ 6	QG/QQ 7	QINV/QQ 8	QDST/QQ 9	QT/QQ 10	Sum (5)+...+(10) 11
<i>Products of agriculture, fishing and forestry</i>												
1	cagr	5.86	7.43	4.23	2.09	51.06	35.26	4.15	4.73	4.80		100.00
2	cfor	0.09	0.03	0.01		68.02	13.09	0.64		18.24		100.00
3	cfish	0.15	0.02	1.84E-03		91.71	5.00	0.13		3.16		100.00
<i>Mining products</i>												
4	cmin	0.97	0.03	0.17		92.90	1.74	1.87		3.48		100.00
5	cpetr	8.80	3.07			123.93	23.51			-47.44		100.00
6	core	3.80				96.91				3.09		100.00
7	comin	1.39	0.01			90.70	0.25			9.05		100.00
<i>Manufacturing products</i>												
8	cfood	3.90	12.29			31.08	53.26			15.66		100.00
9	ctob	0.23	1.34			23.49	75.03			1.48		100.00
10	ctex	0.83	0.75			56.70	27.97			15.33		100.00
11	cwear	0.27	0.22			67.34	29.88			2.77		100.00
12	cleat	0.06	0.03			66.43	15.96			17.61		100.00
13	cwood	0.86	0.01			99.46	0.43			0.11		100.00
14	cpulp	0.74	0.06			91.07	4.25			4.68		100.00
15	cpubl	0.72	0.31		0.08	74.45	17.20		2.11	6.25		100.00
16	ccoke	7.34	2.15			84.95	13.54			1.51		100.00
17	cchem	2.64	1.22			79.55	20.05			0.40		100.00
18	crub	1.04	1.09			58.65	33.54			7.82		100.00
19	cmnmt	2.96	0.11			96.29	1.89			1.82		100.00
20	ciron	9.42	0.02			85.59	0.10			14.31		100.00
21	cfmet	2.68	0.10		0.77	98.39	1.94		7.27	-7.60		100.00
22	cmach	2.79	1.20		16.08	36.69	8.61		54.75	-0.04		100.00
23	cofic	0.34	0.07		0.06	83.30	9.38		3.70	3.62		100.00
24	celmc	1.54	2.48		12.33	23.73	20.73		49.05	6.49		100.00
25	crad	0.36	0.92		0.08	36.83	51.48		2.07	9.62		100.00
26	cmed	0.35	0.31		1.32	38.95	19.07		37.95	4.03		100.00
27	cmvec	0.87	1.38		4.47	28.58	24.67		37.93	8.83		100.00
28	cotr	0.72	0.58		2.24	41.72	18.28		33.54	6.45		100.00
29	cfurn	0.47	0.36		0.43	56.91	24.14		13.52	5.43		100.00
30	crec	0.15				48.27				51.73		100.00
<i>Electrical energy, gas and hot water</i>												
31	cel	4.76	3.74			70.25	30.03			-0.28		100.00
32	cwat	0.69	0.31			80.05	19.95					100.00
<i>Construction works and services</i>												
33	cnst	3.04	3.35	1.52	44.78	18.01	10.82	1.01	68.79	1.37		100.00
34	ctrd	1.37	4.08			6.63	10.75				82.62	100.00
35	chot	0.37	0.42			61.84	38.16					100.00
36	cretr	0.10	0.46			26.90	70.53				2.57	100.00
37	ccant	0.05	0.71			10.18	86.40				3.41	100.00
38	ctrns	9.19	15.64	1.04		42.37	39.24	0.54			17.85	100.00
39	ccom	2.47	0.66			87.27	12.73					100.00
40	cfini	2.43	1.78			71.55	28.45					100.00
41	cins	0.21	0.58			39.91	60.09					100.00
42	caux	0.39	1.15			38.52	61.48					100.00
43	cest	3.42	7.64	6.75		41.07	49.84	9.09				100.00
44	crent	0.50	0.06			94.29	5.71					100.00
45	ccomp	0.30	0.06	0.86	1.05	42.27	4.99	13.89	38.86			100.00
46	cres	0.74		4.855E-03		99.93		0.07				100.00
47	cobus	5.73	11.70	0.88	14.24	36.10	40.07	0.62	23.21			100.00
48	cpa	0.20	3.16	15.46		5.58	46.98	47.45				100.00
49	ceduc	0.10	2.45	31.07		2.10	27.06	70.84				100.00
50	chelt	0.22	1.19	24.99		5.95	17.60	76.46				100.00
51	csew	0.76	0.44	4.65		49.96	15.77	34.27				100.00
52	cmemb	0.08	1.39	1.88E-03		9.56	90.42	0.03		2.47E-06		100.00
53	crecr	0.37	0.65	7.75		23.18	22.20	54.62				100.00
54	coser	0.18	0.43	0.60		36.97	48.96	14.07		4.16E-04		100.00
55	chh	3.71E-17	0.33			2.04E-14	100.00					100.00
	sum	100.00	100.00	100.00	100.00	-	-	-	-	-	-	-
	average	1.82	1.92	5.88	7.14	54.98	28.62	19.40	26.96	5.11	26.61	
	min	3.71E-17	0.01	1.84E-03	0.06	2.04E-14	0.10	0.03	2.07	-47.44	2.57	
	max	9.42	15.64	31.07	44.78	123.93	100.00	76.46	68.79	51.73	82.62	

Source: Own calculations based on the SAM.

Notation: Column 1 shows share of total intermediate demand for commodity *c* (hereafter *c*) in total intermediate demand for all *c*. Column 2 shows share of private consumption of *c* in total private consumption. Column 3 shows share of government demand for *c* in total government demand. Column 4 shows share of investment demand for *c* in total investment demand. Column 5 shows share of intermediate demand for *c* in composite consumption of *c*. Column 6 shows share of private consumption of *c* in composite consumption of *c*. Column 7 shows share of government expenditure on *c* in composite consumption of *c*. Column 8 shows share of investment demand for *c* in composite consumption of *c*. Column 9 shows share of inventory demand for *c* in composite consumption of *c*. Column 10 shows share of transaction services of *c* in composite consumption of *c*.

**Table 6.4 Ranking of the sectors' products according to their shares in the ascending order**

No	Sector	$Qe/Qx$ (1)	No	Sector	$Qd/Qx$ (2)	No	Sector	$Qe/TQE$ (3)	No	Sector	$Qm/TQM$ (4)	No	Sector	$Qd/QQ$ (5)	No	Sector	$Qm/QQ$ (6)
<i>Products of agriculture, forestry and fishing</i>																	
3	cfish	0.03	1	cagr	0.79	3	cfish	1.18E-04	3	cfish	6.60E-05	2	cfor	0.87	3	cfish	0.02
2	cfor	0.09	2	cfor	0.91	2	cfor	2.68E-04	2	cfor	4.05E-04	1	cagr	0.96	1	cagr	0.04
1	cagr	0.21	3	cfish	0.97	1	cagr	6.43E-02	1	cagr	9.66E-03	3	cfish	0.98	2	cfor	0.13
<i>Products of mining</i>																	
7	comin	0.21	5	cpetr	0.15	7	comin	4.16E-03	4	cmin	7.79E-04	5	cpetr	0.71	6	core	0.03
6	core	0.22	4	cmin	0.53	4	cmin	1.73E-02	7	comin	1.81E-03	7	comin	0.95	4	cmin	0.03
4	cmiin	0.47	6	core	0.78	6	core	2.15E-02	6	core	2.93E-03	4	cmin	0.97	7	comin	0.05
5	cpetr	0.85	7	comin	0.79	5	cpetr	5.14E-01	5	cpetr	4.17E-02	6	core	0.97	5	cpetr	0.29
<i>Products of manufacturing</i>																	
27	cmvec	4.14E-03	17	cchem	0.07	27	cmvec	2.99E-06	12	cleat	6.21E-04	24	celmc	0.05	9	ctob	0.05
28	cotr	0.01	24	celmc	0.30	23	cofic	6.12E-05	9	ctob	1.05E-03	23	cofic	0.08	8	cfood	0.16
19	cmnmt	0.01	20	ciron	0.48	28	cotr	9.44E-05	11	cwear	3.61E-03	25	crad	0.12	16	ccoke	0.21
15	cpubl	0.02	12	cleat	0.54	13	cwood	1.41E-04	15	cpubl	7.44E-03	17	cchem	0.13	20	ciron	0.23
18	crub	0.05	25	crad	0.58	19	cmnmt	1.99E-04	23	cofic	8.68E-03	26	cmed	0.25	19	cmnmt	0.25
9	ctob	0.05	23	cofic	0.64	15	cpubl	3.31E-04	10	ctex	8.72E-03	14	cpulp	0.32	10	ctex	0.25
13	cwood	0.05	26	cmed	0.77	18	crub	3.34E-04	29	cfurn	1.09E-02	27	cmvec	0.33	12	cleat	0.33
16	ccoke	0.06	22	cmach	0.82	14	cpulp	3.87E-04	13	cwood	1.15E-02	22	cmach	0.37	15	cpubl	0.33
14	cpulp	0.07	8	cfood	0.88	29	cfurn	3.89E-04	14	cpulp	1.26E-02	18	crub	0.39	21	cfmet	0.39
29	cfurn	0.07	11	cwear	0.89	11	cwear	5.92E-04	26	cmed	1.56E-02	13	cwood	0.40	11	cwear	0.40
10	ctex	0.09	21	cfmet	0.91	12	cleat	6.66E-04	19	cmnmt	1.72E-02	29	cfurn	0.43	28	cotr	0.55
21	cfmet	0.09	10	ctex	0.91	9	ctob	8.43E-04	25	crad	1.97E-02	28	cotr	0.45	29	cfurn	0.57
11	cwear	0.11	29	cfurn	0.93	26	cmed	1.08E-03	28	cotr	2.17E-02	11	cwear	0.60	13	cwood	0.60
8	cfood	0.12	14	cpulp	0.93	25	crad	1.16E-03	21	cfmet	2.43E-02	21	cfmet	0.61	18	crub	0.61
22	cmach	0.18	16	ccoke	0.94	10	ctex	1.81E-03	18	crub	2.49E-02	15	cpubl	0.67	22	cmach	0.63
26	cmed	0.23	13	cwood	0.95	21	cfmet	1.84E-03	16	ccoke	3.97E-02	12	cleat	0.67	27	cmvec	0.67
23	cofic	0.36	9	ctob	0.95	22	cmach	4.15E-03	8	cfood	4.38E-02	10	ctex	0.75	14	cpulp	0.68
25	crad	0.42	18	crub	0.95	16	ccoke	6.98E-03	27	cmvec	4.63E-02	19	cmnmt	0.75	26	cmed	0.75
12	cleat	0.46	15	cpubl	0.98	24	celmc	7.87E-03	20	ciron	5.46E-02	20	ciron	0.77	17	cchem	0.87
20	ciron	0.52	19	cmnmt	0.99	8	cfood	1.85E-02	17	cchem	6.33E-02	16	ccoke	0.79	25	crad	0.88
24	celmc	0.70	28	cotr	0.99	17	cchem	2.39E-02	22	cmach	1.06E-01	8	cfood	0.84	23	cofic	0.92
17	cchem	0.93	27	cmvec	1.00	20	ciron	1.70E-01	24	celmc	1.42E-01	9	ctob	0.95	24	celmc	0.95
30	crec	-	30	crec	1.00	30	crec	-	30	crec	-	30	crec	1.00	30	crec	-
<i>Electrical energy, gas and hot water</i>																	
31	cel	0.02	31	cel	0.98	31	cel	2.82E-03	31	cel	3.26E-03	31	cel	0.98	31	cel	0.02
32	cwat	-	32	cwat	1.00	32	cwat	-	32	cwat	-	32	cwat	1.00	32	cwat	-
<i>Construction works and services</i>																	
53	crecr	1.42E-04	44	crent	0.03	53	crecr	5.07E-06	34	ctrld	8.36E-05	44	crent	0.01	34	ctrld	1.73E-04
34	ctrld	3.06E-04	38	ctrms	0.81	45	ccomp	3.68E-05	53	crecr	9.37E-04	41	cins	0.45	53	crecr	0.03
45	ccomp	2.72E-03	48	cpa	0.85	34	ctrld	1.45E-04	45	ccomp	1.57E-03	47	cobus	0.74	48	cpa	0.04
33	ccnst	4.29E-03	39	ccom	0.93	41	cins	1.53E-04	48	cpa	3.10E-03	33	ccnst	0.84	40	cfini	0.06
40	cfini	0.01	41	cins	0.97	40	cfini	1.03E-03	39	ccom	4.62E-03	38	ctrms	0.87	39	ccom	0.07
47	cobus	0.02	47	cobus	0.98	33	ccnst	1.23E-03	40	cfini	4.67E-03	45	ccomp	0.90	45	ccomp	0.10
41	cins	0.03	40	cfini	0.99	39	ccom	4.37E-03	41	cins	6.71E-03	39	ccom	0.93	38	ctrms	0.13
39	ccom	0.07	33	ccnst	1.00	44	crent	4.68E-03	44	crent	1.15E-02	40	cfini	0.94	33	ccnst	0.16
48	cpa	0.15	45	ccomp	1.00	47	cobus	6.28E-03	33	ccnst	6.21E-02	48	cpa	0.96	47	cobus	0.26
38	ctrms	0.19	34	ctrld	1.00	48	cpa	1.42E-02	38	ctrms	6.47E-02	53	crecr	0.97	41	cins	0.55
44	crent	0.97	53	crecr	1.00	38	ctrms	1.03E-01	47	cobus	9.54E-02	34	ctrld	1.00	44	crent	0.99
35	chot	-	35	chot	1.00	35	chot	-	35	chot	-	35	chot	1.00	35	chot	-
36	cretr	-	36	cretr	1.00	36	cretr	-	36	cretr	-	36	cretr	1.00	36	cretr	-
37	ccant	-	37	ccant	1.00	37	ccant	-	37	ccant	-	37	ccant	1.00	37	ccant	-
42	caux	-	42	caux	1.00	42	caux	-	42	caux	-	42	caux	1.00	42	caux	-
43	cest	-	43	cest	1.00	43	cest	-	43	cest	-	43	cest	1.00	43	cest	-
46	cres	-	46	cres	1.00	46	cres	-	46	cres	-	46	cres	1.00	46	cres	-
49	ceduc	-	49	ceduc	1.00	49	ceduc	-	49	ceduc	-	49	ceduc	1.00	49	ceduc	-
50	chelt	-	50	chelt	1.00	50	chelt	-	50	chelt	-	50	chelt	1.00	50	chelt	-
51	csew	-	51	csew	1.00	51	csew	-	51	csew	-	51	csew	1.00	51	csew	-
52	cmemb	-	52	cmemb	1.00	52	cmemb	-	52	cmemb	-	52	cmemb	1.00	52	cmemb	-
54	coser	-	54	coser	1.00	54	coser	-	54	coser	-	54	coser	1.00	54	coser	-
55	chh	-	55	chh	1.00	55	chh	-	55	chh	-	55	chh	1.00	55	chh	-

Note: Parameters are calculated based on the balanced SAM. Shaded regions indicate nontraded sectors. (-) implies that corresponding shares are equal to zero. The table shows the ranking of commodities according to their shares in ascending order within the corresponding group of commodities. Notation:  $Qe$  – value of exports of a particular commodity.  $Qx$  – value of aggregate supply of a particular commodity.  $Qd$  – value of domestic sales of a particular commodity.  $Qm$  – value of imports of a particular commodity.  $TQE$  – total value of exports.  $TQM$  – total value of imports.  $QQ$  – composite value of a particular commodity.

Intermediate demand for products of mining is very large, whereas private and public demands for mining products are smaller than the average. Intermediate demand for products of manufacturing is also large, with the largest shares of intermediate demand attributed to wood products (cwood), fabricated metal products (cfmet), other non-metallic mineral products (cmmnt), pulp and paper products (cpulp), basic metals (ciron), and coke and refined petroleum products, and other fuel (ccoke). Private final demand for the products of manufacturing is the largest for tobacco products (ctob), food and beverages (cfood), and radio, television and communication equipment (crad). There is no public demand for products of manufacturing, and investment demand is limited to several commodities, among which the largest are for machinery and equipment, n.i.c. (cmach), followed by electrical machinery and apparatus n.i.c. (celmc), medical, precision and optical instruments, watches and clocks (cmed), motor vehicles, trailers, and semitrailers (cmvec), and other transport commodities (cotr).

Intermediate demand for electrical energy, gas, steam, and hot water (cel), and the collection, purification, and distribution of water (cwat) is large. Whereas private demand for cel is slightly above the average, and private demand for cwat is slightly smaller than the average.

Across construction works and services, the largest share of intermediate demand is attributed to research and development services (cres), followed by renting services (crent), post and telecommunication services (ccom), and financial intermediation services, except insurance and pension funding services (cfini). Private demand for this commodity group is large for household services (chh), membership organization services, n.i.c. (cmemb), canteen and catering services (ccant), and food serving services (cretr). In this commodity group investment demand is allocated only across three commodities, among which the highest is for the construction works (ccnst).

Analysis with respect to the compositional structure of demand will prove useful later when I discuss the effects of an oil export price increase on sectoral adjustments. Depending on whether a commodity is largely used for private consumption or as an intermediate input, for instance, might play a certain role in how an oil export price increase might affect the output of the sector producing this commodity.

Next, consider the sectoral content of trade, which is useful to examine since this study deals with the effects of the oil export price increase on the economy (Table 6.4). In the first commodity group, namely products of agriculture, fishing, and forestry, the highest share of exports in total output is attributed to the products of agriculture, hunting, and related services (cagr) and the least to the fish and other fishing products (cfish) (column 1 of Table 6.4). Within this group, the highest shares of imports in composite demand belong to the products of forestry, logging and related services (cfor) and the least to fish and other fishing products (cfish) (column 6 of Table 6.4). In light of this analysis, it appears that the fishing sector (afish) is the least traded sector in this group, whereas agriculture, hunting, and related services activities (aagr) and forestry and related service activities (afor) are traded sectors.

In the products of mining group, the highest share of exports in total output, except for crude petroleum and natural gas, is relevant for coal and lignite (cmin) and the lowest share of exports in total output is relevant for products of other mining and quarrying (comin). The largest share of imports in this group is attributable to the products of other mining and quarrying (comin). Overall, shares of imports of non-oil mining goods are low, whereas shares of exports of non-oil mining goods are large. Thus, I can treat the mining sectors as traded sectors.

The manufacturing commodities group includes twenty-two traded commodities and one pure nontraded commodity: services of recycling sector (crec). The least exported commodities are motor vehicles, trailers and semitrailers (cmvec), other transport equipment (cotr), and other non-metallic mineral products (cmmnt). The most exported commodities are chemicals and chemical products (cchem), electrical machinery and apparatus (celmc), and basic metals (ciron). The least imported commodities are tobacco (ctob) and food products and beverages (cfood), whereas the most imported commodities are electrical machinery and apparatus n.i.c. (celmc), office machinery and computers (cofic), radio, television, and communication equipment and apparatus (crad), chemicals, chemical products, and chemical fibers (cchem), and medical, precision, and optical instruments, watches, and clocks (cmed). It appears that imported manufacturing commodities are more differentiated than exported manufacturing commodities and the total imports of manufacturing goods are two times larger than exports of manufacturing goods. Given that most of the manufacturing goods are either exported and/or imported, I can treat these manufacturing sectors as traded sectors.

The electrical energy, gas and water commodities group consists of two commodities: (1) electrical energy, gas, steam, and hot water (cel); and (2) collection, purification and distribution of water (cwat). The sector that produces electrical energy, gas, and hot water is close to being treated as nontraded sector as its exports and imports are low, whereas the sector that collects, purifies and distributes water is purely nontraded.

In the construction works and services group twelve commodities are purely nontraded, and the majority of the remaining commodities are close to being treated as nontraded. Among the least exported commodities are recreational, cultural and sporting services (crecr), trade services (ctrd), computer and related services (ccomp), construction works (ccnst), financial intermediation services except insurance and funding services (cfini), and other business services (cobus). Among the least imported commodities are trade services (ctrd) and recreational, cultural and sporting services (crecr). Hence, I treat trade services sector (atrđ) and recreational, cultural and sporting services activities (arecr) as almost nontraded, given that their exports and imports are negligible. Among the most imported services are renting services (crent) and insurance and pension funding services (cins). And among the most exported services are renting services (crent) and transport services (ctrns).

Given this sectoral content of trade in Kazakhstan, I might conclude that exports have a low degree of diversification. Exports are largely represented by exports of crude petroleum and natural gas. Undoubtedly, such undiversified structure of exports, given the volatile character of world crude oil and natural gas prices, might trigger large imbalances in the current account in the future and hence might have a further negative impact on fiscal policy, economic growth, and the overall development of the economy.

Imports, however, are more diversified than exports. It is necessary to note that most of the imported goods are used as intermediate inputs in production. Thus, further liberalization of the imports of commodities, of imports of capital goods in particular, might lead to a flow of new technology that might further enhance total productivity and economic growth. However, a shock to the exchange rate, for example, a depreciation of the domestic currency, could make imported goods more expensive and thus might have a negative impact on the welfare of households.

Such an unbalanced structure of imports and exports should be taken into account by policymakers. To lessen the degree of the vulnerability of the economy to different types of shocks, such as adverse terms of trade shocks, for instance, the government should design policies that would promote exports of other non-oil goods, manufacturing products in

particular. Different tax schemes can be devised that might diversify the economy away from the crude petroleum and natural gas sector and give a boost to other production sectors.

Assessing the foreign trade performance of the economy overall, Kazakhstan has high degree of openness of about 91 percent, a moderate ratio of current account deficit to GDP of around 1 percent, an export rate of growth of 48 percent, and a ratio of imports to GDP of 43 percent.

#### **6.4 Margins**

The transition from basic prices to purchaser prices is accomplished by adding the margins and relevant taxes on products and imports to the value of commodities expressed in the basic prices. The margins account used in the SAM treats these margins explicitly. The SAM differentiates between transport margins for domestically supplied and exported goods and trade and distribution margins for domestically supplied and exported goods.

The highest transport margins are attributed to manufacturing products (96.6 percent), among which the highest are attributed to coke, and refined petroleum products and other fuel (18.4 percent). Concerning the allocation of transport margins across the components of domestic absorption, transport margins are the highest in intermediate demand (75 percent), followed by investment demand (18 percent) and final demand (7 percent). High transport margins in intermediate demand can be due to large geographical distances between main production centers and weak transportation infrastructure in the domestic economy.

Concerning trade and distribution margins, the highest trade and distribution margins are for manufacturing products (89 percent), within which the highest share is attributed to food products, including beverages (23 percent) (Agency on Statistics of the Republic of Kazakhstan, 2005c).

#### **6.5 Factors Account**

The factor account shows the allocation of labor income across households and rest of the world, and capital income across households, enterprises, and government (Table 6.5). Overall, entries in the factor account are excerpted from the Kazakhstani 2003 national accounts. Given that the national accounts consider only one representative household, its factor incomes were further disaggregated into factor incomes of urban and rural households based on the 2003 household survey (Agency of Statistics of the Republic of Kazakhstan, 2003). Labor income was disaggregated across the urban and rural households based on their shares in labor income. Capital income was disaggregated based of the households' shares of other transfers in total income.

The allocation of capital income across institutions is as follows. Nonfinancial enterprises receive the highest share of capital income (0.57), followed by urban households (0.24 percent), rural households (0.16), government (0.02) and financial enterprises (0.01) (Table 6.5). Relatively high shares of capital income by households stands from the fact that remuneration of labor received by firm owners or members of households is added to capital outlays, because it cannot be distinguished from profits in unincorporated enterprises, although it represents labor costs.



**Table 6.5 Factor income distribution**

	Urban households	Rural households	Nonfinancial enterprises	Financial enterprises	Government	Rest of the world	Total
Labor income (w) (in millions of tenges)	914301.77	570479.32	0.00	0.00	0.00	33090.20	1517871.29
w/ $\Sigma$ w	0.60	0.38	0.00	0.00	0.00	0.02	1.00
Gross capital income (r) (in millions of tenges)	630235.33	420169.80	1506249.77	32112.67	54513.29	0.00	2643280.85
r/ $\Sigma$ r	0.24	0.16	0.57	0.01	0.02	0.00	1.00

Source: Own calculations based on the balanced SAM.

## 6.6 Institutional Structure

Institutions consist of households, enterprises, and the government. Households alone consist of all resident households and non-profit institutions serving households (NPISH), which in turn consist of political parties, religious societies, trade unions, and non-profit associations. Households are represented by rural and urban households in the SAM.

In general, urban households consume more than rural households, except for some goods for which the demand of rural households is larger (Table 6.6). This is primarily due to the higher income of urban households, as compared with rural households.

Households, in addition to factor incomes, receive transfers from enterprises and the government. All necessary data on the allocation of transfers across institutions, except payments on property, are available in the national accounts. The national accounts provide only the total property income and total property expenditures of each institution, as shown in Table 6.7 in the total column and total row. To disaggregate it across institutions, I impose certain assumptions. To accomplish this, I use Table 6.7, in which rows indicate receipts and columns expenditures. To fill in the entries of the matrix, it is sufficient to calculate entries, with third column entries being calculated residually.

**Table 6.6 Allocation of private final demand across households (in millions of tenges)**

	cagr	cfor	cfish	cmin	cpetr	comin	cfood	ctob	ctex	cwear	cleat	cwood	cpulp
	1	2	3	4	5	6	7	8	9	10	11	12	13
Urb hh (Qh_urb)	115422.84	454.86	219.26	506.48	46356.11	107.86	150132.91	16611.91	9489.46	2745.63	319.42	103.89	955.77
Rur hh (Qh_rur)	71611.75	365.49	161.49	337.87	30923.80	71.96	159106.36	17019.89	9510.49	2751.71	320.13	69.31	637.59
Total	187034.59	820.36	380.76	844.35	77279.91	179.82	309239.27	33631.80	18999.95	5497.34	639.54	173.20	1593.36
Qh_urb/TotalQH	0.62	0.55	0.58	0.60	0.60	0.60	0.49	0.49	0.50	0.50	0.50	0.60	0.60
Qh_rur/TotalQH	0.38	0.45	0.42	0.40	0.40	0.40	0.51	0.51	0.50	0.50	0.50	0.40	0.40
	cpubl	ccoke	cchem	crub	cmnmt	ciron	cfmet	cmach	cofic	celmc	crad	cmed	cmvec
	14	15	16	17	18	19	20	21	22	23	24	25	26
Urb hh (Qh_urb)	4644.20	24814.24	17087.97	16451.62	1614.05	279.78	1465.47	16786.50	933.13	37439.15	13904.06	4400.27	15955.83
Rur hh (Qh_rur)	3050.61	29340.64	13688.79	10974.75	1076.72	224.81	977.60	13488.32	845.69	24975.36	9133.10	3524.96	18866.35
Total	7694.81	54154.88	30776.76	27426.36	2690.78	504.59	2443.07	30274.82	1778.82	62414.52	23037.16	7925.23	34822.18
Qh_urb/TotalQH	0.60	0.46	0.56	0.60	0.60	0.55	0.60	0.55	0.52	0.60	0.60	0.56	0.46
Qh_rur/TotalQH	0.40	0.54	0.44	0.40	0.40	0.45	0.40	0.45	0.48	0.40	0.40	0.44	0.54
	cotr	cfurn	cel	cwat	ccnst	ctrd	chot	cretr	ccant	ctrns	ccom	cfini	cins
	27	28	29	30	31	32	33	34	35	36	37	38	39
Urb hh (Qh_urb)	8096.43	5070.11	53811.73	4523.60	56591.39	68901.60	7046.60	7765.06	11981.24	252501.77	10698.16	29959.72	9839.58
Rur hh (Qh_rur)	6505.66	4073.94	40284.58	3386.46	27808.19	33857.25	3462.60	3886.36	5996.52	141222.83	5983.42	14721.78	4835.03
Total	14602.09	9144.05	94096.31	7910.06	84399.58	102758.85	10509.20	11651.42	17977.76	393724.60	16681.58	44681.50	14674.60
Qh_urb/TotalQH	0.55	0.55	0.57	0.57	0.67	0.67	0.67	0.67	0.67	0.64	0.64	0.67	0.67
Qh_rur/TotalQH	0.45	0.45	0.43	0.43	0.33	0.33	0.33	0.33	0.33	0.36	0.36	0.33	0.33
	caux	cest	crent	ccomp	cobus	cpa	ceduc	chelt	csew	cmemb	crecr	coser	chh
	40	41	42	43	44	45	46	47	48	49	50	51	52
Urb hh (Qh_urb)	19338.49	128943.42	938.72	1081.55	197432.12	53362.81	34699.52	19768.63	6369.80	23479.82	10986.96	7245.33	5648.64
Rur hh (Qh_rur)	9502.65	63360.94	461.27	531.46	97015.30	26221.72	27027.91	10143.20	4768.56	11537.65	5398.83	3560.25	2775.66
Total	28841.14	192304.36	1399.99	1613.01	294447.42	79584.53	61727.43	29911.83	11138.36	35017.47	16385.79	10805.59	8424.30
Qh_urb/TotalQH	0.67	0.67	0.67	0.67	0.67	0.67	0.56	0.66	0.57	0.67	0.67	0.67	0.67
Qh_rur/TotalQH	0.33	0.33	0.33	0.33	0.33	0.33	0.44	0.34	0.43	0.33	0.33	0.33	0.33

Source: Own calculations based on the balanced SAM

**Table 6.7 Distribution of property income across institutions (in millions of tenges)**

	Nonfinancial enterprises	Financial enterprises	Government	Households	Total
Nonfinancial enterprises	9782.51	10061.90	0	3076.91	22921.32
Financial enterprises	94007.32	825.21	0	40860.87	135693.40
Government	51730.04	8671.33	0	43.12	60444.49
Households	76645.03	30345.67	0	0	106990.70
<b>Total</b>	<b>232164.90</b>	<b>49904.11</b>	<b>0</b>	<b>43980.90</b>	

Source: Own calculations based on the national accounts (Agency on Statistics of the Republic of Kazakhstan, 2005a), household survey (Agency on Statistics of the Republic of Kazakhstan, 2003), finances of enterprises (Agency on Statistics of the Republic of Kazakhstan, 2005b).

I assume that:

- The property payments of households to financial enterprises take the form of expenditures on loan payments, which are calculated by multiplying the share of household expenditure on loan payments (1.5 percent) by total household expenditure (2,724,058.1 million tenges).
- The property payments of households to nonfinancial enterprises (3,076.9 million tenges) have been calculated by multiplying the share of expenditures on housing rent by total expenditures of households. However, given that the 2003 household survey does not provide data on housing rents, the share of expenditures on housing rent was taken from the 2005 household survey<sup>61</sup>, which is adjusted to account for the differences in prices for housing in 2005 and 2003.
- Households pay the remaining expenditures on property to the government.
- Intrahousehold property transfers are very small and therefore are simply neglected.

The enterprises account is a second institutional account. It includes nonfinancial and financial enterprises, whereby the financial enterprises comprise the National Bank of Kazakhstan, commercial banks, insurance companies, pension funds, etc. This account includes both the private and public sector.

The distribution of property payments made by financial enterprises across institutions was calculated using the following assumptions:

- The property payments of financial enterprises to households comprise payments for compulsory insurance (2,842 million tenges), private insurance (2,778 million tenges) and part of the payments for property insurance that were distributed to households (23,107.8 million tenges) (which were calculated by multiplying household share in insurance payments by household total insurance payments), dividends from insurance organizations (472 million tenges), pension funds (10 million tenges) and dividends from banks that were distributed to households (1,135.9 million tenges) depending on

<sup>61</sup> Agency on Statistics of the Republic of Kazakhstan (2005d)

the savings rate of households (Agency on Statistics of the Republic of Kazakhstan, 2005b)

- The property payments of financial enterprises to financial enterprises were calculated as the part of the dividends paid by financial enterprises depending on the savings rate of financial enterprises (825.2 million tenges).
- The property payments from financial enterprises to nonfinancial enterprises comprise dividend payments (5,494 million tenges) and property insurance premia (4,568 million tenges) (which were calculated by multiplying the savings rates of nonfinancial enterprises by the total dividends payable by financial enterprises and their shares in insurance payments by total property insurance payments, respectively).
- The property payments from financial enterprises to the government were calculated residually.

Property incomes payable by nonfinancial enterprises were calculated residually.

The third institution – government – receives capital income, taxes on products and imports, corporate taxes, individual income taxes, net transfers from enterprises and net transfers from the rest of the world. And the government uses its revenues for public expenditures and net transfers to households. The rest of the revenues the government saves.

The tax account consists of four groups of taxes: other taxes on production, taxes on products and imports, corporate taxes, and individual income taxes. This separate account is needed to differentiate government revenues from taxes from the rest of the revenues that the government receives. Tax payments by sectors, by commodities, by households, and by enterprises are indicated in the rows of the tax account. These payments are further distributed to the government account and are indicated by the corresponding columns of the account.

Further disaggregation of taxes on products into VAT, excises, and tariffs would be needed for extensive treatment of the effects of tax policies. This, however, I have not done in this chapter due to the large inconsistencies in the data. I, therefore, leave this for future research.

Subsidies on products and imports are not shown explicitly in the input-output table and thus were calculated as follows:

**Subsidies on products and imports = total output + imports + transport margins + trade and distribution margins + taxes on products and imports - total demand in purchaser prices.**

The results show that subsidies on products and imports amounting to 3,628.8 million tenges were distributed across agricultural and hunting products (2,517.5 million tenges), which account for 69.4 percent of the total subsidies on products provided; food products including tobacco (140.5 million tenges), which account for 3.9 percent of the total subsidies on products; collection, purification, and distribution of water (465 million tenges), which account for 12.8 percent of the total subsidies on products; transport services (467.3 million tenges), which account for 12.9 percent of the total subsidies on products; health and social services and recreational, cultural, and sportive services (38.477 million tenges) which account for 1 percent of the total subsidies on products. Net taxes on products and imports were calculated by subtracting these subsidies on products and imports from the taxes on the corresponding products and imports.

### **6.7 Savings and Investment**

On the income side, the savings investment account comprises the gross savings of households, enterprises, government and foreign savings. On the expenditure side, it comprises investment demand, which consists of demand for investment goods and changes in inventories.

The savings rate of the domestic economy is 25.8 percent, with highest savings rate attributed to financial enterprises (95.6 percent), followed by nonfinancial enterprises (52.7 percent), the government (28.5 percent), rural households (4.3 percent), and urban households (3.3 percent). I find that household savings are low, compared to what they consume. This is primarily due to the fact that, on average, household incomes are not high enough for households to accumulate large savings.

### **6.8 Conclusions**

This chapter described the construction of the 2003 SAM for Kazakhstan and highlighted main features of the Kazakhstani economy in 2003. Since the SAM was compiled using the data from various sources, there are certain discrepancies and inconsistencies. To eliminate them, I applied the RAS balancing procedure.

Constructed SAM has large sectoral and commodities disaggregation, namely 55 sectors and 55 commodities. It includes two factors, two types of households, two types of enterprises, government and the rest of the world. The constructed SAM is a suitable database for CGE analysis, which can be used to examine an array of issues. In particular, it will be used to examine the effects of the oil export price increase on Kazakhstani economy in the next chapter.

## Appendix 6A Correspondence Table

Notation used for activities in the SAM	Classification of activities in the SAM	Notation used for commodities in the SAM	Classification of commodities in the SAM	Classification of commodities in the households survey
aagr	Agriculture, hunting and related service activities	cagr	Products of agriculture, hunting and related services	Meat
aagr	Agriculture, hunting and related service activities	cagr	Products of agriculture, hunting and related services	Fruit and vegetables
afor	Forestry and related service activities	cfor	Products of forestry, logging and related services	Rest of non-food products
afish	Fishing, operation of fish hatcheries and fish farms; service activities incidental to fishing	cfish	Fish and other fishing products; services incidental to fishing	Fish and seafood
amin	Mining of coal and lignite; extraction of peat	cmin	Coal and lignite; peat	Maintenance and repair of dwelling materials
apetr	Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction	cpetr	Crude petroleum and natural gas; services incidental to oil and gas extraction, excluding surveying	Maintenance and repair of dwelling materials
aore	Mining of metal ores	core	Metal ores	Maintenance and repair of dwelling materials
aomin	Other mining and quarrying	comin	Other mining and quarrying products	Maintenance and repair of dwelling materials
afood	Manufacture of food products and beverages	cfood	Food products, including beverages	Bread and cereals
afood	Manufacture of food products and beverages	cfood	Food products, including beverages	Milk
afood	Manufacture of food products and beverages	cfood	Food products, including beverages	Oils and fats
afood	Manufacture of food products and beverages	cfood	Food products, including beverages	Sugar jam honey, chocolate and confectionary
afood	Manufacture of food products and beverages	cfood	Food products, including beverages	Food, n.i.c.
afood	Manufacture of food products and beverages	cfood	Food products, including beverages	Non-alcoholic drinks
afood	Manufacture of food products and beverages	cfood	Food products, including beverages	Eggs
afood	Manufacture of food products and beverages	cfood	Food products, including beverages	Alcoholic drinks
atob	Manufacture of tobacco products	ctob	Tobacco products	Tobacco
atex	Manufacture of textiles	ctex	Textiles	Clothing, textiles and footwear
aware	Manufacture of wearing apparel; dressing and dyeing of fur	cwear	Wearing apparel, fur	Clothing, textiles and footwear
aleat	Manufacture of leather products and footwear	cleat	Leather, leather products and footwear	Clothing, textiles and footwear
awood	Manufacture of wood and of products of wood and cork, except furniture	cwood	Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	Maintenance and repair of dwelling materials
apulp	Manufacture of pulp, paper, paperboard and paper products	cpulp	Pulp, paper and paper products	Maintenance and repair of dwelling materials
apubl	Publishing, printing and reproduction of recorded media	cpubl	Printed matter and recorded media	Audio visual, photographic and information processing equipment
acoke	Manufacture of coke, refined petroleum products and other fuel	ccoke	Coke, refined petroleum products, and other fuel	Motor vehicles and fuels
achem	Manufacture of chemicals and chemical products	cchem	Chemicals, chemical products and chemical fiber	Pharmaceutics
arub	Manufacture of rubber and plastics products	crub	Rubber and plastic products	Maintenance and repair of dwelling materials
amnm	Manufacture of other non-metallic mineral products	cmnm	Other non-metallic mineral products	Maintenance and repair of dwelling materials
airon	Manufacture of iron and steel	ciron	Basic metals	Rest of non-food products
afmet	Manufacture of fabricated metal products	cfmet	Fabricated metal products, except machinery and equipment	Maintenance and repair of dwelling materials
amach	Manufacture of machinery and equipment	cmach	Machinery and equipment, n.i.c.	Rest of non-food products
aofic	Manufacture of office and computing machinery	cofic	Office machinery and computers	Furnishings, household equipment
aelmc	Manufacture of electrical machinery and apparatus	celmc	Electrical machinery and apparatus n.i.c.	Maintenance and repair of dwelling materials
arad	Manufacture of radio, television and communication equipment and apparatus	crad	Radio, television, communication equipment and apparatus	Audio visual, photographic and information processing equipment
amed	Manufacture of medical, precision and optical instruments, watches and clocks	cmed	Medical, precision and optical instruments, watches and clocks	Pharmaceutics
amvec	Manufacture of motor vehicles, trailers and semi-trailers	cmvec	Motor vehicles, trailers and semitrailers	Motor vehicles and fuels
aotr	Manufacture of other transport equipment	cotr	Other transport equipment	Rest of non-food products

## Appendix 6A

Notation used for activities in the SAM	Classification of activities in the SAM	Notation used for commodities in the SAM	Classification of commodities in the SAM	Classification of commodities in the households survey
afurn	Manufacture of furniture and other products, n.i.c.	cfurn	Furniture; other manufactured goods, n.i.c.	Rest of non-food products
arec	Recycling	crec	Services on recycling of secondary raw materials	Rest of services
ael	Electricity, gas, steam and hot water supply	cel	Electrical energy, gas, steam and hot water	Public utilities and repair of the dwelling
awat	Collection, purification and distribution of water	cwat	Collection, purification and distribution of water	Public utilities and repair of the dwelling
acnst	Construction	ccnst	Construction works	Maintenance and repair of dwelling materials
atrd	Trade; maintenance and repair of motor vehicles and motorcycles; repair of personal and household goods	ctrd	Trade; maintenance and repair services of motor vehicles and motor cycles; repair of personal and household goods	Rest of the services
ahot	Hotels; camping sites and other provision of short-stay accommodation	chot	Hotel services, camping sites and other short-stay accommodation services	Rest of the services
aretr	Restaurants, bars	cretr	Food serving services	Food and beverages outside of the house
acant	Canteens and catering	ccant	Canteen and catering services	Food and beverages outside of the house
atrn	Transport	ctrn	Transport	Transport and communication services
acom	Communication	ccom	Post and telecommunication services	Transport and communication services
afini	Financial intermediation	cfini	Financial intermediation services, except insurance and pension funding services	Rest of the services
ains	Insurance	cins	Insurance and pension funding services (except compulsory social security services)	Rest of the services
aux	Activities auxiliary to financial intermediation and insurance	caux	Services auxiliary to financial intermediation	Rest of the services
aest	Real estate activities	cest	Real estate services	Rest of the services
arent	Renting of machinery and equipment without operator and of personal and household goods	crent	Renting services of machinery and equipment without operator and of personal and household goods	Rest of the services
acomp	Computer and related activities	ccomp	Computer and related services	Rest of the services
ares	Research and development	crec	Research and development services	Rest of the services
aobus	Other business activities	cobus	Other business services	Rest of the services
apa	Public administration	cpa	Public administration and defense services; compulsory social security services	Rest of the services
aeduc	Education	ceduc	Education services	Education services
ahelt	Health and social work	chelt	Health and social work services	Health services
asew	Sewage and refuse disposal, sanitation and similar activities	csew	Sewerage, and refuse disposal services, sanitation and similar services	Public utilities and repair of the dwelling
amemb	Activities of membership organizations	cmemb	Membership organizations services, n.i.c.	Rest of the services
arecr	Recreational, cultural and sporting activities	crecr	Recreational, cultural and sporting services	Cultural services
aoser	Other service activities	coser	Other services	Rest of the services
ahh	Private households with employed persons	chh	Services of private households with employed persons	Rest of the services

## Appendix 6B SAM Cell Entries

Cell entries in the SAM are documented in the {row account, column account} format. Each entry tracks expenditure flows from column accounts to the corresponding row accounts. Hence, expenditures are illustrated in column accounts and receipts are illustrated in row accounts.

**Intermediate demand {commodities, activities}**. Intermediate demand equals the value of the goods and services that are transformed or completely used in the production process in the accounting period.

**Value added (net of taxes on production) {factors, activities}**. This is the sum of gross profits, mixed income, and compensation of employees.

**Taxes on production less subsidies {taxes, activities}**. This group of taxes consists of all taxes, with the exception of the taxes on products, that are payable by employers who carry out production or use factors of production, irrespective of profitability and sales.

**Gross output {activities, commodities}**. This indicates the total value of goods and services produced in the economy within the accounting period.

**Margins {margins, commodities}**. Margins consist of transport and trade and distribution margins, which represent the difference between purchaser and producer prices, taxes on products and imports are excluded. The rows show the distribution of margins over commodities, and the columns assign total trade margins to the trade and repair sector, total transport margins to the transport sector, and total distribution margins to the food serving services and canteens and catering services sectors, respectively.

**Taxes on products and imports less subsidies {taxes, commodities}**. Taxes on products include taxes that directly depend on the value of the products and services provided. Net taxes on products and imports were calculated by subtracting subsidies from the total amount of taxes on products and imports.

**Imports of goods and services {ROW, commodities}**. This is the total imports of goods and services.

**Households factor income {households, factors}**. Household factor income is the sum of the mixed income of households, the mixed income of NPISH, and the compensation to employees less net compensation of employees payable by residents to the ROW.

**Enterprises factor income {enterprises, factors}**. The receipts to enterprises from the factor account were calculated as a sum of the gross surplus accruing to nonfinancial and financial enterprises after subtracting FISIM.

**Government factor income {government, factors}**. This is a gross surplus to the government.

**Net factor income to ROW {ROW, factors}**. This was taken from the account of primary income distribution by sectors and was calculated as a difference between the compensation of employees payable by residents to nonresidents and the compensation of employees payable by nonresidents to residents.

**Household final consumption {commodities, households}**. Household final consumption was obtained by summing over the final consumption of households and NPISH.

**Household income tax {taxes, households}**. This is the personal income tax payable by households.



**Savings {savings, households}**. This is gross savings, which was calculated as the difference between the gross national disposable income of households and their final consumption.

**Net transfers to ROW {ROW, households}**. This was calculated as the sum of the net property income and net current transfers receivable by the ROW.

**Income tax {tax, enterprises}**. This is the corporate tax paid to the government by financial and nonfinancial enterprises.

**Net transfers {households, enterprises}**. This is the sum of all transfers receivable by households from enterprises, including social benefits other than social transfers in kind, property income receivable from enterprises, insurance premia, adjustments for change in net equity of households on pension funds, which was subtracted by social insurance contributions and insurance payments.

**Transfers {enterprises, enterprises}**. The interenterprise transfers are composed of the following components: insurance payments, insurance premia, and property income.

**Net transfers {government, enterprises}**. The transfers that were made by enterprises to the government consist of property income, fines, other current transfers, and insurance payments made by the government.

**Gross savings {savings, enterprises}**. This is the gross savings of financial and nonfinancial enterprises.

**Net transfers to the ROW {ROW, enterprises}**. This the sum of the net property income receivable by the ROW and other net current transfers.

**Government consumption {commodities, government}**. This is the final consumption expenditures made by the government.

**Net transfers {households, government}**. Households receive social benefits other than social transfers in kind, other net current transfers and pay for the use of property, make social insurance contributions and pay fines.

**Gross savings {savings, government}**. This is the gross savings of government.

**Investment demand {commodities, investment}**. This is the gross fixed capital formation and changes in inventory.

**Exports of goods and services {commodities, ROW}**. This is the total exports of goods and services.

**Net transfers from abroad {government, ROW}**. Government receives other net current transfers from abroad and pays for the use of property.

**Foreign savings {savings, ROW}**. Since the national accounts do not explicitly include foreign savings, I assume that they are equal to the current account balance, which equals the difference between the net lending by the ROW and the net capital transfers to the ROW in the capital account.

## Appendix 6C SAMs

**Table 6C.1 Macro SAM 1 for Kazakhstan, 2003 (in millions of tenges)**

	Activities	Commodities	Margins	Factors	Taxes	Households	Enterprises	Government	Saving-Inv	ROW	TOTAL
Activities		8924010									8924010
Commodities	4626328		969939			2516671		520060	1332246	2208306	12173550
Margins		969939									969939
Factors	4161152										4161152
Taxes	136529	313023				101147	272661				823360
Households				2535186			65041	170886			2771113
Enterprises				1538362			96067			7004	1641434
Government				54513	823360		62307			26401	966581
Savings - Inv						98578	920350	275636		37682	1332246
ROW		1966579		33090		54717	225007				2279394
TOTAL	8924010	12173550	969939	4161152	823360	2771113	1641434	966581	1332246	2279394	

Source: Micro SAM

**Table 6C.2 Macro SAM 2 for Kazakhstan, 2003 (in millions of tenges)**

	Activities	Commodities	Factors	Taxes	Households	Enterprises	Government	Saving-Inv	ROW	TOTAL
Activities		8930920								8930920
Commodities	4631968	969662			2512838		519195	1332246	2232981	12198890
Factors	4162287									4162287
Taxes	136665	313023			101147	272661				823496
Households			2535353			64720	171073			2771146
Enterprises			1538556			95920				1634476
Government			54698	823496		62199			26325	966717
Savings - Inv					100292	917964	276449		37542	1332246
ROW		1985285	33680		56870	221013				2296848
TOTAL	8930920	12198890	4162287	823496	2771146	1634476	966717	1332246	2296848	35117029

Source: 2003 National accounts (Agency on Statistics of the Republic of Kazakhstan, 2005a)

Table 6C.3 Micro SAM for Kazakhstan, 2003 (in millions of tenges)

		Activities																						
		aagr	afor	afish	amin	apetr	aore	aomin	afood	atob	atex	awear	aleat	awood	apulp	apubl	acoke	achem	arub	ammnt	airon	afmet	amach	aofic
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Activities	aagr	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	afor	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	afish	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	amin	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	apetr	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	aore	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	aomin	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	afood	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	atob	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	atex	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	awear	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	aleat	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	awood	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	apulp	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	apubl	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	acoke	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	achem	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	arub	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ammnt	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	airon	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	afmet	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	amach	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	aofic	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	aelmc	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	arad	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	amed	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	amvec	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	aotr	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	afurn	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	arec	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ael	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	awat	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	acnst	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	atrd	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ahot	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	aretr	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	acant	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	atrns	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	acom	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	affini	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ains	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	aux	42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	aest	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	arent	44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	acomp	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ares	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	aobus	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	apa	48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	aeduc	49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ahet	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	asew	51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	amemb	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	arecr	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	aoser	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ahh	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 6C.3 Continued

		Activities																							
		aagr	afor	afish	amin	apetr	aore	aomin	afood	atob	atex	awear	aleat	awood	apulp	apubl	acoke	achem	arub	ammnt	airon	afmet	amach	aofic	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
cagr	56	129654	64	310	6	10	12	105	28815	2394	4147	7	103	8	0	1	119	214	14	10	436	3	660	0	
cfor	57	685	816	2	49	23	236	25	89	0	5	1	5	593	44	0	0	11	0	7	15	1	11	0	
cfish	58	17	0	1742	0	0	1	0	4720	0	0	0	0	0	0	0	11	5	0	0	0	0	0	0	
cmin	59	2287	1	1	489	81	5049	21	390	0	23	62	0	48	0	1	105	201	10	1378	12773	71	23	0	
cpetr	60	422	0	0	1	294216	1746	0	169	0	0	0	0	0	1	0	66631	209	0	800	0	40	311	0	
core	61	0	0	0	0	0	40289	94	0	0	0	0	0	0	0	0	0	3149	0	35	131538	0	0	0	
comin	62	575	0	20	669	2248	17197	9085	806	2	71	20	18	64	0	0	206	185	10	4757	6867	84	56	0	
cfood	63	26094	5	34	64	1893	232	103	82660	156	24	360	0	2	74	12	691	1504	17	53	852	113	13	0	
ctob	64	70	0	0	0	0	0	0	5	3767	0	0	0	0	0	0	0	0	1	1	0	0	0	0	
ctex	65	352	12	106	2	265	179	87	500	12	15780	225	55	5	29	15	363	76	384	148	173	165	31	0	
cwear	66	169	4	3	17	1137	184	6	63	18	18	3669	30	2	1	3	736	28	11	52	462	220	46	0	
cleat	67	7	0	1	5	179	68	1	3	8	132	43	1153	1	0	7	77	9	0	4	23	7	14	0	
cwood	68	1060	46	31	282	450	307	131	611	4	41	8	24	909	26	18	123	39	192	313	1007	326	135	0	
cpulp	69	433	3	12	6	258	61	136	2706	4768	10	7	4	8	4499	3372	267	39	122	340	107	57	46	0	
cpubl	70	34	1	0	13	4046	51	1	204	554	3	7	0	1	450	10594	275	60	16	41	41	21	7	2	
ccoke	71	4103	444	287	2150	18569	19545	535	5784	120	476	41	6	165	145	100	78044	1329	175	2155	19265	2271	627	0	
cchem	72	2631	14	21	1688	7697	900	2936	2238	198	590	105	91	160	929	929	2225	9780	1629	849	4048	861	602	0	
crub	73	1818	17	15	341	6053	1686	295	3139	463	66	90	9	73	81	271	572	1485	2906	267	2581	1131	197	0	
cmnmt	74	1320	33	13	16	16033	597	337	2539	1	55	14	35	234	4	17	844	873	118	6599	2403	1187	482	0	
ciron	75	1087	13	15	596	82775	950	327	1008	178	457	8	34	136	31	243	6683	1163	404	3973	191807	4431	7013	0	
cfmet	76	3002	79	12	549	7149	900	281	1806	7	78	12	18	78	13	31	496	154	754	1158	2848	8167	1629	0	
cmach	77	9663	44	4	5836	31738	4354	1068	948	720	490	29	5	19	121	27	931	1015	355	192	5115	603	6797	0	
cofic	78	20	4	0	4	962	133	1	19	72	4	163	0	2	6	178	143	1	4	3	53	32	27	119	
celmc	79	484	24	62	1770	1337	1740	80	238	20	57	23	0	35	4	37	1194	98	54	165	2425	332	480	21	
crad	80	18	1	0	0	838	107	0	9	0	2	0	0	2	0	3	350	13	6	0	226	588	108	35	
cmed	81	153	0	0	3	710	180	1	27	6	7	0	0	0	5	2	228	19	103	3	90	83	99	0	
cmvec	82	6401	60	3	365	820	486	107	422	5	191	5	4	4	0	13	112	606	4	251	587	313	265	0	
cotr	83	4309	19	7	1945	223	66	12	5	0	0	0	0	1	0	0	52	0	0	37	82	225	85	0	
cfurn	84	50	4	8	1	488	86	4	49	3	44	71	7	15	1	39	60	28	43	15	41	109	49	10	
crec	85	13	0	0	0	0	35	0	27	0	0	9	0	0	0	0	0	0	1	1	521	0	35	0	
cel	86	4150	38	99	2118	27076	8125	3113	4758	47	546	176	18	81	218	126	850	5720	166	2743	9463	1251	920	15	
cwat	87	1594	0	5	45	5414	256	6	336	1	14	21	1	0	5	3	741	147	2	68	726	15	33	0	
ccnst	88	649	44	0	236	34514	791	223	287	4	19	16	0	40	13	55	185	411	94	849	766	209	290	0	
ctrd	89	2173	0	0	61	4161	128	40	541	24	91	14	0	1	39	8	0	48	80	69	7	24	64	0	
chot	90	32	8	1	0	3173	28	3	14	488	4	3	0	0	120	17	0	4	1	1	116	15	9	0	
cretr	91	8	0	0	0	2006	8	0	2	6	0	1	0	0	0	0	0	67	0	0	304	8	1	0	
ccant	92	16	4	0	0	1363	0	0	1	0	0	0	0	0	0	0	0	0	0	1	11	1	3	0	
ctrns	93	59200	93	38	22887	153688	4164	2151	2244	860	337	39	11	92	85	383	8438	149	66	2138	719	712	412	2	
ecom	94	861	22	16	294	3532	185	98	422	162	66	64	7	23	61	314	113	200	65	180	747	118	140	1	
cfini	95	4996	4	13	441	7766	200	54	3258	1	171	60	5	19	27	62	382	222	268	229	441	253	480	0	
cins	96	73	2	0	7	2555	79	18	58	59	89	1	0	1	1	6	61	6	1	84	998	4	76	0	
caux	97	100	0	0	1658	2829	571	0	297	9	1	0	0	0	56	16	48	201	19	19	82	5	175	0	
cest	98	1818	20	82	224	762	62	162	603	369	110	31	3	72	66	175	5206	2638	357	273	98	182	177	5	
crent	99	751	33	7	884	787	11	482	466	1	10	12	0	67	91	4	14	31	15	93	70	99	196	0	
ccomp	100	264	1	0	1	252	7	0	117	0	0	2	0	6	1	49	0	5	7	4	47	2	2	14	
cres	101	71	0	0	16	2694	41	1	11	1	0	0	0	0	0	0	0	16	0	0	186	0	721	0	
cbus	102	5907	12	19	3619	62616	465	92	4881	5252	448	136	37	41	125	719	2159	1283	116	778	1507	378	695	6	
cpa	103	75	28	0	218	1116	0	21	69	51	68	2	2	11	1	0	335	18	1	5	246	5	7	0	
ceduc	104	5	0	0	0	815	3	1	7	61	2	0	0	0	0	1	2	1	1	1	8	1	2	0	
chelt	105	20	0	0	0	1639	56	0	14	0	0	1	0	0	0	1	0	5	0	0	60	4	3	0	
csew	106	62	0	0	0	270	0	0	4149	0	2	15	0	0	2	30	569	27	3	6	561	144	9	0	
cmemb	107	475	0	0	0	76	1	0	13	1	0	0	0	10	1	61	0	0	0	9	96	2	1	0	
crecr	108	1259	0	0	5	3032	0	0	103	26	1	2	0	0	38	762	90	2	8	3	153	777	4	0	
coser	109	37	0	1	60	2144	0	0	97	0	5	8	0	0	0	11	18	112	16	5	77	4	26	0	
chh	110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 6C.3 Continued

Margins	Activities																								
		aagr	afor	afish	amin	apetr	aore	aomin	afood	atob	atex	awear	aleat	awood	apulp	apubl	acoke	achem	arub	ammmt	airon	afmet	amach	aofic	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
M_tt_d	111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M_td_d	112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M_tt_e	113	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M_td_e	114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Factors	LAB	115	66458	2034	1006	11751	95687	42328	12549	35465	4411	2981	1465	431	946	1296	7278	18138	8523	1925	11027	84382	5766	11066	40
	CAP	116	277713	1614	3435	11700	267397	34238	3477	112343	8115	13484	3377	797	1589	2972	3507	44870	9232	3300	12210	160023	10314	11593	70
Other taxes on prod.		117	1371	113	116	623	54716	10352	949	2199	844	311	31	15	81	27	163	3218	411	40	586	7357	117	480	0
Sales tax		118	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual income tax		119	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corporate tax		120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HH	HURB	121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	HRUR	122	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Firms	NENT	123	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FENT	124	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GOV		125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S-I		126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stock ch.		127	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ROW		128	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL		129	627068	5779	7547	73714	1222279	199475	39219	312753	34270	41532	10456	2928	5644	11710	29668	246973	51770	13886	54989	655638	41849	47435	343



Table 6C.3 Continued

	Activities																																	
	aelmc	arad	amed	amvec	aotr	afurn	arec	ael	awat	acnst	atrd	ahot	aretr	acant	atrsn	acom	afini	ains	aux	aest	arent	acomp	ares	aobus	apa	aeduc	ahelt	asew	amemb	arecr	aoser	ahh		
	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55		
cagr	56	148	0	3	0	1	24	6	30	11	297	17851	45	243	219	79206	0	73	0	279	512	88	1	854	985	0	610	1560	169	0	453	137	0	
cfor	57	151	0	0	0	0	13	0	3	7	219	327	0	1	0	33	14	0	0	278	10	0	21	32	0	3	28	12	0	9	483	0		
cfish	58	20	0	0	0	0	4	0	0	0	0	130	34	39	39	7	0	0	0	12	0	0	0	5	0	2	168	0	0	25	0	0		
cmin	59	566	0	1	0	61	207	2	14516	164	279	1856	10	2	0	2511	53	1	0	113	10	2	211	190	0	128	734	256	18	56	72	0		
cpetr	60	7	0	0	0	0	1	0	26463	20	39	459	3	0	0	14516	0	85	0	0	125	0	1	5	1007	0	11	2	19	0	1	0	0	
core	61	0	0	0	0	0	0	0	0	6	4	4	0	0	0	0	0	0	0	0	0	597	0	0	303	0	0	0	0	0	0	0	0	
comin	62	78	0	21	1	12	22	6	397	208	14042	1628	11	7	5	715	2	90	0	551	1286	22	5	13	463	0	119	72	1177	0	159	115	0	
cfood	63	36	0	0	0	13	435	106	140	89	399	25639	235	4512	3923	962	2	662	0	5	2874	129	34	86	430	6360	2772	14223	28	0	1165	281	0	
ctob	64	0	0	0	0	0	0	0	0	0	1	6319	28	127	17	5	0	0	0	0	50	0	0	6	5	0	1	21	0	0	98	5	0	
ctex	65	297	0	114	0	77	357	2	73	6	161	5193	364	25	2	3242	54	2	0	1	365	0	1	119	600	3768	412	3614	38	0	455	207	0	
cwear	66	20	0	10	0	58	13	7	220	99	954	429	22	0	34	960	45	6	0	3	253	6	2	30	1312	341	120	257	41	0	248	17	0	
cleat	67	2	0	34	0	3	6	3	52	14	100	68	5	0	3	265	58	0	0	0	14	0	0	9	96	0	13	115	17	0	37	4	0	
cwood	68	221	0	24	1	73	1477	6	2117	54	13363	5410	74	87	84	5467	49	59	0	4	2412	4	40	44	371	0	865	706	93	49	305	282	0	
cpulp	69	68	51	39	0	12	157	5	95	22	314	4178	82	87	99	465	146	355	54	114	1667	8	306	96	2265	0	1173	1183	45	62	3691	72	0	
cpubl	70	41	0	1	0	4	20	1	72	11	156	4173	44	19	11	997	296	193	1	159	2273	21	86	213	2101	0	3028	452	46	592	1847	27	0	
ccke	71	323	3	113	9	1876	170	176	9608	1599	2971	35454	337	95	40	94731	1089	472	0	1239	11475	339	83	883	5425	0	2583	3971	6871	114	938	340	0	
cchem	72	896	124	520	6	361	200	72	2765	830	2646	21476	222	107	116	4702	33	99	0	5	3187	33	88	1218	19198	513	1828	17855	405	0	741	718	0	
crub	73	182	981	29	26	144	230	21	671	373	6141	4923	132	69	285	2867	165	186	0	73	2046	62	41	184	1807	0	1218	504	460	0	439	141	0	
cmmnt	74	182	0	53	4	384	224	12	1208	278	70466	12006	448	169	16	1999	65	281	0	14	5357	63	6	108	1840	0	1346	2165	3315	1	766	481	0	
ciron	75	4157	9	880	51	633	556	904	4702	1637	12877	14285	42	26	0	77521	23	2195	0	1	4151	20	32	434	5268	0	434	335	654	14	213	199	0	
cfmet	76	1225	3	197	9	5690	334	385	3325	506	47009	6899	215	12	115	18603	92	282	0	10	3938	34	123	414	1998	0	847	847	1215	0	211	355	0	
cmach	77	277	86	294	45	458	40	53	1928	437	4992	3456	73	16	98	10553	417	1454	0	9	764	98	131	348	2791	28266	214	815	372	0	210	285	0	
cofic	78	2	3	31	0	4	0	3	539	20	344	2565	24	6	95	3802	545	55	0	645	356	1	312	1009	731	946	564	546	34	0	372	296	0	
celmc	79	5030	50	419	22	681	12	17	4209	320	13619	3303	233	14	28	21897	3097	5	0	73	961	146	69	746	2839	0	213	505	1674	0	519	88	0	
crad	80	50	1909	616	2	4	411	0	79	1	1202	985	9	13	4	3733	101	14	0	4	384	1	148	360	1196	0	135	67	5	0	2729	11	0	
cmed	81	63	3	1417	1	488	0	0	357	75	4092	794	2	0	11	338	61	93	0	5	121	108	4	139	438	0	66	5439	1	0	13	337	0	
cmvec	82	146	0	21	266	203	1	2	420	138	6779	10214	13	1	54	6964	74	66	0	46	468	67	9	60	670	0	517	427	1243	6	368	74	0	
cotr	83	73	2	5	0	5619	0	0	25	6	125	530	0	0	0	19369	0	0	0	0	6	0	0	1	46	0	0	30	387	0	44	0	0	
cfurn	84	14	0	9	0	8	1816	1	239	25	1671	6961	155	25	28	351	17	50	0	105	2939	2	115	75	1210	0	1477	1814	54	4	1091	72	0	
crec	85	3	0	0	0	0	0	6013	0	0	1	202	0	0	0	0	0	0	0	0	0	0	0	9	0	0	1	0	1	0	0	0	0	0
cel	86	425	13	264	306	419	268	150	45549	10805	14119	12226	618	409	142	15418	891	269	0	183	14358	108	205	405	1211	6387	11593	6311	1552	1374	1792	495	0	
ewat	87	9	0	12	1	62	7	6	1043	234	9465	275	284	23	14	1141	68	22	0	12	865	6	1	66	80	0	1734	1227	5481	0	114	62	0	
ccnst	88	955	1	152	0	172	25	1	758	1264	4317	22348	612	17	2	14792	726	291	0	12	18985	169	19	170	6378	8989	12606	1808	2358	0	1227	537	1041	
ctrd	89	47	0	18	1	69	13	1	458	21	486	49551	305	2	1	1613	473	456	0	107	614	31	118	29	455	0	382	432	60	0	69	11	0	
chot	90	70	14	34	0	8	1	2	200	1	1328	766	361	14	17	3215	32	31	0	0	144	3	49	94	2414	0	221	262	5	3470	210	30	0	
cretr	91	33	0	3	0	9	1	0	32	0	216	19	374	53	3	754	9	1	0	0	2	0	0	19	67	0	192	144	0	0	97	1	0	
ccant	92	0	0	0	0	0	0	0	1	0	102	92	0	0	413	40	0	0	0	0	0	0	0	0	63	0	9	0	0	1	0	0	0	
ctrns	93	538	82	149	23	94	78	1210	5286	131	46016	30098	176	108	89	51734	990	870	0	2885	6979	283	125	342	6732	6934	421	1056	1461	87	413	125	658	
ccom	94	70	9	82	4	64	42	73	596	34	1387	5070	544	140	47	53198	29389	529	0	293	1196	197	723	354	2569	3281	1953	1668	328	313	2390	152	0	
cfini	95	66	11	32	10	51	25	58	2004	81	2582	43484	317	107	53	1094	576	18653	0	536	16124	244	136	415	1907	232	1745	605	184	0	1448	230	0	
cins	96	1	10	1	0	1	0	0	423	8	361	1066	109	1	2	1528	118	196	0	3	728	17	137	47	632	0	21	55	86	0	14	1	0	
caux	97	157	1	7	6	27	7	61	135	31	153	2121	14	119	146	136	493	891	0	997	3501	13	70	249	1084	678	201	0	19	0	416	255	0	
cest	98	123	30	65	6	208	147	44	1698	81	2240	8986	2240	943	210	3249	3136	12081	0	5177	70854	215	454	548	4652	6869	8674	2747	86	6989	1945	253	0	
crent	99	150	9	68	2	61	20	11	565	55	3996	4946	87	107	35	3670	645	609	0	62	110	120	102	303	886	0	325	123	402	0	1409	108	0	
ccomp	100	24	4	3	0	8	2	2	835	84	127	959	14	3	16	3339	361	570	0	166	697	3	1489	517	1653	973	427	360	149	70	31	5	0	
eres	101	0	4	8	0	0	0	0	24	2	20	209	0	0	0	8298	2	69	0	10	485	0	11	1636	1669	18010	8	0	10	0	7	0	0	
cobus	102	308	349	240	6	132	91	246	6511	308	11789	41909	1357	604	436	30668	6836	1103	3350	586	13193	250	7768	1495	23677	8066	4387</							

Table 6C.3 Continued

Margins			Activities																
			aelmc	arad	amed	amvec	aotr	afurn	arec	ael	awat	acnst	atrd	ahot	aretr	acant	atrns	acom	afini
			24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
	M_tt_d	111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	M_td_d	112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	M_tt_e	113	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	M_td_e	114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Factors	LAB	115	2675	636	1115	443	10118	1377	1677	47185	7578	105579	199605	7682	3918	6819	179665	43474	30091
	CAP	116	2576	1150	2304	169	4258	2518	2466	50154	11009	162899	321777	8600	3984	6930	291427	27630	65457
Other taxes on prod.		117	95	7	36	31	274	39	103	9553	566	3810	5833	378	23	18	17376	2830	7606
Sales tax		118	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual income tax		119	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corporate tax		120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HH	HURB	121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	HRUR	122	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Firms	NENT	123	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FENT	124	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GOV		125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S-I		126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stock ch.		127	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ROW		128	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL		129	22705	5553	9463	1454	32998	11408	13944	248118	39555	578087	953216	27213	16397	20777	1063792	125840	149052



Table 6C.3 Continued

		Activities															
		ains	aux	aest	arent	acomp	ares	aobus	apa	aeduc	ahelt	asew	amemb	arecr	aoser	ahh	
		41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
Margins	M_tt_d	111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	M_td_d	112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	M_tt_e	113	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	M_td_e	114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Factors	LAB	115	4549	112	24776	2022	8850	12880	107346	65081	121133	47069	8425	14126	16868	6423	1621
	CAP	116	3322	31857	149014	4172	5009	6091	331384	21972	37759	35037	21300	10104	13485	5475	4621
Other taxes on prod.		117	20	26	915	15	46	129	1184	59	378	250	168	315	247	8	70
Sales tax		118	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual income tax		119	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corporate tax		120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HH	HURB	121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	HRUR	122	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Firms	NENT	123	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FENT	124	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GOV		125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S-I		126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stock ch.		127	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ROW		128	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL		129	11295	46529	384679	9762	27228	34057	555069	191325	227918	169848	70400	38667	71591	20721	8424

Table 6C.3 Continued

		Commodities																											
		cagr	cfor	cfish	cmin	cpetr	core	comin	cfood	ctob	ctex	cwear	cleat	cwood	cpulp	cpubl	ccoke	cchem	crub	cmnmt	ciron	cfmet	cmach	cofic	celmc	crad	cmed	cmvec	cotr
		56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
aagr	1	627068	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
afor	2	0	5779	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
afish	3	0	0	7547	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
amin	4	0	0	0	73714	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
apetr	5	0	0	0	0	1222279	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
aore	6	0	0	0	0	0	199475	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
aomin	7	0	0	0	0	0	0	39219	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
afood	8	0	0	0	0	0	0	0	312753	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
atob	9	0	0	0	0	0	0	0	0	34270	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
atex	10	0	0	0	0	0	0	0	0	0	41532	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
aware	11	0	0	0	0	0	0	0	0	0	0	10456	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
aleat	12	0	0	0	0	0	0	0	0	0	0	0	2928	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
awood	13	0	0	0	0	0	0	0	0	0	0	0	0	5644	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
apulp	14	0	0	0	0	0	0	0	0	0	0	0	0	0	11710	0	0	0	0	0	0	0	0	0	0	0	0	0	
apubl	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29668	0	0	0	0	0	0	0	0	0	0	0	0	
acoke	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	246973	0	0	0	0	0	0	0	0	0	0	0	
achem	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	51770	0	0	0	0	0	0	0	0	0	0	
arub	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13886	0	0	0	0	0	0	0	0	0	
ammmt	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	54989	0	0	0	0	0	0	0	0	
airon	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	655638	0	0	0	0	0	0	0	
afmet	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41849	0	0	0	0	0	0	
amach	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47435	0	0	0	0	0	
aofic	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	343	0	0	0	0	0	
aelmc	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22705	0	0	0	0	
arad	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5553	0	0	0	
amed	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9463	0	0	
amvec	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1454	0	
aotr	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32998	
afurn	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
arec	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ael	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
awat	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
acnst	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
atrd	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ahot	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
aretr	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
acant	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
atrms	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
acom	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
afini	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ains	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
aux	42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
aest	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
arent	44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
acomp	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ares	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
aobus	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
apa	48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
aeduc	49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ahelt	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
asew	51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
amemb	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
arecr	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
aoser	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ahh	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Table 6C.3 Continued

		Commodities																											
		cagr	cfor	cfish	cmin	cpetr	core	comin	cfood	ctob	ctex	cwear	cleat	cwood	cpulp	cpubl	ccoke	cchem	crub	cmnmt	ciron	cfmet	cmach	cofic	celmc	crad	cmed	cmvec	cotr
		56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
cagr	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cfor	57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cfish	58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cmin	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cpetr	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
core	61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
comin	62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cfood	63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ctob	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ctex	65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cwear	66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cleat	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cwood	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cpulp	69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cpubl	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ccoke	71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cchem	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
crub	73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cmnmt	74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ciron	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cfmet	76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cmach	77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cofic	78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
celmc	79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
crad	80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cmed	81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cmvec	82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cotr	83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cfurn	84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
crec	85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cel	86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cwat	87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
censt	88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ctrd	89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chot	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cretr	91	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ccant	92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ctrns	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ecom	94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cfini	95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cins	96	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
caux	97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cest	98	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
crent	99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ecomp	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
eres	101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cobus	102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cpa	103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ceduc	104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chelt	105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
csew	106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cmemb	107	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
crecr	108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
coser	109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chh	110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 6C.3 Continued

			Commodities														
			cagr	cfor	cfish	cmin	cpetr	core	comin	cfood	ctob	ctex	cwear	cleat	cwood	cpulp	cpubl
			56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
Margins	M_tt_d	111	525	9	0	4209	5	12746	18564	3110	3	80	1318	841	1097	451	29
	M_td_d	112	5648	3	124	1380	12673	0	15877	181196	8047	12231	145	43	8836	327	90
	M_tt_e	113	181	3	3	1043	4	136	0	198	0	2	0	188	47	4	62
	M_td_e	114	50	1	0	869	57063	6864	74	3879	13	1094	2	0	174	384	10
Factors	LAB	115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CAP	116	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other taxes on prod.		117	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sales tax		118	7701	217	48	2358	44932	6926	1899	34561	2142	580	572	315	2120	1072	983
Individual income tax		119	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corporate tax		120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HH	HURB	121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	HRUR	122	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Firms	NENT	123	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FENT	124	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GOV		125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S-I		126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stock ch.		127	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ROW		128	19004	797	130	1532	82024	5757	3562	86226	2057	17148	7094	1221	22629	24743	14634
TOTAL		129	660233	6865	7911	85163	1419039	231965	79258	621985	46596	72732	19654	5603	40615	38759	45548

Table 6C.3 Continued

			Commodities													
			cpubl	c coke	c chem	crub	cmnmt	ciron	cfmet	cmach	cofic	celmc	crad	cmed	cmvec	cotr
			70	71	72	73	74	75	76	77	78	79	80	81	82	83
Margins	M_tt_d	111	29	29624	11730	7588	18011	9830	4227	28971	359	5614	1670	2901	2813	5
	M_td_d	112	90	28063	2649	10611	26661	45341	31734	54802	955	2958	357	135	40003	2121
	M_tt_e	113	62	3275	1486	1021	233	1561	338	2726	0	0	0	0	0	0
	M_td_e	114	10	34078	1179	331	517	72199	1093	4368	0	26	0	0	0	0
Factors	LAB	115	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CAP	116	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other taxes on prod.		117	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sales tax		118	983	31186	10871	1418	9264	32336	4153	20997	370	6419	823	579	5885	2234
Individual income tax		119	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corporate tax		120	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HH	HURB	121	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	HRUR	122	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Firms	NENT	123	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FENT	124	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GOV		125	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S-I		126	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stock ch.		127	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ROW		128	14634	78023	124521	48950	33771	107421	47883	207910	17068	279259	38681	30651	91026	42727
TOTAL		129	709278	212272	160782	166603	1704331	533217	208800	1251068	77751	398286	70462	42626	215396	112978

Table 6C.3 Continued

			Commodities																												
			cfurn	crec	cel	cwat	ccnst	ctrd	chot	cretr	ccant	ctrns	ccom	cfini	cins	caux	cest	crent	ccomp	eres	cobus	cpa	ceduc	chelt	csew	cmemb	crecr	coser	chh		
			84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110		
	aagr	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	afor	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	afish	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	amin	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	apetr	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	aore	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	aomin	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	afood	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	atob	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	atex	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	aware	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	aleat	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	awood	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	apulp	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	apubl	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	acoke	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	achem	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	arub	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	ammmt	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	airon	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	afmet	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	amach	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	aofic	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	aelmc	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	arad	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	amed	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	amvec	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	aotr	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	afurn	29	11408		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	arec	30		13944	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	ael	31	0	0	248118	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	awat	32	0	0	0	39555	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	acnst	33	0	0	0	0	578087	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	atrd	34	0	0	0	0	0	953216	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	ahot	35	0	0	0	0	0	27213	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	aretr	36	0	0	0	0	0	0	16397	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	acant	37	0	0	0	0	0	0	0	20777	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	atrn	38	0	0	0	0	0	0	0	0	1063792	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	acom	39	0	0	0	0	0	0	0	0	0	125840	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	afini	40	0	0	0	0	0	0	0	0	0	0	149052	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	ains	41	0	0	0	0	0	0	0	0	0	0	0	11295	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	aux	42	0	0	0	0	0	0	0	0	0	0	0	0	46529	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	aest	43	0	0	0	0	0	0	0	0	0	0	0	0	0	384679	0	0	0	0	0	0	0	0	0	0	0	0	0		
	arent	44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9762	0	0	0	0	0	0	0	0	0	0	0	0		
	acom	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27228	0	0	0	0	0	0	0	0	0	0	0		
	ares	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34057	0	0	0	0	0	0	0	0	0		
	aobus	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	555069	0	0	0	0	0	0	0		
	apa	48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	191325	0	0	0	0	0	0	0		
	aeduc	49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	227918	0	0	0	0	0	0		
	ahelt	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	169848	0	0	0	0	0		
	asew	51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	70400	0	0	0	0	0		
	amemb	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38667	0	0	0	0		
	arecr	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	71591	0	0	0		
	aoser	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20721	0	0		
	ahh	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8424		

Table 6C.3 Continued

		Commodities																										
		cfurn	crec	cel	cwat	ccnst	ctrd	chot	cretr	ccant	ctrns	ccom	cfini	cins	caux	cest	crent	ccomp	eres	cobus	cpa	ceduc	chelt	csew	cmemb	crecr	coser	chh
		84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110
cagr	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cfor	57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cfish	58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cmin	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cpetr	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
core	61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
comin	62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cfood	63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ctob	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ctex	65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cwear	66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cleat	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cwood	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cpulp	69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cpubl	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ccoke	71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cchem	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
crub	73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cmnmt	74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ciron	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cfmet	76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cmach	77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cofic	78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
celmc	79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
crad	80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cmed	81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cmvec	82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cotr	83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cfurn	84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
crec	85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cel	86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cwat	87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ccnst	88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ctrd	89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chot	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cretr	91	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ccant	92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ctrns	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ccom	94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cfini	95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cins	96	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
caux	97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cest	98	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
crent	99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ccomp	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
eres	101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cobus	102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cpa	103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ceduc	104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chelt	105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
csew	106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cmemb	107	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
crecr	108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
coser	109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chh	110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 6C.3 Continued

			Commodities												
			cfurn	crec	cel	cwat	ccnst	ctrd	chot	cretr	ccant	ctrns	ccom	cfini	cins
			84	85	86	87	88	89	90	91	92	93	94	95	96
Margins	M_tt_d	111	264	0	0	0	0	0	0	0	0	0	0	0	0
	M_td_d	112	5354	287	56522	0	51296	0	0	0	0	0	0	0	0
	M_tt_e	113	3	0	0	0	0	0	0	0	0	0	0	0	0
	M_td_e	114	96	0	0	0	0	0	0	0	0	0	0	0	0
Factors	LAB	115	0	0	0	0	0	0	0	0	0	0	0	0	0
	CAP	116	0	0	0	0	0	0	0	0	0	0	0	0	0
Other taxes on prod.		117	0	0	0	0	0	0	0	0	0	0	0	0	0
Sales tax		118	120	9	7933	103	30926	2760	330	122	30	18614	4924	890	243
Individual income tax		119	0	0	0	0	0	0	0	0	0	0	0	0	0
Corporate tax		120	0	0	0	0	0	0	0	0	0	0	0	0	0
HH	HURB	121	0	0	0	0	0	0	0	0	0	0	0	0	0
	HRUR	122	0	0	0	0	0	0	0	0	0	0	0	0	0
Firms	NENT	123	0	0	0	0	0	0	0	0	0	0	0	0	0
	FENT	124	0	0	0	0	0	0	0	0	0	0	0	0	0
GOV		125	0	0	0	0	0	0	0	0	0	0	0	0	0
S-I		126	0	0	0	0	0	0	0	0	0	0	0	0	0
Stock ch.		127	0	0	0	0	0	0	0	0	0	0	0	0	0
ROW		128	21509	0	6405	0	122108	164	0	0	0	127200	9090	9179	13192
TOTAL		129	0	0	8256	38922	14409	319151	39832	782593	956319	27722	16701	20991	1209792

Table 6C.3 Continued

			Commodities													
			caux	cest	crent	ccomp	cres	cobus	cpa	ceduc	chelt	csew	cmemb	crecr	coser	chh
			97	98	99	100	101	102	103	104	105	106	107	108	109	110
Margins	M_tt_d	111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	M_td_d	112	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	M_tt_e	113	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	M_td_e	114	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Factors	LAB	115	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CAP	116	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other taxes on prod.		117	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sales tax		118	386	1157	1476	2097	207	4903	469	202	133	221	61	399	1350	0
Individual income tax		119	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corporate tax		120	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HH	HURB	121	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	HRUR	122	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Firms	NENT	123	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FENT	124	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GOV		125	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S-I		126	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stock ch.		127	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ROW		128	0	0	22689	3093	0	187563	6094	0	0	0	0	1842	0	0
TOTAL		129	140042	159310	24922	46626	384777	12012	27811	35413	579436	196718	228330	362521	77172	39081



Table 6C.3 Continued

		Margins				Factors		Other taxes on prod.	Sales tax	Individual income tax	Corporate tax	HH		Firms		GOV	S-I	Stock ch.	ROW	TOTAL
		M_tt_d	M_td_d	M_tt_e	M_td_e	LAB	CAP					HURB	HRUR	NENT	FENT					
		111	112	113	114	115	116					117	118	119	120					
aagr	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	627068
afor	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5779
afish	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7547
amin	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	73714
apetr	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1222279
aore	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	199475
aomin	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39219
afood	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	312753
atob	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34270
atex	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41532
awear	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10456
aleat	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2928
awood	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5644
apulp	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11710
apubl	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29668
acoke	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	246973
achem	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	51770
arub	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13886
ammnt	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	54989
airon	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	655638
afmet	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41849
amach	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47435
aofic	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	343
aelmc	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22705
arad	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5553
amed	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9463
amvec	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1454
aotr	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32998
afurn	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11408
arec	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13944
ael	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	248118
awat	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39555
acnst	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	578087
atrd	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	953216
ahot	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27213
aretr	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16397
acant	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20777
atrns	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1063792
acom	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	125840
afini	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	149052
ains	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11295
aux	42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	46529
aest	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	384679
arent	44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9762
acomp	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27228
ares	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34057
aobus	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	555069
apa	48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	191325
aeduc	49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	227918
ahelt	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	169848
asew	51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	70400
amemb	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38667
arecr	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	71591
aoser	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20721
ahh	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8424

Table 6C.3 Continued

		Margins				Factors		Other taxes on prod.	Sales tax	Individual income tax	Corporate tax	HH		Firms		GOV	S-I	Stock ch.	ROW	TOTAL
		M_tt_d	M_td_d	M_tt_e	M_td_e	LAB	CAP					HURB	HRUR	NENT	FENT					
		111	112	113	114	115	116					121	122	123	124					
cagr	56	0	0	0	0	0	0	0	0	0	115423	71612	0	0	22016	25088	25474	129667	660177	
efor	57	0	0	0	0	0	0	0	0	0	455	365	0	0	40	0	1143	541	6808	
cfish	58	0	0	0	0	0	0	0	0	0	219	161	0	0	10	0	241	240	7853	
cmin	59	0	0	0	0	0	0	0	0	0	506	338	0	0	909	0	1687	36631	85104	
cpetr	60	0	0	0	0	0	0	0	0	0	46356	30924	0	0	0	0	-155922	1090311	1418979	
core	61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5612	50273	231904	
comin	62	0	0	0	0	0	0	0	0	0	108	72	0	0	0	0	6402	8448	79196	
cfood	63	0	0	0	0	0	0	0	0	0	150133	159106	0	0	0	0	90933	41255	621922	
ctob	64	0	0	0	0	0	0	0	0	0	16612	17020	0	0	0	0	662	1709	46532	
ctex	65	0	0	0	0	0	0	0	0	0	9489	9510	0	0	0	0	10416	4739	72667	
cwear	66	0	0	0	0	0	0	0	0	0	2746	2752	0	0	0	0	510	1193	19588	
cleat	67	0	0	0	0	0	0	0	0	0	319	320	0	0	0	0	706	1528	5536	
cwood	68	0	0	0	0	0	0	0	0	0	104	69	0	0	0	0	43	504	40547	
cpulp	69	0	0	0	0	0	0	0	0	0	956	638	0	0	0	0	1757	1166	38690	
cpubl	70	0	0	0	0	0	0	0	0	0	4644	3051	0	0	0	943	2795	738	45478	
ccoke	71	0	0	0	0	0	0	0	0	0	24814	29341	0	0	0	0	6020	51385	451222	
cchem	72	0	0	0	0	0	0	0	0	0	17088	13689	0	0	0	0	615	50730	204206	
crub	73	0	0	0	0	0	0	0	0	0	16452	10975	0	0	0	0	6393	2024	83804	
cmnmt	74	0	0	0	0	0	0	0	0	0	1614	1077	0	0	0	0	2593	1150	143446	
ciron	75	0	0	0	0	0	0	0	0	0	280	225	0	0	0	0	72805	415430	924326	
cfmet	76	0	0	0	0	0	0	0	0	0	1465	978	0	0	0	0	9175	-9589	5138	131277
emach	77	0	0	0	0	0	0	0	0	0	16787	13488	0	0	0	192580	-147	15449	367209	
cofic	78	0	0	0	0	0	0	0	0	0	933	846	0	0	0	0	703	687	123	19094
celmc	79	0	0	0	0	0	0	0	0	0	37439	24975	0	0	0	0	147688	19545	15864	316980
crad	80	0	0	0	0	0	0	0	0	0	13904	9133	0	0	0	0	926	4303	2336	47084
emed	81	0	0	0	0	0	0	0	0	0	4400	3525	0	0	0	0	15772	1674	2171	43729
cmvec	82	0	0	0	0	0	0	0	0	0	15956	18866	0	0	0	0	53546	12462	6	141181
cotr	83	0	0	0	0	0	0	0	0	0	8096	6506	0	0	0	0	26800	5157	190	80085
cfurn	84	0	0	0	0	0	0	0	0	0	5070	4074	0	0	0	0	5119	2055	881	38754
crec	85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7366	0	14239
cel	86	0	0	0	0	0	0	0	0	0	53812	40285	0	0	0	0	0	-871	5670	318979
cwat	87	0	0	0	0	0	0	0	0	0	4524	3386	0	0	0	0	0	0	0	39658
ccnst	88	0	0	0	0	0	0	0	0	0	56591	27808	0	0	0	7902	536493	10715	2479	782417
ctrd	89	0	605332	0	184362	0	0	0	0	0	68902	33857	0	0	0	0	0	0	291	956141
chot	90	0	0	0	0	0	0	0	0	0	7047	3463	0	0	0	0	0	0	0	27542
cretr	91	0	425	0	0	0	0	0	0	0	7765	3886	0	0	0	0	0	0	0	16519
ccant	92	0	710	0	0	0	0	0	0	0	11981	5997	0	0	0	0	0	0	0	20807
ctrns	93	166597	0	12513	0	0	0	0	0	0	252502	141223	0	0	0	5429	0	0	206261	1209606
ccom	94	0	0	0	0	0	0	0	0	0	10698	5983	0	0	0	0	0	0	8787	139854
cfini	95	0	0	0	0	0	0	0	0	0	29960	14722	0	0	0	0	0	0	2075	159120
cins	96	0	0	0	0	0	0	0	0	0	9840	4835	0	0	0	0	0	0	308	24730
caux	97	0	0	0	0	0	0	0	0	0	19338	9503	0	0	0	0	0	0	0	46915
cest	98	0	0	0	0	0	0	0	0	0	128943	63361	0	0	0	35085	0	0	0	385835
crent	99	0	0	0	0	0	0	0	0	0	939	461	0	0	0	0	0	0	9421	33927
ccomp	100	0	0	0	0	0	0	0	0	0	1082	531	0	0	0	4492	12569	0	74	32418
cres	101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	34265
cobus	102	0	0	0	0	0	0	0	0	0	197432	97015	0	0	0	4567	170605	0	12633	747535
cpa	103	0	0	0	0	0	0	0	0	0	53363	26222	0	0	0	80385	0	0	28473	197888
ceduc	104	0	0	0	0	0	0	0	0	0	34700	27028	0	0	0	161605	0	0	0	228120
chelt	105	0	0	0	0	0	0	0	0	0	19769	10143	0	0	0	129960	0	0	0	169981
csew	106	0	0	0	0	0	0	0	0	0	6370	4769	0	0	0	24200	0	0	0	70622
cmemb	107	0	0	0	0	0	0	0	0	0	23480	11538	0	0	0	10	0	0	0	38728
crecr	108	0	0	0	0	0	0	0	0	0	10987	5399	0	0	0	40321	0	0	10	73832
coser	109	0	0	0	0	0	0	0	0	0	7245	3560	0	0	0	3105	0	0	0	22071
chh	110	0	0	0	0	0	0	0	0	0	5649	2776	0	0	0	0	0	0	0	8424

Table 6C.3 Continued

			Margins				Factors		Other taxes on prod.				HH		Firms		GOV	S-I	Stock ch.	ROW	TOTAL
			M_tt_d	M_td_d	M_tt_e	M_td_e	LAB	CAP	Sales tax	Individual income tax	Corporate tax	HURB	HRUR	NENT	FENT						
			111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129
Margins	M_tt_d	111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	166597
	M_td_d	112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	606467
	M_tt_e	113	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12513
	M_td_e	114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	184362
Factors	LAB	115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1517871
	CAP	116	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2643281
	Other taxes on prod.	117	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	136529
	Sales tax	118	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	313023
	Individual income tax	119	0	0	0	0	0	0	0	0	0	0	56522	44626	0	0	0	0	0	0	101147
	Corporate tax	120	0	0	0	0	0	0	0	0	0	0	0	0	267346	5315	0	0	0	0	272661
HH	HURB	121	0	0	0	0	914302	630235	0	0	0	0	0	0	44353	-4376	91737	0	0	0	1676252
	HRUR	122	0	0	0	0	570479	420170	0	0	0	0	0	0	29570	-4505	79148	0	0	0	1094862
Firms	NENT	123	0	0	0	0	0	1506250	0	0	0	0	0	0	9836	0	0	0	0	0	1516086
	FENT	124	0	0	0	0	0	32113	0	0	0	0	0	0	85408	824	0	0	0	7004	125348
	GOV	125	0	0	0	0	0	54513	136529	313023	101147	272661	0	0	54114	8193	0	0	0	26401	966581
	S-I	126	0	0	0	0	0	0	0	0	0	0	53868	44710	800452	119898	275636	0	0	134241	134241
	Stock ch.	127	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ROW	128	0	0	0	0	33090	0	0	0	0	0	30576	24141	225007	0	0	0	0	0	2279394
	TOTAL	129	166597	606467	12513	184362	1517871	2643281	136529	313023	101147	272661	1676252	1094862	1516086	125348	966581	1332246	134241	2279394	

**Note:**

Notation for commodities and activities is shown in Appendix 6A.

