

Essays on Social Policy in Germany: Analyses Based on Survey and Simulated Data

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List of Abbreviations

AHES	Australian Household Expenditure Survey
AME	Average Marginal Effect
ASID	Old-Age Security in Germany
CP	Custodial Parent
CPI	Consumer Price Index
EVS	German Sample Survey of Income and Expenditure
GCC	German Civil Code
GSC	German Social Code
GTC	German Personal Income Tax Code
HRS	Health and Retirement Study
MEA	Mannheim Research Institute for the Economics of Aging
MEM	Marginal Effect at the Mean
NCP	Non-Custodial Parent
NL	New Laender
NP-UEP	Non-Pensioner Units of Elderly Persons
OECD	Organisation for Economic Co-operation and Development
OL	Old Laender
P-UEP	Pensioner Units of Elderly Persons
PAYG	Pay-As-You-Go
PUI	Public Unemployment Insurance
SAVE	Savings Behavior and Old-Age Provision in Germany
SHI	Statutory Health Insurance
SNI	Statutory Nursing Insurance
SOEP	German Socio-Economic Panel
SPI	Statutory Pension Insurance
SSL	Solitary Surcharge Law
UEB II	Unemployment Benefit II
UEP	Units of Elderly Persons

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Chapter 1

Introduction

Social Policy in Germany faces a multitude of challenges which are mostly induced by demographic and social-cultural changes of society. This thesis is concerned with the economic consequences of two current aspects of the changing structure of the German society. On the one side this relates to the aging of society, and on the other side to the shifting household composition from ‘classic’ families to single-parent households.

The aging of society directly influences the functioning of the German old-age pension system as it is primarily based on a pay-as-you-go (PAYG) system. An appropriate indicator to unveil the necessity to modify the German pension system in order to maintain old-age security is the projected evolution of the ratio ‘pensioners to employees’, the so-called ‘Rentnerquotient’. Whereas in 2007 the ratio amounted to 0.54, thus about two employees had to finance one pensioner, BÖRSCH-SUPAN and WILKE (2007) predict a ratio ranging between 0.70 and 0.95 for the year 2030.¹ Hence, in the worst case scenario one employee has to finance almost one pensioner.

The changes in the family structure pose challenges in so far as empirical investigations reveal that single-parent households have a significant higher probability of being poor than ‘classic’ families (see e.g. DEUTSCHER BUNDESTAG, 2008; GRABKA and FRICK, 2010). Figures of the GERMAN FEDERAL STATISTICAL OFFICE (2010) reveal that single-parent households are firmly established in the German society. Moreover, their share in households with children is continuously increasing. Whereas in 1996 about 14% of the households with children were single-parent households, this share has risen steadily to 19% in 2009. Hence, against the background of the increasing share of separated family forms, and concerning the fact that this group is prevalently threatened by poverty, it should be examined whether the current tax-benefit system is organized appropriately in order to treat those persons fairly. From a methodological point of view the thesis provides empirical investigations that are based on the analysis of survey and simulated data.

¹The predicted ratio depends on different demographic scenarios. For further information see BÖRSCH-SUPAN and WILKE (2007).

Part I of the thesis relates to two different aspects of the impact of the aging of society on old-age security. As already mentioned above, the German old-age pension system is primarily based on a pay-as-you-go (PAYG) system, thus population aging has caused and will cause fiscal imbalances threatening the financial situation of the elderly. Hence, the matter of old-age security has gained more and more attention. This becomes obvious when considering the multitude of reforms that have been undertaken in the last decade, in order to maintain old-age security in Germany. Those reforms will affect both income level as well as income composition of the elderly. As an example, the rise in retirement age and the introduction of the ‘factor of sustainability’² may lower the relative importance of payments from statutory pensions, whereas the importance of income from employment will rise. At the same time, it is to be expected that the relative importance of capital income will rise as well, since politicians intend to strengthen self-reliance for old-age income by implementing subsidies for private provision (e.g. ‘Riester’ and ‘Rürup’ pension schemes). Thereby individuals, even though belonging to the same age cohort, will react in different ways.

In Chapter 2 and Chapter 3 we analyze the evolution of the financial situation, the changes in income composition as well as the evolution of income distribution of the elderly. In doing so, we are allowed to reveal the impact of different income components on inequality. Subsequently, we are able to deduce possible inequality trends for the previous years.

Although both chapters are similar from a methodological point of view, they differ in the data used. Whereas we use the German Sample Survey of Income and Expenditure (EVS) in Chapter 2 and cover the period 1978–2003, we use the German Socio-Economic Panel (SOEP) in Chapter 3 and analyze the period since the German reunification. Hence, the examination of both datasets enables us to analyze a wide period, reaching from the late 70s up to current years. In so far, Chapter 2 and 3 can be regarded as current completion of previous works on the income distribution of the elderly in Germany (see BIEWEN, 2004; BÖRSCH-SUPAN ET AL., 2001; MÜNICH, 2001; SCHWARZE and FRICK, 2000). We focus our investigation on persons that are 55 years and older and provide their price-adjusted annual pre-tax-post-transfer equivalent incomes. Throughout the examination we distinguish between elderly from the Old and New Federal States, and additionally, between elderly drawing their main income from retirement or employment, respectively. We use the Gini index as measure of inequality since it is additively decomposable into single income components. With the Gini elasticity we are able to quantify the impact of changes of the relative share of single income components on inequality (see LERMAN and YITZHAKI, 1985; RAO,

²The ‘factor of sustainability’ (*Nachhaltigkeitsfaktor*) was introduced by the ‘Pension Scheme Sustainability Law’ (*RV Nachhaltigkeitsgesetz*) of 2004 and came into effect in 2005. It is a mathematical term that was incorporated in the pension formula in order to account for the increasing relation of pensioners to employees. In the long-term the introduction will lower replacement rates by about 15 percentage points (see GRIMM, 2005).

1969). In doing so, to the best of our knowledge, we are the first who apply this method in order to analyze the income distribution of the elderly in Germany. Furthermore, we test the statistical significance of our results with the bootstrap method.

As mentioned above, reforms will cause a shift of old-age provision from the public to the private sector. In Chapter 4 it is examined, whether the German market for private old-age provision is organized efficiently. Thereby, we focus on market failure caused by adverse selection in the private pension insurance market. Adverse selection in the market for private old-age provision is a concern, since premiums rise and eventually become prohibitively high for low-risk individuals who are pushed out of the market.

Methodologically, we use the 2005 wave of the survey data on Savings Behavior and Old-Age Provision in Germany (SAVE) and estimate a probit model of insurance holdings. Referring to the research question, subjective life-expectancy is the core determinant in investigating the uptake of private old-age insurance. Furthermore, the selected estimation model allows us to determine further determinants for the uptake. Following the theory of YAARI (1965) we additionally take into consideration time and risk preferences. Furthermore, we contribute to the discussion on the low uptake of annuities, the ‘annuity puzzle’, by taking into account further determinants like substitutive old-age provision from the public pension system, financial literacy and socio-economic characteristics.³

Referring to the applicability of the results, Chapter 4 gives deeper insights into the functioning of the market for private pension insurance. This knowledge facilitates to provide a more efficient configuration of the market and helps to direct incentives to those persons, which under current terms, are less willing to make provisions for old-age.

Part II of the thesis is dedicated to the economic consequences of the changing family structure from ‘classic’ families to single-parent households. Whereas a wide body of literature is concerned with the gender-specific changes in well-being after marital dissolution (see e.g. BURKHAUSER ET AL., 1991; GADALLA, 2009; HOLDEN and SMOCK, 1991; MCKEEVER and WOLFINGER, 2001), this work aims at analyzing the distributive justice between the divorced or legally separated parents. To the best of our knowledge, the study presented in Chapter 5 is the first, which investigates the question of distributive justice between formerly related or married by revealing the equity perceptions that are inherent in the prevailing tax-benefit system.⁴

From a methodological point of view, we generate an artificial dataset that comprises various combinations of separately living families. That means, in each case of a separated family we consider a single household of the non-custodial parent and

³For further literature on the discussion on the ‘annuity puzzle’ see e.g. BROWN ET AL. (2008a); INKMANN ET AL. (2011) or more detailed Sections 4.2 and 4.4.

⁴This methodology has been predominantly used with respect to analyze the distributive justice inherent in tax-benefit without taking into consideration the support legislation, see e.g. BÖNKE and EICHFELDER (2010); MUELLBAUER and VEN (2002, 2004).

an associated single-parent household of the custodial parent, which comprises one to three dependent children. Our analysis is done for varying annual gross incomes of both households. Thereby we assume that the non-custodial parent draws an income at least as high as that of the custodial parent. Hence, starting-point of the analysis is the pre-tax-pre-transfer income of both considered households. Income undergoes a simulation model of the German tax-benefit system, including the tax legislation, contributions to social security, public transfers in form of the unemployment benefit II and private transfers in form of support payments. Referring to the support payments we consider two scenarios, the non-custodial parent is liable for (a) ‘child support only’ or (b) ‘child and spousal support’. Finally, we obtain the disposable incomes of the concerned households.

We analyze the equity perceptions by means of equivalence scales which are employed in two different applications. On the one side, we reverse the commonly applied equivalence scale methodology by assuming that horizontal equity is satisfied by the German tax-benefit system. Hence, we investigate the equity perceptions by means of implicit equivalence scales that are inherent in the interplay of the comprehensive tax-benefit system. Finally, the derived implicit equivalence scales provide those relations of disposable incomes that ensure equal living standards for both parents. On the other side, we employ equivalence scales in order to provide distributive justice in a more ‘applied’ manner. We investigate to what extent the actual support payments differ from those payments that would be ‘recommended’ by commonly used equivalence scales.

Besides its contribution to the political debate on distributive justice, Chapter 5 contributes to the economic literature by applying the framework of implicit equivalence scales to the context of support payments. Additionally, Chapter 5 is engaged in the discussion on an appropriate design of equivalence scales.⁵

⁵For a further discussion on the design of equivalent scales see e.g. MUELLBAUER and VEN (2002).

Part I: Old-Age Security

Chapter 2

Incomes and Inequality in the Long Run: The Case of German Elderly¹

2.1 Introduction

This study investigates the long-run changes in the income distribution for the elderly in Germany, defined as persons age 55 and older. Amongst other reasons, this era is interesting as several fundamental reforms of the statutory German pay-as-you-go (PAYG) pension system have been undertaken. Indeed, in the late 1970s, the German PAYG system was expanded to one of the World's most generous ones, both in terms of replacement rates and early retirement provisions. Population ageing, German reunification and high unemployment rates, however, caused a raising fiscal imbalance. Policy makers reacted. The eligibility age has been raised, replacement rates have been lowered, and subsidies have been introduced to stimulate private old-age provisions.² The reforms undertaken and in preparation have direct implications for the financial situation of Germany's actual and future elderly. They also change the legal framework under which individual labour supply, retirement, savings or fertility decisions are made (see e.g. BERKEL and BÖRSCH-SUPAN, 2003; BÖRSCH-SUPAN ET AL., 2003; FROMMERT and HEIEN, 2006; HIRTE, 2002; SCHNABEL, 1999; SIDDIQUI, 1997).

Taking stock of the changes in the income distribution of the elderly in the last decades can provide a useful yardstick for taxing the costs and benefits of the ongoing reform process. Already, several empirical studies have provided information on the shape of the income distribution for the elderly, including BIEWEN (2004); BÖRSCH-SUPAN ET AL. (2001); MÜNNICH (2001); SCHWARZE and FRICK (2000) and others. This study builds on this literature, extending information along two dimensions.

First, we seek to investigate, in detail, the financial situation of elderly persons and its intertemporal evolution. Throughout the period under consideration, we provide

¹The chapter is a slightly modified version of BÖNKE ET AL. (2010).

²An overview of the 12 major reforms between 1977 and 2003 can be found in Appendix A, Table A.3.

price-adjusted annual pre-tax-post-transfer equivalent incomes and factor shares, the percentage shares of different income components in elderly households' budgets. Second, we examine the intertemporal evolution of income inequality, measured by the Gini index, and how changes in factor shares and income components' distributions contribute to overall inequality. Whereas most previous literature lacks information on statistical inference, we use the bootstrap method to test for statistical significance of the results. By means of the Gini elasticity, we further assess the impact of a marginal equiproportionate change in income from a specific component on overall inequality (see LERMAN and YITZHAKI, 1985; RAO, 1969). Such estimates are of particular interest for policy-makers who are concerned about the relationship between policy-driven changes of peoples' budgets and the income distribution. All results are provided for four subpopulations of elderly people. Two criteria define these subpopulations: region of residence (New vs. Old German Federal States, or 'Laender') and (non)receipt of an old-age PAYG or civil servant pension. The database underlying our calculations are six cross-sections of the German Sample Survey of Income and Expenditure (EVS), harmonized in an intertemporally consistent manner.

The remainder of this chapter is organized as follows. Section 2.2 introduces the database and describes its processing. Section 2.3 explains inequality measures, the bootstrap method and statistical test procedures employed. Empirical results are provided in Section 2.4, and Section 2.5 concludes.

2.2 Construction of the Database

Our study is based on six EVS cross-sections, collected between 1978 and 2003. The EVS is provided by the German Federal Statistical Office, conducted at five-year intervals, and contains representative household income, wealth and consumption data.³ Cross-section size ranges between 40,000 and 60,000 household units. Persons living in communal establishments and institutions, and households exceeding a specific income cut-off are not included.⁴

From each cross-section, only persons of age 55 and older enter our database. A minority of elderly subjects is not considered as a result of two technical reasons. First, intrafamilial relationships remain unclear in some cases. This especially applies to households with three or more elderly persons. Second, income components sometimes cannot be assigned to the household members without extra assumptions. To reduce resulting inaccuracies, only the first two elderly persons from every EVS household unit are included in the database.⁵ The eliminated fraction of elderly persons is small, for example 4.3% in 2003. Another concern is over- and undersampling. Compared with the German micro-census, the EVS oversamples people in their 70s on the account of subjects age 80 and older. To fit the German microcensus statistics, we have adjusted EVS sample weights according to the entropy-based minimum information loss principle.⁶

Income reported throughout this paper is annual pre-tax-post-transfer equivalent income expressed in year 2003 prices,⁷ comprising (a) *employment income*: earned income and self-employed income; (b) *retirement income*: retirement pensions from public pension fund, civil servant's pensions, company pensions, and other pensions; (c) *transfer income*: benefits related to former employment, social assistance, family-related benefits and other transfers; (d) *investment income*; and (e) *other income*.⁸ *Other income* is a residual that cannot unambiguously be assigned to the previous four income components. Pre-tax-post-transfer income is the sum of all individual incomes

³For further information, see GERMAN FEDERAL STATISTICAL OFFICE (2005).

⁴According to the GERMAN FEDERAL STATISTICAL OFFICE (2005), the number of top-income households participating in the EVS is not sufficient to provide reliable information. Monthly household disposable income cut-offs (in prices of 2003) are as follows: 18,811 € in 1978; 18,546 € in 1983; 17,497 € in 1988; 20,788 € in 1993; 19,131 € in 1998; 18,000 € in 2003.

⁵Within the questionnaire of the EVS, each household can chose the ranking of the household members on its own. This applies to all household members except for the first person in the household, which has to be the head of the household. However, for the EVS this does not automatically mean that this person is the main earner. From every household we keep the first two persons of age 55 years and older in our dataset. Hence, we cannot give generalities on the position or function of the elderly which comprise our households. Our decision to keep the first two persons of age 55 years and older is driven by the assumption that households rank their members according to their contributions to household income.

⁶Details on the reweighting procedure are outlined in Appendix A.

⁷Incomes have been adjusted using consumer prices, employed consumer price indices (CPI) are provided in Appendix A, Table A.1.

⁸The income components are constructed from several EVS variables. See Appendix A, Table A.2 for details.

of elderly persons living in a household unit plus a fraction of incomes reported at the household level only, with individual incomes of other household members being ignored. The fraction is given by the number of elderly persons divided by the number of all persons in the original household unit. Finally, to make incomes of elderly household units with one member and two members comparable, pre-tax-post-transfer incomes are equalized using the OECD-modified equivalence scale.⁹ The resulting pre-tax-post-transfer equivalent income is assigned to each elderly person in the household unit.¹⁰

⁹The OECD-modified equivalence scale assigns a value of 1.0 to the one-member household, an increment of 0.5 to each additional adult household member. See OECD (2009) for details.

¹⁰The suitability of different income concepts from a welfare perspective is discussed in PODDER and CHATTERJEE (2002). Benefits and strengths of our income concept are discussed in Appendix A.

2.3 Methodological Considerations

2.3.1 Measurement of Inequality

Inequality estimates provided throughout this paper consider sampling weights. Hence, if an elderly person lives in a household unit with a sampling weight of 50, in all calculations this observation is considered 50 times. Our inequality measure is the Gini index, G , twice the area between the Lorenz curve and the equality line. The Gini index gives a relative small weight to 'outliers', i.e. very high incomes, so that biases in the inequality estimates driven by top coding should be small. The Gini index is additively decomposable by income components (see LERMAN and YITZHAKI, 1985; RAO, 1969).¹¹ Such a decomposition is of interest as previous and future pension reforms most likely will alter the composition of elderly peoples' budgets.

To better understand the role that changes in factor shares of different income components i ($i = 1, \dots, I$) have for inequality, Gini elasticities are provided. The Gini elasticity of i , η_i , gives the percentage change in the Gini index with respect to an equiproportionate marginal change in equivalent income of i . It is defined as

$$\eta_i = \frac{\partial G}{\partial \mu_i} \frac{\mu_i}{G} = \frac{1}{G} \left[\frac{\mu_i}{\mu} (C_i - G) \right] \quad \text{with} \quad \sum_{i=1}^I \eta_i = 0 \quad (2.1)$$

where μ is mean equivalent income, μ_i is mean equivalent income of income component i and C_i is the respective concentration coefficient. If the elasticity is negative (positive), an increase in mean equivalent income of i reduces (increases) inequality. From (2.1) it can be seen that an income component affects the Gini index through two different channels: (a) through its relative share in total equivalent income, $w_i = \frac{\mu_i}{\mu}$; and (b) through its spread over the range of total equivalent income, C_i . Let $\Delta G_i = G_t - G_{t-x}$ denote the difference in Gini indices for periods t and $t-x$, and let w_i and C_i be functions of time, then

$$\Delta G_t \approx \sum_{i=1}^I \left(\frac{C_{i,t} + C_{i,t-x}}{2} \right) \Delta w_{i,t} + \sum_{i=1}^I \left(\frac{w_{i,t} + w_{i,t-x}}{2} \right) \Delta C_{i,t} \quad (2.2)$$

for discrete periods.¹² The sum $\sum_{i=1}^I \left(\frac{C_{i,t} + C_{i,t-x}}{2} \right) \Delta w_{i,t}$ is the change of the Gini index as a result of changes in the shares of different income components in total equivalent income, the *share effect*. The second term, $\sum_{i=1}^I \left(\frac{w_{i,t} + w_{i,t-x}}{2} \right) \Delta C_{i,t}$, quantifies the impact of changes in concentration coefficients on overall inequality, the *concentration effect* (see PODDER and CHATTERJEE, 2002).

¹¹Our presentation is a brief summary of the analysis outlined in PODDER (1993); PODDER and CHATTERJEE (2002), where further details are provided.

¹²PODDER and CHATTERJEE (2002, p. 8) have suggested an averaging of the two periods' estimates as a 'compromise - and for a better approximation', as changes can be measured both with respect to period t and $t-x$.

2.3.2 Bootstrap Inference and Inequality

To test for statistical significance of results, we compute standard errors and confidence intervals using the bootstrap method (see MILLS and ZANDVAKILI, 1997). From each cross-section of elderly people, we draw, with replacement, 100 random samples.¹³ Each random sample has as many sampling units as the original cross-section, and each sampling unit in the original cross-section has the same probability of being selected. Hence, the bootstrap does not account for differences in sampling weights. Sampling weights, however, are accounted for whenever an income or inequality measure is computed, be it for the calculation of point estimates from the original database or for the calculation of standard errors and confidence intervals from bootstrap samples (see BIEWEN, 2002).¹⁴

Our particular interest is the assessment of statistical significance of intertemporal changes. The test procedure is illustrated by means of the Gini index, but applies analogously to other measures derived in the empirical part of this paper. Per cross-section, we compute 100 values of the Gini index, one per random bootstrap sample. This gives 100 Gini differences for each two consecutive cross-sections, $\Delta G_t^{*b} = G_t^{*b} - G_{t-5}^{*b}$, where $b = 1, \dots, 100$. The difference in the Gini point estimates derived from the original EVS database is $\Delta \hat{G}_t = \hat{G}_t - \hat{G}_{t-5}$. Hence, suppressing the period subscripts, HALL (1994) percentile confidence interval for the Gini difference is $Pr(2\Delta \hat{G} - \Delta G_{high}^* \leq \Delta G \leq 2\Delta \hat{G} - \Delta G_{low}^*) = \frac{(100-2\alpha)}{100}$. The estimate ΔG_{high}^* is the 2.5th upper and ΔG_{low}^* is the 2.5th lower percentile in the bootstrap distribution of differences and ΔG is the true difference. The change in the Gini index is statistically significant if the Hall confidence interval does not include zero (see ATHANASOPOULOS and VAHID, 2003).

The statistical significance of differences within a cross-section, for example in Gini indices for pensioners and non-pensioners, can be assessed through examining overlaps of confidence intervals for group-specific estimates.¹⁵

Our bootstrap approach does not account for the fact that the EVS is a stratified sample. In case of stratification, sampling units are selected from the overall population according to household characteristics. Typically, population units belonging to a stratum consisting of many observations have a smaller probability of being included

¹³It has to be criticized that the chosen number of 100 repetitions is not large enough to yield a confidence interval that is close to the ideal bootstrap confidence interval (see ANDREWS and BUCHINSKY, 2002). In our follow-up analysis, which can be found in Chapter 3, we therefore decided to apply a number of 1000 repetitions.

¹⁴A technical equivalent analysis with two cross-sections of Australian Household Expenditure Survey (AHES) data is conducted by ATHANASOPOULOS and VAHID (2003). Like the EVS, the AHES is a representative cross-sectional database derived from stratified multistage probability sampling.

¹⁵It has to be mentioned that the applied method to test the statistical significance of differences of the bootstrap distribution, by examining overlaps of confidence intervals for group-specific estimates, yields a higher power than the assigned 5 percent level of significance. Hence, the conducted test is stricter than required. An examination of the bootstrap distribution of the mean differences would be more appropriate.

in the original database than units belonging to another stratum with few observations. Then the selected sample is not a random sample. To account for this feature of our database, bootstrap samples alternatively could be drawn independently within each stratum and then be merged. Unfortunately, the EVS does not contain a variable indicating the strata associated with sample points. The EVS stratification variables, however, are documented (see GERMAN FEDERAL STATISTICAL OFFICE, 2005): region of residence, household type, social situation of the household head and net income class. Using the stratification variables, we have identified the stratum to which each sample point belongs to.¹⁶ Drawing bootstrap samples independently within each stratum does not change our conclusions, and so we refrain from reporting results from the second and focus on the estimates of the first bootstrap approach.¹⁷

¹⁶As an example, this gives 3,060 strata for year 2003. The German Federal Statistical Office merges neighbouring strata if sample size in a stratum is small. Unfortunately, to the best of our knowledge, a guideline on the merging procedure for neighbouring strata is publicly not available. Hence, our stratification can only be seen as an approximation.

¹⁷ATHANASOPOULOS and VAHID (2003) come to similar conclusions. Estimates are summarized in Appendix A, Tables A.4–A.9.

2.4 Empirical Results

The empirical results are edited in two parts. First, we show how the financial situation of the elderly, measured by equivalent incomes and compositions of household budgets, has changed over time. The second part deals with the issue of income inequality. Results are tested for statistical significance, and provided for four different subsamples of the elderly population. For grouping individuals, two partitioning criteria are applied: region of residence (New vs. Old German Federal States) and the receipt or non-receipt of an old-age PAYG or civil servant pension. If an elderly person draws a 'classic' old-age pension (in form of a PAYG or civil servant's pension), she is assigned to the subsample of pensioners, else to the non-pensioners.¹⁸ This distinction does not mean that retirement income of non-pensioners is zero. Besides old-age PAYG or civil servant pensions, retirement income also includes company pensions and pensions due to special regulations (i.e. compensations and assistance for war victims, survivors' pensions and pensions due to early retirement).

Table 2.1: Unweighted number of household units (EVS)

Year	Total Sample Size	Pensioners		Non-pensioners	
		OL	NL	OL	NL
2003	17,104	10,054	2,596	3,581	873
1998	18,643	10,232	3,272	4,150	989
1993	15,334	9,019	1,990	3,150	1,175
1988	16,498	12,408		4,090	
1983	16,349	11,950		4,399	
1978	19,277	14,532		4,745	

Note: Unweighted number of household units with elderly members.
Source: German Sample Survey of Income and Expenditures (1978–2003).

Unweighted numbers of observations by subsample are provided in Table 2.1. The unweighted total number of household observations ranges between 15,334 and 19,277 per cross-section. Smallest is the group of non-pensioners resident in the New Laender (NL) in 2003, i.e. 873 observations.

2.4.1 The Financial Situation of Elderly People

The intertemporal evolution of mean pre-tax-post-transfer equivalent incomes is summarized in Figure 2.1. The left-hand graph refers to pensioners; the right-hand graph to non-pensioners. Dark dashed lines connect point estimates of average CPI-adjusted

¹⁸Of course, several other options for differentiation exist, such as labour market withdrawal, lack of earnings, receipt of retirement incomes and age. The empirical implications are discussed in SMEEDING (1990). For Germany, see also MÜNNICH (2001) and MÜNNICH and ILLGEN (2000).

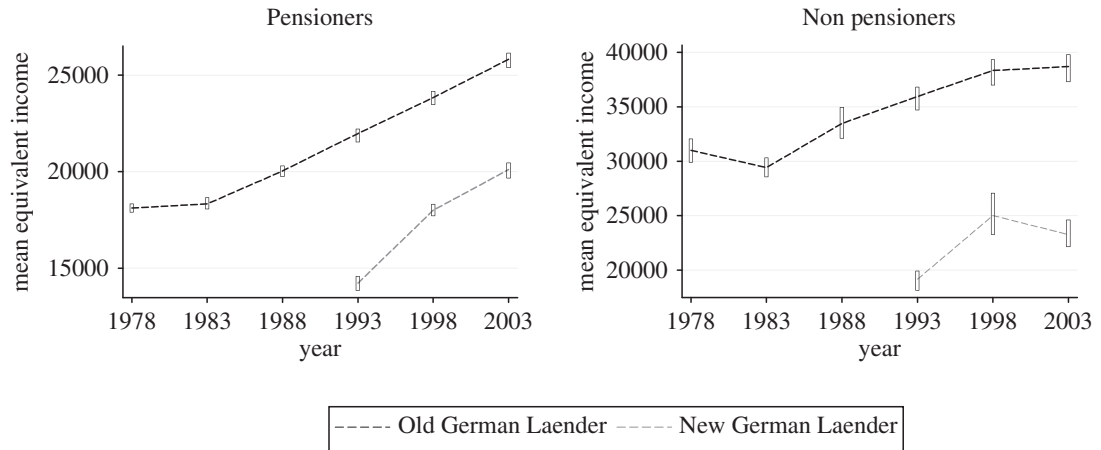


Figure 2.1: Evolution of mean equivalent income (EVS)

equivalent incomes for elderly persons resident in the Old Laender (OL), whereas light dashed lines connect the respective numbers for people living in the NL. Vertical bars indicate 95% Hall confidence intervals given by $(2\hat{\mu} - \mu_{high}^*, 2\hat{\mu} - \mu_{low}^*)$, where $\hat{\mu}$ is the point estimate of average equivalent income, μ_{high}^* is the 2.5th upper and μ_{low}^* is the 2.5th lower percentile of the bootstrap distribution. Test statistics on the statistical significance of intertemporal equivalent income changes are provided in Table 2.2. More precisely, Table 2.2 provides the pair-wise differences in point estimates of annual average equivalent incomes for periods t and $t - 5$, $\Delta\hat{\mu}$, together with Hall confidence intervals of differences, $(2\hat{\mu} - \mu_{high}^*, 2\hat{\mu} - \mu_{low}^*)$. An asterisk indicates that an intertemporal change between two consecutive periods is significant at the 5% level.

For pensioners, Figure 2.1 in combination with Table 2.2 indicates a substantial and significant improvement of the financial situation in both parts of Germany. In the OL, average CPI-adjusted equivalent income grew by 42.56% (17.51%) from 1978 to 2003 (1993 to 2003). Moreover, income growth rates were rather stable, about 8% over a five-years period, except between 1978 and 1983 when it was lower. In the NL, incomes grew even faster, 41.37% from 1993 to 2003, indicating a substantial catch-up process. However, still in year 2003, the regional divide in equivalent incomes is substantial: annual equivalent income for pensioners in the OL is about 5,714€ higher.

Also non-pensioners experienced significant income growth, yet at lower rates: 24.78% (7.62%) from 1978 (1993) to 2003 in the OL compared with 21.40% from 1993 to 2003 in the NL. Moreover, the growth path is more volatile. Indeed, it tends to mimic the German business cycle.¹⁹ In this sense, the German pension system can be seen as an insurance device against cyclical income variations. Another point is remarkable. Like their counterparts in the OL, incomes of NL non-pensioners stagnate between 1998 and 2003, and the income divide between the regions remains fairly high, amounting to 15,423€ in year 2003.

¹⁹For longitudinal data on the German business cycle see BUCH ET AL. (2004).

Table 2.2: Intertemporal changes in CPI-adjusted mean equivalent incomes (EVS)

	OL				NL				
	1983 %1978	1988 %1983	1993 %1988	1998 %1993	2003 %1998	1998 %1993	2003 %1998	1998 %1993	2003 %1998
Pensioners									
$\Delta \hat{\mu}$	215	1,708*	1,938*	1,866*	1,981*	3,774*	2,108*	3,774*	2,108*
(95% CI)	(-158; 566)	(1,381; 2,105)	(1,552; 2,259)	(1,440; 2,418)	(1,559; 2,438)	(3,250; 4,244)	(1,526; 2,642)	(3,250; 4,244)	(1,526; 2,642)
Non-pensioners									
$\Delta \hat{\mu}$	-1,580*	4,041*	2,482*	2,379*	359	5,856*	1,756	5,856*	1,756
(95% CI)	(-3,213; -294)	(2,292; 5,459)	(646; 4,231)	(1,089; 3,846)	(-1,350; 1,909)	(4,124; 7,573)	(-4,271; 390)	(4,124; 7,573)	(-4,271; 390)

Notes: $\Delta \hat{\mu}$ is the observed change in mean equivalent income between periods t and $t - 5$. All numbers rounded to full € amount. CI denotes Hall's confidence interval. *Change is significantly different from zero at the 5% level.

Source: German Sample Survey of Income and Expenditures (1978–2003).

The previous paragraph concluded that all four subsamples experienced significant income growth, but at rather different rates. We proceed by complementary evidence on the composition of elderly peoples' budgets. In Figure 2.2, four graphs are provided, one for each subsample. Within each graph, lines connect point estimates of factor shares for subsequent periods. Vertical bars indicate 95% Hall confidence intervals of factor shares. Tests of statistical significance of intertemporal change in the shares are provided in Table 2.3. Here, point estimates of pair-wise differences between the factor shares of periods t and $t - 5$, $\Delta\hat{w}_i$, and Hall confidence intervals derived from the bootstrap samples are provided.

We comment on pensioners first. The most important income source for pensioners is retirement income. It never accounts for less than 60% of all income in the OL, and always around 80% in the NL. In the OL, the share of investment income significantly increased until year 1998 at the expense of the retirement income factor share. From 1998 to 2003 the picture reverts, so that OL pensioners' factor shares all in all changed only little. Factor shares in the NL are more volatile. Although changes tend to mitigate one another over time, the figures indicate increasing factor shares of investment and other income to the account of retirement and employment income.

For non-pensioners, incomes from employment make up most of their budget: around 70-80% in the OL compared with around 50-60% in the NL. In the OL, the share has significantly decreased during the observation period, especially in the 1990s. There is no specific single income component compensating for this loss. Most robust is the upwards trend in the share of investment income until 1998. In the NL, most remarkable is the sharp decline in the share of retirement incomes between 1993 and 1998 in combination with an increasing share of transfer income. Indeed, surging unemployment rates in the NL since reunification prompted the government back then to introduce special early retirement regulations of limited duration (i.e. 'Altersübergangsgeld' and 'Altersteilzeit') for people age 55 and older. This explains the high factor share of retirement income for NL non-pensioners in 1993. These regulations eventually phased out and many elderly started receiving 'classic' old-age pension in later years, contributing to the declining factor share of retirement income for NL non-pensioners between 1993 and 1998. The rising share of transfer income between 1993 and 1998 and the decline in the share of employment income between 1998 and 2003 reflect the rise in unemployment rates in Germany's newly formed Laender.

2.4.2 Income Inequality

The results from the previous section indicate a substantial financial improvement for an average elderly person over the last decades. Yet, is it the case that incomes grew equally fast at the bottom, in the middle or at the top of the income distribution? We start off looking at the issue of income inequality by means of the Gini index. As

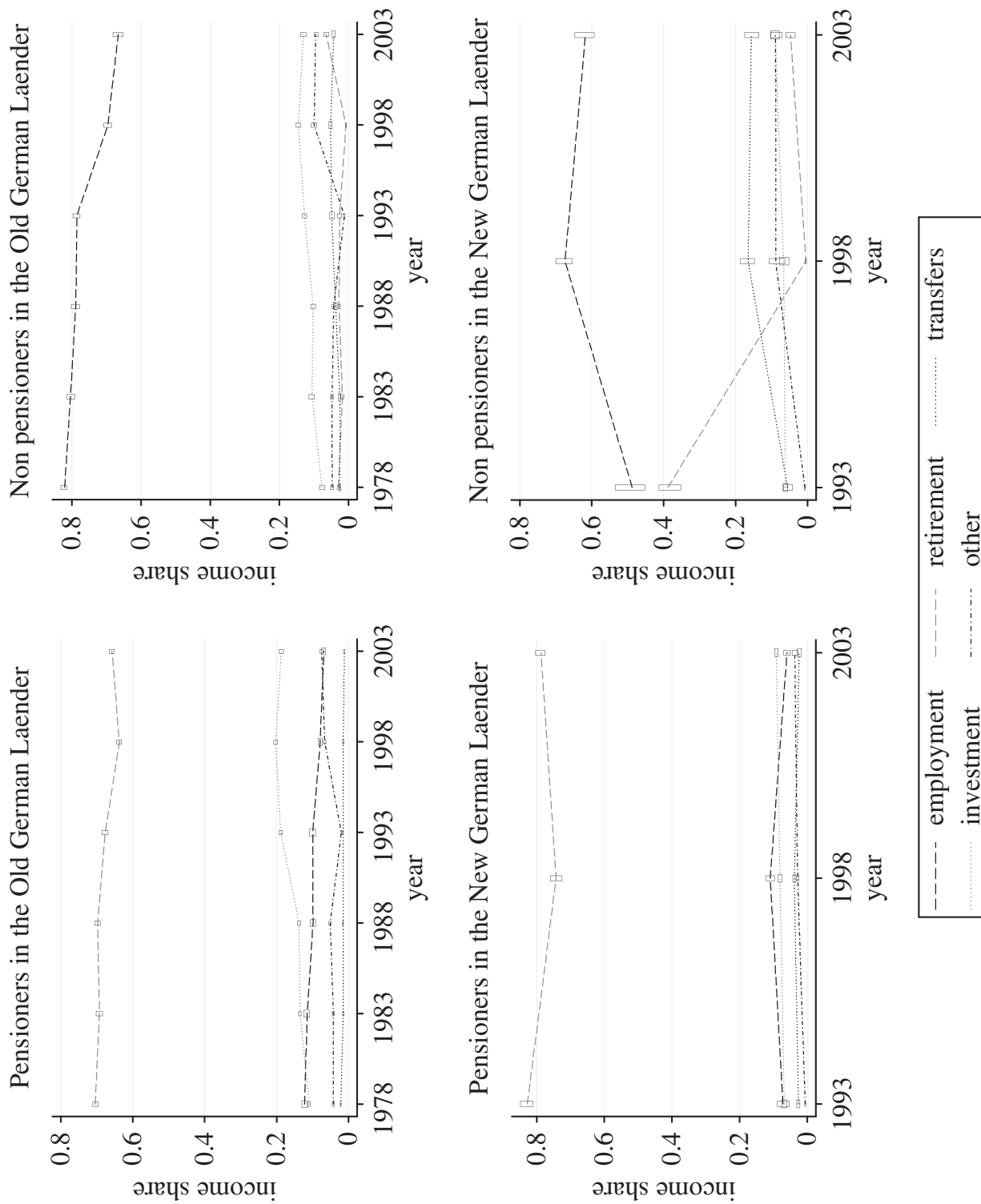


Figure 2.2: Evolution of income shares (EVS)

Table 2.3: Intertemporal changes in factor shares (EVS)

	OL					NL		
	1983 %1978	1988 %1988	1993 %1988	1998 %1993	2003 %1998	1998 %1993	2003 %1998	2003 %1998
Pensioners								
Employment								
$\Delta\hat{w}_1$	-0.75	-1.59*	0.07	-2.05*	-1.04*	3.75*	-4.97*	
(95% CI)	(-1.99; 0.36)	(-2.82; -0.53)	(-1.01; 1.21)	(-3.12; -1.08)	(-1.74; -0.32)	(1.44; 5.78)	(-6.70; -3.20)	
Retirement								
$\Delta\hat{w}_2$	-1.18	0.50	-2.13*	-3.92*	2.05*	-8.49*	4.46*	
(95% CI)	(-2.28; 0.72)	(-0.73; 1.63)	(-3.31; -0.99)	(-5.04; -2.68)	(0.95; 3.17)	(-10.97; -6.50)	(2.12; 6.67)	
Transfers								
$\Delta\hat{w}_3$	-0.68*	0.00	0.01	-0.03	-0.29*	1.21*	-1.41*	
(95% CI)	(-0.96; -0.38)	(-0.19; 0.22)	(-0.21; 0.25)	(-0.25; 0.22)	(-0.56; -0.05)	(0.62; 1.89)	(-2.17; -0.58)	
Investments								
$\Delta\hat{w}_4$	2.62*	0.21	5.13*	1.38*	-1.57*	1.27*	1.07*	
(95% CI)	(1.95; 3.19)	(-0.44; 0.69)	(4.44; 5.86)	(0.63; 2.08)	(-2.38; -0.71)	(0.27; 2.24)	(0.22; 1.93)	
Other								
$\Delta\hat{w}_5$	-0.01	0.87*	-3.08*	4.62*	0.85*	2.25*	0.85	
(95% CI)	(-0.40; 0.39)	(0.46; 1.33)	(-3.56; -2.85)	(4.22; 5.04)	(0.24; 1.59)	(1.82; 2.65)	(-0.11; 1.64)	
Non-pensioners								
Employment								
$\Delta\hat{w}_1$	-1.68*	-1.53	-0.34	-8.94*	-3.03*	18.71*	-5.70*	
(95% CI)	(-3.35; -0.54)	(-2.78; 0.25)	(-2.07; 1.38)	(-10.70; -7.52)	(-4.71; -1.19)	(14.31; 22.50)	(-9.96; -2.09)	
Retirement								
$\Delta\hat{w}_2$	-1.15*	0.99*	-0.16	-1.87*	5.78*	-38.35*	4.28*	
(95% CI)	(-1.62; -0.52)	(0.41; 1.48)	(-0.84; 0.64)	(-2.47; -1.25)	(4.92; 6.51)	(-40.89; -34.77)	(2.89; 5.70)	
Transfers								
$\Delta\hat{w}_3$	-0.03	1.26*	1.12*	0.29	-0.89*	10.96*	-0.88	
(95% CI)	(-0.41; 0.48)	(0.56; 1.78)	(0.33; 1.82)	(-0.63; 1.21)	(-1.49; -0.37)	(8.35; 12.95)	(-4.17; 1.98)	
Investments								
$\Delta\hat{w}_4$	2.82*	-0.26	2.46*	1.79*	-1.44*	0.55	2.29*	
(95% CI)	(1.75; 4.05)	(-1.61; 0.62)	(1.33; 3.79)	(0.71; 2.80)	(-2.61; -0.47)	(-1.02; 1.78)	(0.57; 4.17)	
Other								
$\Delta\hat{w}_5$	0.05	-0.46	-3.08*	8.74*	-0.43	8.13*	0.02	
(95% CI)	(-0.61; 0.76)	(-1.27; 0.35)	(-3.75; -2.70)	(7.91; 9.63)	(-1.57; 0.40)	(5.60; 9.98)	(-3.00; 3.08)	

Note: $\Delta\hat{w}_i$ denotes the observed change in the share of income component i in total household income between periods t and $t - 5$.

CI denotes Hall's confidence interval. *Change is significantly different from zero at the 5% level.

Source: German Sample Survey of Income and Expenditures (1978–2003).

a relative index, it remains invariant under equiproportionate variation in income, it increases under variations in favour of the 'rich' and it decreases under variations in favor of the 'poor'.

Point estimates of Gini indices and Hall confidence intervals, $(2\hat{G} - G_{high}^*, 2\hat{G} - G_{low}^*)$, are provided in Figure 2.3. Different bar widths are chosen to ensure that confidence intervals are visually distinguishable.

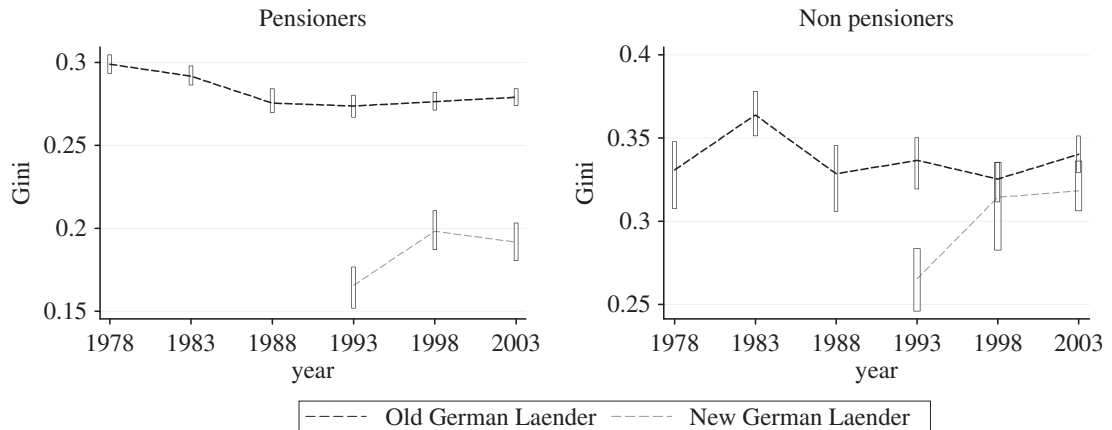


Figure 2.3: Evolution of income inequality (EVS)

Gini indices for the OL indicate little change in inequality levels for pensioners and non-pensioners from 1978 onwards. For pensioners, the index slightly drops by 2 percentage points from 29.89% in 1978 to 27.89% in 2003. For non-pensioners, the index increased by less than 1 percentage point from 33.07% in 1978 to 34.01% in 2003. In the NL, the picture differs: Gini indices increased considerably between 1993 and 1998. However, inequality at the start of the 1990s was fairly low: in 1993 the Gini index for pensioners was 16.56%, echoing a flat income distribution in the former German Democratic Republic. For non-pensioners, it is 26.51% in 1993 compared with 31.78% in 2003. Indeed, overlaps of confidence intervals indicate convergence of inequality levels for non-pensioners across the two regions. As opposed to this, for pensioners the inequality divide between the two regions remains substantial. In 2003, Gini indices still differ by more than 8.5 percentage points (OL: 27.89%; NL: 19.16%).

The test statistics for pair-wise differences in Gini indices for consecutive observation periods in Table 2.4 corroborate the descriptive picture. Table 2.4 summarizes differences in Gini point estimates for consecutive periods, $\Delta\hat{G}$, together with Hall confidence intervals of these differences. We first comment on the results for the OL. Concerning pensioners, our tests indicate a significant decline of the Gini index for the period 1978–1988. From then onwards, differences are insignificant. The distribution of non-pensioners' incomes exhibits more variation. The Gini index rises significantly from 1983 to 1988 and from 1998 to 2003, before falling significantly between 1988 and 1993. Moreover, intertemporal differences in Gini indices are quantitatively larger. For the NL, test statistics reveal a sharp and significant rise in inequality from 1993 to 1998,

Table 2.4: Intertemporal changes in Gini indices (EVS)

	OL				NL				
	1983 %1978	1988 %1983	1993 %1988	1998 %1993	2003 %1998	1998 %1993	2003 %1998	1998 %1993	2003 %1998
Pensioners									
$\Delta \hat{G}$	-0.73*	-1.62*	-0.18	0.27	0.26	3.25*	-0.66		
(95% CI)	(-1.38; -0.03)	(-2.43; -0.78)	(-0.94; 0.64)	(-0.45; 1.02)	(-0.57; 1.04)	(1.75; 5.29)	(-2.10; 0.93)		
Non-pensioners									
$\Delta \hat{G}$	3.31*	-3.54*	0.81	-1.12	1.41*	4.91*	0.39		
(95% CI)	(0.54; 5.39)	(-6.23; -1.19)	(-1.57; 3.67)	(-2.83; 0.31)	(0.16; 3.10)	(1.30; 7.64)	(-2.72; 3.77)		

Note: $\Delta \hat{G}$ is the observed change in the Gini index between periods t and t-5. CI denotes Hall's confidence interval. *Change is significantly different from zero at the 5% level.

Source: German Sample Survey of Income and Expenditures (1978-2003).

and stagnation since then. This is equally true for both pensioners and non-pensioners.

We can conclude from the above results that inequality changed rather little during the observation period in the OL, but that it increased rapidly from 1993 to 1998 in the NL. As a result, for non-pensioners, our findings indicate a convergence of inequality levels in the OL and NL.

For better understanding group-specific inequality trends, we proceed with a breakdown of income inequality by income components. More precisely, Figure 2.4 depicts point estimates of concentration coefficients together with confidence intervals (indicated by vertical bars) at different points in time. Again, differences in bar width are chosen to offset Hall confidence intervals visually. As a bivariate inequality measure, the concentration coefficient of i gives the inequality in i related to a household ranking by pre-tax-post-transfer equivalent income. We find similar results for all four subsamples. Concentration coefficients for employment income, investment income and other incomes are positive, and hence distributed in favour of elderly persons belonging to the upper part of the income distribution. By contrast, negative concentration indices for transfer and retirement income reveal that both are distributed in favour of elderly people with low pre-tax-post-transfer equivalent income.

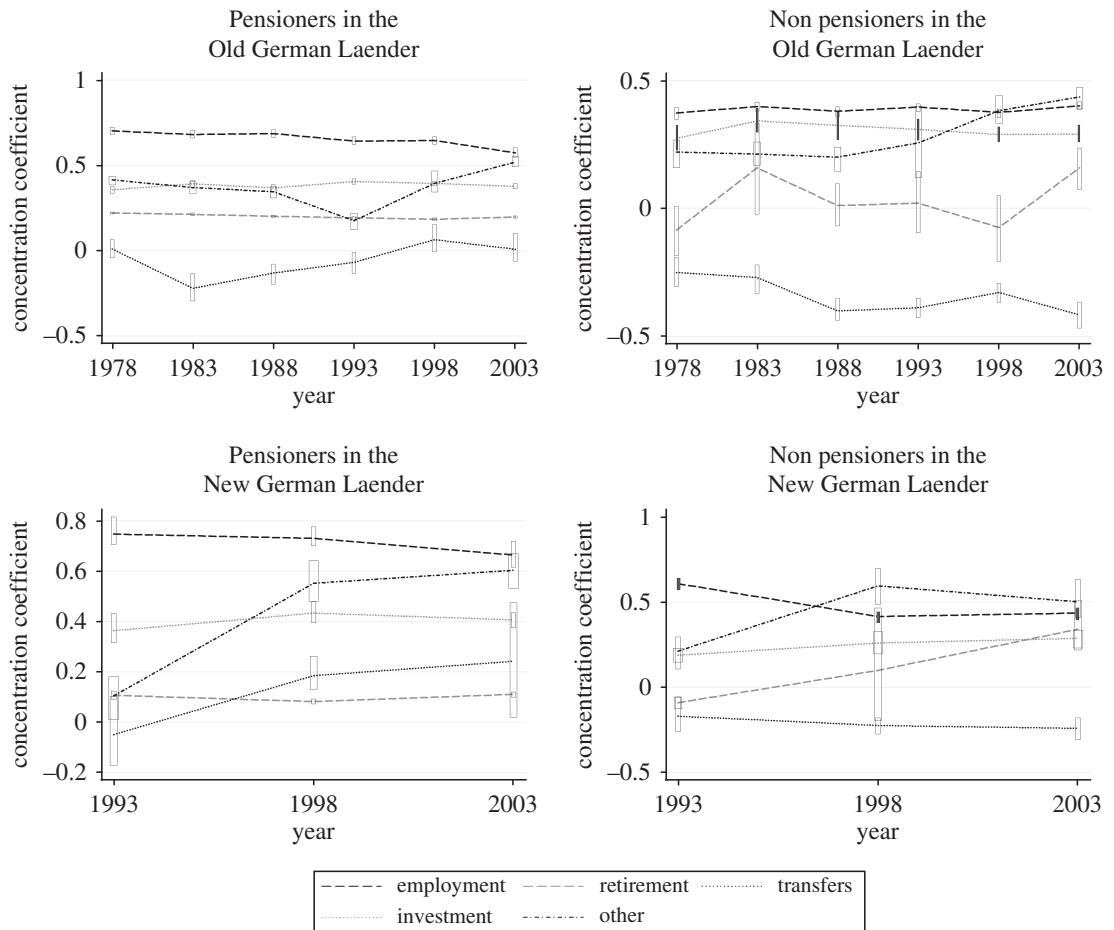


Figure 2.4: Evolution of income concentration (EVS)

Table 2.5: Intertemporal changes in concentration coefficients (EVS)

	OL				NL			
	1983 %1978	1988 %1983	1993 %1988	1998 %1993	2003 %1998	1998 %1993	2003 %1998	2003 %1998
Pensioners								
Employment								
$\Delta\hat{C}_1$	-2.12	0.54	-4.40*	0.36	-7.30*	-1.65	-6.62*	-6.62*
(95% CI)	(-5.30; 0.95)	(-3.17; 3.83)	(-7.46; -1.24)	(-2.59; 4.08)	(-10.87; -3.83)	(-8.21; 4.47)	(-14.36; -1.47)	(-14.36; -1.47)
Retirement								
$\Delta\hat{C}_2$	-0.82	-1.12*	-0.94*	-0.78	1.26*	-2.48*	2.87*	2.87*
(95% CI)	(-1.63; 0.18)	(-2.07; -0.36)	(-1.98; -0.10)	(-2.07; 0.38)	(0.17; 2.16)	(-4.53; -0.44)	(1.52; 4.25)	(1.52; 4.25)
Transfers								
$\Delta\hat{C}_3$	-23.09*	8.96	6.25	13.31*	-5.61	23.42*	5.71	5.71
(95% CI)	(-33.35; -11.86)	(-1.01; 18.21)	(-0.46; 15.19)	(3.89; 24.29)	(-16.78; 5.05)	(5.44; 40.27)	(-21.43; 26.68)	(-21.43; 26.68)
Investments								
$\Delta\hat{C}_4$	3.54*	-2.40*	3.71*	-1.07	-1.76	7.01	-2.74	-2.74
(95% CI)	(0.65; 6.57)	(-4.80; -0.07)	(1.32; 6.74)	(-3.18; 1.07)	(-3.98; 0.58)	(-0.96; 14.16)	(-8.79; 1.33)	(-8.79; 1.33)
Other								
$\Delta\hat{C}_5$	-4.54*	-2.44	-16.99*	21.96*	12.42*	44.70*	5.17	5.17
(95% CI)	(-9.08; -0.47)	(-7.10; 1.18)	(-23.13; -10.65)	(13.36; 30.51)	(3.67; 18.35)	(35.30; 55.98)	(-3.27; 15.20)	(-3.27; 15.20)
Non-pensioners								
Employment								
$\Delta\hat{C}_1$	2.47	-1.81	1.61	-2.05	2.50*	-19.24*	2.00	2.00
(95% CI)	(-1.12; 5.43)	(-5.04; 0.91)	(-1.07; 4.55)	(-4.63; 0.28)	(0.56; 5.04)	(-24.08; -15.46)	(-3.62; 6.08)	(-3.62; 6.08)
Retirement								
$\Delta\hat{C}_2$	24.34*	-14.74	0.95	-9.53	23.40*	18.94	24.20	24.20
(95% CI)	(1.57; 46.78)	(-33.60; 5.10)	(-13.22; 14.65)	(-27.93; 5.97)	(7.70; 38.49)	(-11.78; 56.54)	(-2.59; 54.91)	(-2.59; 54.91)
Transfers								
$\Delta\hat{C}_3$	-1.96	-13.06*	1.25	5.97	-8.79*	-5.40	-1.65	-1.65
(95% CI)	(-10.46; 5.73)	(-20.34; -4.10)	(-4.75; 6.67)	(-0.34; 11.24)	(-15.77; -2.21)	(-17.08; 4.88)	(-9.91; 5.64)	(-9.91; 5.64)
Investments								
$\Delta\hat{C}_4$	6.83*	-1.73	-1.61	-1.99	0.19	7.14	2.72	2.72
(95% CI)	(0.48; 16.11)	(-8.43; 5.75)	(-7.64; 6.13)	(-6.84; 3.10)	(-5.32; 4.35)	(-0.89; 14.10)	(-5.94; 11.18)	(-5.94; 11.18)
Other								
$\Delta\hat{C}_5$	-0.77	-1.22	5.57	12.62	5.37	38.26*	-9.35	-9.35
(95% CI)	(-7.91; 5.80)	(-7.76; 4.41)	(-9.56; 20.09)	(-2.25; 28.29)	(-1.63; 10.52)	(24.53; 53.36)	(-25.44; 4.96)	(-25.44; 4.96)

Note: $\Delta\hat{C}_i$ denotes the observed change in the concentration coefficient of income component i between periods t and $t - 5$.

CI denotes Hall's confidence interval. *Change is significantly different from zero at the 5% level.

Source: German Sample Survey of Income and Expenditures (1978–2003).

Tests for statistical significance of intertemporal changes in concentration coefficients are provided in Table 2.5. For OL pensioners, estimates from 1978 to 1993 indicate a decline in concentration coefficients: out of nine significant changes, seven have a negative sign. On the contrary, between 1993 and 2003 four out of five significant changes are positive. The aggregate effect of these intertemporal changes is the concentration effect, which can be taken from Table 2.6. Indeed, for OL pensioners this effect is significantly different from zero and negative between 1978 and 1988, and positive when comparing 1998 and 2003. For OL non-pensioners, rising concentration coefficients of retirement and investment income (employment and retirement income) lead to positive concentration effects between 1978 and 1983 (1998 and 2003). A significant decrease of the concentration coefficient for transfer incomes between 1983 and 1988 goes hand in hand with a negative concentration effect for the same period.

For the NL, there is no obvious pattern. Only one concentration effect out of four is significant (pensioners, comparison 1998 and 2003). For this reason, it must be changes in the income composition that have induced the steep inequality increase in the NL. Indeed, point estimates and confidence intervals of share effects summarized in Table 2.6 support this conclusion. For 1993 and 1998, share effects are significant and positive for NL households, particularly for non-pensioners. As opposed to this, share effects in the OL are typically insignificant or tend to mitigate concentration effects, so that no significant change in the Gini index is observed.

We conclude the empirical analysis with a summary of Gini elasticities. All Gini elasticities reported in Table 2.7 are point estimates (in %), $\hat{\eta}_i$, together with corresponding Hall confidence intervals. The interpretation of the reported numbers is straightforward. For example, the entry '0.0728' means that a 1% increase in employment income will lead to an 0.0728% increase of the Gini coefficient. Gini elasticities help answering the following type of question: Let there be an equiproportionate rise of retirement incomes, what will be the effect on the Gini index? As such information is particularly useful for evaluating recent policies we restrict attention to the most recent observation period.

For pensioners from both regions, an increase in retirement income causes the strongest decrease of the Gini index. A rise of transfer income lowers inequality only amongst OL pensioners. However, the effect is quantitatively small. It is insignificant in the NL. In both regions, elasticities for employment income, and followed by investment and other income are positive. It is interesting to note that elasticities, in absolute terms, are higher in the NL (except for transfer income).

For non-pensioners, changes in employment and transfer income have the strongest and opposed effects on inequality: while a rise in employment income is inequality augmenting, the opposite applies to transfer income. Elasticities of retirement and investment income are not significantly different from zero, whereas for other income it is positive.

Table 2.6: Concentration and share effects (EVS)

	OL						NL	
	1983 %1978	1988 %1983	1993 %1988	1998 %1993	2003 %1998	1998 %1993	2003 %1998	
Pensioners								
Concentration effect (95% CI)	-1.00* (-1.70; -0.28)	-1.03* (-1.81; -0.38)	-0.99* (-1.75; -0.37)	0.45 (-0.29; 1.23)	0.73* (0.16; 1.40)	-0.05 (-1.59; 1.75)	1.75* (0.61; 3.26)	
Share effect (95% CI)	0.27 (-0.26; 0.77)	-0.59 (-1.16; 0.00)	0.81* (0.25; 1.30)	-0.19 (-0.73; 0.33)	-0.47* (-0.82; -0.11)	3.31* (2.08; 4.67)	-2.41* (-3.56; -1.33)	
Non-pensioners								
Concentration effect (95% CI)	3.11* (0.54; 5.20)	-2.42* (-5.03; -0.24)	1.31 (-1.14; 3.84)	-0.94 (-3.20; 0.97)	2.68* (1.28; 4.36)	-5.76 (-11.99; 2.38)	1.04 (-2.56; 4.10)	
Share effect (95% CI)	0.20 (-0.28; 0.58)	-1.12* (-1.65; -0.51)	-0.50 (-1.41; 0.38)	-0.18 (-1.14; 1.04)	-1.20* (-2.00; -0.46)	10.66* (2.48; 16.20)	-0.65 (-3.13; 2.02)	

Note: Observed concentration and share effects between periods t and t-5. CI denotes Hall's confidence interval. *Change is significantly different from zero at the 5% level.

Source: German Sample Survey of Income and Expenditures (1978–2003).

Table 2.7: Gini elasticities in year 2003 (EVS)

	OL	NL
Pensioners		
Employment		
$\hat{\eta}_1$	0.0728*	0.1480*
(95% CI)	(0.0622; 0.0841)	(0.1167; 0.1797)
Retirement		
$\hat{\eta}_2$	-0.1923*	-0.3361*
(95% CI)	(-0.2074; -0.1799)	(-0.3691; -0.3004)
Transfers		
$\hat{\eta}_3$	-0.0114*	0.0062
(95% CI)	(-0.0141; -0.0073)	(-0.0299; 0.0308)
Investments		
$\hat{\eta}_4$	0.0662*	0.1025*
(95% CI)	(0.0535; 0.0795)	(0.0858; 0.1169)
Other		
$\hat{\eta}_5$	0.0646*	0.0794*
(95% CI)	(0.0545; 0.0760)	(0.0463; 0.1007)
Non-pensioners		
Employment		
$\hat{\eta}_1$	0.1213*	0.2292*
(95% CI)	(0.1016; 0.1449)	(0.1677; 0.2704)
Retirement		
$\hat{\eta}_2$	-0.0345*	0.0034
(95% CI)	(-0.0522; -0.0208)	(-0.0172; 0.0330)
Transfers		
$\hat{\eta}_3$	-0.0956*	-0.2751*
(95% CI)	(-0.1002; -0.0853)	(-0.3099; -0.2362)
Investments		
$\hat{\eta}_4$	-0.0185*	-0.0088
(95% CI)	(-0.0303; -0.0081)	(-0.0266; 0.0040)
Other		
$\hat{\eta}_5$	0.0272*	0.0514*
(95% CI)	(0.0109; 0.0374)	(0.0216; 0.0834)

Note: $\hat{\eta}_i$ denotes the observed Gini elasticity of income component i . CI denotes Hall's confidence interval. *Elasticity is significantly different from zero at the 5% level.
Source: German Sample Survey of Income and Expenditures (2003).