M_tt_d	transportation costs for domestically supplied commodity
M_td_d	trade and distribution costs for domestically supplied commodity
M_tt_e	transportation costs for exported commodity
M_td_e	trade costs for exported commodity
LAB	labor
CAP	capital
HURB	urban households
HRUR	rural households
NENT	nonfinancial enterprises
FENT	financial enterprises
GOV	government
S-I	savings-investment
DSTK	stock change or inventory
ROW	rest of the world
TOTAL	total

# Chapter 7      Effects of the Oil Export Price Increase on the Kazakhstani Economy: Two-Sector Model

## 7.1      Introduction

This chapter explores the effects of the oil export price increase and different macro and micro closure rules using the data on the Kazakhstani economy and Lofgren et al.'s (2002) standard CGE model. In Chapter 5, I have developed a stylized model and examined the effects of the oil export price increase under different macro closure rules. However, the analysis in Chapter 5 is limited as it uses a stylized model and artificial data. Analysis in this chapter is more realistic, since it uses a CGE model, namely Lofgren et al.'s (2002) CGE model that incorporates some realistic features and real data.

In this chapter I pursue three aims. The *first* aim is to quantify general effects of the oil export price increase on Kazakhstan's economy, the *second* aim is to test whether the main effects found within the stylized model developed in Chapter 5 also hold in Lofgren et al.'s (2002) model, and the *third* aim is to test the implications of different macro and micro closure rules in this large model.

As regards the first aim, the chapter quantifies the effects of the oil export price increase on Kazakhstan's economy using a two-sector version of the constructed SAM. It uses the two-sector version of the SAM for the analysis in order to highlight and quantify the general impact of the oil export price increase on the oil sector, on the one hand, and on the non-oil sector, on the other hand.

As regards the second aim, this chapter tests whether the main effects that operate behind the stylized model discussed in Chapter 5 operate behind large CGE models such as Lofgren et al.'s (2002) model as well. This is tested using a sensitivity analysis. This is another reason why this chapter uses the two-sector version of the SAM.

As regards the third aim, this chapter tests whether different macro closure rules might lead to different conclusions. For this purpose, it applies several macro closure rules such as the neoclassical, Johansen, and only one foreign savings closure rule  $f(1)$  in what follows. I apply only the  $f(1)$  closure rule because only the  $f(1)$  closure rule of all the foreign savings closure rules discussed in Chapter 5 produces appealing results. Thus, in what follows, when I refer to a foreign closure rule, I consistently mean the  $f(1)$  closure rule.

The chapter is structured as follows. Section 7.2 discusses the general features of the model. Section 7.3 discusses sources of the extraneous parameters. Section 7.4 discusses the main features of the two-sector economy. Section 7.5 presents simulation results under alternative macro and micro closure rules. Section 7.6 examines the sensitivity of the results with respect to the selected structural parameters. Section 7.7 concludes.

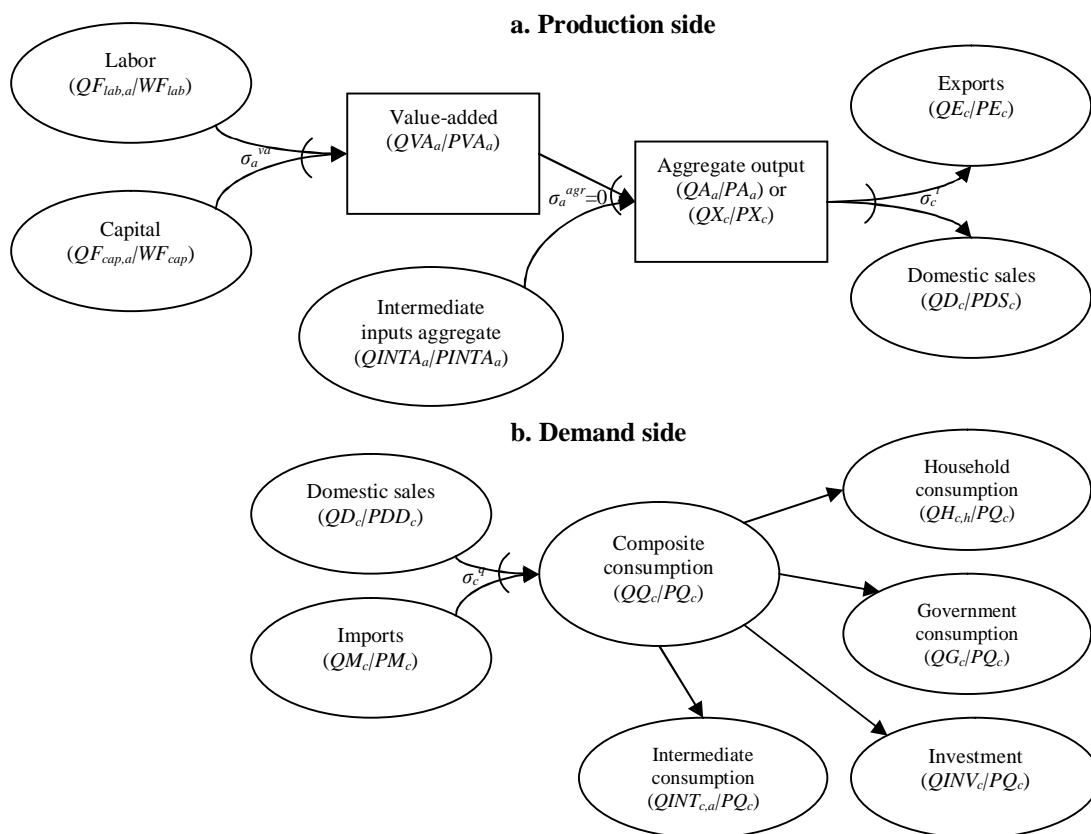
## 7.2 Overview of the Model

In this section, I briefly summarize the main features of Lofgren et al.'s (2002) model, that is, I discuss the model's domestic production structure, institutional characteristics and the closure rules applied. I document the equations of the model in Appendix 7A.2.

### Domestic Production Structure

Lofgren et al.'s (2002) model assumes that each industry produces under constant returns to scale and operates in a perfect competition environment. Production of each industry is characterized by the behavior of a single representative producer, which minimizes its production costs subject to its production technology. The production technology and flows of commodities are summarized in Figure 7.1.

**Figure 7.1 Production technology and flows of commodities in Lofgren et al.'s (2002) model**



Note: Circles indicate commodities. Boxes indicate production processes. Notation enclosed in brackets shows quantities and prices. For complete description of the notation, refer to Appendix 7A.1.

Domestic goods are combined with imported goods via the CES function into the composite consumption good, implying that domestic and imported goods are imperfect substitutes. Later, industries use this composite good for intermediate uses, and households and the

government use this composite good for final uses. The model employs labor and capital in production, which are combined via the CES function into the composite value-added. This composite value-added is combined with the aggregate of intermediate goods via the Leontief function into the aggregate output. The aggregate output, in turn represents the CET aggregate of domestically supplied and exported goods.

Assuming profit-maximizing behavior of the producers, each representative producer uses capital and labor to the level where the marginal revenue product of each factor is equal to its factor price. Profit maximizing equations for producers are derived using a duality approach.

### *Institutional side*

The model incorporates different categories of the representative institutions. Given that the SAM for Kazakhstan distinguishes between two types of households (urban and rural households) and two types of enterprises (financial and nonfinancial enterprises) and considers the government and the rest of the world, the model also distinguishes between two types of households (urban and rural households) and two types of enterprises (financial and nonfinancial enterprises) and considers the government and the rest of the world. In what follows, I discuss income sources and expenditures relevant for each representative institution.

The households receive income from production factors and transfers from the government and enterprises and use their income to pay individual income taxes and make transfers to the rest of the world. The rest of the income the households save. Enterprises receive income from production factors and transfers from other enterprises and use their income to pay corporate taxes and make transfers to households, enterprises, the government and the rest of the world. The rest of the income the enterprises save. The government receives income from capital, tax payments and transfers from enterprises and the rest of the world. The government uses its revenues to cover public expenditures and make transfers to households. The rest of the income the government saves. There are four groups of taxes: taxes on products and imports, corporate taxes, individual income taxes, and taxes on production. A separate tax account is required to differentiate government tax revenues from the rest of the revenues that the government receives. The remaining institution – the rest of the world – receives income from imports of the domestic economy, factor incomes, and transfers from households and enterprises. This institution uses its income to pay for the consumption of the goods exported by the domestic economy and to make transfers to the government. The rest of the income the rest of the world saves.

### *Macro and micro closure rules*

I use two particular groups of macro closure rules, labeled in Chapter 5 as the exchange rate and foreign savings closure rules groups. The groups differ in their treatment of foreign savings. In the exchange rate closure rule group, foreign savings are assumed to be fixed, whereas in the foreign savings closure rules group, foreign savings are assumed to be flexible. The assumption of fixed foreign savings can be interpreted as a government's obligation to meet a balance of payment target (Mohora, 2006); whereas the assumption of flexible foreign savings can be interpreted as the absence of such a target.

The first group encompasses the neoclassical and Johansen closure rules. These two macro closure rules differ in their treatment of savings and investment (Table 7.1). In the neoclassical closure rule, the economy is savings-driven, which implies that investment adjusts to maintain a savings-investment identity. Whereas in the Johansen closure rule the economy is investment-driven, which implies that the savings rates of domestic nongovernment institutions adjust to ensure that the savings and investment are balanced. As Thurlow and van Seventer (2002) indicate, “savings adjust through some forced savings mechanism imposed by the government”. It can be accomplished either through government efforts to lessen inflation, which, in turn, cause the savings rates of domestic nongovernment institutions to increase. Otherwise, it can be achieved via an increase in private bank’s reserve requirements, thereby increasing interest rates and savings (Thurlow and van Seventer, 2002).

**Table 7.1 Macro and micro closure rules**

Symbol	Definition	Neoclassical		Johansen		Foreign	
		FAC1	FAC2	FAC1	FAC2	FAC1	FAC2
<i>Factor markets closure rule</i>							
$WF_{lab}$	Economy-wide wage	n	n	n	n	n	n
$QFS_{lab}$	Labor supply	x	x	x	x	x	x
$WFDIST_{lab,a}$	Wage distortion factor	x	x	x	x	x	x
$WF_{cap}$	Economy-wide rental rate of capital	x	n	x	n	x	n
$QFS_{cap}$	Capital supply	x	x	x	x	x	x
$WFDIST_{cap,a}$	Rental rate of capital distortion factor	n	x	n	x	n	x
<i>Government balance closure rule</i>							
$GADJ$	Government consumption adjustment factor	x		x		x	
$GOVSHR$	Government consumption share in nominal absorption	n		n		n	
$TINSADJ$	Direct tax scaling factor	x		x		x	
$DTINS$	Change in domestic institution tax share	x		x		x	
$GSAV$	Government savings	n		n		n	
<i>Savings-investment balance closure rule</i>							
$IADJ$	Investment demand adjustment factor	n		x		x	
$INVSHR$	Investment share in absorption	n		n		n	
$MPSADJ$	Savings rate scaling factor	x		n		n	
$DMPS$	Change in domestic institution savings rate	x		x		x	
<i>Current account balance closure rule</i>							
$FSAV$	Foreign savings	x		x		n	
$EXR$	Exchange rate	Numeraire		Numeraire		Numeraire	

Note: x implies that the variable is exogenously given. n implies that the variable is endogenously determined.

The second group of macro closure rules assumes that foreign savings are flexible. Unlike the corresponding group in Chapter 5, it covers only one closure rule, the  $f(1)$  closure rule, which is referred here to as the foreign closure rule. I apply only this macro closure rule here because it represents the most restrictive macro closure rule of all the other foreign savings closure rules applied in Chapter 5. This macro closure rule might be associated with the government’s prudent stance on public spending and investment.



In addition, I apply two different micro closure rules within the framework of the neoclassical, Johansen, and foreign closure rules. The micro closure rules are labeled as FAC1 and FAC2 (Table 7.1). The FAC1 closure rule assumes that labor is mobile and capital is sector-specific, whereas the FAC2 closure rule assumes that both labor and capital are perfectly mobile. Given that the FAC1 does not allow for one of the factors to move across sectors, it tends to mimic adjustments in the medium run, whereas given that the FAC2 allows for both factors to move across sectors, it tends to mimic adjustments in the long run. Therefore in what follows I call the FAC1 closure rule a medium-run closure rule and the FAC2 a long-run closure rule.

### 7.3 Sources of Extraneous Parameters

In this section I briefly comment on the sources of the extraneous parameters used in this study, whereas Appendix 7A.3 explains the calibration of the model.

I borrowed the elasticities of substitution between factors from the GTAP 6 database (Dimaranan et al., 2006). The GTAP 6 database does not have estimated parameters for Kazakhstan, but for the former Soviet Union region as a whole among others. Since Kazakhstan was a part of the Soviet Union until 1991, I assume that the values of the parameters for the Soviet Union region apply also for Kazakhstan. Thus, I applied these parameters as they are given in the database. Namely, the elasticity of substitution between factors in the crude petroleum and natural gas sector was taken as it is given in the database. And the elasticity of substitution between factors in the aggregate of the non-crude petroleum and natural gas sectors, non-crude oil and natural gas sector for short, was calculated as a weighted average of the elasticities of substitution between factors in the non-crude petroleum and natural gas sectors, with the weights being equal to the corresponding shares of value-added in the aggregate output of each sector (Table 7.2).

**Table 7.2 Extraneous parameters used in the model**

Parameter	Oil sector/good	Non-oil sector/good
Armington elasticity of substitution between commodities, $\sigma_c^q$	3	3
Elasticity of transformation between commodities, $\sigma_c^t$	5	5
Elasticity of substitution between labor and capital in activity $a$ , $\sigma_a^{va}$	0.2	1.186
Income elasticity of demand for composite commodity	1.11	0.996
Frisch parameter	-3.62	-3.62

Note: Here, I label the crude petroleum and natural gas sector as the oil sector and the non-crude petroleum and natural gas sectors aggregated into one sector as the non-oil sector.

The income elasticities of the demand for composite commodities by households were taken from the GTAP 6 database (Dimaranan et al., 2006) as well. The income elasticity of the demand for the composite crude petroleum and natural gas commodity was taken as it is given in the data, whereas the income elasticity of the demand for the other composite commodity,

namely the non-crude petroleum and natural gas commodity, was calculated using the Engel aggregation. The GTAP 6 provides income elasticities of demand only for one representative household. Given the shortage of the estimates of these parameters for Kazakhstan, I assume that the income elasticities of demand are the same across both household categories. Given the absence of the Frisch parameter in the GTAP 6 database, I borrowed it from the GTAP 3 database (Dimaranan et al., 1997), where it is referred to the former Soviet Union countries region. The value of the Frisch parameter is assumed to be the same for both household categories as well. The elasticities of transformation and the Armington elasticities of substitution were borrowed from Jensen and Tarr's (2008) study.<sup>62</sup> The parameters used are shown in Table 7.2. Since the parameters were borrowed from other studies, the results obtained from the simulation in this study should be interpreted with caution.

#### 7.4 Features of the Economy – Aggregated SAM

In this section I discuss main features of the aggregated version of the 2003 SAM for Kazakhstan (Table 7B.1 in Appendix 7B), which has two sectors: oil and non-oil sectors<sup>63</sup> (Table 7.3).

**Table 7.3 Main features of the two-sector version of the SAM**

Parameter	Value	
Value share of labor force in GDP at factor costs	0.36	
Value share of capital stock in GDP at factor costs	0.64	
	Oil	Non-oil
Value share of labor employed by sector $a$ in its value-added	0.23	0.37
Value share of capital employed by sector $a$ in its value-added	0.64	0.61
Value share of taxes on production levied on sector $a$ in its value-added	0.13	0.02
Value share of labor used in activity $a$ in total labor force	0.06	0.94
Value share of capital used in activity $a$ in total capital stock	0.10	0.90
Value share of demand for domestically supplied commodity in its composite demand	0.71	0.80
Value share of imports of commodity $c$ in its composite demand	0.29	0.20
Value share of exports of commodity $c$ in its total output	0.89	0.15
Value share of domestic sales of commodity $c$ in its total output	0.11	0.85
Value share of exports of commodity $c$ in total exports	0.49	0.51
Value share of imports of commodity $c$ in total imports	0.04	0.51

Source: SAM (2003)

*First*, the oil sector is capital intensive, whereas the non-oil sector is labor intensive. *Second*, there is a home bias in consumption. Consumers tend to prefer domestic goods to imported goods. This is revealed by the larger share of consumption of domestic goods than that of imported goods. *Third*, oil exports are larger than domestic oil sales, whereas non-oil exports

<sup>62</sup> I borrowed the elasticities of transformation and the Armington elasticities of substitution from Jensen and Tarr's (2008) study since their study is based on the Kazakhstani economy.

<sup>63</sup> The oil sector represents the crude petroleum and natural gas sector, whereas the non-oil sector represents the aggregate of the non-crude petroleum and natural gas sectors. I call these two sectors the oil and non-oil sectors for brevity.

are smaller than domestic non-oil sales. *Fourth*, the shares of exports of both commodities in total exports are relatively similar. *Fifth*, imports are biased toward non-oil commodities. This is revealed by the larger shares of non-oil imports in the total imports than by that of oil imports. *Sixth*, the economy runs a trade deficit in the benchmark. *Seventh*, the structure of the GDP is such that it is mostly composed of private consumption and exports. Imports are sizeable. Shares of investment and government spending in GDP are low.

## 7.5 Simulation Results

In this section, I discuss the effects of the simulated 35-percent increase in the oil export price (in foreign currency units), the oil export price for short, under three different macro closure rules. I begin first by discussing the effects of the oil export price increase under different macro closure rules in the medium run using the FAC1 closure rule, and then proceed to its effects in the long run using the FAC2 closure rule.

Note that in the SAM for Kazakhstan the crude oil and natural gas are identified as a single sector. In 2003, the base period for the SAM, the crude oil sector accounted for about 87 percent of the total production from this composite sector (ADB, 2008). Thus 35-percent increase in the oil export price is roughly equivalent to a 30-percent increase in the export price of this composite good (crude oil and natural gas) (in foreign currency units).<sup>64</sup>

### 7.5.1 Simulation Results under the FAC1 Closure Rule

In what follows, I examine the effects of the 35-percent increase in the oil export price under the FAC1 closure rule, which assumes sector-specific capital and mobile labor. I begin with sectoral adjustments and afterwards proceed with adjustments in the real GDP and its main components.

#### 7.5.1.1 Simulation Results under the Neoclassical Closure Rule

##### *Sectoral adjustments*

The increase in the oil export price leads to different adjustments in the aggregate outputs of the oil and the non-oil sectors (upper part of Table 7C.1 in Appendix 7C). I find that the increase in the oil export price causes the aggregate output of the oil sector to increase, while

<sup>64</sup>  $\widehat{pwe}_{oil\&gas} = s_c \times \widehat{pwe}_{oil} + s_g \times \widehat{pwe}_{gas}$ , where  $pwe_{oil\&gas}$ ,  $pwe_{oil}$ , and  $pwe_{gas}$  are export prices (in foreign currency units) of crude oil and natural gas, crude oil, and natural gas, respectively. And  $s_c$  is the value share of exports of crude oil in total exports of crude oil and natural gas and  $s_g$  is the value share of exports of natural gas in total exports of crude oil and natural gas. The circumflex indicates percentage change. Although the study uses the shares of crude oil output (natural gas output) in total output of crude oil and natural gas instead, they are used as these shares should be approximately equal to that of exports. Note that percentage change in export price of natural gas is zero.

causing the aggregate output of the non-oil sector to decrease (row 1, col. 1-2 <sup>65</sup> of Table 7C.1). Why does the increase in the oil export price affect aggregate outputs this way? What are the main effects that are responsible for these adjustments in the aggregate outputs? I attempted to answer these questions in Chapter 5 using a stylized model. I will examine whether the same effects are responsible for the adjustments here as well later in Section 7.6. At this stage, it suffices to state that those effects operate in the present model as well and that the increase in the oil export price causes the real labor costs in the oil sector relative to that in the non-oil sector to decrease, which in turn causes labor to move out of the non-oil sector and into the oil sector (row 8, col. 1-2 of Table 7C.1), and hence, leads to an increase in the aggregate output of the oil sector and a decrease in the aggregate output of the non-oil sector.

The aggregate outputs change at the same rate as the value-added and aggregate intermediate inputs, because the value-added and aggregate intermediate inputs are employed in fixed proportion to the aggregate outputs (rows 1-3, col. 1-2 of Table 7C.1):

$$(7.1) \quad \widehat{QVA}_a = \widehat{QA}_a = \widehat{QINTA}_a .$$

The percentage changes in the aggregate outputs of both sectors are smaller than the percentage changes in the corresponding labor demands from the sectors (rows 2 and 8, col. 1-2 of Table 7C.1). This is because one of the production factors, namely capital, is sector-specific. In addition, the aggregate output of the non-oil sector tends to be more sensitive to the percentage change in the demand for labor than the aggregate output of the oil sector. This is because the non-oil sector is relatively more labor intensive than the oil sector.

Considering the percentage changes in the demand for labor from both sectors, I find that the percentage change in the demand for labor from the oil sector is larger than the percentage change in the demand for labor from the non-oil sector. Similar to the effects considered for the exports, imports, and domestic sales discussed in Chapters 4 and 5, the total effect of the oil export price increase on labor employment can be approximately decomposed into an expansion effect, measured by the percentage change in the aggregate output, and a substitution effect, measured by the percentage change in the corresponding relative factor prices, corrected for the price elasticity of factor demand. With the CES function, the price elasticity of the factor demand is proportional to the elasticity of substitution between the factors and the value share of the other factor demand in the aggregate output.

I find that the percentage changes in demands for labor from both sectors are essentially driven by the extent of the substitution effects in both sectors, with the substitution effect for the demand for labor from the oil sector being much larger than the substitution effect for the demand for labor from the non-oil sector (compare rows 8-9, col. 3 with rows 8-9, col. 4 of Table 7C.1). The larger substitution effect in the oil sector is primarily driven by the fact that the price of capital in the oil sector increases significantly more than in the non-oil sector. To explain why this occurs consider changes in real factor prices.<sup>66</sup>

I find that the real price of capital in the oil sector increases substantially, whereas the real price of capital in the non-oil sector decreases (compare row 9, col. 3-4 with rows 1 or 2, col. 3-4 of Table 7C.1). The real price of labor in the oil sector decreases, but the real price of labor in the non-oil sector increases (compare row 8, col. 3-4 with rows 1 or 2, col. 3-4 of

<sup>65</sup> col. stands for column.

<sup>66</sup> Note that the substitution effect for demand of factors can also be measured by the percentage changes in the real factor prices corrected for the elasticity of substitution between production factors (Horridge et al., 2003).

Table 7C.1). To determine why this occurs, one has to consider the changes in the marginal products. Because of the labor influx to the oil sector, its capital-labor ratio decreases, which, in turn, increases its marginal productivity of capital and hence the real price of capital in this sector. On the other hand, the labor influx to the oil sector leads to an increase in the capital-labor ratio in the non-oil sector and, hence, leads to a decrease in the marginal productivity of capital in the non-oil sector and, hence, to a decrease in the real price of capital in the non-oil sector. This is a phenomenon known in the literature as a neoclassical ambiguity, which is defined in Markusen et al. (1995) as follows: “a relative price increase of a good benefits the specific factor used in that industry, reduces the real income of the other specific factor and has an ambiguous effect on the mobile factor”.

In what follows, I examine the percentage changes in exports, imports, and domestic sales in the wake of the oil export price increase. Considering first the percentage changes in exports, imports and domestic sales of the non-oil good, I find that non-oil exports decrease, non-oil imports increase, and domestic non-oil sales increase. I find that in general the results are similar to the results I obtained in Chapter 5, in which non-oil exports unambiguously decreased due to the expansion and substitution effects, non-oil imports unambiguously increased due to the expansion and substitution effects, while the change in domestic non-oil sales was ambiguous. Domestic non-oil sales decreased due to the expansion effect and they increased due to the substitution effect. In this chapter, I find similar results. I find that the non-oil exports unambiguously decrease primarily due to the negative substitution effect (compare row 1, col. 2 with rows 6-7, col. 4 of Table 7C.1). The expansion effect appears to be lower here than the substitution effect. The same applies for non-oil imports and domestic non-oil sales for which the substitution effect tends to be a dominating effect (rows 5 and 7, col. 4 of Table 7C.1).

The percentage change in the non-oil exports in absolute value is larger than that in the non-oil imports and non-oil domestic sales. This primarily occurs due to the larger substitution effect for non-oil exports given that the benchmark share of domestic non-oil sales in the output of the non-oil sector is larger than that of the non-oil exports:

$$(7.2) \quad \left| \widehat{QE}_N \right| > \left| \widehat{QM}_N \right| > \left| \widehat{QD}_N \right|$$

Considering the percentage changes in the oil exports, oil imports and domestic oil sales, I find that oil imports and oil exports increase, whereas domestic oil sales decrease (rows 5-7, col. 1 of Table 7C.1). It appears that oil exports increase due to the positive substitution and expansion effects. Given that the oil sector’s production is largely export oriented, which is revealed in the larger share of oil exports in the aggregate oil output, the percentage change in oil exports due to the substitution effect tends to be lower than that in the domestic oil sales. The domestic oil sales tend to be more sensitive to the relative price changes in light of this feature of the economy. I observe that, although the expansion effect is positive, domestic oil sales decline due to the larger negative substitution effect. Oil imports unambiguously increase because of the increase in the demand for the composite non-oil good, or the expansion effect, and the positive substitution effect. Oil imports increase primarily due to the substitution effect. Given that there is a home bias towards the consumption of the domestic oil, oil imports tend to respond more to changes in the relative prices than domestic oil sales do. The magnitudes of the percentage changes in the quantities of oil goods in absolute values are as follows:

$$(7.3) \quad \left| \widehat{QM}_o \right| > \left| \widehat{QD}_o \right| > \left| \widehat{QE}_o \right|.$$

*Macro response*

To understand the effects of the oil export price increase on the real GDP at factor costs, consider first the definition of the real GDP at factor costs. With no factor distortions and only capital and labor being production factors, the real GDP at factor costs is given by

$$(7.4) \quad GDP^{FC} = \frac{WF_L \times QFS_L + WF_K \times QFS_K}{P_{GDP}^{FC}},$$

where  $P_{GDP}^{FC}$  is the price of the GDP at factor costs,  $WF_L$  and  $WF_K$  are the economy-wide wage and rental rate of capital respectively and  $QFS_L$  and  $QFS_K$  are the total labor force and capital stocks respectively.

When there is no change in the total labor force and total stock of capital, the percentage change in the real GDP at factor costs can be approximately determined by the percentage changes in the real price of labor ( $rw_L$ ) and the real price of capital ( $rw_K$ ):

$$(7.5) \quad \widehat{GDP^{FC}} = s_L \times \widehat{rw_L} + s_K \times \widehat{rw_K},$$

where  $s_L$  and  $s_K$  are the shares of labor and capital in the economy ( $s_L + s_K = 1$ ). The real prices of factors are defined as the corresponding ratios of the economy-wide factor prices to the price of the GDP at factor costs  $\left(\frac{WF_f}{P_{GDP}^{FC}}\right)$ . With no change in the total stocks of factors, there is no, or a negligible, change in the real GDP at factor costs. I find that it decreases, but its decrease is negligible (Table 7C.4).

To understand its source of decrease, one has to consider the effect of the oil export price increase on the real price of labor and the real price of capital separately. Before proceeding further, the real price of labor can be defined as follows (Adams, 2005):

$$(7.6) \quad rw_L = \frac{WF_L}{P_{GDP}^{FC}} = \frac{WF_L}{CPI} \times \frac{CPI}{P_{GDP}^{MP}} \times \frac{P_{GDP}^{MP}}{P_{GDP}^{FC}},$$

where  $CPI$  is the consumer price index and  $P_{GDP}^{MP}$  is the price of the GDP at market prices. The first term on the right-hand side of the expression (7.6),  $\frac{WF_L}{CPI}$ , is the real wage, the second term,  $\frac{CPI}{P_{GDP}^{MP}}$ , is defined in Adams (2005) as a function of the inverse terms of trade, and the third term,  $\frac{P_{GDP}^{MP}}{P_{GDP}^{FC}}$ , equals  $(1+tx)$ , which, here, corresponds to the aggregate indirect tax rate.

Similarly, the real price of capital is given by

$$(7.7) \quad r_{W_K} = \frac{WF_K}{P_{GDP}^{FC}} = \frac{WF_K}{CPI} \times \frac{CPI}{P_{GDP}^{MP}} \times \frac{P_{GDP}^{MP}}{P_{GDP}^{FC}},$$

where  $\frac{WF_K}{CPI}$  is the real rental rate of capital.

Hence, the percentage change in the real price of labor can be approximately determined as the sum of the percentage changes in (a) the real wage rate, (b) the ratio of the CPI to the market-price GDP deflator and (c) the market-price GDP deflator vis-à-vis the factor-cost GDP deflator (Adams, 2005). The percentage change in the real price of capital is derived in a similar mode.

I find that the real price of labor decreases (Table 7C.3 in Appendix 7C) because the negative percentage change in (b), the ratio of the CPI to the market-price GDP deflator, outweighs the positive percentage change in (a), the real wage, and in (c), the market-price GDP deflator vis-à-vis the factor-cost GDP deflator. On the other hand, I find that the real price of capital increases (Table 7C.3) because the positive percentage change in the real rental rate of capital and in (c) dominate the negative percentage change in (b).

As a result of such a change in the real price of labor and the real price of capital, the percentage change in the real GDP at factor costs is negative, but negligible (Table 7C.2). This is in line with the findings of previous studies (e.g., Robinson, 2006), which state that in the neoclassical framework there is no, or a negligible, effect of any kind of shock on the aggregate employment and hence on the real GDP.

I now turn to the real GDP at market prices, which is defined as follows:

$$GDP^{MP} = \sum_h \sum_c QH_{ch} + \sum_c QINV_c + \sum_c qdst_c + \sum_c QG_c + \sum_c QE_c - \sum_c QM_c.$$

This is a standard textbook definition of the real GDP at market prices, which is defined as the sum of the real domestic absorption and the real net exports. To examine the effect of the oil export price increase on the real GDP at market prices, I consider first the effect of the oil export price increase on the compositional structure of the real GDP at market prices.

I find that private consumption in both real and nominal terms increases (Table 7C.2) because nominal and real income increase. Fixed investment increases as well because public and private savings increase. Note that, given that the fixed investment in oil is equal to zero in the benchmark, fixed investment increases solely due to the increase in the fixed investment in the composite non-oil good.

I find that the real total exports decrease, although the real oil exports increase. This can be explained by virtue of the fact that the decrease in the real non-oil exports is larger than the increase in the real oil exports. Nearly the same base contribution of the oil and non-oil exports to the total exports along with the substantial decrease in the non-oil exports cause a decrease in the total real exports. Compared to the real exports, the total real imports increase because real oil and non-oil imports increase. The initial composition of imports is strongly biased toward non-oil goods. Hence, the increase in the total real imports is essentially driven by the increase in the real non-oil imports.

Taking into account such a change in the compositional structure of the GDP and the composition of the nominal GDP at market prices in the base scenario, the real GDP at market prices decreases (Table 7C.2 in Appendix 7C). Namely, in the base scenario, private consumption and exports contribute mostly to the nominal GDP at market prices, whereas large amount of imports tends to reduce the nominal GDP at market prices. The contribution of investment to the nominal GDP at market prices is negligible. In the light of this structure of nominal GDP in the base scenario, an ex post decrease in the real exports and an increase in the real imports decreases the real GDP at market prices, although the total real absorption increases.

In addition, I show the percentage changes in some macroeconomic indicators along with their base values (Table 7C.3 in Appendix 7C). I find that investment, private savings, government savings, and public income as a share of the nominal GDP at market prices increase. Additionally, I determine the share of the non-oil exports in the non-oil GDP at market prices. This index is considered as a measure of the Dutch disease, with smaller values corresponding to the presence of the Dutch disease effects and vice versa (Gelb, 1985). Given that the non-oil exports decrease, the share of the non-oil exports in the non-oil GDP at market prices decreases as well.

Lastly, I consider the percentage change in the DPI, which serves as the real exchange rate here because the nominal exchange rate is taken as a numeraire, and the DPI is by definition a weighted producer price index of domestic goods. Increase in the DPI is associated with the real exchange rate appreciation and a decrease in it with the real exchange rate depreciation. I find that the DPI increases; hence, the real exchange rate appreciates (Table 7C.3).

### 7.5.1.2 Simulation Results under the Johansen Closure Rule

The percentage changes in the aggregate oil and non-oil outputs under the Johansen closure rule and the neoclassical closure rule are similar, whereas the percentage changes in exports, imports, and domestic sales are somewhat different (Table 7C.1). This is primarily due to the different treatment of private savings and investment under these macro closure rules, which, in turn affects consumption differently and, hence, induces a slightly different demand effect.<sup>67</sup>

Given that the level of investment is kept unchanged, an increase in government savings brought about by an increase in the government revenue and the constant government expenditures causes households savings rates to decrease because of the oil export price increase. The decrease in the household savings rates implies increase in the marginal propensity to consume by households, which in turn brings about a larger increase in private consumption.

Similar to the results under the neoclassical closure rule, the non-oil exports decrease unambiguously, the non-oil imports increase unambiguously, and the domestic non-oil sales increase. The oil imports and the oil exports increase, but the domestic oil sales decrease.

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<sup>67</sup> Here demand effect refers to the demand effect discussed in Chapter 5.



### 7.5.1.3 Simulation Results under the Foreign Closure Rule

The general trends observed under the foreign closure rule are similar to the trends under alternative closure rules. However, the magnitudes of change in some variables are different and therefore need to be examined.

The percentage changes in the aggregate outputs are slightly different. The aggregate oil output tends to increase at a slightly higher rate than under the other macro closure rules, whereas the aggregate non-oil output decreases at a nearly same rate (Table 7C.1). To understand the source of a larger expansion of the oil sector, it is necessary to look at the components of the composite demand. Since the amount of investment and government consumption demand are kept fixed, the demand effect that favors the output of the non-oil sector appears to be smaller, and hence, this effect, in turn, causes the unit revenue of the oil producer to increase more vis-à-vis that of the non-oil producer and thus brings about a larger expansion of the oil sector.

Similar to the results under the macro closure rules discussed, the oil exports increase, and the non-oil exports decrease, the oil and non-oil imports increase, domestic oil sales decrease and domestic non-oil sales increase. However, the magnitudes of the percentage changes in exports, imports and domestic sales are slightly different under this macro closure rule. Given that the aggregate outputs across the macro closure rules do not differ largely, it is primarily due to the different substitution effects, largely determined by the real exchange rate appreciation.

Under this macro closure rule, I find lower real exchange rate appreciation (Table 7C.3). As was in the model in Chapter 5, lower real exchange rate appreciation stems from the lower demand effect implied here by fixed investment, fixed savings rates of nongovernment institutions, and fixed government spending. As was emphasized in Chapter 5, limited spending to some extent diminishes the extent of the real exchange rate appreciation and hence leads to a smaller drop in the non-oil exports.

Compared to other macro closure rules, the Dutch disease index does not decrease (Table 7C.3).

## 7.5.2 Simulation Results under the FAC2 closure rule

The FAC2 closure rule mimics adjustments in the long run, as labor and capital are allowed to move across sectors. Mobility of capital across sectors leads to larger adjustments in the aggregate outputs because of the movement of capital across sectors. The lower part of Table 7C.1 shows the sectoral adjustments under alternative macro closure rules using the FAC2 closure rule.

When capital was assumed to be sector-specific, the demand for an additional unit of labor was constrained by the diminishing returns to labor per unit of employed capital. Introducing capital mobility removes this constraint, and eventually leads to a larger increase in the demand for labor and capital in the oil sector and hence brings about a larger expansion of the oil sector and a larger contraction of the non-oil sector.

Next, consider the percentage changes in real factor prices and factor demands in both sectors.

According to the Stolper-Samuelson Theorem, if there are constant returns to scale and if both goods continue to be produced, a relative increase in the price of a commodity will increase the real price of the factor used intensively by that industry and reduce the real price of the other factor (Markusen et al., 1995). Given that the oil sector is capital intensive, an increase in the relative value-added price of oil leads to an increase in the price of capital in terms of the value-added price of either good, or, in other words, the real price of capital, and a decrease in the price of labor in terms of the value-added price of either good or, in other words, the real price of labor (compare rows 9, 8, col. 3-4 with row 2, col. 3-4 of lower part of Table 7C.1). Taking this into account, the substitution effect is positive for labor and negative for capital in both sectors. Eventually, it leads to a larger decrease in the demand for capital from the non-oil sector than for labor and, correspondingly, to a larger increase in the demand for labor from the oil sector than for capital.

Next, consider adjustments in imports, exports and domestic sales of both oil and non-oil goods. I find that the oil and non-oil imports increase and the oil exports increase, but the non-oil exports decrease and domestic oil sales increase, whereas domestic non-oil sales decrease. The changes in exports, imports and domestic sales of both oil and non-oil goods under the FAC2 closure rule tend to be larger than that under the FAC1 closure rule, which are due to the larger substitution and expansion effects under the FAC2 closure rule. In addition, changes in the domestic oil and non-oil sales are different from the corresponding changes under the FAC1 closure rule. This is primarily driven by the difference in the extent of the expansion and substitution effects. In the current scenario, a larger positive expansion of the aggregate oil output, compared to the negative substitution effect for domestic oil sales, brings about an increase in domestic oil sales. Whereas the dominance of the negative expansion effect over the positive substitution effect for domestic non-oil sales causes a decrease in the domestic non-oil sales (Tables 7C.1 and 7C.2).

As a result of the increase in oil revenues, the total income in the economy rises, which leads to an increase in total absorption, investment, and government savings (see Table 7C.2 and Table 7C.3). Exports and imports rise as well. Although exports, private consumption, and investment rise, real GDP at market prices declines due to the larger inflow of imports, which undermines GDP growth. Given a larger decrease in the aggregate output of the non-oil sector and the non-oil exports, the Dutch disease index decreases drastically (see Table 7C.3).

Overall, the results under the neoclassical and Johansen closure rules are similar, whereas the results under the foreign closure rule tend to be slightly different. The main difference is in the larger increase in the aggregate output of the oil sector.

## 7.6 Sensitivity Analysis

In this section, I attempt to examine whether the effects obtained with the model discussed in Chapter 5 are useful to understand the effects of the oil export price increase within this large two-sector model. To save space, I consider only one macro closure rule, the foreign closure rule, and the sector-specific factor closure rule.

In what follows, I conduct a sensitivity analysis with respect to the Armington elasticity of substitution and the elasticity of transformation between non-oil goods. I find that the results are sensitive to the above mentioned parameters, namely I find that the transformability and import-competing effects associated with non-oil goods may reverse the sectoral adjustments

if these effects are low enough (Table 7D.1 in Appendix 7D). Otherwise, even if one of them tends to be large, I will return to the standard predictions of the model, in which an oil export price causes the oil sector to expand and the non-oil sector to contract (Table 7D.1).

Parameters such as the elasticity of transformation and the Armington elasticity of substitution between oil goods do not play much of a role here. They do not have qualitative effects, but only quantitative. A larger transformability effect associated with oil goods leads to a larger increase in oil exports, whereas a larger import-competing effect associated with oil goods leads to a larger increase in oil imports. As this is an obvious finding, I do not provide the details of the sensitivity analysis with respect to these parameters.

Given the fixed stocks of factors, the effect of the oil export price increase on the real GDP is negligible. Its change remains insignificant irrespective of the simulation scenario (Table 7D.2). Dutch disease index declines in each simulation scenario (Table 7D.3)

Thus, given the results obtained from the sensitivity analysis, I might conclude that the final results depend heavily on the parameters used. In particular in this model, the outcomes of the model are strongly determined by the elasticity of transformation and the Armington elasticity of substitution between non-oil goods, or, in other words, by the extent of the transformability and import-competing effects associated with non-oil goods.

### 7.7 Conclusions

In this chapter, I applied Lofgren et al.'s (2002) model to the Kazakhstani economy using the two-sector version of the SAM for Kazakhstan. I applied three different macro closure rules and two micro closure rules and discussed the effects of the oil export price increase under all of these closure rules.

A comparison of the results under different macro closure rules suggests that all macro closure rules tend to produce similar trends in the variables, yet the magnitudes of the percentage changes appear to differ to some extent, especially under the foreign closure rule. As in Chapter 5, I found that the foreign closure rule seems to be the most restrictive response among the discussed rules against the negative effects of the Dutch disease. It diminishes the extent of real appreciation in the exchange rate and has a favorable impact on exports overall.

The sensitivity analysis shows that the findings of the model developed in Chapter 5 are particularly useful. Lofgren et al.'s (2002) model in general generates the same effects as the model in Chapter 5. The transformability and the import-competing effects associated with non-oil goods may reverse sectoral adjustments if these effects are low enough. Otherwise, even if one of these effects tends to be large, the model predicts that the oil sector expands and the non-oil sector contracts.

The analysis that I carried out in this chapter is based on the two-sector version of the SAM for Kazakhstan that included the oil sector and the non-oil sector. To examine how the oil export price increase affects non-oil sectors in some detail, it is necessary to employ a multisector version of the SAM, which will be accomplished in the next chapter.

## Appendix 7A Mathematical Statement and Calibration of Lofgren et al.'s (2002) model

### Appendix 7A.1 Symbols Used in the Model<sup>68</sup>

#### SETS

$a \in A$	activities
$c \in C$	commodities
$c \in CD(\subset C)$	commodities with domestic sales of domestic output
$c \in CDN(\subset C)$	commodities not in CD
$c \in CE(\subset C)$	exported commodities
$c \in CEN(\subset C)$	commodities not in CE
$c \in CM(\subset C)$	imported commodities
$c \in CMN(\subset C)$	commodities not in CM
$c \in CT(\subset C)$	transactions service commodities
$c \in CX(\subset C)$	commodities with domestic production
$f \in F$	factors
$i \in INS$	institutions (domestic and rest of the world)
$i \in INSD(\subset INS)$	domestic institutions
$i \in INSDNG(\subset INSD)$	domestic nongovernment institutions
$h \in H(\subset INSDNG)$	households

#### PARAMETERS

##### Latin letters

$cwts_c$	weight of commodity $c$ in the <i>CPI</i>
$dwts_c$	weight of commodity $c$ in the producer price index
$ica_{ca}$	quantity of $c$ as intermediate input per unit of activity $a$
$icd_{cc'}$	quantity of commodity $c$ as transactions service input per unit of $c'$ produced and sold domestically
$ice_{cc'}$	quantity of commodity $c$ as transactions service input per exported unit of $c'$
$inta_a$	quantity of aggregate intermediate input per activity unit
$iva_a$	quantity of value-added per activity unit
$\overline{mps}_i$	base savings-rate for domestic institution $i$
$mps01_c$	0-1 parameter with 1 for institutions with potentially flexed direct tax rates
$pwe_c$	export price (foreign currency unit (FCU))
$pwm_c$	import price (FCU)
$\overline{qdst}_c$	quantity of stock change
$\overline{qg}_c$	base-year quantity of government demand
$\overline{qinv}_c$	base-year quantity of private investment demand
$shif_{if}$	share for domestic institution $i$ in income of factor $f$
$\overline{shii}_{i'}$	share of net income of $i'$ to $i$ ( $i' \in INSDNG'$ ; $i \in INSDNG$ )
$\overline{tins}_i$	exogenous direct tax rate for domestic institution $i$

<sup>68</sup> For additional information on notational principles refer to Lofgren et al. (2002).

$tinsOI_i$	0-1 parameter with 1 for institutions with potentially flexed direct tax rates
$tq_c$	rate of sales tax
$trnsfr_{if}$	transfer from factor $f$ to institution $i$
$tva_a$	rate of value-added tax for activity $a$ (or in other words rate of tax on production)
$dh_{ch}$	consumption of commodity $c$ by household $h$ as defined in the SAM
$dstk_c$	stock change as defined in the SAM
$exp_c$	value of exports in local currency unit (LCU) as defined in the SAM
$frisch_h$	Frisch parameter, which represents a ratio of total consumption to discretionary consumption
$if_f$	total income received by factor $f$ as defined in the SAM
$inc_{if}$	total income of institution $i$ received from factor $f$ as defined in the SAM
$inc_i$	total income of institution as defined in the SAM
$instx_i$	value of taxes paid by domestic nongovernment institution $i$ as defined in the SAM
$invd_c$	value of fixed investment as defined in the SAM
$leselas_{ch}$	income elasticity of market demand for composite commodity $c$ by household $h$
$mdtrd_c$	total trade and distribution costs for commodity $c$ produced and sold domestically as defined in the SAM
$mdtrt_c$	total transportation costs for commodity $c$ produced and sold domestically as defined in the SAM
$metrd_c$	total trade costs for commodity $c$ exported as defined in the SAM
$metrt_c$	total transportation costs for commodity $c$ exported as defined in the SAM
$s_i$	savings of institution as defined in the SAM
$stax_c$	sales taxes paid on consumption of commodity $c$
$tr_{ii'}$	transfers received by institution $i$ from institution $i'$ as defined in the SAM
$tr_{gov i'}$	transfers received by government from institution $i'$ as defined in the SAM
$tr_{row i'}$	transfers received by rest of the world from institution $i'$ as defined in the SAM
$trrow_f$	transfers from the rest of the world to factor $f$ as defined in the SAM
$vat_a$	amount of value-added taxes paid by activity $a$ (or amount of taxes on production)

**Greek letters**

$\alpha_a^{va}$	efficiency parameter in the CES value-added function
$\alpha_a^{ac}$	shift parameter for domestic commodity aggregation function
$\alpha_c^q$	Armington function shift parameter
$\alpha_c^t$	CET function shift parameter
$\beta_{ch}^m$	marginal share of consumption spending on commodity $c$ for household $h$
$\delta_{ac}^{ac}$	share parameter for domestic commodity aggregation function

$\delta_c^q$	Armington function share parameter
$\delta_c^t$	CET function share parameter
$\delta_{fa}^{va}$	CES value-added function share parameter for factor $f$ in activity $a$
$\gamma_{ch}^m$	subsistence consumption of commodity $c$ for household $h$
$\theta_{ac}$	yield of output $c$ per unit of activity $a$
$\rho_a^{va}$	CES value-added function exponent
$\rho_c^{ac}$	domestic commodity aggregation function exponent
$\rho_c^q$	Armington function exponent
$\rho_c^t$	CET function exponent

**EXOGENOUS VARIABLES**

$\overline{DMPS}$	change in domestic institution savings rates (= 0 for base; exogenous variable)
$\overline{DTINS}$	change in domestic institution tax share (= 0 for base; exogenous variable)
$\overline{EXR}$	exchange rate (LCU per unit of FCU) is a numeraire
$\overline{GADJ}$	government consumption adjustment factor
$\overline{QFS}_f$	quantity supplied of factor
$\overline{TINSADJ}$	direct tax scaling factor (=0 for base; exogenous variable)

**ENDOGENOUS VARIABLES**

$CPI$	consumer price index
$DPI$	producer price index for domestically marketed output
$EG$	government expenditure
$EH_h$	consumption spending for household
$FSAV$	foreign savings (FCU)
$GOVSHR$	government consumption share in nominal absorption
$GSAV$	government savings
$IADJ$	investment adjustment factor
$INVSHR$	investment share in nominal absorption
$MPS_i$	marginal propensity to save for domestic nongovernment institution (exogenous variable)
$MPSADJ$	savings rate scaling factor (=0 for base)
$PA_a$	activity price (unit gross revenue)
$PDD_c$	demand price for commodity produced and sold domestically
$PDS_c$	supply price for commodity produced and sold domestically
$PE_c$	export price (LCU)
$PINTA_a$	aggregate intermediate input price for activity $a$
$PM_c$	import price (LCU)
$PQ_c$	composite commodity price
$PVA_a$	value-added price (factor income per unit of activity)
$PX_c$	aggregate producer price for commodity
$PXAC_{ac}$	producer price of commodity $c$ for activity $a$
$QA_a$	quantity (level) of activity
$QD_c$	quantity sold domestically of domestic output
$QE_c$	quantity of exports
$QF_{fa}$	quantity demanded of factor $f$ from activity $a$
$QG_c$	government consumption demand for commodity

$QH_{c,h}$	quantity consumed of commodity $c$ by household $h$
$QINTA_a$	quantity of aggregate intermediate input
$QINT_{c,a}$	quantity of commodity $c$ as intermediate input to activity $a$
$QINV_c$	quantity of investment demand for commodity
$QM_c$	quantity of imports of commodity
	quantity of goods supplied to domestic market (composite supply)
$QQ_c$	
$QT_c$	quantity of commodity demanded as transactions service input
$QVA_a$	quantity of (aggregate) value-added
$QX_c$	aggregate marketed quantity of domestic output of commodity
$QXAC_{a,c}$	quantity of marketed output of commodity $c$ from activity $a$
$TABS$	total nominal absorption
$TINS_i$	direct tax rate for institution $i$ ( $i \in INSDNG$ )
$TRII_{i,i'}$	transfers from institution $i'$ to $i$ (both in the set $INSDNG$ )
$WF_f$	average price of factor $f$
$WFDIST_{f,a}$	wage distortion factor for factor $f$ in activity $a$
$YF_f$	income of factor $f$
$YG$	government revenue
$YI_i$	income of domestic nongovernment institution
$YIF_{i,f}$	income of domestic institution $i$ from factor $f$

## Appendix 7A.2 Mathematical Statement of the Model

The statement of the model is divided into several blocks: price block, production and trade block, institution block, and system constraint block.

### PRICE BLOCK

The model has a rich price system, given that it differentiates among goods across their origins and destinations.

*Import price*

$$(7A.2.1) \quad PM_c = pwm_c \times \overline{EXR} \quad c \in CM$$

where

$c \in C$	a set of commodities (also referred to as $c'$ and $C'$ ),
$c \in CM \subset C$	a set of imported commodities,
$c \in CT \subset C$	a set of domestic transactions service inputs (distribution commodities),
$PM_c$	import price in local-currency units (LCU) including transaction costs,
$pwm_c$	c.i.f. import price in foreign-currency units (FCU),
$\overline{EXR}$	exchange rate (LCU per FCU) (exogenous variable).

Equation (7A.2.1) defines the import price in LCU. The domain is limited to imported commodities only.

*Export price*

$$(7A.2.2) \quad PE_c = pwe_c \times \overline{EXR} - \sum_{c' \in CT} PQ_{c'} \times ice_{c'c} \quad c \in CE$$

where

$c \in CE \subset C$	a set of exported commodities (with domestic production),
$PE_c$	export price (LCU),
$pwe_c$	f.o.b. export price (FCU), and
$ice_{c'c}$	quantity of commodity $c'$ as transactions service input per exported unit of $c$ ,
$PQ_c$	composite commodity price (including sales tax and transaction costs).

Equation (7A.2.2) defines the export price in LCU. Compared to the import price, the export price received by the producer is reduced by the transaction costs per unit of exported commodity. The domain is limited to exported commodities.

*Demand price of domestic nontraded goods*

$$(7A.2.3) \quad PDD_c = PDS_c + \sum_{c' \in CT} PQ_{c'} \times icd_{c'c} \quad c \in CD$$

where

$c \in CD \subset C$	a set of commodities with domestic sales of domestic output,
$PDD_c$	demand price for commodity produced and sold domestically,
$PDS_c$	supply price for commodity produced and sold domestically, and



$icd_{c'c}$  quantity of commodity  $c'$  as transactions service input per unit of  $c$  produced and sold domestically.

Equation (7A.2.3) defines the demand price as the supply price plus the costs of transactions service input per unit of domestic sales.

*Absorption*

$$(7A.2.4) \quad PQ_c \times (1 - tq_c) \times QQ_c = PDD_c \times QD_c + PM_c \times QM_c \quad c \in CD \cup CM$$

where

$QQ_c$  quantity of goods supplied to domestic market (composite supply),  
 $QD_c$  quantity sold domestically of the domestic output,  
 $QM_c$  quantity of the imported commodity, and  
 $tq_c$  the sales tax rate (as the share of the composite price inclusive of sales tax).

Equation (7A.2.4) defines the value of composite demand or the absorption of composite commodity  $c$ . This value represents total domestic spending on a commodity  $c$ , evaluated in the consumer prices. Note that this value does not include sales tax.

*Marketed output value*

$$(7A.2.5) \quad PX_c \times QX_c = PDS_c \times QD_c + PE_c \times QE_c \quad c \in CX$$

where

$c \in CX \subset C$  a set of commodities with domestic output,  
 $PX_c$  aggregate producer price for commodity,  
 $QX_c$  aggregate marketed quantity of the domestic output of commodity, and  
 $QE_c$  export quantity.

Equation (7A.2.5) defines the marketed output value as a sum of the domestic sales and exports. The domain limited to domestically produced commodities (CX) includes only those categories of commodities with domestic production.

*Activity Price*

$$(7A.2.6) \quad PA_a = \sum_{c \in C} PXAC_{ac} \times \theta_{ac} \quad a \in A$$

where

$a \in A$  a set of activities,  
 $PA_a$  activity price (gross revenue per activity unit),  
 $PXAC_{ac}$  producer price of commodity  $c$  for activity  $a$ , and  
 $\theta_{ac}$  yield of output  $c$  per unit of activity  $a$ .

Equation (7A.2.6) is relevant for the activities that produce more than one type of commodity.

*Aggregate intermediate input price*

$$(7A.2.7) \quad PINTA_a = \sum_c PQ_c \times ica_{ca} \quad a \in A$$

where

$PINTA_a$  aggregate intermediate input price for activity  $a$ , and  
 $ica_{c a}$  quantity of  $c$  per unit of aggregate intermediate input  $a$ .

Equation (7A.2.7) defines the aggregate intermediate input price as a weighted sum of the prices of the intermediate goods used in the production of activity  $a$ , with weights equal to the intermediate input coefficients.

*Activity revenue and costs*

$$(7A.2.8) \quad PA_a \times QA_a = PVA_a \times QVA_a + PINTA_a \times QINTA_a \quad a \in A$$

where

$QA_a$  quantity (level) of activity,  
 $QVA_a$  quantity of (aggregate) value-added,  
 $QINTA_a$  quantity of aggregate intermediate input, and  
 $PVA_a$  price of (aggregate) value-added.

The total revenue in each activity is fully exhausted by payments for value-added and intermediate inputs.

*Consumer price index*

$$(7A.2.9) \quad CPI = \sum_{c \in C} PQ_c \times cwts_c$$

where

$cwts_c$  weight of commodity  $c$  in the consumer price index, and  
 $CPI$  consumer price index.

*Producer price index for nontraded market output*

$$(7A.2.10) \quad DPI = \sum_c PDS_c \times dwts_c$$

where

$dwts_c$  weight of commodity  $c$  in the producer price index, and  
 $DPI$  producer price index for domestically marketed output.

Equations (7A.2.9) and (7A.2.10) define the consumer price index and the domestic producer index respectively.

## PRODUCTION AND TRADE BLOCK

This block of equations identifies the optimal conditions for the production process, given the production technology and prices. The block represents a perfectly competitive environment.

*Leontief technology: demand for aggregate value-added*

$$(7A.2.11) \quad QVA_a = iva_a \times QA_a \quad a \in A$$

*Leontief technology: demand for aggregate intermediate input*

$$(7A.2.12) \quad QINTA_a = inta_a \times QA_a \quad a \in A$$

where

$iva_a$  quantity of value-added per activity unit, and  
 $inta_a$  quantity of aggregate intermediate input per activity unit.

Equations (7A.2.11) and (7A.2.12) show that the value-added and aggregate intermediate inputs are used in fixed proportion to the total output. The equations indicate that the value-added and aggregate intermediate inputs are complements.

*Value-added and factor demands*

$$(7A.2.13) \quad QVA_a = \alpha_a^{va} \times \left( \sum_{f \in F} \delta_{fa}^{va} \times QF_{fa}^{-\rho_a^{va}} \right)^{-\frac{1}{\rho_a^{va}}} \quad a \in A$$

*Factor demand*

$$(7A.2.14) \quad WF_f \times WFDIST_{fa} = PVA_a \times (1 - tva_a) \times QVA_a \times \left( \sum_{f \in F'} \delta_{fa}^{va} \times QF_{fa}^{-\rho_a^{va}} \right)^{-1} \times \delta_{fa}^{va} \times QF_{fa}^{-\rho_a^{va} - 1}$$

$a \in A$   
 $f \in F$

where

$f \in F (= F')$  a set of factors,  
 $tva_a$  rate of value-added tax for activity  $a$  (or tax on production),  
 $\alpha_a^{va}$  efficiency parameter in the CES value-added function,  
 $\delta_{fa}^{va}$  CES value-added function share parameter for factor  $f$  in activity  $a$ ,  
 $QF_{fa}$  quantity demanded of factor  $f$  from activity  $a$ ,  
 $\rho_a^{va}$  CES value-added function exponent,  
 $WF_f$  average price of factor, and  
 $WFDIST_{fa}$  wage distortion factor for factor  $f$  in activity  $a$ .

Equation (7A.2.13) defines the quantity of value-added for each activity. The quantity of value-added represents a CES function of primary factors. Equation (7A.2.14) states that factors are demanded at the point where the activity-specific price of a factor is equal to the marginal revenue product of this factor.

*Disaggregated intermediate input demand*

$$(7A.2.15) \quad QINT_{ca} = ica_{ca} \times QINTA_a \quad a \in A, c \in C$$

where

$QINT_{ca}$  quantity of commodity  $c$  as an intermediate input to activity  $a$ .

An intermediate input of commodity  $c$  to activity  $a$  is demanded in a fixed proportion to the aggregate intermediate input.

*Output aggregation function*

$$(7A.2.16) \quad QX_c = \alpha_c^{ac} \times \left( \sum_{a \in A} \delta_{ac}^{ac} \times QXAC_{ac}^{-\rho_c^{ac}} \right)^{-\frac{1}{\rho_c^{ac}}} \quad c \in CX$$

where

- $\alpha_c^{ac}$  shift parameter for domestic commodity aggregation function,  
 $\delta_{ac}^{ac}$  share parameter for domestic commodity aggregation function, and  
 $\rho_c^{ac}$  domestic commodity aggregation function exponent.

*First-order condition for output aggregation function*

$$(7A.2.17) \quad PXAC_{ac} = PX_c \times QX_c \times \left( \sum_{a \in A'} \delta_{ac}^{ac} \times QXAC_{ac}^{-\rho_c^{ac}} \right)^{-1} \times \delta_{ac}^{ac} \times QXAC_{ac}^{-\rho_c^{ac}-1}$$

$a \in A, c \in CX$

Equations (7A.2.16) to (7A.2.17) define aggregate marketed production as a CES function of the outputs of activities producing commodity  $c$  and the corresponding first-order condition for the output aggregation function. The equations (7A.2.16) and (7A.2.17) allow for the production of multiple commodities by each type of activity. Although the SAM for Kazakhstan does not have activities that produce multiple commodities, I use this equation to map an activity with its corresponding commodity. In the case when there is a single producer of a commodity  $c$ , the value of the share parameter would be unity; hence, the expressions reduce to  $QXAX=QX$ ,  $PXAC=PX$ .

*Output transformation function (CET)*

$$(7A.2.18) \quad QX_c = \alpha_c^t \times \left( \delta_c^t \times QE_c^{\rho_c^t} + (1 - \delta_c^t) \times QD_c^{\rho_c^t} \right)^{\frac{1}{\rho_c^t}} \quad c \in (CE \cap CD)$$

where

- $\alpha_c^t$  a CET function shift parameter,  
 $\delta_c^t$  a CET function share parameter, and  
 $\rho_c^t$  a CET function exponent.

*Export-Domestic supply ratio*

$$(7A.2.19) \quad \frac{QE_c}{QD_c} = \left( \frac{PE_c}{PDS_c} \times \frac{(1 - \delta_c^t)}{\delta_c^t} \right)^{\frac{1}{\rho_c^t-1}} \quad c \in (CE \cap CD)$$

Equations (7A.2.18) and (7A.2.19) define the transformation function and the optimal allocation of the output across exports and domestic sales correspondingly.

*Output transformation for domestically sold outputs without exports and for exports without domestic sales*

$$(7A.2.20) \quad QX_c = QD_c + QE_c \quad c \in (CD \cap CEN) \cup (CE \cap CDN)$$

where

- $c \in CEN(\subset C)$  non-exported commodities (complement of CE), and  
 $c \in CDN(\subset C)$  commodities without domestic market sales of domestic output (complement of CD).

This equation replaces the CET function for domestically produced commodities that do not have both exports and domestic sales. The equation allocates the total output produced to one of these two destinations.

*Composite supply (Armington) function*

$$(7A.2.21) \quad QQ_c = \alpha_c^q \times \left( \delta_c^q \times QM_c^{-\rho_c^q} + (1 - \delta_c^q) \times QD_c^{-\rho_c^q} \right)^{-\frac{1}{\rho_c^q}} \quad c \in (CM \cap CD)$$

where

- $\alpha_c^q$  an Armington function shift parameter,
- $\delta_c^q$  an Armington function share parameter, and
- $\rho_c^q$  an Armington function exponent.

*Import-domestic demand ratio*

$$(7A.2.22) \quad \frac{QM_c}{QD_c} = \left( \frac{PDD_c}{PM_c} \times \frac{\delta_c^q}{(1 - \delta_c^q)} \right)^{\frac{1}{1 + \rho_c^q}} \quad c \in (CM \cap CD)$$

Equation (7A.2.21) defines Armington function that reflects imperfect substitutability between imports and domestic output. Equation (7A.2.22) defines an optimal allocation of imports and domestic output.

*Composite supply for non-imported outputs and non-produced imports*

$$(7A.2.23) \quad QQ_c = QD_c + QM_c \quad c \in (CD \cap CMN) \cup (CM \cap CDN)$$

where

- $c \in CMN (\subset C)$  non-imported commodities.

This equation replaces the Armington equation for the set of commodities that have either imports or domestic sales of domestic outputs but no both. The composite supply is equal to one of the variables on the right-hand side.

*Demand for transaction services*

$$(7A.2.24) \quad QT_c = \sum_{c' \in C'} (ice_{cc'} \times QE_{c'} + icd_{cc'} \times QD_{c'}) \quad c \in CT$$

where

- $QT_c$  quantity of the commodity demanded as transactions service input.

The total demand for transaction services is defined as the sum of the transaction services generated by exports and domestic sales.

## INSTITUTION BLOCK

*Factor income*

$$(7A.2.25) \quad YF_f = \sum_{a \in A} WF_f \times WFDIST_{fa} \times QF_{fa} \quad f \in F$$

where

$YF_f$  income of factor  $f$ .

The income of factor  $f$  is the sum of the products of activity-specific factor prices times the quantities of factor  $f$  demanded in corresponding activities.

*Institutional factor incomes*

$$(7A.2.26) \quad YIF_{i_f} = shif_{i_f} \times (YF_f - transfr_{row_f} \times \overline{EXR}) \quad i \in INSD, f \in F$$

where

$i \in INS$  a set of institutions (domestic and rest of the world),  
 $i \in INSD(\subset INS)$  a set of domestic institutions,  
 $YIF_{i_f}$  income to domestic institution  $i$  from factor  $f$ ,  
 $shif_{i_f}$  share of domestic institution  $i$  in income of factor  $f$ , and  
 $transfr_{i_f}$  transfer from factor  $f$  to institution  $i$ .

Equation (7A.2.26) splits the income from factor  $f$  across domestic institutions according to their shares in factor income, after the corresponding transfers to the rest of the world are deducted from the factor income.

*Income of domestic, nongovernment institutions*

$$(7A.2.27) \quad YI_i = \sum_{f \in F} YIF_{i_f} + \sum_{i' \in INSDNG'} TRII_{i_i'} + transfr_{i_gov} \times CPI + transfr_{i_row} \times \overline{EXR} \quad i \in INSDNG$$

where

$i \in INSDNG$   
 $(= INSDNG' \subset INSD)$  a set of domestic nongovernment institutions,  
 $YI_i$  income of institution  $i$  (in the set  $INSDNG$ ), and  
 $TRII_{i_i'}$  transfers from institution  $i'$  to  $i$  (both in the set  $INSDNG$ ).

The total income of the domestic nongovernment institution  $i$  is the sum of factor incomes accruing to the institution  $i$ , transfers received from other nongovernment institutions, transfers from the government, and transfers from the rest of the world.

*Intra-Institutional Transfers*

$$(7A.2.28) \quad TRII_{i_i'} = shii_{i_i'} \times (1 - MPS_{i'}) \times (1 - TINS_{i'}) \times YI_{i'} \quad \begin{array}{l} i \in INSDNG \\ i' \in INSDNG \end{array}$$

where

$shii_{i_i'}$  share of net income of  $i'$  to  $i$  ( $i' \in INSDNG'$ ;  $i \in INSDNG$ )  
 $MPS_{i'}$  marginal propensity to save for domestic nongovernment institution,  
 $TINS_{i'}$  direct tax rate for institution  $i'$  ( $i' \in INSDNG'$ ).

Transfers between domestic nongovernment institutions are defined as the fixed shares of the total income of the institution  $i'$ , net of direct taxes and savings.

*Household consumption expenditures*

$$(7A.2.29) \quad EH_h = \left( 1 - \sum_{i \in INSDNG} shii_{i_h} \right) \times (1 - MPS_h) \times (1 - TINS_h) \times YI_h \quad h \in H$$

where

$i \in H (\subset INSDNG)$  a set of households, and  
 $EH_h$  household consumption expenditures.

A household spends only a fraction of its total income, which is the net of transfers to other domestic nongovernment institutions, net of savings and direct taxes.

*Household consumption spending on commodities*

$$(7A.2.30) \quad PQ_c \times QH_{ch} = PQ_c \times \gamma_{ch}^m + \beta_{ch}^m \times \left( EH_h - \sum_{c' \in C} PQ_{c'} \times \gamma_{c'h}^m \right) \quad c \in C, h \in H$$

where

$QH_{ch}$  quantity of consumption of commodity  $c$  for household  $h$ ,  
 $\gamma_{ch}^m$  subsistence consumption of commodity  $c$  for household  $h$ , and  
 $\beta_{ch}^m$  marginal share of consumption spending on commodity  $c$  for household  $h$ .

Equation (7A.2.30) specifies the household consumption of a commodity using the linear expenditure system demand function.

*Investment demand*

$$(7A.2.31) \quad QINV_c = IADJ \times \overline{qinv}_c \quad c \in C$$

where

$QINV_c$  quantity of fixed investment demand for commodity,  
 $IADJ$  investment adjustment factor, and  
 $\overline{qinv}_c$  base-year quantity of fixed investment demand.

*Government consumption demand*

$$(7A.2.32) \quad QG_c = \overline{GADJ} \times \overline{qg}_c \quad c \in C$$

where

$QG_c$  government consumption demand for commodity,  
 $\overline{GADJ}$  government consumption adjustment factor, and  
 $\overline{qg}_c$  base-year quantity of government demand.

Investment and government consumption demands are defined as the corresponding base-year quantities multiplied by the corresponding adjustment factors. Adjustment factors can be either taken as exogenous or endogenous depending on the closure rules applied.

*Government revenue*

$$(7A.2.33) \quad YG = \sum_{i \in INSDNG} TINS_i \times YI_i + \sum_{a \in A} tva_a \times PVA_a \times QVA_a + \sum_{c \in C} tq_c \times PQ_c \times QQ_c \\ + \sum_{f \in F} YIF_{gov f} + trnsfr_{gov row} \times \overline{EXR} + \sum_{i \in INSDNG} trnsfr_{gov i} \times CPI$$

where

$YG$  government revenue.

Government revenue is the sum of revenues from taxes, factor incomes, and transfers from the rest of the world and nongovernment institutions.

*Government expenditure*

$$(7A.2.34) \quad EG = \sum_{c \in C} PQ_c \times QG_c + \sum_{i \in INSDNG} \text{trnsfr}_{i \text{ gov}} \times CPI$$

where

$EG$  government expenditure.

Government expenditure is the sum of expenditures on government consumption and transfers to nongovernment institutions.

## SYSTEM CONSTRAINT BLOCK

*Factor markets*

$$(7A.2.35) \quad \sum_{a \in A} QF_{f a} = \overline{QFS}_f \quad f \in F$$

where

$\overline{QFS}_f$  quantity of supplied factor.

Equation (7A.2.35) defines an equilibrium in factor markets.

*Composite commodity markets*

$$(7A.2.36) \quad QQ_c = \sum_{a \in A} QINT_{c a} + \sum_{h \in H} QH_{c h} + QG_c + QINV_c + qdst_c + QT_c \quad c \in C$$

where

$qdst_c$  quantity of stock change.

This is an equilibrium condition in a composite commodity market.

*Current-account balance for the rest of the world, in foreign currency*

$$(7A.2.37) \quad \sum_{c \in CM} pwm_c \times QM_c + \sum_{f \in F} \text{trnsfr}_{row f} + \sum_{i \in INSD} \text{trnsfr}_{row i} = \sum_{c \in CE} pwe_c \times QE_c + \sum_{i \in INSD} \text{trnsfr}_{i row} + FSAV$$

where

$FSAV$  foreign savings (FCU).

The current account balance imposes equality between the country's spending and its earning of foreign exchange.

*Government balance*

$$(7A.2.38) \quad YG = EG + GSAV$$



where  
 $GSAV$  government savings.

The government balance equation imposes equality between the government revenue and the sum of government expenditures and government savings.

*Direct institutional tax rates*

$$(7A.2.39) \quad TINS_i = \overline{tins}_i \times \left(1 + \overline{TINSADJ} \times tins01_i\right) + \overline{DTINS}_i \times tins01_i \quad i \in INSDNG$$

where  
 $\overline{TINS}_i$  rate of direct tax on domestic institutions  $i$ ,  
 $\overline{tins}_i$  exogenous direct tax rate for domestic institution  $i$ ,  
 $\overline{TINSADJ}$  direct tax scaling factor (=0 for base)  
 $tins01_i$  0-1 parameter with 1 for institutions with potentially flexed direct tax rates, and  
 $\overline{DTINS}_i$  change in domestic institution tax share (=0 for base).

Equation (7A.2.39) defines the direct tax rates of domestic nongovernment institutions. The equation provides alternative ways of adjusting the direct tax rates. The base-year direct tax rates either can be adjusted endogenously by the same number of percentage points ( $\overline{TINSADJ}$  is exogenous and  $\overline{DTINS}$  is endogenous), or the rates can be multiplied by a flexible scalar ( $\overline{TINSADJ}$  is endogenous and  $\overline{DTINS}$  is exogenous).

*Institutional savings rates*

$$(7A.2.40) \quad MPS_i = \overline{mps}_i \times \left(1 + \overline{MPSADJ} \times mps01_i\right) + \overline{DMPS} \times mps01_i \quad i \in INSDNG$$

where  
 $\overline{mps}_i$  base savings rate for domestic institution  $i$ ,  
 $\overline{MPSADJ}$  savings rate scaling factor (=0 for base),  
 $mps01_i$  0-1 parameter with 1 for institutions with potentially flexed direct tax rates, and  
 $\overline{DMPS}$  change in domestic institution savings rates (=0 for base).

Equation (7A.2.40) provides alternative ways of adjusting the nongovernment institutions savings rates. It has the same structure as the equation (7A.2.39). The base savings rates can either be proportionally scaled or adjusted endogenously by the same number of percentage points. The choice of the adjustment rules is defined by the savings-investment closure rule.

*Savings-Investment Balance*

$$(7A.2.41) \quad \sum_{i \in INSDNG} \overline{MPS}_i \times (1 - \overline{TINS}_i) \times YI_i + GSAV + \overline{EXR} \times FSAV = \sum_{c \in C} PQ_c \times QINV_c + \sum_{c \in C} PQ_c \times qdst_c$$

Equation (7A.2.41) defines the savings-investment balance. It ensures that the total savings is equal to the total investment. I introduce the artificial variable *walras*, which is added to this equation to ensure that the number of equations is equal to the number of unknowns.

*Total absorption*

$$(7A.2.42) \quad TABS = \sum_{h \in H} \sum_{c \in C} PQ_c \times QH_{ch} + \sum_{c \in C} PQ_c \times QG_c + \sum_{c \in C} PQ_c \times QINV_c + \sum_{c \in C} PQ_c \times qdst_c$$

where

$TABS$  total nominal absorption.

Total absorption is defined as the sum of the total private consumption, total public consumption, total fixed investment and total stock change.

*Ratio of investment to absorption*

$$(7A.2.43) \quad INVSHR \times TABS = \sum_{c \in C} PQ_c \times QINV_c + \sum_{c \in C} PQ_c \times qdst_c$$

where

$INVSHR$  investment share in nominal absorption.

Equation (7A.2.43) measures the ratio of the total investment to absorption.

*Ratio of government consumption to absorption*

$$(7A.2.44) \quad GOVSHR \times TABS = \sum_{c \in C} PQ_c \times QG_c$$

where

$GOVSHR$  government consumption share in nominal absorption.

Equation (7A.2.44), similar to the equation (7A.2.43), defines the ratio of government consumption to absorption.

### Appendix 7A.3 Calibration of Lofgren et al.'s (2002) Model

The 2003 SAM for Kazakhstan is used to calibrate Lofgren et al.'s (2002) model. The data in the SAM are given in value terms, whereas the model requires the separation of prices and quantities. Lofgren et al.'s (2002) model uses Harberger's (1962) approach by defining physical quantities such that producer prices are normalized to unity. In what follows I shortly describe the calibration of this model.

#### *Calibration of production and trade*

I begin by describing the calibration of production. Given that the outer nest, which combines the aggregate intermediate commodities and value-added, employs the Leontief function, the corresponding coefficients are calculated as follows:

$$(7A.3.1) \quad ica_{ca} = \frac{QINT_{ca}}{QINTA_a}, \quad a \in A$$

$$(7A.3.2) \quad iva_a = \frac{QVA_a}{QA_a}, \quad a \in A$$

$$(7A.3.3) \quad inta_a = \frac{QINTA_a}{QA_a}. \quad a \in A$$

The symbols used here are defined in Appendix 7.A.1.

The value-added production function is modeled using the CES function. Shift and share parameters can be calibrated from the SAM, whereas the elasticity of substitution between production factors is an external parameter, which should be obtained from an external source. Conventionally, the elasticity of substitution between production factors is either estimated or taken from the literature. Taking into account the shortage of data for Kazakhstan, estimation of the elasticity of substitution between factors turns out to be a difficult exercise; hence, I borrowed the elasticity from an external source, namely the GTAP 6 database (Dimaranan et al., 2006). The rest of the parameters in the value-added production function are defined as follows:

$$(7A.3.4) \quad \rho_a^{va} = \frac{1}{\sigma_a^{va}} - 1, \quad a \in A$$

$$(7A.3.5) \quad \delta_{fa}^{va} = \frac{WFDIST_{fa} \times WF_f \times QF_{fa}^{1+\rho_a^{va}}}{\sum_{f' \in F'} \left( WFDIST_{f'a} \times WF_{f'} \times (QF_{f'a})^{1+\rho_a^{va}} \right)}, \quad a \in A, f \in F$$

$$(7A.3.6) \quad \alpha_a^{va} = \frac{QVA_a}{\left( \sum_{f \in F} \delta_{fa}^{va} \times QF_{fa}^{-\rho_a^{va}} \right)^{-\frac{1}{\rho_a^{va}}}}. \quad a \in A$$

The wage distortion factor for factor  $f$  in activity  $a$  ( $WFDIST_{fa}$ ), defined as the ratio of the activity-specific factor price to an economy-wide factor price, is equal to unity, as I do not differentiate between the corresponding factor prices in the benchmark.

The parameters for the output transformation function are derived as follows:

$$(7A.3.7) \quad \rho_c^t = \frac{1}{\sigma_c^t} + 1, \quad c \in CE$$

$$(7A.3.8) \quad \delta_c^t = \frac{1}{\left(1 + \frac{PDS_c}{PE_c} \times \left(\frac{QE_c}{QD_c}\right)^{\rho_c^t - 1}\right)}, \quad c \in CE$$

$$(7A.3.9) \quad \alpha_c^t = \frac{QX_c}{\left(\delta_c^t \times QE_c^{\rho_c^t} + (1 - \delta_c^t) \times QD_c^{\rho_c^t}\right)^{1/\rho_c^t}}. \quad c \in CE$$

To calibrate the CET function, I need an external parameter, the elasticity of transformation,  $\sigma_c^t$ . Given the shortage of the estimated elasticities of transformation for Kazakhstan, I took them from Jensen and Tarr's (2008) study, which is based on the Kazakhstani economy.

The parameters for the Armington composite supply function are defined as follows:

$$(7A.3.10) \quad \rho_c^q = \frac{1}{\sigma_c^q} - 1, \quad c \in CM$$

$$(7A.3.11) \quad \delta_c^q = \frac{\frac{PM_c}{PDD_c} \times \left(\frac{QM_c}{QD_c}\right)^{1+\rho_c^q}}{\left(1 + \frac{PM_c}{PDD_c} \times \left(\frac{QM_c}{QD_c}\right)^{1+\rho_c^q}\right)}, \quad c \in CM$$

$$(7A.3.12) \quad \alpha_c^q = \frac{QQ_c}{\left(\delta_c^q \times QM_c^{-\rho_c^q} + (1 - \delta_c^q) \times QD_c^{-\rho_c^q}\right)^{-1/\rho_c^q}} \quad c \in CM$$

The procedure to define the corresponding coefficients of the CES function is quite standard. The parameters needed for the other CES functions used in the model can be found in a similar fashion. I do not derive them here for brevity.

Since each activity produces only one type of commodity, the elasticities of substitution needed for the output aggregation functions are arbitrarily chosen, as they do not affect the final outcome. I use the output aggregation function only for technical purposes, specifically to switch from an activity to the corresponding commodity.

To bring commodity  $c$  to a market, the supplier incurs transaction costs. The data in the SAM include two types of transaction costs, specifically trade and distribution and transportation costs. To calibrate the demand for transaction services, the transactions' input coefficients must be defined. In what follows, I show how they are defined in Lofgren et al.'s (2002) model. The input of transactions commodity  $ct$  per unit of commodity  $c$  produced and sold domestically is defined as follows:

$$(7A.3.13) \quad icd_{ctc} = \frac{mdtrt_c + mdtrd_c}{PQ_{ct} \times QD_c}, \quad ct \in CT, c \in CD$$

where  $mdtrt_c$  and  $mdtrd_c$  are the total transportation and trade and distribution costs for commodity  $c$  produced and sold domestically as defined in the SAM.

The input of the transactions commodity  $ct$  per unit of commodity  $c$  exported is defined as follows:

$$(7A.3.14) \quad ice_{ctc} = \frac{metrt_c + metrd_c}{PQ_{ct} \times QM_c}, \quad ct \in CT, c \in CE$$

where  $metrt_c$  and  $metrd_c$  are the total transportation and total trade costs for commodity  $c$  exported as defined in the SAM.

The domestic sales price weights ( $dwtsc$ ) are defined as

$$(7A.3.15) \quad dwtsc = \frac{PX_c \times QX_c - exp_c - metrt_c - metrd_c}{\sum_{c' \in C} (PX_{c'} \times QX_{c'} - exp_{c'} - metrt_{c'} - metrd_{c'})}, \quad c \in C$$

where  $exp_c$  is the value of the exports in local currency units as defined in the SAM.

The consumer price index weights ( $cwtsc$ ) are defined as

$$(7A.3.16) \quad cwtsc = \frac{\sum_{h \in H} dh_{ch}}{\sum_{c' \in C} \sum_{h' \in H} dh_{c'h'}}, \quad c \in C$$

where  $dh_{ch}$  is the amount of consumption of commodity  $c$  by household  $h$  as defined in the SAM.

The quantity of the factor supply ( $\overline{QFS}_f$ ) is calibrated as a sum of the corresponding factor demands as defined in the SAM.

### *Calibration of domestic nongovernment institutions*

In what follows, I discuss the calibration of the parameters related to domestic nongovernment institutions. I begin first with the calibration of household demand and proceed with the calibration of the parameters relevant for enterprises.

#### *Calibration of household demand*

Household demand in Lofgren et al.'s (2002) model is obtained by assuming that each of the households maximizes a utility function of the Stone-Geary form subject to the budget constraint.

The utility function of the Stone-Geary form for household  $h$  is defined as:

$$(7A.3.17) \quad U_h = \prod_{c \in C} (QH_{ch} - \gamma_{ch}^m)^{\beta_{ch}^m}, \quad h \in H$$

which is maximized subject to the budget constraint

$$(7A.3.18) \quad EH_h = \sum_{c \in C} PQ_c \times QH_{ch} \text{ and } \sum_{c \in C} \beta_{ch}^m = 1, \quad h \in H$$

where  $\gamma_{ch}^m$  is the subsistence consumption of commodity  $c$  for household  $h$  and  $\beta_{ch}^m$  is the marginal share of consumption spending on commodity  $c$  for household  $h$ .

The Lagrangian expression for each household  $h$  is set up as follows:

$$(7A.3.19) \quad L_h = \prod_{c \in C} (QH_{ch} - \gamma_{ch}^m)^{\beta_{ch}^m} + \lambda_h \times \left( EH_h - \sum_{c \in C} PQ_c \times QH_{ch} \right). \quad h \in H$$

The first-order conditions are as follows:

$$(7A.3.20) \quad \frac{\partial L_h}{\partial \lambda_h} = 0 \Rightarrow EH_h = \sum_{c \in C} PQ_c \times QH_{ch}, \quad h \in H$$

$$(7A.3.21) \quad \frac{\partial L_h}{\partial QH_{ch}} = 0 \Rightarrow \beta_{ch}^m \cdot (QH_{ch} - \gamma_{ch}^m)^{-1} \times U = \lambda_h \cdot PQ_c, \quad h \in H, c \in C$$

$$\text{or } \beta_{ch}^m = (QH_{ch} - \gamma_{ch}^m) \times U^{-1} \times \lambda_h \times PQ_c. \quad h \in H, c \in C$$

Since  $\sum_{c \in C} \beta_{ch}^m = 1$ , I obtain

$$1 = U^{-1} \times \lambda_h \times \sum_{c \in C} PQ_c \times (QH_{ch} - \gamma_{ch}^m).$$

Further, the Lagrangian multiplier is given by

$$(7A.3.22) \quad \lambda_h = \frac{U}{\sum_{c \in C} PQ_c \times (QH_{ch} - \gamma_{ch}^m)} = \frac{U}{EH_h - \sum_{c \in C} PQ_c \times \gamma_{ch}^m}. \quad h \in H$$

Substituting (7A.3.22) into (7A.3.21) and rearranging yields the demand for commodity  $c$  that is consumed by household  $h$ , which is known in the literature as the linear expenditure system (LES) demand

$$(7A.3.23) \quad QH_{ch} = \gamma_{ch}^m + \frac{\beta_{ch}^m}{PQ_c} \times \left( EH_h - \sum_{c' \in C} PQ_{c'} \times \gamma_{c'h}^m \right). \quad h \in H, c \in C$$

In what follows, I explain how the parameters  $\beta_{ch}^m$  and  $\gamma_{ch}^m$  are calibrated.

To calibrate  $\beta_{ch}^m$ , the definition of the income elasticity of market demand for commodity  $c$  by household  $h$  is invoked ( $leselas_{ch}$ ), which is defined as follows:

$$leselas_{c_h} = \frac{\beta_{c_h}^m \times EH_h}{PQ_c \times QH_{c_h}} \quad h \in H, c \in C$$

Hence  $\beta_{c_h}^m$  is defined as follows:

$$(7A.3.24) \quad \beta_{c_h}^m = \frac{leselas_{c_h} \times PQ_c \times QH_{c_h}}{EH_h} \quad h \in H, c \in C$$

To calibrate  $\gamma_{c_h}^m$ , I invoke the Frisch parameter, which is the ratio of total consumption to discretionary consumption (Annabi et al., 2006):

$$(7A.3.25) \quad frisch_h = -\frac{EH_h}{EH_h - \sum_c PQ_c \times \gamma_{c_h}^m}. \quad h \in H$$

Substituting the expression for  $frisch_h$  (7A.3.25) into (7A.3.23) and rearranging yields

$$(7A.3.26) \quad QH_{c_h} = \gamma_{c_h}^m - \frac{\beta_{c_h}^m \times EH_h}{PQ_c \times frisch_h}. \quad h \in H, c \in C$$

From this expression, I derive  $\gamma_{c_h}^m$ , which is given as follows:

$$(7A.3.27) \quad \gamma_{c_h}^m = QH_{c_h} + \frac{\beta_{c_h}^m \times EH_h}{PQ_c \times frisch_h}, \quad h \in H, c \in C$$

or, alternatively, this expression can be written as:

$$(7A.3.27a) \quad \gamma_{c_h}^m = \frac{EH_h}{PQ_c} \times \left( \frac{PQ_c \times QH_{c_h}}{EH_h} + \frac{\beta_{c_h}^m}{frisch_h} \right). \quad h \in H, c \in C$$

It is necessary to note several features of the LES demand here. *First*, it is own price inelastic, given that the own price elasticity of demand is smaller than one in absolute value. *Second*, it assumes that goods are complements, given that the cross-price elasticities of demand are negative, and that, moreover, the demand is cross-price inelastic. *Third*, it assumes that goods are normal, given that the income elasticity of demand is positive. *Fourth*, income elasticities of demand in the set of demand equations are interdependent. LES is “largely used to estimate demand for goods with independent marginal utilities, such as a large basket of goods or large categories of expenditures such as clothing, housing, food and durables” (Stone, 1954). Thus, the LES demand tends to be a plausible representation of the demand behavior for a representative household.

#### Calibration of domestic institutions

The share of domestic institution  $i$  in the income of factor  $f$  is derived as follows:

$$(7A.3.28) \quad shif_{if} = \frac{inc_{if}}{if_f - trrow_f}, \quad i \in INSD, f \in F$$

where  $inc_{if}$  is the total income of institution  $i$  received from factor  $f$ .  $if_f$  is the total income received by factor  $f$ .  $trrow_f$  is the transfers from the rest of the world to factor  $f$ . All of them are as defined in the SAM.

The share of institution  $i$  in the post-tax post-savings income of institution  $i'$  is given by:

$$(7A.3.29) \quad shii_{ii'} = \frac{tr_{ii'}}{inc_{i'} - instx_{i'} - s_{i'} - tr_{row i'} - tr_{gov i'}}, \quad \begin{array}{l} i \in INSDNG \\ i' \in INSDNG \end{array}$$

where  $tr_{ii'}$  is the transfers received by institution  $i$  from institution  $i'$ ,  $inc_{i'}$  is the total income of institution  $i'$ ,  $instx_{i'}$  is the income tax paid by institution  $i'$ ,  $s_{i'}$  is the savings of institution  $i'$ ,  $tr_{row i'}$  is the transfers received by the rest of the world from institution  $i'$ ,  $tr_{gov i'}$  is the transfers received by the government from institution  $i'$ . All of them are as defined in the SAM.

Transfers from nongovernment institution  $i'$  to  $i$  ( $TRII_{ii'}$ ) are defined exactly as they are given in the SAM, whereas transfers from (to) factors, government and rest of the world to (from) domestic nongovernment institution are defined slightly different. They are calibrated as the ratio of their values in the SAM to their corresponding prices. For instance, transfers to the rest of the world from factors are determined as the ratio of their values in the SAM to the exchange rate, and transfers from institutions to the government and back are defined as the ratio between their corresponding values in the SAM to the benchmark *CPI*.

#### Calibration of the government sector

The government receives its income from taxes levied on the income of domestic nongovernment institutions, value-added, and commodity sales in the domestic market. In what follows, I show how the tax rates are defined in the model. The income tax rate is defined as follows:

$$(7A.3.30) \quad \overline{tins}_i = \frac{instx_i}{YI_i}, \quad i \in INSDNG$$

where  $instx_i$  is the amount of income tax paid by the domestic nongovernment institution and  $YI_i$  is the income received by the corresponding institution as provided in the SAM.

The value-added tax rate in activity  $a$  (or in other words tax rate on production) is defined as follows:

$$(7A.3.31) \quad tva_a = \frac{vat_a}{PVA_a \times QVA_a}, \quad a \in A$$

where  $vat_a$  is the amount of the value-added tax paid by activity  $a$  (or in other words tax on production) as defined in the SAM, and  $PVA_a$  and  $QVA_a$  are the price of the value-added and the quantity of the value-added of activity  $a$  correspondingly.

The rate of sales tax ( $tq_c$ ) in the domestic market is defined as follows:



$$(7A.3.32) \quad tq_c = \frac{stax_c}{PQ_c \times QQ_c}, \quad c \in (CD \cup CM)$$

where  $stax_c$  is the amount of sales taxes paid on the consumption of commodity  $c$ ,  $PQ_c$  and  $QQ_c$  are the corresponding price of composite commodity  $c$  and the quantity of composite commodity  $c$  respectively.

The closure rules allow government demand to be modeled as endogenous. To endogenize government demand, the model uses a government demand scaling factor ( $\overline{GADJ}$ ), which scales benchmark government spending to trigger the necessary adjustments in the government balance constraint. In the model, its initial value is set equal to unity. The point change ( $\overline{DTINS}$ ) and scaling factor ( $\overline{TINSADJ}$ ) for direct taxes are set initially equal to zero.

#### *Calibration of investment demand*

Investment demand in Lofgren et al.'s (2002) model is defined through a savings-investment accounting condition, which requires that the sum of fixed investment and stock change equals the total savings accumulated in the economy, composed of the savings of domestic nongovernment institutions, public savings, and foreign savings. To calibrate investment demand, it is necessary to define several parameters, which are defined below. The marginal propensity of domestic nongovernment institution to save is derived as follows:

$$(7A.3.33) \quad \overline{mps}_i = \frac{s_i}{YI_i - instx_i}, \quad i \in INSDNG$$

where  $s_i$  is the amount of savings accumulated by institution  $i$  as defined in the SAM.

Stock change is taken as an exogenous variable and is defined as follows:

$$(7A.3.34) \quad qdst_c = \frac{dstk_c}{PQ_c}, \quad c \in C$$

where  $dstk_c$  is the amount of the stock change as defined in the SAM, and  $PQ_c$  is the price of composite commodity  $c$ .

Exogenous (unscaled) investment demand is defined as follows:

$$(7A.3.35) \quad \overline{qinv}_c = \frac{invd_c}{PQ_c}, \quad c \in C$$

where  $invd_c$  is the value of the fixed investment demand as defined in the SAM.

The closure rules allow fixed investment demand to be modeled as endogenous. To endogenize fixed investment demand, the model uses the investment demand scaling factor ( $\overline{IADJ}$ ), which scales the benchmark fixed investment demand to trigger the necessary adjustments in the savings-investment balance constraint. In the model, the initial value of  $\overline{IADJ}$  is set equal to unity. The point change ( $\overline{DMPS}$ ) and scaling factor ( $\overline{MPSADJ}$ ) for savings are initially set equal to zero.

## Appendix 7B Data

**Table 7B.1 Aggregated SAM – two sector version (in millions of tenges)**

	A_oil	A_nonoil	C_oil	C_nonoil	M_tt_d	M_td_d	M_tt_e	M_td_e	LAB	CAP	vattax	stax	ytax_h	ytax_e	HURB	HRUR	NENT	FENT	GOV	S-I	DSTK	ROW	TOTAL
<b>A_oil</b>	0	0	1222279	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1222279
<b>A_nonoil</b>	0	0	0	7701731	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7701731
<b>C_oil</b>	294216	113095	0	0	0	0	0	0	0	0	0	0	0	0	46356	30924	0	0	0	0	-155922	1090311	1418979
<b>C_nonoil</b>	510263	3708755	0	0	166597	606467	12513	184362	0	0	0	0	0	0	1488929	950462	0	0	520060	1198005	290164	1117995	10754571
<b>M_tt_d</b>	0	0	5	166592	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	166597
<b>M_td_d</b>	0	0	12673	593794	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	606467
<b>M_tt_e</b>	0	0	4	12509	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12513
<b>M_td_e</b>	0	0	57063	127298	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	184362
<b>LAB</b>	95687	1422184	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1517871
<b>CAP</b>	267397	2375884	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2643281
<b>vattax</b>	54716	81813	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	136529
<b>stax</b>	0	0	44932	268091	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	313023
<b>ytax_h</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	56522	44626	0	0	0	0	0	0	101147
<b>ytax_e</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	267346	5315	0	0	0	0	272661
<b>HURB</b>	0	0	0	0	0	0	0	0	914302	630235	0	0	0	0	0	0	44353	-4376	91737	0	0	0	1676252
<b>HRUR</b>	0	0	0	0	0	0	0	0	570479	420170	0	0	0	0	0	0	29570	-4505	79148	0	0	0	1094862
<b>NENT</b>	0	0	0	0	0	0	0	0	0	1506250	0	0	0	0	0	0	9836	0	0	0	0	0	1516086
<b>FENT</b>	0	0	0	0	0	0	0	0	0	32113	0	0	0	0	0	0	85408	824	0	0	0	7004	125348
<b>GOV</b>	0	0	0	0	0	0	0	0	0	54513	136529	313023	101147	272661	0	0	54114	8193	0	0	0	26401	966581
<b>S-I</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53868	44710	800452	119898	275636	0	0	37682	1332246
<b>DSTK</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	134241	0	0	134241
<b>ROW</b>	0	0	82024	1884556	0	0	0	0	33090	0	0	0	0	0	30576	24141	225007	0	0	0	0	0	2279394
<b>TOTAL</b>	1222279	7701731	1418979	10754571	166597	606467	12513	184362	1517871	2643281	136529	313023	101147	272661	1676252	1094862	1516086	125348	966581	1332246	134241	2279394	

**Notation:**

A_oil	oil activity
A_nonoil	non-oil activity
C_oil	oil commodity
C_nonoil	non-oil commodity
M_tt_d	transportation costs for domestically supplied commodity
M_td_d	trade and distribution costs for domestically supplied commodity
M_tt_e	transportation costs for exported commodity
M_td_e	trade costs for exported commodity
LAB	labor
CAP	capital
vattax	taxes on production
stax	sales tax on composite commodity
ytax_h	individual income tax
ytax_e	corporate tax
HURB	urban households
HRUR	rural households
NENT	nonfinancial enterprise
FENT	financial enterprise
GOV	government
S-I	savings-investment
DSTK	stock change or inventory
ROW	rest of the world
TOTAL	total

## Appendix 7C Simulation Results

**Table 7C.1 Effects of the 35-percent increase in the oil export price on structural adjustments under alternative closure rules (in percentage change from the base)**

		FAC1																
		Neoclassical closure rule				Johansen closure rule				Foreign closure rule								
		Oil	Non-oil		Oil	Non-oil	Oil	Non-oil	Oil	Non-oil	Oil	Non-oil	Oil	Non-oil	Oil	Non-oil		
		1	2		3	4	5	6	7	8	9	10	11	12				
1.	<i>QX</i>	2.97	-0.37	<i>PX</i>	30.63	2.72	<i>QX</i>	2.98	-0.37	<i>PX</i>	30.69	2.67	<i>QX</i>	3.11	-0.39	<i>PX</i>	30.71	0.96
2.	<i>QVA</i>	2.97	-0.37	<i>PVA</i>	75.96	2.65	<i>QVA</i>	2.98	-0.37	<i>PVA</i>	76.02	2.58	<i>QVA</i>	3.11	-0.39	<i>PVA</i>	78.12	0.64
3.	<i>QINTA</i>	2.97	-0.37	<i>PINTA</i>	7.09	2.80	<i>QINTA</i>	2.98	-0.37	<i>PINTA</i>	7.15	2.76	<i>QINTA</i>	3.11	-0.39	<i>PINTA</i>	6.09	1.29
4.	<i>QQ</i>	2.76	3.55	<i>PQ</i>	15.18	2.42	<i>QQ</i>	4.99	3.48	<i>PQ</i>	15.44	2.38	<i>QQ</i>	2.71	1.03	<i>PQ</i>	15.15	0.87
5.	<i>QM</i>	57.01	11.26	<i>PM</i>	-	-	<i>QM</i>	61.53	11.03	<i>PM</i>	-	-	<i>QM</i>	56.81	3.69	<i>PM</i>	-	-
6.	<i>QE</i>	6.54	-14.39	<i>PE</i>	31.52	-0.35	<i>QE</i>	6.30	-14.14	<i>PE</i>	31.53	-0.34	<i>QE</i>	6.70	-5.64	<i>PE</i>	31.61	-0.12
7.	<i>QD</i>	-17.02	1.64	<i>PDD</i>	23.68	3.06	<i>QD</i>	-15.57	1.60	<i>PDD</i>	24.14	3.00	<i>QD</i>	-17.01	0.37	<i>PDD</i>	23.63	1.09
8.	<i>QF<sub>lab</sub></i>	14.57	-0.98	<i>Wf<sub>lab</sub></i>	3.18	3.18	<i>QF<sub>lab</sub></i>	14.60	-0.98	<i>Wf<sub>lab</sub></i>	3.11	3.11	<i>QF<sub>lab</sub></i>	15.45	-1.04	<i>Wf<sub>lab</sub></i>	1.20	1.20
9.	<i>QF<sub>cap</sub></i>	-	-	<i>Wf<sub>cap</sub></i>	103.73	2.33	<i>QF<sub>cap</sub></i>	-	-	<i>Wf<sub>cap</sub></i>	103.83	2.26	<i>QF<sub>cap</sub></i>	-	-	<i>Wf<sub>cap</sub></i>	107.56	0.31
		FAC2																
		Neoclassical closure rule				Johansen closure rule				Foreign closure rule								
		Oil	Non-oil		Oil	Non-oil	Oil	Non-oil	Oil	Non-oil	Oil	Non-oil	Oil	Non-oil	Oil	Non-oil		
		1	2		3	4	5	6	7	8	9	10	11	12				
1.	<i>QX</i>	207.50	-19.94	<i>PX</i>	29.15	33.89	<i>QX</i>	208.53	-20.04	<i>PX</i>	29.21	33.88	<i>QX</i>	245.28	-23.60	<i>PX</i>	29.14	33.72
2.	<i>QVA</i>	207.50	-19.94	<i>PVA</i>	44.26	42.66	<i>QVA</i>	208.53	-20.04	<i>PVA</i>	44.25	42.64	<i>QVA</i>	245.28	-23.60	<i>PVA</i>	44.42	42.43
3.	<i>QINTA</i>	207.50	-19.94	<i>PINTA</i>	21.30	24.99	<i>QINTA</i>	208.53	-20.04	<i>PINTA</i>	21.39	24.99	<i>QINTA</i>	245.28	-23.60	<i>PINTA</i>	21.20	24.88
4.	<i>QQ</i>	183.17	11.46	<i>PQ</i>	14.35	25.31	<i>QQ</i>	190.24	11.31	<i>PQ</i>	14.61	25.30	<i>QQ</i>	215.59	6.23	<i>PQ</i>	14.26	25.20
5.	<i>QM</i>	323.40	119.31	<i>PM</i>	-	-	<i>QM</i>	336.93	118.99	<i>PM</i>	-	-	<i>QM</i>	370.75	108.47	<i>PM</i>	-	-
6.	<i>QE</i>	220.94	-84.52	<i>PE</i>	30.26	-3.62	<i>QE</i>	221.31	-84.54	<i>PE</i>	30.26	-3.62	<i>QE</i>	260.63	-85.12	<i>PE</i>	30.27	-3.60
7.	<i>QD</i>	131.74	-11.67	<i>PDD</i>	22.25	35.41	<i>QD</i>	136.55	-11.78	<i>PDD</i>	22.70	35.40	<i>QD</i>	158.64	-15.71	<i>PDD</i>	22.09	35.24
8.	<i>QF<sub>lab</sub></i>	211.78	-14.25	<i>Wf<sub>lab</sub></i>	34.64	34.64	<i>QF<sub>lab</sub></i>	212.84	-14.32	<i>Wf<sub>lab</sub></i>	34.58	34.58	<i>QF<sub>lab</sub></i>	251.18	-16.90	<i>Wf<sub>lab</sub></i>	32.69	32.69
9.	<i>QF<sub>cap</sub></i>	206.04	-23.19	<i>Wf<sub>cap</sub></i>	47.74	47.74	<i>QF<sub>cap</sub></i>	207.05	-23.30	<i>Wf<sub>cap</sub></i>	47.75	47.75	<i>QF<sub>cap</sub></i>	243.29	-27.38	<i>Wf<sub>cap</sub></i>	48.66	48.66

Table 7C.2 Effects of the 35-percent increase in the oil export price on the GDP and its components under alternative closure rules

Variable	FAC1						FAC2					
	Nominal GDP (% for nonbase)			Real GDP (% for nonbase)			Nominal GDP (% for nonbase)			Real GDP (% for nonbase)		
	Neoclassical	Johansen	Foreign	Neoclassical	Johansen	Foreign	Neoclassical	Johansen	Foreign	Neoclassical	Johansen	Foreign
1. Absorption	10.34	10.31	2.97	7.95	7.95	2.33	50.22	50.30	34.15	19.75	19.86	7.02
2. Private consumption	7.19	16.95	5.40	4.27	13.80	4.05	40.77	68.03	40.06	12.66	34.48	12.19
3. Fixed investment	22.94	2.38	0.87	20.03	-	-	82.25	25.30	25.20	45.44	-	-
4. Stock change	-12.39	-12.80	-15.71	-	-	-	38.04	37.73	37.91	-	-	-
5. Government consumption	2.42	2.38	0.87	-	-	-	25.31	25.30	25.20	-	-	-
6. Exports	11.73	11.70	16.26	-4.05	-4.05	0.45	113.83	114.06	139.00	66.29	66.47	85.59
7. Imports	13.17	13.13	5.91	13.17	13.13	5.91	127.82	128.08	119.41	127.82	128.08	119.41
8. GDP <sup>MP</sup>	9.80	9.77	8.08	-0.02	-0.01	-0.09	47.59	47.66	48.01	-4.05	-3.97	-3.29
9. Net indirect taxes	15.74	15.95	13.19	0.47	0.65	-0.16	90.43	91.35	95.85	-40.70	-39.89	-32.48
10. GDP <sup>FC</sup>	9.16	9.10	7.52	-0.08	-0.08	-0.09	42.96	42.94	42.84	-0.09	-0.09	-0.13

Note: Figures in the table are given in percentages.

**Table 7C.3 Effects of the 35-percent increase in the oil export price on economic indicators under alternative closure rules**

Variable	FAC1				FAC2		
	Base	Neoclassical	Johansen	Foreign	Neoclassical	Johansen	Foreign
Investment/ nominal GDP	26	3.1	-1.7	-1.7	6.1	-3.9	-4
Private savings/nominal GDP	22.1	0.9	-3.6	1	1.2	-9.5	1.3
Foreign savings/ nominal GDP	0.8	-0.1	-0.1	-4.9	-0.3	-0.3	-10.8
Trade deficit/nominal GDP	-1	-0.2	-0.1	-4.8	1.2	1.2	-9
Government savings/nominal GDP	6	1.7	1.3	1.6	5	5.7	5.4
Government income/ nominal GDP	19.6	0.8	0.4	0.7	2.9	3.6	3.3
Government spending/ nominal GDP	11.3	-0.8	-0.8	-0.8	-1.7	-1.7	-1.7
CPI	1.15	2.84	2.8	1.34	24.95	24.95	24.84
DPI	1.00	3.73	3.69	1.77	36.15	36.16	35.98
Dutch disease index	27.6	22.9	23.0	25.9	5.5	5.5	6.5
Real price of labor	1.00	-5.54	-5.56	-5.97	-5.91	-5.94	-7.23
Real price of capital	1.00	3.06	3.07	3.29	3.25	3.26	3.94
Real wage rate	0.87	0.33	0.30	-0.14	7.76	7.71	6.29
Real rental rate of capital	0.87	9.47	9.46	9.69	18.24	18.25	19.08
$CPI/P_{GDP}^{MP}$	1.15	-6.35	-6.34	-6.32	-18.77	-18.75	-18.43
$P_{GDP}^{MP}/P_{GDP}^{FC}$	1.00	0.54	0.54	0.52	7.50	7.48	7.00

Note: Figures in the table are given in percentages. Figures in the columns other than the base column are given as the percentage change from their base values, except for the Dutch disease index, which is not given as the percentage change from its value.

## Appendix 7D Sensitivity Analysis Results

**Table 7D.1 Effects of the 35-percent increase in the oil export price on structural adjustments under the foreign closure rule and FAC1**

$\sigma_O^q = 3, \sigma_N^q = 0.19, \sigma_O^t = 5, \sigma_N^t = 0.1$					
Variable	Oil	Non-oil	Variable	Oil	Non-oil
1. <i>QX</i>	-0.21	0.02	<i>PX</i>	29.10	35.27
2. <i>QVA</i>	-0.21	0.02	<i>PVA</i>	35.24	39.18
3. <i>QINTA</i>	-0.21	0.02	<i>PINTA</i>	25.91	31.30
4. <i>QQ</i>	2.73	1.60	<i>PQ</i>	15.74	31.77
5. <i>QM</i>	59.27	7.07	<i>PM</i>	-	-
6. <i>QE</i>	2.94	-3.41	<i>PE</i>	29.90	-4.54
7. <i>QD</i>	-17.79	0.43	<i>PDD</i>	24.66	40.02
8. <i>QF<sub>lab</sub></i>	-0.77	0.05	<i>Wf<sub>lab</sub></i>	39.15	39.15
9. <i>QF<sub>cap</sub></i>	-	-	<i>Wf<sub>cap</sub></i>	33.85	39.21

Note: Figures in the table are given in percentages. Subscripts *o* and *n* stand for oil and non-oil commodities respectively.

**Table 7D.1 Continued**

$\sigma_O^q = 3, \sigma_N^q = 3, \sigma_O^t = 5, \sigma_N^t = 0.1$						$\sigma_O^q = 3, \sigma_N^q = 0.19, \sigma_O^t = 5, \sigma_N^t = 5$					
Variable	Oil	Non-oil	Variable	Oil	Non-oil	Variable	Oil	Non-oil	Variable	Oil	Non-oil
1. <i>QX</i>	3.03	-0.38	<i>PX</i>	30.66	2.04	<i>QX</i>	3.05	-0.38	<i>PX</i>	30.67	1.76
2. <i>QVA</i>	3.03	-0.38	<i>PVA</i>	76.76	1.85	<i>QVA</i>	3.05	-0.38	<i>PVA</i>	77.12	1.53
3. <i>QINTA</i>	3.03	-0.38	<i>PINTA</i>	6.72	2.24	<i>QINTA</i>	3.05	-0.38	<i>PINTA</i>	6.55	1.99
4. <i>QQ</i>	2.73	1.07	<i>PQ</i>	15.17	1.84	<i>QQ</i>	2.73	1.04	<i>PQ</i>	15.16	1.59
5. <i>QM</i>	56.92	6.77	<i>PM</i>	-	-	<i>QM</i>	56.89	1.34	<i>PM</i>	-	-
6. <i>QE</i>	6.61	-0.60	<i>PE</i>	31.56	-0.26	<i>QE</i>	6.63	-9.72	<i>PE</i>	31.57	-0.23
7. <i>QD</i>	-17.02	-0.34	<i>PDD</i>	23.66	2.33	<i>QD</i>	-17.02	0.96	<i>PDD</i>	23.65	1.99
8. <i>QF<sub>lab</sub></i>	14.91	-1.00	<i>Wf<sub>lab</sub></i>	2.40	2.40	<i>QF<sub>lab</sub></i>	15.05	-1.01	<i>Wf<sub>lab</sub></i>	2.08	2.08
9. <i>QF<sub>cap</sub></i>	-	-	<i>Wf<sub>cap</sub></i>	105.17	1.53	<i>QF<sub>cap</sub></i>	-	-	<i>Wf<sub>cap</sub></i>	105.81	1.21

Note: Figures in the table are given in percentages. Subscripts *o* and *n* stand for oil and non-oil commodities respectively.

**Table 7D.2 Effects of the 35-percent increase in the oil export price on the GDP and its components under the foreign closure rule and the FAC1**

Variable	$\sigma_o^q = 3, \sigma_n^q = 0.19, \sigma_o^t = 5, \sigma_n^t = 0.1$	
	Nominal GDP	Real GDP
1. Absorption	37.03	3.80
2. Private consumption	39.91	6.59
3. Fixed investment	31.77	-
4. Stock change	50.39	-
5. Government consumption	31.77	-
6. Exports	14.97	-0.27
7. Imports	9.24	9.24
8. GDP at market prices	38.32	-0.47
9. GDP at factor costs	38.84	0.00

Note: Figures in the table are given in percentages.

Subscripts  $o$  and  $n$  stand for oil and non-oil commodities respectively.

**Table 7D.2 Continued**

Variable	$\sigma_o^q = 3, \sigma_n^q = 3, \sigma_o^t = 5, \sigma_n^t = 0.1$		$\sigma_o^q = 3, \sigma_n^q = 0.19, \sigma_o^t = 5, \sigma_n^t = 5$	
	Nominal GDP	Real GDP	Nominal GDP	Real GDP
Absorption	4.04	2.39	3.76	2.38
Private consumption	6.48	4.15	6.19	4.12
Fixed investment	1.84	-	1.59	-
Stock change	-13.63	-	-14.18	-
Government consumption	1.84	-	1.59	-
Exports	18.75	2.96	14.15	-1.65
Imports	8.86	8.86	3.66	3.66
GDP at market prices	9.03	-0.10	8.77	-0.10
GDP at factor costs	8.51	-0.08	8.25	-0.08

Note: Figures in the table are given in percentages. Subscripts  $o$  and  $n$  stand for oil and non-oil commodities respectively.



**Table 7D.3 Effects of the 35-percent increase in the oil export price on economic indicators under the foreign closure rule and the FAC1**

Variable	Base	Sim. 1
	$\sigma_o^q = 3, \sigma_N^q = 0.19, \sigma_o^t = 5, \sigma_N^t = 0.1$	
Investment/ nominal GDP	26	-1.2
Private savings/nominal GDP	22.1	1.1
Foreign savings/ nominal GDP	0.8	-2.6
Trade deficit/nominal GDP	-1	-1.1
Government savings/nominal GDP	6	0.5
Government income/ nominal GDP	19.6	-0.1
Government spending/ nominal GDP	11.3	-0.5
CPI	1.15	31.24
DPI	1.00	40.50
Dutch disease index	27.62	18.2

Note: Figures in the table are given in percentages. Figures in the columns other than the base column are given as the percentage change from their base values, except for the Dutch disease index, which is not given as the percentage change from its base value. Subscripts *o* and *n* stand for oil and non-oil commodities respectively.

**Table 7D.3 Continued**

Variable	Base	Sim. 2	Sim. 3
		$\sigma_o^q = 3, \sigma_N^q = 3,$	$\sigma_o^q = 3, \sigma_N^q = 0.19,$
		$\sigma_o^t = 5, \sigma_N^t = 0.1$	$\sigma_o^t = 5, \sigma_N^t = 5$
Investment/ nominal GDP	26	-1.7	-1.7
Private savings/nominal GDP	22.1	1	1
Foreign savings/ nominal GDP	0.8	-4.8	-4.9
Trade deficit/nominal GDP	-1	-4.6	-4.9
Government savings/nominal GDP	6	1.6	1.6
Government income/ nominal GDP	19.6	0.7	0.7
Government spending/ nominal GDP	11.3	-0.7	-0.7
CPI	1.148	2.29	2.03
DPI	1.00	3.00	2.66
Dutch disease index	27.623	27.0	24.5

Note: Figures in the table are given in percentages. Figures in the columns other than the base column are given as the percentage change from their base values, except for the Dutch disease index, which is not given in percentage change from its base value. Subscripts *o* and *n* stand for oil and non-oil commodities respectively.

# Chapter 8      Effects of the Oil Export Price Increase on Kazakhstani economy: Multisector Model

## 8.1      Introduction

Much has been said and written about the possible effects of the oil export price increase on the Kazakhstani economy in general; however, little has been done to quantify the possible effects of the oil export price increase or a boom in the oil sector on the Kazakhstani economy at a more detailed sectoral level. The literature on these effects is far from complete. Therefore, to fill this gap in the literature, I attempt to quantify the possible effects of the oil export price increase by applying Lofgren et al.'s (2002) CGE model to a complete version of the SAM for Kazakhstan, which incorporates 55 sectors. This analysis helps to show clearly how the oil export price increase might affect Kazakhstan's economy at a very detailed sectoral level.

In addition, I aim to test the implications of various macro closure rules at a more detailed sectoral level. The analysis conducted here will show whether alternative macro closure rules might lead to different results.

Specifically, in this chapter, I pursue three aims. *First*, I aim to quantify the effects of the oil export price increase on Kazakhstan's economy. I attempt to explain the mechanisms through which the oil export price increase affects sectoral outputs, exports, imports, private consumption, investment, and the real GDP using the intuition developed by the two-sector model shown in Chapter 5. *Second*, I aim to analyze whether different macro closure rules lead to different results. Here, I show how sensitive the results are with respect to different macro closure rules compared with the two-sector version of the model. *Third*, I aim to conduct the systematic sensitivity analysis that determines which structural parameters play a role in determining the outcomes of the selected variables of interest.

The chapter is organized as follows. Section 8.2 presents the extraneous parameters used to in the model. Section 8.3 provides a comprehensive and comparative analysis of the effects of the oil export price increase under alternative macro closure rules. Section 8.4 discusses the results of the sensitivity analysis and Section 8.5 concludes.

## 8.2      Extraneous parameters

Since I explained the calibration of Lofgren et al.'s (2002) model and sources of the extraneous parameters in the previous chapter, in what follows I present the values of these parameters only. The extraneous elasticities used in the analysis are shown in Table 8.1.

Table 8.1 Extraneous elasticities

No	Sectors	$\sigma_c^q$	$\sigma_c^t$	$\eta_c^{urb}$	$\eta_c^{rur}$	$\sigma_c^{va}$
<i>Products of agriculture, forestry and fishing</i>						
1.	cagr	3	5	0.54	0.54	0.24
2.	cfor	3	5	1.09	1.09	0.2
3.	cfish	3	5	1.08	1.08	0.2
<i>Products of mining</i>						
4.	cmin	3	5	1.14	1.14	0.2
5.	cpetr	3	5	1.11	1.11	0.2
6.	core	3	5	-	-	0.2
7.	comin	3	5	1.09	1.09	0.2
<i>Products of manufacturing</i>						
8.	cfood	3	5	1.08	1.08	1.12
9.	ctob	3	5	0.83	0.83	1.12
10.	ctex	3	5	0.97	0.97	1.26
11.	cwear	3	5	0.97	0.97	1.26
12.	cleat	3	5	0.97	0.97	1.26
13.	cwood	3	5	1.09	1.09	1.26
14.	cpulp	3	5	1.09	1.09	1.26
15.	cpubl	3	5	1.09	1.09	1.26
16.	ccoke	3	5	1.11	1.11	1.26
17.	cchem	3	5	1.09	1.09	1.26
18.	crub	3	5	1.09	1.09	1.26
19.	cmnmt	3	5	1.09	1.09	1.26
20.	ciron	3	5	1.09	1.09	1.26
21.	cfmet	3	5	1.09	1.09	1.26
22.	cmach	3	5	1.09	1.09	1.26
23.	cofic	3	5	1.09	1.09	1.26
24.	celmc	3	5	1.09	1.09	1.26
25.	crad	3	5	1.09	1.09	1.26
26.	cmed	3	5	1.09	1.09	1.26
27.	cmvec	3	5	1.09	1.09	1.26
28.	cotr	3	5	1.11	1.11	1.26
29.	cfurn	3	5	1.09	1.09	1.26
30.	crec	-	-	-	-	1.26
<i>Electrical energy, gas and hot water</i>						
31.	cel	3	5	1.14	1.14	1.26
32.	cwat	-	-	1.14	1.14	1.26
<i>Construction works and services</i>						
33.	ccnst	3	5	1.14	1.14	1.68
34.	ctrd	3	5	1.02	1.02	1.68
35.	chot	-	-	1.03	1.03	1.68
36.	cretr	-	-	1.03	1.03	1.68
37.	ccant	-	-	1.03	1.03	1.68
38.	ctrns	3	5	1.11	1.11	1.68
39.	ccom	3	5	1.11	1.11	1.26
40.	cfini	3	5	1.14	1.14	1.26
41.	cins	3	5	1.14	1.14	1.26
42.	caux	-	-	1.14	1.14	1.26
43.	cest	-	-	1.14	1.14	1.26
44.	crent	3	5	1.03	1.03	1.26
45.	ccomp	3	5	1.03	1.03	1.26
46.	cres	-	-	-	-	1.26
47.	cobus	3	5	1.14	1.14	1.26
48.	cpa	3	5	1.03	1.03	1.26
49.	ceduc	-	-	1.03	1.03	1.26
50.	chelt	-	-	1.03	1.03	1.26
51.	csew	-	-	1.03	1.03	1.26
52.	cmemb	-	-	1.03	1.03	1.26
53.	crecr	3	5	1.03	1.03	1.26
54.	coser	-	-	1.03	1.03	1.26
55.	chh	-	-	1.03	1.03	1.26

Note :  $\sigma_c^q$  denotes the Armington elasticity of substitution,  $\sigma_c^t$  denotes the elasticity of transformation,  $\eta_c^{urb}$  denotes the income elasticity of demand for commodity  $c$  by an urban household,  $\eta_c^{rur}$  denotes the income elasticity of demand for commodity  $c$  by a rural household,  $\sigma_c^{va}$  denotes the elasticity of substitution between labor and capital in activity  $a$ . Shaded cells denote nontraded commodities. Source: Jensen and Tarr (2008), Dimaranan et al. (2006).

### 8.3 Simulation Results

In this section, I discuss the effects of the 35-percent increase in the oil export price on the non-oil economy of Kazakhstan under alternative macro closure rules by applying Lofgren et al.'s (2002) model to the complete version of the SAM for Kazakhstan.<sup>69</sup> In particular, I discuss the effects of the oil export price increase on the economy in the medium run<sup>70</sup>, *first*, under the neoclassical closure rule, *second*, under the Johansen closure rule, and *finally*, under the foreign closure rule. I do not discuss the effects of the oil export price increase on the crude petroleum and natural gas sector itself here because it is quite natural to expect that the crude petroleum and natural gas sector expands in the wake of the oil export price increase. Moreover, the effects of the oil export price increase on the crude petroleum and natural gas sector were discussed in the previous chapters.

I do not consider adjustments under a long-run closure rule (FAC2) for two reasons. *First*, it appears that the results under the FAC2 closure rule do not address long-run adjustments accurately given the static nature of the model. To reflect long-run adjustments, it would be necessary to introduce some dynamic features such as the updating of capital stock, for instance. Obviously, in the long run, capital stock should necessarily be updated by adding up the investment to the existing capital stock. However, this trend would engender different sectoral adjustments that are beyond the scope of the static models. *Second*, from the previous chapter, I found that there are no large changes across the macro closure rules under the FAC2, but there are appealing results under the FAC1. Therefore, I avoid considering the FAC2 and apply the FAC1 instead in what follows.

#### 8.3.1 Results under the Neoclassical Closure Rule

##### *Adjustments in the outputs of the non-oil sectors*

I find that some of the non-oil sectors expand and some of the non-oil sectors contract in the wake of the 35-percent oil export price increase (Table 8A.1 in Appendix 8A). The outputs of the agriculture (cagr), forestry (cfor), fishing (cfish), mining sectors other than the crude petroleum and natural gas sector, and most of the manufacturing sectors decrease, except for the outputs of manufacture of tobacco products (ctob), manufacture of other non-metallic mineral products (cmmnt), manufacture of motor vehicles, trailers and semitrailers (cmvec), and manufacture of other transport equipment (cotr) (column 1 of Table 8A.1)<sup>71</sup>. The outputs of the electrical energy, gas, steam and hot water (cel), collection, purification and distribution of water (cwat), construction (ccnst) and most of the services sectors increase, except for the outputs of the trade (ctrd), transport (ctrns), post and telecommunication services (ccom), financial intermediation services (cfini), insurance and pension funding services (cins),

<sup>69</sup> Note that as was mentioned in the previous chapter, 35-percent increase in the oil export price is roughly equivalent to a 30-percent increase in the export price of the composite good (crude oil and natural gas) (in foreign currency units).

<sup>70</sup> The closure rule that corresponds to the medium run is the FAC1 closure. For further details, please see the previous chapter.

<sup>71</sup> Since in the SAM for Kazakhstan each activity produces a single commodity and each commodity is produced by a single activity, I use the same notation for activities and commodities here in this chapter. For instance cfish might indicate as well as fishing (an activity) and fishing products (a commodity).

renting services (crent), research and development services (cres) and public and social security services (cpa) sectors.

To understand why some non-oil sectors contract and some non-oil sectors expand in the wake of the oil export price increase, I created additional, separate tables for the sectors that expand and the sectors that contract (Tables 8A.2 and 8A.3). In these tables, I rank the sectors according to the percentage changes in their outputs in descending order and provide a short description of some of their key features, namely their content of trade<sup>72</sup> (column 2), corresponding shares of domestic sales in total outputs (column 3), and corresponding shares of demand for domestically produced commodities in the composite demand (column 4).

In what follows, I examine from the demand and production sides why some non-oil sectors contract and some non-oil sectors expand. I do so first from the demand side and later from the production side.

From the demand side, I find that there are several factors that explain why some non-oil sectors expand and some non-oil sectors contract in the wake of the oil export price increase, or, in other words, factors that are responsible for the adjustments in the non-oil sectors. The *first* factor is the sectoral content of trade. The higher the sectoral content of trade is, or, in other words, the more traded a sector is, the more likely that this sector will contract, and vice versa (i.e., the lower the sectoral content of trade is, or, in other words, the more nontraded a sector is, the more likely that this sector will expand in the wake of the oil export price increase). For instance, a sector that is heavily hit by the oil export price increase is the manufacture of chemicals and chemical products (cchem). Its production decreases the most in the wake of the oil export price increase because it is a largely traded sector.<sup>73</sup>

The *second* factor is the allocation of total demand for a particular commodity across its intermediate use and its private consumption. The more of the demand for a particular commodity is allocated for intermediate use and the less for private consumption, the more likely that the sector that produces this commodity will contract in the wake of the oil export price increase, although its sectoral content of trade might be low enough and vice versa. It is primarily due to the negative backward linkages induced by sectors, which are negatively hit by the oil export price increase and which employ these commodities in their production. The sectors that contract due to this factor are the fishing (cfish), recycling (crec) and research and development (cres). Although the fishing is an almost nontraded sector<sup>74</sup> as the manufacture of tobacco products (ctob), the share of private consumption of fishing products is smaller than that of tobacco products and the fishing products are used more as intermediate inputs than tobacco products (columns 5 and 6 of Table 6.3 in Chapter 6). This partially explains why the fishing contracts and the manufacture of tobacco products expands. The other two sectors, the recycling (crec) and research and development (cres), are purely nontraded sectors, but they contract because the shares of the commodities that these sectors produce in private consumption is zero, whereas the corresponding shares in intermediate demand are substantial.

The *third* factor is the effect of the closure rule. Here, I employ the neoclassical closure rule, which implies that fixed investment is endogenously determined, whereas the savings rates of nongovernment institutions are exogenous. Hence, when the income of nongovernment

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<sup>72</sup> The sectoral content of trade shows to what extent sectors are traded or nontraded.

<sup>73</sup> Note that its share of production allocated for the domestic market is low.

<sup>74</sup> I label as almost nontraded sectors those sectors that supply the largest portion of their output to the domestic market, and in addition, the demand for their products at the domestic market is substantial. Or, in other words, they represent sectors that have negligible shares of exports, and imports of these products are negligible.

institutions increases, so does the fixed investment, which, in turn, has a positive effect on the outputs of investment commodities. Thus, the sectors whose commodities are used for investment purposes are more likely to expand. For instance, the construction sector expands (about 9 percent) because construction services are largely used as investment commodities. The manufacturing commodities, motor vehicles, trailers and semitrailers (cmvec) and other transport equipment (cotr) are investment commodities as well, which, in turn, explain the rise in their outputs.

If increase in investment has a positive effect on sectors that produce investment commodities, why do other sectors whose commodities are used for investment purposes as well, namely agriculture (cagr), publishing (cpubl), manufacture of fabricated metal products (cfmet), manufacture of machinery and equipment (cmach), manufacture of office and computing machinery (cofic), manufacture of electrical machinery and apparatus (celmc), manufacture of radio, television, communication equipment, and apparatus (crad), manufacture of medical, precision and optical instruments, watches and clocks (cmed), and manufacture of furniture and other manufactured goods, n.i.c. (cfurn) contract? Obviously this is because they are traded sectors and that the import-competing and transformability effects dominate the demand effect for the outputs of these commodities.

Overall, all these three factors emphasize the importance of the demand effect for non-oil sectors, which is determined by the compositional structure of demand. From this, I might conclude that the larger the demand effect is, which is revealed by the higher share of private consumption and investment and negligible content of trade, the more likely it is that this non-oil sector will expand in the aftermath of the oil export price increase.

Here, I again find the findings of the two-sector model developed in Chapter 5 valuable. Although the model in Chapter 5 does not explicitly consider the nontraded sectors, the results from that model can be easily extended to nontraded sectors as well. For the nontraded sectors the import-competing and transformability effects are zero, but the demand effect is substantial. Since the import-competing and transformability effects tend to favor the oil sector and the demand effect the non-oil sectors, the absence of the import-competing and transformability effects and the substantial demand effect explain why most of the nontraded sectors would expand in the wake of the oil export price increase. Thus, I might again conclude that the model developed in Chapter 5 reveals the effects that operate in the multisector models and represents a good contribution to the theoretical literature that is focused on the effects of an oil export price increase on the economy.

In addition, the analysis conducted in Chapter 5 showed that the demand effect was mostly driven by the share of the domestic sales in the total output under the neoclassical closure rule. Extending the two-sector setup of the model via introducing several other sectors clearly adds a new twist to the model. However, the findings of the two-sector model are valuable. Close inspection of Tables 8A.2 and 8A.3 reveals the importance of the demand effect, found in Chapter 5. In line with the findings of Chapter 5, overall, the sectors with the lowest shares of domestic sales in the total output are heavily affected by the oil export price increase. This is an important finding that holds in the multisector model as well.

Now I consider why some non-oil sectors expand and some non-oil sectors contract from the production side. In order to do so, I define whether the real wage increases or decreases (column 6 of Table 8A.4). I find that it decreases in the expanding sectors and increases in the contracting sectors. Given that labor is the only mobile factor, a change in the real wage determines a change in producer costs and, hence, a change in the outputs.

Finally, I consider the effect of the oil export price increase on the demand for labor (column 2 of Table 8A.4), disaggregating its approximated total effect on the demand for labor (column 14 of Table 8A.4) into an expansion effect<sup>75</sup> (column 12 of Table 8A.4) and a substitution effect<sup>76</sup> (column 13 of Table 8A.4). The substitution effect (column 16 of Table 8A.4) in most of the cases is larger than the expansion effect (column 15 of Table 8A.4).

Note that given that capital is sector-specific, the total output change should be lower than the corresponding change in labor, but it will be higher with a higher share of labor in total value-added. This is why, for instance, the aggregate output of construction grows more than the aggregate output of services auxiliary to financial intermediation, although the corresponding labor input in production grows at a similar rate.

### *Adjustments in exports, imports and domestic sales of non-oil commodities*

In what follows, I discuss the adjustments in exports, imports and domestic sales of non-oil goods.

The results show that exports of most non-oil commodities decrease. This is because of the negative substitution and negative expansion effects for most of the exports of non-oil commodities (columns 8 and 9 of Table 8A.5). These trends are in line with the predictions of the two-sector models in Chapters 5 and 7. There I found that changes in non-oil exports are ambiguous: they tend to decrease due to the negative substitution effect but might increase or decrease due to the expansion effect. However, unlike the predictions of the two-sector models, I find that the exports of metal ores (core) increase, and substitution effects for exports of fishing products (cfish), metal ores (core), and office machinery and computers (cofic) are positive.

In Chapter 5, I found that the percentage change in the price of a domestically supplied commodity is proportional to the share of domestic sales in its total output. To verify whether this is the case in this model as well, I constructed an additional table that shows the ranking of the percentage changes in the domestic prices and exports of commodities along with their shares of domestic sales in total output. Overall, the findings obtained in Chapter 5 hold in this model as well. The change in prices for domestic goods will be higher if the corresponding shares of domestic sales are higher (Table 8A.6). This is particularly visible as regards the construction and services. In general, this is quite an intuitive result: when overall income rises, the demand for commodities that have been primarily sold domestically should rise, which, in turn, induces a higher price increase. In turn, higher increase in the prices for commodities that have been largely sold domestically imply higher negative substitution effects for exports, given that the substitution effect for exports is primarily measured in terms of changes in prices for domestic goods because the nominal exchange rate is used as a numeraire. As a result there is a larger decline in exports of these commodities and vice versa.

Now consider the effect of the oil export price increase on imports. I examine it in terms of the approximated expansion and substitution effects (Table 8A.7). As already discussed, the expansion effect corresponds to the percentage change in the quantity of composite commodity and the substitution effect corresponds to the weighted percentage change in the relative prices of domestically consumed commodity versus import prices, with the weights

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<sup>75</sup> The expansion effect is equivalent to the percentage change in the magnitude of value-added.

<sup>76</sup> The substitution effect is a weighted percentage change in the relative factor prices, with the weights equal to the product of the elasticity of substitution between factors (column 11 of Table 8A.4) and the corresponding share of capital in the total value-added (column 8 of Table 8A.4).

being equal to the product of the Armington elasticity of substitution and the share of the demand for the corresponding domestically produced and domestically sold commodity in total consumption. I find that imports of most commodities increase except for imports of fishing products (cfish), mineral ores (core), and basic metals (ciron).

Finally, I consider the effects of the oil export price increase on domestic sales. Similar to the analysis presented above, I discuss the effects of the oil export price increase in terms of the corresponding expansion and substitution effects (Table 8A.8). Previously, I found that domestic sales rise due to the substitution effects given that domestic prices rise, whereas they might either fall or rise due to the expansion effect. In this case, the substitution effect on most of the commodities is positive except for mineral ores (core) and office machinery and computers (cofic), and the expansion effect in some cases is negative and in some positive. I find that the domestic sales of most of the manufacturing sectors decline. Although the substitution effect is positive on most of them, the negative expansion effect outweighs the positive substitution effect, causing most of them to decline.

### *Macro response*

The percentage change in the real GDP at factor prices is negligible and negative (Table 8B.2 in Appendix 8B). The change is negligible because factor supplies are assumed to be exogenously given, and hence, the percentage change in the real GDP at factor prices is determined by the percentage changes in the real price of labor and real price of capital. The change is negative because the decrease in the real price of labor outweighs the increase in the real price of capital (Table 8B.1 in Appendix 8B). Such a change in the real price of labor and the real price of capital is due to the factors mentioned in the previous chapter. Since I have discussed it in the previous chapter in some detail, I will not repeat it here for brevity.

I find that the real GDP at market prices decreases as well (Table 8B.2). It decreases because the increase in the real imports and the decrease in the real exports outweigh the increase in real private consumption and the real investment. In what follows, I discuss the changes in each of the components of the real GDP at market prices.

Real private consumption increases because of the increase in the household real incomes. Investment increases as real total savings in the economy increase. Total investment is made up mostly of the savings of nonfinancial enterprises and government. Hence, an increase in the real income of nonfinancial enterprises and real income of the real government income largely determines such a response in the investment.

Real exports decrease because most of the real non-oil exports decrease, although the real oil exports increase. Real imports increase because real imports of most categories of commodities increase.

In addition, I show the percentage changes in some of the macroeconomic indicators along with their base values (Table 8B.1). Similar to the results in Chapter 7, I find an increase in investment, private savings, government savings and government income as a share of nominal GDP. Given that non-oil exports decrease, the Dutch disease index decreases. The DPI increases, which signifies that the real exchange rate appreciates.



### 8.3.2 Results under the Johansen Closure

#### *Adjustments in the aggregate outputs of non-oil sectors*

In general, the effects of the oil export price increase under the Johansen closure rule are similar to what I found under the neoclassical closure rule, except for some sectors that exhibit a different pattern of response.

This difference between the Johansen and neoclassical closure rules highlights the effect of the closure rule discussed earlier. Note that the difference between the Johansen closure rule and the neoclassical closure rule lies in their different treatment of the savings rates of nongovernment institutions and investment. Under the Johansen closure rule, investment is exogenous, and the savings rates should adjust to maintain the savings-investment identity in equilibrium, whereas under the neoclassical closure rule, investment is endogenous, and the savings rates are exogenous.

The different treatment of investment and savings rates here is likely to lead to different responses in the outputs of some non-oil sectors. Consider first how adjustments in savings rates affect some non-oil sectors differently. First of all, under the Johansen closure rule, the savings rates will decline, which implies that the marginal propensity to consume will increase, and, hence, private consumption will increase. This effect explains why some sectors whose commodities are largely used for private consumption expand. Thus, the fishing (cfish), manufacture of food and beverages (cfood), financial intermediation (cfini), and public administration (cpa) tend to expand here (Table 8C.1 in Appendix 8C).

The exogenous investment causes the sectors that produce investment commodities to contract. Thus, the manufacture of motor vehicles, trailers and semi-trailers (cmvec), manufacture of other transport equipment (cotr), and construction (ccnst) that expanded under the neoclassical closure rule tend to contract under the Johansen closure rule.

Similar to what I did in the analysis of the neoclassical closure rule, I construct an additional table that shows the decomposition of the approximated total effect of the oil export price increase on labor employment (Table 8C.2). Since I have commented a similar table before, to save space I will not discuss it here.

I find that, overall, the aggregate outputs of the traded sectors decrease more, whereas the aggregate outputs of the nontraded sectors increase more, than with the neoclassical closure rule. Why does this happen? The decrease in the savings rates of nongovernment institutions causes a larger increase in private demand and hence causes domestic prices to increase more. This, in turn, induces a larger real appreciation of the exchange rate and thus leads to a larger fall in the aggregate outputs of the traded sectors and a larger rise in the aggregate outputs of the nontraded sectors than was the case under the neoclassical closure rule. The different treatment of the investment and savings rates explain why some non-oil sectors under the Johansen closure rule tend to be more sensitive to the oil export price.

#### *Adjustments in exports, imports and domestic sales of non-oil commodities*

The exports of non-oil commodities under the Johansen closure rule, in general, decline more than under the neoclassical closure rule. This is primarily explained by the different treatment of investment and nongovernment savings rates. With an increase in income, the marginal

propensity of nongovernment institutions, including households, to save tends to decline and therefore causes larger private consumption. Because of such pressure coming from the demand side, domestic prices rise more than under the neoclassical closure rule. This, in turn, causes a larger negative substitution effect for exports, and, hence, a larger fall in exports under the Johansen closure rule overall. Taking this into account, domestic sales rise more or decline less than under the neoclassical closure rule. The higher demand pressure that stems from higher private consumption leads in addition to a larger import demand. Tables 8C.3 to 8C.5 show the effect of the oil export price increase on exports, imports, and domestic sales. As I did earlier, I have disaggregated the approximated total effect on exports, imports, and domestic sales into the corresponding substitution and expansion effects.

#### *Macro response*

As the household savings rates decrease, private consumption increases in real terms more and exports decrease more than under the neoclassical closure rule. As a result of these changes, the real GDP at market prices decreases slightly more under the Johansen closure rule than under the neoclassical closure rule. The GDP at factor prices also decreases slightly more (Table 8B.2).

As a result, the CPI and DPI rise slightly more and the Dutch disease index decreases slightly more under this macro closure rule (Table 8B.1). Private savings decline as a percent of nominal GDP because the savings rates decline. Government savings increase and government income as a share of nominal GDP also increases.

### **8.3.3 Results under the Foreign Closure Rule**

#### *Adjustments in the aggregate outputs of non-oil sectors*

Under this closure rule, I find that the same factors that were responsible for sectoral adjustments under the neoclassical and Johansen closure rules are responsible for sectoral adjustments under the foreign closure rule. However, under this closure rule, I find slightly different sectoral adjustments than under the neoclassical and Johansen closure rules (Table 8D.1 in Appendix 8D), which are due to the effect of the closure rule itself (as discussed in Section 8.3.1.). Hence, a detailed analysis is in order here.

I find that, in general, outputs of most of the non-oil sectors decline except for tobacco (ctob), food (cfood), electricity, gas and hot water (cel), collection, purification and distribution of water (cwat), hotel services, camping sites and other short-stay accommodation services (chot), food serving services (cretr), canteen and catering services (ccant), financial intermediation services, except insurance and pension funding services (cfini), services auxiliary to financial intermediation (caux), real estate services (cest), other business services (cobus), education services (ceduc), health and social work services (chelt), sewerage, and refuse disposal services (csew), membership organizations services (cmemb), recreational, cultural and sporting services (crecr), other services (coser), services of private households with employed persons (chh). What factors play the dominant role here? Obviously, increased competition in the domestic markets underlined by the import-competing and transformability effects such as those discussed in Chapter 5 caused the outputs of the least competitive traded sectors to contract and the demand effect caused the outputs of the most nontraded sectors to

expand. However, what determines the different response of the sectoral outputs under this closure rule?

The different response of sectoral outputs under this closure rule is primarily driven by the different treatment of the savings-investment identity and foreign savings. With exogenous investment, exogenous savings rates and, thus, exogenous marginal propensities to consume, under this closure rule, there is less demand pressure on the domestic markets and hence lower real exchange rate appreciation. This eventually results, overall, in the lower contraction of the non-oil traded sectors and in the lower expansion of the nontraded sectors under this closure rule than under the other closure rules (compare Tables 8A.1, 8C.1 and 8D.1).

In Chapter 5, I determined that under the foreign closure rule, the share of private consumption in total consumption ( $s_{gh}$ ) largely determines the extent of the demand effect. In what follows, I create an additional table that ranks outputs along with the corresponding shares of private consumption in the total consumption in ascending order and determine whether the findings of the model discussed in Chapter 5 hold here as well (Table 8D.2).

In general, I observe that the findings of the model discussed in Chapter 5 also hold in this model. For instance, the manufacture of tobacco products (ctob) and manufacture of food products and beverages (cfood) have the largest shares of private consumption in total consumption across manufacturing sectors and they are the only expanding sectors in the manufacturing sectors group. For other contracting sectors with a high share of private consumption of their commodities, it appears that the transformability and import-competing effects outweigh the demand effect. For instance, the construction sector (ccnst), which was the most growing under the neoclassical closure rule, shrinks under this closure rule. And manufacture of chemicals and chemical products (cchem), which contracted largely under the neoclassical and Johansen closure rule, also contracts under the foreign closure rule, but less so than under the neoclassical and Johansen closure rules.

### *Adjustments in exports, imports and domestic sales of non-oil commodities*

I find that adjustments in exports, imports, and domestic sales across commodities are in general in line with the findings of Chapter 5 (Tables 8D.4 to 8D.6). I find a lower decrease in exports, a lower increase in imports, and a lower increase in domestic sales across commodities overall under this closure rule. As was discussed above, this can be largely explained by a lower extent of the real exchange rate appreciation and hence a lower extent of the substitution effect for exports, imports, and domestic sales of non-oil commodities.

### *Macro response*

Since the foreign closure rule is more restrictive than the other macro closure rules, I find that in general the economy performs better under this macro closure rule. I find a lower increase in real total absorption, a slight increase in real exports, and a lower increase in real imports (Table 8B.2). In addition, I find that the Dutch disease index decreases less than under the other macro closure rules (Table 8B.1). The CPI and DPI increase less. Foreign savings as a share of nominal GDP decreases, government savings as a share of GDP increases.

## 8.4 Sensitivity Analysis

This section presents the results from two sensitivity analyses. The first sensitivity analysis examines the sensitivity of the results with respect to a 15-percent increase in the export price of crude oil and natural gas (in FCU).<sup>77</sup> The second sensitivity analysis examines the robustness of the results with respect to the underlying structural parameters.

The first sensitivity analysis is performed to determine whether the increase in the export price of crude oil and natural gas of different magnitudes triggers nonlinear results. Namely, it aims to uncover whether decreasing the export price of crude oil and natural gas by one half compared to that in the benchmark simulation scenario<sup>78</sup> will decrease the results of the model exactly by one half or will decrease them more or less than by one half. The second sensitivity analysis aims to apportion the uncertainty in the results due to the underlying parameters. For these purposes, I carry out the Monte-Carlo sensitivity analysis<sup>79</sup> and calculate the Spearman correlation coefficients<sup>80</sup> between some variables of interest and all of the structural parameters.

### 8.4.1 Sensitivity Analysis: 15-percent Increase in the Export Price of Crude Oil and Natural Gas

Overall, the effect of the 15-percent increase in the export price of crude oil and natural gas on structural adjustments is almost half of that observed under the 30-percent increase in the export price of crude oil and natural gas (compare Tables in Appendix 8E with the corresponding ones in Appendix 8D<sup>81</sup>). Being close to one half but not exactly one half indicates the presence of nonlinearity. The nonlinearity curvature has a convex shape, which implies that, decreasing the export price of crude oil and natural gas by one half relative to the benchmark simulation scenario will not decrease the results by one half exactly, but will decrease them by a slightly higher rate than one half. The nonlinearity occurs primarily due to the presence of the diminishing returns of the variables with respect to the increase in the export price of crude oil and natural gas.<sup>82</sup>

### 8.4.2 Systematic Sensitivity Analysis

Since the structural parameters used in the study are entirely excerpted from the literature, it is necessary to determine the robustness of the results with respect to these parameters.

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<sup>77</sup> The analysis employs the foreign closure rule and FAC1.

<sup>78</sup> Henceforth, I refer to the 30-percent increase in the export price of crude oil and natural gas as a benchmark simulation.

<sup>79</sup> Monte-Carlo sensitivity analysis is a stochastic sensitivity analysis that is based on performing multiple evaluations with a randomly selected model output, and then using the results of these evaluations to approximate the mean, variance, and distribution of a particular variable (Saltelli et al., 2000).

<sup>80</sup> The Spearman correlation coefficient is a measure of correlation between a variable of interest and a parameter, which is computed by using ranks of both a variable of interest and a parameter instead of using the raw values (Saltelli et al., 2000).

<sup>81</sup> Note that the 30-percent increase in the export price of crude oil and natural gas corresponds to the 35-percent increase in the export price of crude oil (see Chapter 7).

<sup>82</sup> I also conducted a 60-percent increase in the export price of crude oil and natural gas. The results under the 60-percent increase support this argument. However, due to space limitations, I do not include these results in the study. An interested reader can obtain the results from this simulation upon request.

Conventionally, this is performed using a sensitivity analysis, defined in the literature as “the study of how the variation in the output of a model can be apportioned, qualitatively or quantitatively to different sources of variation and of how the given model depends upon the information fed into it” (Saltelli et al., 2000).

Despite the popularity of sensitivity analysis now, it was not popular until the very early 1980s. The popularity of sensitivity analysis in economic research can be largely attributed to Leamer. He was among the first researchers who stressed the importance of conducting sensitivity analysis in economic science. In his study, Leamer (1985) underlines the strong need for the “organized sensitivity analyses in economics” that he calls “global sensitivity analyses”.

Another study that urges to apply systematic sensitivity analysis in applied general equilibrium models is Harrison et al.’s (1993) study. It argues that systematic sensitivity analysis should be applied to all policy simulations. The study states that, to a large extent, the “approach to the question of the robustness of applied GE analysis, urging the undertaking of systematic sensitivity analyses, is no more than requesting that currently implicit and ad hoc processes be made explicit and more systematic.”

The present study employs a systematic sensitivity analysis based on the Monte-Carlo approach. To some extent, it was inspired by Jensen and Tarr’s (2008) study. Jensen and Tarr’s (2008) study examined the robustness of the results using the Monte-Carlo approach. The accuracy of the Monte-Carlo approach strongly depends on the number of runs. This approach delivers reliable and systematic insights if the number of model runs is sufficiently high (Haber, 1970; Arndt, 1996). In the present study, as in Jensen and Tarr’s (2008) study I ran the model 30,000 times<sup>83</sup>, which should be sufficient to obtain plausible results.

Earlier in this chapter, I examined the effects of the oil export price increase under three different macro closure rules using FAC1. Here, I conduct a sensitivity analysis under the foreign closure rule only. I chose this particular macro closure rule for several reasons. First, compared to the other macro closure rules, it represents the most appealing and the most efficient scenario in response to the oil export price increase. Second, the robustness of the results with respect to the parameters used is not expected to vary largely across different macro closure rules given that to some extent similar effects are observed across them. Third, to save space, I limit the analysis by employing only one macro closure rule.

Given the sectoral disaggregation, the model employs 243 exogenous parameters: 41 Armington elasticities of substitution, 41 elasticities of transformation, 52 income elasticities of the demand of rural households, 52 income elasticities of the demand of urban households, 55 elasticities of substitution between capital and labor, and 2 Frisch parameters for urban and rural households. I assume that the parameters are stochastically independent. Given no prior information concerning the distribution of the parameters, I assume the uniform distribution for all parameters. The ranges of the parameters’ variation are shown in Table 8F.1 in Appendix 8F.

Appendix 8F contains detailed results on the distribution of the effects of the 35-percent increase in the oil export price on aggregate outputs, exports and employment in all sectors. The appendix also shows the calculated Spearman correlation coefficients between the variables of interest and the parameters employed in the model. In the nonlinear model, the

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<sup>83</sup> The model has been run 30,000 times; however, the results reported here are based on the results from 29,730 runs. This is because for some sets of parameters (in 270 times out of 30,000 times) I faced infeasible solutions. Therefore, these solutions have been removed from the analysis.

Spearman correlation coefficients tend to perform better than the linear correlation coefficients (Saltelli et al., 2000). Hence, I use the Spearman correlation coefficients in what follows.

Figures 8F.1 and 8F.2 show the distribution of the effect of the oil export price increase on real exports. It appears that real exports change in most cases between 0.1 percent and 6 percent. The minimum value is -1.95 percent and the maximum value is 9.35 percent. The statistics shows that 14 percent of the solutions are below percentage change in real exports of 0.1 percent, and that 2.0 percent of solutions are above a percentage change in real exports of 6 percent. More than 80 percent of the solutions yield a percentage change in real exports between 0.1 percent and 6 percent. Thus, in the considered set of configuration of parameters, real exports are most likely expected to grow rather than to fall in the wake of the oil export price increase.

Figures 8F.3 to 8F.57 show the distribution of the impacts on the outputs, employment, and exports in all the 55 sectors under consideration. It appears that the outputs of most of the sectors are more robust to the variation in the parameters than employment and exports, whereby the latter exhibit a large sensitivity to the chosen configuration of parameters.

Table 8F.2 shows the range of variation in the variables of interest and the frequency of positive changes in the variables. Overall, qualitative changes in the variables obtained earlier hold overall for most of the configurations. Earlier, I observed that most of the traded sectors contract and most of the nontraded sectors expand. The sensitivity results show that the probability that traded sectors expand is low, whereas the probability that nontraded sectors expand is high. In the considered set of configuration of parameters, the crude petroleum and natural gas sector expands unambiguously.

Tables 8F.3 to 8F.12 show the calculated Spearman correlation coefficients between the outputs and exports with structural parameters. Tables 8F.3 to 8F.12 consist of many details that, at first sight, are difficult to absorb. To provide a better understanding, I constructed Tables 8F.13 and 8F.14 that show the Spearman correlation coefficients between outputs, exports and the most important parameters. The most relevant parameters chosen are those that are strictly greater or equal to 0.5 in absolute value. In what follows, I discuss first the correlation between the outputs of traded sectors with parameters, second the correlation between the outputs of nontraded sectors with parameters, and third the correlation between the exports with parameters.

It appears that the most important parameter that determines the variation in all non-crude petroleum and natural gas traded sectors outputs is the elasticity of substitution between capital and labor in the crude petroleum and natural gas sector ( $\sigma_{va\_cpetr}$ ). These outputs are negatively correlated with this parameter, which is primarily because the larger this parameter is, the larger the demand for labor in the crude petroleum and natural gas sector is. This, in turn, causes a larger outflow of labor from other non-crude petroleum and natural gas traded sectors and, hence, causes a decrease in their outputs. Additionally, these outputs are negatively correlated with their own elasticities of substitution between capital and labor. The larger these elasticities, the larger the contraction of these sectors' outputs. These outputs are also negatively correlated with the own Armington elasticities of substitution and elasticities of transformation. This is due to the earlier discussed import-competing and transformability effects. The larger the transformability and import-competing effects in the non-crude petroleum and natural gas traded sectors, the larger the decline in the outputs of these sectors. The own income elasticities of the demand of rural and urban households are to some extent responsible for demand effects that tend to decrease the extent of contraction of these sectors. This is revealed in the positive correlation between these outputs and these elasticities.

Further, in most of the cases, the outputs of most of the other traded sectors are positively correlated with the elasticity of substitution between capital and labor in the iron and steel sector ( $\sigma_{va\_ciron}$ ). It is natural to expect this because the iron and steel sector is the most labor intensive across the largely traded sectors. As the oil export price increases, the marginal product of labor in the crude petroleum and natural gas sector increases. This, in turn, increases the demand for labor in this sector. Since the iron and steel sector is largely labor intensive, larger  $\sigma_{va\_ciron}$  tends to cause a smaller outflow of labor from the non-crude petroleum and natural gas traded sectors other than the iron and steel sector. Therefore, in most of the cases, the outputs of these sectors are positively correlated with  $\sigma_{va\_ciron}$ .

For most of the purely nontraded commodities except for recycling services (*crec*), research and development services (*cres*) and sewerage, and refuse disposal services, sanitation and similar services (*csew*) there is a positive correlation between these outputs and the elasticities of substitution between capital and labor in the crude petroleum and natural gas sector ( $\sigma_{va\_cpetr}$ ). Why does this occur? This is primarily due to the strong demand effect. Since these sectors are purely nontraded, the expansion of the crude petroleum and natural gas sector tends to increase overall income and, hence, boost domestic demand. The higher the  $\sigma_{va\_cpetr}$ , the larger the expansion of the crude petroleum and natural gas sector and, thus, the larger the increase in overall income, which brings about a larger expansion of the purely nontraded sectors. Therefore, most of the outputs of the purely nontraded sectors are positively correlated with  $\sigma_{va\_cpetr}$ . For similar reasons, these outputs tend to positively correlate with the own elasticities of substitution between capital and labor in these sectors. Most of the outputs of the purely nontraded sectors are negatively correlated with the income elasticities of the demand of households for other commodities. They tend to decrease the extent of the increased demand for these commodities.

For most of the commodities, exports are negatively correlated with their own elasticities of transformation, elasticities of substitution between capital and labor, income elasticities of the demand of rural and urban households, and the elasticity of substitution between labor and capital in the crude petroleum and natural gas sector. It is natural to expect this, given that the mentioned elasticities tend to undermine the exports of these sectors. The elasticities of transformation tend to increase the competition between corresponding exported and domestic goods, higher elasticities of substitution between capital and labor tend to increase the outflow of labor from these sectors, and income elasticities of the demand of both households increase the demand effect that favors domestic sales and, hence, undermines exports. Exports of most commodities are positively correlated with the Armington elasticities of substitution for the own commodities, with the elasticities of transformation and Armington elasticities of substitution for some other commodities and in some cases with the elasticities of substitution between capital and labor in the iron and steel sector ( $\sigma_{va\_ciron}$ ), the trade sector ( $\sigma_{va\_ctrd}$ ), and the transport sector ( $\sigma_{va\_ctrns}$ ). Higher Armington elasticities of substitution with real appreciation of the exchange rate tend to decrease the amount of demand for domestically supplied goods, which, in turn, has a positive effect on exports because domestically supplied goods and exports are transformable. Higher Armington elasticities of substitution and elasticities of transformation for other commodities increase the flow of labor out of those sectors and the flow into the sectors with higher marginal products of labor. This might explain why the exports of some goods are positively correlated with the elasticities of transformation and Armington elasticities of substitution for some other goods. Finally, the positive correlation between exports and the elasticities of substitution between capital and labor in the iron and steel, trade, and transport sectors can be partly explained by their high labor intensity.

## 8.5 Conclusions

In this chapter I applied Lofgren et al.'s (2002) model to a complete version of the SAM for Kazakhstan to evaluate the possible effects of the oil export price increase on Kazakhstan's economy under alternative macro closure rules, such as the neoclassical, Johansen, and foreign closure rules.

I found that there are three main factors that explain adjustments in the aggregate outputs of the non-crude petroleum and natural gas sectors. The *first* factor is a sectoral content of trade. The higher the sectoral content of trade is, the more likely that this sector will contract and vice versa. The *second* factor is the allocation of demand for a particular commodity across its intermediate use and private consumption. The more the demand for a particular commodity is allocated for intermediate use and less for private consumption, the more likely that the sector that produces this commodity will contract in the wake of the oil export price increase although its sectoral content of trade might be low enough and vice versa. And, finally and most importantly, the *third* factor is the effect of the closure rule. The third factor provides more evidence that supports the finding that different closure rules might lead to different results and therefore have to be chosen carefully. Otherwise, one might face the problem of the wrong inference. In what follows, I summarize the main results under the different closure rules.

Under the neoclassical closure rule because investment is endogenously determined, the demand effect can be stronger than the import-competing and transformability effects for some investment goods. For instance, the construction sector expands because its commodity is largely used for investment purposes. Under the Johansen closure rule, investment is exogenously given and nongovernment savings rates are endogenously determined. To keep the savings-investment identity in equilibrium, nongovernment institutions savings rates, including the household savings rates decline, which, in turn, cause the household propensity to consume to rise. This, in turn, causes the larger contraction of most of the traded sectors and the larger expansion of most of the nontraded sectors than is the case with the other closure rules.

Under the foreign closure rule, foreign savings are flexible, but the investment and the nongovernment savings rates are fixed. Oil export price increase under this treatment of macroeconomic constraints causes most of the traded sectors to contract less and most of the nontraded sectors to expand less than is the case with the other macro closure rules. Under the foreign closure rule, the real exchange rate appreciates the least, compared to other closure rules, which causes a comparatively a lower increase in private consumption, a lower increase in imports, a lower decrease in exports, and, hence, a lower decrease in the Dutch disease index.

To check the nonlinearity of the effects and determine the robustness of the results with respect to the extraneous parameters, I carry out a sensitivity analysis. To check the nonlinearity of the effects, I impose a 15-percent increase in the export price of crude oil and natural gas and compare these results with those obtained when a 30-percent increase was imposed. Overall, the trends of the results across the two types of shocks<sup>84</sup> are similar. The sectors that expanded or contracted under the 30-percent increase expand or contract under the 15-percent increase as well. However, the difference in the magnitudes is only almost half and not exactly one half of that observed under the 30-percent increase. Being close to one half, but not exactly one half indicates the presence of nonlinearity. The nonlinearity

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<sup>84</sup> Here two shocks refer to the 15- and 30-percent increase in the export price of crude oil and natural gas.



curvature has a convex shape, which implies that decreasing the oil export price increase by one half relative to the benchmark simulation scenario will not decrease the results by one half exactly, but will decrease by a higher rate. I can experiment further and impose different types of shocks of different magnitudes; however, the main results observed here still apply.

The robustness of the results with respect to extraneous parameters was tested using the Monte-Carlo approach. To obtain the distribution of the variables of interest and calculate the Spearman correlation coefficients, I ran the model 30,000 times. I obtained the distribution for percentage changes in real exports, outputs, exports, and labor. Real exports do not show a large variation. More than 80 percent of the solutions show a percentage change in the real exports between 0.1 percent and 6 percent. Thus, depending on the set of parameters used, real exports will most likely increase, rather than decrease, in the wake of the oil export price increase under the foreign closure rule.

Overall, outputs are more robust to parameter variations than exports and labor. The results show that the likelihood that traded sectors expand is low, but the likelihood that nontraded sectors expand is high. In the set of the considered configuration of parameters, the crude petroleum and natural gas sector expands unambiguously.

It appears that the most important parameter for most of the outputs and exports is the elasticity of substitution between capital and labor in the crude petroleum and natural gas sector. The larger this elasticity of substitution is, the larger the expansion of the crude petroleum and natural gas should be, the larger the contraction of the traded sectors is, and the larger the expansion of most purely nontraded sectors is. Other parameters that affect the distribution of variables of interest are the Armington elasticities of substitution, elasticities of transformation, income elasticities of the demand of both groups of households, and elasticities of substitution between capital and labor in the most labor-intensive and traded sectors, such as the iron and steel sector.

This chapter showed and provided a detailed explanation of the possible effects of the oil export price increase on Kazakhstan's economy. Although the economy in reality is subject to many types of shocks, examining the effects of a single shock in isolation is useful. Since to the best of my knowledge, there are no studies that examine the effects of the oil export price increase on Kazakhstan's economy using an economy-wide framework, this study contributes to the existing literature by filling some gaps. Certainly, the model used here has some certain limitations, which are necessary to overcome. However, due to space constraints, I leave this research for the future. Next chapter provides a general overview of the study and provides recommendations and directions for future research.

## Appendix 8A Effects of the 35-percent Increase in the Oil Export Price under the Neoclassical Closure Rule

**Table 8A.1 Effects of the 35-percent increase in the oil export price on sectoral adjustments under the neoclassical closure rule**

No	Commodity	<i>QX</i> 1	<i>QVA</i> 2	<i>QINTA</i> 3	<i>QQ</i> 4	<i>QD</i> 5	<i>QF<sub>lab</sub></i> 6	<i>PX</i> 7	<i>PVA</i> 8	<i>PINTA</i> 9	<i>PQ</i> 10	<i>PDD</i> 11	<i>WF<sub>lab</sub></i> 12	<i>WF<sub>cap</sub></i> 13
<i>Products of agriculture, forestry and fishing</i>														
1.	cagr	-0.32	-0.32	-0.32	1.34	1.17	-1.63	1.20	0.23	2.38	1.47	1.52	5.91	-1.12
2.	cfor	-1.20	-1.20	-1.20	0.23	-0.45	-2.11	1.55	1.14	2.31	1.48	1.71	5.91	-4.80
3.	cfish	-0.40	-0.40	-0.40	-0.41	-0.41	-1.72	-0.08	-0.92	1.21	-0.02	-0.02	5.91	-2.91
<i>Products of mining</i>														
4.	cmin	-2.87	-2.87	-2.87	-1.57	-1.64	-5.37	0.08	-7.00	3.52	0.73	0.75	5.91	-19.61
<b>5.</b>	<b>cpetr</b>	2.83	2.83	2.83	1.52	-17.85	13.63	30.53	74.58	7.65	15.05	23.47	5.91	100.68
6.	core	-3.08	-3.08	-3.08	-4.28	-4.17	-5.26	-1.39	-5.47	1.76	-1.17	-1.21	5.91	-19.17
7.	comin	-3.18	-3.18	-3.18	0.26	-0.27	-3.97	2.37	1.63	2.94	3.17	3.35	5.91	-13.52
<i>Products of manufacturing</i>														
8.	cfood	-1.00	-1.00	-1.00	2.60	0.94	-4.11	2.83	2.93	2.73	2.85	3.41	5.91	2.01
<b>9.</b>	<b>ctob</b>	0.81	0.81	0.81	2.57	1.87	2.32	4.69	7.33	3.01	4.43	4.67	5.91	8.11
10.	ctex	-1.60	-1.60	-1.60	0.66	-0.68	-8.57	0.93	-0.09	1.63	1.30	1.75	5.91	-1.36
11.	cwear	-2.29	-2.29	-2.29	1.18	-1.31	-7.40	1.63	1.49	1.76	1.24	2.09	5.91	-0.36
12.	cleat	-4.85	-4.85	-4.85	-0.71	-2.39	-13.32	0.10	-1.64	1.38	1.14	1.71	5.91	-5.45
13.	cwood	-3.87	-3.87	-3.87	2.27	-2.91	-10.09	1.30	0.43	2.05	1.15	2.92	5.91	-2.66
14.	cpulp	-3.25	-3.25	-3.25	-0.32	-2.43	-10.39	0.69	-0.34	1.29	0.33	1.05	5.91	-2.92
15.	cpubl	-2.59	-2.59	-2.59	0.95	-2.24	-3.81	3.11	4.85	2.08	2.08	3.18	5.91	2.69
16.	ccoke	-6.62	-6.62	-6.62	-1.48	-3.97	-21.51	3.49	-7.73	7.60	3.11	4.00	5.91	-12.61
17.	cchem	-12.37	-12.37	-12.37	0.13	-7.63	-24.36	-0.12	-5.76	2.92	0.38	3.12	5.91	-15.14
18.	crub	-4.53	-4.53	-4.53	1.97	-2.88	-11.91	0.94	-0.64	1.91	1.02	2.68	5.91	-4.23
<b>19.</b>	<b>cmnmt</b>	0.92	0.92	0.92	4.65	1.23	1.94	4.76	6.76	3.23	3.16	4.31	5.91	7.54
20.	ciron	-4.65	-4.65	-4.65	-1.69	-2.16	-13.00	-0.32	-1.52	0.42	0.55	0.71	5.91	-5.17
21.	cfmet	-1.56	-1.56	-1.56	4.27	0.19	-4.31	2.73	3.56	2.21	2.01	3.38	5.91	2.27
22.	cmach	-2.23	-2.23	-2.23	10.83	3.16	-4.52	3.02	3.94	2.15	1.37	3.82	5.91	2.09
23.	cofic	-6.60	-6.60	-6.60	0.70	-7.40	-17.32	-0.30	-3.86	1.39	0.24	3.09	5.91	-8.93
24.	celmc	-8.88	-8.88	-8.88	10.63	0.67	-16.82	0.94	-1.48	1.69	0.17	3.37	5.91	-8.49
25.	crad	-4.19	-4.19	-4.19	3.37	-2.09	-11.41	0.62	-0.47	1.14	0.24	2.07	5.91	-3.80
26.	cmed	-1.35	-1.35	-1.35	9.28	1.80	-4.09	2.33	3.57	1.62	0.77	3.18	5.91	2.46
<b>27.</b>	<b>cmvec</b>	0.92	0.92	0.92	8.80	1.00	1.27	4.54	6.21	3.21	1.17	3.71	5.91	6.98
<b>28.</b>	<b>cotr</b>	0.14	0.14	0.14	6.80	0.24	0.20	3.84	5.96	2.15	1.68	3.85	5.91	6.08
29.	cfurn	-1.72	-1.72	-1.72	4.21	-0.81	-4.80	2.29	3.27	1.77	1.22	2.89	5.91	1.86
30.	crec	-0.37	-0.37	-0.37	-0.37	-0.37	-0.92	4.30	5.45	3.79	4.28	4.28	5.91	5.14
<i>Electrical energy, gas and hot water</i>														
<b>31.</b>	<b>cel</b>	0.65	0.65	0.65	1.62	1.24	1.35	6.14	6.50	5.87	5.64	5.78	5.91	7.05
<b>32.</b>	<b>cwat</b>	3.30	3.30	3.30	3.30	3.30	8.26	7.03	9.92	4.32	7.03	7.03	5.91	12.80
<i>Construction works and services</i>														
<b>33.</b>	<b>cnst</b>	9.12	9.12	9.12	13.72	9.27	24.14	8.29	14.36	2.89	6.52	7.94	5.91	20.46
34.	ctrd	-1.92	-1.92	-1.92	-1.91	-1.91	-4.96	3.77	3.94	3.56	3.77	3.77	5.91	2.75
<b>35.</b>	<b>chot</b>	2.35	2.35	2.35	2.35	2.35	5.02	6.71	7.55	5.38	6.71	6.71	5.91	9.05
<b>36.</b>	<b>cretr</b>	3.15	3.15	3.15	3.15	3.15	6.41	5.98	7.90	4.18	5.98	5.98	5.91	9.91
<b>37.</b>	<b>ccant</b>	3.63	3.63	3.63	3.63	3.63	7.41	6.64	8.19	3.59	6.64	6.64	5.91	10.52
38.	ctrns	-2.41	-2.41	-2.41	2.45	0.91	-6.25	3.16	3.41	2.95	3.33	3.85	5.91	1.92
39.	ccom	-3.33	-3.33	-3.33	-1.02	-2.00	-5.41	4.23	4.11	4.42	4.17	4.52	5.91	1.34
40.	cfini	-0.26	-0.26	-0.26	1.13	0.08	-0.81	5.72	5.45	6.35	5.43	5.79	5.91	5.23
41.	cins	-3.58	-3.58	-3.58	3.60	-3.11	-6.14	4.00	3.68	4.74	1.80	4.10	5.91	0.72
<b>42.</b>	<b>caux</b>	0.08	0.08	0.08	0.08	0.08	26.49	21.12	27.55	6.98	21.12	21.12	5.91	27.63
<b>43.</b>	<b>cest</b>	1.74	1.74	1.74	1.74	1.74	12.69	10.33	14.87	6.56	10.33	10.33	5.91	16.45
44.	crent	-4.37	-4.37	-4.37	0.88	-1.15	-12.90	0.02	-1.66	2.97	0.01	0.69	5.91	-5.08
<b>45.</b>	<b>ccomp</b>	5.32	5.32	5.32	7.60	5.40	8.43	6.56	8.39	4.65	5.84	6.57	5.91	12.94
46.	cres	-1.50	-1.50	-1.50	-1.50	-1.50	-2.21	4.44	5.31	3.32	4.44	4.44	5.91	4.05
<b>47.</b>	<b>cobus</b>	0.53	0.53	0.53	6.54	1.15	2.19	6.51	7.30	3.52	4.81	6.64	5.91	7.75
48.	cpa	-1.96	-1.96	-1.96	2.04	1.44	-2.61	4.65	5.35	4.06	5.16	5.36	5.91	3.71
<b>49.</b>	<b>ceduc</b>	1.13	1.13	1.13	1.13	1.13	1.48	5.89	6.21	5.17	5.89	5.89	5.91	7.16
<b>50.</b>	<b>chelt</b>	0.82	0.82	0.82	0.82	0.82	1.43	4.61	6.42	2.91	4.61	4.61	5.91	7.12
<b>51.</b>	<b>csew</b>	0.93	0.93	0.93	0.93	0.93	3.32	5.78	7.90	4.22	5.78	5.78	5.91	8.70
<b>52.</b>	<b>cmemb</b>	3.09	3.09	3.09	3.09	3.09	5.35	7.83	7.75	7.97	7.83	7.83	5.91	10.39
<b>53.</b>	<b>crecr</b>	0.68	0.68	0.68	1.06	0.68	1.23	4.81	6.37	3.65	4.69	4.82	5.91	6.94
<b>54.</b>	<b>coser</b>	2.48	2.48	2.48	2.48	2.48	4.64	5.99	7.68	3.70	5.99	5.99	5.91	9.79
<b>55.</b>	<b>chh</b>	2.73	2.73	2.73	2.73	2.73	10.83	10.70	12.49	5.35	10.70	10.70	5.91	14.92

Notes: Shaded cells in the table denote percentage change in quantities and prices for nontraded goods. Commodities which outputs increase are shown in bold font. Notation for variables is defined in Appendix 7A.1, notation for commodities is defined in Appendix 6A. Subscripts *lab* and *cap* denote labor and capital respectively.

**Table 8A.2 Ranking of the expanding sectors in descending order under the neoclassical closure rule**

No	Commodity	% change in QX 1	Traded (t) or nontraded (n) 2	QD/QX 3	QD/QQ 4
<i>Products of mining</i>					
<b>5.</b>	<b>cpetr</b>	2.83	t	medium	medium+
<i>Products of manufacturing</i>					
<b>19.</b>	<b>cmmmt</b>	0.92	t	high +	medium+
<b>27.</b>	<b>cmvec</b>	0.92	t	high +	medium-
<b>9.</b>	<b>ctob</b>	0.81	t	high +	high+
<b>28.</b>	<b>cotr</b>	0.14	t	high +	medium-
<i>Electrical energy, gas and hot water</i>					
<b>32.</b>	<b>cwat</b>	3.3	n		
<b>31.</b>	<b>cel</b>	0.65	t	high +	high+
<i>Construction works and services</i>					
<b>33.</b>	<b>ccnst</b>	9.12	t	high +	high-
<b>45.</b>	<b>ccomp</b>	5.32	t	high +	high-
<b>37.</b>	<b>ccant</b>	3.63	n		
<b>36.</b>	<b>cretr</b>	3.15	n		
<b>52.</b>	<b>cmemb</b>	3.09	n		
<b>55.</b>	<b>chh</b>	2.73	n		
<b>54.</b>	<b>coser</b>	2.48	n		
<b>35.</b>	<b>chot</b>	2.35	n		
<b>43.</b>	<b>cest</b>	1.74	n		
<b>49.</b>	<b>ceduc</b>	1.13	n		
<b>51.</b>	<b>csew</b>	0.93	n		
<b>50.</b>	<b>chelt</b>	0.82	n		
<b>53.</b>	<b>crecr</b>	0.68	t	high +	high+
<b>47.</b>	<b>cobus</b>	0.53	t	high +	medium+
<b>42.</b>	<b>caux</b>	0.08	n		

Note: Shaded cells in the table denote percentage changes in quantities of nontraded goods. Commodities which outputs increase are shown in bold font. Notation for commodities is defined in Appendix 6A. Column 1 shows percentage change in outputs, column 3 shows the shares of domestic sales in outputs, column 4 shows the shares of domestic sales in composite demand. The shares  $QD/QX$  and  $QD/QQ$  are described qualitatively as follows:

- low implies that the shares are in the range of 0.01 to 0.09;
- medium- implies that the shares are in the range of 0.10 to 0.50;
- medium implies that the shares are in the range of 0.51 to 0.69;
- medium+ implies that the shares are in the range of 0.70 to 0.799;
- high- implies that the shares are in the range of 0.80 to 0.89;
- high implies that the shares are in the range of 0.90 to 0.95;
- high+ implies that the shares are in the range of 0.951 to 0.9999.

**Table 8A.3 Ranking of contracting sectors in descending order under the neoclassical closure rule**

No	Commodity	% change in QX 1	Traded (t) or nontraded(n) 2	QD/QX 3	QD/QQ 3
<b>Products of agriculture, forestry and fishing</b>					
1.	cagr	-0.32	t	medium +	high+
3.	cfish	-0.4	t	high +	high+
2.	cfor	-1.2	t	high	high-
<b>Products of mining</b>					
4.	cmin	-2.87	t	medium	high+
6.	core	-3.08	t	medium +	high+
7.	comin	-3.18	t	medium +	high
<b>Products of manufacturing</b>					
30.	crec	-0.37	n		
8.	cfood	-1	t	high -	high-
26.	cmed	-1.35	t	medium +	medium-
21.	cfmet	-1.56	t	high	medium
10.	ctex	-1.6	t	high	medium+
29.	cfurn	-1.72	t	high	medium-
22.	cmach	-2.23	t	high -	medium-
11.	cwear	-2.29	t	high -	medium
15.	cpubl	-2.59	t	high +	medium
14.	cpulp	-3.25	t	high	medium-
13.	cwood	-3.87	t	high	medium-
25.	crad	-4.19	t	medium	medium-
18.	crub	-4.53	t	high +	medium-
20.	ciron	-4.65	t	medium-	medium+
12.	cleat	-4.85	t	medium	medium
23.	cofic	-6.6	t	medium	low
16.	ccoke	-6.62	t	high	medium+
24.	celmc	-8.88	t	medium-	low
17.	cchem	-12.37	t	low	medium-
<b>Construction works and services</b>					
40.	cfini	-0.26	t	high +	high
46.	cres	-1.5	n		
34.	ctrd	-1.92	t	high +	high+
48.	cpa	-1.96	t	high -	high+
38.	ctrns	-2.41	t	high -	high-
39.	ccom	-3.33	t	high -	high
41.	cins	-3.58	t	high +	medium-
44.	crent	-4.37	t	low	low

Note: Shaded cells in the table denote percentage changes in quantities of nontraded goods. Notation for commodities is defined in Appendix 6A. Column 1 shows percentage change in outputs, column 3 shows the shares of domestic sales in outputs, column 4 shows the shares of domestic sales in composite demand. The shares  $QD/QX$  and  $QD/QQ$  are described qualitatively as follows:

- low implies that the shares are in the range of 0.01 to 0.09;
- medium- implies that the shares are in the range of 0.10 to 0.50;
- medium implies that the shares are in the range of 0.51 to 0.69;
- medium+ implies that the shares are in the range of 0.70 to 0.799;
- high- implies that the shares are in the range of 0.80 to 0.89;
- high implies that the shares are in the range of 0.90 to 0.95;
- high+ implies that the shares are in the range of 0.951 to 0.9999.