2.5 Conclusion

In this chapter, we have studied intertemporal changes in the income distribution of Germany's elderly between 1978 and 2003. The elderly population, defined as people of age 55 and older, has been decomposed by residence (Old vs. New Federal States), and we have also distinguished elderly persons receiving an old-age PAYG or civil servant pensions (pensioners) and elderly persons who do not (non-pensioners). By means of price-adjusted pre-tax-post-transfer equivalent income and factor shares we have described changes in the financial situation of elderly people. Gini indices and further complementing information, particularly concentration coefficients and Gini elasticities for different income components, have been provided to shed light on extent and driving sources of inequality. To establish statistical significance of results, we have estimated standard errors and Hall confidence intervals using the bootstrap method. Our findings build on six cross-sections of the EVS.

During the observation period, the financial situation of elderly people improved significantly. Particularly, this applies to pensioners in the NL. Nevertheless, annual average pre-tax-post-transfer equivalent income in the NL remains significantly below the OL level. On an annual basis, in year 2003 the difference amounts to about 5,700 € for pensioners and 15,400 € for non-pensioners. It can also be shown that income growth rates are less volatile and higher for pensioners compared to non-pensioners. In this sense, the German pension system is an effective insurance device against aggregate GDP shocks.

Concerning the issue of income inequality, we find that the income distribution of the elderly in the OL is both rather stable and flat. For pensioners, we find a slight but significant decline of the Gini index in the first half of the observation period and stagnation since then. For non-pensioners, there is more variability in Gini indices between consecutive periods. However, due to opposing signs of intertemporal differences, Gini point estimates for 1978 and 2003 differ by less than one percentage point. In the NL, inequality from 1993 to 1998 surged rapidly. As a result, by 2003 the observed divide in inequality levels between non-pensioners in east and west almost vanished. For pensioners, the divide remains, with inequality being lower among NL pensioners.

Recent reforms of the German pension system include a paradigm shift towards a more funded pension scheme. Moreover, retirement age has been raised from 65 to 67 years. To compensate for resulting future replacement rate reductions, in 2001 the German government started to promote the development of private pensions by means of special saving subsidies and tax incentives, the so-called 'Riester' pension scheme. Participation in the 'Riester' pension scheme is voluntary. Evidence from micro data suggests that the stimulating effect of the 'Riester' pension scheme on private old-age provision in case of low income households is small (for Germany, see CORNEO ET AL., 2009). Hence, together with high and positive Gini elasticities for investment income,

the evidence suggests that such a reform is likely to increase inequality among elderly in the future, and that old-age poverty might become a more important issue in future decades. To mitigate these effects, one could try to enhance participation rates of low income households in private retirement plans either through higher saving subsidies or through making participation compulsory.

Finally, some words about the intertemporal comparability of results. As two referees correctly pointed out, our database is cross-sectional in structure, and derived point estimates must be complemented by standard errors or confidence intervals for examining the statistical significance of results. This is what we have done in the present version of this chapter. In this sense, our results also contribute to closing the 'lack of statistical inference in the literature on measurement of income inequality' (ATHANASOPOULOS and VAHID, 2003, p.415). To ensure intertemporal comparability of estimates, we have spent a lot effort on ensuring that our income variable, pre-tax-post-transfer equivalent incomes, which is constructed from various EVS variables, contains intertemporally consistent information. What we have to take as given is the top coding of incomes, potentially resulting in downward-biased inequality estimates, and the exclusion of residents in nursing homes or other institutional accommodations from the database.

Chapter 3

Evolution of Incomes and Inequality Since the German Reunification: The Case of German Elderly¹

3.1 Introduction

The reforms referring to German old-age security will affect both income level as well as income composition of the elderly. As an example, the rise in retirement age and the introduction of the ‘factor of sustainability’² may lower the relative importance of payments from statutory pensions, whereas the importance of income from employment will rise. At the same time, it is to be expected that the relative importance of capital income will rise as well, since politicians intend to strengthen self-reliance for old-age income by implementing subsidies for private provision (e.g. ‘Riester’ and ‘Rürup’ pension schemes). Thereby individuals, even though belonging to the same age cohort, will react in different ways. As an example with respect to the retirement age ASTLEITNER ET AL. (2010) observe a dependence on the occupational category resulting from differences in physical and mental loadings. The same holds for financial opportunities and willingness to make private provision.

In this article we employ data from the German Socio-Economic Panel (SOEP) to examine the income distribution for the age cohort 55 and older since the German Reunification. Throughout the period under consideration, we provide price-adjusted annual pre-tax-post-transfer equivalent incomes. In the following we analyze the evolution of the financial situation, the changes in income composition as well as the evolution of income distribution for the elderly. Additionally, we investigate the spe-

¹The chapter is a translated version of BÖNKE ET AL. (2011).

²The ‘factor of sustainability’ (*Nachhaltigkeitsfaktor*) was introduced by the ‘Pension Scheme Sustainability Law’ (*RV Nachhaltigkeitsgesetz*) of 2004 and came into effect in 2005. It is a mathematical term that was incorporated in the pension formula in order to account for the increasing relation of pensioners to employees. In the long-term the introduction will lower replacement rates by about 15 percentage points (see GRIMM, 2005).

cial impact of different income components on inequality. As measure of inequality we use the Gini index and with the bootstrap method we test the statistical significance of our results. Hence, from a methodological point of view we mostly follow Chapter 2. However, Chapter 2 is based on the German Sample Survey of Income and Expenditure (EVS), a distinct dataset which has not yet covered the current years. By employing the SOEP we are enabled to close this time gap. In so far, this study can be regarded as a current completion of previous works on the income distribution of the elderly in Germany (see BIEWEN, 2004; BÖNKE ET AL., 2010; BÖRSCH-SUPAN ET AL., 2001; MÜNNICH, 2001; SCHWARZE and FRICK, 2000).

The remainder of this article is organized as follows. Section 3.2 introduces the database and describes its processing. Section 3.3 explains inequality measures, the bootstrap method and statistical test procedures employed. The empirical results are provided in Section 3.4. Section 3.5 concludes.

3.2 Construction of the Database

Our analysis focuses on the period after the German reunification. Hence, we apply SOEP waves ‘i’ to ‘z’, whereas wave ‘i’ corresponds to the year 1992 and contains income information of 1991, wave ‘j’ information on income of 1992, and so on.³

In data processing we mostly follow the methodology applied in Chapter 2. We exclusively consider households with at least one household member older than 55 years. As we are only interested in the elderly, we delete those persons of the selected households which are younger than 55 years. Additionally, we only include the first two household members.⁴ Hence, our subsample consists of artificial 1- and 2-person-units, whose single members are all 55 years and older. In the following we call these households ‘units of elderly persons’ (UEP).

Concerning the income concept, we provide annual pre-tax-post-transfer equivalent incomes price-adjusted to 2000. In applying a gross-income-concept, we take into consideration that UEP are not necessarily taxable income-units. In those cases the calculation of a common tax burden would be restricted by strict assumptions. Additionally, our procedure enables us to exclude distributional effects, resulting from intertemporal changes of the tax legislation (for further justification of the income concept see Chapter 2.2). To take into account differences in needs between 1- and 2-person-UEP, we apply the modified-OECD equivalence scale (see OECD, 2009). Incomes of 2-person-UEP are deflated to equivalent incomes by division with the factor 1.5.

The construction of equivalent incomes underlies a further difficulty. Most of the income variables are provided on individual level, although there are some exceptions where information is provided on household level. In order to generate the total income of a UEP we follow the methodology introduced in Chapter 2. We sum up all the individual incomes of those persons regarded as household members in our dataset. Additionally, we assign by proportion those incomes, which are provided only on household level. The proportionality is given by the number of persons in an UEP divided by the number of persons originally attributed to the SOEP-household.⁵

³Information on income and personal characteristics are provided by the so-called PEQUIV-datasets. Our analysis is based on the following SOEP-subsamples: A (Western Germany), B (Foreigner), C (Eastern Germany), E (Additional Sample, 1999), F (Additional Sample, 2001). Hence, we disregard the subsamples D (Immigrants), G (Sample of the Rich) and H (Additional Sample, 2007).

⁴Within the questionnaire of the SOEP, each household can chose the ranking of the household members on its own. This applies to all household members except for the first person in the household, which has to be the head of the household. From every household we keep the first two persons of age 55 years and older in our dataset. Hence, we cannot give generalities on the position or function of the elderly which comprise our households. Our decision to keep the first two persons of age 55 years and older is driven by the assumption that households rank their members according to their contributions to household income.

⁵An alternative manner in the construction for equivalence incomes consists in attributing the whole original SOEP-household-income to the UEP and deflating it by an equivalence scale comprising all SOEP-household-members. We opt for the prior procedure in order to approximate the self-earned

In constructing the UEP gross equivalent incomes, we incorporate the following five income sources: (a) *employment income*: earned income and self-employed income (including special payments like Christmas and holiday money, annual bonuses as well as thirteenth and fourteenth salary); (b) *retirement income*: retirement pensions from the public pension fund, civil servant's pensions, company pensions, and other pensions; (c) *transfer income*: benefits related to former employment, social assistance, family-related benefits and other transfers; (d) *capital income*⁶; and (e) *other income*. Concerning the minor relevance of *other income* we refrain from a single analysis of this income source in the following. However, *other income* is an integrant of equivalent income.

The last step of database construction is concerned with the adjustment of incomes to ensure intertemporal comparability. Thereby, we make use of the price-index given by the SOEP. Hence, all incomes are adjusted to prices of 2000.⁷ Additionally, we trim the data in order to prevent biases caused by outliers at the upper and lower bound of the distribution. For this purpose, we eliminate for each year those UEP which exhibit the lowest four and the highest two percent of price-adjusted equivalent incomes.^{8 9}

The following analysis distinguishes between UEP living in the Old and the New German Laender (OL and NL) as well as between pensioner and non-pensioner UEP (P-UEP and NP-UEP). The latter distinction is made based on the income source at old-age. If the retirement income exceeds the income from employment, a UEP is assigned to the group of pensioner UEP and vice versa. The resulting unweighted number of household units can be found in Table 3.1.¹⁰

income of the elderly, instead of considering the financial possibilities elderly persons face in case of income-pooling.

⁶In the following also referred to as *investment income*.

⁷In Chapter 2 prices are adjusted to 2003.

⁸In Chapter 2 we refrain from this trimming.

⁹We decided for this asymmetric trimming to cope with two features concerning the data. First, the trimming of four percent at the lower bound of the income distribution ensures the elimination of observations with zero or implausible low income over all cross-sections. Second, the cutting of the highest two percent of price-adjusted equivalent income eliminates the most severe outliers by keeping the loss of observations to a minimum.

¹⁰In Chapter 2 the group of pensioner UEP is more broadly defined, since all UEP with strict positive retirement incomes are assigned as pensioners.

Table 3.1: Unweighted number of household units (SOEP)

Year	Total Sample Size	Pensioners		Non pensioners	
		OL	NL	OL	NL
1991	2,268	1,024	379	561	286
1992	2,308	1,056	385	574	293
1993	2,320	1,057	404	567	292
1994	2,326	1,023	418	608	277
1995	2,326	1,012	481	594	239
1996	2,312	1,034	475	574	229
1997	2,704	1,270	525	656	253
1998	2,597	1,224	517	604	252
1999	5,020	2,586	916	1,135	383
2000	4,557	2,343	882	991	341
2001	4,419	2,261	859	968	331
2002	4,376	2,282	859	908	327
2003	4,314	2,239	852	914	309
2004	4,196	2,037	827	925	307
2005	4,117	2,123	816	874	304
2006	3,984	2,030	794	855	305
2007	3,869	1,966	775	820	308
2008	4,426	2,224	850	975	377

Note: Unweighted number of household units with elderly members.

Source: German Socio-Economic Panel (Waves 1992–1009).

3.3 Measurement of Inequality: Methodological Considerations

3.3.1 Construction of a Quasi-Homogeneous Population

All our empirical results are based on a quasi-homogeneous population of pseudo-1-person-UEP. In order to generate that kind of population, it is essential to take into account three information for each UEP, $h = 1, \dots, H$: (a) number of considered elderly persons, $n_h \in [1; 2]$, living in a SOEP-household with $N_h \geq n_h$ persons, (b) h 's SOEP-weighting factor, hrf_h ,¹¹ and (c) h 's equivalence income, $\frac{\sum_{a=1}^A \sum_{i=1}^I y_{i,h}^a + \sum_{i=1}^I \frac{n_h}{N_h} \cdot y_{i,h}}{(1+0.5 \cdot (n_h-1))}$, where $y_{i,h}^a$ indicates the individual income of income component i drawn from person a in household h . The second term of the summation in the numerator refers to those incomes only stated on household level. Hence, $\frac{n_h}{N_h} \cdot y_{i,h}$ represents the share of the household income from income source i assigned to the elderly persons of h . Finally, we generate the quasi-homogeneous population by allocating the equivalent income y_h to each member n_h of the UEP and by weighting the UEP with the corresponding weighting-factor hrf_h . As an example, assume $H = 2$, with $n_1 = 1$, $y_1 = 100$, $hrf_1 = 2$ and $n_2 = 2$, $y_2 = 150$, $hrf_2 = 3$. Accordingly, the corresponding quasi-homogenous population consists of $n_1 \cdot hrf_1 = 2$ pseudo-1-person-UEP possessing an equivalent income of 100 monetary units and of $n_2 \cdot hrf_2 = 6$ pseudo-1-person-UEP possessing an equivalent income of 150 monetary units. By applying this approach, we follow the principle of normative individualism. This is, instead of analyzing the material situation of (homogeneous) households, an approach focussing on individuals.¹²

3.3.2 Inequality Indices, Inequality Decomposition and Bootstrapping

We use the Gini index in order to measure inequality since it is additively decomposable into single income components. Therefore, we are able to investigate the impact of different income sources on inequality. This is of interest because the reforms undertaken and in preparation of the German pension system, will trigger a change in the income composition of the elderly. It is to be expected that the importance of the payments from the statutory pensions will decrease ('factor of sustainability', rise in retirement age, etc.), whereas the importance of private old-age provision will rise (e.g. 'Riester' and 'Rürup' pension schemes). Additionally, it is to be expected that individuals at the lower end of the income distribution will react to these changes in a different way than those at the upper end.

We denote average equivalent income by μ , average equivalent income of income

¹¹We make use of the household cross-section weighting factor, provided by the *hhrf*-SOEP dataset.

¹²See BÖNKE and SCHRÖDER (2010) for this and further alternative weighting procedures.

component i by μ_i and $w_i = \frac{\mu_i}{\mu}$ is the share of income component i on average total equivalent income. Hence, the Gini coefficient G can be calculated in its additively notation as follows:

$$G = \sum_{i=1}^I w_i C_i, \quad (3.1)$$

where $-1 \leq C_i \leq 1$ denotes the concentration coefficient of income source i .¹³ Graphically, the concentration coefficient corresponds to twice the area between the line of perfect equity and the concentration curve of the income source under consideration, derived by ordering the observations in terms of increasing total equivalent income (not in terms of increasing level of income source i). Hence, the concentration coefficient reveals the variance of income source i over the range of equivalent income in total. The closer the concentration coefficient of an income component to $-1(1)$, the more are the individuals drawing a high share of their income from this component concentrated at the lower (upper) end of the distribution of equivalent income. The comparison between concentration and Gini coefficients allows making statements on whether the component under consideration has an augmenting or diminishing impact on inequality. In case of $(C_i - G) > 0$ ($(C_i - G) < 0$), an increase in average equivalent income induced by component i causes an increase (decrease) in inequality, measured by the Gini coefficient.

Gini elasticities are provided in order to reveal the influence of changes in factor shares of different income components on inequality. The Gini elasticity of i , η_i , measures the percentage change in the Gini index with respect to an equiproportionate marginal change in the equivalent income of i (see LERMAN and YITZHAKI, 1985; RAO, 1969). It is defined as

$$\eta_i = \frac{\partial G}{\partial \mu_i} \frac{\mu_i}{G} = \frac{1}{G} \left[\frac{\mu_i}{\mu} (C_i - G) \right] \quad \text{with} \quad \sum_{i=1}^I \eta_i = 0. \quad (3.2)$$

Given that the reforms in the German pension system will trigger a shift in the income composition of the elderly, such an isolated investigation of factor shares of different income components, is of particular importance.

From (3.2) it can be seen that an income component affects the Gini index through two different channels: (a) through its relative share in total equivalent income, w_i ; and (b) through its spread over the range of total equivalent income, C_i . The impact of w_i and C_i on G between the periods t and $t - x$ can be calculated using equation

¹³In the notation and decomposition of the Gini coefficient we follow PODDER (1993) and PODDER and CHATTERJEE (2002), see Chapter 2 additionally.

(3.1), as follows:

$$\frac{dG}{dt} = \sum_{i=1}^I C_{i,t} \frac{\partial w_{i,t}}{\partial t} + \sum_{i=1}^I w_{i,t} \frac{\partial C_{i,t}}{\partial t}, \quad (3.3)$$

or alternatively in discrete notation:

$$\Delta G_t \approx \sum_{i=1}^I \left(\frac{C_{i,t} + C_{i,t-x}}{2} \right) \Delta w_{i,t} + \sum_{i=1}^I \left(\frac{w_{i,t} + w_{i,t-x}}{2} \right) \Delta C_{i,t}. \quad (3.4)$$

The sum $\sum_{i=1}^I \left(\frac{C_{i,t} + C_{i,t-x}}{2} \right) \Delta w_{i,t}$ is the change of the Gini index as a result of changes in the shares of different income components in total equivalent income, the *share effect*. The second term, $\sum_{i=1}^I \left(\frac{w_{i,t} + w_{i,t-x}}{2} \right) \Delta C_{i,t}$, quantifies the impact of changes in concentration coefficients on overall inequality, the *concentration effect* (see PODDER and CHATTERJEE, 2002).

Since the SOEP is a random sample, all the information on income and the deduced inequality measures can be interpreted as a realization of a random variable. Hence, to test for statistical significance of results, we compute standard errors and confidence intervals using the bootstrap method (see MILLS and ZANDVAKILI, 1997; BIEWEN, 2002). Concretely we draw 1000 random samples from each cross-section of elderly people with replacement. Each random sample has as many sampling units as the original cross-section, and each sampling unit in the original cross-section has the same probability of being selected. Using the SOEP-weighting factors and the bootstrap-weights, indicating how often a UEP is to be regarded in a bootstrap-sample, we are able to calculate the above mentioned statistics for each of the single bootstrap-samples.¹⁴

¹⁴See ATHANASOPOULOS and VAHID (2003); HALL (1994) for further information and for the explanation why bootstrap confidence intervals do not have to be symmetric about the point estimate.

3.4 Empirical Results

3.4.1 Development of the Income Level and the Income Composition

The most important indicator for the development of the financial situation of the elderly in Germany is the evolution of their average equivalent income. Figure 3.1 and Table 3.2 provide the appertaining information. Figure 3.1 displays how the level of average equivalent income developed over time, differentiated by pensioner and non-pensioner UEP as well as by region (New German Laender vs. Old German Laender). Solid lines refer to UEP in the Old Laender and dashed lines to those in the New Laender. The point estimates are connected by those lines. Vertical bars indicate the period specific bootstrap confidence intervals. Table 3.2 provides the observed changes in the average and median incomes (point estimates) over five-year intervals. Additionally it provides the confidence intervals for those differences in brackets (see HALL, 1994). The changes over time are not significant in those cases where the stated 95% confidence interval comprises the value zero. Additionally, changes in median incomes (point estimates) can be inferred from the table.

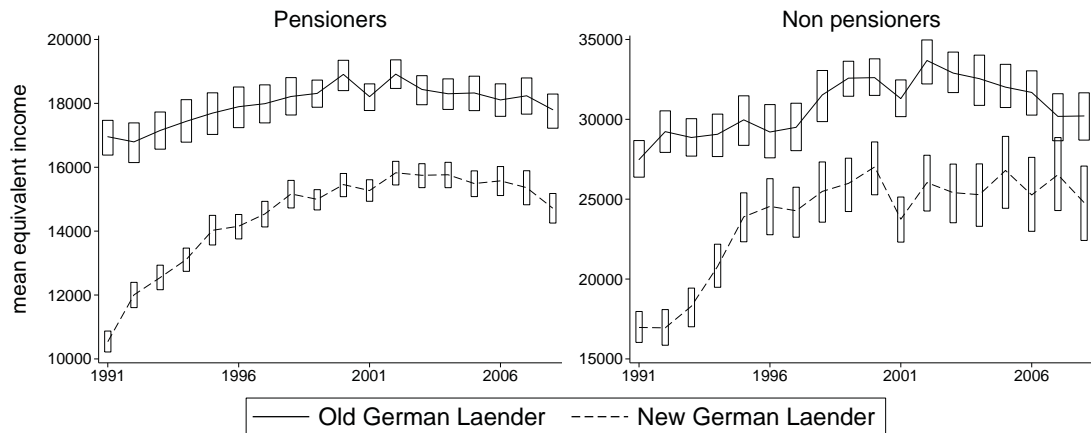


Figure 3.1: Evolution of mean equivalent income (SOEP)

Figure 3.1 in combination with Table 3.2 shows an improvement of the financial situation of the elderly in Germany between 1991 and the first decade of the 21st century. This applies to all examined subgroups of elderly in Germany, the pensioner and non-pensioner UEP in both German regions. However, in 2002/2003 income began to stagnate (P-UEP OL, NP-UEP NL) or even declined significantly (NP-UEP OL, P-UEP NL). Over the whole period, those UEP living in the New Laender experience substantial and statistical significantly lower equivalent incomes than their western counterparts. At the beginning of the observation period, right after the German reunification, a reduction in the absolute income difference between both German regions can be observed. In 2008 pensioner UEP in the Old Laender realize an aver-

Table 3.2: Intertemporal changes in CPI-adjusted mean equivalent incomes (SOEP)

	OL			NL		
	1998 %1993	2003 %1998	2008 %2003	1998 %1993	2003 %1998	2008 %2003
Pensioners						
$\Delta\hat{\mu}$	1,064*	220	-634	2,620*	583	-1,031*
(95% CI)	(202; 1,897)	(-533; 980)	(-1,384; 47)	(2,023; 3,174)	(-5; 1,166)	(-1,663; -450)
Δ Median	733*	307	-725*	2,492*	659*	-1,014*
(95% CI)	(89; 1,347)	(-400; 1,090)	(-1,559; -179)	(1,932; 3,106)	(70; 1,273)	(-1,591; -365)
Non-pensioners						
$\Delta\hat{\mu}$	2,665*	1,368	-2,684*	7,190*	-78	-622
(95% CI)	(536; 4,662)	(-695; 3,651)	(-4,696; -803)	(5,003; 9,471)	(-2,677; 2,457)	(-3,794; 2,220)
Δ Median	893	2,650*	-3,093*	7,724*	1,638	-829
(95% CI)	(-2,235; 3,634)	(9; 5,729)	(-5,958; -313)	(4,129; 10,774)	(-400; 6,113)	(-5,526; 2,229)

Notes: $\Delta\hat{\mu}$ (Δ Median) is the observed change in mean equivalent income between periods t and $t - 5$. All numbers rounded to full € amount. CI denotes Hall's confidence interval. *Change is significantly different from zero at the 5% level.

Source: German Socio-Economic Panel (Waves 1992–2009).

age equivalent income of 17.802 €, so they exceed the reference value of the pensioner UEP in the New Laender by 3.804 €. The difference between east and west holds for the group of non-pensioner UEP as well. Whereas the non-pensioner UEP in the Old Laender earn an income of 30.212 €, the corresponding amount of non-pensioner UEP in the New Laender lies about 5.423 € lower. Similarly, systematic differences can be observed between the group of the non-pensioner UEP and that of the pensioner UEP. Non-pensioner UEP exhibit a substantial higher income than the pensioner UEP. In 2008 non-pensioner UEP display average equivalent incomes of 30.212 € (OL) and 24.789 € (NL), respectively. Hence, their incomes exceed those of their pensioner UEP counterparts by 12.410 €, or 10.071 € respectively.

The evolution of the income shares referring to total equivalent income is provided by Figure 3.2 in combination with Table 3.3. Again, results are presented for non-pensioner and pensioner UEP in the Old and the New Laender separately. By definition, the share of retirement income on total equivalent income is substantial higher for the group of pensioner UEP (85–90%) than for the group of non-pensioner UEP (<10%). Regarding the latter, employment income is dominating. For the pensioner UEP in the Old Laender, capital income is the second most important income component. On average this income component displays a share of just under 10%, with a slightly increasing trend during the last decade (see Table 3.3). For this subgroup, employment income as well as transfer income is only of marginal importance. This applies likewise to the pensioner UEP in the New Laender with the only distinction that for this subgroup capital income does not play any role either. Hence, pensioner UEP in the New Laender are almost only equipped with retirement income; a result that holds over the whole observation period.

In case of the non-pensioner UEP, retirement income is the second most important income source, whereas social transfers and capital income are hardly of importance. This applies to both the non-pensioner UEP in the New Laender and the non-pensioner UEP in the Old Laender. Table 3.3 shows that these results are very stable over time: By tendency, the importance of capital income remains constant and as a whole, the share of transfer income decreases. For the Old Laender, there is a small and significant increase between 1993 and 1998. For the non-pensioner UEP in the New Laender, a significant change in the income composition between 2003 and 2008 is worth mentioning: A slight shift from transfer income to employment income can be observed.

3.4.2 Development of the Income Distribution

Figure 3.3 displays the evolution of the income distribution for the four subsamples measured by the Gini index. For the pensioner UEP in the Old Laender the Gini index stays constant at about 25% over the whole observation period. This applies likewise to

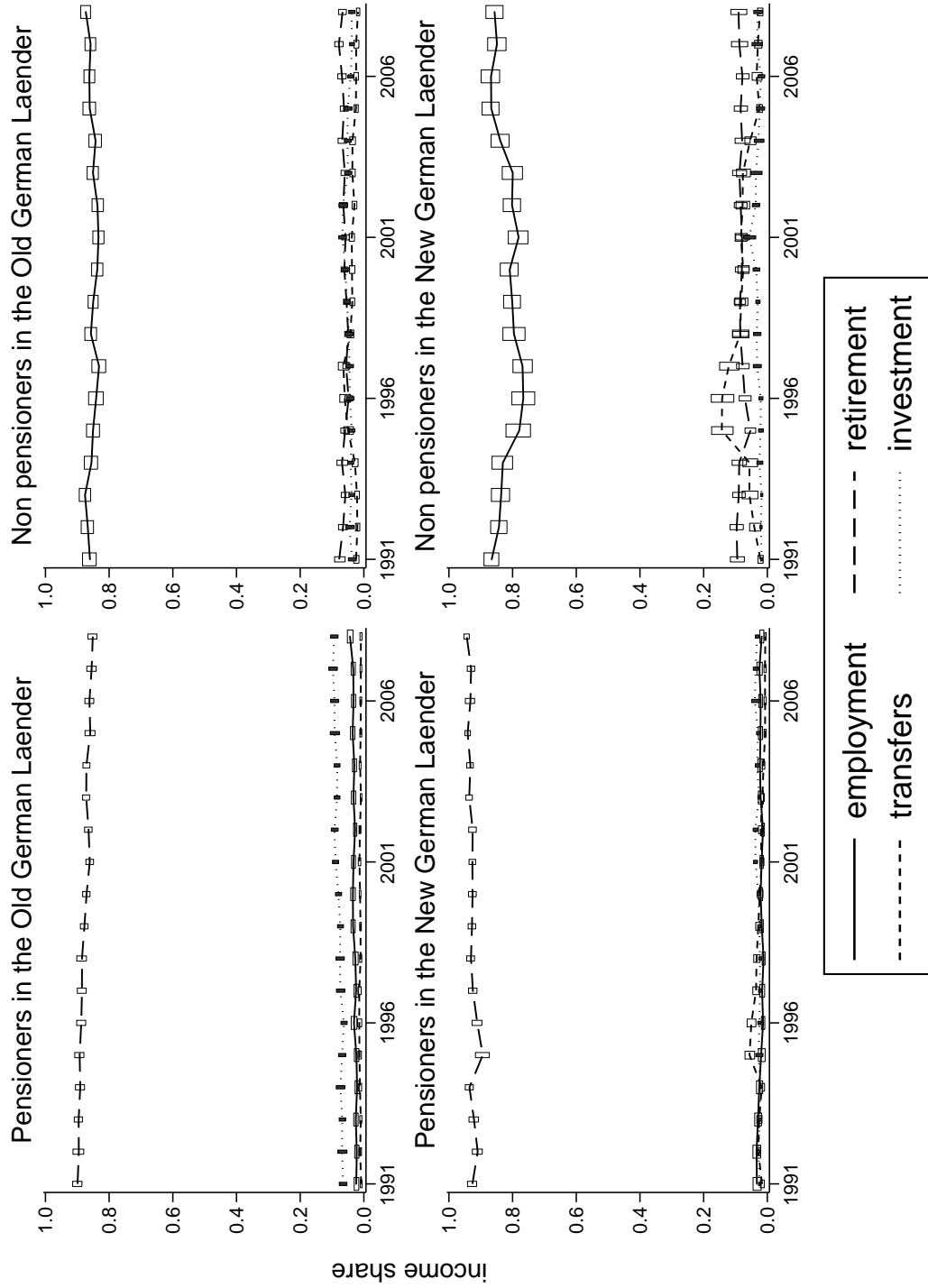


Figure 3.2: Evolution of income shares (SOEP)

Table 3.3: Intertemporal changes in factor shares (SOEP)

	OL				NL				
	1998 %1993	2003 %1998	2008 %2003	1998 %1998	2003 %2003	2008 %2008	1998 %1998	2003 %2003	2008 %2008
Pensioners									
Employment									
$\Delta \hat{w}_1$	0.15	0.58	1.09	-1.74*	0.93*	-0.35	-1.74*	0.93*	-0.35
(95% CI)	(-1.02; 1.19)	(-0.42; 1.65)	(-0.06; 2.13)	(-2.86; -0.58)	(0.03; 1.79)	(-1.27; 0.67)	(-2.86; -0.58)	(0.03; 1.79)	(-1.27; 0.67)
Retirement									
$\Delta \hat{w}_2$	-1.04	1.33	-2.06	0.95	0.56	0.77	0.95	0.56	0.77
(95% CI)	(-3.01; 0.92)	(-3.38; 0.41)	(-3.70; 0.02)	(-0.95; 2.81)	(-1.06; 2.03)	(-0.58; 2.06)	(-0.95; 2.81)	(-1.06; 2.03)	(-0.58; 2.06)
Transfers									
$\Delta \hat{w}_3$	0.05	-0.11	0.03	0.83	-1.82*	-0.93*	0.83	-1.82*	-0.93*
(95% CI)	(-0.41; 0.51)	(-0.51; 0.30)	(-0.38; 0.44)	(-0.44; 2.11)	(-2.89; -0.61)	(-1.57; -0.26)	(-0.44; 2.11)	(-2.89; -0.61)	(-1.57; -0.26)
Investments									
$\Delta \hat{w}_4$	0.72	0.93	0.90	-0.08	0.35	0.54	-0.08	0.35	0.54
(95% CI)	(-0.83; 2.42)	(-0.66; 2.62)	(-0.60; 2.33)	(-0.73; 0.54)	(-0.12; 0.98)	(-0.16; 1.17)	(-0.73; 0.54)	(-0.12; 0.98)	(-0.16; 1.17)
Non-pensioners									
Employment									
$\Delta \hat{w}_1$	-1.84	-0.66	2.26	-4.01	0.36	5.71*	-4.01	0.36	5.71*
(95% CI)	(-4.46; 0.59)	(-3.15; 1.91)	(-0.17; 4.59)	(-8.46; 0.23)	(-4.30; 5.19)	(1.39; 9.54)	(-8.46; 0.23)	(-4.30; 5.19)	(1.39; 9.54)
Retirement									
$\Delta \hat{w}_2$	-0.91	1.07	0.70	-0.45	0.26	0.27	-0.45	0.26	0.27
(95% CI)	(-2.72; 0.86)	(-0.66; 2.82)	(-1.01; 2.48)	(-3.72; 2.82)	(-3.13; 3.72)	(-3.18; 3.77)	(-3.72; 2.82)	(-3.13; 3.72)	(-3.18; 3.77)
Transfers									
$\Delta \hat{w}_3$	2.06*	-0.61	-1.78*	2.87	-0.85	-5.37*	2.87	-0.85	-5.37*
(95% CI)	(0.73; 3.36)	(-2.06; 0.65)	(-2.79; -0.75)	(-0.59; 6.52)	(-4.27; 2.61)	(-7.58; -2.79)	(-0.59; 6.52)	(-4.27; 2.61)	(-7.58; -2.79)
Investments									
$\Delta \hat{w}_4$	0.83	0.33	-1.14	1.53*	0.29	-0.62	1.53*	0.29	-0.62
(95% CI)	(-0.82; 2.37)	(-1.29; 2.08)	(-2.69; 0.45)	(0.18; 2.61)	(-2.04; 2.39)	(-2.84; 1.79)	(0.18; 2.61)	(-2.04; 2.39)	(-2.84; 1.79)

Note: $\Delta \hat{w}_i$ denotes the observed change in the share of income component i in total household income between periods t and $t - 5$. CI denotes Hall's confidence interval. *Change is significantly different from zero at the 5% level.

Source: German Socio-Economic Panel (Waves 1992–2009).

the pensioner UEP in the New Laender but at a clearly recognizable lower level of about 15–16%. Hence, income is more equally distributed between the pensioner UEP in the eastern part of Germany. Since confidence intervals do not overlap, we can conclude that these results are statistically significant. The low extent of inequality between the pensioner UEP in the New Laender can be explained economically: pension claims attained in the German Democratic Republic times are more equally distributed than those attained in western Germany. This is due to lower differences in wages and a higher female labor force participation rate.

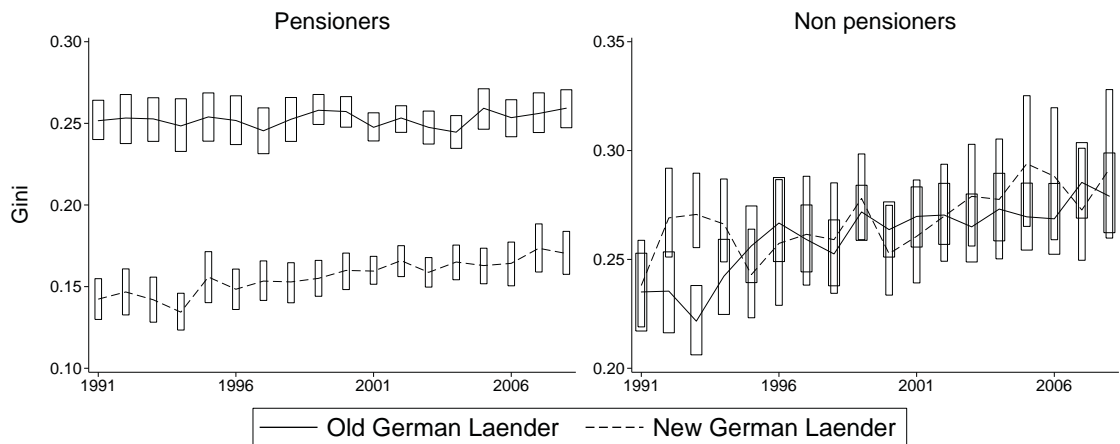


Figure 3.3: Evolution of income inequality (SOEP)

With respect to the non-pensioner UEP in the Old and in the New Laender, significant differences in the Gini index can hardly be perceived. Overlapping confidence intervals for the non-pensioner UEP in the Old and in the New Laender illustrate this (see Figure 3.3). Thereby, the level of inequality is comparable to that of the pensioner UEP in the Old Laender: at the beginning of the observation period the Gini index is located at about 25% and levels out at 27%. This trend emerges, among others, from the significant rise in the Gini index in the Old Laender of 3.09 percentage points between 1993 and 1998 (see Table 3.4).

To sum up, inequality has hardly experienced any change over the observation period. A significant rise of inequality can be observed exclusively in the Old Laender (NP-UEP, 1993 to 1998). Comparisons between the subgroups reveal a higher inequality within the group of non-pensioner UEP than within the group of pensioner UEP. Furthermore, incomes of the pensioner UEP in the New Laender are more equally distributed than in the Old Laender. Regional differences cannot be observed for the group of non-pensioner UEP.

Concentration coefficients, shown in Figure 3.4, contribute to a better understanding of the above mentioned patterns. A concentration coefficient positioned above the zero line indicates that UEP at the upper end of the income distribution benefit from this income component in particular. The reverse holds for negative concentration co-

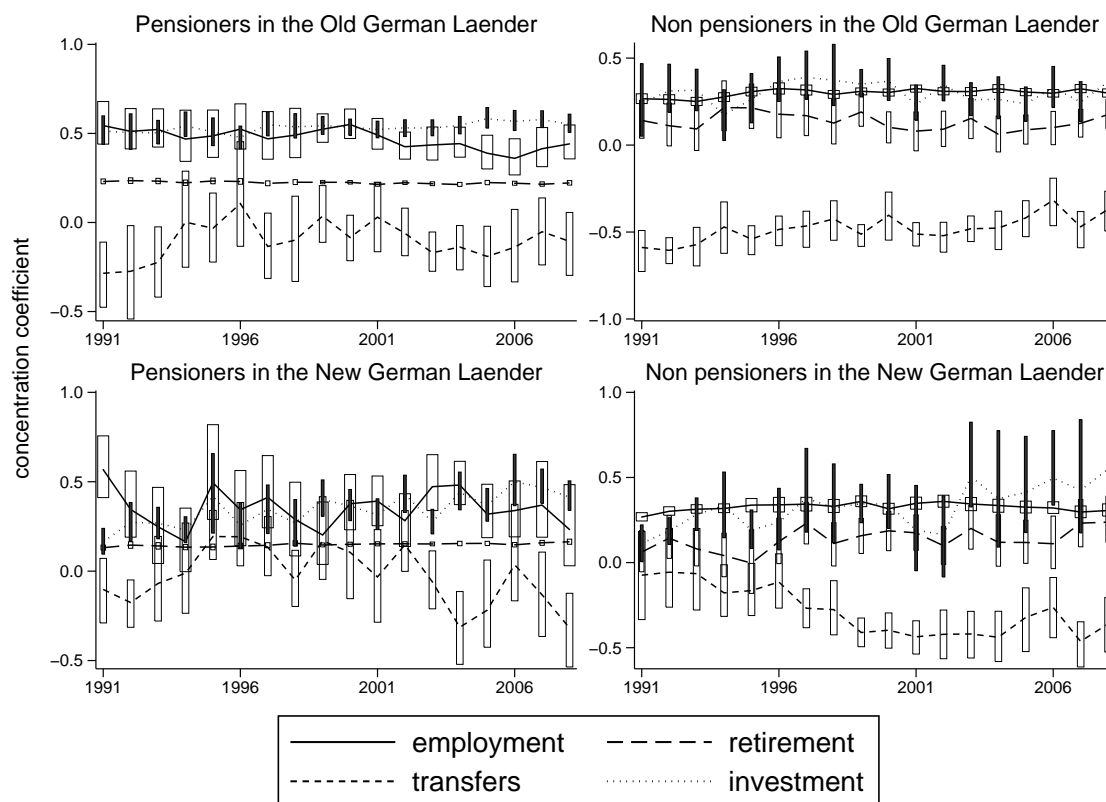


Figure 3.4: Evolution of income concentration (SOEP)

efficients. The illustration is rather homogeneous for all the four subsamples. Capital income and employment income accumulates strongest at the upper end of the income distribution, whereas transfer incomes are located at the bottom. Retirement incomes primary exhibit positive concentration coefficients, but they are located at a significantly lower level than those of capital and employment. The results are very robust over the whole observation period. Table 3.5 shows that there are significant intertemporal changes only in three cases: (a) pensioner UEP in the New Laender (transfer incomes, 2003 to 2008), (b) pensioner UEP in the New Laender (capital income, 2003 to 2008) and (c) non-pensioner UEP in the Old Laender (employment income, 1993 to 1998).

The persistence of the income distribution is also mirrored in the consistency of concentration and share effects over time, displayed in Table 3.6. Table 3.6 shows the corresponding bootstrap confidence intervals as well as test results on statistical significance. Significant changes can be observed for the pensioner UEP (OL, 1998 to 2003; OL, 1998 to 2003 and 2003 to 2008) as well as for the non-pensioner UEP (OL and NL, 2003 to 2008). The positive differences of the share effects indicate an intertemporal shift in the corresponding income shares which causes, *ceteris paribus*, an increase in inequality.

The empirical analysis is completed by documenting the Gini elasticities for the different income components of the year 2008 (see Table 3.7). The reported values can

be interpreted as follows: The point estimate of ‘-0.1221’, associated to the retirement income of the pensioner UEP in the Old Laender, means that an increase in retirement income of one percentage point of this subsample causes a decrease in the Gini index of 0.1221%. The ‘*’ indicates that the result is significantly different from zero at a 5%-level. Concerning the pensioner UEP in both German regions, our results show that an increase in the share of retirement income ensures a reduction of inequality. The same holds for an increase in the share of transfer incomes, although the effect is smaller. This can be explained by the relative low prominence of this income source for both subsamples. On the opposite, a rise in the share of employment income and especially in the share of capital income implies an increase in inequality for the group of pensioner UEP. Both effects are more pronounced in the Old than in the New Laender. Again, this can be attributed to the low share of capital income in the New Laender. Referring to the non-pensioner UEP we can observe qualitatively comparable results, although the effects caused by variations in the share of capital incomes are statistically not significant. This observation is probably generated by the fact that this income component constitutes only a marginal share of total equivalent income for this subsample.

Table 3.4: Intertemporal changes in Gini indices (SOEP)

	OL				NL			
	1998 %1993	2003 %1998	2008 %2003	1998 %1993	2003 %1998	2008 %2003	1998 %1993	2003 %1998
Pensioners								
$\Delta\hat{G}$	0.02	-0.50	1.18	1.09	0.59	1.15		
(95% CI)	(-1.93; 1.96)	(-2.11; 1.14)	(-0.43; 2.70)	(-0.85; 2.88)	(-0.91; 2.12)	(-0.52; 2.71)		
Non-pensioners								
$\Delta\hat{G}$	3.09*	1.25	1.41	-1.16	1.99	1.26		
(95% CI)	(0.92; 5.34)	(-1.06; 3.32)	(-0.86; 3.98)	(-4.27; 1.95)	(-1.35; 5.29)	(-2.71; 5.70)		

Note: $\Delta\hat{G}$ is the observed change in the Gini index between periods t and t-5. CI denotes Hall's confidence interval. *Change is significantly different from zero at the 5% level.

Source: German Socio-Economic Panel (Waves 1992-2009).

Table 3.5: Intertemporal changes in concentration coefficients (SOEP)

	OL				NL				
	1998 %1993	2003 %1998	2008 %2003	1998 %1998	2003 %2003	2008 %2008	1998 %1998	2003 %2003	2008 %2008
Pensioners									
Employment									
$\Delta\hat{C}_1$	-3.16	-5.52	0.60	4.05	18.38	-23.96			
(95% CI)	(-21.93; 13.46)	(-22.88; 10.16)	(-12.53; 13.55)	(-25.83; 33.19)	(-4.47; 44.86)	(-50.58; 5.46)			
Retirement									
$\Delta\hat{C}_2$	-0.64	-0.83	0.44	1.47	-0.39	1.21			
(95% CI)	(-2.59; 1.39)	(-2.65; 0.75)	(-1.13; 2.06)	(-0.91; 3.75)	(-2.19; 1.33)	(-0.53; 2.98)			
Transfers									
$\Delta\hat{C}_3$	12.44	-7.07	6.41	1.95	-1.00	-25.86*			
(95% CI)	(-20.50; 42.79)	(-33.43; 18.34)	(-15.12; 25.00)	(-28.07; 30.53)	(-23.45; 22.12)	(-53.02; -1.86)			
Investments									
$\Delta\hat{C}_4$	3.30	-0.72	2.17	0.09	0.49	13.97*			
(95% CI)	(-6.44; 12.87)	(-9.77; 7.17)	(-4.45; 9.23)	(-15.13; 15.20)	(-13.76; 15.21)	(3.72; 25.87)			
Non-pensioners									
Employment									
$\Delta\hat{C}_1$	4.01*	1.65	-0.87	1.68	1.42	-3.85			
(95% CI)	(0.55; 7.41)	(-1.50; 4.85)	(-4.13; 2.60)	(-2.82; 6.39)	(-4.11; 6.72)	(-8.94; 1.57)			
Retirement									
$\Delta\hat{C}_2$	3.38	2.67	2.22	3.15	8.81	3.71			
(95% CI)	(-14.81; 23.32)	(-14.08; 18.28)	(-11.05; 16.39)	(-14.87; 18.60)	(-8.37; 27.26)	(-14.44; 22.17)			
Transfers									
$\Delta\hat{C}_3$	14.79	-5.63	11.15	-21.14	-14.31	5.88			
(95% CI)	(-0.52; 31.46)	(-18.51; 9.02)	(-3.01; 24.17)	(-51.32; 5.03)	(-36.52; 5.04)	(-13.70; 27.65)			
Investments									
$\Delta\hat{C}_4$	5.66	-11.20	10.33	3.99	18.15	4.43			
(95% CI)	(-13.15; 29.33)	(-32.21; 6.56)	(-6.48; 25.27)	(-19.75; 31.68)	(-12.62; 55.41)	(-29.21; 34.29)			

Note: $\Delta\hat{C}_i$ denotes the observed change in the concentration coefficient of income component i between periods t and $t - 5$. CI denotes Hall's confidence interval. *Change is significantly different from zero at the 5% level.

Source: German Socio-Economic Panel (Waves 1992-2009).

Table 3.6: Concentration and share effects (SOEP)

	OL				NL				
	1998 %1993	2003 %1998	2008 %2003	1998 %1993	2003 %1998	2008 %2003	1998 %1993	2003 %1998	2008 %2003
Pensioners									
Concentration effect (95% CI)	-0.29 (-3.75; 3.46)	-1.02 (-3.74; 2.54)	0.66 (-3.57; 2.43)	1.50 (-3.51; 3.98)	-0.07 (-3.72; 2.36)	0.79 (-3.61; 2.75)			
Share effect (95% CI)	0.21 (-0.40; 0.79)	0.49* (0.00; 1.11)	0.51 (-0.07; 1.05)	-0.40 (-0.79; 0.16)	0.64* (0.16; 0.98)	0.36* (0.03; 0.70)			
Non-pensioners									
Concentration effect (95% CI)	4.38 (-3.69; 6.37)	0.79 (-5.63; 4.14)	0.16 (-6.02; 4.19)	0.25 (-4.95; 7.84)	1.36 (-7.92; 6.94)	-2.42 (-12.18; 5.72)			
Share effect (95% CI)	-1.34* (-2.42; -0.24)	0.33 (-0.62; 1.52)	1.20* (0.37; 1.96)	-1.36 (-3.20; 0.73)	0.58 (-1.68; 2.89)	3.68* (1.72; 5.42)			

Note: Observed concentration and share effects between periods t and t-5. CI denotes Hall's confidence interval. *Change is significantly different from zero at the 5% level.

Source: German Socio-Economic Panel (Waves 1992–2009).

Table 3.7: Gini elasticities in year 2008 (SOEP)

	OL	NL
Pensioners		
Employment		
$\hat{\eta}_1$	0.0306*	0.0065
(95% CI)	(0.0105; 0.0498)	(-0.0173; 0.0292)
Retirement		
$\hat{\eta}_2$	-0.1221*	-0.0345*
(95% CI)	(-0.1512; -0.0893)	(-0.0684; -0.0015)
Transfers		
$\hat{\eta}_3$	-0.0132*	-0.0178*
(95% CI)	(-0.0209; -0.0047)	(-0.0270; -0.0075)
Investments		
$\hat{\eta}_4$	0.1053*	0.0458*
(95% CI)	(0.0800; 0.1295)	(0.0237; 0.0660)
Non-pensioners		
Employment		
$\hat{\eta}_1$	0.0619*	0.0422
(95% CI)	(0.0327; 0.0940)	(-0.0133; 0.0901)
Retirement		
$\hat{\eta}_2$	-0.0248*	-0.0167
(95% CI)	(-0.0441; -0.0050)	(-0.0503; 0.0236)
Transfers		
$\hat{\eta}_3$	-0.0428*	-0.0515*
(95% CI)	(-0.0571; -0.0245)	(-0.0729; -0.0243)
Investments		
$\hat{\eta}_4$	0.0118	0.0263
(95% CI)	(-0.0117; 0.0300)	(-0.0044; 0.0530)

Note: $\hat{\eta}_i$ denotes the observed Gini elasticity of income component i . CI denotes Hall's confidence interval. *Elasticity is significantly different from zero at the 5% level.
Source: German Socio-Economic Panel (Wave 2009).

3.5 Conclusion

Our analysis reveals an improved financial situation of the elderly today compared to the period right after the German reunification. This holds in particular for the pensioner and non-pensioner UEP in the New Laender. For the last decade however, our results document a stagnation of the financial evolution of all four subsamples. In case of the pensioner UEP, even a deterioration of the financial situation can be observed.

Concerning inequality, we find Gini indices almost unchanged for all four subsamples over the whole observation period. This stability in the income distribution is not warranted, since Gini elasticities reveal that changes in the income composition cause significant effects on income distribution. Hence, it is to be expected that implemented political reforms in the field of old-age provision – like the rise in retirement age (‘Rente mit 67’) and the simultaneous strengthening of self-reliance for old-age provision (‘Riester-’ and ‘Rürup-Reform’) – are going to imply a twofold effect; on the one hand on income level and on the other hand on income distribution between the elderly in society. The reform ‘Rente mit 67’, implemented in order to give relieve to the taxpayers and contributors to the public pension insurance, is actually accompanied by a reduction of the effective pension level. Having the results concerning the Gini elasticities of retirement incomes in mind, it is to be supposed that the reduction of the pension level is associated with a rise in inequality among the elderly. Similarly, the strengthening of self-reliance for old-age provision and the corresponding increase in the share of capital income may cause a rise in inequality. This holds all the more, since CORNEO ET AL. (2009) find that the willingness for concluding ‘Riester-’ and/or ‘Rürup-Contracts’ increases in income.

Finally, we conduct a comparison of the results of both studies on income evolution and inequality in Germany, as performed in Chapter 2 and Chapter 3. Since both studies follow a similar methodological procedure, a comparison concerning the overlapping period seems to be appropriate, at least with respect to the qualitative statements. Nevertheless, for such a comparison one has to recall that both studies are based on different datasets. Additionally, the distinctions in data processing, presented in Section 3.2, do not allow for a direct comparison of the quantitative results. Some examples: Due to the more far-reaching definition of non-pensioner UEP in this chapter (Chapter 3), a less pronounced distinction between the results is to be assumed. Differences in the absolute income level are to be expected, because of varying striking prices. Furthermore, data trimming conducted in this chapter is mirrored by a level of inequality that lies below the inequality found in Chapter 2.

Conclusively, we find that both studies yield, concerning the overlapping period 1993–2003, similar qualitative results with respect to three main criteria: (a) evolution of the financial situation, (b) evolution of inequality, and (c) algebraic sign of the Gini

elasticities.

Referring to (a): Both studies display an improvement of the financial situation of the elderly. Nevertheless, UEP in the New Laender could not close the gap to their western counterparts. However, the strongest catching-up process can be observed for the pensioner UEP in the New Laender. Likewise, both studies unveil a higher volatility in growth for the non-pensioner UEP than for the pensioner UEP. The same holds for the Old as well as for the New Laender.

Referring to (b): Qualitatively similar results can also be found for the development of inequality, based on the Gini index. In 1993, income was more equally distributed in the New than in the Old Laender. Whereas inequality remained almost constant for the pensioner as well as for the non-pensioner UEP in the Old Laender, inequality increased in the New Laender; slightly for the pensioner UEP, sharply for the non-pensioner UEP. The increase in case of the latter was so sharp, that inequality almost converged for this subsample in both the Old and New Laender.

Referring to (c): Even the comparative view with respect to the politically relevant Gini elasticities displays qualitative consistency – at least concerning the statistically significant results. For all subsamples under investigation it turns out, that an increase in the share of employment and capital income raises inequality, whereas an increase in transfer and pension incomes reduces inequality. The outstanding positive Gini elasticity of capital income for pensioner UEP in both parts of Germany might be of special political interest, because reforms strengthening self-reliance for old-age provision will foster inequality between the elderly.

Chapter 4

Betting on a Long Life: The Role of Subjective Life Expectancy in the Demand for Private Pension Insurance of German Households¹

4.1 Introduction

The German welfare state comprises a public pay-as-you-go (PAYG) pension system designed to prevent old-age poverty and to maintain standard of living after withdrawal from working life. In contrast to funded systems, a PAYG plan is directly financed from current contributions and therefore requires a nearly permanent balance of contributions and payments. Population aging and negative incentive effects have increasingly threatened the German system and triggered a reform process to keep its financing sustainable. This has been accompanied by a lively discussion of the opportunities and limitations of the system, that has created awareness of falling replacement rates from the public statutory system and the need for supplementary private old-age provision. In addition to pure accumulation of financial and non-financial assets, investment in private pension insurance policies presents one possible way to raise retirement income and concomitantly insures against outliving one's wealth. Consequences of shifting substantial parts of old-age provision from the public to the private sector, however, depend on the efficiency of this market.

A main concern over insurance markets raised by theoretical research, is the presence of information asymmetries between insurers and the insured that lead to market failure due to moral hazard and adverse selection. As pension insurance covers the financial risk related to longevity, moral hazard would be present if pension insurance

¹The chapter is a slightly modified version of SCHULTE and ZIRPEL (2010), revise and resubmit at JOURNAL OF APPLIED SOCIAL SCIENCE STUDIES.

coverage induced life-prolonging behavior that cannot be observed by the insurer. Adverse selection would be present if length of life could be more accurately predicted by the insurant himself than by the insurer, and people expecting relatively long life systematically purchased larger pension insurance coverage. Concerning moral hazard, most people agree that in developed countries like Germany individual life-prolonging activities can be seen as independent of pension insurance coverage. Moral hazard is therefore reasonably assumed to be quantitatively negligible, if not non-existent.² In contrast, adverse selection in pension insurance markets is a concern. As a consequence of adverse selection, premiums rise and eventually become prohibitively high for low-risk individuals who are pushed out of the market.

In an attempt to explain the observed low uptake of annuities – the so-called ‘annuity puzzle’ – related studies consistently provide evidence for adverse selection in the UK (see FINKELSTEIN and POTERBA, 2002, 2004) and the US annuities market (see FRIEDMAN and WARSHAWSKY, 1990; MITCHELL ET AL., 1999; BROWN, 2001; BROWN ET AL., 2008a). First empirical evidence by GAUDECKER and WEBER (2004) suggests that the German private pension market is also characterized by adverse selection. If this was the case, it might be too expensive for individuals who expect to die early to compensate public pension shortfalls by private pension insurance.

Our work contributes to the literature on adverse selection in annuity markets. In contrast to most related studies that take the ‘Money’s Worth’ approach introduced by FRIEDMAN and WARSHAWSKY (1988), we investigate the existence of adverse selection on the micro level. Our main interest is the explanatory power of subjective life expectancy in the uptake of private pension insurance. According to previous research, subjective life expectancy is a remarkably good predictor of actual lifetime. In particular, it is superior to predictions based on mortality tables as made by the insurers (see HAMERMESH, 1985; HURD and MCGARRY, 1995, 2002). Expectations about lifetime therefore represent private information and give a risk selection opportunity to the insured as return on investment of a pension insurance policy increases with lifetime. Based on this finding, our work now seeks to answer the question whether people actually make use of their private information about lifetime when deciding about old-age provision. If, conditional on other relevant determinants, subjective life expectancy was positively associated with the probability of having supplementary private pension insurance, this would indicate adverse selection in this market.

We will test this hypothesis using the German SAVE survey data on savings and old-age provision. Guided by the theory of savings and the life cycle with uncertain time of death beginning with YAARI (1965) and previous empirical studies, we provide an in-depth analysis of the determinants of pension insurance uptake of German households

²This view is shared in large parts of the literature; see among others FINKELSTEIN and POTERBA (2004) and ROTHSCILD (2009). See, however, PHILIPSON and BECKER (1998) for a discussion of the existence of moral hazard effects in the market for annuities.

with a special focus on the role of subjective life expectancy. The remainder of this paper is organized as follows: Section 4.2 gives an overview of the related theoretical and empirical literature. The German old-age pension system is presented in Section 4.3. Section 4.4 describes the data and methodology in use and contains estimation results. Section 4.5 concludes.

4.2 Related Literature

Within an overall assessment of the determinants of pension insurance uptake, we specifically focus on the role of subjective life expectancy to understand whether the German private pension market is characterized by adverse selection. Our work thus mainly relates to two broad strands in the literature. First, we refer to the theoretical and empirical literature on life cycle savings and annuity demand dealing with optimal annuitization in portfolio choice and practically relevant determinants of the annuitization decision. Second, we refer to the theoretical and empirical discussion of adverse selection in insurance markets in general and in annuity markets in particular.

YAARI (1965) was the first who incorporated uncertain lifetimes in the classical life cycle savings theory of MODIGLIANI and BRUMBERG (1954). His model is a theoretical conjunction of mortality expectations and time and risk preference parameters in determining optimal annuitization. The main implication of his theory of consumption under the presence of longevity risk is that risk averse utility maximizing consumers who face actuarially fair insurance prices should fully annuitize their wealth, provided that they do not have any bequest motive. DAVIDOFF ET AL. (2005) later confirmed the complete annuitization result within a more general framework.

Compared to the theoretical predictions of full or at least high annuitization, observed uptake of annuities is surprisingly low (see FRIEDMAN and WARSHAWSKY, 1990; BROWN and POTERBA, 2000; JAMES and SONG, 2001; JAMES and VITTAS, 2000). This gap between theory and reality has caused a large body of literature dedicated to resolve this so-called ‘annuity puzzle’. Among potential explanations for the puzzle are adverse selection, administrative load factors, bequest motives, risk-sharing within families, pre-existing annuities from social security, financial illiteracy and precautionary savings for the event of unexpected expenditure shocks. In this context, BROWN (2001) empirically investigates the behavioral relevance of YAARI’S life cycle model by relating a utility measure of annuity value to actual household decisions. Following the life cycle model, he calculates the utility measure – the ‘annuity equivalent wealth’ – based on cohort mortality tables and survey data on risk aversion, marital status, and the presence of pre-existing annuity flows from social security. BROWN (2001) finds that households for which the life cycle model predicts to have a higher valuation of annuities are in fact more likely to annuitize their retirement resources. However, in accordance with the annuity puzzle, much of the variation in the actual decision remains unexplained by the life cycle model. He therefore considers several additional factors that might influence the annuitization decision where he identifies individual health status and time horizon to be the most relevant.

Related to our research purpose, the importance of individual health status in explaining the actual annuitization decision conditional on average mortality from life tables is particularly interesting. It points to the fact that people use private informa-

tion on health status and expected longevity in the old-age provision decision which would be consistent with the presence of adverse selection in annuity markets. A general theoretical framework of adverse selection was introduced by AKERLOF (1970) which ROTHSCILD and STIGLITZ (1976) later applied to the insurance market. The basic idea is that private information about individual risk gives insurants an information advantage over the insurer which allows higher-risk individuals to self-select into insurance contracts. Pooled risks are then comparatively high, insurance premiums rise and crowd lower-risk individuals out of the market. Thus, the theory of adverse selection predicts a positive correlation between insurance coverage and risk.