Table 8A.4 Decomposition of effects of the oil export price increase on sectoral value-added and labor employment under the neoclassical closure rule

No	Commodity	% change in variables						Parameters			Log-lin % change in QVA (2)*(7) or expansion effect	Disaggregation of effects in $QF_{lab}$					
		QVA 1	$QF_{lab}$ 2	PVA 3	$WF_{lab}$ 4	$WF_{cap}$ 5	$Wf_{lab}$ - PVA (4)-(3) 6	$L_a/QVA_a$ 7	$K_a/QVA_a$ 8	$TVA_a/QVA_a$ 9		Check (6)+(7) +(8) 10	$\sigma_a^{va}$ 11	Substitution effect (8)*(11)* ((5)-(4)) 13	Total change in $QF_{lab}$ 14	Due to expan eff (%) 15	Due to subst. eff (%) 16
<i>Products of agriculture, forestry and fishing</i>																	
1.	cagr	-0.32	-1.63	0.23	5.91	-1.12	5.68	0.19	0.80	0.00	1.00	0.24	-0.31	-1.36	-1.67	18.82	81.18
2.	cfor	-1.20	-2.11	1.14	5.91	-4.80	4.77	0.54	0.43	0.03	1.00	0.20	-1.14	-0.92	-2.06	55.38	44.62
3.	cfish	-0.40	-1.72	-0.92	5.91	-2.91	6.84	0.22	0.75	0.03	1.00	0.20	-0.38	-1.33	-1.71	22.25	77.75
<i>Products of mining</i>																	
4.	cmin	-2.87	-5.37	-7.00	5.91	-19.61	12.91	0.49	0.49	0.03	1.00	0.20	-2.62	-2.48	-5.10	51.35	48.65
5.	<b>cpetr</b>	<b>2.83</b>	<b>13.63</b>	74.58	5.91	100.68	<b>-68.66</b>	0.23	0.64	0.13	1.00	0.20	3.12	12.13	15.25	20.47	79.53
6.	core	-3.08	-5.26	-5.47	5.91	-19.17	11.38	0.49	0.39	0.12	1.00	0.20	-2.56	-1.98	-4.54	56.46	43.54
7.	comin	-3.18	-3.97	1.63	5.91	-13.52	4.28	0.74	0.20	0.06	1.00	0.20	-2.94	-0.80	-3.73	78.68	21.32
<i>Products of manufacturing</i>																	
8.	cfood	-1.00	-4.11	2.93	5.91	2.01	2.98	0.24	0.75	0.01	1.00	1.12	-0.97	-3.27	-4.24	22.92	77.08
9.	<b>ctob</b>	<b>0.81</b>	<b>2.32</b>	7.33	5.91	8.11	<b>-1.41</b>	0.33	0.61	0.06	1.00	1.12	0.77	1.49	2.26	33.94	66.06
10.	ctex	-1.60	-8.57	-0.09	5.91	-1.36	6.00	0.18	0.80	0.02	1.00	1.26	-1.52	-7.36	-8.88	17.14	82.86
11.	cwear	-2.29	-7.40	1.49	5.91	-0.36	4.42	0.30	0.69	0.01	1.00	1.26	-2.22	-5.47	-7.70	28.90	71.10
12.	cleat	-4.85	-13.32	-1.64	5.91	-5.45	7.55	0.35	0.64	0.01	1.00	1.26	-4.62	-9.17	-13.80	33.51	66.49
13.	cwood	-3.87	-10.09	0.43	5.91	-2.66	5.48	0.36	0.61	0.03	1.00	1.26	-3.65	-6.57	-10.22	35.74	64.26
14.	cpulp	-3.25	-10.39	-0.34	5.91	-2.92	6.25	0.30	0.69	0.01	1.00	1.26	-3.13	-7.70	-10.84	28.93	71.07
15.	cpubl	-2.59	-3.81	4.85	5.91	2.69	1.06	0.66	0.32	0.01	1.00	1.26	-2.54	-1.30	-3.83	66.12	33.88
16.	ccoke	-6.62	-21.51	-7.73	5.91	-12.61	13.64	0.27	0.68	0.05	1.00	1.26	-5.89	-15.81	-21.70	27.14	72.86
17.	cchem	-12.37	-24.36	-5.76	5.91	-15.14	11.68	0.47	0.51	0.02	1.00	1.26	-11.43	-13.48	-24.91	45.89	54.11
18.	crub	-4.53	-11.91	-0.64	5.91	-4.23	6.56	0.37	0.63	0.01	1.00	1.26	-4.36	-8.01	-12.37	35.22	64.78
19.	<b>cmnmt</b>	<b>0.92</b>	<b>1.94</b>	6.76	5.91	7.54	<b>-0.85</b>	0.46	0.51	0.02	1.00	1.26	0.90	1.05	1.95	46.07	53.93
20.	ciron	-4.65	-13.00	-1.52	5.91	-5.17	7.43	0.34	0.64	0.03	1.00	1.26	-4.36	-8.88	-13.23	32.93	67.07
21.	cfmet	-1.56	-4.31	3.56	5.91	2.27	2.36	0.36	0.64	0.01	1.00	1.26	-1.54	-2.92	-4.46	34.45	65.55
22.	cmach	-2.23	-4.52	3.94	5.91	2.09	1.98	0.48	0.50	0.02	1.00	1.26	-2.16	-2.41	-4.57	47.28	52.72
23.	cofic	-6.60	-17.32	-3.86	5.91	-8.93	9.77	0.36	0.64	0.00	1.00	1.26	-6.30	-11.91	-18.20	34.59	65.41
24.	celmc	-8.88	-16.82	-1.48	5.91	-8.49	7.40	0.50	0.48	0.02	1.00	1.26	-8.42	-8.74	-17.16	49.05	50.95
25.	crad	-4.19	-11.41	-0.47	5.91	-3.80	6.39	0.35	0.64	0.00	1.00	1.26	-4.05	-7.85	-11.90	34.01	65.99
26.	cmed	-1.35	-4.09	3.57	5.91	2.46	2.34	0.32	0.67	0.01	1.00	1.26	-1.32	-2.90	-4.23	31.27	68.73
27.	<b>cmvec</b>	<b>0.92</b>	<b>1.27</b>	6.21	5.91	6.98	<b>-0.29</b>	0.69	0.26	0.05	1.00	1.26	0.88	0.35	1.23	71.26	28.74
28.	<b>cotr</b>	<b>0.14</b>	<b>0.20</b>	5.96	5.91	6.08	<b>-0.05</b>	0.69	0.29	0.02	1.00	1.26	0.14	0.06	0.20	69.18	30.82
29.	cfurn	-1.72	-4.80	3.27	5.91	1.86	2.65	0.35	0.64	0.01	1.00	1.26	-1.68	-3.27	-4.95	33.94	66.06
30.	crec	-0.37	-0.92	5.45	5.91	5.14	0.46	0.40	0.58	0.02	1.00	1.26	-0.36	-0.57	-0.93	39.08	60.92

Effects of the 35-percent Increase in the Oil Export Price under the Neoclassical Closure Rule

Table 8A.4 Continued

No	Commodity	% change in variables					Parameters					$\sigma_a^{va}$	Log-lin % change in QVA (2)*(7) or expansion effect	Disaggregation of effects in $QF_{lab}$				
		QVA 1	$QF_{lab}$ 2	PVA 3	$WF_{lab}$ 4	$WF_{cap}$ 5	$Wf_{lab}$ - PVA (4)-(3) 6	$L_a/QVA_a$ 7	$K_a/QVA_a$ 8	$TVA_a/QVA_a$ 9	Check (6)+(7) +(8) 10			Substitution effect (8)*(11)* ((5)-(4)) 13	Total change in $QF_{lab}$ 14	Due to expan eff (%) 15	Due to subst. eff (%) 16	
<i>Electrical energy, gas and hot water</i>																		
31.	<b>cel</b>	<b>0.65</b>	<b>1.35</b>	6.50	5.91	7.05	<b>-0.58</b>	0.44	0.47	0.09	1.00	1.26	0.60	0.67	1.27	47.08	52.92	
32.	<b>cwat</b>	<b>3.30</b>	<b>8.26</b>	9.92	5.91	12.80	<b>-4.01</b>	0.40	0.57	0.03	1.00	1.26	3.27	4.99	8.25	39.59	60.41	
<i>Construction works and services</i>																		
33.	<b>ccnst</b>	<b>9.12</b>	<b>24.14</b>	14.36	5.91	20.46	<b>-8.45</b>	0.39	0.60	0.01	1.00	1.68	9.36	14.62	23.99	39.03	60.97	
34.	ctrd	-1.92	-4.96	3.94	5.91	2.75	1.97	0.38	0.61	0.01	1.00	1.68	-1.88	-3.24	-5.12	36.70	63.30	
35.	<b>chot</b>	<b>2.35</b>	<b>5.02</b>	7.55	5.91	9.05	<b>-1.64</b>	0.46	0.52	0.02	1.00	1.68	2.31	2.72	5.03	46.00	54.00	
36.	<b>cretr</b>	<b>3.15</b>	<b>6.41</b>	7.90	5.91	9.91	<b>-1.98</b>	0.49	0.50	0.00	1.00	1.68	3.17	3.37	6.54	48.47	51.53	
37.	<b>ccant</b>	<b>3.63</b>	<b>7.41</b>	8.19	5.91	10.52	<b>-2.28</b>	0.50	0.50	0.00	1.00	1.68	3.67	3.89	7.56	48.53	51.47	
38.	ctrns	-2.41	-6.25	3.41	5.91	1.92	2.50	0.37	0.60	0.04	1.00	1.68	-2.30	-4.00	-6.30	36.49	63.51	
39.	ccom	-3.33	-5.41	4.11	5.91	1.34	1.81	0.59	0.37	0.04	1.00	1.26	-3.18	-2.15	-5.33	59.63	40.37	
40.	cfini	-0.26	-0.81	5.45	5.91	5.23	0.47	0.29	0.63	0.07	1.00	1.26	-0.24	-0.55	-0.78	30.25	69.75	
41.	cins	-3.58	-6.14	3.68	5.91	0.72	2.23	0.58	0.42	0.00	1.00	1.26	-3.54	-2.75	-6.29	56.23	43.77	
42.	<b>caux</b>	<b>0.08</b>	<b>26.49</b>	27.55	5.91	27.63	<b>-21.63</b>	0.00	1.00	0.00	1.00	1.26	0.09	27.25	27.34	0.34	99.66	
43.	cest	1.74	12.69	14.87	5.91	16.45	-8.96	0.14	0.85	0.01	1.00	1.26	1.80	11.32	13.13	13.72	86.28	
44.	crent	-4.37	-12.90	-1.66	5.91	-5.08	7.57	0.33	0.67	0.00	1.00	1.26	-4.20	-9.31	-13.51	31.10	68.90	
45.	<b>ccomp</b>	<b>5.32</b>	<b>8.43</b>	8.39	5.91	12.94	<b>-2.48</b>	0.64	0.36	0.00	1.00	1.26	5.37	3.19	8.56	62.72	37.28	
46.	cres	-1.50	-2.21	5.31	5.91	4.05	0.60	0.67	0.32	0.01	1.00	1.26	-1.49	-0.75	-2.23	66.58	33.42	
47.	<b>cobus</b>	<b>0.53</b>	<b>2.19</b>	7.30	5.91	7.75	<b>-1.38</b>	0.24	0.75	0.00	1.00	1.26	0.53	1.74	2.28	23.46	76.54	
48.	cpa	-1.96	-2.61	5.35	5.91	3.71	0.56	0.75	0.25	0.00	1.00	1.26	-1.95	-0.70	-2.65	73.61	26.39	
49.	<b>ceduc</b>	<b>1.13</b>	<b>1.48</b>	6.21	5.91	7.16	<b>-0.29</b>	0.76	0.24	0.00	1.00	1.26	1.13	0.37	1.50	75.21	24.79	
50.	<b>chelt</b>	<b>0.82</b>	<b>1.43</b>	6.42	5.91	7.12	<b>-0.51</b>	0.57	0.43	0.00	1.00	1.26	0.82	0.64	1.46	55.95	44.05	
51.	<b>csew</b>	<b>0.93</b>	<b>3.32</b>	7.90	5.91	8.70	<b>-1.98</b>	0.28	0.71	0.01	1.00	1.26	0.94	2.50	3.43	27.26	72.74	
52.	<b>cmemb</b>	<b>3.09</b>	<b>5.35</b>	7.75	5.91	10.39	<b>-1.84</b>	0.58	0.41	0.01	1.00	1.26	3.08	2.32	5.40	57.03	42.97	
53.	<b>crecr</b>	<b>0.68</b>	<b>1.23</b>	6.37	5.91	6.94	<b>-0.46</b>	0.55	0.44	0.01	1.00	1.26	0.68	0.57	1.25	54.18	45.82	
54.	<b>coser</b>	<b>2.48</b>	<b>4.64</b>	7.68	5.91	9.79	<b>-1.76</b>	0.54	0.46	0.00	1.00	1.26	2.50	2.25	4.75	52.67	47.33	
55.	<b>chh</b>	<b>2.73</b>	<b>10.83</b>	12.49	5.91	14.92	<b>-6.58</b>	0.26	0.73	0.01	1.00	1.26	2.78	8.31	11.09	25.08	74.92	

Notes: Shaded cells in the table denote quantities and prices for nontraded goods. Commodities which outputs increase are shown in bold font. Notation for variables and parameters is defined in Appendix 7A.1, notation for commodities is defined in Appendix 6A. Subscripts  $lab$  and  $cap$  indicate labor and capital respectively.  $L_a$ ,  $K_a$ ,  $TVA_a$  denote labor, capital and total value added net of taxes on production in an activity  $a$  respectively.

Table 8A.5 Disaggregation of the total effect on exports under the neoclassical closure rule

No	Commodity	% change in variables				Parameters			Disaggregation of total effect on QE				
		QE 1	PE 2	PDS 3	Qe/Qx 4	Qd/Qx 5	$\sigma_c^t$ 6	$\sigma_c^a$ 7	Expansion effect or log- lin change in QX 8	Substitution effect (6)*(5)* ((2)-(3)) 9	Total effect (8)+(9) 10	Due to exp. eff (%) (8)/(10) 11	Due to subst. eff. (%) (9)/(10) 12
<b>Products of agriculture, forestry and fishing</b>													
1	cagr	-6.11	-0.01	1.50	0.21	0.79	5.00	3.00	-0.31	-5.97	-6.29	5.00	95.00
2	cfor	-8.63	-0.02	1.71	0.09	0.91	5.00	3.00	-1.14	-7.84	-8.98	12.71	87.29
3	cfish	-0.27	-0.05	-0.08	0.03	0.97	5.00	3.00	-0.38	0.13	-0.25	152.86	-52.86
<b>Products of mining</b>													
4	cmin	-4.26	-0.21	0.33	0.47	0.53	5.00	3.00	-2.62	-1.43	-4.05	64.67	35.33
<b>5</b>	<b>cpetr</b>	<b>6.52</b>	<b>31.45</b>	<b>24.80</b>	<b>0.85</b>	<b>0.15</b>	<b>5.00</b>	<b>3.00</b>	<b>3.12</b>	<b>5.15</b>	<b>8.27</b>	<b>37.76</b>	<b>62.24</b>
<b>6</b>	<b>core</b>	<b>0.82</b>	<b>-0.61</b>	<b>-1.61</b>	<b>0.22</b>	<b>0.78</b>	<b>5.00</b>	<b>3.00</b>	<b>-2.56</b>	<b>3.93</b>	<b>1.36</b>	<b>-187.75</b>	<b>287.75</b>
7	comin	-14.04	-0.03	2.98	0.21	0.79	5.00	3.00	-2.94	-11.85	-14.79	19.86	80.14
<b>Products of manufacturing</b>													
8	cfood	-15.65	-0.41	3.23	0.12	0.88	5.00	3.00	-0.97	-16.04	-17.01	5.72	94.28
9	ctob	-19.96	-0.03	4.91	0.05	0.95	5.00	3.00	0.77	-23.48	-22.71	-3.37	103.37
10	ctex	-11.24	-1.13	1.12	0.09	0.91	5.00	3.00	-1.52	-10.26	-11.78	12.93	87.07
11	cwear	-9.93	-0.01	1.83	0.11	0.89	5.00	3.00	-2.22	-8.16	-10.39	21.42	78.58
12	cleat	-7.79	-0.53	0.61	0.46	0.54	5.00	3.00	-4.62	-3.09	-7.71	59.93	40.07
13	cwood	-22.27	-2.92	1.50	0.05	0.95	5.00	3.00	-3.65	-20.97	-24.62	14.83	85.17
14	cpulp	-14.92	-1.86	0.86	0.07	0.93	5.00	3.00	-3.13	-12.72	-15.86	19.77	80.23
15	cpubl	-18.08	-0.41	3.18	0.02	0.98	5.00	3.00	-2.54	-17.52	-20.06	12.64	87.36
16	ccoke	-53.48	-9.97	4.07	0.06	0.94	5.00	3.00	-5.89	-66.22	-72.11	8.17	91.83
17	cchem	-12.73	-0.21	0.93	0.93	0.07	5.00	3.00	-11.43	-0.41	-11.84	96.55	3.45
18	crub	-38.38	-7.52	1.29	0.05	0.95	5.00	3.00	-4.36	-41.91	-46.27	9.41	90.59
19	cmnmt	-44.35	-6.99	4.83	0.01	0.99	5.00	3.00	0.90	-58.67	-57.78	-1.55	101.55
20	ciron	-6.95	-0.81	0.19	0.52	0.48	5.00	3.00	-4.36	-2.39	-6.75	64.55	35.45
21	cfmet	-20.02	-1.45	3.10	0.09	0.91	5.00	3.00	-1.54	-20.70	-22.24	6.91	93.09
22	cmach	-28.31	-3.18	4.13	0.18	0.82	5.00	3.00	-2.16	-30.11	-32.27	6.70	93.30
23	cofic	-5.17	0.00	-0.47	0.36	0.64	5.00	3.00	-6.30	1.52	-4.78	131.83	-31.83
24	celmc	-13.08	-0.01	2.97	0.70	0.30	5.00	3.00	-8.42	-4.51	-12.92	65.13	34.87
25	crad	-7.10	0.00	1.06	0.42	0.58	5.00	3.00	-4.05	-3.06	-7.10	56.96	43.04
26	cmed	-12.09	0.00	2.98	0.23	0.77	5.00	3.00	-1.32	-11.47	-12.79	10.33	89.67
27	cmvec	-19.16	0.00	4.55	0.00	1.00	5.00	3.00	0.88	-22.67	-21.80	-4.03	104.03
28	cotr	-17.06	0.00	3.86	0.01	0.99	5.00	3.00	0.14	-19.20	-19.06	-0.72	100.72
29	cfurn	-14.28	-0.47	2.48	0.07	0.93	5.00	3.00	-1.68	-13.73	-15.41	10.91	89.09
<b>Electrical energy, gas and hot water</b>													
31	cel	-25.28	0.00	6.26	0.02	0.98	5.00	3.00	0.60	-30.60	-30.01	-1.99	101.99
<b>Construction works and services</b>													
33	ccnst	-26.73	0.00	8.32	0.00	1.00	5.00	3.00	9.36	-41.43	-32.07	-29.19	129.19
34	ctrd	-18.50	0.00	3.77	0.00	1.00	5.00	3.00	-1.88	-18.86	-20.74	9.06	90.94
38	ctrns	-16.48	0.00	3.85	0.19	0.81	5.00	3.00	-2.30	-15.53	-17.83	12.90	87.10
39	ccom	-21.44	0.00	4.52	0.07	0.93	5.00	3.00	-3.18	-21.02	-24.20	13.14	86.86
40	cfini	-24.49	0.00	5.79	0.01	0.99	5.00	3.00	-0.24	-28.57	-28.81	0.82	99.18
41	cins	-20.75	0.00	4.10	0.03	0.97	5.00	3.00	-3.54	-19.95	-23.49	15.06	84.94
44	crent	-4.48	0.00	0.69	0.97	0.03	5.00	3.00	-4.20	-0.12	-4.32	97.22	2.78
45	ccomp	-23.34	0.00	6.57	0.00	1.00	5.00	3.00	5.37	-32.78	-27.41	-19.58	119.58
47	cobus	-26.67	0.00	6.64	0.02	0.98	5.00	3.00	0.53	-32.45	-31.92	-1.67	101.67
48	cpa	-21.89	0.00	5.36	0.15	0.85	5.00	3.00	-1.95	-22.83	-24.78	7.88	92.12
53	crecr	-20.42	0.00	4.82	0.00	1.00	5.00	3.00	0.68	-24.07	-23.40	-2.89	102.89

Notes: Commodities which exports increase are shown in bold font. Notation for variables and parameters is defined in Appendix 7A.1, notation for commodities is defined in Appendix 6A.

**Table 8A.6 Ranking of sectors' exports and domestic producer prices in ascending order under the neoclassical closure rule**

No	Commodity	<i>QE</i>	<i>Qd/Qx</i>	No	Commodity	<i>PDS</i>	<i>Qd/Qx</i>
<i>Products of agriculture, forestry and fishing</i>							
2	cfor	-8.63	high	3	cfish	-0.08	high+
1	cagr	-6.11	medium+	1	cagr	1.50	medium+
3	cfish	-0.27	high+	2	cfor	1.71	high
<i>Products of mining</i>							
7	comin	-14.04	medium+	6	core	-1.61	medium+
4	cmin	-4.26	medium	4	cmin	0.33	medium
<b>6</b>	<b>core</b>	0.82	medium+	7	comin	2.98	medium+
<b>5</b>	<b>cpetr</b>	6.52	medium-	5	cpetr	24.80	medium-
<i>Products of manufacturing</i>							
16	ccoke	-53.48	high	23	cofic	-0.47	medium
19	cmnmt	-44.35	high+	20	ciron	0.19	medium-
18	crub	-38.38	high+	12	cleat	0.61	medium
22	cmach	-28.31	high-	14	cpulp	0.86	high
13	cwood	-22.27	high	17	cchem	0.93	low
21	cfmet	-20.02	high	25	crad	1.06	medium
9	ctob	-19.96	high+	10	ctex	1.12	high
27	cmvec	-19.16	high+	18	crub	1.29	high+
15	cpubl	-18.08	high+	13	cwood	1.50	high
28	cotr	-17.06	high+	11	cwear	1.83	high-
8	cfood	-15.65	high-	29	cfurn	2.48	high
14	cpulp	-14.92	high	24	celmc	2.97	medium-
29	cfurn	-14.28	high	26	cmed	2.98	medium+
24	celmc	-13.08	medium-	21	cfmet	3.10	high
17	cchem	-12.73	low	15	cpubl	3.18	high+
26	cmed	-12.09	medium+	8	cfood	3.23	high-
10	ctex	-11.24	high	28	cotr	3.86	high+
11	cwear	-9.93	high-	16	ccoke	4.07	high
12	cleat	-7.79	medium	22	cmach	4.13	high-
25	crad	-7.10	medium	27	cmvec	4.55	high+
20	ciron	-6.95	medium-	19	cmnmt	4.83	high+
23	cofic	-5.17	medium	9	ctob	4.91	high+
<i>Electrical energy, gas and hot water</i>							
31	cel	-25.28	high+	31	cel	6.26	high+
<i>Construction works and services</i>							
33	ccnst	-26.73	high+	44	crent	0.69	low
47	cobus	-26.67	high+	34	ctrd	3.77	high+
40	cfini	-24.49	high+	38	ctrns	3.85	high-
45	ccomp	-23.34	high+	41	cins	4.10	high+
48	cpa	-21.89	high-	39	ccom	4.52	high
39	ccom	-21.44	high	53	crecr	4.82	high+
41	cins	-20.75	high+	48	cpa	5.36	high-
53	crecr	-20.42	high+	40	cfini	5.79	high+
34	ctrd	-18.50	high+	45	ccomp	6.57	high+
38	ctrns	-16.48	high-	47	cobus	6.64	high+
44	crent	-4.48	low	33	ccnst	8.32	high+

Notes: Commodities which exports increase are shown in bold font. Notation for variables is defined in Appendix 7A.1, notation for commodities is defined in Appendix 6A.

The shares *QD/QX* are described qualitatively:

- *low* implies that the shares are in the range of 0.01 to 0.09;
- *medium-* implies that the shares are in the range of 0.10 to 0.50;
- *medium* implies that the shares are in the range of 0.51 to 0.69;
- *medium+* implies that the shares are in the range of 0.70 to 0.799;
- *high-* implies that the shares are in the range of 0.80 to 0.89;
- *high* implies that the shares are in the range of 0.90 to 0.95;
- *high+* implies that the shares are in the range of 0.951 to 0.9999.



Table 8A.7 Decomposition of total effect on imports under the neoclassical closure rule

Commodity	Parameters	% change in variables			Disaggregation of total effect on QM								
		QM 1	PM 2	PDD 3	Qd/QQ 4	Qm/QQ 5	$\sigma_c^a$ 6	Expansion effect or %change in QQ 7	Substitution effect (6)*(4)* ((3)-(2)) 8	Total effect (7)+(8) 9	Due to exp. eff (%) (7)/(9) 10	Due to subst. eff. (%) (8)/(9) 11	
<b>Agriculture, forestry and fishing</b>													
1	cagr	5.87	0.00	1.52	0.96	0.04	3.00	1.34	4.41	5.75	0.23	0.77	
2	cfor	4.75	0.00	1.71	0.87	0.13	3.00	0.23	4.46	4.69	0.05	0.95	
3	cfish	-0.46	0.00	-0.02	0.98	0.02	3.00	-0.41	-0.05	-0.46	0.89	0.11	
<b>Mining</b>													
4.	cmin	0.60	0.00	0.75	0.97	0.03	3.00	-1.57	2.19	0.62	-2.52	3.52	
5.	cpetr	54.62	0.00	23.47	0.71	0.29	3.00	1.52	50.05	51.57	0.03	0.97	
6.	core	-7.60	0.00	-1.21	0.97	0.03	3.00	-4.28	-3.51	-7.79	0.55	0.45	
7.	comin	10.09	0.00	3.35	0.95	0.05	3.00	0.26	9.53	9.79	0.03	0.97	
<b>Manufacturing</b>													
8.	cfood	11.63	0.00	3.41	0.84	0.16	3.00	2.60	8.62	11.22	0.23	0.77	
9.	ctob	16.81	0.00	4.67	0.95	0.05	3.00	2.57	13.33	15.90	0.16	0.84	
10.	ctex	4.63	0.00	1.75	0.75	0.25	3.00	0.66	3.91	4.58	0.14	0.86	
11.	cwear	4.99	0.00	2.09	0.60	0.40	3.00	1.18	3.77	4.95	0.24	0.76	
12.	cleat	2.71	0.00	1.71	0.67	0.33	3.00	-0.71	3.43	2.72	-0.26	1.26	
13.	cwood	5.83	0.00	2.92	0.40	0.60	3.00	2.27	3.53	5.80	0.39	0.61	
14.	cpulp	0.68	0.00	1.05	0.32	0.68	3.00	-0.32	1.01	0.69	-0.47	1.47	
15.	cpubl	7.39	0.00	3.18	0.67	0.33	3.00	0.95	6.35	7.30	0.13	0.87	
16.	ccoke	8.01	0.00	4.00	0.79	0.21	3.00	-1.48	9.45	7.98	-0.19	1.19	
17.	cchem	1.28	0.00	3.12	0.13	0.87	3.00	0.13	1.19	1.32	0.10	0.90	
18.	crub	5.13	0.00	2.68	0.39	0.61	3.00	1.97	3.14	5.11	0.39	0.61	
19.	cmnmt	14.90	0.00	4.31	0.75	0.25	3.00	4.65	9.65	14.30	0.33	0.67	
20.	ciron	-0.06	0.00	0.71	0.77	0.23	3.00	-1.69	1.66	-0.03	49.43	-48.43	
21.	cfmet	10.70	0.00	3.38	0.61	0.39	3.00	4.27	6.16	10.43	0.41	0.59	
22.	cmach	15.45	0.00	3.82	0.37	0.63	3.00	10.83	4.26	15.09	0.72	0.28	
23.	cofic	1.44	0.00	3.09	0.08	0.92	3.00	0.70	0.76	1.46	0.48	0.52	
24.	celmc	11.19	0.00	3.37	0.05	0.95	3.00	10.63	0.53	11.16	0.95	0.05	
25.	crad	4.12	0.00	2.07	0.12	0.88	3.00	3.37	0.74	4.11	0.82	0.18	
26.	cmed	11.84	0.00	3.18	0.25	0.75	3.00	9.28	2.41	11.69	0.79	0.21	
27.	cmvec	12.67	0.00	3.71	0.33	0.67	3.00	8.80	3.64	12.44	0.71	0.29	
28.	cotr	12.27	0.00	3.85	0.45	0.55	3.00	6.80	5.20	12.00	0.57	0.43	
29.	cfurn	8.06	0.00	2.89	0.43	0.57	3.00	4.21	3.74	7.95	0.53	0.47	
<b>Electrical energy, gas and hot water</b>													
31.	cel	19.82	0.00	5.78	0.98	0.02	3.00	1.62	16.96	18.59	0.09	0.91	
<b>Construction and services</b>													
33.	ccnst	37.43	0.00	7.94	0.84	0.16	3.00	13.72	19.94	33.66	0.41	0.59	
34.	ctrd	9.61	0.00	3.77	1.00	0.00	3.00	-1.91	11.32	9.41	-0.20	1.20	
38.	ctrns	13.03	0.00	3.85	0.87	0.13	3.00	2.45	10.07	12.51	0.20	0.80	
39.	ccom	11.89	0.00	4.52	0.93	0.07	3.00	-1.02	12.58	11.56	-0.09	1.09	
40.	cfini	18.50	0.00	5.79	0.94	0.06	3.00	1.13	16.36	17.49	0.06	0.94	
41.	cins	9.31	0.00	4.10	0.45	0.55	3.00	3.60	5.59	9.19	0.39	0.61	
44.	crent	0.91	0.00	0.69	0.01	0.99	3.00	0.88	0.03	0.91	0.97	0.03	
45.	ccomp	27.58	0.00	6.57	0.90	0.10	3.00	7.60	17.70	25.31	0.30	0.70	
47.	cobus	22.67	0.00	6.64	0.74	0.26	3.00	6.54	14.81	21.35	0.31	0.69	
48.	cpa	18.66	0.00	5.36	0.96	0.04	3.00	2.04	15.51	17.56	0.12	0.88	
53.	crecr	15.94	0.00	4.82	0.97	0.03	3.00	1.06	14.08	15.14	0.07	0.93	

Notes: Notation for variables and parameters is defined in Appendix 7A.1, notation for commodities is defined in Appendix 6A.

**Table 8A.8 Decomposition of total effect on domestic sales under the neoclassical closure rule**

No	Commodity	% change in variables			Parameters			Expansion effect, or log-lin change in QX	Decomposition of total effect on QD			
		QD	PE	PDS	Qe/Qx	Qd/Qx	$\sigma_c^t$		Substitution effect	Total effect	Due to exp.eff (%)	Due to subst.eff. (%)
		1	2	3	4	5	6	7	8	9	10	11
<i>Products of agriculture, forestry and fishing</i>												
1	cagr	1.17	-0.01	1.50	0.21	0.79	5.00	-0.31	1.55	1.24	-25.38	125.38
2	cfor	-0.45	-0.02	1.71	0.09	0.91	5.00	-1.14	0.81	-0.34	339.31	-239.31
3	cfish	-0.41	-0.05	-0.08	0.03	0.97	5.00	-0.38	0.00	-0.38	98.89	1.11
<i>Products of mining</i>												
4	cmin	-1.64	-0.21	0.33	0.47	0.53	5.00	-2.62	1.27	-1.35	194.70	-94.70
5	cpetr	-17.85	31.45	24.80	0.85	0.15	5.00	3.12	-28.13	-25.01	-12.49	112.49
6	core	-4.17	-0.61	-1.61	0.22	0.78	5.00	-2.56	-1.09	-3.65	70.20	29.80
7	comin	-0.27	-0.03	2.98	0.21	0.79	5.00	-2.94	3.22	0.28	-1047.53	1147.53
<i>Products of manufacturing</i>												
8	cfood	0.94	-0.41	3.23	0.12	0.88	5.00	-0.97	2.16	1.19	-81.66	181.66
9	ctob	1.87	-0.03	4.91	0.05	0.95	5.00	0.77	1.22	1.99	38.52	61.48
10	ctex	-0.68	-1.13	1.12	0.09	0.91	5.00	-1.52	0.99	-0.54	283.79	-183.79
11	cwear	-1.31	-0.01	1.83	0.11	0.89	5.00	-2.22	1.05	-1.18	189.15	-89.15
12	cleat	-2.39	-0.53	0.61	0.46	0.54	5.00	-4.62	2.61	-2.01	229.54	-129.54
13	cwood	-2.91	-2.92	1.50	0.05	0.95	5.00	-3.65	1.11	-2.54	143.64	-43.64
14	cpulp	-2.43	-1.86	0.86	0.07	0.93	5.00	-3.13	0.91	-2.23	140.69	-40.69
15	cpubl	-2.24	-0.41	3.18	0.02	0.98	5.00	-2.54	0.40	-2.13	118.86	-18.86
16	ccoke	-3.97	-9.97	4.07	0.06	0.94	5.00	-5.89	3.99	-1.90	309.69	-209.69
17	cchem	-7.63	-0.21	0.93	0.93	0.07	5.00	-11.43	5.29	-6.14	186.24	-86.24
18	crub	-2.88	-7.52	1.29	0.05	0.95	5.00	-4.36	2.13	-2.22	196.05	-96.05
19	cmnmt	1.23	-6.99	4.83	0.01	0.99	5.00	0.90	0.43	1.33	67.57	32.43
20	ciron	-2.16	-0.81	0.19	0.52	0.48	5.00	-4.36	2.60	-1.75	248.60	-148.60
21	cfmet	0.19	-1.45	3.10	0.09	0.91	5.00	-1.54	2.01	0.48	-322.72	422.72
22	cmach	3.16	-3.18	4.13	0.18	0.82	5.00	-2.16	6.44	4.27	-50.60	150.60
23	cofic	-7.40	0.00	-0.47	0.36	0.64	5.00	-6.30	-0.85	-7.15	88.06	11.94
24	celmc	0.67	-0.01	2.97	0.70	0.30	5.00	-8.42	10.39	1.98	-425.38	525.38
25	crad	-2.09	0.00	1.06	0.42	0.58	5.00	-4.05	2.22	-1.83	221.62	-121.62
26	cmed	1.80	0.00	2.98	0.23	0.77	5.00	-1.32	3.42	2.09	-63.10	163.10
27	cmvec	1.00	0.00	4.55	0.00	1.00	5.00	0.88	0.09	0.97	90.30	9.70
28	cotr	0.24	0.00	3.86	0.01	0.99	5.00	0.14	0.11	0.25	55.35	44.65
29	cfurn	-0.81	-0.47	2.48	0.07	0.93	5.00	-1.68	1.01	-0.67	251.32	-151.32
30	crec	-0.37	0.00	4.30	0.00	1.00	0.00	-0.36	0.00	-0.36	100.00	0.00
<i>Electrical energy, gas and hot water</i>												
31	cel	1.24	0.00	6.26	0.02	0.98	5.00	0.60	0.72	1.31	45.47	54.53
32	cwat	3.30	0.00	7.03	0.00	1.00	0.00	3.27	0.00	3.27	100.00	0.00
<i>Construction works and services</i>												
33	ccnst	9.27	0.00	8.32	0.00	1.00	5.00	9.36	0.18	9.54	98.13	1.87
34	ctrd	-1.91	0.00	3.77	0.00	1.00	5.00	-1.88	0.01	-1.87	100.31	-0.31
35	chot	2.35	0.00	6.71	0.00	1.00	0.00	2.31	0.00	2.31	100.00	0.00
36	cretr	3.15	0.00	5.98	0.00	1.00	0.00	3.17	0.00	3.17	100.00	0.00
37	ccant	3.63	0.00	6.64	0.00	1.00	0.00	3.67	0.00	3.67	100.00	0.00
38	ctrns	0.91	0.00	3.85	0.19	0.81	5.00	-2.30	3.74	1.44	-160.23	260.23
39	ccom	-2.00	0.00	4.52	0.07	0.93	5.00	-3.18	1.58	-1.60	198.55	-98.55
40	cfini	0.08	0.00	5.79	0.01	0.99	5.00	-0.24	0.40	0.17	-141.78	241.78
41	cins	-3.11	0.00	4.10	0.03	0.97	5.00	-3.54	0.56	-2.98	118.80	-18.80
42	caux	0.08	0.00	21.12	0.00	1.00	0.00	0.09	0.00	0.09	100.00	0.00
43	cest	1.74	0.00	10.33	0.00	1.00	0.00	1.80	0.00	1.80	100.00	0.00
44	crent	-1.15	0.00	0.69	0.97	0.03	5.00	-4.20	3.32	-0.88	478.78	-378.78
45	ccomp	5.40	0.00	6.57	0.00	1.00	5.00	5.37	0.09	5.46	98.36	1.64
46	cres	-1.50	0.00	4.44	0.00	1.00	0.00	-1.49	0.00	-1.49	100.00	0.00
47	cobus	1.15	0.00	6.64	0.02	0.98	5.00	0.53	0.76	1.29	41.40	58.60
48	cpa	1.44	0.00	5.36	0.15	0.85	5.00	-1.95	3.99	2.04	-95.73	195.73
49	ceduc	1.13	0.00	5.89	0.00	1.00	0.00	1.13	0.00	1.13	100.00	0.00
50	chelt	0.82	0.00	4.61	0.00	1.00	0.00	0.82	0.00	0.82	100.00	0.00
51	csew	0.93	0.00	5.78	0.00	1.00	0.00	0.94	0.00	0.94	100.00	0.00
52	cmemb	3.09	0.00	7.83	0.00	1.00	0.00	3.08	0.00	3.08	100.00	0.00
53	crecr	0.68	0.00	4.82	0.00	1.00	5.00	0.68	0.00	0.68	99.50	0.50
54	coser	2.48	0.00	5.99	0.00	1.00	0.00	2.50	0.00	2.50	100.00	0.00
55	chh	2.73	0.00	10.70	0.00	1.00	0.00	2.78	0.00	2.78	100.00	0.00

Notes: Shaded cells in the table denote quantities and prices for nontraded goods. Notation for variables and parameters is defined in Appendix 7A.1, notation for commodities is defined in Appendix 6A.

## Appendix 8B General Results: Comparison across Closure Rules

**Table 8B.1 The effect of the 35-percent increase in the oil export price on economic indicators under alternative closure rules**

Variable	Base	FAC1		
		Neoclassical	Johansen	Foreign
Investment/ nominal GDP	26	2.9	-2.30	-1.9
Private savings/nominal GDP	22.1	1	-4.40	1
Foreign savings/ nominal GDP	0.8	-0.1	-0.10	-5
Trade deficit/nominal GDP	-1	-0.3	-0.30	-5.1
Government savings/nominal GDP	6	1.4	1.50	1.4
Government income/ nominal GDP	19.6	0.6	0.80	0.6
Government spending/ nominal GDP	11.3	-0.6	-0.50	-0.7
CPI	1.71	3.41	5.10	1.84
DPI	1.00	5.33	7.07	2.78
Dutch disease index	27.62	23.1	22.0	25.7
Real price of labor	1.00	-4.84	-5.62	-5.93
Real price of capital	1.00	2.58	3.00	3.26
Real wage rate	0.58	2.44	1.33	0.33
Real rental rate	0.58	10.43	10.58	10.14
$CPI/P_{GDP}^{MP}$	1.71	-7.44	-7.14	-6.66
$P_{GDP}^{MP}/P_{GDP}^{FC}$	1.00	0.36	0.30	0.45

Note: Figures in the table are given in percentages. Figures in the columns other than the base column are given as a percentage change from their base values, except for the Dutch disease index, which is not given as a percentage change from its value.

**Table 8B.2 Effects of the 35-percent increase in the oil export price on the GDP and its components under alternative closure rules**

Variable	FAC1					
	Nominal GDP (% for nonbase)			Real GDP (% for nonbase)		
	Neoclassical	Johansen	Foreign	Neoclassical	Johansen	Foreign
1. Absorption	12.22	13.66	3.76	7.85	7.73	2.15
2. Private consumption	9.41	21.41	6.40	4.54	13.42	3.73
3. Fixed investment	23.95	2.87	0.95	19.11	-	-
4. Stock change	-13.61	-11.97	-15.68	-	-	-
5. Government consumption	5.44	7.68	2.47	-	-	-
6. Exports	12.70	10.99	16.07	-3.08	-4.74	0.26
7. Imports	14.26	12.34	5.41	14.26	12.34	5.41
8. $GDP^{MP}$	11.58	12.95	8.95	-0.11	-0.21	-0.14
9. Net indirect taxes	15.46	15.46	12.89	0.01	-0.79	-0.63
10. $GDP^{FC}$	11.16	12.67	8.53	-0.13	-0.14	-0.09

## Appendix 8C Effects of the 35-percent Increase in the Oil Export Price under the Johansen Closure Rule

Table 8C.1 Sectoral adjustments under the Johansen closure rule

No	Commodity	QX 1	QVA 2	QINTA 3	QQ 4	QD 5	QFlab 6	PX 7	PVA 8	PINTA 9	PQ 10	PDD 11	WF <sub>lab</sub> 12	WF <sub>cap</sub> 13
<i>Agriculture, forestry and fishing</i>														
1	<b>cagr</b>	-0.32	-0.32	-0.32	2.49	2.20	-1.62	2.08	0.83	3.63	2.52	2.62	6.50	-0.52
2	<b>cfor</b>	-1.03	-1.03	-1.03	1.39	0.21	-1.82	2.66	2.35	3.23	2.52	2.92	6.50	-2.83
3	<b>cfish</b>	0.06	0.06	0.06	1.33	0.95	0.25	6.92	7.52	5.99	6.93	7.06	6.50	7.82
<i>Mining</i>														
4	<b>cmin</b>	-3.90	-3.90	-3.90	-0.85	-1.00	-7.12	0.44	-10.22	5.61	1.44	1.49	6.50	-26.40
5	<b>cpetr</b>	2.77	2.77	2.77	4.06	-16.23	13.31	30.55	73.48	8.26	15.37	24.02	6.50	98.90
6	<b>core</b>	-3.64	-3.64	-3.64	-4.97	-4.84	-6.16	-1.60	-6.69	2.33	-1.32	-1.36	6.50	-22.49
7	<b>comin</b>	-5.16	-5.16	-5.16	-2.22	-2.77	-6.37	1.95	-0.15	3.55	3.38	3.58	6.50	-23.37
<i>Manufacturing</i>														
8	<b>cfood</b>	0.84	0.84	0.84	8.07	4.77	3.56	6.84	9.06	4.79	5.33	6.42	6.50	9.88
9	<b>ctob</b>	5.04	5.04	5.04	8.12	6.82	14.91	8.57	15.39	4.21	7.64	8.08	6.50	20.57
10	<b>ctex</b>	-0.94	-0.94	-0.94	3.65	0.84	-5.08	2.88	2.95	2.84	2.63	3.58	6.50	2.18
11	<b>cwear</b>	-1.88	-1.88	-1.88	3.73	-0.29	-6.09	2.76	2.85	2.68	1.95	3.30	6.50	1.32
12	<b>cleat</b>	-5.32	-5.32	-5.32	0.63	-1.67	-14.54	0.30	-1.82	1.86	1.53	2.32	6.50	-5.99
13	<b>cwood</b>	-6.57	-6.57	-6.57	-0.40	-5.74	-16.82	0.14	-2.89	2.76	1.21	3.09	6.50	-7.99
14	<b>cpulp</b>	-3.38	-3.38	-3.38	1.23	-2.28	-10.80	1.30	-0.05	2.08	0.55	1.73	6.50	-2.74
15	<b>cpubl</b>	-1.41	-1.41	-1.41	3.13	-0.98	-2.08	3.93	5.92	2.77	2.63	4.03	6.50	4.73
16	<b>ccoke</b>	-5.98	-5.98	-5.98	0.42	-2.91	-19.55	4.73	-5.89	8.62	4.06	5.24	6.50	-10.38
17	<b>cchem</b>	-16.08	-16.08	-16.08	2.12	-7.91	-31.10	-0.10	-8.94	4.68	0.48	4.01	6.50	-20.76
18	<b>crub</b>	-3.99	-3.99	-3.99	4.89	-1.95	-10.54	2.06	0.69	2.90	1.40	3.70	6.50	-2.51
19	<b>cmnmt</b>	-3.27	-3.27	-3.27	0.13	-2.95	-6.78	3.58	3.41	3.71	2.99	4.07	6.50	0.73
20	<b>ciron</b>	-5.33	-5.33	-5.33	-2.12	-2.63	-14.82	-0.45	-2.06	0.55	0.60	0.78	6.50	-6.23
21	<b>cfmet</b>	-5.17	-5.17	-5.17	-0.62	-3.97	-13.88	1.07	-1.34	2.59	1.73	2.90	6.50	-5.41
22	<b>cmach</b>	-9.09	-9.09	-9.09	1.27	-5.28	-17.90	0.55	-1.78	2.76	1.28	3.56	6.50	-8.94
23	<b>cofic</b>	-7.59	-7.59	-7.59	1.65	-8.43	-19.79	-0.32	-4.82	1.82	0.30	3.85	6.50	-10.60
24	<b>celmc</b>	-12.87	-12.87	-12.87	3.09	-6.46	-23.99	0.65	-4.43	2.22	0.17	3.47	6.50	-14.33
25	<b>crad</b>	-3.85	-3.85	-3.85	8.30	0.12	-10.51	1.19	0.60	1.47	0.34	3.01	6.50	-2.49
26	<b>cmed</b>	-3.80	-3.80	-3.80	3.27	-2.17	-11.28	1.19	-0.13	1.94	0.60	2.43	6.50	-3.15
27	<b>cmvec</b>	-5.39	-5.39	-5.39	3.78	-5.32	-7.39	4.58	4.71	4.47	1.43	4.58	6.50	0.21
28	<b>cotr</b>	-3.78	-3.78	-3.78	2.35	-3.69	-5.34	3.62	5.13	2.41	1.61	3.69	6.50	1.96
29	<b>cfurn</b>	-2.59	-2.59	-2.59	4.19	-1.59	-7.18	2.49	2.49	2.49	1.40	3.35	6.50	0.38
30	<b>crec</b>	-0.45	-0.45	-0.45	-0.45	-0.45	-1.11	5.26	5.94	4.96	5.24	5.24	6.50	5.56
<i>Electrical energy, gas and hot water</i>														
31	<b>cel</b>	3.60	3.60	3.60	4.87	4.36	7.54	8.14	9.70	6.97	7.42	7.60	6.50	12.82
32	<b>ewat</b>	3.72	3.72	3.72	3.72	3.72	9.33	8.13	11.04	5.39	8.13	8.13	6.50	14.31
<i>Construction works and services</i>														
33	<b>ccnst</b>	-0.46	-0.46	-0.46	1.94	-0.37	-1.16	4.60	6.05	3.32	3.82	4.62	6.50	5.76
34	<b>ctrd</b>	-2.21	-2.21	-2.21	-2.20	-2.20	-5.71	4.55	4.21	4.97	4.55	4.55	6.50	2.84
35	<b>chot</b>	6.10	6.10	6.10	6.10	6.10	13.19	9.96	10.68	8.82	9.96	9.96	6.50	14.65
36	<b>cretr</b>	8.75	8.75	8.75	8.75	8.75	18.09	9.76	11.86	7.81	9.76	9.76	6.50	17.58
37	<b>ccant</b>	10.38	10.38	10.38	10.38	10.38	21.56	10.71	12.79	6.61	10.71	10.71	6.50	19.63
38	<b>ctrns</b>	-1.08	-1.08	-1.08	5.69	3.46	-2.82	4.46	5.38	3.67	4.65	5.40	6.50	4.70
39	<b>ccom</b>	-2.04	-2.04	-2.04	1.12	-0.27	-3.32	5.87	5.39	6.56	5.76	6.25	6.50	3.68
40	<b>cfini</b>	1.54	1.54	1.54	4.05	2.07	4.96	10.28	9.34	12.40	9.69	10.40	6.50	10.67
41	<b>cins</b>	-0.72	-0.72	-0.72	9.88	-0.06	-1.24	5.68	6.06	4.80	2.52	5.82	6.50	5.45
42	<b>caux</b>	0.25	0.25	0.25	0.25	0.25	92.52	58.73	78.76	14.64	58.73	58.73	6.50	79.11
43	<b>cest</b>	5.45	5.45	5.45	5.45	5.45	43.40	22.85	35.93	11.96	22.85	22.85	6.50	41.77
44	<b>crent</b>	-5.18	-5.18	-5.18	0.24	-1.86	-15.20	0.03	-2.53	4.50	0.01	0.72	6.50	-6.56
45	<b>ccomp</b>	-1.03	-1.03	-1.03	0.84	-0.97	-1.61	5.74	6.00	5.47	5.12	5.76	6.50	5.13
46	<b>cres</b>	0.29	0.29	0.29	0.29	0.29	0.43	5.92	6.62	5.03	5.92	5.92	6.50	6.86
47	<b>cobus</b>	0.22	0.22	0.22	6.29	0.84	0.92	6.59	7.08	4.71	4.87	6.72	6.50	7.27
48	<b>cpa</b>	0.91	0.91	0.91	6.15	5.32	1.22	6.16	6.76	5.66	6.79	7.07	6.50	7.52
49	<b>ceduc</b>	3.58	3.58	3.58	3.58	3.58	4.71	7.35	7.42	7.19	7.35	7.35	6.50	10.46
50	<b>chelt</b>	2.47	2.47	2.47	2.47	2.47	4.34	6.11	8.04	4.30	6.11	6.11	6.50	10.15
51	<b>csew</b>	3.41	3.41	3.41	3.41	3.41	12.45	8.90	13.82	5.26	8.90	8.90	6.50	16.89
52	<b>cmemb</b>	9.67	9.67	9.67	9.67	9.67	17.04	13.33	12.13	15.41	13.33	13.33	6.50	20.66
53	<b>crecr</b>	2.63	2.63	2.63	3.16	2.63	4.77	6.65	8.26	5.45	6.47	6.65	6.50	10.51
54	<b>coser</b>	7.05	7.05	7.05	7.05	7.05	13.37	9.05	11.46	5.80	9.05	9.05	6.50	17.65
55	<b>chh</b>	8.26	8.26	8.26	8.26	8.26	34.82	21.23	26.76	4.72	21.23	21.23	6.50	35.00

Notes: Shaded cells in the table denote quantities and prices for nontraded goods. Commodities which outputs increase are shown in bold font. Notation for variables is defined in Appendix 7A.1, notation for commodities is defined in Appendix 6A. Subscripts *lab* and *cap* denote labor and capital respectively.

Table 8C.2 Decomposition of total effect of the oil export price increase on the sectoral value-added and labor employment

No	Commodity	% change in variables					Parameters					Log-lin % change in QVA (2)*(7) or expansion effect 12	Disaggregation of effects in $QF_{lab}$					
		QVA 1	$QF_{lab}$ 2	PVA 3	$WF_{lab}$ 4	$WF_{cap}$ 5	$Wf_{lab}-PVA$ (4)-(3) 6	$L_a/QVA_a$ 7	$K_a/QVA_a$ 8	$TVA_a/QVA_a$ 9	Check (6)+(7) +(8) 10		$\sigma_a^{va}$ 11	Substitution effect (8)*(11)* ((5)-(4)) 13	Total change in $QF_{lab}$ 14	Due to expansion eff (%) 15	Due to subst. eff (%) 16	
<b>Products of agriculture, forestry and fishing</b>																		
1.	cagr	-0.32	-1.62	0.83	6.50	-0.52	5.67	0.19	0.80	0.00	1.00	0.24	-0.31	-1.35	-1.67	18.74	81.26	
2.	cfor	-1.03	-1.82	2.35	6.50	-2.83	4.15	0.54	0.43	0.03	1.00	0.20	-0.98	-0.80	-1.78	55.10	44.90	
3.	cfish	0.06	0.25	7.52	6.50	7.82	-1.02	0.22	0.75	0.03	1.00	0.20	0.05	0.20	0.25	21.48	78.52	
<b>Products of mining</b>																		
4.	cmin	-3.90	-7.12	-10.22	6.50	-26.40	16.72	0.49	0.49	0.03	1.00	0.20	-3.48	-3.20	-6.68	52.09	47.91	
5.	cpetr	2.77	13.31	73.48	6.50	98.90	-66.98	0.23	0.64	0.13	1.00	0.20	3.05	11.83	14.88	20.49	79.51	
6.	core	-3.64	-6.16	-6.69	6.50	-22.49	13.19	0.49	0.39	0.12	1.00	0.20	-3.00	-2.28	-5.28	56.76	43.24	
7.	comin	-5.16	-6.37	-0.15	6.50	-23.37	6.64	0.74	0.20	0.06	1.00	0.20	-4.71	-1.22	-5.93	79.38	20.62	
<b>Products of manufacturing</b>																		
8.	cfood	0.84	3.56	9.06	6.50	9.88	-2.56	0.24	0.75	0.01	1.00	1.12	0.84	2.83	3.68	22.90	77.10	
9.	ctob	5.04	14.91	15.39	6.50	20.57	-8.89	0.33	0.61	0.06	1.00	1.12	4.92	9.56	14.48	33.96	66.04	
10.	ctex	-0.94	-5.08	2.95	6.50	2.18	3.55	0.18	0.80	0.02	1.00	1.26	-0.90	-4.37	-5.28	17.12	82.88	
11.	cwear	-1.88	-6.09	2.85	6.50	1.32	3.65	0.30	0.69	0.01	1.00	1.26	-1.83	-4.52	-6.36	28.81	71.19	
12.	cleat	-5.32	-14.54	-1.82	6.50	-5.99	8.32	0.35	0.64	0.01	1.00	1.26	-5.05	-10.08	-15.13	33.36	66.64	
13.	cwood	-6.57	-16.82	-2.89	6.50	-7.99	9.39	0.36	0.61	0.03	1.00	1.26	-6.09	-11.09	-17.17	35.44	64.56	
14.	cpulp	-3.38	-10.80	-0.05	6.50	-2.74	6.55	0.30	0.69	0.01	1.00	1.26	-3.26	-8.06	-11.32	28.80	71.20	
15.	cpubl	-1.41	-2.08	5.92	6.50	4.73	0.58	0.66	0.32	0.01	1.00	1.26	-1.38	-0.71	-2.10	66.04	33.96	
16.	ccoke	-5.98	-19.55	-5.89	6.50	-10.38	12.39	0.27	0.68	0.05	1.00	1.26	-5.35	-14.41	-19.77	27.08	72.92	
17.	cchem	-16.08	-31.10	-8.94	6.50	-20.76	15.44	0.47	0.51	0.02	1.00	1.26	-14.59	-17.46	-32.05	45.53	54.47	
18.	crub	-3.99	-10.54	0.69	6.50	-2.51	5.81	0.37	0.63	0.01	1.00	1.26	-3.85	-7.11	-10.97	35.13	64.87	
19.	cmnmt	-3.27	-6.78	3.41	6.50	0.73	3.08	0.46	0.51	0.02	1.00	1.26	-3.14	-3.73	-6.87	45.71	54.29	
20.	ciron	-5.33	-14.82	-2.06	6.50	-6.23	8.56	0.34	0.64	0.03	1.00	1.26	-4.97	-10.19	-15.16	32.76	67.24	
21.	cfmet	-5.17	-13.88	-1.34	6.50	-5.41	7.84	0.36	0.64	0.01	1.00	1.26	-4.94	-9.55	-14.49	34.08	65.92	
22.	cmach	-9.09	-17.90	-1.78	6.50	-8.94	8.28	0.48	0.50	0.02	1.00	1.26	-8.56	-9.74	-18.31	46.77	53.23	
23.	cofic	-7.59	-19.79	-4.82	6.50	-10.60	11.32	0.36	0.64	0.00	1.00	1.26	-7.19	-13.71	-20.91	34.40	65.60	
24.	celmc	-12.87	-23.99	-4.43	6.50	-14.33	10.93	0.50	0.48	0.02	1.00	1.26	-12.00	-12.65	-24.65	48.69	51.31	
25.	crad	-3.85	-10.51	0.60	6.50	-2.49	5.90	0.35	0.64	0.00	1.00	1.26	-3.73	-7.26	-10.99	33.91	66.09	

Effects of the 35-percent Increase in the Oil Export Price under the Johansen Closure Rule

Table 8C.2 Continued

No	Commodity	% change in variables					Parameters					Log-lin % change in QVA (2)*(7) or expansion effect (12)	Disaggregation of effects in $QF_{lab}$				
		QVA 1	$QF_{lab}$ 2	PVA 3	$WF_{lab}$ 4	$WF_{cap}$ 5	$Wf_{lab-PVA}$ (4)-(3) 6	$L_a/QVA_a$ 7	$K_a/QVA_a$ 8	$TVA_a/QVA_a$ 9	Check (6)+(7) + (8) 10		$\sigma_a^{va}$ 11	Substitution effect (8)*(11)* ((5)-(4)) 13	Total change in $QF_{lab}$ 14	Due to expan eff (%) 15	Due to subst. eff (%) 16
26.	cmcd	-3.80	-11.28	-0.13	6.50	-3.15	6.63	0.32	0.67	0.01	1.00	1.26	-3.64	-8.11	-11.75	30.98	69.02
27.	cmvec	-5.39	-7.39	4.71	6.50	0.21	1.79	0.69	0.26	0.05	1.00	1.26	-5.09	-2.08	-7.17	70.96	29.04
28.	cotr	-3.78	-5.34	5.13	6.50	1.96	1.37	0.69	0.29	0.02	1.00	1.26	-3.68	-1.66	-5.35	68.93	31.07
29.	cfurn	-2.59	-7.18	2.49	6.50	0.38	4.01	0.35	0.64	0.01	1.00	1.26	-2.51	-4.93	-7.44	33.76	66.24
30.	crec	-0.45	-1.11	5.94	6.50	5.56	0.56	0.40	0.58	0.02	1.00	1.26	-0.44	-0.69	-1.13	38.94	61.06
<i>Electrical energy, gas and hot water</i>																	
31.	<b>cel</b>	3.60	7.54	9.70	6.50	12.82	-3.20	0.44	0.47	0.09	1.00	1.26	3.33	3.74	7.07	47.09	52.91
32.	<b>cwat</b>	3.72	9.33	11.04	6.50	14.31	-4.54	0.40	0.57	0.03	1.00	1.26	3.69	5.66	9.35	39.48	60.52
<i>Construction works and services</i>																	
33.	cnst	-0.46	-1.16	6.05	6.50	5.76	0.45	0.39	0.60	0.01	1.00	1.68	-0.45	-0.74	-1.19	37.78	62.22
34.	ctrd	-2.21	-5.71	4.21	6.50	2.84	2.29	0.38	0.61	0.01	1.00	1.68	-2.16	-3.76	-5.92	36.53	63.47
35.	<b>chot</b>	6.10	13.19	10.68	6.50	14.65	-4.18	0.46	0.52	0.02	1.00	1.68	6.08	7.07	13.15	46.25	53.75
36.	<b>cretr</b>	8.75	18.09	11.86	6.50	17.58	-5.36	0.49	0.50	0.00	1.00	1.68	8.95	9.36	18.30	48.87	51.13
37.	<b>ccant</b>	10.38	21.56	12.79	6.50	19.63	-6.30	0.50	0.50	0.00	1.00	1.68	10.68	11.10	21.78	49.04	50.96
38.	ctrns	-1.08	-2.82	5.38	6.50	4.70	1.12	0.37	0.60	0.04	1.00	1.68	-1.04	-1.80	-2.84	36.53	63.47
39.	ccom	-2.04	-3.32	5.39	6.50	3.68	1.11	0.59	0.37	0.04	1.00	1.26	-1.95	-1.33	-3.28	59.55	40.45
40.	<b>cfini</b>	1.54	4.96	9.34	6.50	10.67	-2.84	0.29	0.63	0.07	1.00	1.26	1.45	3.34	4.78	30.26	69.74
41.	cins	-0.72	-1.24	6.06	6.50	5.45	0.44	0.58	0.42	0.00	1.00	1.26	-0.71	-0.56	-1.27	56.22	43.78
42.	<b>caux</b>	0.25	92.52	78.76	6.50	79.11	-72.26	0.00	1.00	0.00	1.00	1.26	0.32	91.10	91.42	0.35	99.65
43.	<b>cest</b>	5.45	43.40	35.93	6.50	41.77	-29.43	0.14	0.85	0.01	1.00	1.26	6.15	37.91	44.06	13.97	86.03
44.	crent	-5.18	-15.20	-2.53	6.50	-6.56	9.03	0.33	0.67	0.00	1.00	1.26	-4.95	-11.06	-16.01	30.92	69.08
45.	ccomp	-1.03	-1.61	6.00	6.50	5.13	0.50	0.64	0.36	0.00	1.00	1.26	-1.03	-0.62	-1.64	62.35	37.65
46.	cres	0.29	0.43	6.62	6.50	6.86	-0.12	0.67	0.32	0.01	1.00	1.26	0.29	0.15	0.44	66.52	33.48
47.	<b>cobus</b>	0.22	0.92	7.08	6.50	7.27	-0.58	0.24	0.75	0.00	1.00	1.26	0.22	0.73	0.96	23.34	76.66
48.	cpa	0.91	1.22	6.76	6.50	7.52	-0.26	0.75	0.25	0.00	1.00	1.26	0.91	0.33	1.23	73.58	26.42
49.	<b>ceduc</b>	3.58	4.71	7.42	6.50	10.46	-0.93	0.76	0.24	0.00	1.00	1.26	3.58	1.18	4.77	75.17	24.83
50.	<b>chelt</b>	2.47	4.34	8.04	6.50	10.15	-1.54	0.57	0.43	0.00	1.00	1.26	2.48	1.96	4.44	55.89	44.11
51.	<b>csew</b>	3.41	12.45	13.82	6.50	16.89	-7.32	0.28	0.71	0.01	1.00	1.26	3.51	9.33	12.84	27.33	72.67
52.	<b>cmemb</b>	9.67	17.04	12.13	6.50	20.66	-5.64	0.58	0.41	0.01	1.00	1.26	9.80	7.35	17.15	57.17	42.83
53.	<b>crecr</b>	2.63	4.77	8.26	6.50	10.51	-1.76	0.55	0.44	0.01	1.00	1.26	2.63	2.23	4.86	54.13	45.87
54.	<b>coser</b>	7.05	13.37	11.46	6.50	17.65	-4.96	0.54	0.46	0.00	1.00	1.26	7.21	6.46	13.67	52.75	47.25
55.	<b>chh</b>	8.26	34.82	26.76	6.50	35.00	-20.26	0.26	0.73	0.01	1.00	1.26	8.94	26.29	35.24	25.38	74.62

Notes: Shaded cells in the table denote quantities and prices for nontraded goods. Commodities which outputs increase are shown in bold font. Notation for variables and parameters is defined in Appendix 7A.1, notation for commodities is defined in Appendix 6A. Subscripts  $lab$  and  $cap$  indicate labor and capital respectively.  $L_a$ ,  $K_a$ ,  $TVA_a$  denote labor, capital and total value added net of taxes on production in an activity  $a$  respectively.

Table 8C.3 Effects of the oil export price increase on exports

No	Commodity	% change in variables			Parameters				Exp. effect log-lin change in QX	Disaggregation of total effect on QE			
		QE	PE	PDS	Qe/Qx	Qd/Qx	$\sigma_c^t$	$\sigma_c^a$		Subst. effect (6)*(5)* ((2)-(3))	Total effect (8)+(9)	Due to exp. eff (%) (8)/(10)	Due to subst. eff (%) (9)/(10)
1	2	3	4	5	6	7	8	9	10	11	12		
<b>Products of agriculture, forestry and fishing</b>													
1	cagr	-10.13	-0.01	2.59	0.21	0.79	5.00	3.00	-0.31	-10.33	-10.64	2.93	97.07
2	cfor	-13.31	-0.03	2.91	0.09	0.91	5.00	3.00	-0.98	-13.33	-14.32	6.86	93.14
3	cfish	-28.60	-0.06	7.11	0.03	0.97	5.00	3.00	0.05	-34.72	-34.67	-0.16	100.16
<b>Products of mining</b>													
4	cmin	-7.17	-0.25	1.04	0.47	0.53	5.00	3.00	-3.48	-3.42	-6.90	50.42	49.58
<b>5</b>	<b>cpetr</b>	<b>6.17</b>	<b>31.41</b>	<b>25.32</b>	<b>0.85</b>	<b>0.15</b>	<b>5.00</b>	<b>3.00</b>	<b>3.05</b>	<b>4.70</b>	<b>7.75</b>	<b>39.32</b>	<b>60.68</b>
<b>6</b>	<b>core</b>	<b>0.65</b>	<b>-0.74</b>	<b>-1.85</b>	<b>0.22</b>	<b>0.78</b>	<b>5.00</b>	<b>3.00</b>	<b>-3.00</b>	<b>4.34</b>	<b>1.34</b>	<b>-223.86</b>	<b>323.86</b>
7	comin	-14.06	-0.04	2.46	0.21	0.79	5.00	3.00	-4.71	-9.82	-14.54	32.41	67.59
<b>Products of manufacturing</b>													
8	cfood	-29.34	-0.50	7.65	0.12	0.88	5.00	3.00	0.84	-35.93	-35.08	-2.40	102.40
9	ctob	-30.50	-0.03	8.94	0.05	0.95	5.00	3.00	4.92	-42.65	-37.73	-13.04	113.04
10	ctex	-19.79	-1.37	3.25	0.09	0.91	5.00	3.00	-0.90	-21.07	-21.98	4.11	95.89
11	cwear	-14.41	-0.01	3.09	0.11	0.89	5.00	3.00	-1.83	-13.75	-15.58	11.76	88.24
12	cleat	-9.67	-0.64	1.06	0.46	0.54	5.00	3.00	-5.05	-4.61	-9.66	52.24	47.76
13	cwood	-22.56	-3.55	0.32	0.05	0.95	5.00	3.00	-6.09	-18.37	-24.45	24.88	75.12
14	cpulp	-19.23	-2.27	1.53	0.07	0.93	5.00	3.00	-3.26	-17.72	-20.98	15.53	84.47
15	cpubl	-20.70	-0.49	4.03	0.02	0.98	5.00	3.00	-1.38	-22.09	-23.47	5.90	94.10
16	ccoke	-60.91	-12.13	5.40	0.06	0.94	5.00	3.00	-5.35	-82.69	-88.04	6.08	93.92
17	cchem	-16.71	-0.25	1.77	0.93	0.07	5.00	3.00	-14.59	-0.72	-15.32	95.27	4.73
18	crub	-46.35	-9.15	2.49	0.05	0.95	5.00	3.00	-3.85	-55.40	-59.26	6.50	93.50
19	cmnmt	-48.00	-8.51	3.65	0.01	0.99	5.00	3.00	-3.14	-60.36	-63.50	4.94	95.06
20	cion	-7.82	-0.98	0.11	0.52	0.48	5.00	3.00	-4.97	-2.61	-7.58	65.53	34.47
21	cfmet	-17.71	-1.76	1.32	0.09	0.91	5.00	3.00	-4.94	-14.04	-18.98	26.02	73.98
22	cmach	-27.38	-3.87	1.38	0.18	0.82	5.00	3.00	-8.56	-21.60	-30.17	28.38	71.62
23	cofic	-6.11		-0.50	0.36	0.64	5.00	3.00	-7.19	1.60	-5.59	128.55	-28.55
24	celmc	-15.68	-0.01	2.09	0.70	0.30	5.00	3.00	-12.00	-3.17	-15.17	79.11	20.89
25	crad	-9.37		2.01	0.42	0.58	5.00	3.00	-3.73	-5.83	-9.56	39.01	60.99
26	cmed	-9.31		1.53	0.23	0.77	5.00	3.00	-3.64	-5.89	-9.53	38.21	61.79
27	cmvec	-24.36		4.59	0.00	1.00	5.00	3.00	-5.09	-22.87	-27.96	18.20	81.80
28	cotr	-19.44		3.64	0.01	0.99	5.00	3.00	-3.68	-18.08	-21.76	16.93	83.07
29	cfurn	-16.29	-0.57	2.70	0.07	0.93	5.00	3.00	-2.51	-15.22	-17.73	14.17	85.83
<b>Electrical energy, gas and hot water</b>													
31	cel	-29.96		8.30	0.02	0.98	5.00	3.00	3.33	-40.56	-37.23	-8.94	108.94
<b>Construction works and services</b>													
33	ccnst	-20.52		4.62	0.00	1.00	5.00	3.00	-0.45	-23.00	-23.46	1.92	98.08
34	ctrd	-21.72		4.55	0.00	1.00	5.00	3.00	-2.16	-22.75	-24.91	8.68	91.32
38	ctrns	-20.46		5.40	0.19	0.81	5.00	3.00	-1.04	-21.76	-22.80	4.55	95.45
39	ccom	-26.36		6.25	0.07	0.93	5.00	3.00	-1.95	-29.09	-31.04	6.30	93.70
40	cfini	-37.75		10.40	0.01	0.99	5.00	3.00	1.45	-51.25	-49.81	-2.91	102.91
41	cins	-24.67		5.82	0.03	0.97	5.00	3.00	-0.71	-28.28	-28.99	2.46	97.54
44	crent	-5.30		0.72	0.97	0.03	5.00	3.00	-4.95	-0.13	-5.08	97.53	2.47
45	ccomp	-25.15		5.76	0.00	1.00	5.00	3.00	-1.03	-28.71	-29.74	3.45	96.55
47	cobus	-27.16		6.72	0.02	0.98	5.00	3.00	0.22	-32.84	-32.62	-0.69	100.69
48	cpa	-25.15		7.07	0.15	0.85	5.00	3.00	0.91	-30.09	-29.18	-3.11	103.11
53	crecr	-25.62		6.65	0.00	1.00	5.00	3.00	2.63	-33.25	-30.62	-8.59	108.59

Notes: Commodities which exports increase are shown in bold font. Notation for variables and parameters is defined in Appendix 7A.1, notation for commodities is defined in Appendix 6A.

Table 8C.4 Effects of the oil export price increase on imports

No	Commodity	% change in variables			Parameters			Disaggregation of total effect on QM				
		QM 1	PM 2	PDD 3	Qd/QQ 4	Qm/QQ 5	$\sigma_c^a$ 6	Expansion effect or %change in QQ 7	Substitution effect (6)*(4)*((3)- (2)) 8	Total effect (7)+(8) 9	Due to exp. eff. (%) (7)/(9) 10	Due to subst. eff. (%) (8)/(9) 11
<b>Products of agriculture, forestry and fishing</b>												
1	cagr	10.44	0.00	2.62	0.96	0.04	3.00	2.49	7.57	10.06	0.25	0.75
2	cfor	9.24	0.00	2.92	0.87	0.13	3.00	1.39	7.60	8.98	0.15	0.85
3	cfish	23.90	0.00	7.06	0.98	0.02	3.00	1.33	20.83	22.16	0.06	0.94
<b>Products of mining</b>												
4	cmin	3.48	0.00	1.49	0.97	0.03	3.00	-0.85	4.31	3.46	-0.25	1.25
5	cpetr	59.79	0.00	24.02	0.71	0.29	3.00	4.06	51.23	55.28	0.07	0.93
6	core	-8.67	0.00	-1.36	0.97	0.03	3.00	-4.97	-3.95	-8.91	0.56	0.44
7	comin	8.05	0.00	3.58	0.95	0.05	3.00	-2.22	10.18	7.96	-0.28	1.28
<b>Products of manufacturing</b>												
8	cfood	26.28	0.00	6.42	0.84	0.16	3.00	8.07	16.23	24.30	0.33	0.67
9	ctob	34.84	0.00	8.08	0.95	0.05	3.00	8.12	23.06	31.18	0.26	0.74
10	ctex	12.05	0.00	3.58	0.75	0.25	3.00	3.65	8.00	11.65	0.31	0.69
11	cwear	9.90	0.00	3.30	0.60	0.40	3.00	3.73	5.95	9.68	0.39	0.61
12	cleat	5.33	0.00	2.32	0.67	0.33	3.00	0.63	4.66	5.29	0.12	0.88
13	cwood	3.27	0.00	3.09	0.40	0.60	3.00	-0.40	3.74	3.34	-0.12	1.12
14	cpulp	2.90	0.00	1.73	0.32	0.68	3.00	1.23	1.67	2.90	0.42	0.58
15	cpubl	11.48	0.00	4.03	0.67	0.33	3.00	3.13	8.04	11.18	0.28	0.72
16	ccoke	13.16	0.00	5.24	0.79	0.21	3.00	0.42	12.39	12.81	0.03	0.97
17	cchem	3.60	0.00	4.01	0.13	0.87	3.00	2.12	1.52	3.64	0.58	0.42
18	crub	9.35	0.00	3.70	0.39	0.61	3.00	4.89	4.34	9.23	0.53	0.47
19	cmmmt	9.38	0.00	4.07	0.75	0.25	3.00	0.13	9.11	9.24	0.01	0.99
20	cion	-0.35	0.00	0.78	0.77	0.23	3.00	-2.12	1.80	-0.31	6.74	-5.74
21	cfmet	4.64	0.00	2.90	0.61	0.39	3.00	-0.62	5.29	4.68	-0.13	1.13
22	cmach	5.20	0.00	3.56	0.37	0.63	3.00	1.27	3.97	5.23	0.24	0.76
23	cofic	2.57	0.00	3.85	0.08	0.92	3.00	1.65	0.95	2.60	0.63	0.37
24	celmc	3.62	0.00	3.47	0.05	0.95	3.00	3.09	0.55	3.63	0.85	0.15
25	crad	9.42	0.00	3.01	0.12	0.88	3.00	8.30	1.08	9.37	0.89	0.11
26	cmed	5.13	0.00	2.43	0.25	0.75	3.00	3.27	1.83	5.11	0.64	0.36
27	cmvec	8.31	0.00	4.58	0.33	0.67	3.00	3.78	4.50	8.28	0.46	0.54
28	cotr	7.38	0.00	3.69	0.45	0.55	3.00	2.35	4.99	7.34	0.32	0.68
29	cfurn	8.63	0.00	3.35	0.43	0.57	3.00	4.19	4.32	8.51	0.49	0.51
<b>Electrical energy, gas and hot water</b>												
31	cel	30.00	0.00	7.60	0.98	0.02	3.00	4.87	22.32	27.19	0.18	0.82
<b>Construction works and services</b>												
33	ccnst	14.07	0.00	4.62	0.84	0.16	3.00	1.94	11.59	13.53	0.14	0.86
34	ctrd	11.77	0.00	4.55	1.00	0.00	3.00	-2.20	13.65	11.45	-0.19	1.19
38	ctrns	21.14	0.00	5.40	0.87	0.13	3.00	5.69	14.11	19.80	0.29	0.71
39	ccom	19.64	0.00	6.25	0.93	0.07	3.00	1.12	17.41	18.54	0.06	0.94
40	cfini	37.33	0.00	10.40	0.94	0.06	3.00	4.05	29.35	33.40	0.12	0.88
41	cins	18.41	0.00	5.82	0.45	0.55	3.00	9.88	7.93	17.81	0.55	0.45
44	crent	0.27	0.00	0.72	0.01	0.99	3.00	0.24	0.03	0.27	0.88	0.12
45	ccomp	17.14	0.00	5.76	0.90	0.10	3.00	0.84	15.51	16.35	0.05	0.95
47	cobus	22.57		6.72	0.74	0.26	3.00	6.29	14.98	21.27	0.30	0.70
48	cpa	29.27		7.07	0.96	0.04	3.00	6.15	20.44	26.60	0.23	0.77
53	crecr	24.51		6.65	0.97	0.03	3.00	3.16	19.45	22.62	0.14	0.86

Notes: Notation for variables and parameters is defined in Appendix 7A.1, notation for commodities is defined in Appendix 6A.



Table 8C.5 Effects of the oil export price increase on domestic sales

Commo- No duty	% change in variables			Parameters			Expansion effect	Decomposition of total effect on QD				
	QD 1	PE 2	PDS 3	Qe/Qx 4	Qd/Qx 5	$\sigma_c'$ 6		Substit. effect	Total effect	Due to exp.eff (%)	Due to subst.eff. (%)	
<b>Products of agriculture, forestry and fishing</b>												
1 cagr	2.20	-0.01	2.59	0.21	0.79	5.00	-0.31	2.69	2.37	-13.15	113.15	
2 cfor	0.21	-0.03	2.91	0.09	0.91	5.00	-0.98	1.37	0.39	-253.45	353.45	
3 cfish	0.95	-0.06	7.11	0.03	0.97	5.00	0.05	1.12	1.18	4.62	95.38	
<b>Products of mining</b>												
4 cmin	-1.00	-0.25	1.04	0.47	0.53	5.00	-3.48	3.04	-0.43	803.71	-703.71	
5 cpetr	-16.23	31.41	25.32	0.85	0.15	5.00	3.05	-25.71	-22.66	-13.45	113.45	
6 core	-4.84	-0.74	-1.85	0.22	0.78	5.00	-3.00	-1.20	-4.20	71.39	28.61	
7 comin	-2.77	-0.04	2.46	0.21	0.79	5.00	-4.71	2.67	-2.04	230.53	-130.53	
<b>Products of manufacturing</b>												
8 cfood	4.77	-0.50	7.65	0.12	0.88	5.00	0.84	4.85	5.69	14.80	85.20	
9 ctob	6.82	-0.03	8.94	0.05	0.95	5.00	4.92	2.22	7.14	68.90	31.10	
10 ctex	0.84	-1.37	3.25	0.09	0.91	5.00	-0.90	2.03	1.12	-80.41	180.41	
11 cwear	-0.29	-0.01	3.09	0.11	0.89	5.00	-1.83	1.77	-0.07	2786.25	-2686.25	
12 cleat	-1.67	-0.64	1.06	0.46	0.54	5.00	-5.05	3.89	-1.15	438.04	-338.04	
13 cwood	-5.74	-3.55	0.32	0.05	0.95	5.00	-6.09	0.97	-5.11	119.00	-19.00	
14 cpulp	-2.28	-2.27	1.53	0.07	0.93	5.00	-3.26	1.26	-2.00	163.27	-63.27	
15 cpubl	-0.98	-0.49	4.03	0.02	0.98	5.00	-1.38	0.51	-0.88	157.80	-57.80	
16 ccoke	-2.91	-12.13	5.40	0.06	0.94	5.00	-5.35	4.98	-0.37	1438.84	-1338.84	
17 cchem	-7.91	-0.25	1.77	0.93	0.07	5.00	-14.59	9.40	-5.20	280.81	-180.81	
18 crub	-1.95	-9.15	2.49	0.05	0.95	5.00	-3.85	2.82	-1.03	373.33	-273.33	
19 cmnmt	-2.95	-8.51	3.65	0.01	0.99	5.00	-3.14	0.44	-2.70	116.46	-16.46	
20 ciron	-2.63	-0.98	0.11	0.52	0.48	5.00	-4.97	2.84	-2.12	233.95	-133.95	
21 cfmet	-3.97	-1.76	1.32	0.09	0.91	5.00	-4.94	1.36	-3.58	138.16	-38.16	
22 cmach	-5.28	-3.87	1.38	0.18	0.82	5.00	-8.56	4.62	-3.94	217.16	-117.16	
23 cofic	-8.43		-0.50	0.36	0.64	5.00	-7.19	-0.90	-8.09	88.91	11.09	
24 celmc	-6.46	-0.01	2.09	0.70	0.30	5.00	-12.00	7.31	-4.69	255.86	-155.86	
25 crad	0.12		2.01	0.42	0.58	5.00	-3.73	4.23	0.51	-737.73	837.73	
26 cmed	-2.17		1.53	0.23	0.77	5.00	-3.64	1.75	-1.89	192.90	-92.90	
27 cmvec	-5.32		4.59	0.00	1.00	5.00	-5.09	0.10	-4.99	101.90	-1.90	
28 cotr	-3.69		3.64	0.01	0.99	5.00	-3.68	0.10	-3.58	102.92	-2.92	
29 cfurn	-1.59	-0.57	2.70	0.07	0.93	5.00	-2.51	1.12	-1.39	180.63	-80.63	
30 crec	-0.45		5.26	0.00	1.00	0.00	-0.44	0.00	-0.44	100.00	0.00	
<b>Electrical energy, gas and hot water</b>												
31 cel	4.36		8.30	0.02	0.98	5.00	3.33	0.95	4.28	77.82	22.18	
32 cwat	3.72		8.13	0.00	1.00	0.00	3.69	0.00	3.69	100.00	0.00	
<b>Construction works and services</b>												
33 ccnst	-0.37		4.62	0.00	1.00	5.00	-0.45	0.10	-0.35	128.17	-28.17	
34 ctrd	-2.20		4.55	0.00	1.00	5.00	-2.16	0.01	-2.15	100.32	-0.32	
35 chot	6.10		9.96	0.00	1.00	0.00	6.08	0.00	6.08	100.00	0.00	
36 cretr	8.75		9.76	0.00	1.00	0.00	8.95	0.00	8.95	100.00	0.00	
37 ccant	10.38		10.71	0.00	1.00	0.00	10.68	0.00	10.68	100.00	0.00	
38 ctrns	3.46		5.40	0.19	0.81	5.00	-1.04	5.24	4.20	-24.73	124.73	
39 ccom	-0.27		6.25	0.07	0.93	5.00	-1.95	2.18	0.23	-852.41	952.41	
40 cfini	2.07		10.40	0.01	0.99	5.00	1.45	0.72	2.17	66.67	33.33	
41 cins	-0.06		5.82	0.03	0.97	5.00	-0.71	0.79	0.08	-885.74	985.74	
42 caux	0.25		58.73	0.00	1.00	0.00	0.32	0.00	0.32	100.00	0.00	
43 cest	5.45		22.85	0.00	1.00	0.00	6.15	0.00	6.15	100.00	0.00	
44 crent	-1.86		0.72	0.97	0.03	5.00	-4.95	3.46	-1.49	332.81	-232.81	
45 ccomp	-0.97		5.76	0.00	1.00	5.00	-1.03	0.08	-0.95	108.27	-8.27	
46 cres	0.29		5.92	0.00	1.00	0.00	0.29	0.00	0.29	100.00	0.00	
47 cobus	0.84		6.72	0.02	0.98	5.00	0.22	0.76	0.99	22.61	77.39	
48 cpa	5.32		7.07	0.15	0.85	5.00	0.91	5.26	6.17	14.72	85.28	
49 ceduc	3.58		7.35	0.00	1.00	0.00	3.58	0.00	3.58	100.00	0.00	
50 chelt	2.47		6.11	0.00	1.00	0.00	2.48	0.00	2.48	100.00	0.00	
51 csew	3.41		8.90	0.00	1.00	0.00	3.51	0.00	3.51	100.00	0.00	
52 cmemb	9.67		13.33	0.00	1.00	0.00	9.80	0.00	9.80	100.00	0.00	
53 crecr	2.63		6.65	0.00	1.00	5.00	2.63	0.00	2.63	99.82	0.18	
54 coser	7.05		9.05	0.00	1.00	0.00	7.21	0.00	7.21	100.00	0.00	
55 chh	8.26		21.23	0.00	1.00	0.00	8.94	0.00	8.94	100.00	0.00	

Notes: Shaded cells in the table denote quantities and prices for nontraded goods. Notation for variables and parameters is defined in Appendix 7A.1, notation for commodities is defined in Appendix 6A.

## Appendix 8D Effects of the 35-percent Increase in the Oil Export Price under the Foreign Closure Rule

**Table 8D.1 Sectoral adjustments under the foreign closure rule**

No	Commodity	QX 1	QVA 2	QINTA 3	QQ 4	QD 5	QF <sub>lab</sub> 6	PX 7	PVA 8	PINTA 9	PQ 10	PDD 11	WF <sub>lab</sub> 12	WF <sub>cap</sub> 13
<i>Products of agriculture, forestry and fishing</i>														
1	cagr	-0.13	-0.13	-0.13	0.60	0.53	-0.64	0.51	0.00	1.14	0.63	0.65	2.18	-0.52
2	cfor	-0.43	-0.43	-0.43	0.28	-0.05	-0.77	0.76	0.46	1.30	0.72	0.83	2.18	-1.70
3	cfish	-0.05	-0.05	-0.05	0.25	0.18	-0.21	1.44	1.34	1.59	1.46	1.48	2.18	1.09
<i>Products of mining</i>														
4	cmin	-1.24	-1.24	-1.24	-0.52	-0.55	-2.40	0.09	-3.68	1.91	0.35	0.37	2.18	-9.50
5	<b>cpetr</b>	3.05	3.05	3.05	1.95	-17.52	15.05	30.67	77.28	6.46	15.07	23.49	2.18	105.99
6	core	-1.26	-1.26	-1.26	-1.72	-1.67	-2.22	-0.51	-2.70	1.18	-0.43	-0.45	2.18	-8.66
7	comin	-1.77	-1.77	-1.77	-0.74	-0.91	-2.23	0.65	-0.20	1.30	1.04	1.10	2.18	-8.72
<i>Products of manufacturing</i>														
8	<b>cfood</b>	0.06	0.06	0.06	2.24	1.35	0.26	1.90	2.36	1.48	1.54	1.84	2.18	2.42
9	<b>ctob</b>	1.28	1.28	1.28	<b>2.23</b>	1.88	3.66	2.48	4.33	1.30	2.24	2.36	2.18	5.52
10	ctex	-0.42	-0.42	-0.42	0.88	0.11	-2.31	0.77	0.64	0.86	0.74	1.00	2.18	0.31
11	cwear	-0.75	-0.75	-0.75	0.95	-0.23	-2.45	0.83	0.79	0.86	0.59	0.99	2.18	0.19
12	cleat	-1.82	-1.82	-1.82	0.05	-0.65	-5.11	0.11	-0.55	0.59	0.47	0.70	2.18	-1.99
13	cwood	-2.25	-2.25	-2.25	-0.32	-1.97	-5.93	0.10	-0.89	0.96	0.37	0.93	2.18	-2.66
14	cpulp	-1.24	-1.24	-1.24	0.18	-0.89	-4.05	0.40	-0.13	0.70	0.17	0.53	2.18	-1.11
15	cpubl	-0.55	-0.55	-0.55	0.96	-0.39	-0.82	1.31	1.97	0.92	0.89	1.34	2.18	1.52
16	ccoke	-4.28	-4.28	-4.28	-0.56	-2.65	-14.24	3.46	-6.35	7.06	2.59	3.32	2.18	-9.55
17	cchem	-6.03	-6.03	-6.03	0.41	-2.72	-12.23	-0.02	-3.20	1.71	0.15	1.21	2.18	-7.87
18	crub	-1.42	-1.42	-1.42	1.39	-0.67	-3.82	0.66	0.21	0.93	0.43	1.12	2.18	-0.92
19	cmnmt	-1.06	-1.06	-1.06	0.16	-0.93	-2.22	1.47	1.23	1.65	1.06	1.43	2.18	0.38
20	ciron	-1.83	-1.83	-1.83	-0.50	-0.73	-5.24	-0.07	-0.64	0.28	0.26	0.33	2.18	-2.09
21	cfmet	-1.80	-1.80	-1.80	-0.27	-1.36	-4.97	0.46	-0.44	1.02	0.57	0.94	2.18	-1.87
22	cmach	-3.06	-3.06	-3.06	0.47	-1.63	-6.19	0.34	-0.44	1.08	0.41	1.12	2.18	-2.87
23	cofic	-2.61	-2.61	-2.61	0.32	-2.78	-7.04	-0.06	-1.53	0.63	0.09	1.15	2.18	-3.57
24	celmc	-4.67	-4.67	-4.67	0.78	-2.23	-9.00	0.22	-1.52	0.76	0.06	1.07	2.18	-5.18
25	crad	-1.40	-1.40	-1.40	2.26	-0.13	-3.90	0.36	0.13	0.47	0.11	0.90	2.18	-0.99
26	cmed	-1.38	-1.38	-1.38	0.89	-0.81	-4.18	0.39	-0.13	0.69	0.19	0.76	2.18	-1.22
27	cmvec	-1.80	-1.80	-1.80	0.97	-1.77	-2.48	1.71	1.62	1.78	0.44	1.36	2.18	0.16
28	cotr	-1.60	-1.60	-1.60	0.50	-1.57	-2.27	1.25	1.63	0.94	0.56	1.26	2.18	0.34
29	cfurn	-1.02	-1.02	-1.02	1.06	-0.69	-2.86	0.78	0.67	0.83	0.44	1.02	2.18	-0.14
30	crec	-0.17	-0.17	-0.17	-0.17	-0.17	-0.42	1.78	1.98	1.70	1.78	1.78	2.18	1.85
<i>Electrical energy, gas and hot water</i>														
31	<b>cel</b>	0.73	0.73	0.73	1.34	1.12	1.51	3.78	2.81	4.51	3.31	3.39	2.18	3.41
32	<b>cwat</b>	1.24	1.24	1.24	1.24	1.24	3.07	2.97	3.65	2.34	2.97	2.97	2.18	4.67
<i>Construction works and services</i>														
33	ccnst	-0.18	-0.18	-0.18	0.62	-0.15	-0.46	1.57	2.01	1.18	1.30	1.56	2.18	1.90
34	ctrd	-1.27	-1.27	-1.27	-1.27	-1.27	-3.30	1.26	0.93	1.67	1.26	1.26	2.18	0.16
35	<b>chot</b>	1.95	1.95	1.95	1.95	1.95	4.16	3.23	3.50	2.79	3.23	3.23	2.18	4.70
36	<b>cretr</b>	2.79	2.79	2.79	2.79	2.79	5.66	3.10	3.88	2.37	3.10	3.10	2.18	5.59
37	<b>ccant</b>	3.17	3.17	3.17	3.17	3.17	6.46	3.39	4.11	1.98	3.39	3.39	2.18	6.06
38	ctrns	-0.75	-0.75	-0.75	1.78	1.01	-1.96	1.56	1.44	1.67	1.67	1.92	2.18	0.99
39	ccom	-1.00	-1.00	-1.00	0.07	-0.36	-1.64	1.84	1.67	2.08	1.82	1.97	2.18	0.86
40	<b>cfini</b>	0.34	0.34	0.34	1.10	0.53	1.08	3.08	2.78	3.74	2.93	3.12	2.18	3.06
41	cins	-0.40	-0.40	-0.40	2.96	-0.16	-0.69	1.83	1.95	1.55	0.84	1.88	2.18	1.63
42	<b>caux</b>	0.08	0.08	0.08	0.08	0.08	25.86	16.92	22.57	4.49	16.92	16.92	2.18	22.65
43	<b>cest</b>	1.63	1.63	1.63	1.63	1.63	11.85	6.70	10.26	3.74	6.70	6.70	2.18	11.69
44	crent	-1.83	-1.83	-1.83	-0.12	-0.77	-5.51	0.01	-0.87	1.54	0.00	0.22	2.18	-2.31
45	ccomp	-0.45	-0.45	-0.45	0.16	-0.42	-0.70	1.87	1.98	1.76	1.68	1.88	2.18	1.62
46	cres	-0.06	-0.06	-0.06	-0.06	-0.06	-0.09	1.94	2.16	1.66	1.94	1.94	2.18	2.11
47	<b>cobus</b>	0.01	0.01	0.01	1.91	0.24	0.04	2.09	2.21	1.64	1.58	2.14	2.18	2.22
48	cpa	-0.10	-0.10	-0.10	1.77	1.52	-0.13	1.98	2.16	1.83	2.22	2.31	2.18	2.08
49	<b>ceduc</b>	1.02	1.02	1.02	1.02	1.02	1.34	2.44	2.44	2.44	2.44	2.44	2.18	3.27
50	<b>chelt</b>	0.73	0.73	0.73	0.73	0.73	1.27	2.03	2.62	1.46	2.03	2.03	2.18	3.21
51	<b>csew</b>	0.93	0.93	0.93	0.93	0.93	3.32	2.90	4.10	2.02	2.90	2.90	2.18	4.87
52	<b>ememb</b>	2.85	2.85	2.85	2.85	2.85	4.92	4.16	3.82	4.75	4.16	4.16	2.18	6.16
53	<b>crecr</b>	0.82	0.82	0.82	0.98	0.82	1.47	2.17	2.71	1.77	2.12	2.17	2.18	3.38
54	<b>coser</b>	2.24	2.24	2.24	2.24	2.24	4.18	2.94	3.72	1.89	2.94	2.94	2.18	5.56
55	<b>chh</b>	2.53	2.53	2.53	2.53	2.53	10.03	6.45	8.07	1.62	6.45	6.45	2.18	10.24

Notes: Shaded cells in the table denote quantities and prices for nontraded goods. Commodities which outputs increase are shown in bold font. Notation for variables is defined in Appendix 7A.1, notation for commodities is defined in Appendix 6A.

Table 8D.2 Ranking of sectors' outputs in ascending order

No	Commodity	$s_{qh}$	No	Commodity	$QX$
<i>Products of agriculture, forestry and fishing</i>					
3	cfish	0.05	2	cfor	-0.43
2	cfor	0.13	1	cagr	-0.13
1	cagr	0.35	3	cfish	-0.05
<i>Products of mining</i>					
6	core	-	7	comin	-1.77
7	comin	0.003	6	core	-1.26
4	cmin	0.02	4	cmin	-1.24
<b>5</b>	<b>cpetr</b>	<b>0.24</b>	<b>5</b>	<b>cpetr</b>	<b>3.05</b>
<i>Products of manufacturing</i>					
30	crec	0.00	17	cchem	-6.03
20	ciron	0.001	24	celmc	-4.67
13	cwood	0.004	16	ccoke	-4.28
19	cmnmt	0.02	22	cmach	-3.06
21	cfmet	0.02	23	cofic	-2.61
f14	cpulp	0.04	13	cwood	-2.25
22	cmach	0.09	20	ciron	-1.83
23	cofic	0.09	12	cleat	-1.82
16	ccoke	0.14	21	cfmet	-1.80
12	cleat	0.16	27	cmvec	-1.80
15	cpubl	0.17	28	cotr	-1.60
28	cotr	0.18	18	crub	-1.42
26	cmed	0.19	25	crad	-1.40
17	cchem	0.20	26	cmed	-1.38
24	celmc	0.21	14	cpulp	-1.24
29	cfurn	0.24	19	cmnmt	-1.06
27	cmvec	0.25	29	cfurn	-1.02
10	ctex	0.28	11	cwear	-0.75
11	cwear	0.30	15	cpubl	-0.55
18	crub	0.34	10	ctex	-0.42
25	crad	0.51	30	crec	-0.17
<b>8</b>	<b>cfood</b>	<b>0.53</b>	<b>8</b>	<b>cfood</b>	<b>0.06</b>
<b>9</b>	<b>ctob</b>	<b>0.75</b>	<b>9</b>	<b>ctob</b>	<b>1.28</b>
<i>Electrical energy, gas and hot water</i>					
<b>32</b>	<b>cwat</b>	<b>0.20</b>	<b>31</b>	<b>cel</b>	<b>0.73</b>
<b>31</b>	<b>cel</b>	<b>0.30</b>	<b>32</b>	<b>cwat</b>	<b>1.24</b>
<i>Construction works and services</i>					
46	cres	0.00	44	crent	-1.83
45	ccomp	0.05	34	ctrd	-1.27
44	crent	0.06	39	ccom	-1.00
34	ctrd	0.11	38	ctrns	-0.75
33	ccnst	0.11	45	ccomp	-0.45
39	ccom	0.13	41	cins	-0.40
<b>51</b>	<b>csew</b>	<b>0.16</b>	33	ccnst	-0.18
<b>50</b>	<b>chelt</b>	<b>0.18</b>	48	cpa	-0.10
<b>53</b>	<b>crecr</b>	<b>0.22</b>	46	cres	-0.06
<b>49</b>	<b>ceduc</b>	<b>0.27</b>	<b>47</b>	<b>cobus</b>	<b>0.01</b>
<b>40</b>	<b>cfini</b>	<b>0.28</b>	<b>42</b>	<b>caux</b>	<b>0.08</b>
<b>35</b>	<b>chot</b>	<b>0.38</b>	<b>40</b>	<b>cfini</b>	<b>0.34</b>
38	ctrns	0.39	<b>50</b>	<b>chelt</b>	<b>0.73</b>
<b>47</b>	<b>cobus</b>	<b>0.40</b>	<b>53</b>	<b>crecr</b>	<b>0.82</b>
48	cpa	0.47	<b>51</b>	<b>csew</b>	<b>0.93</b>
<b>54</b>	<b>coser</b>	<b>0.49</b>	<b>49</b>	<b>ceduc</b>	<b>1.02</b>
<b>43</b>	<b>cest</b>	<b>0.50</b>	<b>43</b>	<b>cest</b>	<b>1.63</b>
41	cins	0.60	<b>35</b>	<b>chot</b>	<b>1.95</b>
<b>42</b>	<b>caux</b>	<b>0.61</b>	<b>54</b>	<b>coser</b>	<b>2.24</b>
<b>36</b>	<b>cretr</b>	<b>0.71</b>	<b>55</b>	<b>chh</b>	<b>2.53</b>
<b>37</b>	<b>ccant</b>	<b>0.86</b>	<b>36</b>	<b>cretr</b>	<b>2.79</b>
<b>52</b>	<b>cmemb</b>	<b>0.90</b>	<b>52</b>	<b>cmemb</b>	<b>2.85</b>
<b>55</b>	<b>chh</b>	<b>1.00</b>	<b>37</b>	<b>ccant</b>	<b>3.17</b>

Note: Shaded cells in the table denote quantities of nontraded goods. Commodities which outputs increase are shown in bold font.  $s_{qh}$  is a share of private consumption of commodity  $c$  in the total composite demand for commodity  $c$ ,  $QX$  denotes outputs. Notation for commodities is defined in Appendix 6A.

Table 8D.3 Decomposition of effects of the oil export price increase on sectoral value-added and labor under the foreign closure rule

No	Commodity	% change in variables					Parameters					Log-lin % change in QVA (2)*(7) or exp. eff	Disaggregation of effects in $QF_{lab}$				
		QVA 1	$QF_{lab}$ 2	PVA 3	$WF_{lab}$ 4	$WF_{cap}$ 5	$Wf_{lab}$ - PVA (4)-(3) 6	$L_a/QVA_a$ 7	$K_a/QVA_a$ 8	$TVA_a/QVA_a$ 9	Check (6)+(7) +(8) 10		$\sigma_a^{va}$ 11	Substitution effect (8)*(11)* ((5)-(4)) 13	Total change in $QF_{lab}$ 14	Due to expan eff (%) 15	Due to subst. eff (%) 16
<b>Products of agriculture, forestry and fishing</b>																	
1.	cagr	-0.13	-0.64	0.00	2.18	-0.52	2.18	0.19	0.80	0.00	1.00	0.24	-0.12	-0.52	-0.65	0.19	0.81
2.	cfor	-0.43	-0.77	0.46	2.18	-1.70	1.72	0.54	0.43	0.03	1.00	0.20	-0.42	-0.33	-0.75	0.56	0.44
3.	cfish	-0.05	-0.21	1.34	2.18	1.09	0.85	0.22	0.75	0.03	1.00	0.20	-0.05	-0.16	-0.21	0.22	0.78
<b>Products of mining</b>																	
4.	cmin	-1.24	-2.40	-3.68	2.18	-9.50	5.86	0.49	0.49	0.03	1.00	0.20	-1.17	-1.14	-2.31	0.51	0.49
5.	cpetr	3.05	15.05	77.28	2.18	105.99	-75.10	0.23	0.64	0.13	1.00	0.20	3.45	13.29	16.73	0.21	0.79
6.	core	-1.26	-2.22	-2.70	2.18	-8.66	4.88	0.49	0.39	0.12	1.00	0.20	-1.08	-0.85	-1.94	0.56	0.44
7.	comin	-1.77	-2.23	-0.20	2.18	-8.72	2.39	0.74	0.20	0.06	1.00	0.20	-1.65	-0.45	-2.10	0.79	0.21
<b>Products of manufacturing</b>																	
8.	cfood	0.06	0.26	2.36	2.18	2.42	-0.18	0.24	0.75	0.01	1.00	1.12	0.06	0.20	0.26	0.24	0.76
9.	ctob	1.28	3.66	4.33	2.18	5.52	-2.15	0.33	0.61	0.06	1.00	1.12	1.21	2.27	3.47	0.35	0.65
10.	ctex	-0.42	-2.31	0.64	2.18	0.31	1.54	0.18	0.80	0.02	1.00	1.26	-0.41	-1.90	-2.31	0.18	0.82
11.	cwear	-0.75	-2.45	0.79	2.18	0.19	1.39	0.30	0.69	0.01	1.00	1.26	-0.74	-1.74	-2.48	0.30	0.70
12.	cleat	-1.82	-5.11	-0.55	2.18	-1.99	2.73	0.35	0.64	0.01	1.00	1.26	-1.77	-3.37	-5.14	0.35	0.65
13.	cwood	-2.25	-5.93	-0.89	2.18	-2.66	3.07	0.36	0.61	0.03	1.00	1.26	-2.15	-3.71	-5.85	0.37	0.63
14.	cpulp	-1.24	-4.05	-0.13	2.18	-1.11	2.31	0.30	0.69	0.01	1.00	1.26	-1.22	-2.87	-4.10	0.30	0.70
15.	cpubl	-0.55	-0.82	1.97	2.18	1.52	0.22	0.66	0.32	0.01	1.00	1.26	-0.54	-0.27	-0.81	0.67	0.33
16.	ccoke	-4.28	-14.24	-6.35	2.18	-9.55	8.54	0.27	0.68	0.05	1.00	1.26	-3.90	-10.02	-13.92	0.28	0.72
17.	cchem	-6.03	-12.23	-3.20	2.18	-7.87	5.39	0.47	0.51	0.02	1.00	1.26	-5.74	-6.44	-12.17	0.47	0.53
18.	crub	-1.42	-3.82	0.21	2.18	-0.92	1.98	0.37	0.63	0.01	1.00	1.26	-1.40	-2.45	-3.85	0.36	0.64
19.	cmmmt	-1.06	-2.22	1.23	2.18	0.38	0.95	0.46	0.51	0.02	1.00	1.26	-1.03	-1.17	-2.19	0.47	0.53
20.	ciron	-1.83	-5.24	-0.64	2.18	-2.09	2.82	0.34	0.64	0.03	1.00	1.26	-1.76	-3.42	-5.18	0.34	0.66
21.	cfmet	-1.80	-4.97	-0.44	2.18	-1.87	2.62	0.36	0.64	0.01	1.00	1.26	-1.77	-3.25	-5.02	0.35	0.65
22.	cmach	-3.06	-6.19	-0.44	2.18	-2.87	2.62	0.48	0.50	0.02	1.00	1.26	-2.96	-3.19	-6.15	0.48	0.52
23.	cofic	-2.61	-7.04	-1.53	2.18	-3.57	3.71	0.36	0.64		1.00	1.26	-2.56	-4.61	-7.17	0.36	0.64
24.	celmc	-4.67	-9.00	-1.52	2.18	-5.18	3.70	0.50	0.48	0.02	1.00	1.26	-4.50	-4.47	-8.98	0.50	0.50
25.	crad	-1.40	-3.90	0.13	2.18	-0.99	2.06	0.35	0.64	0.00	1.00	1.26	-1.38	-2.57	-3.95	0.35	0.65
26.	cmed	-1.38	-4.18	-0.13	2.18	-1.22	2.31	0.32	0.67	0.01	1.00	1.26	-1.35	-2.86	-4.21	0.32	0.68
27.	cmvec	-1.80	-2.48	1.62	2.18	0.16	0.56	0.69	0.26	0.05	1.00	1.26	-1.71	-0.67	-2.38	0.72	0.28

Effects of the 35-percent Increase in the Oil Export Price under the Foreign Closure Rule

Table 8D.3 Continued

No	Commodity	% change in variables					Parameters					Log-lin % change in QVA (2)*(7) or exp. effect	Disaggregation of effects in $QF_{lab}$				
		$QVA$	$QF_{lab}$	$PVA$	$WF_{lab}$	$WF_{cap}$	$\frac{W_{lab}^f}{PVA}$ (4)-(3)	$L_a/QVA_a$	$K_a/QVA_a$	$TVA_a/QVA_a$	Check (6)+(7) + (8)		$\sigma_a^{va}$	Substitution effect (8)*(11)* ((5)-(4))	Total change in $QF_{lab}$	Due to expan eff (%)	Due to subst. eff (%)
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
28.	cotr	-1.60	-2.27	1.63	2.18	0.34	0.55	0.69	0.29	0.02	1.00	1.26	-1.57	-0.68	-2.24	0.70	0.30
29.	cfurn	-1.02	-2.86	0.67	2.18	-0.14	1.51	0.35	0.64	0.01	1.00	1.26	-1.00	-1.88	-2.88	0.35	0.65
30.	crec	-0.17	-0.42	1.98	2.18	1.85	0.20	0.40	0.58	0.02	1.00	1.26	-0.16	-0.25	-0.41	0.40	0.60
<i>Electrical energy, gas and hot water</i>																	
31.	<b>cel</b>	0.73	1.51	2.81	2.18	3.41	-0.63	0.44	0.47	0.09	1.00	1.26	0.67	0.72	1.39	0.48	0.52
32.	<b>cwat</b>	1.24	3.07	3.65	2.18	4.67	-1.46	0.40	0.57	0.03	1.00	1.26	1.22	1.80	3.01	0.40	0.60
<i>Construction works and services</i>																	
33.	ccnst	-0.18	-0.46	2.01	2.18	1.90	0.17	0.39	0.60	0.01	1.00	1.68	-0.18	-0.28	-0.46	0.39	0.61
34.	ctrd	-1.27	-3.30	0.93	2.18	0.16	1.25	0.38	0.61	0.01	1.00	1.68	-1.25	-2.07	-3.32	0.38	0.62
35.	<b>chot</b>	1.95	4.16	3.50	2.18	4.70	-1.31	0.46	0.52	0.02	1.00	1.68	1.92	2.18	4.10	0.47	0.53
36.	<b>cretr</b>	2.79	5.66	3.88	2.18	5.59	-1.69	0.49	0.50	0.00	1.00	1.68	2.80	2.88	5.68	0.49	0.51
37.	<b>ccant</b>	3.17	6.46	4.11	2.18	6.06	-1.92	0.50	0.50	0.00	1.00	1.68	3.20	3.28	6.48	0.49	0.51
38.	ctrns	-0.75	-1.96	1.44	2.18	0.99	0.74	0.37	0.60	0.04	1.00	1.68	-0.72	-1.20	-1.92	0.38	0.62
39.	ccom	-1.00	-1.64	1.67	2.18	0.86	0.52	0.59	0.37	0.04	1.00	1.26	-0.96	-0.63	-1.59	0.61	0.39
40.	<b>cfini</b>	0.34	1.08	2.78	2.18	3.06	-0.60	0.29	0.63	0.07	1.00	1.26	0.31	0.70	1.01	0.31	0.69
41.	cins	-0.40	-0.69	1.95	2.18	1.63	0.24	0.58	0.42	0.00	1.00	1.26	-0.40	-0.30	-0.69	0.57	0.43
42.	<b>caux</b>	0.08	25.86	22.57	2.18	22.65	-20.39	0.00	1.00	0.00	1.00	1.26	0.09	25.68	25.77	0.00	1.00
43.	<b>cest</b>	1.63	11.85	10.26	2.18	11.69	-8.08	0.14	0.85	0.01	1.00	1.26	1.68	10.21	11.89	0.14	0.86
44.	crent	-1.83	-5.51	-0.87	2.18	-2.31	3.05	0.33	0.67	0.00	1.00	1.26	-1.79	-3.80	-5.60	0.32	0.68
45.	ccomp	-0.45	-0.70	1.98	2.18	1.62	0.21	0.64	0.36	0.00	1.00	1.26	-0.45	-0.26	-0.70	0.63	0.37
46.	cres	-0.06	-0.09	2.16	2.18	2.11	0.02	0.67	0.32	0.01	1.00	1.26	-0.06	-0.03	-0.09	0.67	0.33
47.	<b>cobus</b>	0.01	0.04	2.21	2.18	2.22	-0.03	0.24	0.75	0.00	1.00	1.26	0.01	0.03	0.04	0.24	0.76
48.	cpa	-0.10	-0.13	2.16	2.18	2.08	0.03	0.75	0.25	0.00	1.00	1.26	-0.10	-0.03	-0.13	0.74	0.26
49.	<b>ceduc</b>	1.02	1.34	2.44	2.18	3.27	-0.26	0.76	0.24	0.00	1.00	1.26	1.02	0.32	1.34	0.76	0.24
50.	<b>chelt</b>	0.73	1.27	2.62	2.18	3.21	-0.44	0.57	0.43	0.00	1.00	1.26	0.72	0.55	1.28	0.57	0.43
51.	<b>csew</b>	0.93	3.32	4.10	2.18	4.87	-1.92	0.28	0.71	0.01	1.00	1.26	0.94	2.41	3.35	0.28	0.72
52.	<b>cmemb</b>	2.85	4.92	3.82	2.18	6.16	-1.63	0.58	0.41	0.01	1.00	1.26	2.83	2.06	4.90	0.58	0.42
53.	<b>crecr</b>	0.82	1.47	2.71	2.18	3.38	-0.53	0.55	0.44	0.01	1.00	1.26	0.81	0.66	1.47	0.55	0.45
54.	<b>coser</b>	2.24	4.18	3.72	2.18	5.56	-1.54	0.54	0.46	0.00	1.00	1.26	2.25	1.96	4.21	0.54	0.46
55.	<b>chh</b>	2.53	10.03	8.07	2.18	10.24	-5.89	0.26	0.73	0.01	1.00	1.26	2.58	7.43	10.00	0.26	0.74

Notes: Shaded cells in the table denote quantities and prices for nontraded goods. Commodities which outputs increase are shown in bold font. Notation for variables and parameters is defined in Appendix 7A.1, notation for commodities is defined in Appendix 6A. Subscripts  $lab$  and  $cap$  indicate labor and capital respectively.  $L_a$ ,  $K_a$ ,  $TVA_a$  denote labor, capital and total value added net of taxes on production in an activity  $a$  respectively.

Table 8D.4 Disaggregation of the total effect on exports under the foreign closure rule

No	Commodity	% change in variables				Parameters				Disaggregation of total effect on QE				
		QE 1	PE 2	PDS 3	Qe/Qx 4	Qd/Qx 5	$\sigma_c^t$ 6	$\sigma_c^a$ 7	Expansion effect or log- lin change in QX 8	Substitution effect (6)*(5)* ((2)-(3)) 9	Total effect (8)+(9) 10	Due to exp.eff (%) (8)/(10) 11	Due to subst.eff. (%) (9)/(10) 12	
<b>Products of agriculture, forestry and fishing</b>														
1	cagr	-2.66	0.00	0.65	0.21	0.79	5.00	3.00	-0.12	-2.57	-2.69	4.58	95.42	
2	cfor	-4.15	-0.01	0.83	0.09	0.91	5.00	3.00	-0.42	-3.81	-4.22	9.87	90.13	
3	cfish	-7.02	-0.02	1.48	0.03	0.97	5.00	3.00	-0.05	-7.27	-7.32	0.65	99.35	
<b>Products of mining</b>														
4	cmin	-2.01	-0.07	0.22	0.47	0.53	5.00	3.00	-1.17	-0.78	-1.95	59.97	40.03	
<b>5</b>	<b>cpetr</b>	<b>6.72</b>	<b>31.59</b>	<b>24.98</b>	<b>0.85</b>	<b>0.15</b>	<b>5.00</b>	<b>3.00</b>	<b>3.45</b>	<b>5.11</b>	<b>8.56</b>	<b>40.28</b>	<b>59.72</b>	
<b>6</b>	<b>core</b>	<b>0.25</b>	<b>-0.21</b>	<b>-0.59</b>	<b>0.22</b>	<b>0.78</b>	<b>5.00</b>	<b>3.00</b>	<b>-1.08</b>	<b>1.51</b>	<b>0.43</b>	<b>-252.51</b>	<b>352.51</b>	
7	comin	-4.94	-0.01	0.82	0.21	0.79	5.00	3.00	-1.65	-3.28	-4.93	33.46	66.54	
<b>Products of manufacturing</b>														
8	cfood	-9.57	-0.14	2.16	0.12	0.88	5.00	3.00	0.06	-10.14	-10.08	-0.60	100.60	
9	ctob	-10.45	-0.01	2.60	0.05	0.95	5.00	3.00	1.21	-12.42	-11.22	-10.76	110.76	
10	ctex	-6.02	-0.39	0.88	0.09	0.91	5.00	3.00	-0.41	-5.78	-6.19	6.63	93.37	
11	cwear	-4.76	-0.003	0.93	0.11	0.89	5.00	3.00	-0.74	-4.14	-4.87	15.12	84.88	
12	cleat	-3.22	-0.18	0.34	0.46	0.54	5.00	3.00	-1.77	-1.42	-3.20	55.49	44.51	
13	cwood	-7.53	-1.00	0.16	0.05	0.95	5.00	3.00	-2.15	-5.52	-7.67	28.00	72.00	
14	cpulp	-6.23	-0.64	0.47	0.07	0.93	5.00	3.00	-1.22	-5.17	-6.39	19.10	80.90	
15	cpubl	-7.46	-0.14	1.34	0.02	0.98	5.00	3.00	-0.54	-7.24	-7.78	6.98	93.02	
16	ccoke	-32.18	-3.43	3.81	0.06	0.94	5.00	3.00	-3.90	-34.13	-38.03	10.26	89.74	
17	cchem	-6.29	-0.07	0.68	0.93	0.07	5.00	3.00	-5.74	-0.27	-6.01	95.53	4.47	
18	crub	-16.31	-2.59	0.81	0.05	0.95	5.00	3.00	-1.40	-16.16	-17.55	7.95	92.05	
19	cmnmt	-18.55	-2.41	1.49	0.01	0.99	5.00	3.00	-1.03	-19.34	-20.37	5.04	94.96	
20	ciron	-2.85	-0.28	0.15	0.52	0.48	5.00	3.00	-1.76	-1.03	-2.79	62.91	37.09	
21	cfmet	-6.38	-0.50	0.55	0.09	0.91	5.00	3.00	-1.77	-4.76	-6.53	27.08	72.92	
22	cmach	-9.79	-1.09	0.63	0.18	0.82	5.00	3.00	-2.96	-7.11	-10.07	29.38	70.62	
23	cofic	-2.30	0.00	-0.10	0.36	0.64	5.00	3.00	-2.56	0.31	-2.25	113.82	-13.82	
24	celmc	-5.73	0.00	0.73	0.70	0.30	5.00	3.00	-4.50	-1.10	-5.61	80.30	19.70	
25	crad	-3.15	0.00	0.62	0.42	0.58	5.00	3.00	-1.38	-1.78	-3.17	43.67	56.33	
26	cmed	-3.30	0.00	0.51	0.23	0.77	5.00	3.00	-1.35	-1.97	-3.32	40.66	59.34	
27	cmvec	-9.78	0.00	1.72	0.00	1.00	5.00	3.00	-1.71	-8.55	-10.26	16.68	83.32	
28	cotr	-7.51	0.00	1.25	0.01	0.99	5.00	3.00	-1.57	-6.23	-7.80	20.10	79.90	
29	cfurn	-5.54	-0.16	0.84	0.07	0.93	5.00	3.00	-1.00	-4.68	-5.68	17.60	82.40	
<b>Electrical energy, gas and hot water</b>														
31	cel	-16.33		3.86	0.02	0.98	5.00	3.00	0.67	-18.86	-18.19	-3.67	103.67	
<b>Construction works and services</b>														
33	ccnst	-7.66	0.00	1.58	0.00	1.00	5.00	3.00	-0.18	-7.85	-8.03	2.24	97.76	
34	ctrd	-7.27	0.00	1.26	0.00	1.00	5.00	3.00	-1.25	-6.31	-7.56	16.53	83.47	
38	ctrns	-8.16	0.00	1.92	0.19	0.81	5.00	3.00	-0.72	-7.75	-8.47	8.52	91.48	
39	ccom	-9.61	0.00	1.97	0.07	0.93	5.00	3.00	-0.96	-9.15	-10.11	9.51	90.49	
40	cfini	-13.77	0.00	3.12	0.01	0.99	5.00	3.00	0.31	-15.37	-15.05	-2.09	102.09	
41	cins	-9.03	0.00	1.88	0.03	0.97	5.00	3.00	-0.40	-9.13	-9.53	4.16	95.84	
44	crent	-1.86	0.00	0.22	0.97	0.03	5.00	3.00	-1.79	-0.04	-1.83	97.89	2.11	
45	ccomp	-9.26	0.00	1.88	0.00	1.00	5.00	3.00	-0.45	-9.35	-9.80	4.55	95.45	
47	cobus	-9.83	0.00	2.14	0.02	0.98	5.00	3.00	0.01	-10.45	-10.44	-0.10	100.10	
48	cpa	-9.43	0.00	2.31	0.15	0.85	5.00	3.00	-0.10	-9.82	-9.92	0.98	99.02	
53	crecr	-9.45	0.00	2.17	0.00	1.00	5.00	3.00	0.81	-10.86	-10.05	-8.07	108.07	

Notes: Commodities which exports increase are shown in bold font. Notation for variables and parameters is defined in Appendix 7A.1, notation for commodities is defined in Appendix 6A.

Table 8D.5 Decomposition of total effect on imports under the foreign closure

No	Commodity	% change in variables			Parameters			Disaggregation of total effect on QM				
		QM 1	PM 2	PDD 3	Qd/QQ 4	Qm/QQ 5	$\sigma_c^a$ 6	Expansion effect or %change in QQ 7	Substitution effect (6)*(4)* ((3)-(2)) 8	Total effect (7)+(8) 9	Due to exp. eff (%) (7)/(9) 10	Due to subst. eff. (%) (8)/(9) 11
<b>Products of agriculture, forestry and fishing</b>												
1	cagr	2.52	0.00	0.65	0.96	0.04	3.00	0.60	1.89	2.49	0.24	0.76
2	cfor	2.47	0.00	0.83	0.87	0.13	3.00	0.28	2.17	2.45	0.11	0.89
3	cfish	4.70	0.00	1.48	0.98	0.02	3.00	0.25	4.37	4.62	0.05	0.95
<b>Products of mining</b>												
4	cmin	0.54	0.00	0.37	0.97	0.03	3.00	-0.52	1.06	0.55	-0.95	1.95
5	cpetr	55.33	0.00	23.49	0.71	0.29	3.00	1.95	50.10	52.06	0.04	0.96
6	core	-2.99	0.00	-0.45	0.97	0.03	3.00	-1.72	-1.30	-3.01	0.57	0.43
7	comin	2.40	0.00	1.10	0.95	0.05	3.00	-0.74	3.14	2.40	-0.31	1.31
<b>Products of manufacturing</b>												
8	cfood	7.04	0.00	1.84	0.84	0.16	3.00	2.24	4.64	6.88	0.33	0.67
9	ctob	9.25	0.00	2.36	0.95	0.05	3.00	<b>2.23</b>	6.73	8.96	0.25	0.75
10	ctex	3.13	0.00	1.00	0.75	0.25	3.00	0.88	2.23	3.11	0.28	0.72
11	cwear	2.75	0.00	0.99	0.60	0.40	3.00	0.95	1.78	2.74	0.35	0.65
12	cleat	1.47	0.00	0.70	0.67	0.33	3.00	0.05	1.41	1.47	0.04	0.96
13	cwood	0.80	0.00	0.93	0.40	0.60	3.00	-0.32	1.13	0.81	-0.39	1.39
14	cpulp	0.68	0.00	0.53	0.32	0.68	3.00	0.18	0.51	0.69	0.26	0.74
15	cpubl	3.67	0.00	1.34	0.67	0.33	3.00	0.96	2.68	3.64	0.26	0.74
16	ccoke	7.37	0.00	3.32	0.79	0.21	3.00	-0.56	7.86	7.29	-0.08	1.08
17	cchem	0.87	0.00	1.21	0.13	0.87	3.00	0.41	0.46	0.87	0.47	0.53
18	crub	2.71	0.00	1.12	0.39	0.61	3.00	1.39	1.32	2.70	0.51	0.49
19	cmnmt	3.38	0.00	1.43	0.75	0.25	3.00	0.16	3.20	3.35	0.05	0.95
20	ciron	0.27	0.00	0.33	0.77	0.23	3.00	-0.50	0.77	0.27	-1.86	2.86
21	cfmet	1.44	0.00	0.94	0.61	0.39	3.00	-0.27	1.71	1.44	-0.18	1.18
22	cmach	1.72	0.00	1.12	0.37	0.63	3.00	0.47	1.25	1.72	0.27	0.73
23	cofic	0.60	0.00	1.15	0.08	0.92	3.00	0.32	0.28	0.61	0.53	0.47
24	celmc	0.95	0.00	1.07	0.05	0.95	3.00	0.78	0.17	0.95	0.82	0.18
25	crad	2.59	0.00	0.90	0.12	0.88	3.00	2.26	0.32	2.58	0.88	0.12
26	cmed	1.47	0.00	0.76	0.25	0.75	3.00	0.89	0.57	1.47	0.61	0.39
27	cmvec	2.30	0.00	1.36	0.33	0.67	3.00	0.97	1.34	2.30	0.42	0.58
28	cotr	2.20	0.00	1.26	0.45	0.55	3.00	0.50	1.70	2.20	0.23	0.77
29	cfurn	2.38	0.00	1.02	0.43	0.57	3.00	1.06	1.32	2.38	0.45	0.55
<b>Electrical energy, gas and hot water</b>												
31	cel	11.75	0.00	3.39	0.98	0.02	3.00	1.34	9.95	11.29	0.12	0.88
<b>Construction works and services</b>												
33	ccnst	4.59	0.00	1.56	0.84	0.16	3.00	0.62	3.91	4.53	0.14	0.86
34	ctrd	2.52	0.00	1.26	1.00	0.00	3.00	-1.27	3.79	2.52	-0.50	1.50
38	ctrns	6.95	0.00	1.92	0.87	0.13	3.00	1.78	5.02	6.80	0.26	0.74
39	ccom	5.64	0.00	1.97	0.93	0.07	3.00	0.07	5.48	5.54	0.01	0.99
40	cfini	10.23	0.00	3.12	0.94	0.06	3.00	1.10	8.80	9.90	0.11	0.89
41	cins	5.57	0.00	1.88	0.45	0.55	3.00	2.96	2.56	5.52	0.54	0.46
44	crent	-0.11	0.00	0.22	0.01	0.99	3.00	-0.12	0.01	-0.11	1.09	-0.09
45	ccomp	5.29	0.00	1.88	0.90	0.10	3.00	0.16	5.05	5.21	0.03	0.97
47	cobus	6.81	0.00	2.14	0.74	0.26	3.00	1.91	4.77	6.68	0.29	0.71
48	cpa	8.71	0.00	2.31	0.96	0.04	3.00	1.77	6.67	8.44	0.21	0.79
53	crecr	7.53	0.00	2.17	0.97	0.03	3.00	0.98	6.35	7.33	0.13	0.87

Notes: Notation for variables and parameters is defined in Appendix 7A.1, notation for commodities is defined in Appendix 6A.

Table 8D.6 Decomposition of total effect on domestic sales under the foreign closure

No	Commodity	% change in variables			Parameters			Decomposition of total effect on QD				
		QD 1	PE 2	PDS 3	Qe/Qx 4	Qd/Qx 5	$\sigma_c^t$ 6	Expansion effect 7	Substitution effect 8	Total effect 9	Due to exp.eff (%) 10	Due to subst.eff. (%) 11
<b>Products of agriculture, forestry and fishing</b>												
1	cagr	2.20	-0.01	2.59	0.21	0.79	5.00	-0.31	2.69	2.37	-13.15	113.15
2	cfor	0.21	-0.03	2.91	0.09	0.91	5.00	-0.98	1.37	0.39	-253.45	353.45
3	cfish	0.95	-0.06	7.11	0.03	0.97	5.00	0.05	1.12	1.18	4.62	95.38
<b>Products of mining</b>												
4	cmin	-1.00	-0.25	1.04	0.47	0.53	5.00	-3.48	3.04	-0.43	803.71	-703.71
5	cpetr	-16.23	31.41	25.32	0.85	0.15	5.00	3.05	-25.71	-22.66	-13.45	113.45
6	core	-4.84	-0.74	-1.85	0.22	0.78	5.00	-3.00	-1.20	-4.20	71.39	28.61
7	comin	-2.77	-0.04	2.46	0.21	0.79	5.00	-4.71	2.67	-2.04	230.53	-130.53
<b>Products of manufacturing</b>												
8	cfood	4.77	-0.50	7.65	0.12	0.88	5.00	0.84	4.85	5.69	14.80	85.20
9	ctob	6.82	-0.03	8.94	0.05	0.95	5.00	4.92	2.22	7.14	68.90	31.10
10	ctex	0.84	-1.37	3.25	0.09	0.91	5.00	-0.90	2.03	1.12	-80.41	180.41
11	cwear	-0.29	-0.01	3.09	0.11	0.89	5.00	-1.83	1.77	-0.07	2786.25	-2686.25
12	cleat	-1.67	-0.64	1.06	0.46	0.54	5.00	-5.05	3.89	-1.15	438.04	-338.04
13	cwood	-5.74	-3.55	0.32	0.05	0.95	5.00	-6.09	0.97	-5.11	119.00	-19.00
14	cpulp	-2.28	-2.27	1.53	0.07	0.93	5.00	-3.26	1.26	-2.00	163.27	-63.27
15	cpubl	-0.98	-0.49	4.03	0.02	0.98	5.00	-1.38	0.51	-0.88	157.80	-57.80
16	ccoke	-2.91	-12.13	5.40	0.06	0.94	5.00	-5.35	4.98	-0.37	1438.84	-1338.84
17	cchem	-7.91	-0.25	1.77	0.93	0.07	5.00	-14.59	9.40	-5.20	280.81	-180.81
18	crub	-1.95	-9.15	2.49	0.05	0.95	5.00	-3.85	2.82	-1.03	373.33	-273.33
19	cmnmt	-2.95	-8.51	3.65	0.01	0.99	5.00	-3.14	0.44	-2.70	116.46	-16.46
20	ciron	-2.63	-0.98	0.11	0.52	0.48	5.00	-4.97	2.84	-2.12	233.95	-133.95
21	cfmet	-3.97	-1.76	1.32	0.09	0.91	5.00	-4.94	1.36	-3.58	138.16	-38.16
22	cmach	-5.28	-3.87	1.38	0.18	0.82	5.00	-8.56	4.62	-3.94	217.16	-117.16
23	cofic	-8.43		-0.50	0.36	0.64	5.00	-7.19	-0.90	-8.09	88.91	11.09
24	celmc	-6.46	-0.01	2.09	0.70	0.30	5.00	-12.00	7.31	-4.69	255.86	-155.86
25	crad	0.12		2.01	0.42	0.58	5.00	-3.73	4.23	0.51	-737.73	837.73
26	cmcd	-2.17		1.53	0.23	0.77	5.00	-3.64	1.75	-1.89	192.90	-92.90
27	cmvec	-5.32		4.59	0.00	1.00	5.00	-5.09	0.10	-4.99	101.90	-1.90
28	cotr	-3.69		3.64	0.01	0.99	5.00	-3.68	0.10	-3.58	102.92	-2.92
29	cfurn	-1.59	-0.57	2.70	0.07	0.93	5.00	-2.51	1.12	-1.39	180.63	-80.63
30	crec	-0.45		5.26	0.00	1.00	0.00	-0.44	0.00	-0.44	100.00	0.00
<b>Electrical energy, gas and hot water</b>												
31	cel	4.36		8.30	0.02	0.98	5.00	3.33	0.95	4.28	77.82	22.18
32	cwat	3.72		8.13	0.00	1.00	0.00	3.69	0.00	3.69	100.00	0.00
<b>Construction works and services</b>												
33	ccnst	-0.37		4.62	0.00	1.00	5.00	-0.45	0.10	-0.35	128.17	-28.17
34	ctrd	-2.20		4.55	0.00	1.00	5.00	-2.16	0.01	-2.15	100.32	-0.32
35	chot	6.10		9.96	0.00	1.00	0.00	6.08	0.00	6.08	100.00	0.00
36	cretr	8.75		9.76	0.00	1.00	0.00	8.95	0.00	8.95	100.00	0.00
37	ccant	10.38		10.71	0.00	1.00	0.00	10.68	0.00	10.68	100.00	0.00
38	ctrns	3.46		5.40	0.19	0.81	5.00	-1.04	5.24	4.20	-24.73	124.73
39	ccom	-0.27		6.25	0.07	0.93	5.00	-1.95	2.18	0.23	-852.41	952.41
40	cfini	2.07		10.40	0.01	0.99	5.00	1.45	0.72	2.17	66.67	33.33
41	cins	-0.06		5.82	0.03	0.97	5.00	-0.71	0.79	0.08	-885.74	985.74
42	caux	0.25		58.73	0.00	1.00	0.00	0.32	0.00	0.32	100.00	0.00
43	cest	5.45		22.85	0.00	1.00	0.00	6.15	0.00	6.15	100.00	0.00
44	crent	-1.86		0.72	0.97	0.03	5.00	-4.95	3.46	-1.49	332.81	-232.81
45	ccomp	-0.97		5.76	0.00	1.00	5.00	-1.03	0.08	-0.95	108.27	-8.27
46	cres	0.29		5.92	0.00	1.00	0.00	0.29	0.00	0.29	100.00	0.00
47	cobus	0.84		6.72	0.02	0.98	5.00	0.22	0.76	0.99	22.61	77.39
48	cpa	5.32		7.07	0.15	0.85	5.00	0.91	5.26	6.17	14.72	85.28
49	ceduc	3.58		7.35	0.00	1.00	0.00	3.58	0.00	3.58	100.00	0.00
50	chelt	2.47		6.11	0.00	1.00	0.00	2.48	0.00	2.48	100.00	0.00
51	csew	3.41		8.90	0.00	1.00	0.00	3.51	0.00	3.51	100.00	0.00
52	cmemb	9.67		13.33	0.00	1.00	0.00	9.80	0.00	9.80	100.00	0.00
53	crecr	2.63		6.65	0.00	1.00	5.00	2.63	0.00	2.63	99.82	0.18
54	coser	7.05		9.05	0.00	1.00	0.00	7.21	0.00	7.21	100.00	0.00
55	chh	8.26		21.23	0.00	1.00	0.00	8.94	0.00	8.94	100.00	0.00

Notes: Shaded cells in the table denote quantities and prices for nontraded goods. Notation for variables and parameters is defined in Appendix 7A.1, notation for commodities is defined in Appendix 6A.



## Appendix 8E Effects of the 15-percent Increase in the Export Price of Crude Oil and Natural Gas under the Foreign Closure Rule and FAC1

**Table 8E.1 Sectoral adjustments under foreign closure rule and FAC1**

No	Commodity	<i>QX</i> 1	<i>QE</i> 2	<i>QM</i> 3	<i>QQ</i> 4	<i>QD</i> 5	<i>QF<sub>lab</sub></i> 6	<i>PX</i> 7	<i>PVA</i> 8	<i>PINTA</i> 9	<i>PQ</i> 10	<i>PDD</i> 11	<i>WF<sub>lab</sub></i> 12	<i>WF<sub>cap</sub></i> 13
<i>Products of agriculture, forestry and fishing</i>														
1	cagr	-0.07	-1.29	1.20	0.29	0.25	-0.34	0.25	-0.02	0.57	0.30	0.31	1.12	-0.29
2	cfor	-0.23	-2.08	1.20	0.12	-0.04	-0.41	0.37	0.21	0.67	0.36	0.41	1.12	-0.92
3	cfish	-0.03	-3.28	2.11	0.11	0.07	-0.14	0.65	0.58	0.76	0.66	0.67	1.12	0.42
<i>Products of mining</i>														
4	cmin	-0.62	-0.99	0.24	-0.27	-0.29	-1.21	0.04	-1.88	0.97	0.17	0.18	1.12	-4.88
5	<b>cpetr</b>	1.92	3.90	27.90	1.24	-8.99	8.51	15.35	38.27	3.45	8.10	12.01	1.12	52.10
6	core	-0.63	0.15	-1.54	-0.87	-0.85	-1.13	-0.26	-1.39	0.61	-0.22	-0.23	1.12	-4.48
7	comin	-0.89	-2.54	1.21	-0.36	-0.45	-1.14	0.33	-0.11	0.66	0.52	0.55	1.12	-4.49
<i>Products of manufacturing</i>														
8	<b>cfood</b>	0.01	-4.85	3.42	1.09	0.66	0.04	0.93	1.14	0.74	0.76	0.91	1.12	1.15
9	<b>ctob</b>	0.61	-5.37	4.49	1.09	0.92	1.73	1.23	2.12	0.65	1.11	1.17	1.12	2.68
10	ctex	-0.23	-3.01	1.51	0.42	0.04	-1.24	0.37	0.30	0.43	0.36	0.49	1.12	0.12
11	cwear	-0.39	-2.45	1.37	0.47	-0.12	-1.28	0.42	0.40	0.43	0.30	0.50	1.12	0.09
12	cleat	-0.93	-1.65	0.73	0.02	-0.33	-2.64	0.06	-0.27	0.30	0.24	0.35	1.12	-1.01
13	cwood	-1.15	-3.86	0.39	-0.17	-1.00	-3.05	0.06	-0.43	0.49	0.19	0.47	1.12	-1.34
14	cpulp	-0.64	-3.17	0.33	0.07	-0.46	-2.11	0.20	-0.07	0.35	0.08	0.26	1.12	-0.58
15	cpubl	-0.28	-3.88	1.88	0.50	-0.19	-0.41	0.67	1.01	0.47	0.46	0.69	1.12	0.79
16	ccoke	-2.35	-18.02	3.81	-0.32	-1.42	-7.98	1.81	-3.54	3.77	1.36	1.74	1.12	-5.34
17	cchem	-3.13	-3.26	0.42	0.19	-1.38	-6.43	-0.01	-1.63	0.87	0.08	0.61	1.12	-4.08
18	crub	-0.73	-8.44	1.36	0.69	-0.34	-1.97	0.33	0.11	0.47	0.22	0.56	1.12	-0.47
19	cmnmt	-0.51	-9.81	1.76	0.11	-0.45	-1.08	0.77	0.66	0.86	0.55	0.73	1.12	0.25
20	ciron	-0.93	-1.49	0.22	-0.20	-0.33	-2.68	-0.02	-0.31	0.15	0.14	0.18	1.12	-1.05
21	cfmet	-0.92	-3.32	0.74	-0.12	-0.68	-2.54	0.25	-0.20	0.53	0.29	0.48	1.12	-0.93
22	cmach	-1.56	-5.08	0.89	0.26	-0.81	-3.17	0.19	-0.20	0.56	0.21	0.57	1.12	-1.44
23	cofic	-1.33	-1.20	0.30	0.16	-1.40	-3.63	-0.03	-0.76	0.32	0.05	0.57	1.12	-1.81
24	celmc	-2.43	-2.98	0.46	0.38	-1.15	-4.72	0.11	-0.77	0.39	0.03	0.54	1.12	-2.69
25	crad	-0.73	-1.61	1.26	1.10	-0.09	-2.04	0.18	0.06	0.24	0.05	0.45	1.12	-0.52
26	cmed	-0.71	-1.70	0.73	0.44	-0.42	-2.17	0.20	-0.07	0.36	0.10	0.38	1.12	-0.63
27	cmvec	-0.92	-5.17	1.13	0.47	-0.90	-1.27	0.88	0.83	0.92	0.22	0.68	1.12	0.09
28	cotr	-0.84	-3.94	1.10	0.23	-0.83	-1.20	0.64	0.83	0.48	0.29	0.64	1.12	0.15
29	cfurn	-0.53	-2.84	1.17	0.51	-0.36	-1.50	0.39	0.33	0.42	0.22	0.51	1.12	-0.09
30	crec	-0.09	-	-	-0.09	-0.09	-0.22	0.91	1.01	0.87	0.91	0.91	1.12	0.94
<i>Electrical energy, gas and hot water</i>														
31	<b>cel</b>	0.35	-8.98	5.98	0.68	0.57	0.73	1.97	1.42	2.39	1.72	1.76	1.12	1.70
32	<b>cwat</b>	0.66	-	-	0.66	0.66	1.62	1.54	1.88	1.22	1.54	1.54	1.12	2.42
<i>Construction works and services</i>														
33	ccnst	-0.09	-4.02	2.34	0.32	-0.07	-0.23	0.81	1.03	0.60	0.67	0.80	1.12	0.98
34	ctrd	-0.70	-3.72	1.16	-0.70	-0.70	-1.81	0.62	0.44	0.85	0.62	0.62	1.12	0.02
35	<b>chot</b>	1.00	-	-	1.00	1.00	2.13	1.64	1.79	1.40	1.64	1.64	1.12	2.39
36	<b>cretr</b>	1.42	-	-	1.42	1.42	2.87	1.56	1.98	1.18	1.56	1.56	1.12	2.83
37	<b>ccant</b>	1.59	-	-	1.59	1.59	3.22	1.71	2.08	0.99	1.71	1.71	1.12	3.04
38	ctrns	-0.40	-4.30	3.55	0.92	0.53	-1.05	0.80	0.72	0.87	0.86	0.99	1.12	0.48
39	ccom	-0.53	-5.02	2.81	0.02	-0.20	-0.87	0.93	0.84	1.05	0.92	1.00	1.12	0.41
40	<b>cfini</b>	0.16	-7.19	5.02	0.54	0.26	0.50	1.54	1.39	1.86	1.46	1.56	1.12	1.52
41	cins	-0.22	-4.73	2.80	1.48	-0.09	-0.37	0.93	0.99	0.79	0.43	0.95	1.12	0.82
42	<b>caux</b>	0.04	-	-	0.04	0.04	12.68	8.35	11.13	2.23	8.35	8.35	1.12	11.17
43	<b>cest</b>	0.81	-	-	0.81	0.81	5.76	3.31	5.04	1.87	3.31	3.31	1.12	5.71
44	crent	-0.94	-0.96	-0.07	-0.07	-0.40	-2.86	0.00	-0.44	0.78	0.00	0.11	1.12	-1.18
45	ccomp	-0.24	-4.85	2.66	0.07	-0.22	-0.37	0.95	1.01	0.89	0.85	0.95	1.12	0.82
46	cres	-0.03	-	-	-0.03	-0.03	-0.05	0.99	1.10	0.84	0.99	0.99	1.12	1.08
47	<b>cobus</b>	0.002	-5.14	3.42	0.96	0.12	0.01	1.06	1.12	0.84	0.80	1.09	1.12	1.12
48	cpa	-0.10	-4.94	4.32	0.87	0.74	-0.13	1.00	1.09	0.92	1.13	1.17	1.12	1.01
49	<b>ceduc</b>	0.50	-	-	0.50	0.50	0.66	1.24	1.24	1.24	1.24	1.24	1.12	1.64
50	<b>chelt</b>	0.36	-	-	0.36	0.36	0.63	1.03	1.33	0.74	1.03	1.03	1.12	1.62
51	<b>csew</b>	0.46	-	-	0.46	0.46	1.61	1.46	2.04	1.04	1.46	1.46	1.12	2.41
52	<b>cmemb</b>	1.40	-	-	1.40	1.40	2.42	2.08	1.92	2.37	2.08	2.08	1.12	3.05
53	<b>crecr</b>	0.41	-4.94	3.77	0.50	0.42	0.75	1.10	1.38	0.89	1.07	1.10	1.12	1.71
54	<b>coser</b>	1.14	-	-	1.14	1.14	2.12	1.49	1.89	0.95	1.49	1.49	1.12	2.81
55	<b>chh</b>	1.26	-	-	1.26	1.26	4.92	3.21	4.00	0.83	3.21	3.21	1.12	5.04

Notes: Shaded cells in the table denote quantities and prices for nontraded goods. Commodities which outputs increase are shown in bold font.

Notation for variables is defined in Appendix 7A.1, notation for commodities is defined in Appendix 6A. Subscripts *lab* and *cap* denote labor and capital respectively.

**Table 8E.2 Effects of the 15-percent increase in the export price of crude oil and natural gas on economic indicators under the foreign closure rule and FAC1**

Variable	Base	Foreign
Investment/ nominal GDP	26	-1
Private savings/nominal GDP	22.1	0.5
Foreign savings/ nominal GDP	0.8	-2.6
Trade deficit/nominal GDP	-1	-2.6
Government savings/nominal GDP	6	0.7
Government income/ nominal GDP	19.6	0.3
Government spending/ nominal GDP	11.3	-0.3
CPI	1.71	0.9
DPI	1.00	1.41
Dutch disease index	27.62	26.6
Real price of labor	1.00	-2.98
Real price of capital	1.00	1.66
Real wage rate	0.58	0.18
Real rental rate	0.58	4.97
$CPI/P_{GDP}^{MP}$	1.71	-3.35
$P_{GDP}^{MP}/P_{GDP}^{FC}$	1.00	0.20

Note: Figures in the table are given in percentages. Figures in the columns other than the base column are given as a percentage change from their base values except for the Dutch disease index, which is not given in percentage change from its base value.

**Table 8E.3 Effects of the 15-percent increase in the export price of crude oil and natural gas on the GDP and its components under the foreign closure rule and FAC1**

Variable	Nominal GDP (% for nonbase)	Real GDP (% for nonbase)
1. Absorption	1.84	1.05
2. Private consumption	3.16	1.82
3. Fixed investment	0.49	-
4. Stock change	-8.50	-
5. Government consumption	1.25	-
6. Exports	8.00	0.31
7. Imports	2.72	2.72
8. $GDP^{MP}$	4.41	-0.02
9. Net indirect taxes	6.47	0.07
10. $GDP^{FC}$	4.19	-0.03

## Appendix 8F Results of the Systematic Sensitivity Analysis

**Table 8F.1 Ranges of elasticities**

No	Parameter	Sector	Distribution	Range
<b>Armington elasticities of substitution</b>				
1.	$\sigma_q$ _cagr	Products of agriculture, hunting and related services	Uniform	[0.2, 5.1]
2.	$\sigma_q$ _cfor	Products of forestry, logging and related services	Uniform	[0.2,5.1]
3.	$\sigma_q$ _cfish	Fish and other fishing products; services incidental to fishing	Uniform	[0.2,5.1]
4.	$\sigma_q$ _cmin	Coal and lignite; peat	Uniform	[0.2,5.1]
5.	$\sigma_q$ _cpetr	Crude petroleum and natural gas; services incidental oil and gas extraction , excluding surveying	Uniform	[0.2,5.1]
6.	$\sigma_q$ _core	Metal ores	Uniform	[0.2,5.1]
7.	$\sigma_q$ _comin	Other mining and quarrying products	Uniform	[0.2,5.1]
8.	$\sigma_q$ _cfood	Food products, including beverages	Uniform	[0.2,5.1]
9.	$\sigma_q$ _ctob	Tobacco products	Uniform	[0.2,5.1]
10.	$\sigma_q$ _ctex	Textiles	Uniform	[0.2,5.1]
11.	$\sigma_q$ _cwear	Wearing apparel, fur	Uniform	[0.2,5.1]
12.	$\sigma_q$ _cleat	Leather, leather products and footwear	Uniform	[0.2,5.1]
13.	$\sigma_q$ _cwood	Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	Uniform	[0.2,5.1]
14.	$\sigma_q$ _cpulp	Pulp, paper and paper products	Uniform	[0.2,5.1]
15.	$\sigma_q$ _cpubl	Printed matter and recorded media	Uniform	[0.2,5.1]
16.	$\sigma_q$ _ccoke	Coke, refined petroleum products, and other fuel	Uniform	[0.2,5.1]
17.	$\sigma_q$ _cchem	Chemicals, chemical products and chemical fiber	Uniform	[0.2,5.1]
18.	$\sigma_q$ _crub	Rubber and plastic products	Uniform	[0.2,5.1]
19.	$\sigma_q$ _cmnmt	Other non metallic mineral products	Uniform	[0.2,5.1]
20.	$\sigma_q$ _ciron	Basic metals	Uniform	[0.2,5.1]
21.	$\sigma_q$ _cfmet	Fabricated metal products, except machinery and equipment	Uniform	[0.2,5.1]
22.	$\sigma_q$ _cmach	Machinery and equipment, n.i.c.	Uniform	[0.2,5.1]
23.	$\sigma_q$ _cofic	Office machinery and computers	Uniform	[0.2,5.1]
24.	$\sigma_q$ _celmc	Electrical machinery and apparatus n.i.c.	Uniform	[0.2,5.1]
25.	$\sigma_q$ _crad	Radio, television, communication equipment and apparatus	Uniform	[0.2,5.1]
26.	$\sigma_q$ _cmed	Medical, precision and optical instruments, watches and clocks	Uniform	[0.2,5.1]
27.	$\sigma_q$ _cmvec	Motor vehicles, trailers and semitrailers	Uniform	[0.2,5.1]
28.	$\sigma_q$ _cotr	Other transport equipment	Uniform	[0.2,5.1]
29.	$\sigma_q$ _cfurn	Furniture; other manufactured goods, n.i.c.	Uniform	[0.2,5.1]
30.	$\sigma_q$ _cel	Electrical energy, gas, steam and hot water	Uniform	[0.2,5.1]
31.	$\sigma_q$ _ccnst	Construction works	Uniform	[0.2,5.1]
32.	$\sigma_q$ _ctrd	Trade; maintenance and repair services of motor vehicles and motor cycles; repair of personal and household goods	Uniform	[0.2,5.1]
33.	$\sigma_q$ _ctrns	Transport	Uniform	[0.2,5.1]
34.	$\sigma_q$ _ccom	Post and telecommunication services	Uniform	[0.2,5.1]
35.	$\sigma_q$ _cfini	Financial intermediation services, except insurance and pension funding services	Uniform	[0.2,5.1]
36.	$\sigma_q$ _cins	Insurance and pension funding services (except compulsory social security services)	Uniform	[0.2,5.1]
37.	$\sigma_q$ _crent	Renting services of machinery and equipment without operator and of personal and household goods	Uniform	[0.2,5.1]
38.	$\sigma_q$ _ccomp	Computer and related services	Uniform	[0.2,5.1]
39.	$\sigma_q$ _cobus	Other business services	Uniform	[0.2,5.1]
40.	$\sigma_q$ _cpa	Public administration and defense services; compulsory social security services	Uniform	[0.2,5.1]
41.	$\sigma_q$ _crecr	Recreational, cultural and sporting services	Uniform	[0.2,5.1]
<b>Elasticities of transformation</b>				
42.	$\sigma_t$ _cagr	Products of agriculture, hunting and related services	Uniform	[0.2, 7.1]
43.	$\sigma_t$ _cfor	Products of forestry, logging and related services	Uniform	[0.2, 7.1]

Table 8F.1 Continued

No	Parameter	Sector	Distribution	Range
44.	$\sigma_{cfish}$	Fish and other fishing products; services incidental to fishing	Uniform	[0.2, 7.1]
45.	$\sigma_{cmin}$	Coal and lignite; peat	Uniform	[0.2, 7.1]
46.	$\sigma_{cpetr}$	Crude petroleum and natural gas; services incidental oil and gas extraction, excluding surveying	Uniform	[0.2, 7.1]
47.	$\sigma_{core}$	Metal ores	Uniform	[0.2, 7.1]
48.	$\sigma_{comin}$	Other mining and quarrying products	Uniform	[0.2, 7.1]
49.	$\sigma_{cfood}$	Food products, including beverages	Uniform	[0.2, 7.1]
50.	$\sigma_{ctob}$	Tobacco products	Uniform	[0.2, 7.1]
51.	$\sigma_{ctex}$	Textiles	Uniform	[0.2, 7.1]
52.	$\sigma_{cwear}$	Wearing apparel, fur	Uniform	[0.2, 7.1]
53.	$\sigma_{cleat}$	Leather, leather products and footwear	Uniform	[0.2, 7.1]
54.	$\sigma_{cwood}$	Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	Uniform	[0.2, 7.1]
55.	$\sigma_{cpulp}$	Pulp, paper and paper products	Uniform	[0.2, 7.1]
56.	$\sigma_{cpubl}$	Printed matter and recorded media	Uniform	[0.2, 7.1]
57.	$\sigma_{ccoke}$	Coke, refined petroleum products, and other fuel	Uniform	[0.2, 7.1]
58.	$\sigma_{cchem}$	Chemicals, chemical products and chemical fiber	Uniform	[0.2, 7.1]
59.	$\sigma_{crub}$	Rubber and plastic products	Uniform	[0.2, 7.1]
60.	$\sigma_{cmnmt}$	Other non metallic mineral products	Uniform	[0.2, 7.1]
61.	$\sigma_{ciron}$	Basic metals	Uniform	[0.2, 7.1]
62.	$\sigma_{cfmet}$	Fabricated metal products, except machinery and equipment	Uniform	[0.2, 7.1]
63.	$\sigma_{cmach}$	Machinery and equipment, n.i.c.	Uniform	[0.2, 7.1]
64.	$\sigma_{cofic}$	Office machinery and computers	Uniform	[0.2, 7.1]
65.	$\sigma_{celmc}$	Electrical machinery and apparatus n.i.c.	Uniform	[0.2, 7.1]
66.	$\sigma_{crad}$	Radio, television, communication equipment and apparatus	Uniform	[0.2, 7.1]
67.	$\sigma_{cmed}$	Medical, precision and optical instruments, watches and clocks	Uniform	[0.2, 7.1]
68.	$\sigma_{cmvec}$	Motor vehicles, trailers and semitrailers	Uniform	[0.2, 7.1]
69.	$\sigma_{cotr}$	Other transport equipment	Uniform	[0.2, 7.1]
70.	$\sigma_{cfurn}$	Furniture; other manufactured goods, n.i.c.	Uniform	[0.2, 7.1]
71.	$\sigma_{cel}$	Electrical energy, gas, steam and hot water	Uniform	[0.2, 7.1]
72.	$\sigma_{ccnst}$	Construction works	Uniform	[0.2, 7.1]
73.	$\sigma_{ctrd}$	Trade; maintenance and repair services of motor vehicles and motor cycles; repair of personal and household goods	Uniform	[0.2, 7.1]
74.	$\sigma_{ctrns}$	Transport	Uniform	[0.2, 7.1]
75.	$\sigma_{ccom}$	Post and telecommunication services	Uniform	[0.2, 7.1]
76.	$\sigma_{cfini}$	Financial intermediation services, except insurance and pension funding services	Uniform	[0.2, 7.1]
77.	$\sigma_{cins}$	Insurance and pension funding services (except compulsory social security services)	Uniform	[0.2, 7.1]
78.	$\sigma_{crent}$	Renting services of machinery and equipment without operator and of personal and household goods	Uniform	[0.2, 7.1]
79.	$\sigma_{ccomp}$	Computer and related services	Uniform	[0.2, 7.1]
80.	$\sigma_{cobus}$	Other business services	Uniform	[0.2, 7.1]
81.	$\sigma_{cpa}$	Public administration and defense services; compulsory social security services	Uniform	[0.2, 7.1]
82.	$\sigma_{crecr}$	Recreational, cultural and sporting services	Uniform	[0.2, 7.1]
<b>Income elasticities of demand for rural households</b>				
83.	$\sigma_{cagr}$	Products of agriculture, hunting and related services	Uniform	[0.2, 1.7]
84.	$\sigma_{cfor}$	Products of forestry, logging and related services	Uniform	[0.2, 1.7]
85.	$\sigma_{cfish}$	Fish and other fishing products; services incidental to fishing	Uniform	[0.2, 1.7]
86.	$\sigma_{cmin}$	Coal and lignite; peat	Uniform	[0.2, 1.7]
87.	$\sigma_{cpetr}$	Crude petroleum and natural gas; services incidental oil and gas extraction , excluding surveying	Uniform	[0.2, 1.7]

Table 8F.1 Continued

No	Parameter	Sector	Distribution	Range
88.	$\sigma_{\text{comin}}$	Other mining and quarrying products	Uniform	[0.2, 1.7]
89.	$\sigma_{\text{cfood}}$	Food products, including beverages	Uniform	[0.2, 1.7]
90.	$\sigma_{\text{ctob}}$	Tobacco products	Uniform	[0.2, 1.7]
91.	$\sigma_{\text{ctex}}$	Textiles	Uniform	[0.2, 1.7]
92.	$\sigma_{\text{cwear}}$	Wearing apparel, fur	Uniform	[0.2, 1.7]
93.	$\sigma_{\text{cleat}}$	Leather, leather products and footwear	Uniform	[0.2, 1.7]
94.	$\sigma_{\text{cwood}}$	Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	Uniform	[0.2, 1.7]
95.	$\sigma_{\text{cpulp}}$	Pulp, paper and paper products	Uniform	[0.2, 1.7]
96.	$\sigma_{\text{cpubl}}$	Printed matter and recorded media	Uniform	[0.2, 1.7]
97.	$\sigma_{\text{ccoke}}$	Coke, refined petroleum products, and other fuel	Uniform	[0.2, 1.7]
98.	$\sigma_{\text{cchem}}$	Chemicals, chemical products and chemical fiber	Uniform	[0.2, 1.7]
99.	$\sigma_{\text{crub}}$	Rubber and plastic products	Uniform	[0.2, 1.7]
100.	$\sigma_{\text{cmnmt}}$	Other non metallic mineral products	Uniform	[0.2, 1.7]
101.	$\sigma_{\text{ciron}}$	Basic metals	Uniform	[0.2, 1.7]
102.	$\sigma_{\text{cfmet}}$	Fabricated metal products, except machinery and equipment	Uniform	[0.2, 1.7]
103.	$\sigma_{\text{cmach}}$	Machinery and equipment, n.i.c.	Uniform	[0.2, 1.7]
104.	$\sigma_{\text{cofic}}$	Office machinery and computers	Uniform	[0.2, 1.7]
105.	$\sigma_{\text{celmc}}$	Electrical machinery and apparatus n.i.c.	Uniform	[0.2, 1.7]
106.	$\sigma_{\text{crad}}$	Radio, television, communication equipment and apparatus	Uniform	[0.2, 1.7]
107.	$\sigma_{\text{cmed}}$	Medical, precision and optical instruments, watches and clocks	Uniform	[0.2, 1.7]
108.	$\sigma_{\text{cmvec}}$	Motor vehicles, trailers and semitrailers	Uniform	[0.2, 1.7]
109.	$\sigma_{\text{cotr}}$	Other transport equipment	Uniform	[0.2, 1.7]
110.	$\sigma_{\text{cfurn}}$	Furniture; other manufactured goods, n.i.c.	Uniform	[0.2, 1.7]
111.	$\sigma_{\text{cel}}$	Electrical energy, gas, steam and hot water	Uniform	[0.2, 1.7]
112.	$\sigma_{\text{cwat}}$	Collection, purification and distribution of water	Uniform	[0.2, 1.7]
113.	$\sigma_{\text{ccnst}}$	Construction works	Uniform	[0.2, 1.7]
114.	$\sigma_{\text{ctrd}}$	Trade; maintenance and repair services of motor vehicles and motor cycles; repair of personal and household goods Hotel services, camping sites and other short-stay accommodation services	Uniform	[0.2, 1.7]
115.	$\sigma_{\text{chot}}$	Food serving services	Uniform	[0.2, 1.7]
116.	$\sigma_{\text{cretr}}$	Canteen and catering services	Uniform	[0.2, 1.7]
117.	$\sigma_{\text{ccant}}$	Transport	Uniform	[0.2, 1.7]
118.	$\sigma_{\text{ctrns}}$	Post and telecommunication services	Uniform	[0.2, 1.7]
119.	$\sigma_{\text{ccom}}$	Financial intermediation services, except insurance and pension funding services	Uniform	[0.2, 1.7]
120.	$\sigma_{\text{cfini}}$	Insurance and pension funding services (except compulsory social security services)	Uniform	[0.2, 1.7]
121.	$\sigma_{\text{cins}}$	Services auxiliary to financial intermediation	Uniform	[0.2, 1.7]
122.	$\sigma_{\text{caux}}$	Real estate services	Uniform	[0.2, 1.7]
123.	$\sigma_{\text{cest}}$	Renting services of machinery and equipment without operator and of personal and household goods	Uniform	[0.2, 1.7]
124.	$\sigma_{\text{crent}}$	Computer and related services	Uniform	[0.2, 1.7]
125.	$\sigma_{\text{ccomp}}$	Other business services	Uniform	[0.2, 1.7]
126.	$\sigma_{\text{cobus}}$	Public administration and defense services; compulsory social security services	Uniform	[0.2, 1.7]
127.	$\sigma_{\text{cpa}}$	Education services	Uniform	[0.2, 1.7]
128.	$\sigma_{\text{ceduc}}$	Health and social work services	Uniform	[0.2, 1.7]
129.	$\sigma_{\text{chelt}}$	Sewerage, and refuse disposal services, sanitation and similar services	Uniform	[0.2, 1.7]
130.	$\sigma_{\text{csew}}$	Membership organizations services, n.i.c.	Uniform	[0.2, 1.7]
131.	$\sigma_{\text{cmemb}}$	Recreational, cultural and sporting services	Uniform	[0.2, 1.7]
132.	$\sigma_{\text{crecr}}$	Other services	Uniform	[0.2, 1.7]
133.	$\sigma_{\text{coser}}$			

Table 8F.1 Continued

No	Parameter	Sector	Distribution	Range
134.	$\sigma_{\text{chh}}$	Private households with employed persons	Uniform	[0.2, 1.7]
<b>Income elasticities of demand for urban households</b>				
135.	$\sigma_{\text{cagr}}$	Products of agriculture, hunting and related services	Uniform	[0.2, 1.7]
136.	$\sigma_{\text{cfor}}$	Products of forestry, logging and related services	Uniform	[0.2, 1.7]
137.	$\sigma_{\text{cfish}}$	Fish and other fishing products; services incidental to fishing	Uniform	[0.2, 1.7]
138.	$\sigma_{\text{cmin}}$	Coal and lignite; peat	Uniform	[0.2, 1.7]
139.	$\sigma_{\text{cpetr}}$	Crude petroleum and natural gas; services incidental oil and gas extraction , excluding surveying	Uniform	[0.2, 1.7]
140.	$\sigma_{\text{comin}}$	Other mining and quarrying products	Uniform	[0.2, 1.7]
141.	$\sigma_{\text{cfood}}$	Food products, including beverages	Uniform	[0.2, 1.7]
142.	$\sigma_{\text{ctob}}$	Tobacco products	Uniform	[0.2, 1.7]
143.	$\sigma_{\text{ctex}}$	Textiles	Uniform	[0.2, 1.7]
144.	$\sigma_{\text{cwear}}$	Wearing apparel, fur	Uniform	[0.2, 1.7]
145.	$\sigma_{\text{cleat}}$	Leather, leather products and footwear	Uniform	[0.2, 1.7]
146.	$\sigma_{\text{cwood}}$	Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	Uniform	[0.2, 1.7]
147.	$\sigma_{\text{cpulp}}$	Pulp, paper and paper products	Uniform	[0.2, 1.7]
148.	$\sigma_{\text{cpubl}}$	Printed matter and recorded media	Uniform	[0.2, 1.7]
149.	$\sigma_{\text{cckoke}}$	Coke, refined petroleum products, and other fuel	Uniform	[0.2, 1.7]
150.	$\sigma_{\text{cchem}}$	Chemicals, chemical products and chemical fiber	Uniform	[0.2, 1.7]
151.	$\sigma_{\text{crub}}$	Rubber and plastic products	Uniform	[0.2, 1.7]
152.	$\sigma_{\text{cmnmt}}$	Other non metallic mineral products	Uniform	[0.2, 1.7]
153.	$\sigma_{\text{ciron}}$	Basic metals	Uniform	[0.2, 1.7]
154.	$\sigma_{\text{cfmet}}$	Fabricated metal products, except machinery and equipment	Uniform	[0.2, 1.7]
155.	$\sigma_{\text{cmach}}$	Machinery and equipment, n.i.c.	Uniform	[0.2, 1.7]
156.	$\sigma_{\text{cofic}}$	Office machinery and computers	Uniform	[0.2, 1.7]
157.	$\sigma_{\text{celmc}}$	Electrical machinery and apparatus n.i.c.	Uniform	[0.2, 1.7]
158.	$\sigma_{\text{crad}}$	Radio, television, communication equipment and apparatus	Uniform	[0.2, 1.7]
159.	$\sigma_{\text{cmed}}$	Medical, precision and optical instruments, watches and clocks	Uniform	[0.2, 1.7]
160.	$\sigma_{\text{cmvec}}$	Motor vehicles, trailers and semitrailers	Uniform	[0.2, 1.7]
161.	$\sigma_{\text{cotr}}$	Other transport equipment	Uniform	[0.2, 1.7]
162.	$\sigma_{\text{cfurn}}$	Furniture; other manufactured goods, n.i.c.	Uniform	[0.2, 1.7]
163.	$\sigma_{\text{cel}}$	Electrical energy, gas, steam and hot water	Uniform	[0.2, 1.7]
164.	$\sigma_{\text{cwat}}$	Collection, purification and distribution of water	Uniform	[0.2, 1.7]
165.	$\sigma_{\text{ccnst}}$	Construction works	Uniform	[0.2, 1.7]
166.	$\sigma_{\text{ctrd}}$	Trade; maintenance and repair services of motor vehicles and motor cycles; repair of personal and household goods Hotel services, camping sites and other short-stay accommodation services	Uniform	[0.2, 1.7]
167.	$\sigma_{\text{chot}}$	Food serving services	Uniform	[0.2, 1.7]
168.	$\sigma_{\text{cretr}}$	Canteen and catering services	Uniform	[0.2, 1.7]
169.	$\sigma_{\text{ccant}}$	Transport	Uniform	[0.2, 1.7]
170.	$\sigma_{\text{ctrns}}$	Post and telecommunication services	Uniform	[0.2, 1.7]
171.	$\sigma_{\text{ccom}}$	Financial intermediation services, except insurance and pension funding services	Uniform	[0.2, 1.7]
172.	$\sigma_{\text{cfini}}$	Insurance and pension funding services (except compulsory social security services)	Uniform	[0.2, 1.7]
173.	$\sigma_{\text{cins}}$	Services auxiliary to financial intermediation	Uniform	[0.2, 1.7]
174.	$\sigma_{\text{caux}}$	Real estate services	Uniform	[0.2, 1.7]
175.	$\sigma_{\text{cest}}$	Renting services of machinery and equipment without operator and of personal and household goods	Uniform	[0.2, 1.7]
176.	$\sigma_{\text{crent}}$	Computer and related services	Uniform	[0.2, 1.7]
177.	$\sigma_{\text{ccomp}}$	Other business services	Uniform	[0.2, 1.7]
178.	$\sigma_{\text{cobus}}$	Public administration and defense services; compulsory social security services	Uniform	[0.2, 1.7]
179.	$\sigma_{\text{cpa}}$		Uniform	[0.2, 1.7]

Table 8F.1 Continued

No	Parameter	Sector	Distribution	Range
180.	$\sigma_u$ _ceduc	Education services	Uniform	[0.2, 1.7]
181.	$\sigma_u$ _chelt	Health and social work services	Uniform	[0.2, 1.7]
182.	$\sigma_u$ _csew	Sewerage, and refuse disposal services, sanitation and similar services	Uniform	[0.2, 1.7]
183.	$\sigma_u$ _cmemb	Membership organizations services, n.i.c.	Uniform	[0.2, 1.7]
184.	$\sigma_u$ _crecr	Recreational, cultural and sporting services	Uniform	[0.2, 1.7]
185.	$\sigma_u$ _coser	Other services	Uniform	[0.2, 1.7]
186.	$\sigma_u$ _chh	Private households with employed persons	Uniform	[0.2, 1.7]
<b>Elasticity of substitution between production factors</b>				
187.	$\sigma_{va}$ _cagr	Products of agriculture, hunting and related services	Uniform	[0.2, 1.9]
188.	$\sigma_{va}$ _cfor	Products of forestry, logging and related services	Uniform	[0.2, 1.9]
189.	$\sigma_{va}$ _cfish	Fish and other fishing products; services incidental to fishing	Uniform	[0.2, 1.9]
190.	$\sigma_{va}$ _cmin	Coal and lignite; peat	Uniform	[0.2, 1.9]
191.	$\sigma_{va}$ _cpetr	Crude petroleum and natural gas; services incidental oil and gas extraction , excluding surveying	Uniform	[0.2, 1.9]
192.	$\sigma_{va}$ _core	Metal ores	Uniform	[0.2, 1.9]
193.	$\sigma_{va}$ _comin	Other mining and quarrying products	Uniform	[0.2, 1.9]
194.	$\sigma_{va}$ _cfood	Food products, including beverages	Uniform	[0.2, 1.9]
195.	$\sigma_{va}$ _ctob	Tobacco products	Uniform	[0.2, 1.9]
196.	$\sigma_{va}$ _ctex	Textiles	Uniform	[0.2, 1.9]
197.	$\sigma_{va}$ _cwear	Wearing apparel, fur	Uniform	[0.2, 1.9]
198.	$\sigma_{va}$ _cleat	Leather, leather products and footwear	Uniform	[0.2, 1.9]
199.	$\sigma_{va}$ _cwood	Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	Uniform	[0.2, 1.9]
200.	$\sigma_{va}$ _cpulp	Pulp, paper and paper products	Uniform	[0.2, 1.9]
201.	$\sigma_{va}$ _cpubl	Printed matter and recorded media	Uniform	[0.2, 1.9]
202.	$\sigma_{va}$ _ccoke	Coke, refined petroleum products, and other fuel	Uniform	[0.2, 1.9]
203.	$\sigma_{va}$ _cchem	Chemicals, chemical products and chemical fiber	Uniform	[0.2, 1.9]
204.	$\sigma_{va}$ _crub	Rubber and plastic products	Uniform	[0.2, 1.9]
205.	$\sigma_{va}$ _cmnmt	Other non metallic mineral products	Uniform	[0.2, 1.9]
206.	$\sigma_{va}$ _ciron	Basic metals	Uniform	[0.2, 1.9]
207.	$\sigma_{va}$ _cfmet	Fabricated metal products, except machinery and equipment	Uniform	[0.2, 1.9]
208.	$\sigma_{va}$ _cmach	Machinery and equipment, n.i.c.	Uniform	[0.2, 1.9]
209.	$\sigma_{va}$ _cofic	Office machinery and computers	Uniform	[0.2, 1.9]
210.	$\sigma_{va}$ _celmc	Electrical machinery and apparatus n.i.c.	Uniform	[0.2, 1.9]
211.	$\sigma_{va}$ _crad	Radio, television, communication equipment and apparatus	Uniform	[0.2, 1.9]
212.	$\sigma_{va}$ _cmed	Medical, precision and optical instruments, watches and clocks	Uniform	[0.2, 1.9]
213.	$\sigma_{va}$ _cmvec	Motor vehicles, trailers and semitrailers	Uniform	[0.2, 1.9]
214.	$\sigma_{va}$ _cotr	Other transport equipment	Uniform	[0.2, 1.9]
215.	$\sigma_{va}$ _cfurn	Furniture; other manufactured goods, n.i.c.	Uniform	[0.2, 1.9]
216.	$\sigma_{va}$ _crec	Services on recycling of secondary raw materials	Uniform	[0.2, 1.9]
217.	$\sigma_{va}$ _cel	Electrical energy, gas, steam and hot water	Uniform	[0.2, 1.9]
218.	$\sigma_{va}$ _cwat	Collection, purification and distribution of water	Uniform	[0.2, 1.9]
219.	$\sigma_{va}$ _cnst	Construction works	Uniform	[0.2, 1.9]
220.	$\sigma_{va}$ _ctrd	Trade; maintenance and repair services of motor vehicles and motor cycles; repair of personal and household goods Hotel services, camping sites and other short-stay accommodation services	Uniform	[0.2, 1.9]
221.	$\sigma_{va}$ _chot	services	Uniform	[0.2, 1.9]
222.	$\sigma_{va}$ _cretr	Food serving services	Uniform	[0.2, 1.9]
223.	$\sigma_{va}$ _ccant	Canteen and catering services	Uniform	[0.2, 1.9]
224.	$\sigma_{va}$ _ctrns	Transport	Uniform	[0.2, 1.9]
225.	$\sigma_{va}$ _ccom	Post and telecommunication services	Uniform	[0.2, 1.9]
226.	$\sigma_{va}$ _cfini	Financial intermediation services, except insurance and pension funding services	Uniform	[0.2, 1.9]

Table 8F.1 Continued

No	Parameter	Sector	Distribution	Range
227.	$\sigma_{va\_cins}$	Insurance and pension funding services (except compulsory social security services)	Uniform	[0.2, 1.9]
228.	$\sigma_{va\_caux}$	Services auxiliary to financial intermediation	Uniform	[0.2, 1.9]
229.	$\sigma_{va\_cest}$	Real estate services	Uniform	[0.2, 1.9]
230.	$\sigma_{va\_crent}$	Renting services of machinery and equipment without operator and of personal and household goods	Uniform	[0.2, 1.9]
231.	$\sigma_{va\_ccomp}$	Computer and related services	Uniform	[0.2, 1.9]
232.	$\sigma_{va\_cres}$	Research and development services	Uniform	[0.2, 1.9]
233.	$\sigma_{va\_cobus}$	Other business services	Uniform	[0.2, 1.9]
234.	$\sigma_{va\_cpa}$	Public administration and defense services; compulsory social security services	Uniform	[0.2, 1.9]
235.	$\sigma_{va\_ceduc}$	Education services	Uniform	[0.2, 1.9]
236.	$\sigma_{va\_chelt}$	Health and social work services	Uniform	[0.2, 1.9]
237.	$\sigma_{va\_csew}$	Sewerage, and refuse disposal services, sanitation and similar services	Uniform	[0.2, 1.9]
238.	$\sigma_{va\_cmemb}$	Membership organizations services, n.i.c.	Uniform	[0.2, 1.9]
239.	$\sigma_{va\_crecr}$	Recreational, cultural and sporting services	Uniform	[0.2, 1.9]
240.	$\sigma_{va\_coser}$	Other services	Uniform	[0.2, 1.9]
241.	$\sigma_{va\_chh}$	Private households with employed persons	Uniform	[0.2, 1.9]
<b>Frisch parameters</b>				
242.	Frischurb	Frisch parameter for urban household	Uniform	[-4, -3]
243.	Frischrur	Frisch parameter for rural household	Uniform	[-4, -3]

Figure 8F.1 Distribution of impacts on real exports

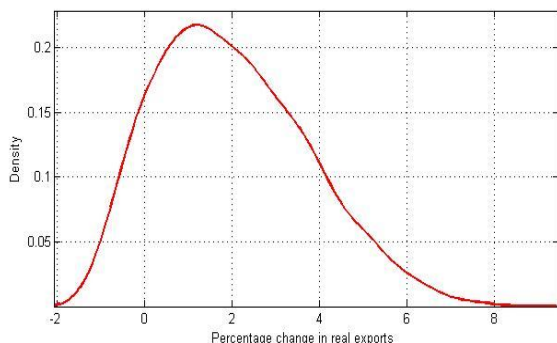


Figure 8F.2 Cumulative distribution of real exports

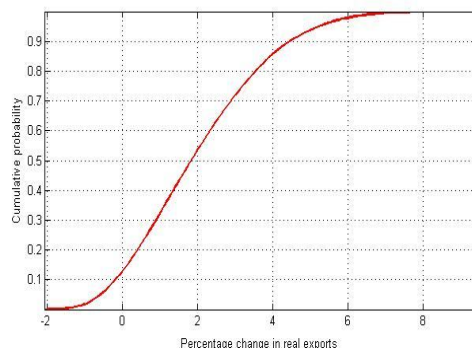


Figure 8F.3 Distribution of impacts on agriculture, hunting and related services

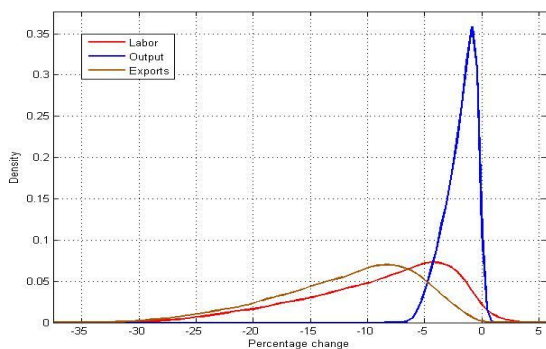
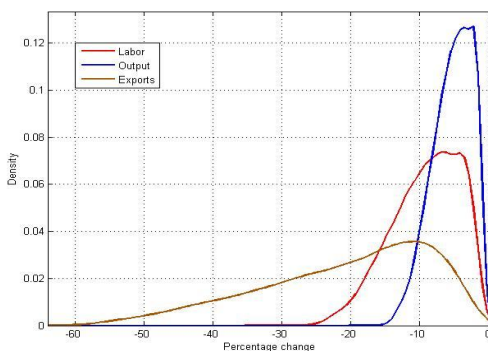
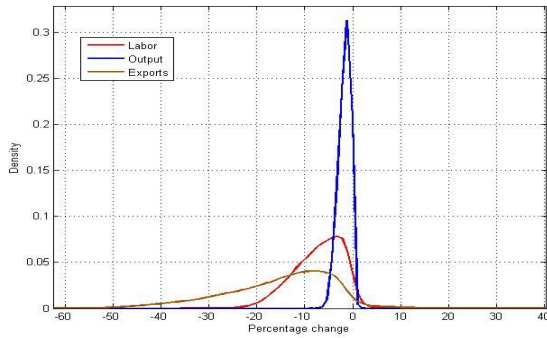


Figure 8F.4 Distribution of impacts on forestry, logging and related services

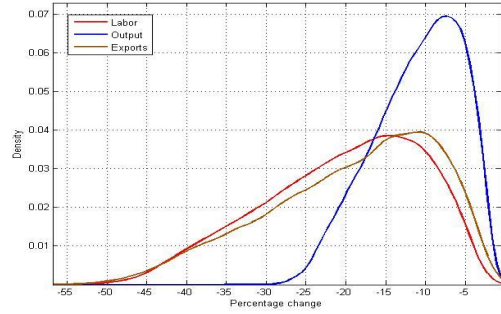




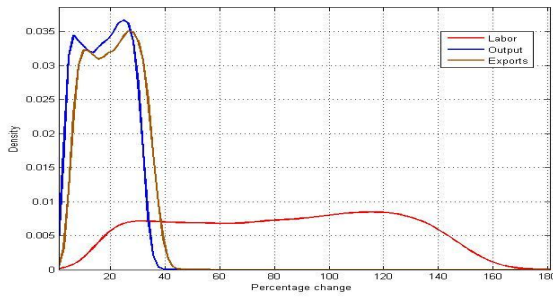
**Figure 8F.5** Distribution of impacts on fish and other fishing products; services incidental to fishing



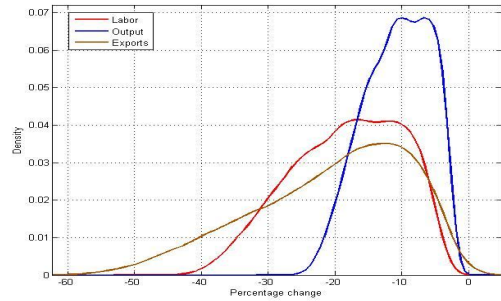
**Figure 8F.6** Distribution of impacts on coal and lignite; peat



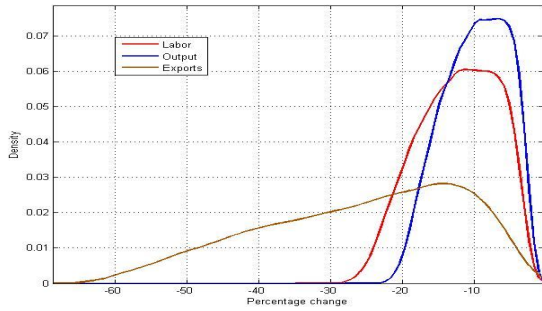
**Figure 8F.7** Distribution of impacts on crude petroleum and natural gas; services incidental to crude oil and gas extraction, excluding surveying



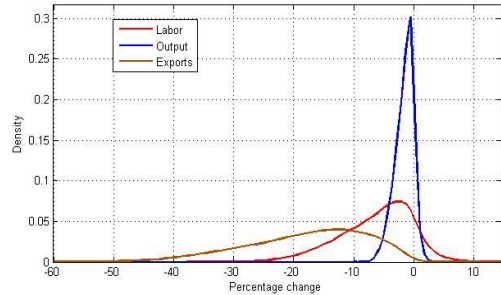
**Figure 8F.8** Distribution of impacts on metal ores



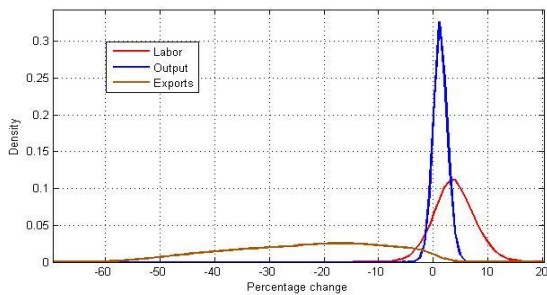
**Figure 8F.9** Distribution of impacts on other mining and quarrying products



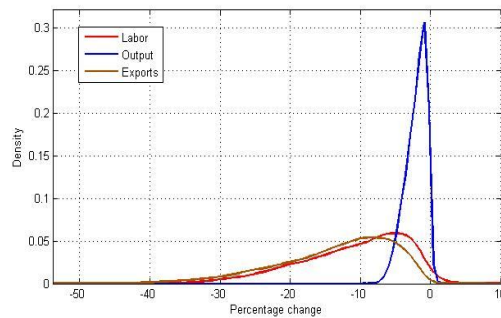
**Figure 8F.10** Distribution of impacts on food products, including beverages



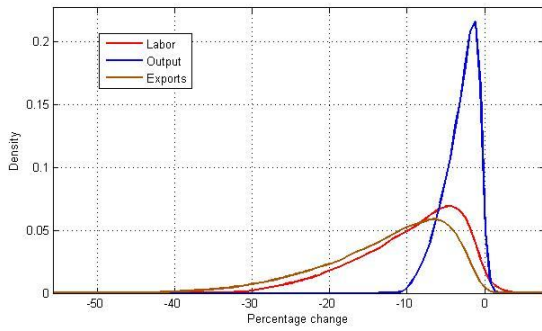
**Figure 8F.11** Distribution of impacts on tobacco products



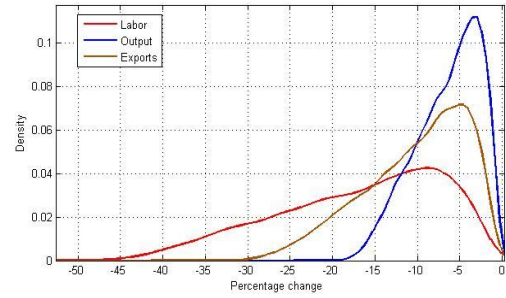
**Figure 8F.12** Distribution of impacts on textiles



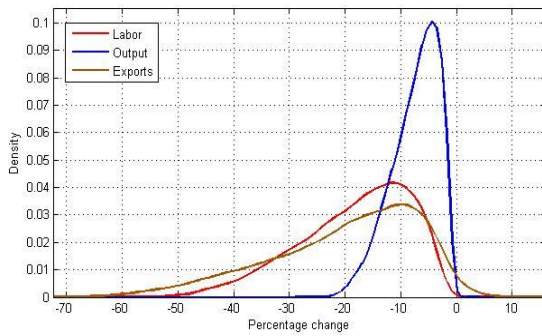
**Figure 8F.13** Distribution of impacts on wearing apparel, fur



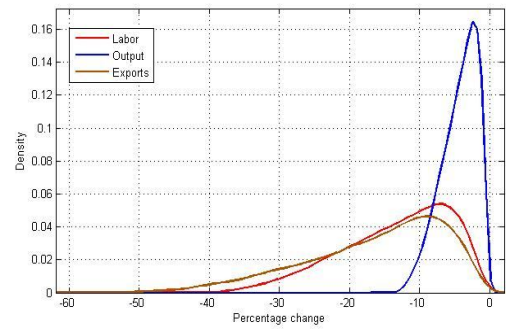
**Figure 8F.14** Distribution of impacts on leather, leather products and footwear



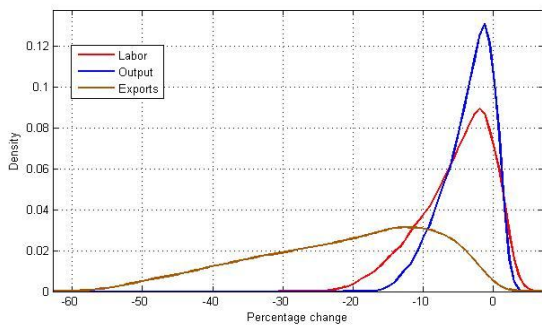
**Figure 8F.15** Distribution of impacts on wood and products of wood and cork (except furniture); articles of straw and plaiting materials



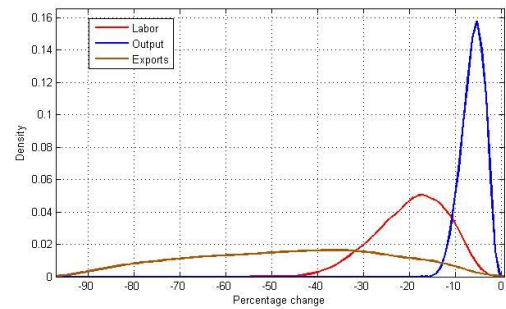
**Figure 8F.16** Distribution of impacts on pulp, paper and paper products



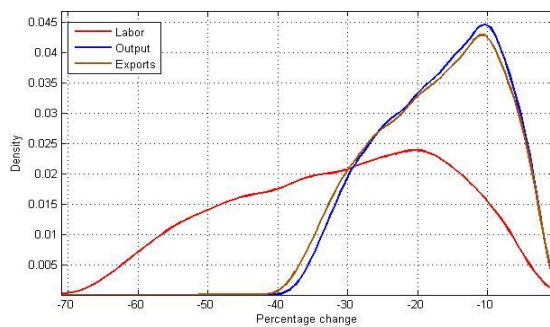
**Figure 8F.17** Distribution of impacts on printed matter and recorded media



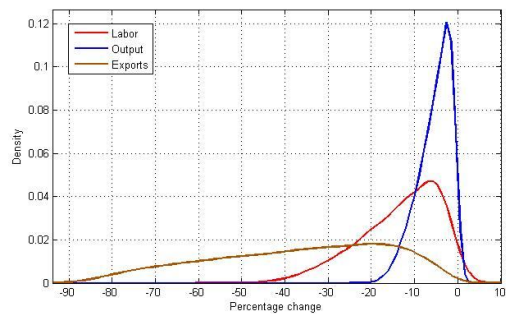
**Figure 8F.18** Distribution of impacts on coke, refined petroleum products, and other fuel



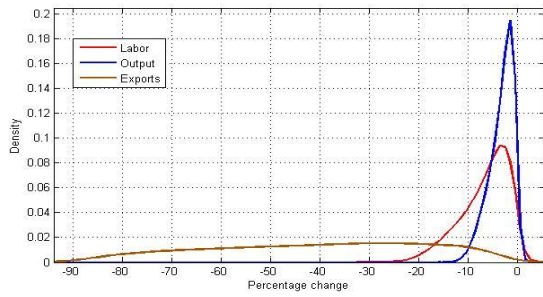
**Figure 8F.19** Distribution of impacts on chemicals, chemical products and chemical fiber



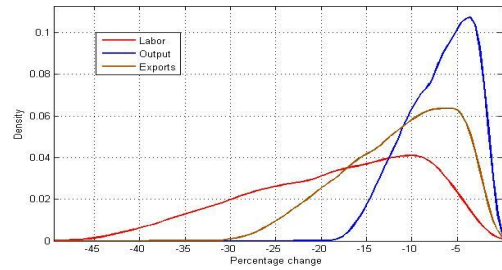
**Figure 8F.20** Distribution of impacts on rubber and plastic products



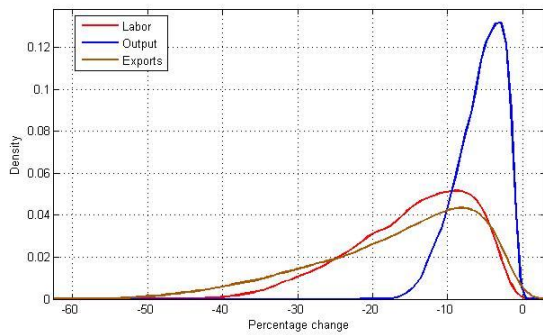
**Figure 8F.21 Distribution of impacts on other non-metallic mineral products**



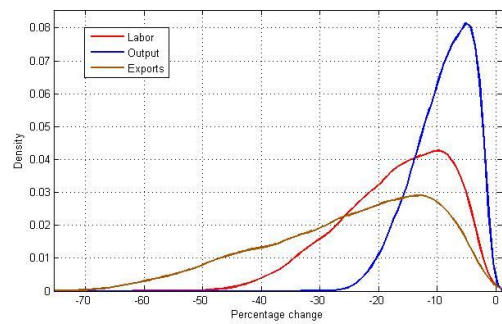
**Figure 8F.22 Distribution of impacts on basic metals**



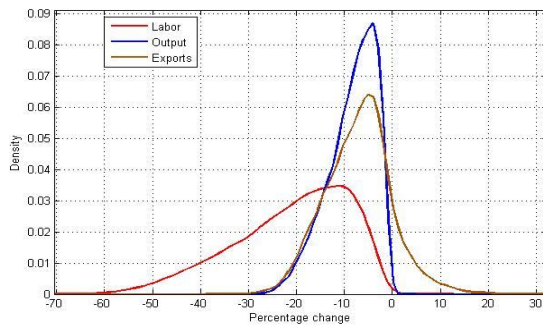
**Figure 8F.23 Distribution of impacts on fabricated metal products, except machinery and equipment**