A wide body of literature studies the empirical importance of adverse selection in insurance markets. Two markets that have been frequently under study are the automobile and the health insurance market. For the automobile insurance market, the early studies of DAHLBY (1983) and PUELZ and SNOW (1994) suggest a positive coverage-risk correlation, which, however, was not reinforced by subsequent research (see CHIAPPORI and SALANIÉ, 2000; DIONNE ET AL., 2001). Conflicting findings are also available for the health insurance market. While CUTLER and ZECKHAUSER (1998) support the theoretical prediction of positive correlation, CARDON and HENDEL (2001) and FANG ET AL. (2008) reject it. Available studies on the market for life insurance (see CAWLEY and PHILIPSON, 1999; MCCARTHY and MITCHELL, 2010) so far consistently suggest absence of adverse selection.³

Concerning annuity markets, the empirical literature rather uniformly concludes that these are characterized by adverse selection. From a methodological point of view, two different strands of empirical investigations of adverse selection in the market for annuities can be distinguished. Roughly, the first strand compares mortality data of annuitants and non-annuitants for the general population. This strand includes the large number of studies that apply the concept of ‘Money’s Worth’ to identify how much of an insurance premium’s deviation from the actuarially fair premium can be attributed to selection effects. FRIEDMAN and WARSHAWSKY (1988) introduced the money’s worth approach which was later refined by MITCHELL ET AL. (1999). By now, the money’s worth is commonly understood as the expected net present value of payouts in relation to premium costs which is separately calculated using population and insurance mortality tables. Several studies applied this concept to investigate the extent of adverse selection in annuity markets in various countries. Most frequently studied are the markets in the US (see FRIEDMAN and WARSHAWSKY, 1990; MITCHELL ET AL., 1999) and in the UK (see FINKELSTEIN and POTERBA, 2002, 2004). Further examinations have been done for Germany (see GAUDECKER and WEBER, 2004), Australia (see DOYLE ET AL., 2004) and Singapore (see DOYLE ET AL., 2004; FONG, 2002), as well as for Canada, Chile, Israel and Switzerland (see JAMES and SONG, 2001).

³See COHEN and SIEGELMAN (2010) for a recent review of the empirical literature on adverse selection in insurance markets.

MCCARTHY and MITCHELL (2010) and ROTHSCILD (2009) also compare mortality tables of policyholders with those of the general population, but do not explicitly calculate the money's worth. All these studies find evidence for adverse selection which, however, can only partially explain the annuity puzzle due to its limited extent.

The more recent second strand, where our study belongs to, analyzes adverse selection from the perspective of the policyholder using micro level data. While the focus of the first strand lies on a quantitative estimation of the effects of adverse selection on insurance premiums, the second strand is able to simultaneously assess the relevance of subjective life expectancy and other determinants of annuity uptake. In addition, the money's worth does not allow to distinguish between active mortality selection based on asymmetric information about health and expected longevity and passive mortality selection reflecting other differences such as wealth and income that are also correlated with mortality (see FINKELSTEIN and POTERBA, 2002).

Due to data limitations, research on the micro level is hardly done. Most closely related to our analysis, is the study by BROWN ET AL. (2008a) who use data from the US Health and Retirement Study (HRS). They investigate self-reported willingness of the elderly population to exchange part of their social security inflation-indexed annuity benefit for an immediate lump-sum payment by self-reported health status and subjective survival probabilities relative to actuarial life tables. Their results are consistent with predictions of standard theoretical models of adverse selection, since individuals with poor health-status and pessimistic life expectations are less likely to annuitize, but tend to prefer lump-sum payments. Another related study by INKMANN ET AL. (2011) uses the English Longitudinal Study of Aging and investigates actual annuity uptake in the UK. In line with BROWN ET AL. (2008a), they find that the subjective survival probabilities of annuitants are significantly higher than those of their non-policyholding counterparts which points to the presence of adverse selection in the UK's annuity market as well.

Our work differs from the existing studies in several aspects: Compared to the US and the UK, Germany is characterized by a dominant public statutory system which leaves a relatively smaller scope for supplementary private insurance. Consequently, selection effects in the private pension insurance market in Germany are likely to differ from those observed in the US and the UK. In contrast to BROWN ET AL. (2008a) who consider stated intentions to annuitize retirement income, we are able to observe actual demand for private pension insurance of households. Compared to INKMANN ET AL. (2011), we dispose of a more comprehensive set of variables, as we are able to build proxies for preference parameters reflecting risk aversion and time preference that are not included in their data. Unlike BROWN ET AL. (2008a) and INKMANN ET AL. (2011), we use subjective life expectancy in years instead of subjective survival probabilities in percent. This overcomes the difficulties respondents might have with thinking in probabilities, especially when it comes to very low or very large probabilities

as suggested by prospect theory (see KAHNEMAN and TVERSKY, 1979).

4.3 The German Old-Age Pension System

For our further analysis, it is instructive to briefly examine the German old-age pension system which consists of three coexisting pillars. Three things should be noted from the following description. First, the public first pillar is still by far the most important source of old-age income. Second, benefit levels from the first pillar differ for different population groups mainly depending on their type of employment. Third, the private pension insurance considered in our work is part of the third pillar and allows anyone to supplement pre-existing benefits.

Introduced by Otto von Bismarck in 1889 as a fully funded system, the German public old-age pension system was gradually converted into a PAYG system from 1957 on. Outstanding generosity was a key characteristic of the German system after the 1972 reform in terms of both replacement rates and flexibility of retirement age. However, increasing life expectancy in times of low fertility and the resulting population aging coupled with negative incentive effects began to threaten the system. Starting with a major reform in 1992, benefit cuts were implemented in an effort to stabilize its functioning (see BÖRSCH-SUPAN and WILKE, 2004). Nowadays, the so-called ‘first pillar’ of the three-pillar old-age provision system comprises statutory pension insurance for all employees covered by the German social security system, old-age security for farmers, professional provision for certain groups of self-employed like physicians, lawyers and architects as well as the civil-service pension scheme. Except for the self-employed who are at liberty to participate, the whole work force is subject to mandatory coverage within the first pillar. Although the relative importance of the three pillars has changed in disfavor of the first pillar, it still constitutes the most important source of old-age income. In 2007, the public pension scheme covered about 92% of the German elderly and accounted for about 79% of total gross old-age income (see ASID 07, 2009).

The various subsystems within the first pillar, like the old-age security for farmers or the civil-service pension scheme have neither historically been equally generous, nor have they undergone benefit cuts in an equal measure. In particular, in 2007, persons of age 65 and older whose last position was denoted as civil-servant, drew an average monthly gross pension of 2670 € from the public system. This amounted to an average of 1195 € for former blue- and white-collar worker and to only 813 € for former farmers and self-employed who were least secured by the public scheme (see ASID 07, 2009).

Employees in the private and the public sector are free to supplement their benefits from the mandatory statutory pension insurance by an occupational pension scheme within the ‘second pillar’. This is typically organized in form of deferred compensations, where employees waive part of their salary in favor of employer-provided retirement benefits. In 2007, benefits from occupational pension plans represented about 9% of total old-age income and accrued to 27% of the retirees (see ASID 07, 2009). Private old-age provision as the ‘third pillar’ involves additional accumulation of assets like

investment funds, shares, real-estate, private pension insurance and life insurance that can be depleted during retirement. From 2002 and 2005 on, the third pillar also includes the state-subsidized Riester- and Rürup pension plans. Overall, the third pillar accounted for 12% of total old-age incomes in 2007 (see ASID 07, 2009).

Our analysis of adverse selection in pension insurance focuses on the uptake of private pension insurance within the third pillar because access to private pension insurance is open for everybody and the uptake is purely voluntary. Riester- and Rürup pension plans are excluded because of the state subsidies that distort their uptake.

Anybody is at liberty to purchase a private pension policy to raise retirement income. Individual premiums are generally calculated based on insurance mortality tables by age and gender. While benefits are usually paid out as a monthly pension, most insurance companies offer the option of a single lump-sum payment, instead. In both cases, a minimum benefit is guaranteed, while any profit bonus is uncertain and depends on the development of the capital market. Insurance companies offer various supplemental agreements for the standard policy, mostly related to dependants' protection. In a standard contract, pensions are paid until the policyholder dies. In order to avoid highly negative returns of investment, guarantee periods, survivor's pensions or contribution refund in case of early death can be agreed upon with the insurer. These additional agreements all come at some cost in the sense of lower pensions for a given monthly contribution. Finally, it should be noted that redemption of a purchased policy is financially highly disadvantageous, since contributions for the first years are used to cover broker remuneration and administrative expenses.

4.4 Empirical Analysis of Insurance Determinants

We now investigate the determinants of private pension insurance demand of German households in a probit model. Section 4.4.1 describes the data and the derived variables. The methodology is explained in Section 4.4.2 that also contains estimation results.

4.4.1 Data and Derived Variables

The cross-sectional data in use is the 2005 wave of the German SAVE study consisting of 2305 households. SAVE is a nationally representative survey of German households held by the Mannheim Research Institute for the Economics of Aging (MEA). With the main focus on savings behavior, financial assets and old-age provision, the survey also includes data on demographic, economic and psychologic characteristics of households. A first experimental wave was launched in 2001. From 2005 on, SAVE is an annually conducted panel of more than 2000 households.⁴

We choose the level of the analysis to be the household because we view old-age provision as a household and not an individual task. Furthermore, the data only contains information on insurance contracts of households and does not allow to distinguish between different policyholders within households. Our attention is restricted to non-retired households where neither the head nor the spouse has retired because old-age provision occurs before retirement. The dependent variable PPI in our probit regression is a binary variable indicating whether a household holds a private pension insurance policy in 2005.⁵ Independent variables are grouped into (a) the theoretically motivated explanatory variables life expectancy, risk and time preferences, (b) control variables for substitutive old-age provision and financial literacy and (c) control variables for other household socio-economic characteristics.

(a) Life expectancy, risk aversion and time preference

Average subjective life expectancy per household is calculated in three steps. First, respondents are asked to estimate average life expectancy of men and women of their age group ($AVLE_{male}$ and $AVLE_{female}$). Second, they indicate the number of years they expect themselves to deviate from the average life expectancy of people of their sex and age ($EXPYEARSDEV_{head}$). Also, they indicate the number of years they

⁴Details on the the design of the SAVE study can be found in SCHUNK (2007) and BÖRSCH-SUPAN ET AL. (2008a). Item nonresponse in SAVE is adressed by an iterative multiple imputation procedure using a Markov chain Monte Carlo algorithm. Provided a properly performed imputation, regression based on multiply imputed data leads to efficiency gains and avoids potential biases from systematic nonresponse. We will therefore take advantage of the five imputed data sets for SAVE 2005 provided by MEA. For further information on the imputation procedure used in SAVE, see BÖRSCH-SUPAN ET AL. (2008a), SCHUNK (2008) and ZIEGELMEYER (2009).

⁵The precise wording in the survey is 'Other contractually agreed private pension scheme, e.g. investment funds geared specifically to the provision of pension cover, private pension insurance policies which are not promoted by the state or which were taken out before such support was available.'

expect their partner to deviate from the average life expectancy of his/her sex and age ($EXPYEARSDEV_{spouse}$). Subjective life expectancy for the household head is implicitly given by this information and can be calculated as $SLE_{head} = AVLE_{(fe)male} + EXPYEARSDEV_{head}$. Calculation of subjective life expectancy for the spouse relies on two (weak) assumptions: first, sex of the spouse is assumed to be opposite to the one of the head, and, second, age of the spouse is assumed to be about the same as the one of the head.^{6 7} It is then given by $SLE_{spouse} = AVLE_{(fe)male} + EXPYEARSDEV_{spouse}$.⁸

Risk attitudes and time preferences of the household head are indirectly inferred from hypothetical choices inquired in the survey. Table 4.1 displays the two sets of options that are used for their derivation. In the first set, people are requested to choose between options A and B in three different hypothetical lotteries. A is always a certain zero, while B implies a 50% chance of loosing 100 € and a 50% chance of winning 200 €, 300 € and 400 €, respectively. *RISK AVERSE* is a dummy variable that is equal to one for the most risk averse individuals who always opt for A, even in the third lottery where potential payment in B is highest.

Table 4.1: Hypothetical choices to elicit risk and time preferences

First Set		1	2	3
A	100%	0	0	0
B	50%	-100	-100	-100
	50%	200	300	400
Second Set		1	2	3
A	now	-800	-800	-800
B	in 10 months	-825	-870	-990

Source: The German SAVE Study (2005).

In the second set, the hypothetical choice is not between certain and uncertain payments, but between payments at different points in time. In each scenario, A is an immediate payment of 800 €, while B is a payment of 825 €, 870 € and 990 € in 10 months. *IMPATIENT* is a dummy variable that is equal to one for the most impatient individuals that always opt for paying in 10 months even if the postponed payment is highest.⁹ We are only able to infer preferences of the household head, but

⁶We view even the latter assumption as non-critical, since, on average, the household head is only 0.17 years older than his or her spouse in the 864 partner households with a standard deviation of 5.31 years.

⁷In a similar manner, BROWN (2001), BROWN ET AL. (2008a) and INKMANN ET AL. (2011) refer to individual expected survival probabilities. Data limitations force most other studies to make either use of aggregate mortality tables or the less nuanced self-assessed health status as a proxy.

⁸Obviously, our variable subjective life expectancy can be subject to measurement errors, induced by the inability to predict personal subjective life expectancy appropriately. However, we decided to use subjective life expectancy to explain the uptake of private pension insurance, since previous research points to the fact that it is a remarkably good predictor of actual lifetime (see HURD and MCGARRY, 1995, 2002).

⁹Comparable measures for risk aversion based on hypothetical lottery choices inquired in surveys are

not of the spouse which, however, is less a concern since the head states to be involved in financial decision-making in 95% of all cases.

(b) Financial literacy and substitutive old-age provision

Since old-age provision is a complex matter that requires a certain degree of knowledge in financial affairs, we account for the financial literacy of households by their stock market participation. More precisely, *FINLIT* is a dummy variable indicating whether the household holds equity and real-estate funds or other financial assets like equity bonds, discount certificates, hedge funds, wind power funds, film funds and other financial innovations. Stock market participation is an appropriate proxy for financial literacy as investment in this type of assets reveals a certain level of financial sophistication (see ROOIJ ET AL., 2007).^{10 11}

As private pension insurance is only one component of overall old-age provision, we need to take into account expected benefits from the first and second pillar as well as other types of third pillar old-age provision like real estate property, Riester pension plans, equity funds etc. We use type of employment of the main earner in order to approximate the expected benefit level from the first pillar of the old-age provision system due to the previously noted substantially varying benefit levels by type of employment. Employment is classified in four categories: civil servant (*CIVSERV*), white/blue-collar worker (*WORKER*), self-employed (*SELFEMPL*) and unemployed (*UNEMPL*).

Part of the population is eligible to occupational pension schemes and the government-subsidized Riester pension plans. We control for benefits from these sources by a variable containing the end of December 2004 balances of occupational pension schemes and Riester contracts (*OTHINS*). We also control for total private wealth that can be

used by SALM (2006) and BROWN ET AL. (2008a). CUTLER ET AL. (2008) furthermore suggests indicators like drinking and smoking behaviour, job-based mortality risk, preventive care and the use of seat belts that are also frequently used. An analogous measure of time preference is derived by BROWN ET AL. (2008a) from an experimental module in the 2004 HRS. Other studies rely on the length of the financial planning horizon to proxy for time preferences (see SALM, 2006; BROWN ET AL., 2008a).

¹⁰The related empirical literature uses various other measures to capture financial literacy. BROWN (2001) and INKMANN ET AL. (2011) rely on the general education level, while MOTTOLA and UTKUS (2007) gather from demographic characteristics to financial experience. Yet others use contact with tax advisors (see BÖRSCH-SUPAN ET AL., 2008b) or create indices by dint of direct investigations in surveys (see AGNEW ET AL., 2008; BROWN ET AL., 2008a; BUCHER-KOENEN, 2009).

¹¹We are aware of the fact that financial literacy and stockmarket participation do not have to be identically. Hence, we checked to make use of quiz-like questions to capture the respondents' financial literacy, since SAVE contains quiz-like questions from 2007 to 2009. Assuming financial literacy to be constant over time and applying this measure to households for which it is available, however, would result in a loss of sample size of about 30%. Instead, we use these later waves to validate our proxy: Correlations between stockmarket participation and correctness of answers to the financial literacy questions are substantial and highly significant. For instance, the tetrachoric correlation between stockmarket participation and a binary variable indicating three out of three correctly answered questions lies between 0.4 and 0.5 depending on the wave and is significantly different from zero at levels of less than 0.001.

used to maintain consumption levels during retirement. *NETWEALTH* is the sum of all assets excluding pension insurance. It consists of financial assets, business property, real property and other assets net of total debt. In some estimation specifications, the latter two types of substitutive old-age provision are adjusted by equivalence scales to account for differing financial needs of single and partner households (*OTHINSEQ*, *NETWEALTHSEQ*). We divide insurance balances and net wealth by 1.5 for partner households following the modified-OECD equivalence scale that assigns a weight of 0.5 to the second adult in a household. Additionally, we include *NETWEALTHSEQSQ* to take possible nonlinear effects into account.

Table 4.2: Sample means of dependent and independent variables by private pension insurance holdings

Variable	Estimation Sample		PPI=1		PPI=0	
	N=1320		N=206 (16%)		N=1114 (84%)	
	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.
AVSLE	78.85	7.45	79.98	7.00	78.64	7.52
RISKAVERSE*	0.65	0.48	0.66	0.47	0.65	0.48
IMPATIENT*	0.11	0.31	0.06	0.23	0.12	0.32
FINLIT*	0.23	0.42	0.40	0.49	0.20	0.40
CIVSERV*	0.07	0.25	0.09	0.28	0.06	0.24
WORKER*	0.63	0.48	0.66	0.48	0.63	0.48
SELFEMPL*	0.10	0.30	0.19	0.39	0.08	0.27
NETWEALTHSEQ	126391.04	654089.98	158505.88	378974.84	120452.38	690881.82
$\frac{NETWEALTHSEQSQ}{1000000}$	444400.00	9266000.00	183180.00	1669200.00	492800.00	10046000.00
NETWEALTH	177730.02	963460.62	228605.02	566677.04	168322.22	1016677.22
OTHINSEQ	2060.69	8313.76	3837.97	11988.97	1732.04	7397.30
OTHINS	2917.71	11651.37	5457.61	16848.50	2448.04	10350.31
AVAGE	41.14	10.86	41.10	8.75	41.14	11.21
AVAGESQ	1810.25	888.30	1765.70	715.02	1818.48	916.80
NRCHILD	1.55	1.31	1.46	1.15	1.56	1.34
PARTNER*	0.65	0.48	0.76	0.43	0.64	0.48
MARRIED*	0.60	0.49	0.68	0.47	0.59	0.49
NETINCEQ	1447.86	1687.41	1807.97	2443.28	1381.27	1498.79
$\frac{NETINCEQSQ}{1000}$	4941.50	35220.00	9209.41	67900.00	4152.28	24900.00
NETINC	2465.45	2801.94	3100.61	3410.99	2348.00	2659.40
EAST*	0.31	0.46	0.33	0.47	0.31	0.46

Note: Sample means are averaged over the five datasets. Variables marked with * are dummy variables.

Source: The German SAVE Study (2005). Own calculations.

(c) Socio-economic characteristics

Finally, we control for households' socio-economic characteristics that we assess to be relevant for the insurance choice. Average age, *AVAGE*, is supposed to represent the maturity status of the household in its life cycle. *AVAGESQ*, the squared average age, is included to allow for a possible nonlinear effect of age. *PARTNER* is a dummy variable designed to distinguish partner and single households. Alternatively, we include *MARRIED* that identifies married respondents. *NRCHILD* equals the number of

children and stepchildren of the head and his spouse.¹² *EAST* is a dummy variable that characterizes households located in Eastern Germany. $NETINC(EQ(SQ))$ is the net (equivalent(squared)) income of the household that should control for its purchasing power and possible nonlinear effects.¹³

The original sample size reduces to an estimation sample of 1320 households due to the following exclusion rules: First, only non-retired households where neither the head nor the spouse has retired are considered (836 observations). Second, we drop households with inconsistent estimates of personal life expectancy, where the indicated average life expectancy of people of their age and sex is less than current age (5 observations). Third, all households with a missing value for the dependent variable *PPI* are excluded (144 observations). The reason is that missing values were imputed using variables that will be partially included on the right hand side of the regression equation which would otherwise yield a self-made correlation. Means of the variables and their cross-correlations for the estimation sample are given in Tables 4.2 and 4.3.^{14 15}

¹²The presence of children is accounted for to capture a possible bequest motive in old-age provision (see HURD, 1987; BERNHEIM, 1991; JOHNSON ET AL., 2004; BÖRSCH-SUPAN ET AL., 2008b; INKMANN ET AL., 2011). Yet other authors rely on self-reported importance of bequest motives (see BROWN, 2001) or the existence of a will or trust (see BROWN ET AL., 2008a).

¹³In contrast to the substitutive old-age provision where we only adjust for a partner, we also account for children when calculating net equivalent income. The reason is that the ability to pay insurance premiums from current income depends on the presence of children, whereas retirement income typically only serves the financial needs of the parents. Calculation of net equivalent income of a household conceptually again follows the modified-OECD equivalence scale. Some specifications contain the net equivalent income, others the unadjusted net income. We also considered an alternative income measure roughly adjusted for subsistence income as defined by the Hartz IV regulations which, however, left our results unaffected.

¹⁴Generally note the following: We observe holdings of private pension insurance and household characteristics in 2005 or end December 2004. Theory suggests that starting from a situation without an insurance policy, a household implicitly calculates his net benefit from buying insurance in any given period. If this benefit is positive, the household buys a private pension insurance policy. In consecutive periods, the problem changes into the one of keeping or selling the previously bought policy. Selling a policy implies a financial loss due to administrative expenses. A critical point in our analysis is that we are unable to distinguish between new and old policyholders. Hence, there might be households in our sample that keep a policy though they would not buy it if they could newly decide in 2005. It would therefore be meaningful to run a similar analysis on the uptake of private pension insurance policies with panel data which, however, requires a larger sample size and a stable panel structure.

¹⁵In order to give an overview on the dependence of the independent variables in use, we show the cross-correlations between the variables in Table 4.3. An alternative to study the patterns of relationship among the dependent variables would be the application of a factor analysis. However, for reasons of simplicity we decided to present cross-correlations.

Table 4.3: Cross-correlations of the independent variables averaged over the five datasets

	AVSLE	RISK-AVERSE*	IMPAT-IENT*	FINLIT*	CIVSERV*	WORKER*	SELFEMPL*	NETWEAL-THEQ	NETWEAL-THEQSQ	NETWEAL-THTH	
AVSLE	1.00										
RISKAVERSE*	-0.04	1.00									
IMPATIENT*	-0.01	-0.07	1.00								
FINLIT*	0.06	-0.02	-0.12	1.00							
CIVSERV*	0.01	0.01	-0.06	0.10	1.00						
WORKER*	-0.01	0.01	-0.10	0.07	-0.35	1.00					
SELFEMPL*	0.08	0.03	-0.01	0.06	-0.09	-0.43	1.00				
NETWEALTHEQ	0.03	0.03	-0.04	0.11	0.00	-0.04	0.08	1.00			
NETWEALTHEQSQ	0.00	0.02	-0.01	0.05	-0.01	-0.04	0.01	0.09	1.00		
NETWEALTH	0.02	0.02	-0.03	0.11	0.00	-0.04	0.09	1.00	0.91	1.00	
OTHINSEQ	0.06	-0.04	-0.04	0.24	-0.04	0.06	0.09	0.15	0.03	0.15	
OTHINS	0.06	-0.04	-0.04	0.24	-0.04	0.06	0.09	0.16	0.03	0.16	
AVAGESQ	-0.05	0.10	-0.05	0.09	0.10	0.02	0.07	0.06	0.02	0.07	
NRCHILD	-0.04	0.09	-0.05	0.07	0.10	-0.01	0.06	0.06	0.02	0.06	
PARTNER*	-0.02	0.11	0.04	-0.01	0.04	0.05	-0.02	0.01	-0.01	0.02	
MARRIED*	0.02	0.06	-0.08	0.19	0.06	0.16	0.12	0.06	0.03	0.08	
NETINCEQ	-0.04	0.09	-0.10	0.17	0.06	0.17	0.05	0.07	0.03	0.08	
NETINCEQSQ	0.02	-0.02	-0.09	0.18	0.11	0.01	0.14	0.12	0.06	0.12	
NETINC	0.00	-0.01	-0.03	0.06	0.04	-0.02	0.07	0.05	0.02	0.05	
EAST*	0.03	0.00	-0.09	0.21	0.11	0.03	0.15	0.14	0.07	0.15	
	-0.07	-0.02	0.06	-0.11	-0.10	-0.06	-0.01	-0.07	-0.03	-0.07	
	OTHINSEQ	OTHINS	AVAGE	AVAGE-SQ	NRCHILD	PARTNER*	MARRIED*	NET-INCEQ	NETINC-EQSQ	NETINC	EAST*
OTHINSEQ	1.00										
OTHINS	0.99	1.00									
AVAGE	0.12	0.13	1.00								
AVAGESQ	0.12	0.12	0.99	1.00							
NRCHILD	0.04	0.05	0.40	0.36	1.00						
PARTNER*	0.09	0.12	0.26	0.21	0.34	1.00					
MARRIED*	0.11	0.14	0.34	0.29	0.36	0.78	1.00				
NETINCEQ	0.30	0.27	0.21	0.20	0.06	0.19	0.16	1.00			
NETINCEQSQ	0.23	0.17	0.09	0.09	0.04	0.02	0.01	0.86	1.00		
NETINC	0.30	0.28	0.20	0.18	0.17	0.32	0.27	0.94	0.75	1.00	
EAST*	-0.10	-0.10	0.04	0.04	0.04	-0.10	-0.10	-0.14	-0.05	-0.15	1.00

Note: Variables marked with * are dummy variables.

Source: The German SAVE Study (2005). Own calculations.

4.4.2 Estimation and Results

To estimate determinants of private pension insurance uptake, we specify a probit model with the dichotomous dependent variable PPI_i for all households $i = 1 \dots N$. PPI_i takes the value one for households holding a private pension insurance policy in 2005 and occurs with the conditional response probability p_i for given values of the independent variables X_i :

$$PPI_i = \begin{cases} 1 & \text{with probability } p_i = Pr(PPI_i = 1 | X_i) \\ 0 & \text{with probability } (1 - p_i) = Pr(PPI_i = 0 | X_i) \end{cases} \quad (4.1)$$

It is illustrative to interpret the binary response model as an outcome of an underlying latent variable model where the latent variable PPI_i^* can generally be modeled as

$$PPI_i^* = X_i\beta + \varepsilon_i. \quad (4.2)$$

In the probit framework, the residual error term is assumed to be standard normally distributed. If the latent dependent variable PPI_i^* exceeds a certain threshold (here set to zero), the observed outcome PPI_i is equal to one:

$$PPI_i = \begin{cases} 1 & \text{if } PPI_i^* > 0 \\ 0 & \text{if } PPI_i^* \leq 0 \end{cases} \quad (4.3)$$

Combining equations (4.1) and (4.2) allows to express the individual probability of having private pension insurance as $Pr(PPI_i = 1) = F(X_i\beta)$, where the parametric function $F(\cdot)$ is assumed to be the (standard) normal cumulative distribution function. As usual, we estimate the probit model by maximum-likelihood estimation. To deal with item non-response, we take advantage of the five multiply imputed data sets provided by MEA and combine the separate complete-data results by the method known as *Rubin's Rule*. This method averages estimated coefficients across datasets and takes within-imputation and between-imputation variances into account when calculating standard errors of the estimates (see RUBIN, 1987).

We distinguish between a model with purely theory-led explanatory variables and six different specifications where vectors of previously derived control variables X_i are included. The underlying latent model is thus specified as

$$PPI_i^* = \beta_1 + \beta_2 AVSLE_i + \beta_3 RISK AVERSE_i + \beta_4 IMPATIENT_i (+X_i\beta) + \varepsilon_i. \quad (4.4)$$

Table 4.4 displays average marginal effects calculated using Rubin's Rules for multiply imputed data for the model without control variables and six different specifications

Table 4.4: Average marginal effects using Rubin's Rule for multiply imputed data for the model without control variables and six different specifications of the model with a vector of control variables

	Without control variables			With control variables														
	dy/dx	P > z	(1)	dy/dx	P > z	(2)	dy/dx	P > z	(3)	dy/dx	P > z	(4)	dy/dx	P > z	(5)	dy/dx	P > z	(6)
AVSLE	0.0034**	0.013	0.0029**	0.0028**	0.042	0.0029**	0.0028**	0.035	0.0029**	0.042	0.0028**	0.042	0.0029**	0.032	0.0029**	0.0024*	0.087	
RISKAVERSE	0.0058	0.784	0.0078	0.702		0.0077	0.706		0.0077		0.0077	0.706		0.0073	0.0073	0.0033	0.871	
IMPATIENT	-0.0806***	0.002	-0.0425	0.173		-0.0422	0.176		-0.0422		-0.0422	0.176		-0.0413	-0.0413	-0.0416	0.187	
FINLIT			0.0985***	0.000		0.1009***	0.000		0.0976***		0.1000***	0.000		0.1007***	0.1007***	0.0964***	0.000	
CIVSERV			0.1237***	0.008		0.1300***	0.005		0.1248***		0.1310***	0.005		0.1244***	0.1244***	0.1306***	0.004	
WORKER			0.0831***	0.000		0.0872***	0.000		0.0833***		0.0874***	0.000		0.0846***	0.0846***	0.0979***	0.000	
SELFEMPL			0.1865***	0.000		0.1909***	0.000		0.1861***		0.1904***	0.000		0.1915***	0.1915***	0.1935***	0.000	
NETWEALTH/10 ⁶			-0.0042	0.823		-0.0038	0.843		-0.0034		-0.0034	0.799		-0.0041	-0.0041	0.1351*	0.094	
NETWEALTH/10 ⁶																-0.0058	0.470	
NETWEALTH/10 ⁶																		
OTHINSEQ/10 ³			0.0013	0.229		0.0013	0.235		0.0010		0.0010	0.815		0.0012	0.0012	0.0006	0.630	
OTHINS/10 ³																		
AVAGE			0.0241***	0.002		0.0243***	0.001		0.0244***		0.0246***	0.001		0.0245***	0.0245***	0.001	0.001	
AVAGESQ			-0.0003***	0.001		-0.0003***	0.001		-0.0003***		-0.0003***	0.001		-0.0003***	-0.0003***	0.001	0.001	
NRCHILD			-0.0178**	0.047		-0.0182**	0.042		-0.0189**		-0.0193**	0.032		-0.0169*	-0.0169*	0.058	0.034	
PARTNER			0.0236	0.308		0.0231	0.319		0.0200		0.0193	0.410		0.0155	0.0155	0.0363	0.116	
MARRIED														0.0061	0.0061	-0.0006	0.974	
NETINCEQ/10 ³			0.0059	0.287		0.0061	0.272							0.0061	0.0061	0.0002	0.724	
NETINCEQ/10 ⁶																		
NETINC/10 ³			0.0506**	0.027		0.0503**	0.028		0.0037		0.0038	0.262		0.0508**	0.0508**	0.0508**	0.028	
EAST									0.0507**		0.0504**	0.027						

Note: Dependent variable = *PPI*, sample size $N = 1320$ (non-retired households), * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: The German SAVE Study (2005). Own calculations.

with control variables.¹⁶ Summaries of the estimations are given in Appendix B, Table B.3. The p-values of the likelihood ratio test of the full vs. the intercept-only model in the second rows of each panel are zero. We therefore conclude that the whole model is statistically significant.