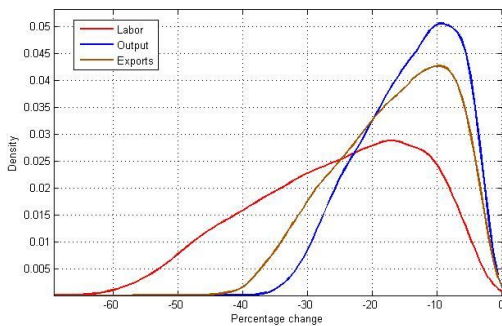
**Figure 8F.24 Distribution of impacts on machinery and equipment, n.i.c.**



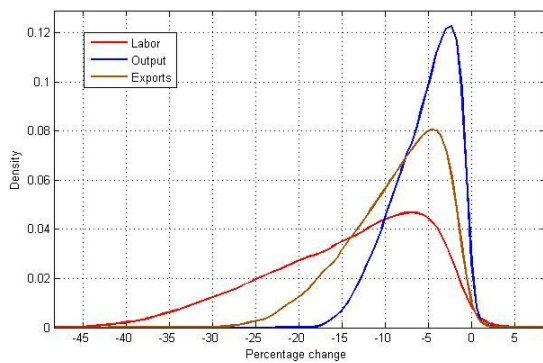
**Figure 8F.25 Distribution of impacts on office machinery and computers**



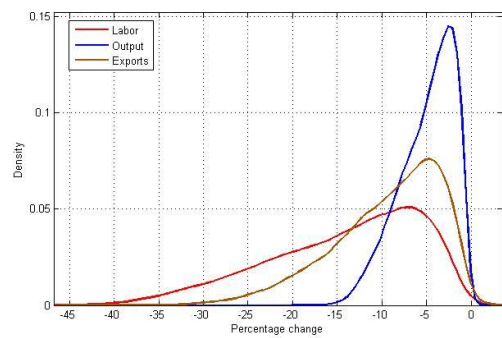
**Figure 8F.26 Distribution of impacts on electrical machinery and apparatus, n.i.c.**



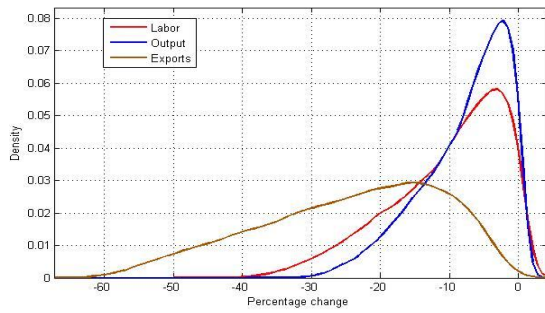
**Figure 8F.27 Distribution of impacts on radio, television, communication equipment and apparatus**



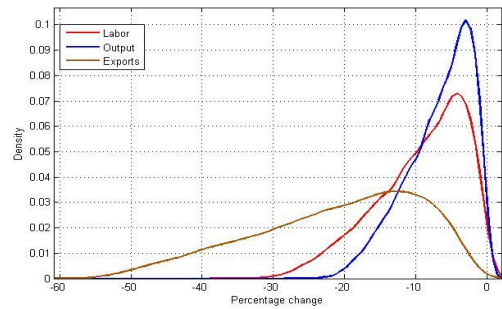
**Figure 8F.28 Distribution of impacts on medical, precision and optical instruments, watches and clocks**



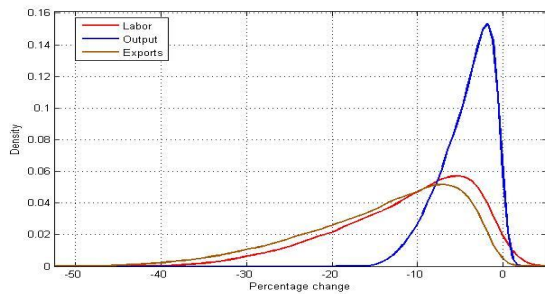
**Figure 8F.29 Distribution of impacts on motor vehicles, trailers and semitrailers**



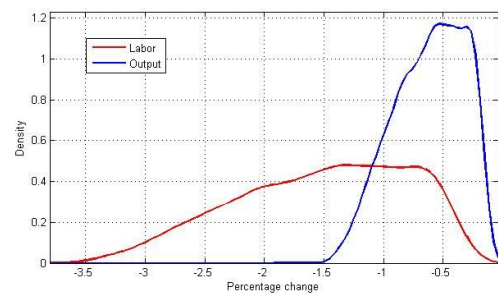
**Figure 8F.30 Distribution of impacts on other transport equipment**



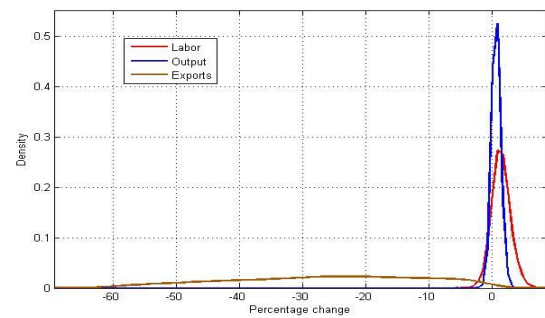
**Figure 8F.31 Distribution of impacts on furniture; other manufactured goods, n.i.c.**



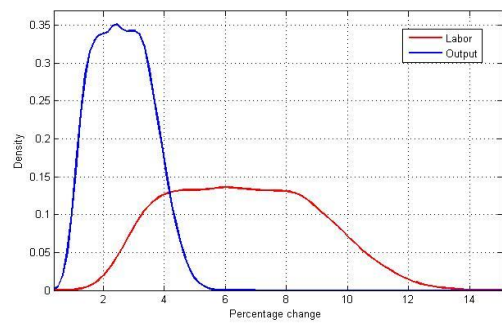
**Figure 8F.32 Distribution of impacts on services on recycling of secondary raw materials**



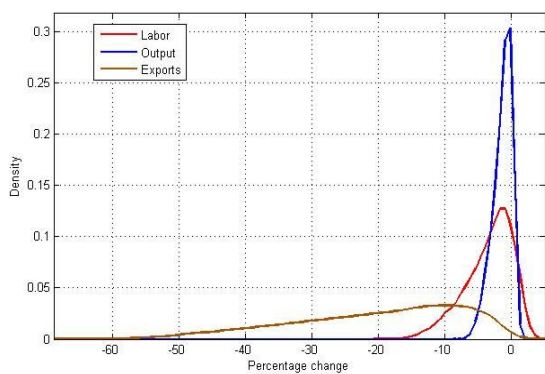
**Figure 8F.33 Distribution of impacts on electrical energy, gas, steam and hot water**



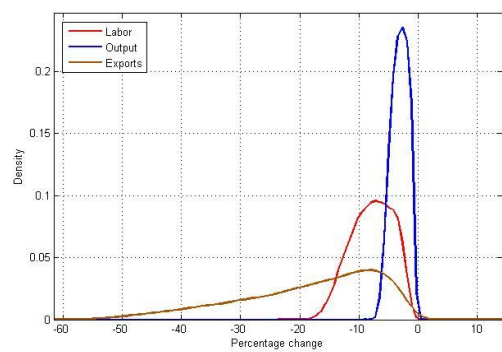
**Figure 8F.34 Distribution of impacts on collection, purification and distribution of water**



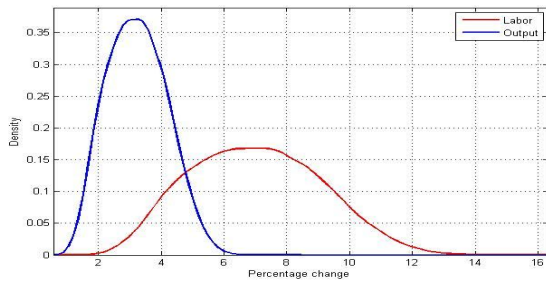
**Figure 8F.35 Distribution of impacts on construction works**



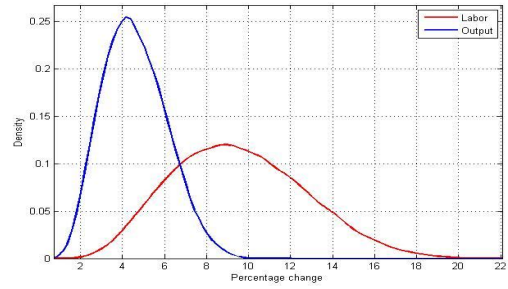
**Figure 8F.36 Distribution of impacts on trade; maintenance and repair services of motor vehicles and motor cycles; repair or personal and household goods**



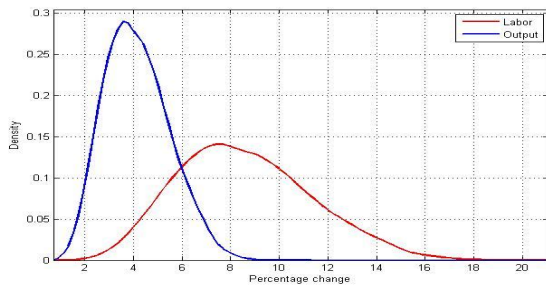
**Figure 8F.37** Distribution of impacts on hotel services, camping sites and other short-stay accommodation services



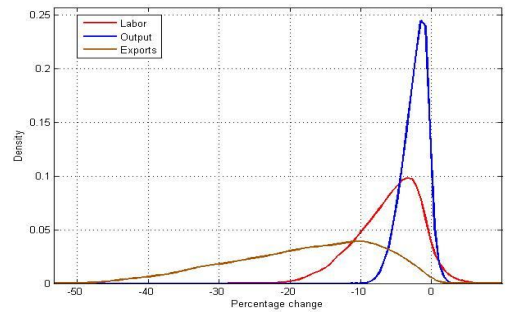
**Figure 8F.38** Distribution of impacts on food serving services



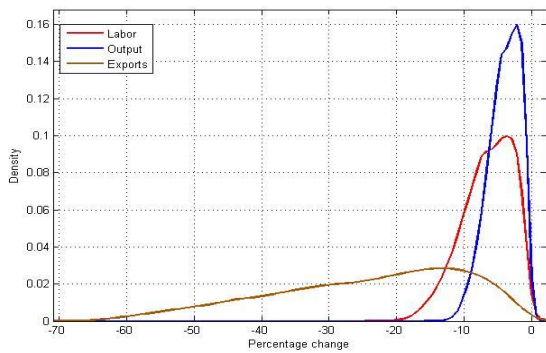
**Figure 8F.39** Distribution of impacts on canteen and catering services



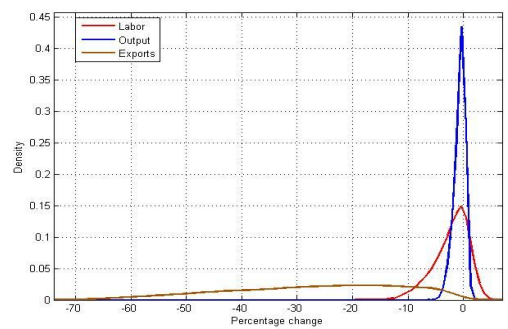
**Figure 8F.40** Distribution of impacts on transport



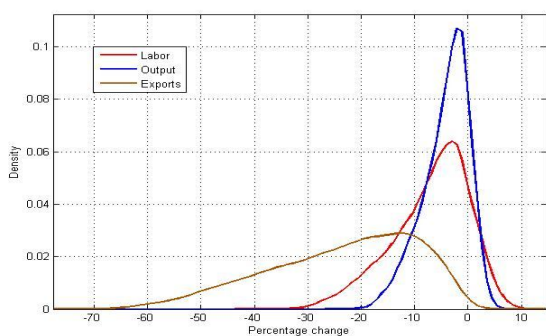
**Figure 8F.41** Distribution of impacts on post and telecommunication services



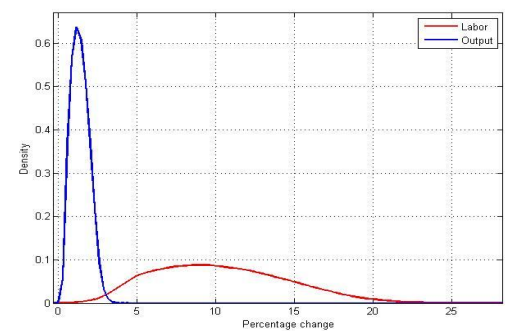
**Figure 8F.42** Distribution of impacts on financial intermediation services, except insurance and pension funding services



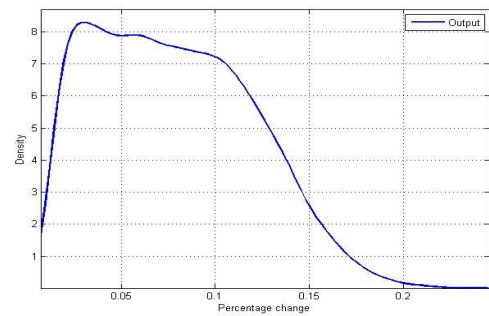
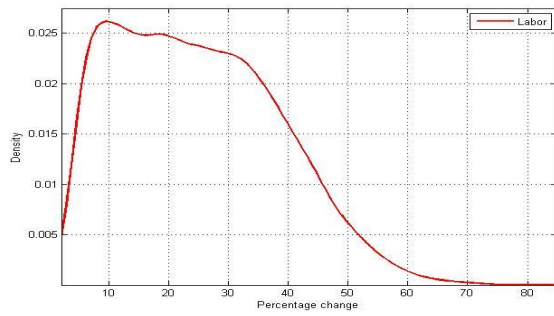
**Figure 8F.43** Distribution of impacts on insurance and pension funding services (except compulsory social security services)



**Figure 8F.44** Distribution of impacts on real estate services

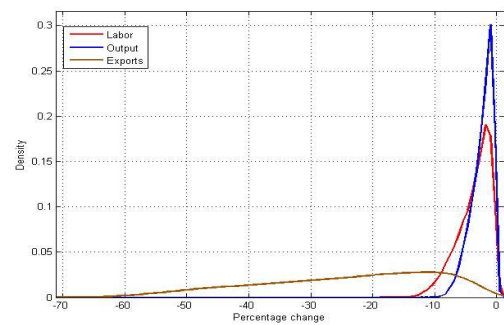
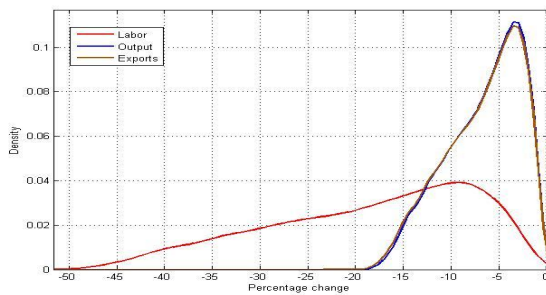


**Figure 8F.45 Distribution of impacts on services auxiliary to financial intermediation**



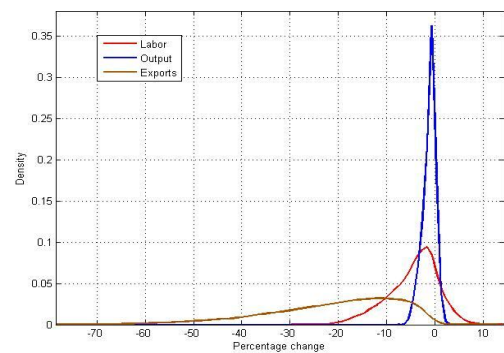
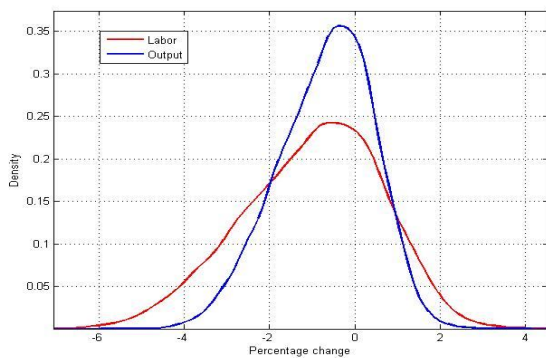
**Figure 8F.46 Distribution of impacts on renting services on machinery and equipment without operator and of personal and household goods**

**Figure 8F.47 Distribution of impacts on computer and related services**



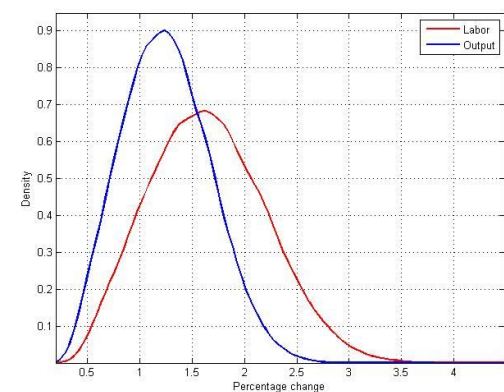
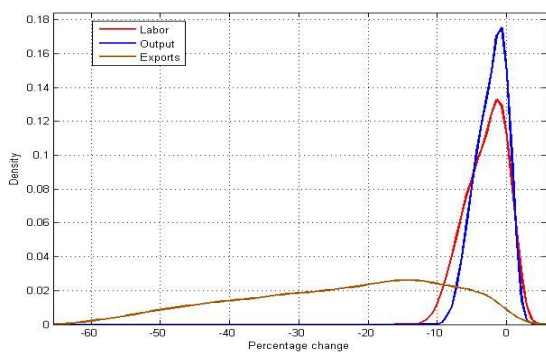
**Figure 8F.48 Distribution of impacts on research and development services**

**Figure 8F.49 Distribution of impacts on other business services**

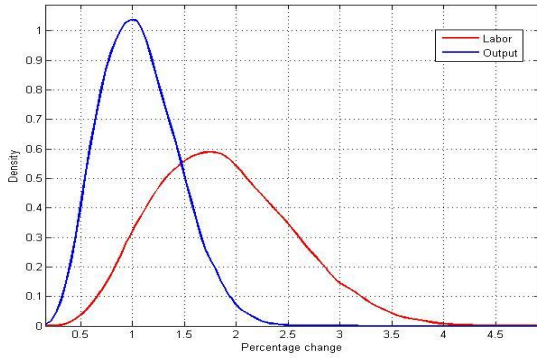


**Figure 8F.50 Distribution of impacts on public administration and defense services; compulsory social security services**

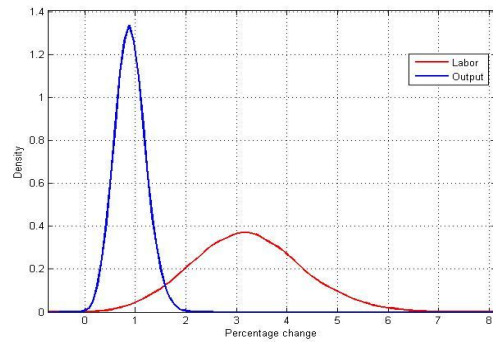
**Figure 8F.51 Distribution of impacts on education services**



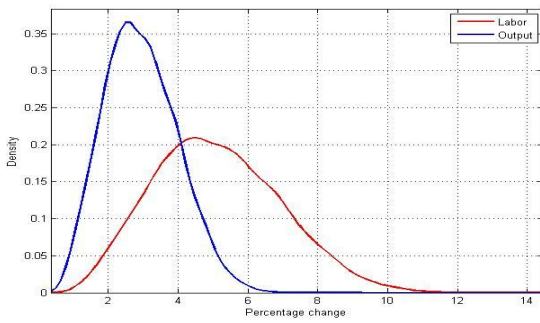
**Figure 8F.52 Distribution of impacts on health and social work services**



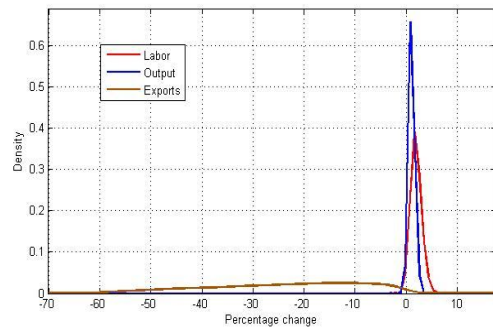
**Figure 8F.53 Distribution of impacts on sewerage, and refuse disposal services, sanitation and similar services**



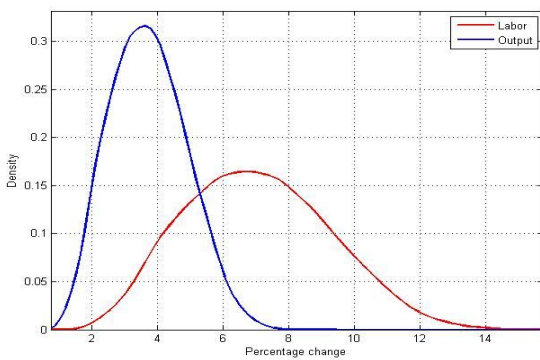
**Figure 8F.54 Distribution of impacts on membership organizations services, n.i.c.**



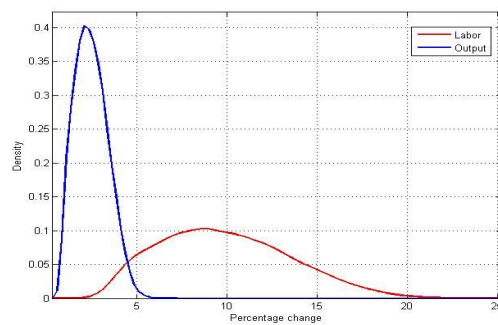
**Figure 8F.55 Distribution of impacts on recreational, cultural and sporting services**



**Figure 8F.56 Distribution of impacts on other services**



**Figure 8F.57 Distribution of impacts on services of private households with employed persons**



**Table 8F.2 Range and frequency of positive changes in outputs, labor employment and exports**

	Output			Labor			Exports		
	min	max	positive changes	min	max	positive changes	min	max	positive changes
			(frequency, %)			(frequency, %)			(frequency, %)
cagr	-7.09	1.00	1.94	-33.71	5.26	1.94	-37.09	-0.23	0.00
cfor	-17.27	0.30	0.02	-29.71	0.53	0.02	-63.33	-0.48	0.00
cfish	-7.43	1.65	3.72	-30.47	7.57	3.72	-61.48	39.44	3.71
cmin	-29.13	-1.04	0.00	-52.77	-2.06	0.00	-56.27	-1.32	0.00
cpetr	2.95	37.83	100.00	14.37	179.00	100.00	3.58	44.76	100.00
core	-25.94	-0.96	0.00	-43.74	-1.71	0.00	-61.57	4.22	0.30
comin	-22.73	-0.94	0.00	-28.41	-1.20	0.00	-68.03	-1.57	0.00
cfood	-8.28	3.22	12.58	-31.90	13.86	12.58	-59.43	1.17	0.05
ctob	-4.00	6.59	85.31	-11.01	19.35	85.31	-68.75	3.49	1.39
ctex	-8.04	1.67	1.80	-39.94	9.42	1.80	-53.21	0.13	0.00
cwear	-11.70	2.11	1.63	-35.72	7.15	1.63	-55.10	-0.02	0.00
cleat	-20.66	-0.29	0.00	-52.11	-0.81	0.00	-35.13	-0.43	0.00
cwood	-24.38	-0.39	0.00	-57.34	-1.03	0.00	-71.52	15.30	1.60
cpulp	-14.12	0.43	0.04	-41.98	1.43	0.04	-61.30	-0.40	0.00
cpubl	-17.84	4.36	14.56	-25.74	6.53	14.56	-62.09	1.50	0.11
ccoke	-15.17	-0.32	0.00	-46.68	-1.11	0.00	-96.03	-2.91	0.00
cchem	-39.25	-1.20	0.00	-70.29	-2.43	0.00	-41.49	-1.10	0.00
crub	-21.42	3.24	3.09	-51.71	9.03	3.09	-92.80	0.40	0.00
cmnmt	-13.99	2.17	3.67	-27.95	4.60	3.67	-93.02	-1.16	0.00
ciron	-18.88	-0.54	0.00	-48.99	-1.54	0.00	-32.28	-0.79	0.00
cfmet	-18.42	-0.33	0.00	-46.27	-0.91	0.00	-61.84	2.44	0.11
cmach	-28.19	0.18	0.01	-52.09	0.37	0.01	-74.67	-0.53	0.00
cofic	-30.79	0.18	0.01	-69.52	0.50	0.01	-32.52	31.36	12.82
celmc	-40.11	-0.55	0.00	-68.54	-1.08	0.00	-46.99	-0.79	0.00
crad	-18.99	2.79	0.67	-47.82	8.01	0.67	-36.58	3.20	0.38
cmed	-16.75	0.87	0.11	-46.28	2.70	0.11	-40.13	2.99	0.43
cmvec	-33.53	2.56	4.65	-41.91	3.54	4.65	-66.61	1.92	0.01
cotr	-23.73	1.10	1.05	-32.58	1.56	1.05	-60.24	0.02	0.00
cfurn	-16.64	1.61	2.05	-42.91	4.61	2.05	-51.88	1.04	0.03
crec	-1.57	-0.07	0.00	-3.77	-0.18	0.00	-	-	-
cel	-2.09	3.87	84.84	-4.29	8.08	84.84	-68.66	1.32	0.15
cwat	0.52	5.93	100.00	1.29	14.93	100.00	-	-	-
ccnst	-7.13	1.67	16.42	-17.46	4.29	16.42	-68.11	-0.02	0.00
ctrd	-7.87	-0.19	0.00	-19.78	-0.50	0.00	-60.79	13.44	0.09
chot	0.72	7.45	100.00	1.54	16.18	100.00	-	-	-
cretr	0.94	10.53	100.00	1.91	21.87	100.00	-	-	-
ccant	0.90	9.98	100.00	1.83	20.87	100.00	-	-	-
ctrns	-9.66	3.47	5.34	-24.16	9.33	5.34	-52.72	0.92	0.04
ccom	-13.03	0.93	0.36	-20.80	1.53	0.36	-70.19	-0.28	0.00
cfini	-5.61	1.92	26.16	-17.02	6.17	26.16	-73.12	0.24	0.01
cins	-22.40	7.86	15.26	-36.79	13.81	15.26	-76.79	2.64	0.15
caux	0.01	0.24	100.00	2.93	84.02	100.00	-	-	-
cest	0.01	3.75	100.00	0.05	27.91	100.00	-	-	-
crent	-18.83	-0.30	0.00	-51.13	-0.90	0.00	-19.01	-0.30	0.00
ccomp	-10.42	0.32	1.19	-16.04	0.51	1.19	-70.45	-0.40	0.00
cres	-4.79	2.99	29.08	-6.96	4.43	29.08	-	-	-
cobus	-6.52	3.22	18.00	-25.18	13.50	18.00	-77.66	0.08	0.00
cpa	-9.88	3.75	16.81	-13.09	5.07	16.81	-64.77	1.83	0.51
ceduc	0.24	3.36	100.00	0.31	4.44	100.00	-	-	-
chelt	0.21	2.77	100.00	0.37	4.88	100.00	-	-	-
csew	-0.18	2.23	99.97	-0.64	8.05	99.97	-	-	-
cmemb	0.50	8.17	100.00	0.86	14.30	100.00	-	-	-
crecr	-1.02	3.56	97.70	-1.82	6.47	97.70	-69.36	16.79	0.29
coser	0.90	8.27	100.00	1.68	15.60	100.00	-	-	-
chh	0.59	6.20	100.00	2.34	24.95	100.00	-	-	-



Table 8F.3 Spearman correlation coefficients between the outputs and the Armington elasticities of substitution

	$\sigma_q$ cagr	$\sigma_q$ cfor	$\sigma_q$ cfish	$\sigma_q$ cmin	$\sigma_q$ cpetr	$\sigma_q$ core	$\sigma_q$ comin	$\sigma_q$ cfood	$\sigma_q$ ctob	$\sigma_q$ ctex	$\sigma_q$ cwear	$\sigma_q$ cleat	$\sigma_q$ cwood	$\sigma_q$ cpulp	$\sigma_q$ cpubl	$\sigma_q$ ccoke	$\sigma_q$ cchem	$\sigma_q$ crub	$\sigma_q$ cmnmt	$\sigma_q$ ciron
$Qx_{cagr}$	-0.06	-0.01	0.00	0.00	-0.01	0.00	0.00	0.02	0.00	-0.01	0.00	-0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00
$Qx_{cfor}$	0.01	-0.29	0.00	0.00	0.00	-0.01	0.00	0.02	0.00	0.00	0.00	0.00	-0.06	0.00	0.01	0.02	0.01	0.00	0.01	0.01
$Qx_{cfish}$	0.01	-0.01	-0.09	0.00	-0.01	-0.01	0.01	-0.22	0.00	0.01	0.01	0.00	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.02
$Qx_{cmin}$	0.01	0.00	0.00	-0.03	-0.02	0.00	0.00	0.02	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.01	0.01	0.00	0.01	0.01
$Qx_{cpetr}$	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.01	0.01	0.00
$Qx_{core}$	0.00	0.00	0.00	0.00	-0.02	-0.04	0.00	0.02	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.02	0.01	-0.01	0.01	-0.02
$Qx_{comin}$	0.00	0.00	0.00	-0.01	-0.02	-0.02	-0.09	0.02	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.01	0.02	0.00	-0.01	0.00
$Qx_{cfood}$	0.00	-0.01	0.00	0.00	0.00	0.00	0.01	-0.38	0.00	0.00	0.00	0.00	-0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.01
$Qx_{ctob}$	0.01	0.00	0.01	-0.01	0.04	-0.01	-0.01	0.02	-0.36	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00
$Qx_{ctex}$	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.02	0.01	-0.29	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.01	0.02
$Qx_{cwear}$	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.03	0.01	0.00	-0.38	0.00	-0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.01
$Qx_{cleat}$	0.01	0.00	0.01	0.00	-0.03	0.00	0.01	0.02	-0.01	0.00	0.00	-0.10	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.01
$Qx_{cwood}$	0.01	0.00	0.00	0.00	-0.02	0.00	0.00	0.02	0.01	0.00	0.00	0.00	-0.44	0.01	0.01	0.01	0.01	0.00	0.01	0.01
$Qx_{cpulp}$	0.00	0.00	0.00	0.00	-0.02	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	-0.26	-0.03	0.01	0.00	0.00	0.00	0.01
$Qx_{cpubl}$	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.01	-0.01	-0.77	0.01	0.01	-0.01	0.00	0.00
$Qx_{ccoke}$	0.01	-0.01	0.00	-0.01	0.11	-0.01	0.00	0.02	0.01	0.00	0.00	-0.01	0.00	0.01	0.01	-0.45	0.01	0.00	0.00	0.02
$Qx_{cchem}$	0.01	0.00	0.00	0.00	-0.02	-0.01	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	-0.03	-0.01	0.01	0.01
$Qx_{crub}$	0.01	0.00	0.00	-0.01	-0.02	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	-0.60	-0.60	0.02	0.01
$Qx_{cmnmt}$	0.01	0.00	0.00	-0.01	-0.02	-0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.01	0.01	-0.73	0.02
$Qx_{ciron}$	0.00	0.00	0.00	0.00	-0.02	0.00	0.00	0.02	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	-0.05
$Qx_{cfmet}$	0.01	0.00	0.00	0.00	-0.02	-0.01	0.00	0.03	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.02
$Qx_{cmach}$	0.00	0.00	0.01	0.00	-0.03	0.00	0.01	0.03	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.01
$Qx_{coffc}$	0.00	0.00	0.00	-0.01	-0.03	-0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01
$Qx_{celmc}$	0.00	0.00	0.00	0.00	-0.02	-0.01	0.00	0.02	0.01	0.00	0.00	-0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.03
$Qx_{cracl}$	0.00	-0.01	-0.01	0.00	-0.01	0.00	0.00	0.02	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01
$Qx_{cmed}$	0.00	0.00	0.01	0.00	-0.02	-0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	-0.01	0.00	0.02
$Qx_{cmvec}$	0.00	0.00	0.01	0.00	-0.02	0.00	0.01	0.03	0.01	0.00	0.00	0.00	0.01	-0.01	-0.01	0.01	0.01	0.01	0.01	0.02
$Qx_{cotr}$	0.01	0.00	-0.01	-0.01	0.01	0.01	0.01	0.02	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.02	0.00	0.00	0.01	0.01
$Qx_{cfum}$	0.01	0.00	0.00	0.00	-0.02	-0.01	0.00	0.03	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.01
$Qx_{crec}$	0.00	0.00	0.00	0.00	-0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	-0.04
$Qx_{cel}$	0.01	0.01	0.00	0.00	0.12	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.00	0.01	0.00	0.01
$Qx_{cwat}$	-0.01	0.00	0.00	0.00	0.04	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	-0.02	0.00	0.01	0.01	0.00
$Qx_{ccnst}$	0.01	0.00	0.00	0.00	-0.01	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.02
$Qx_{ctrd}$	0.01	0.00	0.00	-0.01	0.01	-0.01	0.00	-0.04	0.00	-0.01	0.00	0.00	-0.01	0.00	0.01	0.00	-0.02	-0.02	-0.03	0.01
$Qx_{chot}$	0.00	0.00	0.00	0.00	0.04	0.01	0.00	0.02	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.01	0.00
$Qx_{cretr}$	-0.01	0.01	0.00	0.00	0.04	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	-0.01	0.01	0.00	-0.01
$Qx_{ccant}$	0.00	0.01	-0.01	0.00	0.06	0.00	0.00	0.02	-0.01	0.00	-0.01	0.00	0.00	0.01	0.00	-0.01	0.00	0.00	0.00	0.00
$Qx_{ctrms}$	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	-0.01	0.01	0.02	0.00	0.00	0.00	0.02
$Qx_{ccom}$	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	-0.01	0.00	0.02
$Qx_{cfini}$	0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.01	0.01	0.00	-0.02	0.00	0.01
$Qx_{cins}$	0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	0.01	0.00	0.00	0.01	0.01
$Qx_{caux}$	0.01	-0.01	-0.01	0.00	0.04	-0.01	-0.01	0.00	0.00	0.00	0.01	0.00	-0.01	0.01	0.00	0.02	-0.01	0.00	0.01	0.00
$Qx_{cest}$	0.00	0.00	0.00	0.00	0.08	0.00	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	-0.02	0.00	-0.01	-0.01	0.01
$Qx_{crent}$	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
$Qx_{ccomp}$	0.01	-0.01	0.00	0.00	-0.02	-0.01	0.00	0.01	-0.01	-0.01	0.01	-0.01	0.00	-0.01	0.00	0.01	0.01	0.00	0.00	0.01
$Qx_{cres}$	0.02	0.00	0.01	0.00	0.01	0.00	-0.01	0.03	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.02	0.01	0.00	0.01	0.02
$Qx_{cobus}$	0.00	-0.01	0.00	0.00	-0.02	0.00	0.00	0.02	0.00	0.01	-0.01	0.00	-0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.01
$Qx_{cpa}$	0.01	0.00	0.01	-0.01	0.01	-0.01	-0.01	0.02	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01
$Qx_{ceduc}$	0.00	0.00	0.01	0.00	0.07	0.00	0.01	0.01	0.01	0.01	0.00	0.00	-0.01	-0.01	-0.01	0.01	0.00	0.01	0.01	-0.01
$Qx_{chelt}$	0.01	0.00	0.00	-0.01	0.06	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.00	-0.01	0.01	-0.01	0.01	0.00	0.00
$Qx_{csew}$	-0.01	0.00	0.01	-0.01	0.12	0.00	0.00	-0.11	0.00	-0.01	0.00	-0.01	0.00	0.01	0.00	-0.01	0.00	0.01	-0.01	0.01
$Qx_{cmemb}$	-0.01	0.00	0.01	0.00	0.07	0.00	0.00	0.00	0.00	0.01	-0.01	-0.01	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.00
$Qx_{crecr}$	0.00	0.01	0.00	0.00	0.03	0.00	-0.01	0.03	0.00	-0.01	0.00	0.01	0.00	-0.01	-0.05	0.01	0.00	0.00	0.00	0.00
$Qx_{coser}$	0.00	0.01	0.01	0.00	0.05	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.01	-0.01	0.00	0.00	0.00	0.01	0.00
$Qx_{chl}$	0.00	0.00	0.00	0.00	0.07	0.01	0.00	0.00	0.01	0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01

Note:  $\sigma_q$ ... denote Armington elasticities of substitutions.  $Qx$ ... denote outputs. For sectoral notation see Appendix 6A.

Table 8F.3 Continued

	$\sigma_q$ cfmet	$\sigma_q$ cmach	$\sigma_q$ cofic	$\sigma_q$ celmc	$\sigma_q$ crad	$\sigma_q$ cmed	$\sigma_q$ cmvec	$\sigma_q$ cotr	$\sigma_q$ cfum	$\sigma_q$ cel	$\sigma_q$ censt	$\sigma_q$ ctrd	$\sigma_q$ ctrms	$\sigma_q$ ccom	$\sigma_q$ cfini	$\sigma_q$ cins	$\sigma_q$ crent	$\sigma_q$ ccomp	$\sigma_q$ cobus	$\sigma_q$ cpa	$\sigma_q$ crecr
Qx_cagr	0.01	0.01	0.00	-0.02	0.00	0.00	0.01	0.01	-0.01	0.00	0.03	0.01	0.02	0.01	0.01	0.00	-0.01	0.01	0.03	0.01	0.00
Qx_cfor	0.02	0.01	0.00	-0.01	0.00	0.00	0.00	0.01	-0.01	0.00	0.02	0.01	0.04	0.01	0.01	0.01	-0.01	0.00	0.02	0.01	0.00
Qx_cfish	0.01	0.01	0.00	-0.01	0.00	-0.01	0.02	0.01	-0.01	0.00	0.03	0.00	0.03	0.00	0.02	0.01	-0.01	0.01	0.04	0.00	0.00
Qx_cmin	0.02	0.02	0.00	0.00	-0.01	0.00	0.01	0.01	-0.01	0.00	0.04	0.00	0.07	0.01	0.01	0.00	-0.01	0.01	0.04	0.01	0.00
Qx_cpetr	-0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.01	0.03	-0.01	0.02	0.00	0.00	0.00	0.01	-0.01	0.02	0.01	0.00
Qx_core	0.02	0.02	0.00	0.00	0.00	-0.01	0.02	0.01	-0.01	0.01	0.04	0.00	0.03	0.00	0.01	0.00	0.00	0.02	0.04	0.01	0.00
Qx_comin	0.01	0.02	0.00	-0.01	0.00	-0.01	0.02	0.01	-0.01	0.00	0.00	0.01	0.04	0.01	0.01	0.01	-0.01	0.02	0.04	0.01	0.00
Qx_cfood	0.01	0.01	0.00	0.00	0.00	-0.01	0.02	0.01	-0.01	0.00	0.02	0.01	0.03	0.00	0.02	0.01	-0.01	0.01	0.03	0.00	0.00
Qx_ctob	0.00	-0.01	-0.01	0.00	0.01	0.00	0.01	0.00	-0.01	0.00	-0.01	-0.01	0.03	0.01	0.02	0.00	0.00	-0.01	0.08	0.00	0.00
Qx_ctex	0.02	0.01	0.00	-0.01	0.00	-0.01	0.01	0.01	0.00	0.00	0.03	0.00	0.03	0.01	0.01	0.01	-0.01	0.01	0.04	-0.01	0.00
Qx_cwear	0.01	0.01	-0.01	0.00	0.00	0.00	0.01	0.00	-0.01	0.00	0.03	0.00	0.03	0.01	0.01	0.01	-0.01	0.02	0.02	0.00	0.00
Qx_cleat	0.01	0.02	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	0.00	0.04	0.00	0.03	0.00	0.01	0.01	0.00	0.02	0.03	0.00	0.00
Qx_cwood	0.02	0.03	0.00	0.00	0.00	0.00	0.02	0.01	-0.01	-0.01	-0.02	0.00	0.03	0.01	0.02	0.00	-0.01	0.01	0.03	0.01	0.00
Qx_cpulp	0.01	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.03	0.00	0.04	0.00	0.01	0.00	0.00	0.01	0.02	0.00	-0.01
Qx_cpubl	0.00	0.02	0.00	0.01	0.00	-0.01	0.00	0.00	0.00	0.01	0.04	0.00	0.03	0.01	0.01	0.00	-0.01	0.00	0.04	0.01	0.00
Qx_ccoke	0.02	0.02	0.00	0.01	0.00	0.00	0.02	0.01	-0.01	0.00	0.04	0.01	-0.01	0.00	0.02	0.01	0.00	0.01	0.04	0.00	0.00
Qx_cchem	0.01	0.02	0.00	0.00	0.01	0.00	0.00	0.01	-0.01	0.01	0.05	0.02	0.03	0.01	0.01	0.00	-0.01	0.01	0.03	0.00	0.00
Qx_crub	0.02	0.02	-0.01	0.00	0.01	0.00	0.02	0.01	-0.01	0.00	0.03	0.00	0.04	0.00	0.01	0.00	-0.01	0.01	0.03	0.00	0.00
Qx_cmmnt	0.01	0.02	0.00	-0.01	0.00	0.00	0.02	0.01	-0.01	0.00	-0.13	0.00	0.05	0.01	0.02	0.02	-0.01	0.01	0.04	0.00	0.00
Qx_ciron	0.02	0.02	0.00	0.00	0.00	-0.01	0.01	0.01	-0.01	0.00	0.04	0.01	0.03	0.01	0.01	0.01	0.00	0.01	0.04	0.01	0.00
Qx_cfmnet	-0.36	0.01	0.00	-0.01	0.01	0.00	0.02	-0.01	-0.01	0.00	-0.03	0.01	0.03	0.01	0.02	0.01	-0.01	0.01	0.04	0.00	-0.01
Qx_cmach	0.02	-0.43	-0.01	0.00	0.00	0.00	0.02	0.01	-0.01	0.00	0.04	0.00	0.04	0.01	0.01	0.00	-0.01	0.02	0.03	0.00	0.00
Qx_cofic	0.02	0.02	-0.42	0.00	0.01	0.00	0.02	0.00	-0.01	0.00	0.03	0.00	0.03	0.00	0.01	0.01	-0.01	0.02	0.03	0.00	0.00
Qx_celmc	0.02	0.02	0.00	-0.21	0.00	0.00	0.01	0.00	-0.01	0.00	0.05	0.00	0.04	0.01	0.01	0.00	0.00	0.01	0.03	0.00	0.00
Qx_crad	0.02	0.01	0.01	-0.01	-0.30	0.00	0.01	0.01	0.00	-0.01	0.04	0.01	0.03	0.01	0.01	0.01	0.00	0.01	0.06	0.00	0.00
Qx_cmed	0.02	0.02	0.00	-0.01	0.01	-0.33	0.01	0.00	-0.02	0.00	0.02	0.00	0.03	0.01	0.01	0.00	-0.01	0.01	0.04	0.01	-0.01
Qx_cmvec	0.02	0.03	0.00	0.00	0.00	-0.01	-0.74	0.00	-0.01	0.01	0.03	0.00	0.03	0.00	0.02	0.00	0.00	0.00	0.02	-0.01	0.00
Qx_cotr	0.03	0.01	-0.01	-0.01	-0.01	0.00	0.01	-0.65	-0.01	0.00	0.03	0.01	0.01	0.01	0.02	0.00	-0.01	0.01	0.02	0.00	0.00
Qx_cfum	0.02	0.02	0.00	-0.01	0.01	-0.01	0.01	0.00	-0.55	0.00	0.03	0.00	0.04	-0.01	0.01	0.01	-0.01	0.01	0.02	0.01	0.00
Qx_crec	0.02	-0.02	0.00	-0.01	0.00	-0.01	0.01	0.01	-0.01	0.00	0.04	0.01	0.04	0.01	0.01	0.01	-0.01	0.01	0.04	0.01	0.00
Qx_cel	0.01	0.02	0.00	0.01	0.00	0.00	0.01	0.01	0.00	-0.44	-0.02	0.00	0.06	0.01	0.02	0.00	0.00	0.01	0.10	0.00	0.00
Qx_cwat	-0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.00	-0.21	-0.01	0.03	0.01	0.01	0.00	0.01	-0.01	0.05	0.00	0.01
Qx_censt	0.01	0.00	-0.01	-0.01	0.00	-0.01	0.01	0.00	-0.01	0.00	-0.78	0.00	0.03	0.01	0.01	0.01	0.00	0.02	0.03	-0.01	0.00
Qx_ctrd	0.00	-0.08	0.00	-0.02	0.00	-0.01	-0.06	0.01	-0.02	0.00	0.02	0.01	0.07	0.01	0.03	0.01	-0.01	0.01	0.07	0.00	-0.01
Qx_cho	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	-0.03	-0.01	-0.02	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00
Qx_cretr	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.01	0.01	-0.01	-0.01	0.00	0.01	0.00	0.00	0.01	-0.01	0.03	0.00	0.00
Qx_ccant	-0.01	-0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-0.01	-0.02	-0.01	0.02	0.01	0.01	-0.01	0.00	0.00	0.01	0.00	0.00
Qx_ctrms	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	0.03	0.01	-0.34	0.01	0.01	0.01	0.00	0.01	0.06	0.01	0.01
Qx_ccom	0.02	0.01	-0.01	0.00	0.00	0.00	0.01	0.01	-0.01	0.00	0.04	0.01	-0.07	-0.34	0.01	0.01	0.00	0.01	0.07	-0.01	-0.01
Qx_cfini	0.01	-0.01	-0.01	0.00	0.00	-0.01	-0.01	0.02	-0.02	0.00	0.02	0.01	0.05	0.00	-0.63	0.01	0.00	0.00	0.05	0.01	-0.01
Qx_cins	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.02	0.00	0.02	-0.71	0.00	0.01	0.11	0.00	0.00
Qx_caux	-0.01	0.01	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	-0.01	0.00	0.00	-0.01	-0.01	0.01	-0.01	0.01
Qx_cest	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	-0.02	0.00	0.01	-0.01	0.00	0.00	0.01	-0.01	0.02	-0.02	-0.01
Qx_crent	0.02	0.01	-0.01	0.01	0.00	-0.01	0.00	0.01	-0.01	-0.01	0.04	0.01	0.03	0.00	0.01	0.00	0.00	0.01	0.04	0.00	0.00
Qx_ccomp	0.01	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.04	0.00	-0.01	0.00	0.00	0.00	-0.01	-0.67	0.09	-0.01	0.00
Qx_cres	0.01	-0.03	0.00	0.00	0.01	0.00	0.01	0.01	-0.01	0.01	0.05	0.01	-0.06	0.03	0.01	0.00	0.00	0.01	0.05	-0.21	0.00
Qx_cobus	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	0.02	0.00	0.03	0.01	0.01	0.00	-0.01	0.00	-0.66	0.00	0.00
Qx_cpa	0.01	0.01	0.00	-0.01	0.01	0.00	0.01	0.01	-0.01	0.00	0.02	0.01	0.04	0.02	0.01	0.00	0.00	0.01	0.04	-0.20	0.00
Qx_ceduc	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	-0.01	0.01	0.00	-0.02	0.00	0.01	0.00	0.00	0.00	0.01	-0.01	0.00	0.00	0.00
Qx_chelt	-0.01	0.01	0.00	0.00	0.01	0.00	0.00	-0.01	0.01	0.00	-0.03	0.00	0.01	0.00	0.01	0.00	0.00	-0.01	0.00	-0.02	0.00
Qx_csew	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	-0.02	-0.01	0.00	-0.03	0.00	0.03	0.00	0.01	0.01	0.00	0.00	0.03	-0.02	-0.02
Qx_cmemb	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	0.01	0.00	-0.03	-0.02	0.02	0.01	0.00	-0.01	0.01	-0.01	0.01	0.00	0.00
Qx_creer	-0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	-0.01	0.02	0.01	0.00	0.00	0.01	0.00	0.03	0.00	-0.61
Qx_coser	-0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.00	-0.01	0.00	0.03	0.00	0.00	0.00	0.01	-0.01	0.02	0.00	0.00
Qx_chh	0.00	0.00	0.01	-0.01	-0.01	0.00	0.00	-0.01	0.00	0.01	-0.02	0.01	0.03	-0.01	0.01	-0.01	0.01	-0.01	0.01	0.01	0.00

Note:  $\sigma_q$ ... denote Armington elasticities of substitutions. Qx\_... denote outputs. For sectoral notation see Appendix 6A.

Table 8F.4 Spearman correlation coefficients between the outputs and the elasticities of transformation

	$\sigma_{t\_cagr}$	$\sigma_{t\_cfor}$	$\sigma_{t\_cfish}$	$\sigma_{t\_cmin}$	$\sigma_{t\_cpetr}$	$\sigma_{t\_core}$	$\sigma_{t\_comin}$	$\sigma_{t\_cfood}$	$\sigma_{t\_ctob}$	$\sigma_{t\_ctex}$	$\sigma_{t\_cwear}$	$\sigma_{t\_cleat}$	$\sigma_{t\_cwood}$	$\sigma_{t\_cpulp}$	$\sigma_{t\_cpubl}$	$\sigma_{t\_ccoke}$	$\sigma_{t\_cchem}$	$\sigma_{t\_crub}$	$\sigma_{t\_cmnmt}$	$\sigma_{t\_ciron}$
Qx_cagr	-0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.03	0.00	-0.01	0.01	0.01
Qx_cfor	0.00	-0.20	-0.01	0.00	0.01	-0.01	-0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.03	-0.01	0.00	0.01	0.01
Qx_cfish	0.05	0.01	-0.16	0.00	0.00	0.00	0.00	-0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.00	0.00	0.01	0.01
Qx_cmin	0.01	0.01	0.00	-0.40	0.02	0.00	0.01	0.02	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00
Qx_cpetr	0.00	-0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.02
Qx_core	0.02	0.00	-0.01	0.00	0.01	-0.22	0.00	0.01	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.05	0.00	0.00	0.00	-0.05
Qx_comin	0.02	0.01	0.00	0.01	0.01	-0.05	-0.45	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	-0.01
Qx_cfood	0.04	0.01	0.00	0.01	0.00	0.00	0.00	-0.34	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.01	0.00	0.01
Qx_ctob	0.04	0.00	0.00	0.00	-0.03	0.00	0.01	0.01	-0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01
Qx_ctex	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.00	-0.16	0.00	0.00	0.00	-0.01	0.00	0.04	0.00	0.01	0.00	0.01
Qx_cwear	0.02	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01	-0.13	0.00	0.00	0.00	0.00	0.03	0.00	0.00	-0.01	0.01
Qx_cleat	0.03	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.00	0.01	-0.13	0.01	0.00	0.00	0.05	0.00	0.00	0.00	0.02
Qx_cwood	0.02	0.01	-0.01	0.00	0.01	0.01	0.00	0.01	-0.01	0.00	0.01	0.01	-0.06	0.00	0.00	0.08	-0.01	0.00	0.00	0.02
Qx_cpulp	0.02	0.01	0.00	0.00	0.01	0.00	0.00	0.01	-0.01	0.00	0.01	0.00	0.00	-0.07	0.00	0.04	-0.01	0.01	0.01	0.01
Qx_cpubl	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.01	-0.02	0.00	0.01	-0.01	0.02	0.00	-0.06	0.01	0.00	0.01	0.00	0.02
Qx_ccoke	0.02	0.01	0.00	0.00	-0.13	-0.01	0.00	0.01	-0.01	0.00	0.00	0.01	0.00	0.01	0.00	-0.22	-0.01	-0.01	0.00	0.01
Qx_cchem	0.02	0.01	0.00	0.01	0.00	0.01	0.00	0.02	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.04	-0.05	0.00	0.00	0.02
Qx_crub	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.09	-0.01	-0.13	0.00	0.03
Qx_cmnmt	0.01	0.01	0.00	0.02	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	-0.01	-0.03	0.03
Qx_ciron	0.01	0.00	-0.01	0.00	0.01	0.03	0.00	0.01	-0.01	0.00	0.01	0.01	-0.01	0.00	0.00	0.05	-0.01	0.00	0.00	-0.14
Qx_cfmet	0.02	0.00	-0.01	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.07	-0.01	0.00	0.01	0.04
Qx_cmach	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.01	-0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.09	-0.01	0.00	0.00	0.03
Qx_cofic	0.02	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.08	-0.01	-0.01	0.00	0.02
Qx_celmc	0.02	0.00	-0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.00	0.00	0.01	0.07
Qx_crad	0.02	0.01	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	-0.01	0.01	0.00	0.01
Qx_cmed	0.02	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.05	-0.01	-0.01	0.00	0.04
Qx_cmvec	0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.10	0.00	0.00	0.01	0.01
Qx_cotr	0.01	0.00	0.00	-0.01	0.01	0.01	0.00	0.02	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	0.03	0.00	0.00	0.01	0.02
Qx_cfum	0.02	0.01	-0.01	0.01	0.05	0.00	0.00	0.02	0.00	0.01	-0.01	0.00	0.00	0.00	0.00	0.05	0.00	0.01	0.00	0.02
Qx_crec	0.02	0.00	-0.01	0.00	0.01	0.01	0.00	0.01	-0.01	0.00	0.01	0.01	-0.01	0.00	0.00	0.02	-0.01	0.00	0.00	-0.11
Qx_cel	0.02	0.00	0.01	0.02	-0.11	-0.01	-0.01	0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.07	-0.01	0.00	0.01	0.02
Qx_cwat	0.00	-0.01	0.01	0.01	-0.02	0.00	0.01	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.02
Qx_ccnst	0.01	0.01	-0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.02
Qx_ctrd	0.03	0.01	-0.01	0.00	-0.02	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.26	0.00	-0.01	0.00	-0.02
Qx_chot	0.02	-0.01	0.01	0.02	-0.02	0.01	0.01	0.01	-0.01	0.00	0.00	-0.01	0.00	0.00	-0.01	0.01	0.00	0.01	-0.01	0.02
Qx_cretr	0.01	0.00	0.00	0.01	-0.02	0.00	0.00	0.02	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Qx_ccant	0.01	-0.01	0.00	0.02	-0.03	0.00	-0.01	0.01	0.01	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	0.00	0.01
Qx_ctms	0.05	0.00	0.00	-0.01	-0.01	0.01	0.01	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.04	-0.01	-0.01	0.00	0.04
Qx_ccom	0.03	0.01	-0.01	0.01	0.00	0.00	0.00	0.02	0.01	0.00	0.01	0.01	0.01	-0.01	0.00	0.03	0.00	0.00	0.01	0.02
Qx_cfini	0.01	0.01	-0.01	0.01	-0.01	0.00	0.00	0.02	0.01	0.01	0.00	0.01	0.00	0.01	0.00	-0.05	-0.01	0.00	0.00	0.01
Qx_cins	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Qx_caux	0.00	0.00	0.00	-0.05	-0.02	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.01	0.00
Qx_cest	0.02	0.00	0.00	0.01	-0.06	0.00	-0.01	0.01	0.00	0.01	0.00	0.00	-0.01	0.01	0.00	-0.01	0.01	0.00	0.00	0.00
Qx_crent	0.02	0.01	-0.01	0.00	0.00	0.00	0.00	0.01	-0.01	0.00	0.00	0.00	0.01	0.00	-0.01	0.02	0.00	0.00	0.00	0.01
Qx_ccomp	0.02	0.00	-0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.01
Qx_cres	0.04	0.00	0.00	0.00	0.00	0.01	0.01	0.03	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.03
Qx_cobus	0.02	0.01	0.00	0.00	0.00	0.01	0.00	0.01	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.02	-0.01	-0.01	0.00	0.02
Qx_cpa	0.02	0.00	-0.01	0.00	-0.01	0.00	0.00	0.02	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Qx_ceduc	0.03	0.00	0.01	0.01	-0.04	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	0.01
Qx_chelt	0.01	-0.01	0.00	0.01	-0.04	0.01	0.00	0.01	0.00	0.01	0.00	0.00	-0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.00
Qx_csew	0.04	0.00	0.02	0.02	-0.09	0.02	0.00	-0.08	0.01	0.01	0.01	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Qx_cmemb	0.00	-0.01	0.00	0.01	-0.05	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
Qx_creer	0.00	-0.01	0.01	0.01	-0.02	0.01	0.00	0.02	0.00	0.01	0.00	-0.01	0.00	-0.01	0.00	0.03	0.01	0.00	0.00	0.02
Qx_coser	0.00	-0.01	0.01	0.01	-0.03	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Qx_chh	0.01	-0.01	0.00	0.01	-0.04	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.01	-0.01	0.00	0.00	0.00	0.00	-0.01

Note:  $\sigma_{t\_...}$  denote elasticities of transformation. Qx\_... denote outputs. For sectoral notation see Appendix 6A.

Table 8F.4 Continued

	$\sigma_t$ cfmet	$\sigma_t$ cmach	$\sigma_t$ cofic	$\sigma_t$ celmc	$\sigma_t$ crad	$\sigma_t$ cmed	$\sigma_t$ cmvec	$\sigma_t$ cotr	$\sigma_t$ cfurn	$\sigma_t$ cel	$\sigma_t$ cconst	$\sigma_t$ ctrd	$\sigma_t$ ctrms	$\sigma_t$ ccom	$\sigma_t$ cfini	$\sigma_t$ cins	$\sigma_t$ crent	$\sigma_t$ ccomp	$\sigma_t$ cobus	$\sigma_t$ cpa	$\sigma_t$ crecr
Qx_cagr	-0.01	0.01	0.00	0.00	-0.01	-0.01	0.00	-0.01	-0.01	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.01
Qx_cfor	-0.01	0.00	0.00	-0.02	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
Qx_cfish	0.00	0.01	0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	0.05	0.00	0.00	0.00	-0.01	0.01	0.01	0.02	0.02
Qx_cmin	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.08	0.01	0.00	0.00	0.00	0.00	0.01	0.02	0.00
Qx_cpetr	0.00	0.00	-0.01	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.00	-0.01	0.00	0.01	-0.01
Qx_core	-0.01	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.05	0.00	0.00	0.00	-0.01	-0.01	0.00	0.02	0.00
Qx_comin	-0.01	0.01	0.00	-0.01	0.01	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.01
Qx_cfood	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.05	-0.01	0.01	-0.01	-0.01	0.01	0.01	0.01	0.02
Qx_ctob	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	0.06	0.01	0.00	0.00	0.00	0.00	0.02	0.01	0.01
Qx_ctex	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.01	0.00	0.01	-0.01	0.00	0.04	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00
Qx_cwear	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.01
Qx_cleat	-0.01	0.00	0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.04	-0.01	0.00	0.00	0.00	0.01	0.00	0.03	0.00
Qx_cwood	0.00	0.01	0.00	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.01
Qx_cpulp	-0.01	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.01	0.00	0.00	0.04	0.00	0.01	0.00	0.00	0.00	0.01	0.02	0.00
Qx_cpubl	-0.01	0.01	0.01	0.00	-0.01	0.00	0.00	-0.01	-0.02	0.01	0.00	0.00	0.04	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.01
Qx_ccoke	0.00	0.01	0.01	0.00	0.00	0.01	-0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00	0.01	0.02	0.00
Qx_cchem	-0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.01	-0.01	0.01	-0.01	0.01	0.04	0.00	0.00	-0.01	0.00	0.01	0.01	0.02	0.00
Qx_crub	0.00	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
Qx_cmmnt	-0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.08	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.00
Qx_ciron	0.00	0.00	0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	0.04	0.00	0.00	0.00	-0.01	0.01	0.00	0.02	0.01
Qx_cfmet	-0.12	0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	-0.01	0.04	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00
Qx_cmach	0.00	-0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Qx_cofic	-0.01	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.04	-0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.01
Qx_celmc	0.00	0.01	0.00	-0.16	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.06	0.00	0.01	0.00	0.00	0.00	0.01	0.02	0.02
Qx_crad	-0.01	0.01	0.00	-0.01	-0.13	-0.01	-0.01	0.00	0.00	0.01	0.00	0.00	0.04	0.00	0.01	0.00	0.00	0.00	0.00	0.03	0.01
Qx_cmed	-0.01	0.01	0.00	0.00	-0.01	-0.11	0.00	0.00	0.00	0.00	-0.01	0.00	0.04	0.01	0.01	-0.01	0.00	0.00	0.01	0.02	0.01
Qx_cmvec	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.05	0.00	0.01	0.00	0.01	0.00	0.00	0.02	0.01
Qx_cotr	0.00	0.01	0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	-0.01	0.01	0.00	0.02	0.01
Qx_cfurn	0.00	0.01	0.00	-0.01	0.00	0.00	-0.01	-0.01	-0.09	0.01	-0.01	0.00	0.05	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.01
Qx_crec	0.00	-0.01	0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	0.05	0.00	0.00	0.00	-0.01	0.01	0.00	0.02	0.01
Qx_cel	0.00	0.01	-0.01	0.00	-0.01	-0.01	0.01	0.00	0.00	-0.40	0.01	0.01	0.08	0.01	0.00	0.01	0.00	0.00	0.01	0.00	-0.01
Qx_cwat	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.05	0.01	0.00	0.00	0.00	-0.01	0.00	0.01	-0.01
Qx_cconst	0.01	0.01	0.01	0.00	0.01	0.00	-0.02	0.00	0.00	0.00	-0.02	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Qx_ctrd	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.01	0.10	0.00	0.00	0.00	0.00	0.01	0.01	0.03	0.01
Qx_chot	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	-0.03	0.01	0.00	0.00	0.00	-0.01	-0.01	0.02	-0.01
Qx_cretr	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01
Qx_ccant	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.00
Qx_ctrms	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.01	-0.49	0.00	0.00	-0.01	-0.01	0.00	0.01	0.03	-0.01
Qx_ccom	0.00	0.01	0.00	-0.01	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	-0.09	-0.29	0.00	0.00	0.00	0.00	0.01	0.02	0.00
Qx_cfini	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	-0.01	0.00	0.00	0.00	0.07	0.01	-0.11	0.01	0.00	0.00	0.00	0.03	-0.01
Qx_cins	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	-0.01	0.00	0.00	0.01	0.03	0.00	0.00	-0.04	-0.01	0.00	0.02	0.02	0.01
Qx_caux	0.01	0.00	0.00	-0.01	0.01	0.00	-0.01	-0.01	0.00	-0.01	0.00	0.00	0.04	0.00	0.01	0.00	0.01	0.01	0.00	-0.01	-0.01
Qx_cest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	-0.03	0.00
Qx_crent	0.00	0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	-0.02	0.01	0.00	0.00	0.04	0.01	0.00	0.00	-0.01	0.00	0.00	0.02	0.01
Qx_ccomp	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.02	0.00	0.01	0.00	-0.02	-0.01	-0.01	0.00	0.01	-0.01	0.00	-0.01	0.00
Qx_cres	-0.01	-0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	-0.01	-0.10	0.01	0.00	0.00	0.01	0.01	0.01	-0.74	0.00
Qx_cobus	-0.01	0.00	-0.01	-0.01	0.00	0.01	-0.01	0.00	-0.01	0.00	0.00	0.00	0.04	0.00	0.00	-0.01	0.00	0.00	-0.06	0.02	0.00
Qx_cpa	-0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.00	-0.01	0.01	0.00	-0.01	0.05	0.01	0.00	0.00	0.01	0.01	0.01	-0.67	0.01
Qx_ceduc	-0.01	0.00	0.00	0.00	0.01	0.01	0.01	-0.01	0.00	0.00	0.01	-0.01	0.01	-0.01	0.00	0.00	-0.01	-0.01	0.00	0.00	-0.01
Qx_chelt	0.01	0.01	0.00	0.01	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	-0.05	-0.01
Qx_csew	-0.01	0.00	0.01	-0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.04	0.00	0.00	-0.01	0.00	-0.01	0.00	-0.05	0.00
Qx_cmemb	-0.01	-0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	-0.01	0.01	0.00	0.01	0.03	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Qx_creer	-0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.03	0.01	-0.01	0.00	0.00	-0.01	0.01	0.01	0.00

Note:  $\sigma_t$ ... denote elasticities of transformation. Qx... denote outputs. For sectoral notation see Appendix 6A.

Table 8F.5 Spearman correlation coefficients between the outputs and the income elasticities of demand of rural households

	$\sigma_{\text{cagr}}$	$\sigma_{\text{cfor}}$	$\sigma_{\text{cfish}}$	$\sigma_{\text{cmin}}$	$\sigma_{\text{cpetr}}$	$\sigma_{\text{comin}}$	$\sigma_{\text{cfood}}$	$\sigma_{\text{ctob}}$	$\sigma_{\text{ctex}}$	$\sigma_{\text{cwear}}$	$\sigma_{\text{cleat}}$	$\sigma_{\text{cwood}}$	$\sigma_{\text{cpulp}}$	$\sigma_{\text{cpubl}}$	$\sigma_{\text{ccoke}}$	$\sigma_{\text{chem}}$	$\sigma_{\text{crub}}$
Qx_cagr	0.08	0.00	0.01	-0.01	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.00
Qx_cfor	0.01	0.04	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.00
Qx_cfish	-0.02	-0.01	0.03	-0.01	-0.02	-0.01	0.12	-0.01	-0.02	-0.02	-0.01	-0.01	-0.02	-0.01	0.00	-0.02	0.00
Qx_cmin	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	-0.01	0.01
Qx_cpetr	0.00	0.00	0.00	0.01	0.01	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	-0.01	0.01	-0.01
Qx_core	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.01	-0.01	-0.01	0.01	0.01	-0.01	0.00
Qx_comin	0.01	0.00	0.00	-0.01	-0.01	0.00	0.01	0.01	0.00	0.00	0.00	-0.01	-0.01	0.00	0.01	-0.01	0.00
Qx_cfood	-0.03	-0.02	-0.02	-0.03	-0.03	-0.02	0.20	-0.02	-0.02	-0.03	-0.02	-0.02	-0.03	-0.02	-0.01	-0.03	-0.02
Qx_ctob	-0.01	0.03	0.03	0.03	0.03	0.03	-0.07	0.55	0.02	0.03	0.03	0.04	0.02	0.03	0.01	0.02	0.02
Qx_ctex	0.00	0.00	0.01	-0.01	0.01	0.01	-0.01	0.01	0.11	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.01
Qx_cwear	0.00	0.01	0.00	0.00	0.00	0.01	-0.02	0.00	0.00	0.09	0.01	0.00	0.00	0.01	0.01	0.00	0.01
Qx_cleat	-0.01	-0.01	0.00	0.00	0.00	0.01	0.00	0.01	-0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01
Qx_cwood	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.00
Qx_cpulp	0.00	-0.01	0.00	-0.01	0.00	0.00	-0.01	0.02	0.00	-0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.01
Qx_cpubl	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.07	0.02	0.01	0.01
Qx_ccoke	0.00	0.00	0.01	0.00	-0.01	0.01	-0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.08	-0.01	0.00
Qx_chem	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	0.00
Qx_crub	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.01	0.01	-0.01	0.09
Qx_cmnmnt	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00
Qx_ciron	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.01	-0.01	0.00	0.00	0.00	-0.01	0.01	0.01	-0.01	0.00
Qx_cfmnt	0.01	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.01	0.00	-0.01	0.00	0.01	-0.01	0.00	0.01	0.00	0.00
Qx_cmach	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	-0.01
Qx_cofic	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00
Qx_celmc	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.01	0.00	-0.01	0.01	-0.01	0.00	0.01	0.01	0.00	0.01
Qx_crad	0.00	0.00	0.01	0.00	0.00	0.01	-0.01	0.00	0.00	0.00	0.01	0.00	-0.01	0.00	0.01	0.00	0.01
Qx_cmed	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Qx_cmvec	0.00	0.00	0.01	0.00	0.00	0.01	-0.02	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.02	0.00	0.01
Qx_cotr	0.00	0.00	0.01	0.01	-0.01	0.01	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00
Qx_cfum	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.01
Qx_crec	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.01	-0.01	0.00	0.00	0.00	-0.01	0.01	0.01	-0.01	0.00
Qx_cel	-0.02	0.01	0.01	0.02	0.01	0.03	-0.06	0.00	0.00	0.01	0.02	0.02	0.02	0.01	0.00	0.01	0.01
Qx_cwat	0.00	0.01	0.01	0.02	0.02	0.00	-0.02	0.00	0.01	0.02	0.01	0.02	0.02	0.01	0.00	0.01	0.01
Qx_ccnst	0.00	0.00	-0.01	0.00	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-0.01	0.01
Qx_ctrd	-0.01	0.00	0.01	0.00	-0.01	0.01	0.02	0.00	-0.01	0.00	0.01	0.00	-0.01	0.01	0.01	0.00	0.01
Qx_chot	0.00	0.02	0.02	0.02	0.02	0.01	-0.04	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.00	0.02	0.01
Qx_cretr	0.00	0.02	0.02	0.02	0.01	0.01	-0.04	0.01	0.01	0.03	0.02	0.02	0.03	0.01	0.00	0.02	0.01
Qx_ccant	-0.01	0.02	0.03	0.02	0.02	0.02	-0.04	0.01	0.02	0.03	0.02	0.03	0.02	0.02	0.01	0.01	0.01
Qx_ctrns	-0.02	-0.01	0.00	-0.02	-0.01	0.00	-0.02	0.00	-0.01	-0.01	0.00	-0.01	-0.02	-0.01	-0.01	-0.01	0.00
Qx_ccom	-0.01	-0.01	0.00	-0.01	0.00	-0.01	-0.01	0.00	0.00	0.00	0.01	0.00	-0.01	0.00	0.01	0.00	0.01
Qx_cfini	0.00	0.01	0.01	0.00	0.01	0.01	-0.01	0.01	0.01	0.00	0.01	0.00	-0.01	0.01	0.01	0.01	0.00
Qx_cins	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.01
Qx_caux	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	-0.01	0.00	0.01	0.00	0.00	0.01
Qx_cest	-0.02	0.00	0.00	0.00	0.00	0.00	-0.06	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	-0.01	0.01	0.00
Qx_crent	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.01	-0.01	-0.01	0.00	-0.01	-0.01	0.00	0.01	0.00	0.00
Qx_ccomp	0.00	0.01	0.00	0.00	0.00	0.01	-0.01	0.00	-0.01	0.01	0.00	0.01	0.00	0.01	0.02	0.00	0.01
Qx_cres	-0.01	0.00	0.01	0.00	0.00	0.01	-0.02	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.01
Qx_cobus	0.00	0.00	-0.01	-0.01	0.00	0.00	-0.02	0.00	0.00	-0.01	-0.01	0.00	0.00	-0.01	0.01	-0.01	0.00
Qx_cpa	0.00	0.00	0.01	0.00	0.01	0.01	-0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.02	0.00	0.01
Qx_ceduc	-0.02	0.04	0.02	0.03	0.02	0.03	-0.09	0.02	0.02	0.03	0.03	0.02	0.04	0.01	0.01	0.01	0.02
Qx_chelt	0.00	0.03	0.03	0.02	0.02	0.02	-0.06	0.02	0.02	0.03	0.02	0.03	0.03	0.03	0.00	0.02	0.02
Qx_csew	-0.02	0.03	0.04	0.04	0.02	0.03	-0.03	0.02	0.02	0.04	0.04	0.05	0.03	0.04	0.01	0.02	0.02
Qx_cmemb	-0.01	0.02	0.03	0.03	0.03	0.02	-0.05	0.02	0.02	0.04	0.03	0.03	0.03	0.03	0.00	0.03	0.01
Qx_creer	-0.01	0.01	0.02	0.01	0.03	0.01	-0.04	0.02	0.02	0.03	0.01	0.01	0.03	0.02	0.00	0.03	0.02
Qx_coser	-0.01	0.01	0.01	0.03	0.02	0.01	-0.03	0.01	0.02	0.02	0.02	0.02	0.02	0.01	0.00	0.01	0.00
Qx_chh	0.00	0.02	0.02	0.03	0.02	0.02	-0.04	0.02	0.01	0.02	0.02	0.02	0.03	0.02	0.01	0.02	0.02

Note:  $\sigma_{\dots}$  denote income elasticities of demand of rural households. Qx... denote outputs. For sectoral notation see Appendix 6A.

Table 8F.5 Continued

	$\sigma$ cmmnt	$\sigma$ ciron	$\sigma$ cfmet	$\sigma$ cmach	$\sigma$ cofic	$\sigma$ celmc	$\sigma$ crad	$\sigma$ cmed	$\sigma$ cmvec	$\sigma$ cotr	$\sigma$ cfurn	$\sigma$ cel	$\sigma$ ewat	$\sigma$ ccnst	$\sigma$ ctrd	$\sigma$ chot	$\sigma$ cretr	$\sigma$ ccant
Qx_cagr	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.00	-0.01	0.00	-0.01	0.00	0.01	0.00	-0.01	-0.01
Qx_cfor	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	-0.01	0.02	0.01	0.00	0.00	-0.01
Qx_cfish	-0.02	-0.01	0.00	-0.01	-0.01	-0.01	-0.01	-0.02	-0.01	0.00	-0.01	-0.01	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01
Qx_cmin	-0.01	0.00	0.01	0.00	0.00	0.01	0.00	-0.01	0.00	0.01	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00
Qx_cpetr	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.01
Qx_core	0.00	0.01	0.01	-0.01	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	-0.01	0.00
Qx_comin	-0.01	0.00	0.00	-0.01	0.00	0.01	0.00	-0.01	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.00
Qx_cfood	-0.03	-0.01	-0.02	-0.03	-0.01	-0.02	-0.02	-0.03	-0.02	-0.01	-0.03	-0.02	-0.02	-0.02	-0.03	-0.01	-0.02	-0.03
Qx_ctob	0.03	0.04	0.03	0.01	0.03	0.01	0.02	0.02	0.01	0.03	0.03	0.01	0.03	0.01	0.02	0.03	0.02	0.02
Qx_ctex	-0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.00	0.02	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00
Qx_cwear	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.01	0.02	0.00	0.00	-0.01	0.01	0.01	0.00	0.00	0.00
Qx_cleat	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01
Qx_cwood	0.00	0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.01	-0.01	0.00	-0.01	-0.01
Qx_cpulp	-0.01	0.00	0.00	0.00	0.00	0.01	0.01	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Qx_cpubl	0.00	0.01	0.00	-0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Qx_ccoke	-0.01	0.00	0.01	0.01	0.01	0.01	0.01	-0.01	0.00	0.00	0.00	0.01	-0.01	0.01	-0.01	0.00	0.00	0.00
Qx_cchem	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	-0.01	0.00	0.01	0.00	0.00	0.00
Qx_crub	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01
Qx_cmmnt	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	-0.02	0.02	0.00	0.01	-0.01	-0.01
Qx_ciron	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00
Qx_cfmet	-0.01	-0.01	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	-0.01	-0.01
Qx_cmach	-0.01	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	-0.01	-0.01	0.00	-0.01	-0.01	0.00	0.00
Qx_cofic	-0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.01	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01
Qx_celmc	-0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.01	0.00	-0.01	0.00
Qx_crad	0.00	0.00	0.01	0.00	0.01	0.00	0.05	-0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.01	0.00	0.00
Qx_cmed	-0.01	0.00	0.01	-0.01	0.00	0.00	0.00	0.03	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00
Qx_cmvec	-0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.07	-0.01	0.00	0.00	0.00	0.01	0.00	-0.01	-0.01	-0.01
Qx_cotr	0.00	0.00	0.00	0.01	0.00	0.01	-0.01	0.00	-0.01	0.06	0.00	0.00	-0.01	0.01	0.00	0.01	0.00	0.00
Qx_cfurn	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	-0.01	0.00	0.01	0.00	0.00	0.00
Qx_crec	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.01	0.00	-0.01	0.00
Qx_cel	0.02	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.42	0.02	0.00	-0.01	0.00	0.01	0.03
Qx_cwat	0.02	0.02	0.01	0.02	0.01	0.01	0.02	0.02	0.01	0.01	0.02	0.00	0.18	0.02	0.00	0.01	0.02	0.02
Qx_ccnst	0.00	0.01	0.01	0.00	0.01	0.02	0.01	0.00	-0.01	0.00	-0.01	0.00	0.00	0.06	0.00	-0.01	-0.01	0.00
Qx_ctrd	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	0.01	0.00	0.00	-0.01	0.01	0.05	0.00	-0.01	0.00
Qx_chot	0.03	0.02	0.01	0.02	0.02	0.01	0.01	0.02	0.01	0.01	0.03	0.00	0.03	0.01	0.00	0.21	0.03	0.02
Qx_cretr	0.02	0.01	0.02	0.02	0.01	0.01	0.02	0.02	0.01	0.01	0.02	0.00	0.02	0.01	0.00	0.03	0.26	0.03
Qx_ccant	0.01	0.02	0.01	0.02	0.02	0.01	0.01	0.03	0.02	0.02	0.02	0.02	0.03	0.01	0.00	0.02	0.03	0.32
Qx_ctrns	-0.02	-0.01	-0.01	0.00	0.00	-0.01	-0.01	-0.01	0.00	-0.02	-0.01	-0.01	-0.02	-0.01	-0.01	0.00	-0.01	-0.01
Qx_ccom	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01
Qx_cfini	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.01	-0.01	0.01	0.00	0.00	-0.01	0.00	0.02	0.01	0.01	0.00
Qx_cins	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00
Qx_caux	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.01
Qx_cest	0.00	0.01	0.00	-0.01	0.00	-0.01	-0.01	0.01	-0.02	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00
Qx_crent	-0.01	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	-0.01	-0.01
Qx_ccomp	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Qx_cres	0.00	0.01	0.01	0.01	0.00	-0.01	0.00	0.01	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	-0.01	-0.01
Qx_cobus	-0.01	-0.01	0.00	-0.02	-0.01	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	-0.01
Qx_cpa	0.00	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Qx_ceduc	0.03	0.02	0.01	0.03	0.02	0.00	0.02	0.02	0.02	0.02	0.03	0.01	0.03	0.01	0.00	0.03	0.03	0.03
Qx_chelt	0.03	0.02	0.03	0.03	0.02	0.01	0.03	0.03	0.02	0.02	0.02	0.00	0.03	0.01	0.01	0.02	0.02	0.03
Qx_csrew	0.04	0.04	0.03	0.03	0.04	0.02	0.03	0.03	0.01	0.03	0.02	0.01	0.02	0.02	0.01	0.03	0.03	0.03
Qx_cmemb	0.03	0.03	0.02	0.03	0.02	0.01	0.02	0.03	0.01	0.02	0.03	0.01	0.03	0.02	0.02	0.02	0.03	0.03
Qx_creer	0.02	0.02	0.01	0.02	0.01	0.00	0.02	0.02	0.01	0.01	0.03	0.00	0.02	0.01	0.01	0.02	0.02	0.02
Qx_coser	0.02	0.02	0.02	0.01	0.01	0.00	0.02	0.01	0.01	0.02	0.02	0.01	0.02	0.00	0.00	0.02	0.02	0.02
Qx_chh	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.00	0.01	0.02	0.01	0.03	0.01	0.01	0.02	0.02	0.02

Note:  $\sigma$  ... denote income elasticities of demand of rural households. Qx ... denote outputs. For sectoral notation see Appendix 6A.

Table 8F.5 Continued

	$\sigma_{\text{ctrns}}$	$\sigma_{\text{ccom}}$	$\sigma_{\text{cfini}}$	$\sigma_{\text{cins}}$	$\sigma_{\text{caux}}$	$\sigma_{\text{cest}}$	$\sigma_{\text{crent}}$	$\sigma_{\text{ccomp}}$	$\sigma_{\text{cobus}}$	$\sigma_{\text{cpa}}$	$\sigma_{\text{ceduc}}$	$\sigma_{\text{chelt}}$	$\sigma_{\text{csew}}$	$\sigma_{\text{cmemb}}$	$\sigma_{\text{crecr}}$	$\sigma_{\text{coser}}$	$\sigma_{\text{chh}}$
Qx_cagr	-0.02	0.00	0.00	-0.01	0.00	-0.02	0.00	0.00	0.00	-0.01	-0.01	0.00	-0.01	0.00	-0.01	0.00	-0.01
Qx_cfor	-0.02	0.00	0.00	0.01	0.01	-0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.01	-0.01
Qx_cfish	-0.05	-0.01	-0.01	-0.01	-0.01	-0.03	-0.01	-0.01	-0.01	-0.01	-0.02	-0.01	-0.01	-0.01	-0.02	-0.01	-0.02
Qx_cmin	-0.01	-0.01	0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
Qx_cpetr	0.01	0.01	-0.01	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	-0.01	0.01
Qx_core	-0.01	0.00	0.00	0.01	0.01	0.00	0.01	-0.01	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.01	-0.01
Qx_comin	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.00	-0.01	0.01	0.00	-0.01	0.00	0.00	-0.01	-0.01	0.00	-0.01
Qx_cfood	-0.07	-0.02	-0.02	-0.01	-0.02	-0.04	-0.03	-0.02	-0.03	-0.03	-0.02	-0.01	-0.02	-0.02	-0.03	-0.02	-0.03
Qx_ctob	-0.07	0.02	0.02	0.02	0.04	0.00	0.02	0.02	-0.02	0.02	0.01	0.02	0.02	0.02	0.03	0.03	0.02
Qx_ctex	-0.02	0.01	0.00	0.00	0.01	-0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00
Qx_cwear	-0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.00	-0.01	0.01	0.00	0.00	-0.01	0.01	-0.01
Qx_cleat	0.00	-0.01	0.00	0.00	0.01	-0.01	0.00	0.00	0.00	0.00	-0.02	0.01	0.00	0.00	0.00	0.00	-0.01
Qx_cwood	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.00	-0.01	0.01	0.00	-0.01	0.01	0.00	-0.01	0.00	-0.01	-0.01
Qx_cpulp	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.00	-0.01	0.01	0.00	-0.01	0.01	0.00	0.00	-0.01	0.00	-0.01
Qx_cpubl	-0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.01	0.00
Qx_ccoke	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.00	-0.01	-0.01	0.01	-0.01	0.00	-0.01	0.00	0.00
Qx_cchem	0.00	0.00	0.00	0.00	0.01	-0.01	0.00	-0.01	0.01	-0.01	-0.01	0.01	0.00	0.00	-0.01	0.00	-0.01
Qx_crub	-0.01	0.00	0.01	-0.01	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	-0.01
Qx_cmmt	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.01	0.00	-0.01	0.01	0.01	0.00	-0.01	0.00	-0.01
Qx_ciron	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00	-0.01	0.00	0.00	0.01	0.00	0.01	-0.01
Qx_cfmet	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	-0.01
Qx_cmach	-0.01	-0.01	0.00	0.01	0.00	-0.01	0.00	-0.01	0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	-0.01
Qx_cofic	-0.01	0.00	0.00	0.00	0.01	-0.01	0.00	-0.01	0.02	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	-0.01
Qx_celmc	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	-0.01	0.00	0.00	-0.01	-0.01	0.01	-0.01
Qx_crad	0.00	0.00	0.00	0.01	0.01	-0.01	0.01	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	-0.01	0.02	-0.01
Qx_cmed	-0.01	0.00	0.00	0.00	0.01	-0.01	0.00	-0.01	0.01	-0.01	-0.01	0.00	0.01	0.00	-0.01	0.01	-0.01
Qx_cmvec	-0.01	-0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.02	0.00	0.00	0.00	0.01	0.00
Qx_cotr	0.00	0.00	0.00	0.00	0.01	-0.01	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Qx_cfum	-0.02	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00	-0.01	0.01	-0.01
Qx_crec	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.01	0.00	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.01	-0.01
Qx_cel	-0.06	0.01	0.01	0.02	0.02	0.00	0.02	0.01	-0.04	0.02	0.00	0.01	0.01	0.02	0.01	0.02	0.01
Qx_cwat	-0.01	0.02	0.01	0.01	0.02	0.02	0.01	0.02	-0.02	0.01	0.02	0.01	0.03	0.02	0.02	0.01	0.03
Qx_censt	-0.01	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	0.01	0.01	0.00	0.00	0.01	0.01
Qx_ctrd	-0.03	-0.01	0.00	0.00	0.00	-0.01	0.01	-0.01	0.00	0.00	-0.01	0.01	0.00	-0.01	-0.01	0.00	-0.01
Qx_chot	-0.01	0.02	0.01	0.01	0.01	0.00	0.01	0.02	-0.02	0.01	0.02	0.01	0.02	0.07	0.02	0.02	0.03
Qx_cretr	-0.01	0.02	0.01	0.01	0.02	0.01	0.02	0.02	-0.01	0.01	0.02	0.01	0.02	0.02	0.02	0.01	0.03
Qx_ccant	-0.02	0.03	0.02	0.01	0.02	0.01	0.02	0.02	-0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.01	0.03
Qx_ctrns	0.08	-0.02	-0.01	-0.01	-0.01	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	0.00	-0.01	-0.01	0.00	-0.01
Qx_ccom	0.01	0.03	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	-0.01
Qx_cfini	-0.02	0.01	0.15	0.01	0.01	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00
Qx_cins	-0.01	0.00	0.01	0.07	0.01	0.00	0.00	-0.01	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.01	0.00
Qx_caux	-0.01	0.00	0.00	0.01	-0.01	0.01	0.00	0.00	0.01	0.01	0.01	-0.01	-0.01	0.00	0.00	0.00	0.00
Qx_cest	-0.04	0.00	0.00	0.01	0.00	0.30	0.00	0.01	-0.02	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.01
Qx_crent	0.00	0.00	0.00	0.01	0.00	-0.02	0.00	0.00	0.01	-0.01	-0.02	0.00	0.00	-0.01	-0.01	0.01	-0.01
Qx_ccomp	0.00	0.00	0.00	0.00	0.01	-0.01	0.00	0.02	-0.01	0.01	-0.01	0.01	0.00	0.00	-0.01	0.01	0.01
Qx_cres	0.02	0.01	0.00	0.01	0.01	-0.02	0.00	0.00	-0.02	0.14	-0.01	0.00	0.01	0.01	0.01	0.00	0.01
Qx_cobus	-0.02	-0.01	0.00	0.00	0.00	-0.01	-0.01	0.00	0.08	-0.02	0.00	0.00	0.00	0.00	-0.01	0.00	-0.02
Qx_cpa	-0.02	0.01	0.00	0.01	0.01	-0.02	0.01	0.00	-0.02	0.13	-0.01	0.01	0.01	0.01	0.01	0.01	0.01
Qx_ceduc	-0.06	0.03	0.01	0.02	0.02	0.00	0.02	0.03	-0.04	0.01	0.59	0.03	0.03	0.03	0.03	0.02	0.03
Qx_chelt	-0.03	0.03	0.02	0.02	0.03	0.01	0.01	0.02	-0.03	0.03	0.39	0.02	0.02	0.02	0.02	0.02	0.03
Qx_csew	-0.09	0.04	0.02	0.03	0.04	0.06	0.04	0.03	-0.04	0.02	0.04	0.05	0.53	0.05	0.05	0.03	0.03
Qx_cmemb	-0.04	0.03	0.03	0.02	0.02	-0.02	0.02	0.02	-0.02	0.02	0.03	0.02	0.03	0.41	0.04	0.02	0.03
Qx_crecr	-0.02	0.02	0.01	0.02	0.02	0.00	0.02	0.02	-0.01	0.00	0.01	0.01	0.02	0.02	0.30	0.02	0.02
Qx_coser	-0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.02	-0.01	0.01	0.01	0.02	0.02	0.01	0.02	0.25	0.02
Qx_chh	-0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.03	-0.01	0.02	0.02	0.02	0.03	0.01	0.02	0.02	0.29

Note:  $\sigma_{\dots}$  denote income elasticities of demand of rural households. Qx\_... denote outputs. For sectoral notation see Appendix 6A.