Let us first consider the model without control variables. As illustrated in the first column of Table 4.4, estimation results closely correspond to our expectations. In particular, average subjective life expectancy significantly positively influences the demand for private pension insurance. Other things being equal, households who expect to become old, are more likely to purchase supplementary private pension insurance than those who expect to die young. Quantitatively, the effect seems to be small, but it is statistically significant at a level of 1.3 percent. Risk averse individuals should be more willing to insure their longevity risk and thus exhibit a larger likelihood of having private pension insurance. Correspondingly, the marginal effect of risk aversion on private pension insurance uptake is positive, but insignificant. Since investment in pension insurance postpones today's consumption to tomorrow, individuals with high time preference should buy private pension insurance less frequently than their patient counterparts. As expected, a high rate of time preference is associated with a low predicted probability of having private pension insurance. With a p-value of 0.002, this relationship is highly significant in the model without the vector of control variables.

Now, let us direct our attention to the model specifications with control variables in columns two to seven of Table 4.4. Estimation results for this model prove to be robust across the six specifications. Compared to the model without control variables, our previous results qualitatively remain stable. As before, the probability of having private pension insurance significantly increases with average subjective life expectancy. We therefore conclude that people rationally take expectations about lifetime into account when deciding about old-age provision. Combined with the predictive power of subjective expectations of lifetime, this indicates risk-based selection due to private information. Hence, our investigation of the German annuity market confirms the common finding that annuity markets are in fact characterized by adverse selection.

The impact of risk aversion on pension insurance is again estimated to be insignificantly positive. Thus, preference-driven selection based on risk aversion does not seem to play a major role in the annuitization decision. This conflicts the emerging literature on propitious or advantageous selection based on risk aversion that emphasizes selection effects driven by risk attitudes instead of riskiness (see HEMENWAY, 1990;

¹⁶Marginal effects can be either evaluated at fixed values of the independent variables, typically the means, or averaged over all observations. The first are called marginal effects at the mean (MEM), while the latter are referred to as average marginal effects (AME). The main argument in favor of AME is the fact that sample means used during the calculation of MEM might refer to either nonexistent or nonsensical observations (see BARTUS, 2005). For comparison, we also calculated the MEM which are almost identical to the AME (see Appendix B, Table B.4).

MEZA and WEBB, 2001). Besides the admittedly noisy proxy, a potential explanation is collinearity of risk aversion and subjective life expectancy. This would hold, if risk aversion increased life expectancy due to more cautious health behavior and if individuals rationally took this effect into account when building their expectations about lifetime. Simple cross-correlation analysis as given in Table 4.3, however, throws doubt on this explanation because the correlation coefficient is close to zero and even slightly negative. Instead, we attribute insignificance of the marginal effect of risk aversion to a framing effect (see BROWN ET AL., 2008b). People might view private pension insurance policies as a type of investment rather than insurance. Due to its dependency on the ex ante unknown lifetime, return on investment in private pension insurance policies is relatively uncertain. In this regard, risk averse people should less frequently invest in pension insurance. Our result closely corresponds to BROWN ET AL. (2008a) who use a similar proxy for risk aversion. In most of their specifications, more risk averse people do not exhibit a significantly higher likelihood of taking annuities instead of a lump-sum payment. In contrast, CUTLER ET AL. (2008) find the expected relationship between risk-related behaviour and annuitization. Smokers or individuals with risky jobs are less likely to be covered by annuities, whereas individuals that undertake preventive health activities or those who always wear seatbelts are more likely to be covered by annuities.

While it is still estimated to be negative, the marginal effect of time preference on the probability of having private pension insurance becomes insignificant once the control variables are taken into consideration. Using an analogous proxy for time preference, BROWN ET AL. (2008a) also does not detect a robust relationship between time preference and annuity uptake. According to his result, patient individuals tend to be less likely to prefer the annuity over the lump-sum payment which, however, is significant at the 10 percent level in only two out of five specifications. We conclude that the effect is mainly attributed to other characteristics of the household than their time preference. A possible candidate is financial literacy which seems to play an outstanding role in the demand for private pension insurance. The probability of having private pension insurance is about 10 percentage points higher in financially literate than in financially illiterate households which is significant at the 1 percent level. This result is in line with the recent literature on the relationship between financial literacy, retirement planning ability and retirement saving (see LUSARDI and MITCHELL, 2006, 2007a,b; ROOIJ ET AL., 2007) and is also supported by BROWN ET AL. (2008a) and BUCHER-KOENEN (2009).

Benefit levels from the first pillar proxied by the type of employment also have substantial explanatory power. As expected, the marginal effect of a self-employed main earner who is least covered by the public pension system is largest. Thus, pre-existing annuities tend to crowd out private pension insurance uptake which ought to be the case according to MITCHELL ET AL. (1999) and DUSHI and WEBB (2004) and

is empirically confirmed by BERNHEIM (1991). According to our results, the predicted probability also increases with being a worker or a civil servant. There, the marginal effect of being a civil servant exceeds that of being a worker. At first glance, this seems counterintuitive due to the relatively more generous benefit levels for civil servants. An explanation might be a more cautious and provident attitude of civil servants on average that is not covered by other regressors.

Rather surprisingly, the monetary variables of (equivalent) net wealth, balance in other insurance-type old-age provision and household income do not determine insurance demand. Wealthy households run a lower risk of depleting their assets before death so that total wealth is theoretically supposed to negatively impact the probability of opting for supplementary private pension insurance. However, in accordance with BÖRSCH-SUPAN ET AL. (2008b), BROWN ET AL. (2008a) and INKMANN ET AL. (2011), we do not find this relationship in our data. In a similar manner, other insurance-type old-age provision can be seen as a substitute to private pension insurance such that a negative relationship is expected again. However, we again do not see evidence of substitution between different sources of old-age income. Instead, ahead thinking households tend to rely on several sources of old-age income. This finding is in line with other studies that also find a positive relationship between participation in alternative old-age provision and uptake of private pension plans (see BÖRSCH-SUPAN ET AL., 2008b; INKMANN ET AL., 2011).¹⁷ Finally, net (equivalent) household income also does not seem to play a role in the uptake of private pension insurance. While BÖRSCH-SUPAN ET AL. (2008b) estimate a weakly significant positive impact of income on pension insurance uptake, our result corresponds to BROWN ET AL. (2008a).¹⁸

As the average age of its members increases, a household's probability to purchase private pension insurance increases, but at a decreasing rate. Aggravating population aging and raising awareness of decreasing replacement rates of the public pension system should lead to a larger probability of supplementary pension insurance in young households. The youngest households, however, possibly have not yet fully addressed the matter of old-age provision which explains the observed nonlinearity. Whether the respondent is married or lives in a partner household, does not seem to influence the insurance decision. Thus, we do not find evidence for intra-household risk pooling theoretically suggested by KOTLIKOFF and SPIVAK (1981). In contrast to BROWN and POTERBA (2000) who find higher annuity demand among singles than couples, our results correspond to BROWN ET AL. (2008a).

Households in Eastern Germany are more likely to purchase private pension in-

¹⁷Note, however, that INKMANN ET AL. (2011) only find this for a subsample of stockholders.

¹⁸Presumably, household income is an important determinant of the amount of insurance purchased because of higher purchasing power and higher standard of living that needs to be insured. In principal, we could estimate a two-stage model with the amount as the dependent variable in the second stage. Unfortunately, data on private pension insurance premium in force and contributions to the scheme prove to be unreliable such that we restrict our attention to the binary variable *PPI*.

insurance than their Western German counterparts. This might be explained by lower expected public pension replacement rates of the Eastern German population due to less continuous employment biographies and lower average income subject to contribution payments (see KRENZ and NAGL, 2009).¹⁹ Interestingly, if the number of children increases by one, the probability of having private pension insurance falls by about two percentage points. We interpret this statistically significant effect as evidence for a bequest motive or expected intergenerational transfer from children to their parents during retirement. As mentioned by BERNHEIM (1991), children's altruism might function as a 'safety net' that makes pension insurance less needed. Our finding corresponds to the empirical results by BERNHEIM (1991). However, quite a number of studies does not find an empirical indication of bequest motives in old-age provision (see HURD, 1987; BROWN, 2001; BÖRSCH-SUPAN ET AL., 2008b; BROWN ET AL., 2008a; INKMANN ET AL., 2011).

¹⁹For a detailed income decomposition of the German elderly in the Old and New Laender see BÖNKE ET AL. (2010).

4.5 Conclusion

We investigate determinants of private pension insurance uptake of German households using the 2005 SAVE survey on savings and old-age provision. In a comprehensive assessment of the relevant factors suggested by theory and previous empirical work, we simultaneously estimate their importance in a multivariate framework. Our main finding is that households take advantage of private information on expected lifetime in the pension insurance choice. Conditional on other relevant variables, households expecting to become old, are relatively more likely to take up supplementary private pension insurance. This indicates the presence of adverse selection in the German annuities market.

We also find financial literacy and pre-existing annuities to play a prominent role in the insurance decision. Financially literate households, identified by their active participation in the stock market, are significantly more likely to hold private pension insurance policies. Pre-existing annuities from the quantitatively most important public pension system, tend to crowd out private insurance. Civil servants who benefit from relatively high public pension replacement rates, are less likely to have supplementary private insurance than households with a self-employed main earner who are typically not covered by the public system. In addition, the number of children is negatively related to the probability of private pension insurance. This can be interpreted as an indication of bequest motives or expected intergenerational altruism. According to our results, uptake of private pension insurance does not differ between single and partner households.

In addition, we only find very limited evidence for the theoretically suggested importance of risk aversion and time preference. Our measure of risk aversion has no explanatory power in the pension insurance choice. This might be explained by the fact that a pension policy cannot only be seen as insurance, but also as a type of investment. On the one hand, the insurance character of private pensions that protects the insurant from longevity risk should be appreciated by risk averse households. On the other hand, the relatively uncertain return on a pension policy that depends on the ex ante unknown length of life tends to retain risk averse households from purchase. These two opposing effects might therefore explain the lacking explanatory power of our measure of risk aversion. Time preference has the expected negative coefficient, but it becomes insignificant as control variables are taken into account.

This work contributes to the literature on adverse selection in annuities markets. Our result is in line with a number of related studies primarily focusing on the UK and US that also find evidence for adverse selection in annuities markets. While most of these studies make use of the money's worth concept to detect adverse selection, we use micro level data and approach the issue from the perspective of the insurant. To our knowledge, we are the first to investigate adverse selection in the German annuities

market at the household level. From the policy point of view, our work suggests that the private pension insurance market is in fact characterized by inefficiencies related to adverse selection. Difficulties arise for low risk individuals for whom insurance in the private pension market is prohibitively expensive. Policy makers should therefore keep in mind that privately insuring longevity risk is not without difficulty for part of the population.

For future research, it would be meaningful to conduct a comparable analysis using panel data that allows to observe household characteristics directly at the time of annuity purchase. Since our indicators of risk and time preferences are rather rough, we additionally consider it worthwhile to construct more sophisticated measures of preferences in surveys. This would provide deeper insight in preference-driven selection in insurance markets. Finally, it would be interesting to follow the development of the German pension system and address to adverse selection in Riester pension plans. While cautiously demanded in the beginning, holding of these increased to about 13 million contracts in end of 2009. Possibly, the design of the subsidy scheme that strongly incentivizes specific parts of the population to take up Riester plans, outruns the importance of life expectancy for profitability of the policies and thus reduces adverse selection.

Part II: Distributive Justice in the German
Support Legislation

Chapter 5

Equity Perceptions Implicit in German Tax and Transfer Policies: A Simulation Analysis with Special Focus on the Support Legislation

5.1 Introduction

The changing pattern of family composition towards single-parent households as well as the support reform in 2008¹ placed special emphasis on the topic of support payments in the political debate in Germany. The reform was in particular aimed at improving child-welfare, strengthening of post-marital self-responsibility and the legal harmonization of children born in and out of wedlock (see DEUTSCHER BUNDESTAG, 2006). The question, to what extent the current support practice provides for distributional justice between the children's parents has not been paid much attention to.

In the first part of this study we address this question by revealing the equity perceptions implicit in the German tax-benefit system. Thereby, we focus on the support legislation in particular. When comparing the well-being of different households derived from disposable income, one faces the challenge of taking into account the different needs of heterogeneous households. These can be caused by, among other things, differences in the number and/or the age of the household members. A conventional method of relating these needs is the use of equivalence scales. Although the concept of equivalence scales is widely accepted, it involves an inherent weakness: the choice of a certain equivalence scale in applied research is a value judgment (see e.g. COWELL and MERCADER-PRATS, 1999; CREEDY, 2007), since each specification makes statements on the relative needs. We avoid this criticism of the prevailing equivalence scales by

¹'Law of the Amendment of the Support Legislation' from 21.12.2007 (*Gesetz zur Änderung des Unterhalts*) see DEUTSCHER BUNDESTAG (2007).

revealing the scales inherent in the German tax-benefit system. Hence, we reverse the order of reasoning. We evaluate the German spousal and child support legislation by assuming that *horizontal equity* is satisfied by the tax-benefit system. That means, that all household members, formerly living in one and the same household and having the same standard of living, continue to have the same standard of living after marital dissolution, even if on a changed level. Since disposable income is determined by various subsets of transfer systems, our assumption implies that the interplay of all these subsets provides for an equalization of both the two newly formed households.²

In order to unveil those implicit scales, we assume the household of the non-custodial parent (NCP) to be the reference household, and relate the corresponding disposable income to that of the household of the custodial parent (CP). Hence, it is required to simulate the disposable income of both of the parents. Therefore, we establish a simulations model. We choose their pre-tax-pre-transfer incomes³ as starting point. This procedure enables us to take into account all subsets of the comprehensive tax-benefit system. This is of importance, since EBERT and LAMBERT (1999) pointed out, that an equivalence scale that represents only part of the tax-benefit system is of limited interest. Hence, our simulation model includes regulations on taxation, social security and public as well as private transfers, latter in terms of support payments. Most of the incorporated tax and benefit schemes comprise own equivalence scales. With the intention to reveal the overall equity perception, it seems essential to us, to have a closer look on the scales that are inherent in the single subsystems. This procedure enables us to unveil possible concurred or even opposed value judgments inherent in the interplay of all subsystems. Therewith, we make an analysis available, which provides for transparency not only in the comprehensive context, but also in the parts that comprise the whole. Such an analysis could serve as a basis, which allows the government to match actual with desired redistribution.

The conducted simulation of the German tax-benefit system can be used, in order to answer a second policy relevant question concerning the distributive justice of the support legislation: To what extent do the actual support payments mirror those payments, alternative equivalence scales would predict? We aim at answering this question in the second part of this study. Therefore, we take the configuration of the German tax and public transfer system as given and calculate the corresponding disposable incomes for both newly formed households. Thus, in a first step we refrain from incorporating the support legislation. In a second step, the sum of their incomes is distributed according to different equivalence scales, commonly applied to distributional analy-

²For the sake of simplicity, this assumption is based on one presumption, that is not automatically assignable to real world value propositions. It is plausible to assume that in case of a subsistence income or after marital dissolution an equal standard of living is desirable for the concerned households. However this does not apply to the value judgements discussed with regard to taxation (for the various principles of taxation see e.g. KAPLOW, 2008; KENDRICK, 1939).

³In the following also referred to as 'gross incomes'.

sis. Finally, predicted support payments are derived by the difference between actual and artificial disposable incomes of the non-custodial parent or the custodial parent, respectively.

When analyzing the equity perceptions inherent in the German tax-benefit system, we refer to two strands in literature. First, we refer to the literature dealing with equivalence scales inherent in tax-benefit systems. Second, we are concerned with the literature on the application of equity to support payments.

There exist some studies deriving implicit equivalence scales in order to analyze the current tax-benefit systems. MUELLBAUER and VEN (2002, 2004) focus on the methodology of estimating implicit equivalence scales within the tax-benefit systems. Additionally, MUELLBAUER and VEN (2002) contrast their derived scale for the Australian tax-benefit system with an officially applied scale and find a relatively good fit. AYALA ET AL. (2003) investigate those equivalence scales, implicit in the Personal Income Tax in Spain. Thereby, they only refer to scales corresponding to minimal needs. They contrast these minimal income scales to scales, commonly used in distribution analyses. Their comparative results show that scales referring to the minimal income, on average, exhibit higher values when inherent in the Spanish tax system. Hence, in practice economies of scale are taken into account to a lesser extent than in distribution analyses. The study of BÖNKE and EICHFELDER (2010) refers to Germany and investigates distributional justice, defined as an identical average tax-benefit burden, embodied in the German tax-benefit system. Two different equivalence scales, inherent in the German system are employed. BÖNKE and EICHFELDER (2010) refer to a system, which comprises taxes, social security contributions and public transfers, latter in the form of the German unemployment benefit II. Their results show, that the German legislation represents significant contradictions in value judgments between the three single systems under investigation.

Literature on the application of equity to support payments is extremely rare. The existing literature focuses on child support only, hence disregards spousal support. EDEN ET AL. (1987) were the first, who urged to the goal of an equalization of living standards within the framework of child support payments. They proposed a model that provides for an equal standard of living by pooling the parent's incomes and reallocating them according to regulations associated with the federal poverty guideline.⁴ BRAVER and STOCKBURGER (2004) refer to the standard of living approach, even if they apply a given equivalence scales in order to determine the equivalent incomes of the custodial parent for given levels of gross income of the non-custodial parent. While the concept of horizontal equity was originally applied to taxation, SORENSEN and HALPERN (2000) point to the fact that inconsistencies in judicial awards should also be an issue of horizontal equity. Thereby horizontal equity is defined as the equal treatment of equals. FARR and BUURMAN (2003) take up their definition of horizontal

⁴For a sample calculation see ROWE (1989).

equity and investigate horizontal and vertical equity⁵ within the framework of child support for Australia. Therefore, they simulate a model indicating the amounts each parent has to contribute to the costs of the children and relate those amounts to the levels dedicated by the equity principles. For both cases, they find that the Australian child support regulations treat the custodial parent more favourable than the non-custodial parent. Only in the case the custodial parent draws a relatively high income, vertical equity is approximately fulfilled.

To our knowledge the German support legislation has not been investigated yet on the principle of horizontal equity. With this study, in which we use two different – but methodologically similar – approaches to reveal the implicit value judgments within the German support legislation, we connect both above mentioned strands of the literature. Hence, we contribute to the literature by applying the concept of implicit equivalence scales to the topic of distributional equity in the context of regulations on support. In contrast to the first strand, we extend the tax-benefit system to private transfers, those in the form of support payments. With respect to the literature on the application of equity to the support legislation, we contrast by relying on implicit scales instead of given ones, like done by BRAVER and STOCKBURGER (2004). Additionally, we integrate not only child support, but also spousal support payments.

The remainder of the chapter is as follows: In Section 5.2 the concept of equivalence scales and the most prominent procedures of deriving them are introduced. In particular, those scales, adapted to this study, are amplified. Section 5.3 presents the German tax-benefit system and illustrates how the simulated data is gathered. Section 5.4 deduces the scales implicit in single provisions of the German tax-benefit system. Subsequently, the inherent scale of the whole tax-benefit system is derived and comparisons to the single scales as well as to commonly used scales are made. The results concerning differences between the actual and predicted support payments are presented in Section 5.5. Conclusively, Section 5.6 summarizes and presents policy implications.

⁵FARR and BUURMAN (2003) define ‘vertical equity’ as the principle, that people with a greater ability to pay should do so.

5.2 Methodological Concepts

To analyze the equity perceptions implicit in the German tax-benefit system it is essential to provide a definition of ‘equity’ in the context of this study. Subsequently, we associate the definition of equity with the core instrument of our analysis, the equivalence scales. In this framework we introduce the property of base (in)dependence and the most prominent procedures of deriving equivalence scales. Finally, we amplify those scales, adapted to the analysis.

5.2.1 Horizontal Equity and Equivalence Scales

When investigating distributional justice in the German tax-benefit system we refer to the definition of *horizontal equity* as stated by FELDSTEIN (1976). Thereafter, redistribution should be organized in a way that the ranking of utility levels remains unchanged. Hence, referring to our case of marital dissolution, we assume one and the same standard of living for all household members before divorce. By assuming that the German tax-benefit satisfies horizontal equity, we proceed on the assumption that after divorce both newly formed households still realize an identical standard of living, even if on a changed level.

Our measure of equity perceptions implicit in tax-benefit systems are equivalence scales. Intuitively, equivalence scales mirror the relatives in requirements necessary to attain one and the same standard of living. But at first, consider the ‘classic’ perspective on equivalence scales and reverse the reasoning: Equivalence scales allow comparing the material comfort of different household types. Thereby, an identical material comfort, or identical standard of living, is defined by an *equivalent income*.⁶ The determination of equivalent incomes is done by means of equivalence scales. The idea behind the concept of equivalence scales is the following: Requirements of a household increase with the number of household members but simultaneously, due to joint house-keeping, *economies of scale* can be realized (see DONALDSON and PENDAKUR, 1999). Hence, total requirements increase less than the number of household members. Equivalence scales assign to each household member those additional requirements, needed to keep the household on a constant standard of living. For this reason, equivalence scales can be regarded as deflators of the household income echoing certain household characteristics.

Let us assume two households r and h ($i = r, h$). Both differ concerning their income, μ_i , and their household characteristics, z_i , as for instance number and age of the household members. In the basic case, household r consists of one adult and is assumed to be the reference household. Now, we are interested in the income μ_h , that

⁶The formal notation interprets an identical material comfort as an identical indirect utility level of different household types (see e.g. BRADBURY, 1989; COULTER ET AL., 1992b; COWELL and MERCADER-PRATS, 1999).

grants its members a standard of living equal to that of the single household r , which draws an income of μ_r . Thereby, the household characteristics of household h , z_h , have to be taken into consideration. This can formally written as:

$$E(\mu_h, z_h) = \mu_r \quad , \quad (5.1)$$

whereas $E(\mu_h, z_h)$ is denoted as the equivalent income function. The equivalent income is, thus, defined here as the income the reference household needs in order to attain the same standard of living as household h with income μ_h .

As equivalence scales, m_i , are deflators of the income, the formal link between equivalent income, $E(\mu_h, z_h)$, and actual income, μ_h , of household h can be formulated by means of the equivalence scale, m_h , as:

$$E(\mu_h, z_h) = \frac{\mu_h}{m(z_h)} \quad \Leftrightarrow \quad m(z_h) = \frac{\mu_h}{E(\mu_h, z_h)} \quad . \quad (5.2)$$

Combining Equation 5.1 and Equation 5.2 displays equivalence scale $m(z_h)$ as relation of actual incomes of households differing in income and household characteristics, and illustrates the above mentioned intuitive perspective on equivalence scales:

$$m(z_h) = \frac{\mu_h}{\mu_r} \quad . \quad (5.3)$$

A question discussed in the literature, is whether equivalence scales are allowed to be *independent of base*⁷ or not. Hence, it is discussed whether scales are allowed to vary with the income of the reference household or not.⁸ Equation 5.2 displays a scale independent of base, whereas scales dependent on base can, for example, be written as:

$$E(\mu_h, z_h) = \mu_h - \Omega(z_h) = \frac{\mu_h}{m(\mu_h, z_h)} \quad . \quad (5.4)$$

Thereby, Ω denotes the basic needs as a function of the household characteristics z_h (see BÖNKE and EICHFELDER, 2010).

5.2.2 Types of Equivalence Scales

A variety of equivalence scales is discussed in the literature. Concerning the methodology of derivation, they can be classified into three different groups: (a) expert based, (b) demand based, and (c) survey based scales.⁹

⁷The terminology of *Independence of Base* goes back to LEWBEL (1989) and is also named as *Equivalence Scale Exactness* (see e.g. BLACKORBY and DONALDSON, 1993).

⁸See e.g. BLACKORBY and DONALDSON (1993); BLUNDELL and LEWBEL (1991); CONNIFFE (1992); DONALDSON and PENDAKUR (2004); KOULOVATIANOS ET AL. (2005); MUELLBAUER and VEN (2002, 2004); PENDAKUR (1998).

⁹For an overview of different equivalence scales see e.g. COWELL and MERCADER-PRATS (1999); NELSON (1993). For an overview of the classification of scales see e.g. COULTER ET AL. (1992a); FAIK

Most of the scales applied in empirical work on distributional topics are based on statements of experts on specific minimal needs of households. These statements are, however, arbitrary even if they are based on an empirical basis. The reference point of those scales is the subsistence level of the corresponding household types.¹⁰ The ideas behind the expert approach are manifold¹¹, but all in common is that the weights assigned to additional household members are shares of the requirements of the first person in the household.

The demand based approach aims at deriving equivalence scales on the basis of observed consumer behaviour. Single-equation models identify different household types to exhibit the same standard of living by means of the same share (see ENGEL, 1895) or the same absolute amount (see ROTHBARTH, 1943) of income spent on food. Multi-equation models extend the single-equation models on product-specific scales (see BARTEN, 1964; PRAIS and HOUTHAKKER, 1955).

A further method of deriving equivalence scales is based on revealing subjective perceptions on an equal material comfort with the assistance of interviews and surveys.¹² In the literature there exist two competing approaches, the *consensual* and the *subjective* approach. The decisive difference consists in the household types about which respondents have to give judgements. Within the framework of the consensual approach, the respondent has to give judgements on the relation between financial resources and material comfort about different household types. Within the framework of the subjective approach the respondent only assesses her own household type.¹³

Irrespective of the methodology, BUHMANN ET AL. (1988) established that all types of scales can be expressed in a parametric form. The first and most straightforward of these parametric scales goes back to the article of BUHMANN ET AL. (1988). Their scale is characterized by one parameter ϕ , the *equivalence elasticity*, indicating the economies of scale of joint housekeeping:

$$m(s, \phi) = s^\phi \quad \text{with} \quad 0 \leq \phi \leq 1, \quad (5.5)$$

where s denotes the number of household members. Economies of scale are the higher the smaller ϕ . In order to account for the differences in needs between adults and minors, as pointed out by MCCLEMENTS (1977), the basis parametric form was extended by e.g. BANKS and JOHNSON (1994); COULTER and KATZ (1992); JENKINS and COWELL (1994) to the following formula:

$$m(a, c, \eta, \phi) = (a + \eta c)^\phi \quad \text{with} \quad 0 \leq \phi \leq 1 \quad \text{and} \quad 0 \leq \eta \leq 1, \quad (5.6)$$

(1995); SCHRÖDER (2004, 2009).

¹⁰The pioneering work goes back to ENGEL (1895); ORSHANSKY (1965); ROWNTREE (1901).

¹¹For an overview see COULTER ET AL. (1992a).

¹²The pioneering work goes back to KAPTEYN and PRAAG (1978) and PRAAG (1971).

¹³For further details on the different scales see COULTER ET AL. (1992a), FAIK (1995) and SCHRÖDER (2004).

where a denotes the number of adults and c the number of children. The parameter η provides for the adjustment in terms of lower needs of children and ϕ , as stated above, considers the correction with respect economies of scale.

5.2.3 Equivalent Scales Employed in this Study

In our study we contrast the revealed implicit scales with commonly used ones in order to have reference points of equity perceptions discussed in the literature. As already mentioned, there exists no consensus on the ‘correct’ scale. Following BUHMANN ET AL. (1988), all the scales have equivalence elasticities ranking between 0.2 (survey scales) and 0.8 (expert scales). To cover different assumptions on the extent of economies of scale, to take into account differences in needs between adults and minors and to consider scales dependent as well as independent on base, we decide to consider four scales in our investigation: (a,b) both OECD scales,¹⁴ (c) a scale recommended by CITRO and MICHAEL (1995), an US expert commission,¹⁵ and (d) a scale of KOULOVATIANOS ET AL. (2009).¹⁶ The first three scales (a–c) can be assigned to the class of expert based scales, whereas the KSS scales belongs to the consensual approach of the survey based scales.¹⁷

The three expert based scales are commonly used in distribution and poverty analyses. For Germany, the two OECD scales are usually applied (see e.g. DEUTSCHER BUNDESTAG, 2001, 2005, 2008). For the United States, the scale recommended by CITRO and MICHAEL (1995) is frequently used (see e.g. BRAVER and STOCKBURGER, 2004). Whereas the OECD scales only account for the differences in needs between adults and minors, CITRO and MICHAEL (1995) in addition consider a parameter accounting for economies of scale.

The functional notation of the OECD scales is as follows:

$$m(a, c, \alpha, \beta) = 1 + (\alpha(a - 1) + \beta c) \quad , \quad (5.7)$$

where a denotes the number of adults, c the number of children, and α and β denote the relative requirements of additional adults¹⁸ or of the children. The old-OECD scale sets $\alpha = 0.7$ and $\beta = 0.5$. Thus, it allocates to the first person in the household a value of 1, each further adult in the household is allocated an additional requirement of 70% and each child an additional requirement of 50% of the first person (see OECD, 1982). The modified-OECD scale sets $\alpha = 0.5$ and $\beta = 0.3$ (see HAGENAARS ET AL., 1994).

¹⁴In the following referred to as *old-OECD scale* or rather *modified-OECD scale*.

¹⁵In the following referred to as *CITRO scale*.

¹⁶In the following referred to as *KSS scale*.

¹⁷We do not refer to scales based on consumer demand behaviour, as the four selected scales represent the all above mentioned main features of equivalence scales. Additionally, in comparison to expert based scales the demand based scales are less frequently used in applied analysis.

¹⁸‘Additional’ means additional to the first person in the household.

Hence, with setting smaller values the modified-OECD scale implicitly assumes higher economies of scale.

As mentioned above, the functional notation of the CITRO scale is characterized by an additional parameter, ϕ , explicitly accounting for economies of scale:

$$m(a, c, \beta, \phi) = (a + \beta c)^\phi \quad . \quad (5.8)$$

Each adult is assigned an identical requirement of 1, each child is allocated a weight of $\beta = 0.7$ and the expert commission recommends an equivalence elasticity ranking between $\phi = 0.65$ and $\phi = 0.75$ (see CITRO and MICHAEL, 1995). We follow BRAVER and STOCKBURGER (2004) in assuming a value $\phi = 0.7$, the average of recommendation.

Additionally, we refer to a survey based scale of KOULOVATIANOS ET AL. (2009), henceforth KSS Scale. The difference of the latter scale to the further ones is based on two of its properties: (a) it is dependent on base and (b) it allows for differences in the employment status of the adults in the household. Thus, it seems to be particularly suitable for our research purpose. Since the scale distinguishes between the employment status of the adults, we are enabled to quantify the differences in well-being caused by the loss of household production and the harm associated with employment. This is in particular useful for the analysis of support payments, as it is to be expected that labor market participation of the non-custodial parent and the custodial parent fall apart. A further advantage of the KSS scale is that the scale is deduced from a survey conducted in Germany.

Table 5.1: Survey referring to KOULOVATIANOS ET AL. (2009)

Incomes have to be stated that way, that all household types realize the same standard of living	1 adult, nonworking	1 adult, working full time	2 adults, both nonworking	2 adults, 1 nonworking 1 working full time	2 adults, both working full time
0 children	500 €*				
1 child					
2 children					
3 children					

Note: *Exemplary declaration on the monthly disposable income of the reference household.

Each respondent have been presented three different surveys with differing reference incomes, 500 €, 2,000 € and 3,500 €.

Source: KOULOVATIANOS ET AL. (2009, S. 51).

The subjective equivalence scales derived by this survey are associated to the consensual approach. Thus, the respondents were asked to give statements on identical standards of living for different household types. In this specific case three surveys were presented to each of the respondents. The three surveys exclusively differed concerning the level of income of the reference household, an unemployed single. They displayed monthly disposable incomes of 500 €, 2,000 € and 3,500 €, respectively. The survey design is shown in Table 5.1. The surveys had to be processed in ascending order of reference income. Thereby, the respondents were asked to fill the blank boxes with those monthly disposable incomes, that enable – to the respondents opinion – the corresponding household types to realize the same standard of living as the unemployed single, equipped with the stated reference income. Hence, they were asked to give statements to equivalent incomes.

Table 5.2 displays the results of the surveys conducted by KOULOVATIANOS ET AL. (2009). N and W denote the employment status of the adults. Each N points to a nonworking adult, each W to an adult in employment (full time) and each C to a child in the household. The results can be exemplified as follows: Assuming the unemployed single has an income of 2,000 € at disposal, then a working (nonworking) single living in a household with two children would need an income of 3,700.30 € (2,812.20 €) to realize the same standard of living that the reference household provides.

According to Equation 5.3 equivalence scales can be derived by relating income levels of different household types to each other. KSS scales comparable to our investi-

Table 5.2: Equivalent incomes referring to KOULOVATIANOS ET AL. (2009)

y_r		Singles		Couples		
		N	W	N/N	W/N	W/W
500	No Children	500	903.35 (21.66)	977.13 (18.63)	1,314.33 (33.50)	1,715.85 (53.18)
	C	802.13 (8.43)	1,227.90 (25.65)	1,266.10 (20.52)	1,603.96 (36.27)	2,070.58 (55.63)
	CC	1,073.41 (16.59)	1,498.63 (31.90)	1,522.38 (27.41)	1,866.16 (4.36)	2,371.19 (61.40)
	CCC	1,323.05 (26.58)	1,758.69 (40.93)	1,747.35 (34.96)	2,102.74 (52.20)	2,645.58 (70.85)
	No Children	2,000	2,829.57 (67.48)	3,227.29 (57.10)	3,856.16 (89.18)	4,718.60 (147.11)
2,000	C	2,460.37 (36.42)	3,308.08 (82.82)	3,628.81 (78.24)	4,287.35 (109.57)	5,249.54 (168.85)
	CC	2,812.20 (56.29)	3,700.30 (98.11)	3,960.06 (91.18)	4,622.41 (119.55)	5,660.76 (181.48)
	CCC	3,149.39 (78.51)	4,066.74 (117.10)	4,297.53 (116.45)	4,969.21 (139.19)	6,092.07 (203.18)
	No Children	3,500	4,540.70 (94.02)	5,277.44 (92.51)	6,135.82 (139.01)	7,432.32 (228.72)
3,500	C	3,980.95 (31.45)	5,104.73 (105.89)	5,752.10 (108.92)	6,695.43 (157.54)	8,077.59 (246.22)
	CC	4,410.34 (63.10)	5,576.07 (124.63)	6,175.15 (128.12)	7,141.49 (177.50)	8,592.84 (265.15)
	CCC	4,815.52 (94.54)	6,028.02 (148.12)	6,594.02 (155.18)	7,582.62 (201.16)	9,100.91 (285.35)

Note: Standard deviations in brackets. y_r : Level of reference income in €. Each N points to a nonworking adult, each W to an adult in work and each C for a child.

Source: KOULOVATIANOS ET AL. (2009, S. 45)

gation relate disposable income of single-parent households (with one to three children) to disposable income of a single household. Thereby the single household is chosen to be the reference household. As in our investigation we assume that the non-custodial parent is in employment and lives in a single household,¹⁹ the single household in employment is chosen to be the reference household. Thus, when deriving those KSS scales applicable to our scenarios, we refer to Table 5.3 and only make use of the two columns entitled with ‘Singles’. For each of the three household types of the custodial parent (one, two and three children) we determine three equivalence scales, one for each reference income. Comparing the equivalence scales for one and the same custodial parent household type (one to three children) at the three reference points, we observe a decrease in the scale associated with an increase in income of the reference household. This relation holds for all household types.

To visualize the KSS scale, we estimate the non-linear relationship between equivalence scale and disposable income for each household type. Thereby, we distinguish

¹⁹For details on the investigated scenarios see Section 5.3.1.

between the employment status of the custodial parent. To make the scales applicable to subsequent analyses,²⁰ we process the gathered data shown in Table 5.2 in two manners. First, we adjust the data to prices of 2010. Second, we conclude from the stated disposable income to pre-tax-pre-transfer income with the help of the simulation model outlined in this study.²¹

Figure 5.1 illustrates the derived KSS scales. Subfigure (a) displays the case of a

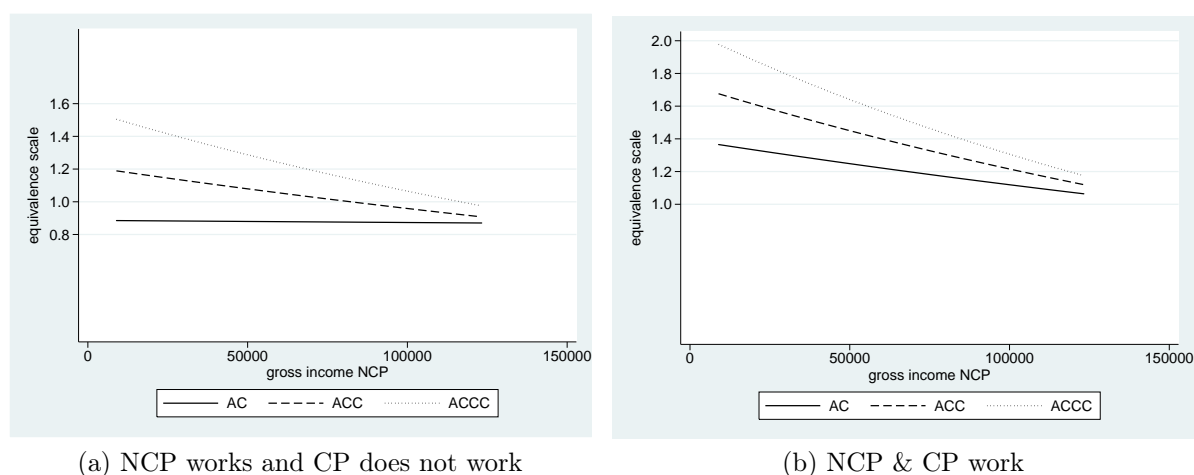


Figure 5.1: KSS scale: NCP & CP work

non-custodial parent in employment and a corresponding unemployed custodial parent, in subfigure (b) both, the non-custodial parent as well as the custodial parent are in employment. Both figures have three characteristics, worth mentioning, in common: First, as to be expected, the higher the number of children in the household of the custodial parent the higher is the associated equivalence scale. Second, the KSS scale is income dependent as all the scales show a decreasing slope. Third, with increasing income the scales converge. A comparison of the subfigures illustrates, that the estimated equivalence scales of case (a) show lower levels than those of case (b). Hence, the requirements awarded to the household of an unemployed custodial parent in relation to a non-custodial parent in employment are lower than those awarded to the household of a custodial parent in employment. We interpret this finding as a compensation of the non-custodial parent for the loss of household production and the harm associated with employment.

Table 5.3 provides an overview of all equivalence scales employed in this study. As our study is focused on the equivalent incomes of single-parent families in relation to singles, the table exclusively displays scales for different single-parent household types. The first column describes the household type of the custodial parent. The *A* indicates, that there is only one adult in the household and the number of stated *C*s indicates

²⁰Subsequent analyses base on pre-tax-pre-transfer income, also understood as gross wage (see Section 5.3).

²¹For further details on the simulation model see Section 5.3.

Table 5.3: Employed scales

Household type	Income independent scales			Income dependent scales	
	OECD old ^a (Deflator)	OECD mod. ^b (Deflator)	CITRO ^c (Deflator)	CP works (Max. Deflator)	KSS ^d CP works not (Max. Deflator)
AC	1.50	1.30	1.45	1.359	0.888
ACC	2.00	1.60	1.85	1.659	1.188
ACC	2.50	1.90	2.21	1.947	1.465

Notes: The stated maximum deflators refer to the lowest reference income. The number of *As* points to the number of adults and the number of *Cs* to the number of children in the household of the custodial parent.

Source: ^aOECD (1982), ^bHAGENAARS ET AL. (1994), ^cCITRO and MICHAEL (1995), ^dKOULOVIATIANOS ET AL. (2009). Own calculations.

the corresponding number of dependent children.²² From the table can be gathered that we refer to both, income dependent and income independent scales. The scales of the latter category are entitled as ‘deflators’. In contrast, the term ‘max. deflator’ points to the income dependence of the scale. Stated values refer to the lowest reference income of KOULOVATIANOS ET AL. (2009).

The figures in the table can be exemplified as follows: According to the modified-OECD scale, a household comprising one adult and two children has requirements 1.6-times as high as that of a single, so as to realize the same standard of living. Referring to the KSS scale two distinctions have to be made. First, the scales vary with the employment status of the custodial parent. As an example, in the case that the custodial parent is in employment, the maximum deflators resemble those of the modified-OECD scale rather well. A custodial parent with two children has e.g. requirements 1.659-times as high as that of a single. The maximum deflator reduces to requirements of 1.188-times in the case the custodial parent is unemployed. Second, the stated maximum deflators only refer to the reference income of 903.35 €. ²³ As the KSS scale is income dependent, the equivalence scales decrease with an increase in income.

²²We assume that the children are aged between 6 and 11 years (see Section 5.3.1). Hence, as the children are minors we only account for one adult in the household of the custodial parent.

²³This amount relates to 2003, adjusted to 2010 it equals a disposable income of 977.42 € and estimated to pre-tax-pre-transfer annual income it equals to 16,613.32 €.

5.3 The Simulation Model of the German Tax-Benefit System

This section presents the simulation model used to calculate the post-tax-post-transfer incomes of our simulated data. The section begins with an introduction to the simulated population and to the scenarios under investigation. Subsequently, the features of the different subsystems of the German tax-benefit system, incorporated in the simulation model, are introduced.

5.3.1 Simulated Data and Scenarios

We generate a synthetic population that comprises various combinations of separately living families. For each of these families we consider two households, the household of the non-custodial parent and the one of the custodial parent. Thereby the latter lives with one up to three dependent children. Hence, our population exclusively consists of single adults and single-parents with one up to three children.²⁴ Our analysis is conducted for varying annual gross incomes of both households. Thereby, three peculiarities are worth noting: First, in any of the cases the non-custodial parent is in employment and draws a pre-tax-pre-transfer annual income of at least 15,600 € rising up to 117,600 €. ²⁵ Second, the corresponding custodial parent draws a pre-tax-pre-transfer annual income varying between 0 € and 117,600 €. ²⁶ Third, the non-custodial parent draws an income at least as high as that of the corresponding custodial parent. In total, our synthetic population consists of 207 different income combinations of non-custodial and custodial parent, whereas for each combination the number of dependent children varies from one to three. Hence, given the number of income combinations and the number of children, our total sample comprises 621 observations. For each of these observations we investigate two different scenarios: (a) the non-custodial parent is liable for ‘child support only’ and (b) the non-custodial parent is liable for ‘child and spousal support’.²⁷

5.3.2 Tax System and Social Security Contributions

As a first step in transforming pre-tax-pre-transfer income into post-tax-post-transfer income, we calculate the aggregate burden of taxes and social security contributions in order to determine post-tax-pre-transfer income minus expenses for social security contributions. Therefore, we assume pre-tax-pre-transfer income as gross wage and

²⁴We assume that all children in a household are aged between 6 and 11 years. It is necessary to make an assumption on the childrens age since in the German legislation stated requirements depend on the childrens age.

²⁵The rise proceeds in increments of 6,000 €.

²⁶The first increment amounts to 9,600 €, the further rise proceeds in increments of 6,000 €.

²⁷For a justification of these two scenarios see Section 5.3.4.

calculate taxable income according to §39b GTC (German Tax Code), at first. Subsequently, income tax, supplementary taxes (*Zuschlagssteuern*) as well as social security contributions for employees are determined. As all households in our simulated dataset are separated they are assessed separately for tax.

Taxable income is computed by deducting the following allowances and exemptions from gross wage: (a) work related standard tax deduction (*Arbeitnehmerpauschbetrag*), (b) blanket allowance for special expenses (*Sonderausgabenpauschbetrag*) and (c) provisional lump sum (*Vorsorgepauschale*). Tax exemption for dependent children (*Kinderfreibetrag*) is considered if it is more advantageous than the receipt of child allowance (*Kindergeld*).²⁸ Furthermore, in the case of custodial parents, we take single-parent lump sum (*Alleinerziehendenentlastung*) into account.²⁹ In order to calculate income tax we apply the income tax rate (*Einkommenssteuertarif*) according to §32a GTC.³⁰

Referring to supplementary taxes, we consider the solitary surcharge (*Solidaritätsszuschlag*) only. Hence, we follow BÖNKE and EICHFELDER (2010) and disregard church tax (*Kirchensteuer*). BÖNKE and EICHFELDER (2010) interpret church tax as a voluntary donation. The solitary surcharge amounts to 5.5% of income tax subject to tax exemption for dependent children. In our simulation we also take the exemption limit (*Freigrenze*) and the transition section (*Übergangsbereich*) into consideration.³¹

In determining social security contributions it is essential to make some further assumptions on the synthetic population. All the employees are subject to social insurance contributions and are located in the western part of Germany. Concerning the statutory health insurance (SHI), we assume an insurer, not charging supplemental contributions.³²

5.3.3 Public Transfers: Basic Security for Unemployed

A household qualifies for transfers according to German Social Code II (GSC II) if its post-tax income, deducting expenses for social security contributions, falls below of the unemployment benefit II (UEB II), entitled to the corresponding household type.³³ To those households we assign, as post-tax-pre-private-transfer income, an amount corresponding to the UEB II. For its calculation we comprise regular and supplemental payments (*Regel- und Mehrbedarf*) according to §§20 and 21 GSC II as well as costs for housing and heating. Latter we estimate referring to the average actual reimbursed

²⁸We disregard the devolution of the tax exemption for dependent children to the non-custodial parent, as §32 subp. 6 sent. 6 GTC does not allow for devolution by default.

²⁹For details on the allowances see Appendix C, Tables C.1 and C.2.

³⁰For details on the income tax rate see Appendix C, Table C.3.

³¹For details see Appendix C, Table C.4.

³²For details see Appendix C, Table C.5.

³³For reasons of clarity, we disregard those unemployment benefits resulting from unemployment insurance, the so-called unemployment benefit I.

costs in the city of Berlin.³⁴ In case the concerned household is in employment we raise its disposable income according to §11b GSC II.

5.3.4 Private Transfers: Support Legislation

The German support legislation is established in the German Civil Code (GCC) and distinguishes between spousal (§§1569–1586b GCC) and child support (§§1601–1615n GCC). With coming into effect of the ‘Law of the Amendment of the Support Legislation’, regulations on spousal benefits sharpened. Primarily, each of the divorced spouses is constrained to account for its own maintenance (§1569 GCC), hence claims for spousal support only remain in some exceptional cases (see §§1570–1573 and 1576 GCC) and apply to the first years after marital dissolution. Child support, in contrast, is strengthened by the above mentioned law as differences concerning the legal claims of children born in and out of wedlock have been removed. Additionally, the order of priority changed in favour of the children as liabilities against children is given priority to those of all other relatives. Because of these differences in law between child and spousal support, we decide to conduct our analysis for two cases: (a) the case ‘child support only’ and (b) the case of joint ‘child and spousal support’. Hence, we disregard the third conceivable case ‘spousal support only’.

The legal text on itself only provides statutory provisions on the normative level of ‘reasonable’ support payments (§§1578 and 1610 GCC) as well as provisions on the minimum requirements a dependent child is allowed to claim from the non-custodial parent (§1612a GCC). The precise regulations on support payments entering our simulation model are ruled by the *Düsseldorfer Table*.³⁵ In order to understand our procedure of simulating German support guidelines and to evaluate the outcomes, it is essential to introduce the German support practice in more detail.

The eponymous core of the German guideline for support payments is indeed a table (see Table 5.4), regulating child support. Figures stated in the table are monthly amounts on the requirements of a dependent child. Amounts vary with the child’s age and with the ‘adjusted net income’ (*bereinigtes Nettoeinkommen*) of the non-custodial parent. For reasons of simplification and clarity, we assign to all the children in our synthetic dataset a middle age between 6 and 11 years. Adjusted net income is calculated by deducting net income by occupational expenditures, following Remark A3 OBERLANDESGERICHT DÜSSELDORF (2011). However, the payable amount cannot be gathered from the table directly. To determine the actual payable amount three

³⁴We assume that this is a good predictor for average actual reimbursement, since the rent index in Berlin ranks in the German midfield. Additionally, we calculated average reimbursed costs for the city of Kiel, likewise a city with an average rent index, and come to similar results. For a detailed overview see Appendix C, Table C.6.

³⁵The *Düsseldorfer Table* is the German guideline on support payments established in 1962 and adjusted in a two-year cycle. It is divided in five sections (A to E), whereas the first (Section A) rules child support and the second (Section B) spousal support.

Table 5.4: Düsseldorf Table

Income Class	Net Income of NCP	Age Group in Years (§ 1612a GCC)				Percentage	Amount to Check NCP's Requirements
		0-5	6-11	12-17	from 18		
All Amounts in Euro							
1.	up to 1,500	317	364	426	488	100	770/950
2.	1,501-1,900	333	383	448	513	105	1,050
3.	1,901-2,300	349	401	469	537	110	1,150
4.	2,301-2,700	365	419	490	562	115	1,250
5.	2,701-3,100	381	437	512	586	120	1,350
6.	3,101-3,500	406	466	546	625	128	1,450
7.	3,501-3,900	432	496	580	664	136	1,550
8.	3,901-4,300	457	525	614	703	144	1,650
9.	4,301-4,700	482	554	648	742	152	1,750
10.	4,701-5,100	508	583	682	781	160	1,850
starting from 5,101 according to context of the certain case							
<i>Source:</i> OBERLANDESGERICHT DÜSSELDORF (2011).							

aspects have to be taken into account: (a) the number of entitled persons, (b) the offsetting of child allowance, and (c) non-custodial parent's personal requirements.

By default, the Düsseldorf Table assumes two entitled persons.³⁶ In case of a lower (higher) number, surcharges (deductions) have to be done. These corrections are realized by up- (down-)grading the non-custodial parent's income class. As an example, the non-custodial parent draws an adjusted net income of 2,450 € and is liable for maintenance against one child of 10 years. According to his income, he is classified to the fourth income class. Since he is liable for one person, he is to be upgraded to the fifth class and, as a consequence, the child's requirements rise from 419 € to 437 €.

A further deviation of stated amount and amount actual payable is caused by the offsetting of child allowance. According to §1612b GCC child allowance is to be used to cover the child's requirements, half the allowance for minor children and the full allowance for adult children. As all the children in our dataset are minors and, as we assign the child allowance to the custodial parent, the non-custodial parent is allowed to diminish the stated amount by half of the monthly child allowance. At present,³⁷ child allowance amounts to 184 € for the first two children each, to 190 € for the third and to 215 € for each further child (§66 GTC). Concerning the above mentioned scenario, this implicates a reduction of 92 € and the non-custodial parent has to pay 345 € instead of 437 €.

The last column of the Düsseldorf Table undertakes the task to preserve necessary personal requirements (*notwendiger Eigenbedarf*) to the non-custodial parent, or rather

³⁶The Düsseldorf Table assumes two children or one child and a former marital partner (see Remark A1 OBERLANDESGERICHT DÜSSELDORF, 2011).

³⁷Effective: July 2011.

to provide for a balanced budget (*Bedarfskontrollbetrag*) between the entitled children and the non-custodial parent.³⁸ If remaining income – after payment of all child support liabilities – falls below the stated amount of the last column for the income class the non-custodial parent belongs to, the non-custodial parent has to be downgraded to a lower income class. The non-custodial parent has to be downgraded to that income class, the amount is not undercut anymore. In case the necessary requirements could not cover even in the first income class, a deficiency calculation (*Mangelfallberechnung*) is conducted following Section C Düsseldorf Table.

In case, we investigate the combination ‘child and spousal support’, we also rely our simulation model on Section B Düsseldorf Table. According to our assumptions on the employment status of the non-custodial and the custodial parent as well as due to the fact that in both scenarios the non-custodial parent has liabilities against children, our simulation is exclusively concerned with Remarks I.1.a) and b), III. and IV. of Section B. Two aspects are worth noting. First, the reform of 2008 changed the order of priority in favour of the children (§1609 GCC), hence the payment liability against the former marital partner is determined on the basis of the non-custodial parent’s remaining income – remaining after payment of child support (see Remark III., Section B OBERLANDESGERICHT DÜSSELDORF, 2011). Second, although child support overrides spousal support, child claims are directly affected by spousal support as the number of entitled persons rises and non-custodial parent is downgraded with respect to his income class.

Spousal support is calculated according to Remark I.1.a) and b), Section B OBERLANDESGERICHT DÜSSELDORF (2011). Thus, spousal support rates amount to $\frac{3}{7}$ of the difference between remaining income of the non-custodial parent and adjusted net income of the custodial parent. Nevertheless, spousal support equals to zero in two cases: (a) adjusted net income of the custodial parent exceeds the remaining income of the non-custodial parent and (b) a deficiency calculation has been conducted in the context of determining the child support payment. In comparison to the child support regulations, the non-custodial parent has constant necessary personal requirements of 1,050 € towards the entitled former marital partner (see Remark IV., Section B OBERLANDESGERICHT DÜSSELDORF, 2011). If the non-custodial parent’s remaining income – after the payment of all liabilities – falls below this amount, spousal support amounts to the difference between the remaining income of the non-custodial parent – after the payment of child liabilities – and 1,050 €.

Finally, it is essential to spend some words on our determination of disposable income of the custodial parent in the case the custodial parent qualifies for UEB II.

³⁸The former refers to the first income class, the latter to all further ones. In case of the first income class a distinction is made concerning the employment status of the non-custodial parent. A minimum personal requirement of 770 € is allocated to an unemployed non-custodial parent. As we assume that the non-custodial parent is in employment (see Section 5.3.1), in the simulation model we refer to the amount of 950 €.

Many additional income sources additional to UEB II are allowable on UEB II (§11 GTC), so as e.g. returns on support claims and child allowances. As a consequence, disposable income of the concerned households does not necessarily increase with the receipt of support payments. In our simulation model we test whether the sum of child allowance and support exceeds the minimum requirements stated by legislation. We do this for each single household member of the custodial parent household. For those household members for whom the sum of child allowance and support claims exceeds the minimum requirements, it is advantageous to quit the household community (*Bedarfgemeinschaft*) formally. For those members UEB II is shortened, in return, the whole support associated to the corresponding household member, can be added to disposable income. In the case, that it is not advantageous to quit the community, we follow BUNDESSOZIALGERICHT (2009) and add an additional amount of 30€ to disposable income for each member remaining in the community.

5.4 Results: Equivalence Scales Implicit in the German Tax-Benefit System

This section presents the results to the question, which equity perceptions are inherent in the German tax-benefit system. At first, we present selected scales inherent in single subsystems. Subsequently, those scales arising through the interplay of the comprehensive tax-benefit system are revealed. We conclude with a comparative look at the derived scales and those commonly used in distributional analyses.

5.4.1 Single Value Judgements in the German Tax-Benefit System

Considering the whole German tax-benefit system, one can find a wide range of value judgements implemented by the legislation. In order to unveil those judgements, they could be transformed into implicit equivalence scales. Many of the value judgements pertain to the bottom tail of the income distribution, others can be applied to the whole income distribution and still others only pertain to selected groups of society, so as to the group of marital dissolved.

We decided to subject three implicit scales into further analysis: (a) The ‘unemployment scale’ refers to the minimal needs of unemployed households, (b) the ‘tax scale’ refers to the German Income Tax Law and (c) the ‘support scale’ relates to the value judgements implicit in the German Support Legislation. This approach enables us to cover a broad array of applications. Despite the contentswise covering of employed and unemployed households, different properties of equivalent scales are taken into consideration. Whereas the unemployment scale is a representative for a scale independent of base, both further ones belong to the class of income dependent equivalence scales.

Concerning the unemployment scale, we refer to the subsistence level according to DEUTSCHER BUNDESTAG (2011). For the calculation, we comprise regular and supplemental payments, assessed costs for housing and heating and the children’s needs for education and social participation. Thereby, we refer to the relevant paragraphs of the German Social Code II (GSC II) and the corresponding sections of DEUTSCHER BUNDESTAG (2011). Following those regulations, we calculate an average annual subsistence level of 7,728 € for a single adult.³⁹ The corresponding implicit equivalence scales are displayed in the second column of Table 5.5.

To analyze the value judgements imposed by the German tax system, we make use of the stated annual allowances. Each adult gets a basic allowance of 8,008 € (see §32a GTC), the child allowance amounts to 7,008 € (see §32 subp. 6 GTC)⁴⁰

³⁹For detailed information on the calculation of the average subsistence level see Appendix C, Table C.7.

⁴⁰Child allowance consists of two components, an allowance for the subsistence level (4,368 €) and an

and single parents get an additional tax allowance of 1,308 € (see §24b GTC). Similar to the unemployment scale, these amounts should guarantee the material needs of the households (see DEUTSCHER BUNDESTAG, 2011). Following this interpretation one can derive an implicit scale that refers to the bottom tail of the distribution, likewise as the unemployment scale (see third column of Table 5.5).⁴¹ Furthermore, it is possible to derive a scale which pertains to the whole income distribution. Here we follow the procedure of BÖNKE and EICHFELDER (2010) and attain an income dependent equivalence scale corresponding to Equation 5.4. The deductions $\Omega(z_i)$ displayed in the fourth column of Table 5.5 represent the additional amount of income required to achieve the same standard of living as the reference household. The maximum deflators (fifth column of Table 5.5) are calculated in order to account for the fact that deriving equivalence scales for low market incomes yields to negative equivalent incomes. Hence, a minimum disposable income, which equals to the subsistence level of a single household, is assumed. In our case it corresponds to 7,728 €.⁴²

Referring to the equity perceptions inherent in the German support legislation we derive maximum deflators which relate to both scenarios under investigation, the case of ‘child support only’ and the case of joint ‘child and spousal support’ (see the two last columns of Table 5.5). However, in the latter case we abstain from deriving a scale for varying income levels of the custodial parent. This approach would presuppose too many assumptions and universally valid results could not be inferred. Hence, we only take into account the minimal requirements of the household of the custodial parent, expressed as UEB II.⁴³ We relate these to the minimal requirements of the non-custodial parent, stated by the Düsseldorfer Table. In the case of ‘child support only’ we oppose the minimal child requirements as stated in the Düsseldorfer Table plus half the child allowance to the minimal requirements of the non-custodial parent.

Table 5.5 provides an overview of the scales inherent in single subsystems of the German tax-benefit system. It can be inferred that the equity perceptions implied in political regulations, in parts, differ considerably. Taking a closer look at both the scales independent of base reveals two particularities: First, in both cases the effect of an additional child on the scale/deflator is not constant. In the case of the tax scale we observe a relatively high effect to the first child and lower but constant effects between the first and second as well as between the second and third child. This

allowance for childcare and education (2,640 €).

⁴¹The difference between the above derived unemployment scale and the stated income independent tax scale consists in an additional consideration of supplemental social requirements as e.g. expenditure on health and nursing insurance etc. (see DEUTSCHER BUNDESTAG, 2011).