**Table 8F.6 Spearman correlation coefficients between the outputs and the income elasticities of demand of urban households and Frisch parameters**

	$\sigma_{u\_cagr}$	$\sigma_{u\_cfor}$	$\sigma_{u\_cfish}$	$\sigma_{u\_cmin}$	$\sigma_{u\_cpetr}$	$\sigma_{u\_comin}$	$\sigma_{u\_cfood}$	$\sigma_{u\_ctob}$	$\sigma_{u\_ctex}$	$\sigma_{u\_cwear}$	$\sigma_{u\_cleat}$	$\sigma_{u\_cwood}$	$\sigma_{u\_cpulp}$	$\sigma_{u\_cpubl}$	$\sigma_{u\_ccoke}$	$\sigma_{u\_cchem}$	$\sigma_{u\_crub}$
Qx_cagr	0.13	-0.02	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.01	0.00	-0.01	0.00	-0.01	0.00	-0.01	0.00
Qx_cfor	0.01	0.04	0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.02	0.00	0.00	0.00	0.01	0.00	0.00
Qx_cfish	-0.01	0.00	0.05	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Qx_cmin	0.01	-0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00
Qx_cpetr	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.01	0.00	0.00	0.00
Qx_core	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-0.01	0.00	0.00	0.00	0.00	0.00
Qx_comin	0.01	-0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00
Qx_cfood	-0.03	-0.01	0.00	0.00	-0.01	0.00	0.20	0.00	-0.01	0.00	0.00	-0.01	-0.01	-0.01	-0.01	0.00	-0.01
Qx_ctob	-0.02	0.03	0.04	0.02	0.03	0.03	-0.02	0.51	0.03	0.03	0.03	0.03	0.04	0.03	0.02	0.03	0.04
Qx_ctex	-0.01	0.00	0.01	0.00	0.01	0.01	-0.01	0.01	0.12	0.01	0.02	0.00	0.01	0.00	0.01	-0.01	0.00
Qx_cwear	0.01	0.00	0.01	0.00	0.01	0.01	-0.01	0.01	0.01	0.09	0.01	0.00	0.00	0.00	0.01	0.00	0.00
Qx_cleat	0.01	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	-0.01	0.00
Qx_cwood	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01	-0.01	0.00
Qx_cpulp	0.00	0.01	0.01	0.00	0.01	0.00	0.01	0.02	0.01	0.01	0.00	-0.01	0.02	0.01	0.00	-0.01	0.00
Qx_cpubl	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.02	0.01	0.01	0.01	0.00	0.00	0.07	0.00	0.00	0.00
Qx_ccoke	0.00	0.00	0.01	-0.01	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.01	0.00	0.00	0.00	0.06	0.00	0.00
Qx_cchem	0.01	0.00	-0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Qx_crub	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.01	0.12
Qx_cmmt	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.01	-0.01
Qx_ciron	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-0.01	0.00	-0.01	0.00	0.00	0.01
Qx_cfmet	0.01	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00
Qx_cmach	0.01	-0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00
Qx_cofic	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	-0.01
Qx_celmc	0.02	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	-0.01
Qx_crad	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.01	0.00	-0.01	0.00	0.00	0.00
Qx_cmed	0.01	-0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Qx_cmvec	0.01	-0.01	0.01	0.00	-0.01	0.01	-0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.00
Qx_cotr	0.01	-0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	-0.01	0.00
Qx_cfurn	0.01	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.02	0.01	0.00	0.00	0.01	0.00	0.01
Qx_crec	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-0.01	0.00	-0.01	0.00	0.00	0.01
Qx_cel	-0.02	0.02	0.03	0.00	0.02	0.03	-0.04	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.01	0.01	0.02
Qx_cwat	-0.01	0.02	0.01	0.02	0.01	0.01	-0.01	0.01	0.02	0.01	0.01	0.02	0.02	0.02	0.01	0.02	0.02
Qx_ccnst	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.01	-0.01	-0.01
Qx_ctrd	0.00	0.00	0.01	0.00	0.00	0.01	0.03	0.00	0.01	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.01
Qx_chot	-0.03	0.04	0.03	0.03	0.02	0.03	-0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.02	0.03	0.03	0.02
Qx_cretr	-0.02	0.04	0.04	0.04	0.02	0.02	-0.03	0.02	0.03	0.03	0.02	0.03	0.04	0.03	0.02	0.03	0.03
Qx_ccant	-0.02	0.04	0.04	0.04	0.03	0.03	-0.03	0.03	0.04	0.03	0.02	0.04	0.04	0.03	0.02	0.02	0.03
Qx_ctrns	-0.03	-0.02	-0.02	-0.01	-0.02	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.01	-0.02
Qx_ccom	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.00
Qx_cfini	-0.01	0.01	0.02	0.01	0.01	0.02	0.00	0.00	0.02	0.02	0.01	0.02	0.01	0.01	0.02	0.00	0.01
Qx_cins	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.02	0.01
Qx_caux	0.00	-0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Qx_cest	-0.06	-0.01	0.00	0.00	-0.01	-0.01	-0.06	-0.01	-0.01	-0.01	0.00	0.00	-0.01	-0.01	-0.02	-0.01	-0.02
Qx_crent	0.02	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Qx_ccomp	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Qx_cres	-0.02	0.00	0.00	0.00	0.00	0.00	-0.02	0.00	0.00	0.02	0.02	0.01	0.00	-0.01	0.00	0.00	0.00
Qx_cobus	-0.01	-0.01	0.00	0.00	-0.01	0.00	-0.03	-0.01	-0.01	-0.02	-0.01	-0.01	-0.02	-0.02	-0.01	-0.02	-0.02
Qx_cpa	0.00	0.01	0.01	0.01	0.00	0.01	-0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.01
Qx_ceduc	-0.03	0.04	0.03	0.04	0.03	0.03	-0.04	0.02	0.03	0.03	0.02	0.04	0.03	0.03	0.02	0.03	0.03
Qx_chelt	-0.02	0.05	0.03	0.05	0.03	0.04	-0.04	0.02	0.05	0.03	0.03	0.04	0.04	0.03	0.02	0.03	0.03
Qx_csew	-0.04	0.05	0.05	0.06	0.02	0.04	0.00	0.04	0.03	0.04	0.06	0.03	0.04	0.05	0.03	0.04	0.03
Qx_cmemb	-0.03	0.04	0.04	0.04	0.03	0.03	-0.04	0.03	0.03	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.03
Qx_creer	-0.01	0.04	0.03	0.04	0.02	0.03	-0.03	0.03	0.04	0.04	0.04	0.03	0.04	0.04	0.03	0.03	0.03
Qx_coser	-0.02	0.04	0.03	0.04	0.03	0.03	-0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.02
Qx_chh	-0.01	0.04	0.03	0.03	0.03	0.02	-0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.04	0.02	0.03	0.02

Note:  $\sigma_{u\_...}$  denote income elasticities of demand of urban households. Qx\_... denote outputs. For sectoral notation see Appendix 6A.



Table 8F.6 Continued

	$\sigma_u$ cmmmt	$\sigma_u$ ciron	$\sigma_u$ cfmet	$\sigma_u$ cmach	$\sigma_u$ cofic	$\sigma_u$ celmc	$\sigma_u$ crad	$\sigma_u$ cmed	$\sigma_u$ cmvec	$\sigma_u$ cotr	$\sigma_u$ cfurm	$\sigma_u$ cel	$\sigma_u$ cwat	$\sigma_u$ ccnst	$\sigma_u$ ctrd	$\sigma_u$ chot	$\sigma_u$ cretr	$\sigma_u$ ccant
Qx_cagr	-0.01	-0.01	-0.01	-0.01	0.00	0.00	-0.01	-0.01	-0.01	-0.01	0.00	-0.01	0.00	-0.01	-0.02	0.00	0.00	-0.01
Qx_cfor	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.02	0.00
Qx_cfish	0.01	-0.01	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	-0.02	0.01	0.01	0.00
Qx_cmin	0.01	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.02	0.01	0.00	-0.01	0.01	0.01	-0.01
Qx_cpetr	-0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	0.01	-0.01	-0.01	0.00
Qx_core	0.01	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.01	0.00	-0.02	0.01	0.01	-0.01
Qx_comin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.01	0.01	-0.02	0.01	0.01	0.00
Qx_cfood	0.00	-0.01	0.00	-0.01	0.00	-0.01	-0.01	0.00	-0.01	-0.01	0.00	-0.02	0.00	-0.01	-0.02	-0.01	0.00	0.00
Qx_ctob	0.04	0.03	0.03	0.02	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.02	0.03	0.02	0.01	0.03	0.03	0.03
Qx_ctex	0.02	-0.01	0.01	0.01	0.01	0.01	0.01	-0.01	0.00	0.01	0.01	0.01	0.01	0.01	-0.02	0.02	0.02	0.01
Qx_cwear	0.02	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.01	0.01	0.01
Qx_cleat	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.01	0.00	-0.02	0.00	0.00	0.00
Qx_cwood	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.01	0.00	-0.02	0.01	0.01	0.00
Qx_cpulp	0.01	-0.01	0.00	0.00	0.01	0.01	0.00	0.00	-0.01	0.00	0.01	0.01	0.01	0.00	-0.01	0.01	0.01	0.00
Qx_cpubl	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	-0.01	0.00	0.01	0.00	0.01	0.00	0.00
Qx_ccoke	0.01	-0.01	0.00	-0.01	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.01	0.00	-0.02	0.01	0.01	0.01
Qx_cchem	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.01	0.00	-0.01	0.01	0.01	-0.01
Qx_crub	0.02	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.00	-0.03	0.01	0.01	0.01
Qx_cmnmt	0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	-0.02	0.01	0.01	0.00
Qx_ciron	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.01	0.01	0.00	-0.02	0.01	0.01	0.00
Qx_cfmet	0.00	-0.01	0.01	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.01	0.01	-0.03	0.01	0.01	0.00
Qx_cmach	0.01	-0.01	0.00	0.01	0.00	0.01	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	-0.03	0.01	0.01	0.00
Qx_cofic	0.00	-0.01	0.00	0.00	0.01	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.01	0.00	-0.02	0.01	0.00	-0.01
Qx_celmc	0.00	-0.01	0.00	0.00	0.00	0.01	0.00	-0.01	-0.01	-0.01	0.00	-0.01	0.00	0.00	-0.02	0.00	0.01	-0.01
Qx_crad	0.01	0.00	0.00	0.00	0.01	0.00	0.08	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	0.02	-0.01
Qx_cmed	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.04	0.00	0.00	0.01	0.00	0.01	0.00	-0.02	0.01	0.01	0.00
Qx_cmvec	0.00	-0.01	0.00	-0.01	0.00	0.01	0.00	0.00	0.06	-0.01	0.00	0.00	-0.01	0.01	-0.03	0.00	0.00	0.00
Qx_cotr	0.01	0.00	0.00	0.00	0.00	0.01	-0.01	0.00	-0.01	0.05	-0.01	0.00	0.01	0.00	-0.02	0.01	0.01	0.00
Qx_cfurm	0.01	0.00	0.01	0.01	0.01	0.01	0.00	0.00	-0.01	0.00	0.09	0.00	0.01	0.01	-0.01	0.01	0.01	0.00
Qx_crec	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.01	0.01	0.00	-0.01	0.01	0.01	0.00
Qx_cel	0.03	0.02	0.02	0.01	0.03	0.01	0.02	0.02	0.02	0.03	0.02	0.55	0.03	0.01	-0.02	0.02	0.02	0.02
Qx_cwat	0.01	0.03	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.20	0.04	0.01	0.01	0.01	0.02
Qx_ccnst	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.09	0.00	0.01	0.01	0.00
Qx_ctrd	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.09	0.02	0.01	0.00
Qx_chot	0.03	0.03	0.03	0.03	0.03	0.01	0.03	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.39	0.02	0.03
Qx_cretr	0.03	0.04	0.04	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.04	0.02	0.03	0.02	0.01	0.03	0.48	0.03
Qx_ccant	0.04	0.04	0.04	0.03	0.04	0.02	0.02	0.04	0.04	0.04	0.03	0.02	0.03	0.02	0.01	0.03	0.03	0.60
Qx_ctrns	-0.01	-0.02	-0.01	-0.02	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.01	-0.03	-0.02	-0.02	-0.03	-0.01	-0.01	-0.02
Qx_ccom	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	0.01	-0.01
Qx_cfini	0.03	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.01
Qx_cins	0.02	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.00	0.00	0.02	0.02	0.01
Qx_caux	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.01	0.00
Qx_cest	-0.01	-0.01	0.00	-0.01	0.00	-0.02	-0.01	-0.01	-0.02	-0.01	0.00	-0.03	-0.01	-0.02	-0.03	-0.01	0.00	0.00
Qx_crent	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.01	-0.01
Qx_ccomp	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.01	-0.01
Qx_cres	0.01	0.00	0.00	-0.01	0.01	0.01	0.01	-0.01	0.00	0.00	0.01	0.00	0.02	-0.01	-0.03	0.00	0.01	-0.01
Qx_cobus	0.00	-0.02	-0.01	-0.01	-0.01	-0.03	-0.01	-0.01	-0.02	-0.01	-0.02	-0.02	0.00	-0.02	-0.01	-0.01	-0.01	-0.02
Qx_cpa	0.02	0.00	0.00	0.00	0.02	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.03	0.00	-0.01	0.01	0.02	0.00
Qx_ceduc	0.03	0.03	0.03	0.02	0.03	0.02	0.02	0.03	0.03	0.04	0.03	0.00	0.03	0.01	0.00	0.03	0.03	0.03
Qx_chelt	0.04	0.05	0.04	0.03	0.05	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.03	0.01	0.01	0.04	0.04	0.03
Qx_csew	0.05	0.05	0.05	0.04	0.05	0.02	0.03	0.03	0.03	0.05	0.04	0.01	0.05	0.02	0.00	0.05	0.05	0.05
Qx_cmemb	0.04	0.04	0.03	0.03	0.04	0.02	0.02	0.04	0.03	0.05	0.03	0.02	0.03	0.02	0.01	0.04	0.04	0.03
Qx_cretr	0.05	0.04	0.03	0.04	0.03	0.03	0.04	0.04	0.03	0.03	0.03	0.01	0.03	0.03	0.01	0.02	0.03	0.03
Qx_coser	0.03	0.04	0.03	0.03	0.03	0.02	0.03	0.03	0.04	0.04	0.03	0.01	0.02	0.02	0.01	0.02	0.02	0.03
Qx_chh	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.03	0.02	0.01	0.04	0.03	0.03

Note:  $\sigma_u$ ... denote income elasticities of demand of urban households. Qx... denote outputs. For sectoral notation see Appendix 6A.

Table 8F.6 Continued

	$\sigma_{\text{ctms}}$	$\sigma_{\text{ccom}}$	$\sigma_{\text{cfini}}$	$\sigma_{\text{cins}}$	$\sigma_{\text{caux}}$	$\sigma_{\text{cest}}$	$\sigma_{\text{crent}}$	$\sigma_{\text{ccomp}}$	$\sigma_{\text{cobus}}$	$\sigma_{\text{cpa}}$	$\sigma_{\text{ceduc}}$	$\sigma_{\text{chelt}}$	$\sigma_{\text{csew}}$	$\sigma_{\text{cmemb}}$	$\sigma_{\text{crecr}}$	$\sigma_{\text{coser}}$	$\sigma_{\text{chh}}$	Frischurb	Frischrur
Qx_cagr	-0.02	-0.01	-0.02	-0.01	0.00	0.00	0.00	-0.01	-0.02	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00
Qx_cfor	-0.01	-0.01	-0.01	-0.01	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.01	0.00	0.00	0.01	0.02	0.00	0.00	0.00
Qx_cfish	-0.04	-0.01	-0.01	-0.01	0.01	-0.01	0.00	0.00	-0.02	-0.01	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Qx_cmin	-0.01	-0.01	-0.01	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Qx_cpctr	0.00	0.01	0.01	0.01	0.00	-0.01	0.00	0.00	0.01	0.00	-0.01	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.01
Qx_core	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
Qx_comin	-0.01	-0.01	-0.01	-0.01	0.01	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00
Qx_cfood	-0.05	-0.01	-0.02	-0.01	0.00	-0.01	-0.01	0.00	-0.03	-0.01	-0.02	0.00	-0.01	0.00	0.00	-0.01	-0.01	-0.01	0.00
Qx_ctob	-0.06	0.03	0.01	0.02	0.04	0.00	0.03	0.03	-0.06	0.02	0.02	0.03	0.03	0.02	0.02	0.03	0.04	0.00	-0.01
Qx_ctex	-0.01	0.00	-0.01	0.01	0.02	0.00	0.01	0.01	-0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.00
Qx_cwear	-0.01	-0.01	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.00
Qx_cleat	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	-0.01	0.00	0.01	-0.01	0.00	0.00
Qx_cwood	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01
Qx_cpulp	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.00
Qx_cpubl	-0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	-0.02	0.01	0.01	0.01	0.01	-0.01	0.02	0.01	0.01	0.01	0.00
Qx_ccoke	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-0.01
Qx_cchem	0.01	-0.01	-0.01	-0.01	0.00	-0.02	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Qx_crub	-0.01	0.00	0.00	0.00	0.01	0.01	0.00	-0.01	-0.01	-0.01	0.00	0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.00
Qx_cmmnt	-0.02	-0.01	0.00	0.00	0.01	0.02	0.00	0.01	0.00	0.00	-0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00
Qx_ciron	0.00	-0.02	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	-0.01
Qx_cfmct	0.00	-0.01	-0.01	-0.01	0.00	0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00
Qx_cmach	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Qx_cofic	0.00	-0.01	-0.01	-0.01	0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
Qx_celmc	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Qx_crad	-0.01	0.00	-0.01	-0.01	0.00	0.00	0.00	0.01	0.00	-0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.01
Qx_cmed	-0.01	-0.01	-0.01	0.00	0.01	0.00	0.00	-0.01	0.00	-0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Qx_cmvec	0.00	-0.01	-0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.01	0.00	0.00	-0.01	0.00	0.00
Qx_cotr	0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	-0.01
Qx_cfum	-0.01	0.00	-0.01	0.00	0.01	0.00	0.01	-0.01	-0.01	0.00	0.01	0.00	0.01	0.00	0.02	0.00	0.01	0.01	0.00
Qx_crec	0.00	-0.02	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01
Qx_cel	-0.08	0.03	0.01	0.02	0.02	-0.01	0.02	0.03	-0.08	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.02	-0.02	-0.01
Qx_cwat	-0.04	0.03	0.02	0.02	0.02	0.00	0.02	0.02	-0.02	0.01	0.02	0.02	0.04	0.01	0.01	0.01	0.03	-0.01	0.00
Qx_ccnst	-0.03	0.00	-0.01	-0.01	0.01	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Qx_ctrld	-0.03	-0.01	-0.01	0.00	0.01	0.00	0.00	0.01	-0.02	-0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.00
Qx_cho	-0.04	0.04	0.03	0.03	0.03	-0.03	0.03	0.03	-0.03	0.01	0.02	0.02	0.03	0.11	0.02	0.02	0.04	-0.03	-0.02
Qx_cretr	-0.05	0.03	0.03	0.04	0.04	-0.01	0.03	0.03	-0.04	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.04	-0.02	-0.01
Qx_ccant	-0.07	0.05	0.03	0.03	0.03	0.00	0.04	0.04	-0.05	0.02	0.02	0.03	0.04	0.03	0.03	0.03	0.04	-0.04	-0.03
Qx_ctrms	-0.15	-0.03	-0.02	-0.02	-0.02	-0.02	-0.01	-0.02	-0.04	-0.03	-0.03	-0.02	-0.03	-0.02	-0.01	-0.02	-0.02	0.00	-0.01
Qx_ccom	0.03	0.06	-0.02	-0.01	0.01	-0.01	0.00	0.00	-0.02	-0.01	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	0.00	0.00
Qx_cfini	-0.05	0.00	0.28	0.02	0.03	-0.01	0.02	0.01	-0.03	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.02	0.00	0.00
Qx_cins	-0.01	0.00	0.00	0.15	0.01	0.00	0.01	0.02	-0.04	0.01	0.00	0.02	0.01	0.01	0.01	0.01	0.01	0.00	-0.01
Qx_caux	-0.02	0.00	0.00	0.01	-0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	-0.09	-0.05
Qx_cest	-0.12	0.00	-0.01	-0.01	0.00	0.58	0.00	-0.01	-0.10	-0.01	-0.01	0.00	-0.01	-0.01	-0.01	-0.01	0.00	-0.05	-0.04
Qx_crent	-0.01	-0.02	-0.01	0.00	0.00	0.00	0.01	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.00
Qx_ccomp	0.00	-0.01	0.00	0.00	0.00	0.00	0.01	0.05	-0.02	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Qx_cres	0.02	0.00	-0.01	0.00	0.01	-0.02	0.00	0.00	-0.05	0.28	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Qx_cobus	-0.04	-0.02	-0.01	-0.01	-0.01	-0.02	-0.01	-0.02	0.15	-0.01	-0.01	-0.01	-0.02	-0.01	0.00	-0.01	-0.01	0.01	0.00
Qx_cpa	-0.04	0.01	0.00	0.01	0.02	-0.01	0.01	0.00	-0.04	0.26	0.01	0.01	0.01	0.01	0.02	0.01	0.00	0.00	0.00
Qx_ceduc	-0.10	0.04	0.02	0.04	0.03	-0.02	0.03	0.04	-0.06	0.01	0.73	0.03	0.03	0.03	0.02	0.02	0.04	-0.02	-0.03
Qx_chelt	-0.09	0.05	0.03	0.05	0.04	-0.01	0.04	0.04	-0.06	0.04	0.03	0.74	0.04	0.03	0.03	0.03	0.04	-0.01	0.00
Qx_csew	-0.13	0.04	0.02	0.04	0.05	0.15	0.05	0.04	-0.10	0.04	0.06	0.08	0.68	0.09	0.05	0.05	0.05	-0.03	-0.04
Qx_cmemb	-0.09	0.02	0.03	0.04	0.05	-0.04	0.04	0.04	-0.05	0.02	0.03	0.03	0.04	0.81	0.03	0.04	0.05	-0.06	-0.04
Qx_creer	-0.07	0.04	0.04	0.03	0.03	-0.01	0.04	0.03	-0.04	0.02	0.03	0.03	0.03	0.03	0.61	0.04	0.03	0.00	0.01
Qx_coser	-0.07	0.04	0.03	0.03	0.03	0.03	0.03	0.02	-0.04	0.03	0.02	0.03	0.03	0.03	0.03	0.48	0.03	-0.02	-0.01
Qx_chh	-0.06	0.03	0.02	0.03	0.04	0.01	0.02	0.04	-0.04	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.52	-0.06	-0.04

Note:  $\sigma_{\text{u}_i}$  denote income elasticities of demand of urban households.  $Qx_{\text{u}_i}$  denote outputs. For sectoral notation see Appendix 6A.

Table 8F.7 Spearman correlation coefficients between the outputs and elasticities of substitution between capital and labor

	$\sigma_a$ cagr	$\sigma_a$ cfor	$\sigma_a$ cfish	$\sigma_a$ cmin	$\sigma_a$ cpetr	$\sigma_a$ core	$\sigma_a$ comin	$\sigma_a$ cfood	$\sigma_a$ ctob	$\sigma_a$ ctex	$\sigma_a$ cwear	$\sigma_a$ cleat	$\sigma_a$ cwood	$\sigma_a$ cpulp	$\sigma_a$ cpubl	$\sigma_a$ ccoke	$\sigma_a$ cchem	$\sigma_a$ crub
Qx_cagr	-0.48	0.00	-0.01	0.00	-0.72	0.03	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.01	0.00
Qx_cfor	0.01	-0.30	-0.01	0.00	-0.82	0.02	0.00	0.00	0.00	0.00	0.00	0.00	-0.04	0.00	0.00	0.01	0.00	0.00
Qx_cfish	0.02	0.00	-0.26	0.02	-0.80	0.04	0.01	-0.16	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Qx_cmin	0.02	0.00	-0.01	-0.38	-0.77	-0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Qx_cpetr	0.01	0.00	0.01	0.01	0.99	0.02	0.00	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00
Qx_core	0.03	0.00	-0.01	0.00	-0.85	-0.33	0.00	0.02	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.02	-0.01	0.00
Qx_comin	0.03	0.00	-0.01	0.00	-0.83	-0.06	-0.12	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.02	0.00	0.00
Qx_cfood	0.01	0.00	-0.01	0.02	-0.65	0.04	0.01	-0.28	0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	0.02	0.00	0.00
Qx_ctob	0.00	0.00	0.00	0.00	-0.19	0.01	0.00	0.00	0.20	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.01	0.00
Qx_ctex	0.01	0.00	0.00	0.00	-0.72	0.03	0.00	0.00	0.01	-0.47	0.00	0.01	0.01	0.00	-0.01	0.03	0.00	0.00
Qx_cwear	0.03	0.01	-0.01	0.01	-0.68	0.03	0.00	0.00	0.01	-0.01	-0.46	-0.01	0.00	0.00	0.00	0.02	0.01	0.00
Qx_cleat	0.02	0.00	-0.01	0.00	-0.71	0.03	0.00	0.01	0.01	0.00	-0.01	-0.60	0.00	-0.01	0.00	0.03	0.01	0.00
Qx_cwood	0.02	-0.02	-0.01	0.00	-0.78	0.03	0.01	0.01	0.00	0.00	0.00	-0.29	0.00	0.00	0.00	0.03	0.01	0.00
Qx_cpulp	0.03	0.01	-0.01	0.01	-0.75	0.03	0.00	-0.01	0.02	0.00	0.00	0.00	0.00	-0.50	-0.01	0.02	0.00	0.00
Qx_cpubl	0.04	0.00	-0.01	0.01	-0.48	0.04	0.00	0.01	0.00	-0.01	0.00	0.00	-0.01	-0.02	-0.13	0.02	0.00	0.01
Qx_ccoke	0.02	0.00	0.00	0.00	-0.65	0.01	0.00	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.00	-0.39	0.01	0.00
Qx_cchem	0.04	0.01	-0.01	0.00	-0.72	0.00	0.00	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.02	-0.64	0.00
Qx_crub	0.03	0.00	-0.01	0.01	-0.63	0.03	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.03	-0.01	-0.23
Qx_cmmt	0.03	0.01	0.00	0.00	-0.52	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.00
Qx_ciron	0.03	0.01	-0.01	0.00	-0.77	-0.05	0.01	0.01	0.00	0.01	0.00	-0.01	0.00	-0.01	0.01	0.03	0.01	0.00
Qx_cfmet	0.03	0.00	0.00	0.00	-0.78	0.04	0.00	0.01	0.00	0.00	-0.01	-0.01	0.00	-0.01	0.00	0.02	0.00	0.00
Qx_cmach	0.03	0.00	-0.01	0.01	-0.74	0.04	0.01	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.01	0.04	0.01	0.00
Qx_coffic	0.03	0.00	0.00	0.00	-0.72	0.04	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01
Qx_celmc	0.02	0.00	-0.01	0.00	-0.76	0.03	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00
Qx_crad	0.03	0.01	0.00	0.00	-0.71	0.03	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.03	0.01	-0.01
Qx_cmed	0.02	0.01	-0.01	0.01	-0.72	0.02	0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.03	0.01	0.00
Qx_cmvvec	0.01	0.00	0.00	0.00	-0.53	0.04	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00
Qx_cotr	0.02	0.00	-0.01	0.00	-0.65	0.03	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.01	0.01	0.00
Qx_cfum	0.02	0.00	0.00	0.00	-0.67	0.03	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Qx_crec	0.03	0.01	-0.01	0.00	-0.86	-0.03	0.01	0.00	0.00	0.01	-0.01	-0.01	0.00	0.00	0.01	0.02	0.01	0.00
Qx_cel	0.04	0.00	0.01	-0.02	0.04	-0.03	-0.01	0.02	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.01	-0.10	0.00
Qx_cwat	0.00	0.00	0.01	0.01	0.90	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.01	0.00
Qx_ccnst	0.02	0.00	0.00	0.00	-0.47	0.03	0.00	0.01	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	0.01	0.02	-0.01
Qx_ctrd	0.04	0.00	-0.01	0.00	-0.86	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.05	0.00	-0.01
Qx_chot	0.01	0.00	0.01	0.01	0.81	0.02	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.00
Qx_cretr	0.00	0.00	0.01	0.01	0.74	0.01	0.00	-0.01	0.00	0.00	0.01	0.01	0.01	0.01	-0.01	0.00	0.00	0.00
Qx_ccant	0.00	0.00	0.00	0.01	0.53	0.01	0.01	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	0.00
Qx_ctms	0.02	0.01	-0.01	-0.01	-0.61	0.04	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	0.00
Qx_ccom	0.03	0.00	-0.01	0.00	-0.79	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.01	0.00
Qx_cfini	0.03	0.00	-0.01	0.00	-0.57	0.03	0.01	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	-0.01
Qx_cins	0.03	0.01	-0.01	0.00	-0.50	0.02	0.01	0.00	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00
Qx_caux	0.01	0.00	0.00	-0.04	0.19	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00
Qx_cest	-0.01	-0.01	0.00	0.01	-0.07	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.00	-0.04	-0.03	-0.01
Qx_crent	0.03	0.00	-0.01	0.01	-0.67	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.00
Qx_ccomp	0.02	0.00	-0.01	0.00	-0.66	0.03	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	-0.01
Qx_cres	0.05	0.00	-0.01	0.01	-0.38	0.05	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.02	0.00
Qx_cobus	0.02	0.00	-0.01	0.01	-0.52	0.03	0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.02	0.00	0.00
Qx_cpa	0.03	0.00	-0.01	0.01	-0.57	0.02	0.00	0.00	0.00	0.00	0.00	0.01	-0.01	-0.01	-0.01	0.01	0.00	-0.01
Qx_ceduc	-0.02	0.01	0.01	-0.01	0.27	0.00	-0.01	0.00	0.00	-0.01	0.01	0.00	0.01	0.00	0.00	-0.01	0.01	0.00
Qx_chelt	-0.01	0.00	0.00	0.00	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	0.00
Qx_csew	0.01	0.00	0.00	0.01	-0.02	0.01	0.00	-0.09	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	-0.05	0.00	-0.01
Qx_cmemb	-0.02	0.00	0.01	0.00	0.12	-0.01	0.00	-0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.01	0.00
Qx_creer	0.01	0.00	0.01	0.01	0.21	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	-0.01	0.02	0.01	0.00
Qx_coser	0.00	-0.01	0.01	0.01	0.77	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00	-0.01	0.01
Qx_chh	-0.02	-0.01	-0.01	0.00	0.17	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	-0.01	0.00	0.00	0.00	0.00

Note:  $\sigma_a$ ... denote elasticities of substitution between capital and labor. Qx... denote outputs. For sectoral notation see Appendix 6A.

Table 8F.7 Continued

	$\sigma_{va\_cmmnt}$	$\sigma_{va\_ciron}$	$\sigma_{va\_cfmet}$	$\sigma_{va\_cmach}$	$\sigma_{va\_cofic}$	$\sigma_{va\_celmc}$	$\sigma_{va\_crad}$	$\sigma_{va\_cmed}$	$\sigma_{va\_cmvec}$	$\sigma_{va\_cotr}$	$\sigma_{va\_cfurn}$	$\sigma_{va\_crec}$	$\sigma_{va\_cel}$	$\sigma_{va\_cwat}$	$\sigma_{va\_ccnst}$	$\sigma_{va\_ctrd}$	$\sigma_{va\_chot}$	$\sigma_{va\_cretr}$
Qx_cagr	0.00	0.08	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.02	0.00	0.01	0.05	0.01	-0.01
Qx_cfor	0.00	0.08	0.00	0.00	-0.01	-0.02	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.03	0.01	-0.01
Qx_cfish	-0.01	0.09	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	0.00
Qx_cmin	0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.03	0.00	-0.01
Qx_cpetr	0.01	0.04	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	-0.01	0.00
Qx_core	0.00	-0.16	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.00
Qx_comin	-0.01	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.00
Qx_cfood	-0.01	0.09	0.00	0.01	0.00	-0.01	0.00	-0.01	0.00	0.00	0.01	0.01	-0.01	0.00	0.01	-0.05	0.00	0.00
Qx_ctob	0.00	0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	-0.01	0.00	0.02	-0.05	0.02	0.00
Qx_ctex	0.00	0.09	0.00	0.01	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.01	0.01	0.00	0.00	0.01	-0.03	0.00	-0.01
Qx_cwear	-0.01	0.08	0.00	0.00	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.01	-0.01	0.00	0.01	0.04	0.00	0.00
Qx_cleat	-0.01	0.08	0.00	0.01	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	-0.01	0.01	-0.01
Qx_cwood	0.00	0.10	-0.01	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	-0.10	0.01	-0.01
Qx_cpulp	-0.01	0.09	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.01	0.01	-0.01
Qx_cpubl	-0.01	0.08	0.01	-0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	-0.01	-0.01	0.00	0.01	0.05	0.00	-0.01
Qx_ccoke	0.00	0.07	-0.01	0.01	0.00	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	-0.10	0.00	-0.01
Qx_cchem	0.00	0.09	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.02	0.00	0.00
Qx_crub	0.00	0.09	-0.01	0.02	0.00	0.00	-0.02	-0.01	0.00	-0.01	0.01	0.00	0.00	0.01	0.01	-0.13	0.00	-0.01
Qx_cmmnt	-0.14	0.10	-0.01	Qx_cmin	-0.01	0.00	-0.01	-0.01	0.00	0.00	0.01	0.01	-0.01	0.01	-0.04	-0.06	0.00	-0.01
Qx_ciron	0.00	-0.53	0.01	0.00	0.00	0.00	-0.01	-0.01	0.01	0.00	0.01	-0.01	0.00	0.00	0.01	0.00	0.01	0.00
Qx_cfmet	0.00	0.11	-0.35	0.01	0.00	-0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	-0.01	-0.06	-0.01	0.00
Qx_cmach	0.00	0.10	0.00	-0.29	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	0.01	-0.12	0.00	0.00
Qx_cofic	0.00	0.11	0.00	0.00	-0.41	0.01	0.00	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	-0.08	0.00	0.00
Qx_celmc	0.00	0.06	0.00	Qx_cfor	0.00	-0.51	-0.01	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.01	0.00	0.00
Qx_crad	0.00	0.08	0.01	0.00	0.00	0.00	-0.50	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	-0.01
Qx_cmed	0.00	0.07	0.00	Qx_cmin	-0.01	0.00	-0.01	-0.49	0.01	-0.00	0.01	-0.01	0.00	0.00	0.01	0.00	0.00	0.00
Qx_cmvec	-0.01	0.09	0.00	0.02	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	-0.19	0.00	0.00
Qx_cotr	0.00	0.08	-0.02	0.00	0.00	0.00	0.00	-0.01	0.01	-0.18	0.00	0.00	-0.02	0.00	0.01	0.02	0.00	0.00
Qx_cfurn	-0.01	0.09	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.31	0.00	0.00	0.00	0.00	-0.06	0.00	0.00
Qx_crec	0.00	-0.41	0.00	-0.02	0.00	0.00	-0.01	-0.01	0.01	0.00	0.01	0.00	-0.01	0.00	0.01	-0.04	0.01	0.00
Qx_cel	0.01	0.04	-0.01	Qx_cfor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.01	0.00	-0.02	0.00	0.00
Qx_cwat	0.00	0.04	0.00	0.02	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.11	-0.05	0.02	-0.01	0.00
Qx_ccnst	-0.01	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	-0.13	0.02	0.00	0.00
Qx_ctrd	-0.01	-0.02	-0.02	-0.04	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	-0.27	0.01	0.00
Qx_chot	0.00	0.06	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.02	0.21	0.00
Qx_cretr	0.01	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.25
Qx_ccant	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	-0.01	0.00	0.00	0.00	0.01	0.00	0.01	-0.01	0.00	0.00
Qx_ctrns	0.00	0.11	0.00	Qx_cfor	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.06	0.00	0.00
Qx_ccom	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.06	0.00	0.00
Qx_cfmi	0.00	0.08	0.00	-0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	-0.01	-0.01	0.01	-0.02	0.01	0.00
Qx_cins	0.00	0.05	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.01	0.01	-0.02	0.01	0.01	0.06	0.00	-0.02
Qx_caux	0.01	0.02	-0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
Qx_cest	0.00	0.01	0.00	Qx_cfor	0.00	0.01	0.01	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	-0.03	0.00	0.01
Qx_crent	0.00	0.08	-0.01	0.00	0.01	-0.01	-0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.01	0.05	0.01	-0.01
Qx_ccomp	0.00	0.08	-0.01	-0.01	0.00	-0.01	-0.01	0.00	-0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.05	0.00	0.00
Qx_cres	0.00	0.14	0.00	-0.03	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.08	0.00	0.00
Qx_cobus	-0.01	0.09	0.01	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.05	0.01	0.00
Qx_cpa	-0.01	0.06	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.05	0.01	0.00
Qx_ceduc	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	-0.01	0.01	-0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01
Qx_chelt	0.01	-0.01	0.00	Qx_cfor	0.00	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-0.03	0.00	0.00
Qx_csew	-0.01	-0.01	0.00	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.01	-0.07	0.00	0.00
Qx_cmemb	-0.01	-0.01	0.00	0.01	0.00	0.01	-0.01	0.00	0.00	0.00	0.01	0.00	-0.01	0.01	0.01	-0.01	0.03	0.00
Qx_creer	0.00	0.07	-0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	0.02	0.03	0.00	0.00
Qx_coser	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00
Qx_chh	0.00	0.00	0.00	Qx_cfor	0.01	0.01	0.00	-0.01	-0.01	0.00	-0.01	-0.01	0.00	0.01	0.00	0.00	0.01	0.00

Note:  $\sigma_{va\_...}$  denote elasticities of substitution between capital and labor.  $Qx\_...$  denote outputs. For sectoral notation see Appendix 6A.

Table 8F.7 Continued

	$\sigma_{va\ ccant}$	$\sigma_{va\ ctrms}$	$\sigma_{va\ ccom}$	$\sigma_{va\ cfini}$	$\sigma_{va\ cins}$	$\sigma_{va\ caux}$	$\sigma_{va\ cest}$	$\sigma_{va\ crent}$	$\sigma_{va\ ccomp}$	$\sigma_{va\ cres}$	$\sigma_{va\ cobus}$	$\sigma_{va\ cpa}$	$\sigma_{va\ ceduc}$	$\sigma_{va\ chelt}$	$\sigma_{va\ csew}$	$\sigma_{va\ cmemb}$	$\sigma_{va\ crecr}$	$\sigma_{va\ coser}$	$\sigma_{va\ chh}$
Qx_cagr	0.01	0.01	0.01	-0.01	0.01	0.00	-0.02	0.00	0.01	0.00	0.01	-0.01	0.00	-0.01	0.02	0.01	0.00	0.01	0.01
Qx_cfor	0.00	0.04	0.00	0.00	0.00	0.00	-0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01
Qx_cfish	0.01	0.04	0.01	-0.01	0.00	0.00	-0.01	-0.01	0.01	-0.01	0.01	-0.01	0.00	0.00	0.01	0.00	-0.01	0.00	0.01
Qx_cmin	0.00	0.00	0.01	-0.01	0.00	0.00	-0.02	0.00	0.00	0.00	0.02	-0.01	0.00	-0.01	0.01	0.01	0.01	0.00	0.00
Qx_cpetr	-0.01	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	-0.01	-0.01	0.01	-0.01	-0.01
Qx_core	0.00	0.04	0.01	0.00	0.00	0.00	-0.02	0.00	0.01	0.00	0.02	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Qx_comin	0.00	0.04	0.00	0.00	0.00	0.00	-0.02	0.00	0.00	-0.01	0.02	-0.01	0.00	0.00	0.00	0.01	-0.01	0.00	0.00
Qx_cfood	0.01	0.03	0.01	-0.01	0.00	0.00	-0.01	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	-0.01	0.00	0.00
Qx_ctob	0.01	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.01	-0.01	0.01	-0.01	0.01	0.00	0.00	-0.01	0.00	0.00
Qx_ctex	0.00	0.03	0.01	-0.01	0.00	-0.01	-0.01	0.01	0.01	0.00	0.01	-0.02	0.00	0.00	0.01	0.01	0.00	0.00	0.00
Qx_cwear	0.00	0.03	0.00	0.00	-0.01	-0.01	-0.02	0.01	0.00	0.00	0.02	0.00	0.00	-0.01	0.01	0.00	0.00	0.00	0.00
Qx_cleat	0.00	0.04	0.00	-0.01	0.00	0.00	-0.03	0.01	-0.01	-0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.01
Qx_cwood	0.00	0.02	0.01	0.00	0.00	0.00	-0.02	0.00	0.00	0.00	0.01	-0.01	0.01	-0.01	0.01	0.01	0.00	0.00	0.00
Qx_cpulp	0.00	0.03	0.01	-0.01	0.00	-0.01	-0.02	0.01	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Qx_cpubl	0.00	0.04	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.01
Qx_ccoke	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.01	0.00	-0.01	0.00	0.01
Qx_cchem	0.00	0.03	0.00	0.00	0.00	-0.01	0.01	0.01	0.00	-0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00
Qx_crub	0.00	0.02	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	-0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Qx_cmmmt	0.00	0.03	0.01	-0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.02	0.00	0.01	0.00	0.01	-0.01	-0.01	0.00	0.00
Qx_ciron	0.00	0.04	0.00	0.00	0.00	-0.01	-0.02	0.00	0.01	-0.01	0.01	-0.02	0.00	-0.01	0.01	0.01	0.00	0.01	0.00
Qx_cfmet	0.01	0.02	0.01	-0.01	0.00	0.00	-0.02	0.00	0.01	-0.01	0.02	-0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.00
Qx_cmach	0.01	0.03	0.00	-0.01	0.00	-0.01	-0.02	0.00	0.00	-0.01	0.02	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00
Qx_coffic	0.01	0.01	0.01	-0.01	0.00	-0.01	-0.01	0.00	-0.01	0.00	0.02	-0.02	0.00	0.00	0.01	0.01	0.00	0.01	0.00
Qx_celmc	0.00	0.03	0.01	-0.01	0.00	0.00	-0.02	0.00	0.00	0.00	0.01	-0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00
Qx_crad	0.00	0.02	0.00	-0.01	0.01	-0.01	-0.02	0.00	0.00	0.00	0.01	-0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00
Qx_cmed	0.00	0.04	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	-0.01	0.01	-0.01	0.00	0.00	0.01	0.00	-0.01	0.00	0.00
Qx_cmvec	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	-0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00
Qx_cotr	0.00	0.00	0.01	0.01	0.00	0.00	-0.02	0.00	0.00	-0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01
Qx_cfum	0.00	0.02	0.01	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00	-0.01	0.00	0.01
Qx_crec	0.01	0.05	0.01	0.00	0.00	-0.01	-0.02	0.00	0.01	-0.01	0.02	-0.02	0.00	-0.01	0.01	0.01	0.00	0.01	0.00
Qx_cel	0.00	0.02	-0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.03	-0.01	-0.01	0.00	0.00	0.01	-0.01	0.00	-0.01
Qx_cwat	-0.01	0.02	0.00	0.01	0.00	0.00	0.02	0.00	-0.01	0.01	0.02	0.01	0.00	0.01	-0.01	-0.01	0.00	0.00	0.00
Qx_ccnst	0.00	0.02	0.01	0.00	0.00	0.00	-0.01	0.01	-0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01
Qx_ctrd	0.00	0.05	0.01	-0.01	0.00	0.00	-0.02	0.00	0.00	0.00	0.03	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Qx_chot	0.00	-0.04	-0.01	0.00	0.00	0.00	0.04	0.00	0.00	0.01	-0.02	0.01	-0.01	0.00	-0.01	0.02	0.01	0.00	0.00
Qx_cretr	0.00	-0.01	-0.01	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00
Qx_ccant	0.38	-0.01	0.00	0.01	0.00	0.00	0.02	0.00	0.00	0.01	-0.01	0.02	0.00	0.00	0.00	0.01	0.01	0.01	-0.01
Qx_ctrms	0.01	-0.28	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	-0.01	0.03	0.00	0.00	0.00	0.01	-0.01	0.00	0.00	0.00
Qx_ccom	0.00	-0.04	-0.20	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.02	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00
Qx_cfini	0.01	0.05	0.01	-0.12	0.00	0.00	0.04	0.00	-0.01	0.00	0.02	0.00	0.00	-0.01	0.00	0.00	0.00	0.01	0.00
Qx_cins	0.00	0.03	0.00	0.00	-0.22	0.01	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.01	0.00	-0.01	0.01	0.00
Qx_caux	-0.01	0.01	-0.01	0.00	-0.01	0.96	0.05	0.00	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.00
Qx_cest	-0.01	-0.02	0.00	-0.01	0.00	0.01	0.64	0.00	0.00	0.01	-0.01	0.00	0.01	0.00	0.01	0.02	-0.01	0.02	0.00
Qx_crent	0.01	0.04	0.00	0.00	0.00	0.00	-0.02	-0.68	0.01	0.00	0.01	-0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.00
Qx_ccomp	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.08	-0.01	-0.01	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.00
Qx_cres	0.01	-0.06	0.01	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	0.01	-0.07	0.00	0.01	0.00	0.00	-0.01	0.01	0.00
Qx_cobus	0.00	0.03	0.01	-0.01	0.00	0.00	-0.02	0.01	0.00	0.00	-0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Qx_cpa	0.01	0.02	0.01	-0.01	0.00	0.00	0.01	0.00	0.00	-0.01	0.01	-0.07	0.00	0.01	0.00	0.01	-0.01	0.01	0.00
Qx_ceduc	0.00	-0.02	-0.01	0.01	0.00	0.00	0.02	0.00	-0.01	0.00	0.00	-0.01	0.04	0.00	0.00	0.01	0.00	0.00	0.00
Qx_chelt	0.00	-0.01	0.01	0.01	0.00	0.00	0.03	0.00	0.01	0.00	0.00	0.01	-0.01	0.05	0.00	0.00	0.01	0.00	0.00
Qx_csew	0.00	-0.04	0.00	0.00	0.00	0.00	0.17	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.02	0.00	0.01	0.01
Qx_cmemb	0.00	-0.02	0.00	0.01	0.00	0.00	0.09	0.00	0.01	0.00	0.01	0.00	-0.01	0.00	0.01	0.25	0.00	-0.01	-0.01
Qx_crecr	0.00	0.01	0.00	0.01	0.01	0.00	0.02	0.01	0.00	0.00	0.00	0.01	-0.01	0.00	0.01	0.00	0.08	0.00	0.00
Qx_coser	-0.01	0.00	-0.01	0.01	0.00	0.00	0.05	0.00	0.00	0.01	0.00	0.01	-0.01	0.00	0.00	-0.01	0.00	0.20	-0.01
Qx_chh	0.00	-0.02	0.00	0.00	0.00	0.00	0.03	0.01	0.02	0.01	-0.01	0.00	0.00	0.00	-0.01	0.01	-0.01	0.01	0.68

Note:  $\sigma_{va\ \dots}$  denote elasticities of substitution between capital and labor.  $Qx_{\dots}$  denote outputs. For sectoral notation see Appendix 6A.

Table 8F.8 Spearman correlation coefficients between exports and the Armington elasticities of substitution

	$\sigma_q$ cagr	$\sigma_q$ cfor	$\sigma_q$ cfish	$\sigma_q$ cmin	$\sigma_q$ cpetr	$\sigma_q$ core	$\sigma_q$ comin	$\sigma_q$ cfood	$\sigma_q$ ctob	$\sigma_q$ ctex	$\sigma_q$ cwear	$\sigma_q$ cleat	$\sigma_q$ cwood	$\sigma_q$ cpulp	$\sigma_q$ cpubl	$\sigma_q$ ccoke	$\sigma_q$ cchem	$\sigma_q$ crub	$\sigma_q$ cmnmt	$\sigma_q$ ciron
Qe_cagr	0.07	-0.01	0.00	0.00	-0.04	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	0.00
Qe_cfor	0.01	0.04	0.01	0.00	-0.01	-0.01	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.02	0.01	0.00	0.00	0.01
Qe_cfish	0.01	-0.01	0.03	0.00	-0.03	-0.01	0.00	0.20	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	0.01	0.00
Qe_cmin	0.01	0.00	-0.01	0.00	-0.02	0.01	0.00	0.02	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.01	0.01	0.00	0.01	0.02
Qe_cpetr	0.00	0.00	0.00	0.00	0.13	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	-0.01	0.01	0.01	0.00
Qe_core	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.02	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.02	0.01	-0.01	0.02	0.01
Qe_comin	0.00	-0.01	0.00	-0.01	-0.02	-0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.01	0.00	0.00	0.01
Qe_cfood	0.00	-0.01	0.00	0.00	-0.03	0.00	0.00	0.22	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00
Qe_ctob	0.00	0.01	0.01	0.00	-0.02	0.00	0.00	0.01	0.05	0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	0.01	0.00	0.00	0.01
Qe_ctex	0.01	0.00	0.00	0.00	-0.03	0.01	0.00	0.01	0.01	0.26	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.01
Qe_cwear	-0.01	0.00	0.01	0.00	-0.02	0.00	0.01	0.01	0.01	0.00	0.26	0.00	0.00	0.00	0.01	0.01	0.00	-0.01	0.00	0.00
Qe_cleat	0.01	0.00	0.00	0.00	-0.03	0.00	0.01	0.02	-0.01	0.00	0.00	0.08	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01
Qe_cwood	0.00	0.01	0.00	0.00	-0.03	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.17	0.01	0.00	0.01	0.01	0.01	0.01	0.01
Qe_cpulp	0.00	0.00	-0.01	0.00	-0.03	-0.01	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.09	0.02	0.02	0.00	0.01	0.01	0.01
Qe_cpubl	0.00	0.00	-0.01	0.00	-0.02	-0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	-0.02	0.01	0.01	0.00	0.00	0.00
Qe_ccoke	0.00	-0.01	0.00	0.00	0.03	-0.01	0.00	0.03	0.01	-0.01	0.00	-0.01	0.00	0.01	0.00	0.04	0.01	0.00	0.00	0.01
Qe_cchem	0.01	0.00	0.00	0.00	-0.02	-0.01	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	0.01	0.01
Qe_crub	0.01	0.00	0.00	0.00	-0.02	0.00	0.00	0.03	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.07	0.01	0.01
Qe_cmnmt	0.00	0.00	0.00	0.00	-0.02	0.00	0.00	0.02	0.00	0.00	-0.01	0.01	0.00	0.00	0.00	0.01	0.02	0.00	0.04	0.01
Qe_ciron	0.00	0.00	0.00	0.00	-0.02	0.00	0.00	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.04
Qe_cfmct	0.00	0.00	0.01	-0.01	-0.01	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	0.01	0.01
Qe_cmach	0.00	0.00	0.01	0.00	-0.03	0.00	0.00	0.02	0.00	0.00	0.01	-0.01	0.00	-0.01	0.00	0.01	0.01	0.01	0.01	0.01
Qe_cofic	0.00	0.00	0.00	0.01	-0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	0.01
Qe_celmc	0.00	0.00	0.00	0.00	-0.02	-0.01	0.00	0.01	0.01	0.01	0.00	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.03
Qe_crad	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	0.01
Qe_cmed	0.00	0.00	0.01	-0.01	-0.03	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.01	0.01	-0.01	0.00	0.02
Qe_cmvec	0.00	0.00	0.00	0.00	-0.02	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.02
Qe_cotr	0.01	0.00	0.00	-0.01	-0.02	0.00	0.01	0.02	0.00	0.00	0.01	-0.01	0.00	0.00	0.00	0.02	0.01	-0.01	0.01	0.01
Qe_cfurn	0.01	-0.01	0.00	-0.01	-0.03	0.00	0.00	0.02	-0.01	0.01	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Qe_cel	0.01	0.00	-0.01	0.00	0.03	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	-0.01	-0.01	0.01	0.01	0.00	0.00	0.00	0.00
Qe_ccnst	0.00	-0.01	0.00	0.00	-0.02	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.01	0.00	0.00	0.01	0.01	0.01	-0.01	0.02	0.01
Qe_ctrd	0.00	0.00	0.01	0.00	-0.03	-0.01	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.01	0.01	0.01
Qe_ctrns	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01
Qe_ccom	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01
Qe_cfini	0.00	0.00	0.00	0.00	-0.02	0.00	0.01	0.02	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	-0.01	0.00	0.01
Qe_cins	0.00	-0.01	0.00	-0.01	-0.02	0.00	0.01	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.01
Qe_crent	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Qe_ccomp	0.00	-0.01	-0.01	-0.01	-0.02	-0.01	0.01	0.01	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.01	0.00	0.00	-0.01	0.00	0.01
Qe_cobus	0.00	0.00	-0.01	0.00	-0.02	-0.01	0.00	0.01	0.00	0.00	0.01	-0.01	-0.01	0.00	0.00	-0.02	0.01	0.00	0.00	0.01
Qe_cpa	0.01	0.00	0.00	-0.01	-0.01	-0.01	-0.01	0.01	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Qe_creer	0.00	0.00	0.00	0.00	-0.02	0.00	0.01	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	0.00

Note:  $\sigma_q$ ... denote Armington elasticities of substitution. Qe... denote exports. For sectoral notation see Appendix 6A.

Table 8F.8 Continued

	$\sigma_{q\_cfmet}$	$\sigma_{q\_cmach}$	$\sigma_{q\_cofic}$	$\sigma_{q\_celmc}$	$\sigma_{q\_crad}$	$\sigma_{q\_cmed}$	$\sigma_{q\_cmvec}$	$\sigma_{q\_cotr}$	$\sigma_{q\_cfurn}$	$\sigma_{q\_cel}$	$\sigma_{q\_cconst}$	$\sigma_{q\_ctrd}$	$\sigma_{q\_ctrns}$	$\sigma_{q\_ccom}$	$\sigma_{q\_cfini}$	$\sigma_{q\_cins}$	$\sigma_{q\_crent}$	$\sigma_{q\_ccomp}$	$\sigma_{q\_cobus}$	$\sigma_{q\_cpa}$	$\sigma_{q\_crecr}$
Qe_cagr	0.01	0.01	0.00	-0.02	0.00	0.00	0.01	0.01	-0.01	0.00	0.03	0.01	0.05	0.01	0.00	0.00	-0.01	0.01	0.02	0.00	-0.01
Qe_cfor	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	0.03	0.00	0.03	0.01	0.01	0.00	-0.01	0.00	0.02	0.01	0.00
Qe_cfish	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	0.01	0.00	0.00
Qe_cmin	0.01	0.02	0.00	0.00	-0.01	0.00	0.01	0.01	-0.01	0.00	0.03	0.00	0.07	0.00	0.01	0.00	-0.01	0.01	0.04	0.01	0.00
Qe_cpetr	-0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.01	0.03	-0.01	0.02	0.00	0.00	0.00	0.01	-0.01	0.02	0.01	0.00
Qe_core	0.01	0.01	0.00	0.00	0.00	-0.01	0.01	0.01	-0.01	0.01	0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.02	0.03	0.00	0.00
Qe_comin	0.01	0.02	0.01	0.00	0.00	-0.01	0.01	0.00	-0.01	0.00	0.03	0.01	0.03	0.00	0.01	0.01	-0.01	0.01	0.03	0.01	0.00
Qe_cfood	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.02	0.01	0.00	0.01	0.00	0.01	0.02	0.01	0.01
Qe_ctob	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.03	-0.01	0.02	0.01	0.01	0.00	-0.01	0.01	0.05	0.00	0.00
Qe_ctex	0.01	0.02	-0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.03	0.01	0.01	0.00	0.01	0.00	0.00	0.02	0.02	0.01	0.01
Qe_cwear	0.01	0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	0.03	0.00	0.03	0.00	0.01	0.01	0.00	0.00	0.02	0.00	0.00
Qe_cleat	0.01	0.02	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	0.00	0.04	0.00	0.02	0.01	0.00	0.01	0.00	0.02	0.02	0.00	0.00
Qe_cwood	0.02	0.03	0.00	-0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.05	0.00	0.02	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.00
Qe_cpulp	0.02	0.03	0.00	-0.01	0.00	0.00	0.02	0.00	-0.01	0.01	0.03	0.00	0.03	-0.01	0.01	0.00	0.00	0.01	0.02	0.00	0.00
Qe_cpubl	0.02	0.01	0.00	0.00	0.01	0.00	0.01	0.01	-0.01	-0.01	0.03	0.00	0.03	0.01	0.01	0.00	-0.01	0.01	0.03	0.00	0.00
Qe_ccoke	0.02	0.03	0.00	0.00	0.00	0.00	0.03	0.00	-0.01	0.01	0.04	0.00	0.02	0.00	0.02	0.00	-0.01	0.00	0.03	0.00	-0.01
Qe_cchem	0.01	0.02	0.00	0.00	0.01	0.00	0.00	0.01	-0.01	0.01	0.05	0.02	0.03	0.01	0.01	0.00	-0.01	0.01	0.03	0.00	0.00
Qe_crub	0.02	0.03	0.00	0.01	0.01	0.00	0.02	0.00	0.00	0.00	0.03	0.00	0.01	0.01	0.01	0.01	-0.01	0.01	0.02	-0.01	0.00
Qe_cmnmnt	0.02	0.03	0.00	0.01	0.00	0.00	0.02	0.00	-0.01	0.01	0.04	0.00	0.01	0.01	0.01	0.00	0.00	0.02	0.02	0.01	-0.01
Qe_ciron	0.02	0.02	0.00	0.00	0.00	0.00	0.01	0.01	-0.01	0.00	0.04	0.01	0.03	0.01	0.00	0.01	-0.01	0.01	0.03	0.01	0.00
Qe_cfmet	0.15	0.02	0.00	0.00	0.00	-0.01	0.02	0.02	-0.01	0.00	0.07	0.01	0.03	0.01	0.01	0.01	-0.01	0.01	0.03	0.00	-0.01
Qe_cmach	0.02	0.09	0.00	0.00	0.00	0.00	0.01	0.01	-0.01	0.00	0.04	0.00	0.02	0.00	0.01	0.01	-0.01	0.02	0.02	0.00	-0.01
Qe_cofic	0.01	0.00	0.21	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	-0.01	0.02	0.01	0.00	0.00	-0.01	0.01	0.00	0.00	0.00
Qe_celmc	0.02	0.02	0.00	-0.07	0.00	0.00	0.01	0.01	-0.01	0.00	0.05	0.00	0.03	0.01	0.01	0.00	0.00	0.01	0.03	0.00	0.01
Qe_crad	0.02	0.00	0.00	-0.01	0.13	0.00	0.00	0.02	0.00	-0.01	0.03	0.00	0.02	0.00	0.01	0.01	0.00	0.01	0.06	0.01	0.00
Qe_cmed	0.02	0.01	0.00	-0.01	0.00	0.19	0.00	0.01	-0.01	0.00	0.04	0.00	0.02	0.01	0.01	0.00	0.00	0.01	0.03	0.01	0.00
Qe_cmvec	0.01	0.02	0.00	0.00	-0.01	0.00	-0.08	0.01	-0.01	0.00	0.02	0.00	0.03	0.00	0.01	0.00	0.00	0.01	0.02	0.01	0.00
Qe_cotr	0.03	0.01	-0.01	-0.01	-0.01	-0.01	0.01	-0.04	-0.01	0.00	0.03	0.01	0.03	0.01	0.01	0.01	-0.01	0.01	0.02	0.01	0.00
Qe_cfurn	0.02	0.01	0.00	-0.01	0.01	0.00	0.01	0.00	0.17	0.00	0.04	0.00	0.02	0.00	0.01	0.01	0.00	0.00	0.02	0.00	0.00
Qe_cel	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.02	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.02	0.00	0.00
Qe_ccnst	0.02	0.02	0.00	0.00	0.00	0.00	0.02	0.01	-0.01	0.00	0.13	0.01	0.02	0.00	0.00	0.01	0.00	0.01	0.02	0.01	0.00
Qe_ctrd	0.01	0.02	0.00	0.01	0.00	0.00	0.02	0.00	-0.01	0.00	0.04	0.01	0.00	0.00	0.01	0.01	-0.01	0.02	0.03	0.00	-0.01
Qe_ctrns	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	-0.01	0.03	0.00	0.08	0.00	0.00	0.00	-0.01	0.01	0.02	0.01	0.00
Qe_ccom	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	-0.01	0.03	0.00	0.02	0.03	0.01	0.00	-0.01	0.00	0.04	0.00	-0.01
Qe_cfini	0.01	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.02	0.01	0.13	0.00	-0.01	0.00	0.01	0.00	0.00
Qe_cins	0.01	0.00	-0.01	0.00	0.01	-0.01	0.01	0.00	-0.01	0.00	0.03	0.00	0.02	0.01	0.01	0.10	-0.01	0.01	0.08	0.00	0.00
Qe_crent	0.02	0.01	-0.01	0.01	0.00	-0.01	0.00	0.01	-0.01	-0.01	0.04	0.01	0.03	0.00	0.01	0.00	0.00	0.01	0.04	0.00	0.00
Qe_ccomp	0.01	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	0.02	0.00	0.02	0.01	0.01	0.01	0.00	0.02	0.10	0.01	0.00
Qe_cobus	0.01	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	-0.01	0.02	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.32	0.00	0.01
Qe_cpa	0.01	0.00	0.00	-0.01	0.01	0.00	0.01	0.01	-0.01	0.00	0.02	0.01	0.03	0.02	0.01	0.00	0.00	0.01	0.03	-0.01	0.00
Qe_crecr	0.01	0.01	0.00	0.00	-0.01	0.00	0.01	0.01	-0.01	0.00	0.02	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.03	0.00	0.01

Note:  $\sigma_{q\_...}$  denote Armington elasticities of substitution.  $Qe_{...}$  denote exports. For sectoral notation see Appendix 6A.

Table 8F.9 Spearman correlation coefficients between exports and elasticities of transformation

	$\sigma_{cagr}$	$\sigma_{cfor}$	$\sigma_{cfish}$	$\sigma_{cmin}$	$\sigma_{cpetr}$	$\sigma_{core}$	$\sigma_{comin}$	$\sigma_{cfood}$	$\sigma_{ctob}$	$\sigma_{ctex}$	$\sigma_{cwear}$	$\sigma_{cleat}$	$\sigma_{cwood}$	$\sigma_{cpulp}$	$\sigma_{cpubl}$	$\sigma_{ccoke}$	$\sigma_{cchem}$	$\sigma_{crub}$	$\sigma_{cmnmt}$	$\sigma_{ciron}$
Qe_cagr	-0.53	0.00	0.00	0.00	0.01	-0.01	0.00	0.02	0.00	-0.01	0.01	0.01	0.01	0.00	0.00	0.02	-0.01	0.00	0.01	0.01
Qe_cfor	0.01	-0.62	0.00	0.01	0.01	0.00	0.00	0.01	0.00	-0.01	0.00	0.00	0.01	0.00	0.00	0.02	-0.01	0.01	0.01	0.00
Qe_cfish	0.01	0.00	-0.57	0.00	0.02	0.00	0.00	0.18	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00
Qe_cmin	0.01	0.01	0.00	-0.47	0.02	0.00	0.01	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.01
Qe_cpetr	0.00	-0.01	0.01	0.01	0.09	0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.02
Qe_core	0.01	0.00	0.00	0.00	0.00	-0.41	0.01	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.02
Qe_comin	0.02	0.00	0.00	0.01	0.01	0.00	-0.66	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.01
Qe_cfood	0.03	0.01	0.00	0.00	0.01	0.00	0.00	-0.70	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.01	-0.01	0.00	0.00	0.01
Qe_ctob	0.02	0.00	-0.01	0.00	0.01	-0.01	0.01	0.00	-0.81	0.01	-0.01	0.01	0.00	0.00	0.00	0.01	-0.01	0.00	0.00	0.00
Qe_ctex	0.03	0.01	0.00	-0.01	0.02	0.01	0.00	0.01	0.00	-0.64	0.01	-0.01	0.00	0.00	-0.01	0.03	-0.01	0.00	0.00	0.01
Qe_cwear	0.01	0.01	0.00	0.00	0.02	0.01	0.00	0.01	-0.01	0.00	-0.57	0.01	0.00	0.00	0.01	-0.01	0.01	0.00	0.00	0.00
Qe_cleat	0.03	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.00	0.01	-0.23	0.01	0.00	0.00	0.04	0.00	0.00	0.00	0.01
Qe_cwood	0.01	0.01	-0.01	0.00	0.01	0.01	0.00	0.01	-0.01	-0.01	0.01	0.01	-0.44	0.00	0.00	0.06	-0.01	0.00	0.00	0.01
Qe_cpulp	0.02	0.00	-0.01	0.00	0.02	0.00	0.00	0.01	0.00	-0.01	0.01	0.00	0.00	-0.61	0.00	0.08	-0.01	0.00	0.00	0.02
Qe_cpubl	0.01	0.01	0.00	0.00	0.01	-0.01	0.00	0.02	-0.01	-0.01	0.01	0.00	0.00	0.00	-0.70	0.02	-0.01	0.00	0.00	0.02
Qe_ccoke	0.02	0.00	0.00	0.00	-0.03	0.01	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.69	-0.01	-0.01	0.00	0.01
Qe_cchem	0.02	0.01	0.00	0.01	0.00	0.01	0.00	0.02	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.04	-0.05	0.00	0.00	0.02
Qe_crub	0.01	0.01	0.00	0.00	0.02	0.02	0.00	0.01	0.00	0.01	0.01	0.01	0.00	-0.01	0.00	0.09	-0.01	-0.68	0.00	0.02
Qe_cmnmt	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.09	-0.01	0.00	-0.73	0.02
Qe_ciron	0.01	0.00	-0.01	0.00	0.01	0.03	0.00	0.01	-0.01	-0.01	0.01	0.01	-0.01	0.00	0.00	0.04	-0.01	0.00	0.00	-0.24
Qe_cfmet	0.01	0.00	-0.01	0.00	0.02	0.01	0.00	0.02	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	0.05	-0.01	0.00	0.01	0.02
Qe_cmach	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.03
Qe_cofic	0.01	0.00	-0.01	0.01	0.01	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00
Qe_celmc	0.02	0.00	-0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.01	0.07
Qe_crad	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-0.01	0.00	0.01	0.00
Qe_cmed	0.01	0.00	-0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.03
Qe_cmvec	0.01	0.01	-0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.03	0.00	0.01	0.00	0.02
Qe_cotr	0.01	0.01	-0.01	-0.01	0.01	0.00	0.00	0.01	-0.01	0.00	0.00	0.01	0.00	-0.01	0.00	0.03	0.00	-0.01	0.00	0.02
Qe_cfurn	0.02	0.01	0.00	0.00	0.03	0.00	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.03	0.00	0.00	0.01	0.02
Qe_cel	0.01	0.01	0.00	0.02	-0.04	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.01	0.02	-0.01	0.00	0.01	0.01
Qe_ccnst	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.01	-0.01	0.00	0.00	0.01	-0.01	-0.01	-0.01	0.02	0.00	0.00	0.00	0.01
Qe_ctrd	0.01	0.01	0.00	0.00	0.03	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	-0.01	0.01	0.10	-0.01	0.00	0.00	0.01
Qe_ctrns	0.03	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.02	-0.01	-0.01	0.00	0.01
Qe_ccom	0.01	0.00	-0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00	-0.01	0.02	0.00	0.00	0.01	0.00
Qe_cfini	0.01	0.00	0.00	-0.01	0.02	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.02	0.00	0.00	0.00	0.00
Qe_cins	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.01	0.02	-0.01	-0.01	0.01	0.01
Qe_crent	0.02	0.01	-0.01	0.00	0.00	0.00	0.00	0.01	-0.01	0.00	0.00	0.00	0.01	0.00	-0.01	0.02	0.00	0.00	0.00	0.01
Qe_ccomp	0.01	0.01	-0.01	0.01	0.02	-0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.02	-0.01	0.00	0.01	0.01
Qe_cobus	0.01	0.00	0.00	0.01	0.01	0.00	-0.01	0.01	0.00	-0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Qe_cpa	0.01	0.00	-0.01	0.00	0.01	0.00	0.00	0.01	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01
Qe_creer	0.01	0.01	0.00	0.00	0.02	-0.01	0.00	0.01	0.00	-0.01	0.01	0.01	0.00	0.01	0.01	0.01	-0.01	-0.01	0.00	0.00

Note:  $\sigma_{...}$  denote elasticities of transformation. Qe\_... denote exports. For sectoral notation see Appendix 6A.



Table 8F.9 Continued

	$\sigma_{cfmet}$	$\sigma_{cmach}$	$\sigma_{cofic}$	$\sigma_{celmc}$	$\sigma_{crad}$	$\sigma_{cmed}$	$\sigma_{cmvec}$	$\sigma_{cotr}$	$\sigma_{cfurn}$	$\sigma_{cel}$	$\sigma_{ccnst}$	$\sigma_{ctrd}$	$\sigma_{ctrns}$	$\sigma_{ccom}$	$\sigma_{cfini}$	$\sigma_{cins}$	$\sigma_{crent}$	$\sigma_{ccomp}$	$\sigma_{cobus}$	$\sigma_{cpa}$	$\sigma_{crecr}$
Qe_cagr	-0.01	0.01	0.01	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.08	0.00	0.00	0.00	-0.01	0.00	0.01	0.02	0.01
Qe_cfor	-0.01	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.01	-0.01	0.00	0.00	0.00	0.03	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.01
Qe_cfish	0.00	0.00	0.01	0.00	0.00	-0.01	-0.01	0.00	-0.01	0.01	0.01	0.00	0.00	0.00	-0.01	0.01	0.00	0.01	0.00	0.02	0.00
Qe_cmin	-0.01	0.01	0.00	0.00	0.00	0.01	0.00	-0.01	-0.01	0.01	0.00	0.00	0.08	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.00
Qe_cpetr	0.00	0.00	-0.01	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.00	-0.01	0.00	0.01	-0.01
Qe_core	-0.01	0.01	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
Qe_comin	-0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.01	0.00	0.01	0.06	0.00	0.00	0.00	-0.01	0.01	0.00	0.02	0.01
Qe_cfood	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	-0.02	0.00	0.01	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00
Qe_ctob	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	-0.01	0.00	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.01
Qe_ctex	-0.01	0.00	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.02	0.03	-0.01	0.01	0.00	0.00	0.00	-0.01	0.04	0.00
Qe_cwear	0.01	0.00	0.01	-0.01	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	-0.01	0.03	0.00	0.01	0.00	0.00	0.00	0.01	0.03	0.01
Qe_cleat	-0.01	0.00	0.01	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.01
Qe_cwood	0.00	0.01	-0.01	0.00	0.00	0.00	0.01	-0.01	-0.01	0.00	-0.01	0.00	0.03	0.00	0.01	0.01	0.00	0.01	0.00	0.01	0.00
Qe_cpulp	-0.01	0.01	0.00	-0.01	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.01	0.02	0.01
Qe_cpubl	-0.01	0.01	0.00	-0.01	0.00	0.01	0.00	0.00	-0.02	0.01	-0.01	0.01	0.03	-0.01	0.00	-0.01	-0.01	0.00	0.00	0.01	0.01
Qe_ccoke	0.00	0.01	0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.01	0.03	0.00	-0.01	0.01	0.00	0.00	0.01	0.01	0.00
Qe_cchem	-0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.01	-0.01	0.01	-0.01	0.01	0.04	0.00	0.00	-0.01	0.00	0.01	0.01	0.02	0.00
Qe_crub	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.01	-0.01	0.01	-0.01	0.00	0.00	0.00	0.02	0.00
Qe_cmnt	-0.01	0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.01	-0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01
Qe_ciron	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	0.04	-0.01	0.00	0.00	-0.01	0.01	0.00	0.02	0.01
Qe_cfmet	-0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.03	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Qe_cmach	-0.01	-0.53	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
Qe_cofic	-0.01	0.00	0.07	0.00	0.00	-0.01	0.00	-0.01	-0.01	0.00	0.00	0.01	0.02	0.00	0.01	0.01	0.00	0.01	-0.02	0.02	0.00
Qe_celmc	0.00	0.01	0.00	-0.22	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.05	0.00	0.01	0.00	0.00	0.00	0.01	0.02	0.01
Qe_crad	-0.01	0.01	0.00	0.00	-0.29	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01
Qe_cmed	0.00	0.01	0.00	0.00	0.00	-0.34	0.00	0.01	0.00	0.00	-0.01	0.00	0.02	0.00	0.01	-0.01	0.01	0.00	0.01	0.03	0.00
Qe_cmvec	-0.01	0.00	0.00	-0.01	0.00	0.00	-0.63	0.00	-0.01	0.01	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.00
Qe_cotr	0.00	0.01	0.00	-0.01	0.00	0.01	0.00	-0.61	-0.01	0.00	0.00	0.01	0.04	-0.01	0.01	0.00	0.01	0.00	0.00	0.02	-0.01
Qe_cfurn	-0.01	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	-0.57	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.01	0.02	-0.01
Qe_cel	-0.01	0.01	-0.01	0.00	0.00	-0.01	0.01	0.00	-0.01	-0.85	0.01	0.01	0.02	0.00	0.01	0.00	-0.01	0.00	0.00	0.02	0.00
Qe_ccnst	0.00	0.00	0.00	-0.01	0.01	0.00	-0.01	0.00	0.00	0.01	-0.75	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01
Qe_ctrd	-0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.01	-0.01	0.00	0.00	-0.66	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Qe_ctrns	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	-0.68	0.00	0.00	-0.01	0.00	0.00	0.01	0.02	0.00
Qe_ccom	-0.01	0.01	0.00	-0.01	0.01	0.00	0.00	-0.01	-0.01	0.00	0.00	-0.01	0.04	-0.70	0.00	0.00	0.00	0.00	0.00	0.02	0.01
Qe_cfini	0.00	0.01	0.01	0.00	0.01	0.01	-0.01	0.01	0.01	0.01	-0.01	0.00	0.00	0.00	-0.80	0.00	-0.01	0.01	0.00	0.02	0.01
Qe_cins	-0.01	0.02	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.01	0.00	0.00	0.02	-0.01	0.00	-0.69	-0.01	0.00	0.01	0.02	0.00
Qe_crent	0.00	0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	-0.02	0.01	0.00	0.00	0.04	0.01	0.00	0.00	-0.01	0.00	0.00	0.02	0.01
Qe_ccomp	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.02	0.00	0.01	0.01	0.00	-0.75	0.02	0.02	0.00
Qe_cobus	-0.02	0.00	0.01	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.02	0.00	0.00	0.01	0.00	0.00	-0.74	0.01	0.01
Qe_cpa	-0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	-0.01	0.04	0.00	0.01	0.00	0.00	0.01	0.01	-0.76	0.01
Qe_creer	0.00	0.00	0.01	0.00	0.00	-0.01	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.02	0.02	-0.80

Note:  $\sigma_{...}$  denote elasticities of transformation.  $Qe_{...}$  denote exports. For sectoral notation see Appendix 6A.

Table 8F.10 Spearman correlation coefficients between exports and income elasticities of demand of rural households

	$\sigma_{\text{cagr}}$	$\sigma_{\text{cfor}}$	$\sigma_{\text{cfish}}$	$\sigma_{\text{cmin}}$	$\sigma_{\text{cpetr}}$	$\sigma_{\text{comin}}$	$\sigma_{\text{cfood}}$	$\sigma_{\text{ctob}}$	$\sigma_{\text{ctex}}$	$\sigma_{\text{cwear}}$	$\sigma_{\text{cleat}}$	$\sigma_{\text{cwood}}$	$\sigma_{\text{cpulp}}$	$\sigma_{\text{cpubl}}$	$\sigma_{\text{ccoke}}$	$\sigma_{\text{cchem}}$	$\sigma_{\text{crub}}$
Qe_cagr	-0.12	0.00	0.00	-0.01	0.00	0.00	0.02	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.03	0.00	0.00
Qe_cfor	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	0.01
Qe_cfish	0.01	0.00	-0.03	0.01	0.01	0.00	-0.09	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01
Qe_cmin	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.01	-0.01	0.01
Qe_cpetr	0.00	0.00	0.00	0.01	0.01	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	0.01	-0.01
Qe_core	0.01	0.01	0.00	-0.01	-0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.00
Qe_comin	0.01	0.00	0.00	-0.01	0.00	-0.01	0.01	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.01	-0.01	-0.01
Qe_cfood	0.02	0.01	0.01	0.00	0.02	0.00	-0.12	0.02	0.01	0.00	0.01	0.01	0.00	0.01	0.03	0.01	0.00
Qe_ctob	0.01	0.00	0.00	-0.01	0.00	-0.01	0.01	-0.07	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.01	-0.01	0.00
Qe_ctex	-0.01	-0.01	0.00	-0.01	0.00	0.00	0.02	0.00	-0.12	-0.01	-0.01	-0.01	-0.02	-0.01	0.01	0.00	-0.01
Qe_cwear	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.01	-0.01	-0.02	-0.08	-0.01	-0.01	-0.02	-0.01	0.00	-0.01	-0.01
Qe_cleat	-0.01	-0.01	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	-0.01	-0.03	-0.01	-0.01	0.00	0.01	0.00	0.00
Qe_cwood	0.00	-0.01	0.00	0.00	-0.01	0.01	0.01	0.01	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.01	-0.01	0.01
Qe_cpulp	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	0.00	-0.01	-0.01	0.00	0.00	0.00	-0.02	0.00	0.00	0.00	0.01
Qe_cpubl	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	-0.01	-0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00
Qe_ccoke	0.00	0.01	0.01	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	0.01	0.00	0.01	0.01
Qe_cchem	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	0.00
Qe_crub	0.00	0.00	0.01	0.00	-0.01	-0.01	0.00	0.00	-0.01	-0.01	0.00	-0.01	-0.01	0.01	0.01	-0.01	-0.01
Qe_cmnmt	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.00
Qe_ciron	0.00	0.00	0.00	-0.01	0.00	0.01	-0.01	0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.01	-0.01	0.00
Qe_cfmet	0.01	-0.01	-0.01	0.00	-0.01	0.00	-0.01	0.01	-0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00
Qe_cmach	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00
Qe_cofic	0.01	-0.01	0.00	-0.01	-0.01	0.00	0.01	0.01	-0.01	-0.01	0.01	0.00	0.00	-0.01	0.00	-0.01	0.00
Qe_celmc	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.01	0.00	-0.01	0.01	-0.01	0.00	0.01	0.01	0.00	0.01
Qe_crad	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00
Qe_cmed	0.00	-0.01	0.01	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.01	-0.01	-0.01
Qe_cmvec	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	0.00
Qe_cotr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Qe_cfurn	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.01	0.00	0.00
Qe_cel	0.00	-0.01	0.00	-0.01	-0.01	0.00	0.01	0.00	0.00	-0.01	0.00	-0.01	-0.01	0.00	0.01	0.00	0.00
Qe_ccnst	0.00	-0.01	0.01	0.00	-0.01	0.01	0.01	0.01	0.00	0.00	0.01	-0.01	-0.01	0.01	0.01	0.00	0.00
Qe_ctrd	0.00	0.00	0.01	0.00	-0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Qe_ctrns	0.00	0.00	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	-0.01	0.01	0.01	0.01
Qe_ccom	0.00	-0.01	0.00	-0.01	0.00	-0.01	0.01	0.00	-0.01	-0.01	0.01	0.00	0.00	-0.01	0.00	0.01	0.01
Qe_cfini	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.02	0.00	0.01
Qe_cins	0.00	-0.01	0.00	-0.01	0.00	0.00	0.01	0.01	0.00	0.01	0.01	-0.01	-0.01	0.00	0.00	0.00	0.00
Qe_crent	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.01	-0.01	-0.01	0.00	-0.01	-0.01	0.00	0.01	0.00	0.00
Qe_ccomp	0.00	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.01	-0.01	0.00
Qe_cobus	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	-0.01	0.00	0.01	0.00	0.00	0.01	0.02	0.00	0.00
Qe_cpa	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	-0.01	0.01	0.02	0.00	0.01
Qe_creer	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.02

Note:  $\sigma_{\dots}$  denote income elasticities of demand of rural households. Qe\_... denote exports. For sectoral notation see Appendix 6A.

Table 8F.10 Continued

	$\sigma_{\text{cmnmt}}$	$\sigma_{\text{ciron}}$	$\sigma_{\text{cfmet}}$	$\sigma_{\text{cmach}}$	$\sigma_{\text{cofic}}$	$\sigma_{\text{celmc}}$	$\sigma_{\text{crad}}$	$\sigma_{\text{cmed}}$	$\sigma_{\text{cmvec}}$	$\sigma_{\text{cotr}}$	$\sigma_{\text{cfurn}}$	$\sigma_{\text{cel}}$	$\sigma_{\text{cwat}}$	$\sigma_{\text{ccnst}}$	$\sigma_{\text{ctrd}}$	$\sigma_{\text{chot}}$	$\sigma_{\text{cretr}}$	$\sigma_{\text{ccant}}$
Qe_cagr	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.01	-0.01	0.01	-0.02	0.01	0.01	0.00	0.00	-0.01
Qe_cfor	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	-0.01	0.01	0.01	0.00	0.00	-0.01
Qe_cfish	0.01	-0.01	0.01	0.02	-0.01	0.01	0.01	0.00	0.00	0.01	0.02	0.01	0.00	0.01	0.02	0.00	0.00	0.00
Qe_cmin	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Qe_cpetr	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	-0.01	0.00	0.01	0.01
Qe_core	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	0.01	0.01	0.00	-0.01	0.00
Qe_comin	-0.01	-0.01	-0.01	0.00	-0.01	0.01	0.00	-0.01	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00
Qe_cfood	0.01	0.02	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.01	0.00	0.01	0.03	0.02	0.01	-0.01
Qe_ctob	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.01	0.00	0.01	-0.01	-0.02
Qe_ctex	-0.02	-0.01	-0.01	-0.02	-0.01	0.00	0.00	-0.01	0.00	-0.01	-0.02	0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Qe_cwear	0.00	-0.01	-0.01	-0.01	-0.01	0.00	0.00	-0.01	-0.01	-0.01	-0.02	-0.01	-0.01	-0.01	0.01	-0.01	-0.01	-0.01
Qe_cleat	-0.01	0.00	-0.01	-0.01	0.00	0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.02	0.00	0.00	-0.01	-0.01	-0.01
Qe_cwood	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	-0.01
Qe_cpulp	-0.01	0.00	0.00	0.00	0.01	0.00	-0.01	-0.01	0.00	0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	-0.01
Qe_cpubl	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00
Qe_ccoke	0.00	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.01	-0.02	0.00	0.00	0.00
Qe_cchem	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	-0.01	0.00	0.01	0.00	0.00	0.00
Qe_crub	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	-0.01	-0.01	-0.01	-0.01
Qe_cmnmt	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	-0.01	0.00	0.00	-0.01	0.00	-0.01	-0.01	0.00	0.01	0.00	0.00
Qe_ciron	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00
Qe_cfmet	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	-0.01	0.01	0.00	-0.01
Qe_cmach	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.00
Qe_cofic	-0.01	0.00	-0.01	-0.01	-0.01	0.00	0.00	-0.01	0.00	-0.01	-0.01	0.01	0.00	0.00	0.01	-0.01	-0.01	-0.01
Qe_celmc	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.01	0.00	-0.01	0.00
Qe_crad	-0.01	0.00	0.00	0.00	0.00	0.01	-0.04	-0.01	-0.01	0.00	0.00	0.00	-0.02	0.00	0.00	0.00	-0.01	-0.01
Qe_cmed	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	-0.03	0.00	0.00	-0.01	0.01	-0.01	-0.01	0.01	0.00	-0.01	-0.01
Qe_cmvec	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	0.01	0.01	-0.01	0.00	0.00
Qe_cotr	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	-0.01	-0.01	-0.01
Qe_cfurn	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	-0.04	0.00	-0.01	0.01	0.01	0.00	-0.02	-0.01
Qe_cel	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.02	-0.01	-0.01	0.01	0.00	0.00	0.00
Qe_ccnst	0.00	0.00	-0.01	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.02	-0.01	0.01	0.00	0.00	-0.01
Qe_ctrd	0.00	0.00	0.00	0.00	0.01	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	-0.01	0.01	-0.01	-0.01	0.00	-0.01
Qe_ctrns	-0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.01	-0.01	0.00
Qe_ccom	-0.01	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	-0.02	0.00	0.01	-0.01	0.00	-0.01
Qe_cfini	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	-0.01
Qe_cins	0.00	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	-0.01	0.01	0.00	-0.01	-0.01
Qe_crent	-0.01	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	-0.01	-0.01
Qe_ccomp	-0.01	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.01	0.00	-0.01
Qe_cobus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	0.01	0.00	0.00	-0.01	0.01	0.01	0.01	0.00	0.00
Qe_cpa	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	-0.01
Qe_creer	0.00	0.00	0.01	0.00	-0.01	0.01	0.00	-0.01	0.01	0.00	0.00	0.01	-0.01	0.00	0.01	0.00	-0.01	-0.01

Note:  $\sigma_{\text{...}}$  denote income elasticities of demand of rural households.  $Qe_{\text{...}}$  denote exports. For sectoral notation see Appendix 6A.

Table 8F.10 Continued

	$\sigma$ ctrns	$\sigma$ ccom	$\sigma$ cfini	$\sigma$ cins	$\sigma$ caux	$\sigma$ cest	$\sigma$ crent	$\sigma$ ccomp	$\sigma$ cobus	$\sigma$ cpa	$\sigma$ ceduc	$\sigma$ chelt	$\sigma$ csew	$\sigma$ cmemb	$\sigma$ crecr	$\sigma$ coser	$\sigma$ chh
Qe_cagr	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	0.03	0.00	-0.01	0.00	-0.01	0.00	0.00	0.01	-0.01
Qe_cfor	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	-0.01
Qe_cfish	0.03	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.03	0.01	-0.01	0.00	0.00	0.00	0.00	0.01	0.00
Qe_cmin	-0.01	-0.01	0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Qe_cpetr	0.01	0.01	-0.01	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
Qe_core	-0.01	0.00	0.00	0.01	0.01	0.00	0.00	-0.01	0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	-0.01
Qe_comin	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	-0.01	-0.01	-0.02	0.00	-0.01
Qe_cfood	0.03	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.05	0.00	0.01	0.02	0.00	0.01	0.00	0.01	0.00
Qe_ctob	0.00	0.00	-0.01	-0.01	0.00	0.00	-0.01	0.00	0.01	-0.01	-0.01	0.00	-0.01	-0.01	0.00	0.00	-0.01
Qe_ctex	0.00	0.00	-0.01	0.00	-0.01	-0.01	-0.01	-0.01	0.01	-0.02	0.00	-0.01	-0.02	-0.01	-0.02	-0.01	-0.01
Qe_cwear	0.02	-0.01	0.00	0.00	-0.01	-0.01	-0.01	-0.01	0.02	-0.01	-0.02	-0.01	-0.01	-0.01	-0.02	-0.01	-0.02
Qe_cleat	0.00	-0.01	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	-0.02	0.00	-0.01	-0.01	0.00	0.00	-0.01
Qe_cwood	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	0.00	0.00	0.00	-0.02	0.00	-0.01
Qe_cpulp	0.00	0.00	-0.01	0.00	0.00	-0.01	-0.01	-0.01	0.02	0.00	0.00	0.00	0.00	-0.01	-0.02	0.00	-0.02
Qe_cpubl	-0.01	-0.01	0.01	0.00	0.00	0.00	0.00	-0.01	0.01	-0.01	-0.01	0.00	-0.01	-0.01	-0.01	0.00	-0.01
Qe_ccoke	0.01	-0.01	0.01	0.00	0.00	0.00	0.01	-0.01	0.01	0.00	0.00	0.01	-0.01	-0.01	-0.02	0.00	0.00
Qe_cchem	0.00	0.00	0.00	0.00	0.01	-0.02	0.00	-0.01	0.01	-0.01	-0.01	0.01	0.00	0.00	-0.01	0.00	-0.01
Qe_crub	0.00	-0.01	0.01	0.00	-0.01	-0.02	0.00	-0.01	0.02	0.00	-0.01	0.00	0.00	-0.01	-0.01	-0.01	-0.01
Qe_cmnt	-0.01	-0.01	0.00	0.00	0.00	0.00	0.01	-0.01	0.02	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	-0.01
Qe_ciron	-0.01	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.01	0.00	-0.01	0.00	0.00	0.01	0.00	0.01	-0.01
Qe_cfmct	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00
Qe_cmach	-0.01	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.00	-0.01
Qe_cofic	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.01	-0.01	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01
Qe_celmc	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	-0.01	0.00	0.00	-0.01	-0.01	0.00	-0.01
Qe_crad	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.00	-0.01	0.00	-0.01	-0.01	-0.01	0.00	0.00	-0.02	0.00	-0.02
Qe_cmed	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	-0.01	-0.01	-0.01	0.00	-0.01	-0.01	0.00	-0.01
Qe_cmvec	-0.01	-0.01	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	-0.02
Qe_cotr	0.00	-0.01	0.00	-0.01	0.01	-0.01	-0.01	0.00	0.01	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01
Qe_cfu	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00
Qe_cel	0.00	-0.01	0.00	0.00	0.01	-0.01	0.01	-0.01	0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	-0.01
Qe_ccnst	-0.01	0.00	0.00	0.01	0.01	-0.01	0.00	-0.01	0.00	-0.01	-0.01	0.01	0.01	0.00	0.00	0.00	-0.01
Qe_ctrd	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.01	-0.01	0.00	0.00	-0.01	0.00	0.00	0.01	-0.01
Qe_ctrns	-0.03	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.01	0.00	0.00	0.01	-0.01
Qe_ccom	0.00	-0.02	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	-0.02
Qe_cfini	0.00	0.00	-0.04	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	-0.01
Qe_cins	0.00	0.00	0.01	-0.01	0.00	-0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	-0.01	-0.02	0.01	-0.01
Qe_crent	0.00	0.00	0.00	0.01	0.00	-0.02	0.00	0.00	0.01	-0.01	-0.02	0.00	0.00	-0.01	-0.01	0.01	-0.01
Qe_ccomp	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	-0.01	0.00	-0.01	0.00	0.00	0.01	0.00	-0.01	0.00	-0.01
Qe_cobus	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	-0.05	0.00	-0.01	0.00	0.01	0.00	-0.01	0.00	-0.01
Qe_cpa	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.01	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	0.00
Qe_creer	-0.01	0.00	0.01	0.00	0.00	-0.01	0.01	0.00	0.01	-0.01	0.00	0.00	0.00	0.00	-0.02	0.00	-0.01

Note:  $\sigma_{...}$  denote income elasticities of demand of rural households.  $Qe_{...}$  denote exports. For sectoral notation see Appendix 6A.

Table 8F.11 Spearman correlation coefficients between exports and income elasticities of demand of urban households and Frisch parameters

	$\sigma_{u\_cagr}$	$\sigma_{u\_cfor}$	$\sigma_{u\_cfish}$	$\sigma_{u\_cmin}$	$\sigma_{u\_cpetr}$	$\sigma_{u\_comin}$	$\sigma_{u\_cfood}$	$\sigma_{u\_ctob}$	$\sigma_{u\_ctex}$	$\sigma_{u\_cwear}$	$\sigma_{u\_cleat}$	$\sigma_{u\_cwood}$	$\sigma_{u\_cpulp}$	$\sigma_{u\_cpubl}$	$\sigma_{u\_ccoke}$	$\sigma_{u\_cchem}$	$\sigma_{u\_crub}$
Qe_cagr	-0.18	-0.01	0.00	0.00	0.01	0.00	0.03	0.00	0.00	0.01	0.01	-0.01	0.01	0.00	0.01	0.00	0.00
Qe_cfor	0.01	-0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.01	-0.01	0.00	0.00	0.00	0.00	0.00
Qe_cfish	0.03	-0.01	-0.05	-0.01	0.01	-0.01	-0.09	-0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	0.01	-0.01	0.01
Qe_cmin	0.01	-0.01	0.01	-0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00
Qe_cpetr	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	0.00	0.00
Qe_core	0.01	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01
Qe_comin	0.01	-0.01	0.00	0.00	0.00	0.00	0.01	-0.01	0.01	0.00	0.00	0.01	0.00	-0.01	0.01	0.00	0.00
Qe_cfood	0.01	0.00	-0.01	0.00	0.00	0.00	-0.12	0.01	0.00	0.01	0.01	-0.01	0.00	0.00	0.01	0.00	0.00
Qe_ctob	0.01	-0.01	0.00	0.00	-0.01	-0.01	0.02	-0.07	-0.01	0.00	0.01	-0.01	-0.01	-0.01	0.00	-0.01	0.00
Qe_ctex	-0.01	-0.02	-0.01	0.00	-0.01	-0.01	0.00	0.00	-0.12	-0.01	-0.01	-0.01	0.00	-0.01	0.00	-0.02	-0.02
Qe_cwear	0.01	-0.01	0.01	-0.01	0.01	0.00	0.01	0.00	0.00	-0.07	0.00	0.00	-0.01	-0.01	0.00	-0.01	0.00
Qe_cleat	0.01	-0.01	0.00	-0.01	0.01	-0.01	0.00	0.00	0.00	-0.01	-0.02	-0.01	0.00	-0.01	0.00	-0.01	-0.01
Qe_cwood	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.01
Qe_cpulp	0.01	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00	-0.01
Qe_cpubl	0.02	-0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.00	-0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01
Qe_ccoke	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Qe_cchem	0.01	0.00	-0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Qe_crub	0.02	-0.01	0.00	0.00	0.00	-0.01	-0.01	0.01	0.00	-0.01	0.00	-0.01	0.00	-0.01	0.00	-0.01	-0.02
Qe_cmnmt	0.01	-0.01	-0.01	-0.01	-0.01	0.00	0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00
Qe_ciron	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-0.01	0.00	-0.01	0.00	0.00	0.00
Qe_cfmet	0.01	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.00
Qe_cmach	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	-0.01	0.00	-0.01	0.00
Qe_cofic	0.01	0.00	0.00	0.00	0.00	0.00	0.01	-0.01	-0.01	-0.01	0.00	-0.01	0.00	0.00	0.01	0.00	-0.01
Qe_celmc	0.02	-0.01	0.00	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	-0.01
Qe_crad	0.02	-0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.02	0.00	0.00	-0.01
Qe_cmed	0.01	-0.01	0.00	0.00	-0.01	0.01	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00
Qe_cmvec	0.01	-0.01	0.01	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	-0.01	-0.01
Qe_cotr	0.01	-0.01	0.01	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.01
Qe_cfurn	0.01	-0.01	0.00	0.00	-0.01	0.00	0.00	-0.01	-0.01	0.00	0.01	0.00	-0.01	0.00	0.01	-0.01	-0.01
Qe_cel	0.00	-0.01	0.00	-0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.01	0.00	0.00
Qe_ccnst	0.01	-0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00
Qe_ctrd	0.00	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00
Qe_ctrns	0.00	-0.01	0.00	0.00	0.00	0.00	0.02	0.00	-0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.01
Qe_ccom	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00
Qe_cfini	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	0.00	-0.01	0.01	0.00	0.00
Qe_cins	0.01	-0.01	0.01	-0.01	0.00	-0.01	0.02	0.00	-0.01	0.00	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.00
Qe_crent	0.02	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Qe_ccomp	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.01
Qe_cobus	0.01	0.00	0.00	0.01	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	-0.01	0.00
Qe_cpa	0.01	-0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.00	-0.01	-0.01	0.00	-0.01	0.00
Qe_creer	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.01	-0.01

Note:  $\sigma_{u\_...}$  denote income elasticities of demand of urban households.  $Qe_{...}$  denote exports. For sectoral notation see Appendix 6A.

Table 8F.11 Continued

	$\sigma_u$ cmnmt	$\sigma_u$ ciron	$\sigma_u$ cfmet	$\sigma_u$ cmach	$\sigma_u$ cofic	$\sigma_u$ celmc	$\sigma_u$ crad	$\sigma_u$ cmed	$\sigma_u$ cmvec	$\sigma_u$ cotr	$\sigma_u$ cfurn	$\sigma_u$ cel	$\sigma_u$ cwat	$\sigma_u$ ccnst	$\sigma_u$ ctrd	$\sigma_u$ chot	$\sigma_u$ cretr	$\sigma_u$ ccant
Qe_cagr	-0.01	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.00
Qe_cfor	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Qe_cfish	0.00	-0.01	0.00	-0.01	0.00	0.01	-0.01	0.00	0.00	-0.01	-0.01	0.00	0.00	0.01	0.00	0.00	0.01	-0.01
Qe_cmin	0.01	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01	-0.01
Qe_cpetr	-0.01	0.01	0.00	0.01	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	0.01	-0.01	-0.01	0.00
Qe_core	0.01	-0.01	0.00	0.00	0.01	0.00	0.01	0.00	-0.01	-0.01	0.00	-0.01	0.01	0.00	-0.01	0.01	0.00	-0.01
Qe_comin	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	0.00	0.01	-0.01	0.01	0.01	0.00
Qe_cfood	0.00	-0.02	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00
Qe_ctob	0.00	-0.01	-0.01	-0.01	-0.01	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	0.01	-0.01
Qe_ctex	-0.01	-0.02	-0.01	-0.01	-0.01	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	-0.01	0.00	0.00	0.00
Qe_cwear	0.00	-0.02	0.00	-0.01	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	-0.01	-0.01	0.00	0.00	0.01	0.01	0.00
Qe_cleat	0.00	-0.01	-0.01	-0.02	0.00	-0.01	0.00	0.00	-0.01	-0.01	0.00	-0.01	0.01	0.00	-0.02	0.00	0.00	-0.01
Qe_cwood	0.00	-0.01	-0.01	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.00	-0.02	0.00	0.00	0.00
Qe_cpulp	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	-0.03	0.01	0.00	0.00
Qe_cpubl	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.01	0.00	0.00
Qe_ccoke	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.01	-0.01	0.00	0.00	0.00	-0.03	0.01	0.01	0.00
Qe_cchem	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.01	0.00	-0.01	0.01	0.01	-0.01
Qe_crub	0.00	-0.01	0.00	-0.02	0.00	-0.01	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	-0.04	0.00	0.01	0.00
Qe_cmnmt	0.00	-0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	-0.02	-0.03	0.00	-0.01	-0.01
Qe_ciron	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.01	0.01	0.00	-0.02	0.01	0.01	0.00
Qe_cfmet	0.00	-0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.01	0.00	0.00	0.00	-0.02	0.01	0.01	0.00
Qe_cmach	0.01	-0.01	0.00	-0.01	0.00	0.01	0.00	-0.01	-0.01	-0.01	0.00	0.00	-0.01	0.00	-0.03	0.00	0.00	0.00
Qe_cofic	0.00	-0.01	-0.01	0.00	-0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00
Qe_celmc	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	-0.01	-0.01	-0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	0.01	0.00
Qe_crad	0.01	-0.01	0.00	-0.01	0.00	0.01	-0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	-0.02
Qe_cmed	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.03	0.00	-0.01	0.01	-0.01	0.00	-0.01	-0.01	0.01	0.00	-0.01
Qe_cmvec	0.00	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	-0.01	-0.01	0.00	-0.01	0.00	0.00	-0.01	0.01	0.00	0.00
Qe_cotr	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.01	-0.01	-0.01	0.01	0.01	-0.01
Qe_cfurn	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	-0.02	-0.01	-0.03	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
Qe_cel	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00	-0.02	0.01	0.00	-0.01	0.00	0.01	0.00
Qe_ccnst	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	-0.02	-0.01	0.01	0.00	-0.01
Qe_ctrd	0.01	0.00	0.00	-0.01	0.00	0.00	-0.01	-0.01	-0.01	0.00	-0.01	-0.01	-0.01	0.00	-0.04	0.00	0.01	0.00
Qe_ctrns	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
Qe_ccom	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	0.02	-0.01
Qe_cfini	0.01	-0.01	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.00	0.01	0.01	0.00	0.00	0.00	-0.01	0.01	0.00	-0.01
Qe_cins	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.01	0.00	-0.01	0.00	0.01	-0.01
Qe_crent	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.01	-0.01
Qe_ccomp	0.01	-0.01	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	-0.01
Qe_cobus	0.01	0.00	0.01	0.00	0.02	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.02	0.01	0.01
Qe_cpa	0.00	-0.01	-0.01	-0.01	0.01	0.01	0.00	-0.01	-0.01	0.00	0.00	0.00	0.01	0.00	-0.02	0.00	0.01	-0.01
Qe_crecr	0.00	-0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	-0.01

Note:  $\sigma_u$ ... denote income elasticities of demand of urban households. Qe... denote exports. For sectoral notation see Appendix 6A.

Table 8F.11 Continued

	$\sigma_{ctrms}$	$\sigma_{ccom}$	$\sigma_{cfini}$	$\sigma_{cins}$	$\sigma_{caux}$	$\sigma_{cest}$	$\sigma_{crent}$	$\sigma_{ccomp}$	$\sigma_{cobus}$	$\sigma_{cpa}$	$\sigma_{ceduc}$	$\sigma_{chelt}$	$\sigma_{csew}$	$\sigma_{cmemb}$	$\sigma_{crecr}$	$\sigma_{coser}$	$\sigma_{chh}$	Frischurb	Frischrur
Qe_cagr	0.02	-0.01	0.00	0.00	0.00	0.02	0.00	-0.01	0.04	0.00	0.00	0.00	0.00	0.01	0.01	0.00	-0.01	-0.01	-0.01
Qe_cfor	0.00	-0.01	-0.01	-0.02	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00
Qe_cfish	0.03	-0.01	0.00	-0.01	0.00	0.00	-0.01	-0.01	0.02	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00
Qe_cmin	-0.01	-0.01	-0.01	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Qe_cpetr	0.00	0.01	0.01	0.01	-0.01	-0.01	0.00	0.00	0.01	0.00	-0.01	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.01
Qe_core	0.00	0.00	-0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Qe_comin	-0.01	-0.01	-0.01	0.00	0.01	0.01	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00
Qe_cfood	0.04	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.02	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	-0.01	0.00
Qe_ctob	0.01	-0.02	0.00	0.00	0.00	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00
Qe_ctex	0.02	-0.02	-0.02	-0.02	0.00	0.00	-0.01	-0.01	0.02	-0.01	0.00	-0.02	0.00	0.00	-0.01	-0.01	-0.01	0.00	-0.01
Qe_cwear	0.00	-0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	-0.01	-0.01	0.00	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.00
Qe_cleat	0.01	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00
Qe_cwood	0.01	-0.02	-0.01	-0.01	0.00	0.00	-0.01	-0.01	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	-0.01	-0.01
Qe_cpulp	0.01	0.00	-0.01	-0.01	0.00	-0.01	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	0.00	-0.01
Qe_cpubl	0.00	-0.01	-0.01	0.00	0.00	0.01	0.01	-0.01	-0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	-0.01	0.00
Qe_ccoke	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	-0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	-0.01
Qe_cchem	0.01	-0.01	-0.01	-0.01	0.00	-0.02	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Qe_crub	0.02	-0.01	-0.02	-0.01	0.00	0.00	0.00	-0.01	0.01	-0.01	-0.01	-0.01	-0.01	0.00	0.01	-0.01	-0.01	0.00	0.00
Qe_cmnt	0.01	-0.01	-0.01	-0.01	0.00	0.00	0.01	-0.01	0.01	-0.01	0.00	0.01	0.00	-0.01	0.00	-0.01	-0.01	0.00	0.00
Qe_ciron	0.00	-0.02	-0.01	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	-0.01	0.00	0.00	0.00	-0.01	0.00	-0.01
Qe_cfmct	0.00	-0.01	-0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01
Qe_cmach	0.01	-0.01	-0.01	-0.01	0.00	0.01	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01
Qe_cofic	0.00	-0.01	-0.01	-0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00
Qe_celmc	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Qe_crad	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00
Qe_cmed	0.00	-0.02	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.01	-0.02	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00
Qe_cmvec	-0.01	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01	-0.02	-0.01	0.00	0.00	0.00	-0.01	0.01	-0.01	0.01	0.00
Qe_cotr	0.00	-0.01	-0.01	-0.01	-0.01	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.00	-0.01	0.01	0.00
Qe_cfurn	0.01	-0.01	-0.01	0.00	-0.01	0.00	0.00	-0.01	0.01	-0.01	-0.01	0.00	0.00	-0.01	0.00	-0.01	-0.01	0.00	0.00
Qe_cel	0.00	-0.01	-0.01	-0.02	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	-0.01	0.00	-0.01	0.00
Qe_ccnst	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	-0.01	0.00	0.00
Qe_ctrd	0.02	0.00	-0.02	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	-0.01	-0.01	0.01	0.01
Qe_ctrns	-0.04	-0.01	0.00	-0.01	0.01	0.02	0.01	0.00	0.01	0.00	0.00	0.01	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.01
Qe_ccom	0.00	-0.02	-0.01	-0.01	0.00	-0.01	-0.01	0.00	0.00	-0.02	0.01	0.00	-0.01	-0.01	0.00	0.00	-0.01	0.00	0.00
Qe_cfini	0.02	-0.01	-0.08	-0.01	0.00	-0.01	-0.01	0.00	0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00
Qe_cins	0.00	0.00	-0.01	-0.03	0.01	0.01	0.00	-0.01	-0.02	-0.01	0.00	0.01	0.01	-0.01	0.00	0.00	0.00	0.00	0.00
Qe_crent	-0.01	-0.02	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.00
Qe_ccomp	0.00	-0.01	0.00	-0.01	0.00	0.01	0.00	-0.01	-0.02	-0.01	0.01	0.00	0.01	-0.01	0.01	0.00	0.00	0.00	0.01
Qe_cobus	0.02	-0.01	0.00	0.01	0.00	0.02	0.01	0.00	-0.09	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.01
Qe_cpa	0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.02	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	0.01	0.00
Qe_creer	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00

Note:  $\sigma_{...}$  denote income elasticities of demand of urban households. Frischurb denotes Frisch parameter for urban household and Frischrur denotes Frisch parameter for rural household. Qe\_... denote exports. For sectoral notation see Appendix 6A.

Table 8F.12 Spearman correlation coefficients between exports and elasticities of substitution between capital and labor

	$\sigma_{va\_cagr}$	$\sigma_{va\_cfor}$	$\sigma_{va\_cfish}$	$\sigma_{va\_cmin}$	$\sigma_{va\_cpetr}$	$\sigma_{va\_core}$	$\sigma_{va\_comin}$	$\sigma_{va\_cfood}$	$\sigma_{va\_ctob}$	$\sigma_{va\_ctex}$	$\sigma_{va\_cwear}$	$\sigma_{va\_cleat}$	$\sigma_{va\_cwood}$	$\sigma_{va\_cpulp}$	$\sigma_{va\_cpubl}$	$\sigma_{va\_ccoke}$	$\sigma_{va\_cchem}$	$\sigma_{va\_crub}$
Qe_cagr	-0.30	0.00	0.00	0.00	-0.62	0.02	0.00	0.02	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.02	0.01	-0.01
Qe_cfor	0.03	-0.30	-0.01	0.01	-0.63	0.03	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	-0.01
Qe_cfish	0.02	0.00	-0.44	0.01	-0.37	0.01	-0.01	0.15	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00
Qe_cmin	0.02	0.00	-0.01	-0.42	-0.68	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Qe_cpetr	0.01	0.00	0.01	0.01	0.98	0.01	0.00	0.01	-0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00
Qe_core	0.02	0.00	-0.01	-0.01	-0.66	-0.47	-0.01	0.01	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Qe_comin	0.02	0.00	-0.01	0.00	-0.67	0.01	-0.16	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.02	0.00	0.00
Qe_cfood	0.02	0.00	-0.01	0.01	-0.52	0.03	0.01	-0.16	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.01	0.01	0.01	0.00
Qe_ctob	0.02	0.00	-0.01	0.00	-0.48	0.01	0.01	0.01	0.10	0.00	0.00	0.01	-0.01	0.00	0.00	0.02	0.00	-0.01
Qe_ctex	0.01	0.00	-0.01	0.00	-0.54	0.02	0.01	0.01	0.00	-0.29	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Qe_cwear	0.02	0.01	-0.01	0.00	-0.59	0.02	-0.01	0.00	0.01	0.00	-0.33	0.00	0.01	0.00	-0.01	0.01	0.00	-0.01
Qe_cleat	0.02	0.00	-0.01	0.00	-0.68	0.03	0.00	0.00	0.01	0.00	-0.01	-0.60	0.00	-0.01	0.00	0.03	0.01	0.01
Qe_cwood	0.02	-0.01	-0.01	0.01	-0.59	0.03	0.01	0.01	0.00	0.00	0.00	0.00	-0.49	0.01	0.01	0.03	0.01	0.00
Qe_cpulp	0.02	0.01	0.00	0.01	-0.64	0.03	0.01	0.00	0.01	0.00	0.00	0.00	0.00	-0.30	0.00	0.03	0.00	0.00
Qe_cpubl	0.03	0.00	-0.01	0.01	-0.62	0.04	0.01	0.00	0.00	0.00	0.01	-0.01	0.00	-0.01	-0.10	0.03	0.01	0.00
Qe_ccoke	0.02	-0.01	-0.01	0.00	-0.58	0.03	0.00	0.02	0.00	0.00	0.01	0.01	0.00	0.00	0.00	-0.10	0.01	0.01
Qe_cchem	0.04	0.01	-0.01	0.00	-0.71	0.00	0.00	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.02	-0.65	0.00
Qe_crub	0.01	0.01	-0.01	0.01	-0.61	0.03	0.01	0.02	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.02	0.01	-0.13
Qe_cmmmt	0.03	0.01	-0.01	0.00	-0.58	0.03	-0.01	0.01	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.03	0.01	-0.01
Qe_ciron	0.02	0.01	-0.01	0.00	-0.79	-0.04	0.01	0.01	0.00	0.01	0.00	-0.01	-0.01	-0.01	0.00	0.03	0.01	0.00
Qe_cfmet	0.02	0.00	0.00	0.00	-0.62	0.03	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00
Qe_cmach	0.03	-0.01	-0.01	0.01	-0.67	0.04	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00	0.03	0.01	0.00
Qe_cofic	0.01	0.00	-0.01	0.01	-0.47	0.02	0.01	-0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01
Qe_celmc	0.03	0.00	-0.01	0.00	-0.73	0.03	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Qe_crad	0.03	0.00	0.00	0.00	-0.64	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00	-0.01
Qe_cmed	0.02	0.01	-0.01	0.00	-0.61	0.03	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.01	0.00
Qe_cmvec	0.03	0.00	-0.01	0.00	-0.68	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00
Qe_cotr	0.03	0.01	-0.01	0.01	-0.69	0.03	0.01	0.01	0.01	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.01	0.00
Qe_cfurn	0.01	-0.01	-0.01	-0.01	-0.60	0.03	0.01	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	-0.01	0.02	0.00	0.00
Qe_cel	0.02	-0.01	0.00	-0.01	-0.46	0.02	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.01	0.01	0.01	0.01	-0.01
Qe_ccnst	0.03	-0.01	-0.01	0.00	-0.57	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	-0.01	0.01	-0.01	0.00
Qe_ctrld	0.01	0.00	0.00	0.00	-0.60	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.02	0.00
Qe_ctrns	0.02	0.00	-0.01	0.00	-0.62	0.02	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Qe_ccom	0.03	0.00	-0.01	0.01	-0.61	0.03	0.01	0.01	0.01	-0.01	-0.01	0.00	0.00	-0.01	0.00	0.03	0.00	0.00
Qe_cfini	0.02	0.00	-0.01	0.00	-0.50	0.01	0.00	0.01	-0.01	0.01	0.01	-0.01	0.00	0.01	0.00	0.02	0.01	0.00
Qe_cins	0.02	-0.01	0.00	0.01	-0.60	0.02	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	0.00	0.02	0.00	0.00
Qe_crent	0.03	0.00	-0.01	0.01	-0.67	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.01
Qe_ccomp	0.03	0.00	0.00	0.00	-0.58	0.03	0.01	0.01	0.01	0.00	-0.01	0.00	0.00	0.00	0.01	0.02	0.01	0.00
Qe_cobus	0.02	0.01	-0.01	-0.01	-0.48	0.01	0.00	0.00	0.01	-0.01	0.01	0.00	-0.01	0.01	0.00	-0.01	0.00	0.00
Qe_cpa	0.02	0.00	0.00	0.01	-0.57	0.02	0.00	-0.01	0.00	0.01	0.00	0.01	-0.01	0.00	0.00	0.01	0.00	0.00
Qe_creer	0.03	0.00	0.00	0.00	-0.52	0.02	0.02	0.01	0.00	-0.01	0.01	0.00	-0.01	-0.01	0.00	0.01	0.00	-0.01

Note:  $\sigma_{va\_...}$  denote elasticities of substitution between capital and labor.  $Qe\_...$  denote exports. For sectoral notation see Appendix 6A.



Table 8F.12 Continued

	$\sigma_{va\_cmmnt}$	$\sigma_{va\_ciron}$	$\sigma_{va\_cfmet}$	$\sigma_{va\_cmach}$	$\sigma_{va\_cofic}$	$\sigma_{va\_celmc}$	$\sigma_{va\_crad}$	$\sigma_{va\_cmed}$	$\sigma_{va\_cmvec}$	$\sigma_{va\_cotr}$	$\sigma_{va\_cfurn}$	$\sigma_{va\_crec}$	$\sigma_{va\_cel}$	$\sigma_{va\_cwat}$	$\sigma_{va\_ccnst}$	$\sigma_{va\_ctrd}$	$\sigma_{va\_chot}$	$\sigma_{va\_cretr}$	$\sigma_{va\_ccant}$
Qe_cagr	0.00	0.07	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.02	0.00	0.00	0.05	0.01	0.00	0.01
Qe_cfor	0.00	0.08	0.00	0.00	-0.01	0.00	0.00	0.00	0.01	-0.01	0.01	0.00	0.00	0.00	0.02	0.06	0.00	-0.01	0.00
Qe_cfish	-0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.01	0.00	0.01	0.09	0.00	0.00	0.00
Qe_cmin	0.01	0.06	-0.01	0.00	0.00	-0.01	0.00	0.00	0.01	-0.01	0.00	0.00	-0.01	0.00	0.00	0.03	0.00	-0.01	0.00
Qe_cpetr	0.01	0.04	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	0.03	-0.01	0.00	-0.01
Qe_core	0.00	0.13	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00
Qe_comin	0.00	0.06	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	-0.01	0.01	0.01	0.00	0.01	0.00	0.02	0.00	0.00	0.00
Qe_cfood	-0.01	0.05	0.00	0.01	0.00	-0.01	-0.01	-0.01	0.00	-0.01	0.00	0.01	0.00	-0.01	0.01	0.05	0.00	-0.01	0.01
Qe_ctob	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.04	0.01	0.00	0.00
Qe_ctex	0.01	0.07	0.00	0.01	-0.01	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.01	0.01	0.00	0.00	0.00	0.00
Qe_cwear	0.00	0.06	0.00	0.00	0.01	0.01	-0.01	0.00	-0.01	0.01	0.00	0.00	-0.01	0.00	0.01	0.07	-0.01	0.00	-0.01
Qe_cleat	-0.01	0.07	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	-0.01	0.00
Qe_cwood	0.00	0.08	0.00	0.01	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	0.02	-0.06	0.00	0.00	0.00
Qe_cpulp	0.00	0.09	0.01	0.01	-0.01	0.00	-0.01	0.00	-0.01	0.00	-0.01	-0.01	-0.01	0.01	0.01	-0.09	0.00	0.00	0.00
Qe_cpubl	0.00	0.07	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	0.00	-0.01	0.00	0.01	0.03	0.00	-0.01	0.00
Qe_ccoke	0.00	0.10	-0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.01	0.01	-0.21	0.01	-0.01	0.00
Qe_cchem	0.00	0.09	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.03	0.00	0.00	0.00
Qe_crub	0.00	0.10	-0.01	0.02	-0.01	0.00	-0.01	-0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.01	-0.17	0.00	-0.01	0.00
Qe_cmmnt	-0.07	0.08	0.01	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.01	-0.01	-0.01	0.02	-0.15	0.01	0.00	0.00
Qe_ciron	0.00	-0.46	0.00	0.00	0.00	0.00	-0.01	-0.01	0.01	0.00	0.01	-0.01	-0.01	0.00	0.01	-0.01	0.01	0.00	0.00
Qe_cfmet	0.01	0.07	-0.45	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	-0.01	0.01	-0.04	0.00	-0.01	0.00
Qe_cmach	0.00	0.08	0.01	-0.33	-0.01	0.00	-0.01	0.00	0.00	-0.01	0.01	0.00	-0.01	0.01	0.01	-0.07	0.00	0.00	0.00
Qe_cofic	0.00	0.04	0.00	-0.01	-0.69	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.10	0.00	0.00	0.00
Qe_celmc	0.00	0.05	0.00	0.00	0.00	-0.55	-0.01	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.03	0.01	0.00	0.00
Qe_crad	0.00	0.06	0.01	-0.01	0.00	0.00	-0.55	-0.01	0.00	0.00	0.01	0.00	-0.01	0.01	0.00	0.08	0.01	0.00	0.00
Qe_cmed	0.00	0.04	0.00	0.00	0.00	0.00	-0.01	-0.55	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.08	0.00	0.00	0.00
Qe_cmvec	-0.01	0.07	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	-0.01	0.00
Qe_cotr	0.00	0.08	-0.02	0.00	-0.01	0.00	0.00	0.00	0.01	-0.19	0.00	0.00	-0.01	-0.01	0.01	0.04	0.00	0.00	0.01
Qe_cfurn	0.00	0.07	0.00	0.01	0.00	-0.01	0.01	0.00	0.01	-0.01	-0.36	0.00	-0.01	0.00	0.01	0.03	0.00	-0.01	0.00
Qe_cel	0.00	0.06	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	-0.01	0.00	-0.01	0.03	0.01	0.00	0.02	0.01	-0.01	-0.01
Qe_ccnst	-0.01	0.06	-0.01	0.00	-0.01	-0.01	-0.01	-0.02	0.00	0.00	0.00	0.00	-0.01	0.00	-0.08	0.04	0.00	-0.01	0.00
Qe_ctrd	-0.01	0.10	0.00	0.02	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01	-0.28	0.00	0.00	0.01
Qe_ctrns	0.00	0.06	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.05	0.00	-0.01	0.01
Qe_ccom	0.00	0.06	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	0.01	-0.01	-0.01	0.00	0.01	0.04	0.01	0.00	0.00
Qe_cfini	-0.01	0.05	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.06	0.00	0.00	0.01
Qe_cins	0.00	0.06	-0.01	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.05	0.00	-0.01	0.01
Qe_crent	0.00	0.08	-0.01	0.00	0.01	-0.01	-0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.01	0.05	0.01	-0.01	0.01
Qe_ccomp	0.00	0.07	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.01	-0.01	0.00	0.01	0.05	0.01	-0.01	0.00
Qe_cobus	0.00	0.03	-0.01	-0.01	0.00	0.01	-0.01	0.00	0.00	0.00	0.01	-0.01	-0.01	0.00	0.00	0.03	0.00	0.00	0.00
Qe_cpa	0.00	0.06	0.00	-0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.04	0.01	0.00	0.01
Qe_creer	0.01	0.06	0.00	-0.01	0.01	0.01	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.01	0.01	0.04	0.00	0.00	0.00

Note:  $\sigma_{va\_...}$  denote elasticities of substitution between capital and labor.  $Qe\_...$  denote exports. For sectoral notation see Appendix 6A.

Table 8F.12 Continued

	$\sigma_{va\_ctrns}$	$\sigma_{va\_ccom}$	$\sigma_{va\_cfini}$	$\sigma_{va\_cins}$	$\sigma_{va\_caux}$	$\sigma_{va\_cest}$	$\sigma_{va\_crent}$	$\sigma_{va\_ccomp}$	$\sigma_{va\_cres}$	$\sigma_{va\_cobus}$	$\sigma_{va\_cpa}$	$\sigma_{va\_ceduc}$	$\sigma_{va\_chelt}$	$\sigma_{va\_csew}$	$\sigma_{va\_cmemb}$	$\sigma_{va\_crecr}$	$\sigma_{va\_coser}$	$\sigma_{va\_chh}$
Qe_cagr	0.06	0.01	0.00	0.00	0.00	-0.02	0.01	0.01	0.00	0.01	0.00	-0.01	-0.01	0.01	0.02	0.00	0.01	0.01
Qe_cfor	0.04	0.00	0.01	0.00	0.00	-0.02	0.00	0.00	-0.01	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01
Qe_cfish	0.03	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	-0.01	0.00	0.01
Qe_cmin	0.00	0.01	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.02	0.00	0.00	-0.01	0.01	0.01	0.00	0.00	0.00
Qe_cpetr	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	-0.01	-0.01	0.01	-0.01	0.00
Qe_core	0.03	0.00	-0.01	0.00	0.00	-0.02	0.00	0.00	0.00	0.02	-0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.01
Qe_comin	0.04	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00
Qe_cfood	0.03	0.01	-0.01	0.00	0.01	-0.03	-0.01	0.00	-0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Qe_ctob	0.03	0.01	0.00	0.00	0.00	-0.02	-0.01	0.01	-0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	0.00	0.00
Qe_ctex	0.04	0.01	-0.01	-0.01	-0.01	-0.02	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.01
Qe_cwear	0.03	0.01	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
Qe_cleat	0.04	0.01	-0.01	0.00	0.00	-0.03	0.01	-0.01	-0.01	0.00	0.00	0.01	0.00	0.00	0.01	-0.01	-0.01	0.01
Qe_cwood	0.03	0.00	-0.01	0.00	0.00	-0.02	0.01	0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.01	-0.01	0.00	0.00
Qe_cpulp	0.02	0.00	0.00	0.00	0.00	-0.02	0.01	0.00	-0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00
Qe_cpubl	0.03	0.00	0.00	0.00	0.00	-0.02	0.00	0.01	-0.01	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Qe_ccoke	0.02	0.00	-0.01	0.00	0.01	-0.01	0.00	0.00	0.00	0.01	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Qe_cchem	0.03	0.00	0.00	0.00	-0.01	0.01	0.01	0.00	-0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00
Qe_crub	0.02	0.00	-0.01	0.00	-0.01	-0.01	0.01	0.00	0.00	0.01	-0.01	0.00	0.02	0.01	0.01	-0.01	0.00	0.00
Qe_cmnmnt	0.03	0.01	0.00	0.00	-0.01	-0.02	-0.01	0.00	-0.01	0.00	-0.01	0.01	-0.01	0.01	0.01	-0.01	0.00	0.00
Qe_ciron	0.04	0.00	0.00	0.00	-0.01	-0.02	0.00	0.01	-0.01	0.01	-0.02	0.00	-0.01	0.01	0.01	0.00	0.01	0.00
Qe_cfmet	0.04	0.00	-0.01	0.00	0.00	-0.03	0.00	0.00	-0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00
Qe_cmach	0.03	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.02	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Qe_cofic	0.03	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	-0.01	-0.02	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Qe_celmc	0.03	0.00	-0.01	0.00	0.00	-0.02	0.00	0.00	0.00	0.01	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Qe_crad	0.03	0.00	-0.01	0.01	-0.01	-0.02	-0.01	0.00	-0.01	0.02	-0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00
Qe_cmed	0.03	0.00	-0.01	0.00	0.00	-0.02	0.01	0.00	-0.01	0.01	0.00	0.01	-0.01	0.00	0.01	-0.01	0.00	0.00
Qe_cmvec	0.04	0.01	0.00	0.01	0.01	-0.02	-0.01	0.01	-0.01	0.01	0.00	0.01	-0.01	0.02	0.00	0.00	0.00	0.00
Qe_cotr	0.03	0.01	-0.01	0.00	0.00	-0.02	0.01	0.01	0.00	0.02	0.00	0.00	0.00	0.01	0.01	-0.01	0.00	0.01
Qe_cfurn	0.04	-0.01	0.00	0.00	0.00	-0.02	0.00	0.00	0.00	0.01	-0.01	0.00	-0.01	0.00	0.01	0.00	0.00	0.01
Qe_cel	0.02	0.00	0.00	0.00	0.00	-0.01	0.01	0.01	0.00	0.01	-0.01	0.00	-0.01	0.00	0.01	-0.01	0.01	0.01
Qe_ccnst	0.02	0.00	0.01	0.00	-0.01	-0.02	0.00	0.01	0.00	0.01	-0.01	0.01	0.00	0.00	0.01	-0.01	0.00	0.00
Qe_ctrd	0.03	0.00	-0.01	0.00	0.00	-0.01	0.00	-0.01	-0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Qe_ctrns	-0.14	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.02	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00
Qe_ccom	0.04	-0.16	-0.01	0.00	0.00	-0.01	0.01	0.00	-0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01
Qe_cfini	0.03	0.00	-0.06	0.00	-0.01	0.00	0.00	0.00	-0.01	0.01	-0.01	0.00	0.00	0.02	0.00	0.00	0.00	0.00
Qe_cins	0.03	0.01	0.00	-0.16	0.00	-0.02	0.00	-0.01	0.00	0.00	0.01	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00
Qe_crent	0.04	0.00	0.00	0.00	0.00	-0.02	-0.68	0.01	0.00	0.01	-0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.00
Qe_ccomp	0.03	0.00	0.00	-0.01	-0.01	-0.01	0.00	-0.08	-0.01	0.00	-0.01	0.01	0.00	-0.01	0.01	0.00	0.00	0.00
Qe_cobus	0.03	0.01	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.01	-0.09	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01
Qe_cpa	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.01	-0.05	0.01	0.01	0.00	0.00	-0.01	0.01	0.00
Qe_crecr	0.03	0.00	0.00	0.00	0.01	-0.01	0.01	-0.01	-0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.05	0.00	0.01

Note:  $\sigma_{va\_...}$  denote elasticities of substitution between capital and labor.  $Qe\_...$  denote exports. For sectoral notation see Appendix 6A.

**Table 8F.13 Spearman correlation coefficients between the outputs and the most important parameters**

	Qx_cagr	Qx_cfor	Qx_cfish	Qx_cmin	Qx_cpetr	Qx_core	Qx_comin	Qx_cfood	Qx_ctob
σva_cpetr	-0.72	σva_cpetr -0.82	σva_cpetr -0.80	σva_cpetr -0.77	σva_cpetr 0.99	σva_cpetr -0.85	σva_cpetr -0.83	σva_cpetr -0.65	σq_ctob -0.36
σva_cagr	-0.48	σva_cfor -0.30	σva_cfish -0.26	σt_cmin -0.40		σva_core -0.33	σt_comin -0.45	σq_cfood -0.38	σt_ctob -0.33
σt_cagr	-0.32	σq_cfor -0.29	σq_cfood -0.22	σva_cmin -0.38		σt_core -0.22	σva_comin -0.12	σt_cfood -0.34	σva_cpetr -0.19
σq_cagr	-0.06	σt_cfor -0.20	σt_cfood -0.19	σq_ctrns 0.07		σva_ciron -0.16	σq_comin -0.09	σva_cfood -0.28	σt_ctrns -0.07
σva_ctrd	0.05	σq_cwood -0.06	σva_cfood -0.16	σt_ctrns 0.08		σt_ciron -0.05	σva_core -0.06	σt_ctrns -0.07	σt_cfood -0.07
σt_cagr	0.08	σt_ctrns 0.05	σt_cfish -0.16			σt_ccoke 0.05	σt_core -0.05	σva_ctrd -0.05	σu_ctrns -0.06
σva_ciron	0.08	σva_ciron 0.08	σq_cfish -0.09			σt_ctrns 0.05	σt_ccoke 0.05	σu_ctrns -0.05	σu_cobus -0.06
σu_cagr	0.13		σt_ctrns -0.05				σt_ctrns 0.07	σt_ccoke 0.05	σva_ctrd -0.05
			σt_cagr 0.05					σt_ctrns 0.05	σt_ctrns 0.06
			σu_cfish 0.05					σva_ciron 0.09	σt_ctrns 0.06
			σt_ctrns 0.05					σt_cfood 0.20	σva_ctob 0.20
			σva_ciron 0.09					σu_cfood 0.20	σu_ctob 0.51
			σt_cfood 0.12						σt_ctob 0.55
			σu_cfood 0.12						

Note: σq\_... denote Armington elasticities of substitution, σt\_... denote elasticities of transformation, σr\_... denote income elasticities of demand of rural households, σu\_... denote income elasticities of demand of urban households. Frischurb denotes Frisch parameter for urban household and Frischrur denotes Frisch parameter for rural household. σva\_... denote elasticities of substitution between capital and labor. Qx\_... denote outputs. For sectoral notation see Appendix 6A.

**Table 8F.13 Continued**

	Qx_ctex	Qx_cwear	Qx_cleat	Qx_cwood	Qx_cpulp	Qx_cpubl	Qx_ccoke	Qx_cchem	Qx_crub
σva_cpetr	-0.72	σva_cpetr -0.68	σva_cpetr -0.71	σva_cpetr -0.78	σva_cpetr -0.75	σq_cpubl -0.77	σva_cpetr -0.65	σva_cpetr -0.72	σva_cpetr -0.63
σva_ctex	-0.47	σva_cwear -0.46	σva_cleat -0.60	σq_cwood -0.44	σva_cpulp -0.50	σva_cpetr -0.48	σq_ccoke -0.45	σva_cchem -0.64	σq_crub -0.60
σq_ctex	-0.29	σq_cwear -0.38	σt_cleat -0.13	σva_cwood -0.29	σq_cpulp -0.26	σva_cpubl -0.13	σva_ccoke -0.39	σt_cchem -0.05	σva_crub -0.23
σt_ctex	-0.16	σt_cwear -0.13	σq_cleat -0.10	σva_ctrd -0.10	σt_cpulp -0.07	σt_cpubl -0.06	σt_ccoke -0.22	σq_ccnst 0.05	σva_ctrd -0.13
σt_cagr	0.06	σva_ciron 0.08	σt_ccoke 0.05	σt_cwood -0.06	σva_ciron 0.09	σva_ctrd 0.05	σt_cpetr -0.13	σva_ciron 0.09	σt_crub -0.13
σva_ciron	0.09	σu_cwear 0.09	σva_ciron 0.08	σt_ccoke 0.08		σt_cpubl 0.07	σva_ctrd -0.10		σt_ctrns 0.06
σt_ctex	0.11	σt_cwear 0.09		σva_ciron 0.10		σu_cpubl 0.07	σu_ccoke 0.06		σt_crub 0.09
σu_ctex	0.12					σva_ciron 0.08	σva_ciron 0.07		σva_ciron 0.09
							σt_ccoke 0.08		σt_ccoke 0.09
							σq_cpetr 0.11		σu_crub 0.12

Note: σq\_... denote Armington elasticities of substitution, σt\_... denote elasticities of transformation, σr\_... denote income elasticities of demand of rural households, σu\_... denote income elasticities of demand of urban households. Frischurb denotes Frisch parameter for urban household and Frischrur denotes Frisch parameter for rural household. σva\_... denote elasticities of substitution between capital and labor. Qx\_... denote outputs. For sectoral notation see Appendix 6A.

Table 8F.13 Continued

	Qx_cmnmt	Qx_ciron	Qx_cfmet	Qx_cmach	Qx_cofic	Qx_celmc	Qx_crad	Qx_cmed	Qx_cmvec
σq_cmnmt	-0.73	σva_cpetr -0.77	σva_cpetr -0.78	σva_cpetr -0.74	σva_cpetr -0.72	σva_cpetr -0.76	σva_cpetr -0.71	σva_cpetr -0.72	σq_cmvec -0.74
σva_cpetr	-0.52	σva_ciron -0.53	σq_cfmet -0.36	σq_cmach -0.43	σq_cofic -0.42	σva_celmc -0.51	σva_crad -0.50	σva_cmed -0.49	σva_cpetr -0.53
σva_cmnmt	-0.14	σt_ciron -0.14	σva_cfmet -0.35	σva_cmach -0.29	σva_cofic -0.41	σq_celmc -0.21	σq_crad -0.30	σq_cmed -0.33	σva_ctrd -0.19
σq_ccnst	-0.13	σq_ciron -0.05	σt_cfmet -0.12	σt_cmach -0.22	σva_ctrd -0.08	σt_celmc -0.16	σt_crad -0.13	σt_cmed -0.11	σt_ctrns 0.05
σva_ctrd	-0.06	σva_core -0.05	σva_ctrd -0.06	σva_ctrd -0.12	σt_ccoke 0.08	σq_ccnst 0.05	σt_crad 0.05	σt_ccoke 0.05	σt_cmvec 0.06
σva_core	0.05	σt_ccoke 0.05	σt_ccoke 0.07	σt_ctrns 0.05	σva_ciron 0.11	σt_ctrns 0.06	σq_cobus 0.06	σva_ciron 0.07	σt_cmvec 0.07
σq_ctrns	0.05		σva_ciron 0.11	σt_ccoke 0.09		σva_ciron 0.06	σva_ciron 0.08		σva_ciron 0.09
σt_ccoke	0.06			σva_ciron 0.10		σt_ciron 0.07	σu_crad 0.08		σt_ccoke 0.10
σt_ctrns	0.08								
σva_ciron	0.10								

Note: σq... denote Armington elasticities of substitution, σt... denote elasticities of transformation, σr... denote income elasticities of demand of rural households, σu... denote income elasticities of demand of urban households. Frischurb denotes Frisch parameter for urban household and Frischrur denotes Frisch parameter for rural household. σva... denote elasticities of substitution between capital and labor. Qx... denote outputs. For sectoral notation see Appendix 6A.

Table 8F.13 Continued

	Qx_cotr	Qx_cfurn	Qx_crec	Qx_cel	Qx_cwat	Qx_ccnst	Qx_ctrd	Qx_chot	Qx_cretr
σq_cotr	-0.65	σva_cpetr -0.67	σva_cpetr -0.86	σq_cel -0.44	σq_ccnst -0.21	σq_ccnst -0.78	σva_cpetr -0.86	σva_ciron 0.06	σu_ctrns -0.05
σva_cpetr	-0.65	σq_cfurn -0.55	σva_ciron -0.41	σt_cel -0.40	σva_ccnst -0.05	σva_cpetr -0.47	σva_ctrd -0.27	σt_cmemb 0.07	σva_cretr 0.25
σva_cotr	-0.18	σva_cfurn -0.31	σt_ciron -0.11	σt_cpetr -0.11	σq_cobus 0.05	σva_ccnst -0.13	σt_ccoke -0.26	σu_cmemb 0.11	σt_cretr 0.26
σu_cotr	0.05	σt_cfurn -0.09	σva_core -0.06	σva_cchem -0.10	σt_ctrns 0.05	σt_ctrns 0.05	σq_cmach -0.08	σva_chot 0.21	σu_cretr 0.48
σt_cotr	0.06	σva_ctrd -0.06	σva_ctrns 0.05	σu_ctrns -0.08	σva_cwat 0.11	σt_ccnst 0.06	σq_cmvec -0.06	σt_chot 0.21	σva_cpetr 0.74
σva_ciron	0.08	σt_ccoke 0.05	σt_ctrns 0.05	σu_cobus -0.08	σt_cwat 0.18	σva_ciron 0.08	σva_ccoke -0.05	σu_chot 0.39	
		σt_cpetr 0.05		σt_cfood -0.06	σu_cwat 0.20	σu_ccnst 0.09	σt_ctrd 0.05	σva_cpetr 0.81	
		σt_ctrns 0.05		σt_ctrns -0.06	σva_cpetr 0.90		σva_ctrns 0.05		
		σt_cfurn 0.06		σq_ctrns 0.06			σq_ctrns 0.07		
		σu_cfurn 0.09		σt_ccoke 0.07			σq_cobus 0.07		
		σva_ciron 0.09		σva_cel 0.08			σu_ctrd 0.09		
				σt_ctrns 0.08			σt_ctrns 0.10		
				σq_cobus 0.10					
				σq_cpetr 0.12					
				σt_cel 0.42					
				σu_cel 0.55					

Note: σq... denote Armington elasticities of substitution, σt... denote elasticities of transformation, σr... denote income elasticities of demand of rural households, σu... denote income elasticities of demand of urban households. Frischurb denotes Frisch parameter for urban household and Frischrur denotes Frisch parameter for rural household. σva... denote elasticities of substitution between capital and labor. Qx... denote outputs. For sectoral notation see Appendix 6A.

Table 8F.13 Continued

	Qx_ccant	Qx_ctrns	Qx_ccom	Qx_cfini	Qx_cins	Qx_caux	Qx_cest	Qx_crent	Qx_ccomp	Qx_cres
$\sigma_u$ _ctrns	-0.07	$\sigma_{va}$ _cpetr -0.61	$\sigma_{va}$ _cpetr -0.79	$\sigma_q$ _cfini -0.63	$\sigma_q$ _cins -0.71	Frischurb -0.09	$\sigma_u$ _ctrns -0.12	$\sigma_{va}$ _crent -0.68	$\sigma_q$ _ccomp -0.67	$\sigma_t$ _cpa -0.74
$\sigma_u$ _cobus	-0.05	$\sigma_t$ _ctrns -0.49	$\sigma_q$ _ccom -0.34	$\sigma_{va}$ _cpetr -0.57	$\sigma_{va}$ _cpetr -0.50	Frischrur -0.05	$\sigma_u$ _cobus -0.10	$\sigma_{va}$ _cpetr -0.67	$\sigma_{va}$ _cpetr -0.66	$\sigma_{va}$ _cpetr -0.38
$\sigma_u$ _ccom	0.05	$\sigma_q$ _ctrns -0.34	$\sigma_t$ _ccom -0.29	$\sigma_{va}$ _cfini -0.12	$\sigma_{va}$ _cins -0.22	$\sigma_t$ _emin -0.05	$\sigma_u$ _cfood -0.06	$\sigma_{va}$ _ctrd 0.05	$\sigma_{va}$ _ccomp -0.08	$\sigma_q$ _cpa -0.21
$\sigma_q$ _cpetr	0.06	$\sigma_{va}$ _ctrns -0.28	$\sigma_{va}$ _ccom -0.20	$\sigma_t$ _cfini -0.11	$\sigma_{va}$ _ciron 0.05	$\sigma_{va}$ _cest 0.05	$\sigma_r$ _cfood -0.06	$\sigma_{va}$ _ciron 0.08	$\sigma_u$ _ccomp 0.05	$\sigma_t$ _ctrns -0.10
$\sigma_r$ _ccant	0.32	$\sigma_t$ _cagr 0.05	$\sigma_t$ _ctrns -0.09	$\sigma_t$ _ccoke -0.05	$\sigma_{va}$ _ctrd 0.06	$\sigma_{va}$ _cpetr 0.19	$\sigma_t$ _cpetr -0.06		$\sigma_{va}$ _ctrd 0.05	$\sigma_{va}$ _cpa -0.07
$\sigma_{va}$ _ccant	0.38	$\sigma_{va}$ _ctrd 0.06	$\sigma_q$ _ctrns -0.07	$\sigma_u$ _ctrns -0.05	$\sigma_r$ _cins 0.07	$\sigma_{va}$ _caux 0.96	$\sigma_u$ _cagr -0.06		$\sigma_{va}$ _ciron 0.08	$\sigma_q$ _ctrns -0.06
$\sigma_{va}$ _cpetr	0.53	$\sigma_q$ _cobus 0.06	$\sigma_u$ _ccom 0.06	$\sigma_{va}$ _ctrns 0.05	$\sigma_q$ _cobus 0.11		Frischurb -0.05		$\sigma_q$ _cobus 0.09	$\sigma_{va}$ _ctrns -0.06
$\sigma_u$ _ccant	0.60	$\sigma_r$ _ctrns 0.08	$\sigma_{va}$ _ctrd 0.06	$\sigma_q$ _cobus 0.05	$\sigma_u$ _cins 0.15		$\sigma_{va}$ _cpetr 0.07			$\sigma_u$ _cobus -0.05
		$\sigma_{va}$ _ciron 0.11	$\sigma_q$ _cobus 0.07	$\sigma_q$ _ctrns 0.05			$\sigma_q$ _cpetr 0.08			$\sigma_{va}$ _cagr 0.05
		$\sigma_u$ _ctrns 0.15	$\sigma_{va}$ _ciron 0.11	$\sigma_t$ _ctrns 0.07			$\sigma_r$ _cest 0.30			$\sigma_q$ _cobus 0.05
				$\sigma_{va}$ _ciron 0.08			$\sigma_u$ _cest 0.58			$\sigma_{va}$ _core 0.05
				$\sigma_r$ _cfini 0.15			$\sigma_{va}$ _cest 0.64			$\sigma_q$ _ccnst 0.05
				$\sigma_u$ _cfini 0.28						$\sigma_{va}$ _ctrd 0.08
										$\sigma_r$ _cpa 0.14
										$\sigma_{va}$ _ciron 0.14
										$\sigma_u$ _cpa 0.28

Note:  $\sigma_q$ ... denote Armington elasticities of substitution,  $\sigma_t$ ... denote elasticities of transformation.  $\sigma_r$ ... denote income elasticities of demand of rural households.  $\sigma_u$ ... denote income elasticities of demand of urban households. Frischurb denotes Frisch parameter for urban household and Frischrur denotes Frisch parameter for rural household.  $\sigma_{va}$ ... denote elasticities of substitution between capital and labor. Qx... denote outputs. For sectoral notation see Appendix 6A.

Table 8F.13 Continued

	Qx_cobus		Qx_cpa		Qx_ceduc		Qx_chelt		Qx_csew		Qx_cmemb		Qx_creer		Qx_coser		Qx_chh
σq_cobus	-0.66	σt_cpa	-0.67	σu_ctrns	-0.10	σu_ctrns	-0.09	σu_ctrns	-0.13	σu_ctrns	-0.09	σq_creer	-0.61	σu_ctrns	-0.07	Frischurb	-0.06
σva_cpctr	-0.52	σva_cpctr	-0.57	σr_cfood	-0.09	σu_cobus	-0.06	σq_cfood	-0.11	Frischurb	-0.06	σu_ctrns	-0.07	σq_cpctr	0.05	σu_ctrns	-0.06
σva_cobus	-0.25	σq_cpa	-0.20	σu_cobus	-0.06	σr_cfood	-0.06	σu_cobus	-0.10	σt_cpctr	-0.05	σq_cpubl	-0.05	σva_cest	0.05	σq_cpctr	0.07
σt_cobus	-0.06	σva_cpa	-0.07	σr_ctrns	-0.06	σt_cpa	-0.05	σva_cfood	-0.09	σu_cobus	-0.05	σu_cmmnt	0.05	σva_coser	0.20	σva_cpctr	0.17
σva_ctrd	0.05	σva_ctrd	0.05	σq_cpctr	0.07	σu_cins	0.05	σt_cpctr	-0.09	σr_cfood	-0.05	σva_ciron	0.07	σr_coser	0.25	σr_chh	0.29
σr_cobus	0.08	σt_ctrns	0.05	σva_cpctr	0.27	σu_ctex	0.05	σr_ctrns	-0.09	σu_chh	0.05	σva_creer	0.08	σu_coser	0.48	σu_chh	0.52
σva_ciron	0.09	σva_ciron	0.06	σr_ceduc	0.59	σu_ciron	0.05	σt_cfood	-0.08	σu_caux	0.05	σva_cpctr	0.21	σva_cpctr	0.77	σva_chh	0.68
σu_cobus	0.15	σr_cpa	0.13	σu_ceduc	0.73	σu_ccom	0.05	σva_ctrd	-0.07	σu_cotr	0.05	σr_creer	0.30				
		σu_cpa	0.26			σu_cofic	0.05	σva_ccoke	-0.05	σq_cpctr	0.07	σu_creer	0.61				
						σu_cpubl	0.05	σt_cpa	-0.05	σva_cest	0.09						
						σva_chelt	0.05	σu_cfish	0.05	σva_cpctr	0.12						
						σu_cfor	0.05	σu_cwat	0.05	σva_cmemb	0.25						
						σu_cmin	0.05	σr_chelt	0.05	σr_cmemb	0.41						
						σq_cpctr	0.06	σr_cwood	0.05	σu_cmemb	0.81						
						σr_chelt	0.39	σu_cotr	0.05								
						σva_cpctr	0.48	σu_cfmct	0.05								
						σu_chelt	0.74	σu_coser	0.05								
								σu_crent	0.05								
								σu_caux	0.05								
								σu_cretr	0.05								
								σu_chot	0.05								
								σr_cmemb	0.05								
								σu_ciron	0.05								
								σu_cpubl	0.05								
								σu_cmmnt	0.05								
								σu_chh	0.05								
								σu_cfor	0.05								
								σu_ccant	0.05								
								σu_cofic	0.05								
								σr_creer	0.05								
								σu_creer	0.05								
								σu_cmin	0.06								
								σu_ceduc	0.06								
								σu_cleat	0.06								
								σr_cest	0.06								
								σu_chelt	0.08								
								σu_cmemb	0.09								
								σq_cpctr	0.12								
								σu_cest	0.15								
								σva_cest	0.17								
								σva_csew	0.18								
								σr_csew	0.53								
								σu_csew	0.68								

Note: σq\_... denote Armington elasticities of substitution, σt\_... denote elasticities of transformation. σr\_... denote income elasticities of demand of rural households. σu\_... denote income elasticities of demand of urban households. Frischurb denotes Frisch parameter for urban household and Frischrur denotes Frisch parameter for rural household. σva\_... denote elasticities of substitution between capital and labor. Qx\_... denote outputs. For sectoral notation see Appendix 6A.

**Table 8F.14 Spearman correlation coefficients between exports and the most important parameters**

	Qe_cagr	Qe_cfor	Qe_cfish	Qe_cmin	Qe_cpetr	Qe_core	Qe_comin	Qe_cfood	Qe_ctob
σ <sub>va_cpetr</sub>	-0.62	σ <sub>va_cpetr</sub> -0.63	σ <sub>t_cfish</sub> -0.57	σ <sub>va_cpetr</sub> -0.68	σ <sub>t_cpetr</sub> 0.09	σ <sub>va_cpetr</sub> -0.66	σ <sub>va_cpetr</sub> -0.67	σ <sub>t_cfood</sub> -0.70	σ <sub>t_ctob</sub> -0.81
σ <sub>t_cagr</sub>	-0.53	σ <sub>t_cfor</sub> -0.62	σ <sub>va_cfish</sub> -0.44	σ <sub>t_cmin</sub> -0.47	σ <sub>q_cpetr</sub> 0.13	σ <sub>va_core</sub> -0.47	σ <sub>t_comin</sub> -0.66	σ <sub>va_cpetr</sub> -0.52	σ <sub>va_cpetr</sub> -0.48
σ <sub>va_cagr</sub>	-0.30	σ <sub>va_cfor</sub> -0.30	σ <sub>va_cpetr</sub> -0.37	σ <sub>va_cmin</sub> -0.42	σ <sub>va_cpetr</sub> 0.98	σ <sub>t_core</sub> -0.41	σ <sub>va_comin</sub> -0.16	σ <sub>va_cfood</sub> -0.16	σ <sub>t_ctob</sub> -0.07
σ <sub>u_cagr</sub>	-0.18	σ <sub>va_ctrd</sub> 0.06	σ <sub>u_cfood</sub> -0.09	σ <sub>va_ciron</sub> 0.06		σ <sub>va_ciron</sub> 0.13	σ <sub>t_ctrns</sub> 0.06	σ <sub>t_cfood</sub> -0.12	σ <sub>u_ctob</sub> -0.07
σ <sub>t_cagr</sub>	-0.12	σ <sub>va_ciron</sub> 0.08	σ <sub>t_cfood</sub> -0.09	σ <sub>q_ctrns</sub> 0.07			σ <sub>va_ciron</sub> 0.06	σ <sub>u_cfood</sub> -0.12	σ <sub>q_cobus</sub> 0.05
σ <sub>q_ctrns</sub>	0.05		σ <sub>u_cfish</sub> -0.05	σ <sub>t_ctrns</sub> 0.08				σ <sub>t_cobus</sub> 0.05	σ <sub>va_ciron</sub> 0.05
σ <sub>va_ctrd</sub>	0.05		σ <sub>va_ctrd</sub> 0.09					σ <sub>va_ctrd</sub> 0.05	σ <sub>q_ctob</sub> 0.05
σ <sub>va_ctrns</sub>	0.06		σ <sub>va_cfood</sub> 0.15					σ <sub>va_ciron</sub> 0.05	σ <sub>va_ctob</sub> 0.10
σ <sub>va_ciron</sub>	0.07		σ <sub>t_cfood</sub> 0.18					σ <sub>q_cfood</sub> 0.22	
σ <sub>q_cagr</sub>	0.07		σ <sub>q_cfood</sub> 0.20						
σ <sub>t_ctrns</sub>	0.08								

Note: σ<sub>q\_...</sub> denote Armington elasticities of substitution, σ<sub>t\_...</sub> denote elasticities of transformation, σ<sub>r\_...</sub> denote income elasticities of demand of rural households, σ<sub>u\_...</sub> denote income elasticities of demand of urban households. Frischurb denotes Frisch parameter for urban household and Frischrur denotes Frisch parameter for rural household. σ<sub>va\_...</sub> denote elasticities of substitution between capital and labor. Qe<sub>...</sub> denote exports. For sectoral notation see Appendix 6A.

**Table 8F.14 Continued**

	Qe_ctex	Qe_cwear	Qe_cleat	Qe_cwood	Qe_cpulp	Qe_cpubl	Qe_ccoke	Qe_cchem	Qe_crub
σ <sub>t_ctex</sub>	-0.64	σ <sub>va_cpetr</sub> -0.59	σ <sub>va_cpetr</sub> -0.68	σ <sub>va_cpetr</sub> -0.59	σ <sub>va_cpetr</sub> -0.64	σ <sub>t_cpubl</sub> -0.70	σ <sub>t_ccoke</sub> -0.69	σ <sub>va_cpetr</sub> -0.71	σ <sub>t_crub</sub> -0.68
σ <sub>va_cpetr</sub>	-0.54	σ <sub>t_cwear</sub> -0.57	σ <sub>va_cleat</sub> -0.60	σ <sub>va_cwood</sub> -0.49	σ <sub>t_cpulp</sub> -0.61	σ <sub>va_cpetr</sub> -0.62	σ <sub>va_cpetr</sub> -0.58	σ <sub>va_cchem</sub> -0.65	σ <sub>va_cpetr</sub> -0.61
σ <sub>va_ctex</sub>	-0.29	σ <sub>va_cwear</sub> -0.33	σ <sub>t_cleat</sub> -0.23	σ <sub>t_cwood</sub> -0.44	σ <sub>va_cpulp</sub> -0.30	σ <sub>va_cpubl</sub> -0.10	σ <sub>va_ctrd</sub> -0.21	σ <sub>t_cchem</sub> -0.05	σ <sub>va_ctrd</sub> -0.17
σ <sub>t_ctex</sub>	-0.12	σ <sub>t_cwear</sub> -0.08	σ <sub>va_ciron</sub> 0.07	σ <sub>va_ctrd</sub> -0.06	σ <sub>va_ctrd</sub> -0.09	σ <sub>va_ciron</sub> 0.07	σ <sub>va_ccoke</sub> -0.10	σ <sub>q_ccnst</sub> 0.05	σ <sub>va_crub</sub> -0.13
σ <sub>u_ctex</sub>	-0.12	σ <sub>u_cwear</sub> -0.07	σ <sub>q_cleat</sub> 0.08	σ <sub>q_ccnst</sub> 0.05	σ <sub>t_ccoke</sub> 0.08		σ <sub>va_ciron</sub> 0.10	σ <sub>va_ciron</sub> 0.09	σ <sub>q_crub</sub> 0.07
σ <sub>va_ciron</sub>	0.07	σ <sub>va_ciron</sub> 0.06		σ <sub>t_ccoke</sub> 0.06	σ <sub>q_cpulp</sub> 0.09				σ <sub>t_ccoke</sub> 0.09
σ <sub>q_ctex</sub>	0.26	σ <sub>va_ctrd</sub> 0.07		σ <sub>va_ciron</sub> 0.08	σ <sub>va_ciron</sub> 0.09				σ <sub>va_ciron</sub> 0.10
		σ <sub>q_cwear</sub> 0.26		σ <sub>q_cwood</sub> 0.17					

Note: σ<sub>q\_...</sub> denote Armington elasticities of substitution, σ<sub>t\_...</sub> denote elasticities of transformation, σ<sub>r\_...</sub> denote income elasticities of demand of rural households, σ<sub>u\_...</sub> denote income elasticities of demand of urban households. Frischurb denotes Frisch parameter for urban household and Frischrur denotes Frisch parameter for rural household. σ<sub>va\_...</sub> denote elasticities of substitution between capital and labor. Qe<sub>...</sub> denote exports. For sectoral notation see Appendix 6A.

Table 8F.14 Continued

	Qe_cmnmt	Qe_ciron	Qe_cfmct	Qe_cmach	Qe_cofic	Qe_celmc	Qe_crad	Qe_cmed	Qe_cmvec
$\sigma_{\text{cmnmt}}$	-0.73	$\sigma_{\text{cpetr}}$ -0.79	$\sigma_{\text{cpetr}}$ -0.62	$\sigma_{\text{cpetr}}$ -0.67	$\sigma_{\text{cofic}}$ -0.69	$\sigma_{\text{cpetr}}$ -0.73	$\sigma_{\text{cpetr}}$ -0.64	$\sigma_{\text{cpetr}}$ -0.61	$\sigma_{\text{cpetr}}$ -0.68
$\sigma_{\text{cpetr}}$	-0.58	$\sigma_{\text{ciron}}$ -0.46	$\sigma_{\text{cfmct}}$ -0.49	$\sigma_{\text{cmach}}$ -0.53	$\sigma_{\text{cpetr}}$ -0.47	$\sigma_{\text{celmc}}$ -0.55	$\sigma_{\text{crad}}$ -0.55	$\sigma_{\text{cmed}}$ -0.55	$\sigma_{\text{cmvec}}$ -0.63
$\sigma_{\text{ctrd}}$	-0.15	$\sigma_{\text{ciron}}$ -0.24	$\sigma_{\text{cfmct}}$ -0.45	$\sigma_{\text{cmach}}$ -0.33	$\sigma_{\text{cofic}}$ 0.07	$\sigma_{\text{celmc}}$ -0.22	$\sigma_{\text{crad}}$ -0.29	$\sigma_{\text{cmed}}$ -0.34	$\sigma_{\text{cmvec}}$ -0.16
$\sigma_{\text{cmnmt}}$	-0.07		$\sigma_{\text{ccke}}$ 0.05	$\sigma_{\text{ctrd}}$ -0.07	$\sigma_{\text{ctrd}}$ 0.10	$\sigma_{\text{celmc}}$ -0.07	$\sigma_{\text{crad}}$ -0.05	$\sigma_{\text{ctrd}}$ 0.08	$\sigma_{\text{cmvec}}$ -0.08
$\sigma_{\text{ciron}}$	0.08		$\sigma_{\text{ccnst}}$ 0.07	$\sigma_{\text{ccke}}$ 0.07	$\sigma_{\text{cofic}}$ 0.21	$\sigma_{\text{ciron}}$ 0.05	$\sigma_{\text{ciron}}$ 0.06	$\sigma_{\text{cmed}}$ 0.19	$\sigma_{\text{ciron}}$ 0.07
$\sigma_{\text{ccke}}$	0.09		$\sigma_{\text{cfmct}}$ 0.15	$\sigma_{\text{cmach}}$ 0.09		$\sigma_{\text{ccnst}}$ 0.05	$\sigma_{\text{cobus}}$ 0.06		
						$\sigma_{\text{ctrns}}$ 0.05	$\sigma_{\text{ctrd}}$ 0.08		
						$\sigma_{\text{ciron}}$ 0.07	$\sigma_{\text{crad}}$ 0.13		

Note:  $\sigma_{\text{...}}$  denote Armington elasticities of substitution,  $\sigma_{\text{...}}$  denote elasticities of transformation,  $\sigma_{\text{...}}$  denote income elasticities of demand of rural households,  $\sigma_{\text{...}}$  denote income elasticities of demand of urban households. Frischurb denotes Frisch parameter for urban household and Frischrur denotes Frisch parameter for rural household.  $\sigma_{\text{va...}}$  denote elasticities of substitution between capital and labor.  $Q_{\text{e...}}$  denote exports. For sectoral notation see Appendix 6A.

Table 8F.14 Continued

	Qe_cotr	Qe_cfurn	Qe_cel	Qe_ccnst	Qe_ctrd	Qe_ctrns	Qe_ccom	Qe_cfini	Qe_cins
$\sigma_{\text{cpetr}}$	-0.69	$\sigma_{\text{cpetr}}$ -0.60	$\sigma_{\text{cel}}$ -0.85	$\sigma_{\text{ccnst}}$ -0.75	$\sigma_{\text{ctrd}}$ -0.66	$\sigma_{\text{ctrns}}$ -0.68	$\sigma_{\text{ccom}}$ -0.70	$\sigma_{\text{cfini}}$ -0.80	$\sigma_{\text{cins}}$ -0.69
$\sigma_{\text{cotr}}$	-0.61	$\sigma_{\text{cfurn}}$ -0.57	$\sigma_{\text{cpetr}}$ -0.46	$\sigma_{\text{cpetr}}$ -0.57	$\sigma_{\text{cpetr}}$ -0.60	$\sigma_{\text{cpetr}}$ -0.62	$\sigma_{\text{cpetr}}$ -0.61	$\sigma_{\text{cpetr}}$ -0.50	$\sigma_{\text{cpetr}}$ -0.60
$\sigma_{\text{cotr}}$	-0.19	$\sigma_{\text{cfurn}}$ -0.36	$\sigma_{\text{ciron}}$ 0.06	$\sigma_{\text{ccnst}}$ -0.08	$\sigma_{\text{ctrd}}$ -0.28	$\sigma_{\text{ctrns}}$ -0.14	$\sigma_{\text{ccom}}$ -0.16	$\sigma_{\text{cfini}}$ -0.08	$\sigma_{\text{cins}}$ -0.16
$\sigma_{\text{ciron}}$	0.08	$\sigma_{\text{ciron}}$ 0.07		$\sigma_{\text{ciron}}$ 0.06	$\sigma_{\text{ccke}}$ 0.10	$\sigma_{\text{ctrd}}$ 0.05	$\sigma_{\text{ciron}}$ 0.06	$\sigma_{\text{cfini}}$ -0.06	$\sigma_{\text{ctrd}}$ 0.05
		$\sigma_{\text{cfurn}}$ 0.17		$\sigma_{\text{ccnst}}$ 0.13	$\sigma_{\text{ciron}}$ 0.10	$\sigma_{\text{ciron}}$ 0.06		$\sigma_{\text{ciron}}$ 0.05	$\sigma_{\text{ciron}}$ 0.06
						$\sigma_{\text{ctrns}}$ 0.08		$\sigma_{\text{ctrd}}$ 0.06	$\sigma_{\text{cobus}}$ 0.08
								$\sigma_{\text{cfini}}$ 0.13	$\sigma_{\text{cins}}$ 0.10

Note:  $\sigma_{\text{...}}$  denote Armington elasticities of substitution,  $\sigma_{\text{...}}$  denote elasticities of transformation,  $\sigma_{\text{...}}$  denote income elasticities of demand of rural households,  $\sigma_{\text{...}}$  denote income elasticities of demand of urban households. Frischurb denotes Frisch parameter for urban household and Frischrur denotes Frisch parameter for rural household.  $\sigma_{\text{va...}}$  denote elasticities of substitution between capital and labor.  $Q_{\text{e...}}$  denote exports. For sectoral notation see Appendix 6A.

Table 8F.14 Continued

	Qe_crent	Qe_ccomp	Qe_cobus	Qe_cpa	Qe_creer
$\sigma_{\text{crent}}$	-0.68	$\sigma_{\text{ccomp}}$ -0.75	$\sigma_{\text{cobus}}$ -0.74	$\sigma_{\text{cpa}}$ -0.76	$\sigma_{\text{creer}}$ -0.80
$\sigma_{\text{cpetr}}$	-0.67	$\sigma_{\text{cpetr}}$ -0.58	$\sigma_{\text{cpetr}}$ -0.48	$\sigma_{\text{cpetr}}$ -0.57	$\sigma_{\text{cpetr}}$ -0.52
$\sigma_{\text{ctrd}}$	0.05	$\sigma_{\text{ccomp}}$ -0.08	$\sigma_{\text{cobus}}$ -0.09	$\sigma_{\text{cpa}}$ -0.05	$\sigma_{\text{creer}}$ 0.05
$\sigma_{\text{ciron}}$	0.08	$\sigma_{\text{ctrd}}$ 0.05	$\sigma_{\text{cobus}}$ -0.09	$\sigma_{\text{ciron}}$ 0.06	$\sigma_{\text{ciron}}$ 0.06
		$\sigma_{\text{ciron}}$ 0.07	$\sigma_{\text{cobus}}$ -0.05		
		$\sigma_{\text{cobus}}$ 0.10	$\sigma_{\text{cobus}}$ 0.32		

Note:  $\sigma_{\text{...}}$  denote Armington elasticities of substitution,  $\sigma_{\text{...}}$  denote elasticities of transformation,  $\sigma_{\text{...}}$  denote income elasticities of demand of rural households,  $\sigma_{\text{...}}$  denote income elasticities of demand of urban households. Frischurb denotes Frisch parameter for urban household and Frischrur denotes Frisch parameter for rural household.  $\sigma_{\text{va...}}$  denote elasticities of substitution between capital and labor.  $Q_{\text{e...}}$  denote exports. For sectoral notation see Appendix 6A.



## Chapter 9      Conclusions and Suggestions for Future Research

### 9.1      Overview and Conclusions

This study is an experimental study that examines the effects of the oil export price increase in both theoretical and empirical contexts considering the Kazakhstani economy as a particular case, and discusses the effects of different macro closure rules. This study has been motivated by several factors. *First*, the theoretical literature on the effects of the oil export price increase is to some extent limited as it uses the Salter-Swan framework that does not incorporate two-way trade or it assumes the oil sector an enclave. *Second*, the empirical literature on the effects of the oil export price increase on Kazakhstan using an economy-wide framework is limited as well. To the best of my knowledge there are no studies available that quantify these effects on Kazakhstani economy in isolation, which, however, are necessary to study since the oil prices have been soaring in the recent decade and since Kazakhstan has large oil resources. *Third*, although macro closure rules lie at the core of the static CGE models and different macro closure rules might trigger different results, there is hardly anything in the literature that tests the effects of different macro closure rules in detailed models. The theoretical literature on macro closure rules remains limited, as it primarily considers only one-sector models, which obviously fail to incorporate fully the intricacies of real-life multisector planning models. As a result, most of the CGE modelers conventionally do not explain the rationale behind their choice of macro closure rules, although the results might be different under different macro closure rules. Thus, to overcome these limitations and test the effects of alternative macro closure rules, I developed several stylized models and applied Lofgren et al.'s (2002) model to the Kazakhstani economy. In what follows, I shortly summarize the contents of each chapter.

In Chapter 2, I *first* conducted a literature review of the theoretical literature on the Dutch disease. One of the main studies in this field is the study by Corden and Neary (1982), which examines the effects of the improvement in productivity in the energy sector on the structural adjustments in the economy. *Second*, I discussed the strengths and weaknesses of CGE modeling in general and provided a selective literature review of the CGE models on the effects of the expansion (or contraction) of the natural resource sector, aid, and alternative configurations of stabilization funds on the economy of a resource-rich country. *Third*, I reviewed the empirical literature on the effects of a resource boom on Kazakhstan. In general, the effects found in the empirical literature as a result of the expansion of a resource sector are consistent with the theoretical literature, which predicts that an expansion of the resource sector would most likely lead to real exchange rate appreciation and the expansion of nontraded and contraction of traded sectors.

The literature review shows that the studies on the effects of the oil export price increase on the Kazakhstani economy are scarce. To the best of my knowledge, there is no study available that addresses the effects of the oil export price increase on Kazakhstani economy in isolation using an economy-wide model. The IMF study (2004) on Kazakhstan, for instance, does not show the effects of the expansion of the crude petroleum and natural gas sector in isolation, but instead focuses on the possible path for the economy via imposing several types of shocks including the expansion of the crude petroleum and natural gas sector. The study is of

particular importance. However, it fails to explain in detail the economic mechanisms working behind the expansion of the crude petroleum and natural gas sector, as it considers the effects of different types of shocks simultaneously. Thus, further studies are necessary that address this issue in isolation. This served as one of the factors that motivated this study.

Chapter 3 discussed the historical development of the Kazakhstani economy since its independence until recently. It provided a rigorous discussion of the micro- and macroeconomic indicators during the recent decades.

I found that, overall, the Kazakhstani economy has been performing considerably well in terms of its both macro- and micro indicators in the recent decade. There has been sustained economic growth of above 9 percent starting from 2000. There are no signs of absolute deindustrialization in the economy, although there are signs of relative deindustrialization, which, however, might be due to transition-related reasons and not necessarily due to the presence of the Dutch disease. There has been a substantial increase in the exports of mineral products, in particular of oil. The government, overall, maintained prudent policy with respect to its expenditures. A large portion of the oil revenues has been saved in the National Fund of the Republic of Kazakhstan. The dependence of the public budget on oil revenues has been relatively low. The government has been very conservative with respect to external borrowing than private institutions that have accumulated large foreign debt. And finally, the trade balance was positive for most of the period considered, however, current account balance was in the red. But this should not raise concerns given that it was primarily driven by the payments of dividends to profit investors and by the payments of Kazakhstani banks.

Although the economy has been performing considerably well, given the growing importance of the crude oil and natural gas sector that the Dutch disease might occur in the future cannot be ignored. Therefore the effects of the expansion of the crude oil and natural gas sector on the economy should be studied in some detail.

In Chapter 4, I applied the 1-2-3 model of Devarajan et al. (1990) and developed a two-sector stylized model to shed light on the effects of the increase in the world price of an export good in general and the oil export price increase in particular on structural adjustments via incorporating two-way trade assumption into the models.

Using the 1-2-3-model of Devarajan et al. (1990), I showed that the extent of the import-competing effect, or, in other words, the extent of the substitution between domestic and imported goods defined by the Armington elasticity of substitution ( $\sigma_a$ ) between these goods, plays a major role in determining the outcomes of the model. I found that the real exchange rate always appreciates except for the case when domestic and imported goods are perfect substitutes, in which case no real exchange rate appreciation occurs. Imports rise unambiguously, however the response of domestic sales and exports depends on the extent of the import-competing effect. If the import-competing effect is low ( $\sigma_a < 1$ ), domestic sales will rise and exports will fall. They remain unchanged if  $\sigma_a = 1$ , but if  $\sigma_a > 1$ , domestic sales will fall but exports will rise.

Using the two-sector stylized model, I showed that, by and large, there are two key effects in the model, namely a balance-of-trade effect and an import-competing effect that trigger adjustments in the economy. The balance-of-trade effect shows the response of the economy to the oil export price increase depending on whether the economy runs a trade surplus or a trade deficit in the benchmark equilibrium, when the import-competing effect is set equal to

one. In general, the balance-of-trade effect reveals the conditions that cause the change in producers' real wages. The import-competing effect, under the assumption that trade is balanced, reveals the effect of the variation in the Armington elasticity of substitution between non-oil goods. It shows how different extents of the competition between imported and domestic goods might affect producers' real costs. In this model, the final outcomes will be defined as a result of the interactions of these two effects.

The effects of the balance-of-trade effect are as follows. In the case when the economy runs a trade deficit in the benchmark, the oil sector expands and the non-oil sector contracts. In the other case, when the economy runs a trade surplus, the non-oil sector expands and the oil sector contracts. The balance-of-trade effect operates through the total income accrued to the economy. If trade is in surplus, total income will rise, and hence domestic demand will increase. This in turn causes the non-oil sector to expand and the oil sector to contract. However, when trade is in deficit, income declines, as a result of which domestic demand declines. This in turn causes the oil sector to expand and the non-oil sector to contract.

The effects of the import-competing effect are as follows. With balanced trade, the response of the economy tends to be different under a low and high import-competing effects. Under a low import-competing effect, when non-oil goods are either gross or pure complements, an increase in the household income increases domestic demand, which in turn tends to undermine the oil sector, but boost the non-oil sector. Further, oil exports decrease unambiguously, non-oil imports increase unambiguously, and change in the domestic oil sales is ambiguous. Under a high import-competing effect, when goods are gross or pure substitutes, an increase in demand causes the non-oil sector to contract, but the oil sector to expand. Further, oil exports increase, non-oil imports increase unambiguously and the change in the domestic oil sales is ambiguous.

In general the model represents a good contribution to the literature on the Dutch disease effects. Unlike the core Dutch disease model (e.g., Corden and Neary, 1982), it is possible to expect that the non-oil sector expands and the oil sector contracts. However, although the model overall shows possible mechanisms that work behind the more complicated structure of real world interactions, it suffers from certain limitations. The model developed in Chapter 5 attempted to eliminate these limitations via including some other realistic features, namely some institutional characteristics underlined by the macro closure rules. In what follows, I shortly describe its main features and main results.

The model is structurally slightly more complex than the model in Chapter 4 because it incorporates, in addition, other realistic features sufficient to examine the effects of the oil export price increase under alternative macro closure rules. The model focuses on an oil and non-oil economy, as did the previous model in Chapter 4. The main difference between this model and the previous model is that this model assumes that oil sector production is entirely export-oriented, selling all of its oil produced abroad, whereas the non-oil sector supplies its output both abroad and domestically. Both the oil and non-oil sectors use capital and labor in production. Capital is assumed to be sector-specific, labor to be perfectly mobile. In addition to producers, the model considers three other representative agents: a household, the government and rest of the world. The household owns both sectors; hence, its income is composed of the sectors' revenues.

In addition to examining the effects of the oil export price increase on the economy, the model intends to initiate a discussion on whether the different macro closure rules might lead to different results and thus whether the rationale behind a macro closure rule should be clearly

stated. I examined the effects of the oil export price increase under four different macro closure rules, divided into two groups, labeled as exchange rate and foreign savings closure rules. The first group, the exchange rate closure rule group, contains only one closure rule: a neoclassical closure. The second group, the foreign savings closure rule group, consists of three closure rules. An analytical solution is provided for only two macro closure rules (the neoclassical and  $f(1)$  closure rules), whereas an empirical solution using artificial data is provided for all four macro closure rules. The macro closure rules tested here assume no rigidities; hence, there is no scope for disequilibrium here.

I found that there are three main effects that operate under the different macro closure rules: import-competing, transformability, and demand effects. The import-competing effect captures the impact of the variation in the Armington elasticity of substitution between the imported non-oil good and the domestic non-oil good. The transformability effect covers the impact of the variation in the elasticity of the transformation between the exported non-oil good and the domestic non-oil good. The demand effect captures the impact of pure non-oil composite consumption.

The results show that under the neoclassical closure rule, the import-competing and transformability effects tend to increase competition in the domestic markets and therefore decrease the extent of the real exchange rate appreciation, undermine the non-oil sector, and boost the oil sector. Whereas the demand effect tends to boost the non-oil sector, and undermine the oil sector. The dominating effect determines the final outcome. Under the  $f(1)$  closure rule, I again find that the import-competing and transformability effects favor the oil sector and undermine the non-oil sector, whereas the demand effect has ambiguous implications. Depending on some parameters in the benchmark, it might either boost or undermine the oil and non-oil sectors. It constitutes an important finding, given that in the core model of the Dutch disease (e.g., Corden and Neary, 1982) a spending effect unambiguously tends to boost the nontraded non-resource sector. Thus this model contributes to the literature on the Dutch disease effects.

In addition, Chapter 5 provides a numerical solution based on the data for an archetype economy. It imposes a 30-percent increase in the oil export price and examines its effect on the economy under alternative macro closure rules. In general, I find that the results across alternative macro closure rules are not too different, but they do differ. The main difference is in the extent of change in non-oil exports, non-oil domestic sales, non-oil imports, real exchange rate, and foreign savings, which comes from the different treatment of macroeconomic constraints. This supports an argument that the rationale for choosing a particular macro closure rule should be clearly stated. This is an important finding that is typically neglected in the literature.

Chapter 6 presented a social accounting matrix (SAM) that I constructed for Kazakhstan for 2003 and gave an overview of the economic situation in the corresponding year. This year was selected as a benchmark year for the Kazakhstani SAM because it was economically stable and because the most recent version of the input-output table available at the time I began compiling the SAM was for 2003.

The SAM was constructed using various sources. As a result, the micro SAM is unbalanced. To eliminate any inconsistencies, I used the RAS procedure to conduct the estimation, so that I could obtain a balanced SAM consistent with the prior information.

Chapter 7 examined the effects of the oil export price increase using the standard CGE model developed by Lofgren et al. (2002) under different macro closure rules, namely neoclassical, Johansen, and foreign closure rules, and two factor closure rules. The first factor closure rule assumes capital is sector-specific and labor is perfectly mobile, and the second factor closure rule assumes capital and labor are perfectly mobile. They are applied to test the effects of the 35-percent oil export price increase in the medium and long runs, respectively.

The results obtained across closure rules are qualitatively similar to the results obtained in Chapter 5. The overall aggregate output of oil increases, and the aggregate output of the non-oil good decreases. Imports of both categories of goods rise, oil exports rise, non-oil exports decline, domestic oil sales decline, and domestic non-oil sales rise. As in Chapter 5, I find that the foreign closure rule, of all the rules I use, seems to be the best response to the negative effects of the Dutch disease. It diminishes the extent of the appreciation of real exchange rate and has a favorable impact on exports. Overall, I find that the results across the closure rules are not too different, but they do differ. The sensitivity analysis with respect to selected parameters shows that the effects derived in Chapter 5 hold as well in Lofgren et al's (2002) model.

Chapter 8 provided a comprehensive and comparative analysis of the effects of the 35-percent oil export price increase under the alternative macro closure rules discussed in Chapter 7 using the complete version of the SAM for Kazakhstan. Overall, the results are consistent with those obtained earlier. Under the foreign closure rule most of the traded sectors' outputs and exports decrease less. Given the large sectoral aggregation used in Chapter 7, the two-sector version model did not include nontraded sectors. In the disaggregated version of the SAM, there are 14 nontraded sectors. Hence, unlike the previous models, I additionally found the response of the nontraded sectors' outputs to the oil export price increase. In the wake of the oil export price increase, total income increases, which in turn causes the nontraded sectors to expand.

Here again, I find the effects of the two-sector model developed in Chapter 5 valuable. Although the model does not consider the nontraded sectors explicitly, the results from the model can be easily extended for the nontraded sectors. For these sectors, because they are nontraded, the import-competing and transformability effects are zero, but the demand effect is substantial. Given that the import-competing and transformability effects tend to favor the oil sector and the demand effect, in general, tends to favor the non-oil sectors, the absence of the import-competing and transformability effects and the substantial demand effect explain why most of the nontraded sectors expanded in the wake of the oil export price increase. Thus, I might again conclude that the model developed in Chapter 5 reveals the effects that operate in the multisector models and represents a good contribution to the theoretical literature that is focused on the effects of the oil export price increase on the economy.

The effect of the closure rule becomes more pronounced in the multisector model. I find that under some macro closure rules, some sectors expand, but under the other macro closure rules, these sectors contract. For instance, the construction sector expands under the neoclassical closure rule, whereas it contracts under both the Johansen and foreign closure rules. This again supports an argument that the rationale behind a particular closure rule should be clearly stated, otherwise the inappropriate choice of the closure rule might trigger wrong inferences, which in turn might affect policy-making decisions.

Additionally, Chapter 8 carries out two sensitivity analyses. One to determine whether different magnitudes in the oil export price increase trigger a nonlinear response in the model,

and one to determine the robustness of the results with respect to the structural parameters. The first one indicates the presence of a nonlinear response. It appears that the nonlinear response has a convex shape, which implies that if the oil export price is doubled or decreased by one half relative to the benchmark simulation scenario, the results will not double or decrease by one half exactly, but will increase at a slower rate or decrease at a higher rate, respectively.

The systematic sensitivity analysis was performed using the Monte-Carlo approach. It appears that total real exports and outputs are relatively robust to different configurations of the parameters. The results show that the likelihood that the traded sectors expand is low but the likelihood that nontraded sectors expand is high. Whereas, in the considered set of configuration of parameters the crude petroleum and natural gas sector expands unambiguously. 80 percent of the solutions show that total real export change will be positive, if the oil export price increases. However, real exports of different sectors are very sensitive to the selected configuration of parameters. The systematic sensitivity analysis revealed the most important parameters that largely determine the variation in the variables of interest.

### **9.2 Some Limitations of the Study and Suggestions for Future Research**

Despite the comprehensive and rigorous treatment of the effects of the oil export price increase in this study both in the theoretical and empirical contexts, this study, as any other study, suffers from certain limitations. In this section, I provide some of the most relevant suggestions for a research in this area that can be conducted in the future.

This study is limited by considering equilibrium macro closure rules that are revealed by imposing economic mechanisms that tend to bring markets back to the equilibria after the initial equilibria are distorted. However, in reality the economy does not always reach equilibria in all markets simultaneously. Hence, the employment of disequilibrium macro closure rules would be worthwhile. This can be done, for instance, by employing Keynesian closure rules.

Although the exhaustibility of crude oil and the volatility of the oil export prices prove to be very important issues, I do not address them in this study. One of the main reasons that I avoided incorporating these issues into this study is that I am primarily interested in the effects of the oil export price increase in the medium run. However, considering the effects of the oil export price increase in the long run should entail the incorporation of these issues into the model. For these purposes, a fully dynamic model should be invoked that would address these issues in the coherent and systematic way.

Another drawback of the model that I used is that it is based on the assumption of constant returns to scale and perfect competition. Closer examination of structure in all sectors and incorporation of imperfect competition and economies of scales in some sectors might improve the predictions of the model.

Further, given that the values for the parameters used in the model are borrowed from the literature, econometric research is needed that would estimate these parameters using Kazakhstani data. This would help to improve the predictions of the model and reduce the range of uncertainty.

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## **Affirmation**

I hereby affirm that I have completed my doctoral thesis entitled “Effects of the Oil Export Price Increase on the Economy: Theoretical and Empirical Issues – A CGE Analysis of the Case of Kazakhstan” entirely on my own and unassisted, and that I have specially marked all of the quotes I have used from other authors as well as those passages in my work that are extremely close to the thoughts presented by other authors, and listed the sources in accordance with the regulations I have been given.

08.08.2010, Kiel

(Zhanna Kapsalyamova)



# CV

## Personal Data

First name, Surname : Zhanna Kapsalyamova

Place and Date of Birth : Temirtau (Kazakhstan), April 7, 1980

## Academic Education

2004 –2010 Doctoral Program, Quantitative Economics, Christian Albrechts University of Kiel, Kiel, GERMANY  
2006 – 2007 Advanced Studies in International Economic Policy Research, Kiel Institute for the World Economy,  
GERMANY  
2003 –2004 Exchange student, Ph.D program in Economics, Hacettepe University Ankara, TURKEY  
2002 –2003 Learning Turkish Language, Turkish Language Center Ankara, TURKEY  
2000 –2002 Master studies in International Economics (diploma with distinction)  
Yasawi Kazakh-Turkish International University Turkistan, KAZAKHSTAN  
1996 - 2000 Undergraduate studies in International Economics (diploma with distinction)  
Yasawi Kazakh-Turkish International University Turkistan, KAZAKHSTAN

## Experience

2010-to date Postdoctoral Researcher, Masdar Institute of Science and Technology, Abu Dhabi, UAE  
2002 –2004 Research Assistant, Yasawi Kazakh-Turkish International University (KTIU) Ankara, TURKEY  
02/2002 – 09/2002 Research Assistant, Yasawi Kazakh-Turkish International University Turkistan, KAZAKHSTAN  
2001- 2002 Specialist in General Department (Rectorate) , KTIU Turkistan, KAZAKHSTAN  
2000-2001 Specialist in Science and Publication Department, KTIU Turkistan, KAZAKHSTAN

## Scholarships

2008-2009 Erich-Schneider Scholarship, Christian Albrechts University of Kiel  
2005-2008 Scholarship of the German Academic Exchange Service  
2004-2005 Erich-Schneider Scholarship, Christian Albrechts University of Kiel  
2002-2004 Scholarship of the Ministry of Education of Kazakhstan for studies in Turkey  
1998-1999 South-Kazakhstani regional student scholarship “Orken”, for achievements in studies

## Teaching

*Subject:* Money, Credit and Banks Yasawi Kazakh-Turkish International University KAZAKHSTAN  
*Subject:* Introductory course on Econometrics for 1st year PhD students  
Christian Albrechts University of Kiel GERMANY

## Conferences

06/2010 GTAP Conference, Penang, MALAYSIA  
12/2007 The 6th International Conference of the Japan Economic Policy Association (JEPA) JAPAN  
11/2007 International Economic Conference on Trade and Industry, Universiti Utara MALAYSIA  
06/2005 The Workshop on Trade and Location, Kiel University GERMANY  
04/2002 The Workshop on Teaching Intermediate Course of Microeconomics, New Economic School, RUSSIA

**Research Publications**

*Analysis of External Debt Dynamics and Debt Loading for Economics of Kazakhstan*

// Collections of works of University staff, dedicated to 1500th anniversary of Turkistan, Turkistan, Kazakhstan 2001

*Estimation of External Debt Parameters for Kazakhstan*// International Research Conference, Summaries of Papers “Foreground ways of financial development and financial system liberalization in market conditions” (4-6, December, 2001) Moscow-Russia, 2001

*Environmental Security in External Debt Management* // International research conference “Republic of Kazakhstan: 10 years of independence” (4-5, June 2001) Kyzylorda, Kazakhstan, 2001

*Environmental Aspects in External Debt Management* // International research conference “Kazakhstan within 10 years: Problems of Economics, Education and Science”, Summaries of Papers, 23-24, November, Turkistan, Kazakhstan, 2001

*Pass-through of exchange rate to domestic prices: the case of four East-Asian countries* // the International Journal of Economic Policy Studies. Volume 3 (2008) article 3 with Siok Kun Sek

**Ongoing Research**

Discussion on Closure Rules in Static CGE Models

Effects of the Oil Price Increase on Kazakhstani Economy in a Static CGE Framework

Terms of Trade Shocks Effects on Structural Adjustments in Kazakhstan in Dynamic CGE Framework

**Research Interests**

- International Economics and Trade
- Computable General Equilibrium Modeling
- Economic Growth
- Time Series Analysis

**Languages**

Kazakh (native), Russian (fluent), English (fluent), Turkish (fluent), German (intermediate)

**Computer Skills**

GAMS, E-Views, Microsoft Office, Matlab