⁴²The calculation of the maximum deflators complies with $m(\mu_h, z_h) = \frac{\mu_h}{\mu_h - \Omega(z_h)}$ with $\mu_h - \Omega(z_h) = \mu_r^{min} = 7,728 \text{ €}$ (see BÖNKE and EICHFELDER, 2010, p. 302, fn. 7).

⁴³We refer to the UEB II as derived in Section 5.3.3, Table C.6, column seven in Appendix C instead of referring to the above mentioned subsistence level. We decide for this procedure, aiming at discrimination between pure legislation (subsistence level) and the application of government rules (applied UEB II rates, implementation of support regulation).

Table 5.5: Selected Implicit Scales

Household type	Income independent scales		Income dependent scales		
	Unemployment scale		Tax scale		Support scale
	(Deflator)	(Deflator)	(Deduction)	(Max. Deflator)	(Max. Deflators)
<i>AC</i>	1.551	2.039	8,316	2.076	1.061
<i>ACC</i>	2.239	2.915	15,324	2.983	1.479
<i>ACC</i>	2.792	3.790	22,332	3.890	1.794

Notes: *The max. deflators refer to the children only.

Source: Own calculations.

irregularity can be deduced from the additional tax allowance for single-parents. In the case of the unemployment scale we observe a relatively low but constant effect to the first and between the second and third child and a higher effect between the first and second child. This observation is mainly driven by the rise of supplemental payments between the first and second child in single-parent families (see Appendix C, Table C.7 forth column). Second, the deflators deduced from the tax system are higher than those of the unemployment scale. These relatively higher requirements stated by the tax system can be attributed to two facts. As mentioned above, within the tax system single-parents receive an additional tax allowance, so that we can observe a relatively high effect to the first child. Additionally, the tax scale gives higher minimal requirements to further children, this is due to the additional allowance for childcare and education of the children.

Likewise, we find differences in the maximum deflators. However, as the stated maximum deflators refer to different reference points, they cannot be compared directly. The maximum deflators of the tax scale relate to the subsistence level of a single household. The maximum deflators of the support scale, displayed in the second last column of Table 5.5, refer to the following scenario: The non-custodial parent is liable for child and spousal support. The household of the custodial parent draws UEB II and the non-custodial parent remains an income of the minimal requirements stated by the Düsseldorf Table (last column of Table 5.4). Stated figures can be interpreted as follows: The UEB II of the household of a custodial parent who lives with one child exceeds the minimal requirements of the non-custodial parent by 6.1%. In case the custodial parent lives with three dependent children, the UEB II exceeds the minimal requirements of the non-custodial parent by 79.4%.

A similar interpretation holds for the last column of Table 5.5. These figures refer to the following scenario: The non-custodial parent is only liable for child support and the children as well as the non-custodial parent receive an income that equals the minimal requirements stated by the Düsseldorf Table. Hence, the children draw support payments stated by the Düsseldorf Table and the child allowance. The non-custodial parent receives an income stated by the last column of Table 5.4. The figures of Table 5.5 indicate that each child has approximately half the requirements of the non-custodial parent.

5.4.2 Distributive Justice in the Interplay of the Tax-Benefit System

This subsection presents the results on equity perceptions inherent in the interplay of the comprehensive German tax-benefit system. Results are presented on the basis of the visualized implicit equivalence scales. Therefore, we exhibit seven Figures (5.2 to 5.8), each composed of two subfigures (a) and (b). Any of the figures refers to a different annual pre-tax-pre-transfer income of the custodial parent. Both the corresponding subfigures display our two scenarios under investigation, (a) refers to the case of ‘child support only’ and (b) to ‘child and spousal support’. The three graphs in each subfigure represent the scales for the different household types of the custodial parent, the solid line relates to AC (one adult, one child), the dashed line to ACC (one adult, two children) and the dotted line to ACCC (one adult, three children). With increasing gross income of the custodial parent, scales display shorter path lengths. This rests upon the assumption that the custodial parent draws an pre-tax-pre-transfer income at least as high as that of the non-custodial parent (see Section 5.3.1). We decided for this presentation with graphs becoming shorter, in order to prevent visual distortions. For all the figures, scales and intervals of the axes kept relatively constant.

We refer to the scales related to ‘child support only’ at first. For constellations of low income of both households (see first observations points of Figures 5.2 and 5.3) we observe scales that rank approximately at the level of the unemployment scale (see Section 5.4.1). Hence, the associated scale level is all the higher, the higher the number of children. Referring to subsequent curve behaviour, scales decrease with an increase in gross income of the non-custodial parent. Thereby we observe that the scales start decreasing all the sooner the less children live in the household of the custodial parent.

The above mentioned observation that the scales exhibit all the higher values the more children live in the household of the custodial parent, holds independently of the income level of the custodial parent. A distinction that is associated with an increase of the income of the custodial parent relates to higher scale levels for given incomes of the non-custodial parent. As an example, assume an annual pre-tax-pre-transfer-income of 115,000 € of the non-custodial parent, in the case the custodial parent draws UEB II (Figure 5.2) scales rank between 0.22 (AC) and 0.41 (ACCC). In comparison, in case the custodial parent draws an annual pre-tax-pre-transfer income of 93,600 € (Figure 5.8) scales rank between 0.96 (AC) and 1.30 (ACCC).

The explanations for the characteristics of the displayed curve behaviour are straightforward. For low income levels of both parents, scales remain at a high and relative constant level. On the one side, the non-custodial parent is not equipped with sufficient income to meet his support obligations in its entirety. On the other side, the custodial parent qualifies for UEB II. Since support claims are allowable on UEB II (§11 GTC), disposable income neither for the custodial nor the non-custodial parent changes con-

siderably. A closer look into the data reveals that the subsequent sharp decline in the scales is triggered by those incomes, the non-custodial parent starts meeting his obligations in its entirety. This suggests that in the following the increase in income dominates the stated support payments.

A comparison of Figure 5.2 with Figure 5.3 reveals a further legal regulation. In both figures the custodial parent qualifies for UEB II. However, in Figure 5.3 the custodial parent is in minor employment, thus draws income from employment. It can be observed that the scales of Figure 5.3 exceed those of the case in which the custodial parent is unemployed. This phenomenon can be ascribed to §11b GSC II, which allows unemployed persons to earn some extra money.

Comparisons between the two scenarios (a) and (b) within the same figure reveal, independently of the income level of the custodial parent, similarities for the first observation points and substantial difference for higher incomes of the non-custodial parent. Only in the case the custodial parent is unemployed (Figure 5.2) the subfigures (a) and (b) closely resemble each other with respect to the whole curve behaviour. In this case, scales start at similar levels and decrease with an increase in income of the non-custodial parent. Nevertheless, the decrease proceeds less rapidly in the case of ‘child and spousal support’ and additionally, scales level out at higher levels. As already mentioned above, scale values of the first observation points of subfigures (a) and (b) resemble each other for all further income levels of the custodial parent. However, subsequent paths differ considerably.

For relatively low income levels of the custodial parent (see e.g. Figures 5.3 (b) and 5.4 (b)) the scales experience an intense decline. This decline samples out all the stronger, the higher the number of children in the household of the custodial parent. As a consequence, we observe that at first, the scale of ACC falls below the scale of AC and later, ACCC falls below AC and ACC. Thereby, those households of the custodial parent with a high number of children have – in absolute terms – less income at disposal than single-parent household with fewer children. For the cases of a custodial parent with middle and high pre-tax-pre-transfer incomes (see exemplarily Figures 5.6 (b) – 5.8 (b)) scales do not change order anymore. Instead, one can observe three characteristics worth mentioning. First, in case both households draw an identical gross income (first observation point), the scales still fall apart. Second, the lower the income level of the household of the custodial parent, the closer the scales rank together. And third, scales experience a slight increase with an increase in income of the non-custodial parent. Independently of the income level of the custodial parent, scales level out between 1.1 and 1.3. For low income levels of the custodial parent AC ends up over ACC and ACC and vice versa for high income levels of the custodial parent.

The explanation for the fact that scale paths resample each other with respect to the first observation points has to be twofold: The first answer refers to the those

observations mirroring combinations of low incomes of both parents (see Figures 5.2 – 5.4). In these cases we can point to the explanation given above with respect to the scenario of child support only. The disposable income neither of the non-custodial parent nor of the custodial parent changes considerably, since support payments are not allowable on UEB II for the custodial parent and payment obligations are low for the non-custodial parent. Hence, the scales proceed relatively constant.

For cases of a custodial parent with middle and high pre-tax-pre-transfer income, the first observations points also resemble those of the case ‘child support only’, as those first observation points display income combinations with identical pre-tax-pre-transfer incomes of the parents. Child support is independent of the difference in income and has to be paid at those points. By contrast, spousal support is omitted. Hence, scales fall apart for the different household-types and look like those of scenario (a).

The observation that scales change order is an interesting finding, which unveils that spousal obligations exceed child obligations under certain assumptions. This applies all the more, the wider apart falls the income of the non-custodial parent from that of the custodial parent. As an example, is the non-custodial parent only liable for support for one child and his former spouse, total child support adds up to a relatively low amount. After deducting this amount from disposable income of the non-custodial parent, the difference between the disposable incomes of both parents remains relatively high, so that spousal support adds up to a relatively elevated amount. In comparison, in the case the non-custodial parent is liable for more children, the difference between the income of the parents is smaller. As a consequence, spousal support is smaller as well. We see our conjecture, that spousal obligations exceed child support obligations, supported by the observation that, with an increase in the income level of the custodial parent, the change ceases and the scales rank together less closely. Furthermore, a closer look into the data confirms this conjecture, since spousal support indeed exceeds child support for high differences in the income of both parents.

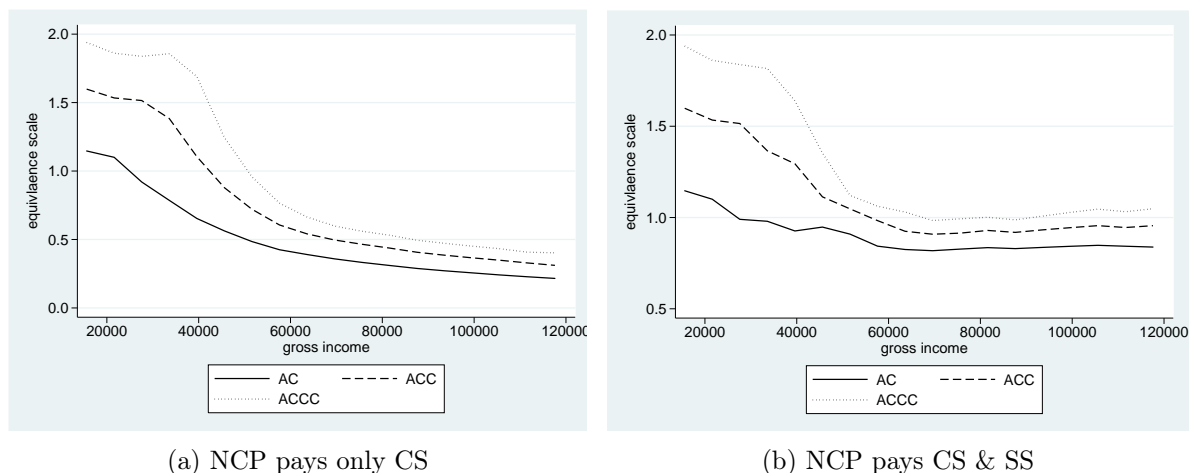
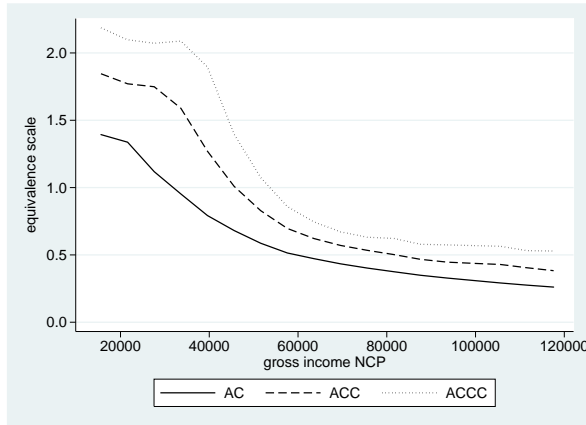
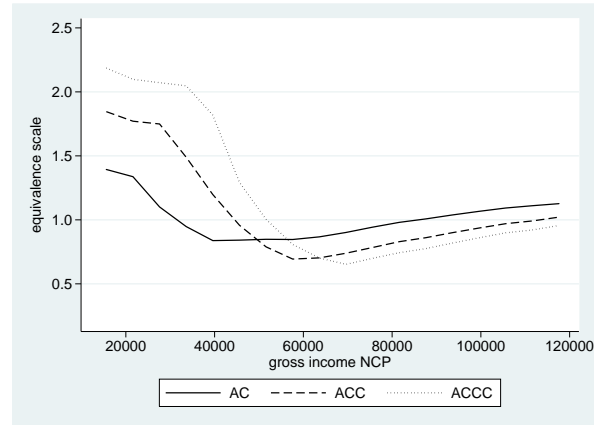


Figure 5.2: Implicit Equivalence Scale: CP draws UEB II

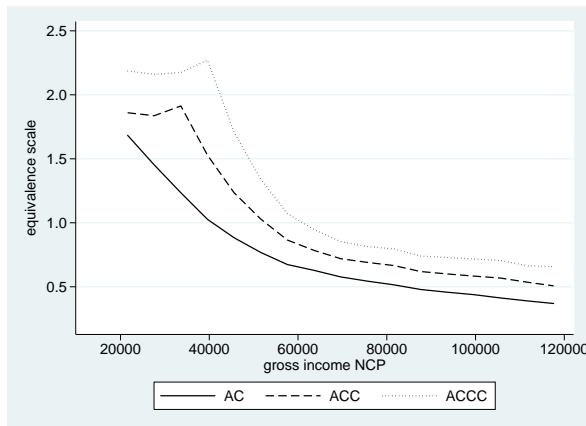


(a) NCP pays only CS

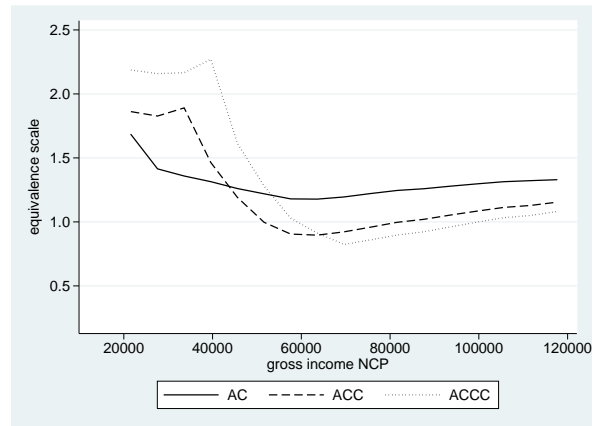


(b) NCP pays CS & SS

Figure 5.3: Implicit Equivalence Scale: CP draws an annual gross income of 9,600 €

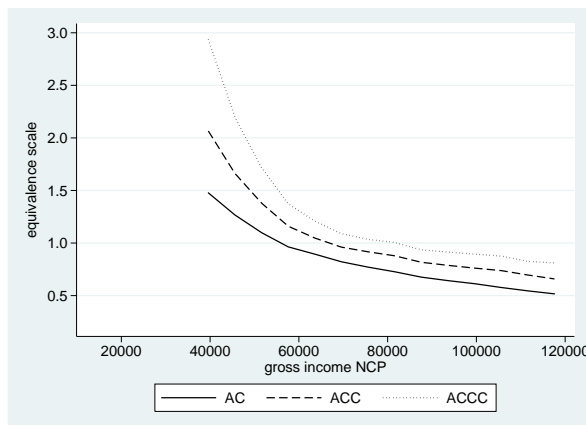


(a) NCP pays only CS

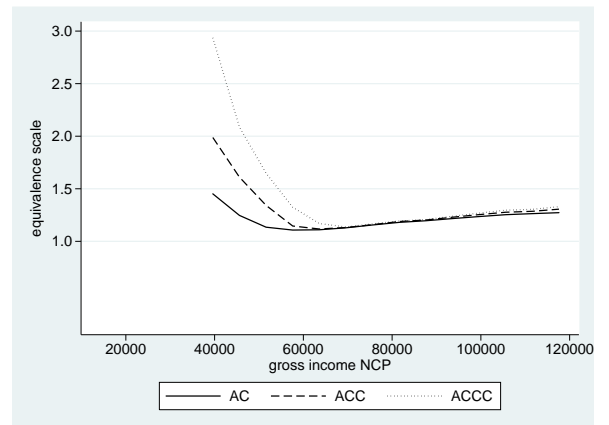


(b) NCP pays CS & SS

Figure 5.4: Implicit Equivalence Scale: CP draws an annual gross income of 21,600 €

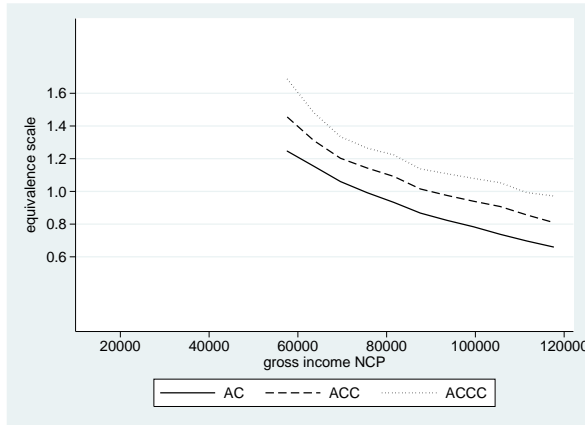


(a) NCP pays only CS

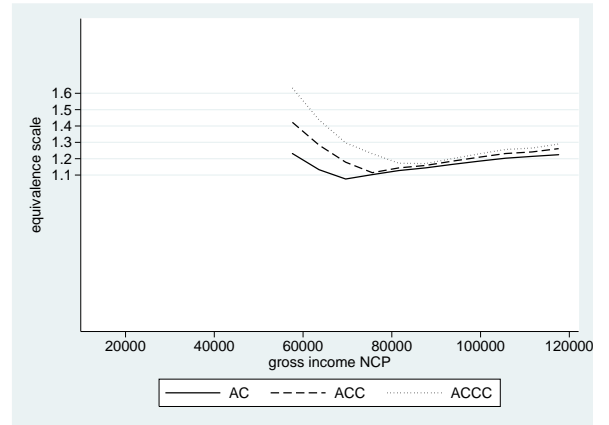


(b) NCP pays CS & SS

Figure 5.5: Implicit Equivalence Scale: CP draws an annual gross income of 39,600 €

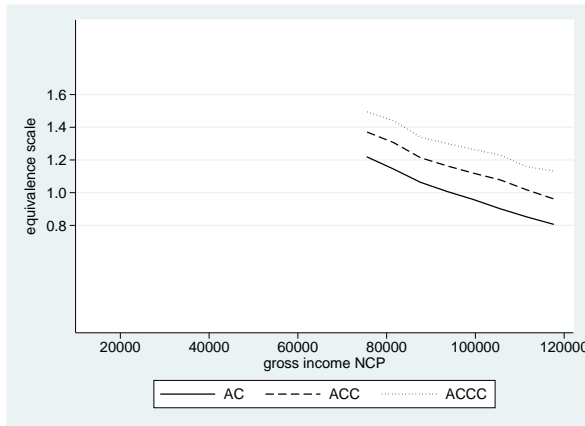


(a) NCP pays only CS

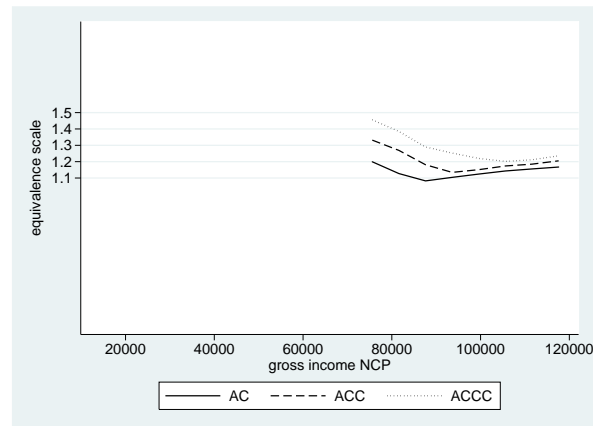


(b) NCP pays CS & SS

Figure 5.6: Implicit Equivalence Scale: CP draws an annual gross income of 57,600 €

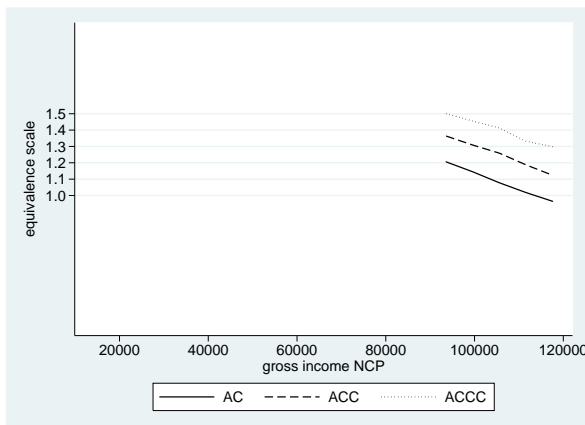


(a) NCP pays only CS

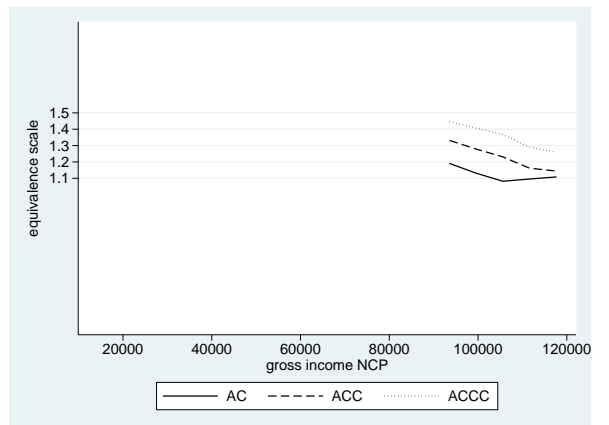


(b) NCP pays CS & SS

Figure 5.7: Implicit Equivalence Scale: CP draws an annual gross income of 75,600 €



(a) NCP pays only CS



(b) NCP pays CS & SS

Figure 5.8: Implicit Equivalence Scale: CP draws an annual gross income of 93,600 €

5.4.3 Comparison of Implicit and Commonly Applied Scales

With a comparative look at the scales, it becomes apparent that the scales inherent in the comprehensive tax-benefit system are dependent on income. Equity perceptions associated with such a legislation imply, that with an increase in pre-tax-pre-transfer income of the reference household (NCP), the difference in disposable income between the non-custodial and the custodial parent has to decrease. Hence, actual scale behaviour is most likely be mirrored by the estimated KSS scale and, in terms of the implicit single scales, by the tax and support scales. Concerning the absolute level the KSS scale and the support scale exhibit similarities to reality in particular. The stated maximum deflators of the support scale (see Table 5.5) refer to the scenario, in which the custodial parent is unemployed. Hence, the scenario conforms to Figure 5.2. Although the actual scale levels slightly exceed those of the support scale, in total we detect a rather good fit (AC: 1.147 to 1.061; ACC: 1.599 to 1.479; ACCC: 1.939 to 1.794).⁴⁴

A comparative look at Figures 5.2 and 5.3 reveals a further similarity between the actual scales and the KSS scales. It becomes obvious, that in common with the survey results of KOULOVATIANOS ET AL. (2009) the German tax-benefit system also compensates the actors for the loss of household production and the harm associated with employment. Those scales, which relate to a custodial parent in minor employment display higher values than the scales, which refer to an unemployed custodial parent. The maximum deflators of the actual scales in comparison to the KSS scales exhibit the following values: First, we refer to the case in which the custodial parent is not working, AC: 1.147 to 0.888; ACC: 1.599 to 1.188; ACCC: 1.939 to 1.465. Second, we refer to the case in which the custodial parent is in minor employment, AC: 1.394 to 1.359; ACC: 1.846 to 1.659; ACCC: 2.186 to 1.947. Thereby, it has to be kept in mind that the stated values of the KSS scales refer to an annual gross income of approximately 16,600 € (see Section 5.2.3), whereas the actual scales refer to 15,600 €. Hence, inferable differences are slightly undervalued. But independently on this, the figures show, that the German tax-benefit system compensates for employment, although less than deducted from the KSS scales.

A further interesting finding also refers to the KSS scale. Therefore, we contrast the ends of the scale paths of the KSS scales (see Figure 5.1) with those of the scenario (b) of Figures 5.2 – 5.8. For the case the custodial parent is unemployed as well as for the cases the custodial parent draws a relatively high income we find, that with an increase in the gross income of the non-custodial parent the scales converge to similar values. This observation holds separately for the cases the custodial parent draws UEB II (Actual: 0.84–1.05 / KSS: 0.87–0.98) and the custodial parent is in

⁴⁴The first figure refers to the actual scale, the second to the support scale. This ranking, actual scale at first, referred scale afterwards, will be maintained also for the subsequent presentations.

employment (Actual: 1.19–1.27 / KSS: 1.07–1.12).

Concerning the income independent scales, we find that both the implicit scales, which are derived from the single subsystems, exhibit the highest scale values. Their values exceed those of the implicit comprehensive scales as well as those of the commonly used expert scales (see Table 5.3). Therefore, we restrict further comparative investigation only to the three expert based scales. We only apply them to the first observation points of Figures 5.2 and 5.3, since these points mirror subsistence minimums, for which expert scales are mostly designed for (see Section 5.2.2). The old-OECD scales exceed actual scales, by contrast, both further expert scales fit rather well to the derived equity perceptions at the bottom tail of the income distribution. Whereas the CITRO scales almost coincide with the case the custodial parent is in minor employment (AC: 1.394 to 1.45; ACC: 1.846 to 1.85; ACCC: 2.186 to 2.21), the modified-OECD scales echo those of the case of an unemployed custodial parent (AC: 1.147 to 1.30; ACC: 1.599 to 1.60; ACCC: 1.939 to 1.90).

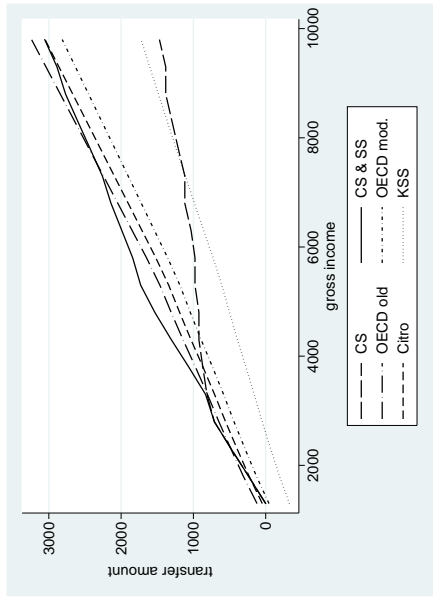
Finally, we want to point to a peculiarity of the comprehensive implicit scale that stands out against all further mentioned scales. This observation refers only to high income differences between the custodial and the non-custodial parent. And additionally, refers only to the scenario (b) joint ‘child and spousal support’. We reveal equity perceptions, which aim to issue households of the custodial parent with fewer children with – in absolute terms – higher disposable incomes than households of custodial parents with more children. Hence, for this special case, implicit scales change ranking (AC scale > ACC scale > ACCC scale). None of the alternatively mentioned scales display such behaviour.

5.5 Results: Standard of Living Equalizing Support Payments

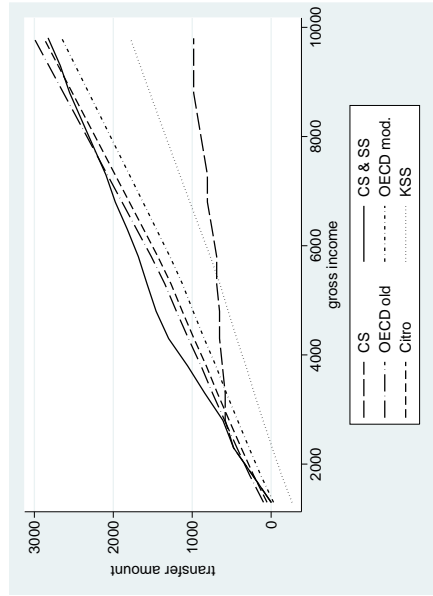
This section presents the results to the question to what extent the actual support payments mirror those payments that alternative equivalence scales would predict. The section is based on the simulation model presented in Section 5.3. We calculate the actual support payments, corresponding to the different scenarios under investigation. In order to approximate support payments alternative equivalence scales would predict, we take the configuration of the German tax and public transfer system as given and calculate the disposable incomes for both newly formed households. In a next step, the sum of their incomes is reallocated according to the four equivalence scales amplified in Section 5.2.3; those are the old-OECD, the modified-OECD, the CITRO and the KSS scale. Hence, we allocate to the households artificial disposable incomes which guarantee for an identical standard of living. Finally, predicted support payments are derived by the difference between actual and artificial disposable income of the non-custodial parent and the custodial parent, respectively.

Since the KSS scale is income dependent, data preparation is more complex. Also in this case, we determine the actual post-tax-post-public-transfer incomes for the non-custodial parent and the custodial parent separately and sum them up, in a first step. In order to reallocate the sum according to the KSS scale, further adjustments have to be made. As explained in Section 5.2.3, we estimate the non-linear relationship between the derived equivalence scales and disposable income on the basis of the survey results (see Table 5.2). We do this separately for both the employment statuses of the custodial parent. By means of these equivalent scales, we are able to determine for each income of the custodial parent the corresponding income of the non-custodial parent. The sum of disposable incomes equals the sum of the corresponding equivalence scale. As an example, the custodial parent has a given income of 2,000 € and the estimated equivalence scale is 0.8. Thus, the non-custodial parent needs an equivalent income of 1,600 €. Their equivalent incomes sum up to 3,600 € and this corresponds to an equivalence scale of $1 + 0.8 = 1.8$. In order to calculate the corresponding equivalence scale for any sum of household incomes, we estimate the relationship by use of linear regression. In total, we establish six different relationships, each household type of the custodial parent exhibits its own, differentiated by employment status. On the basis of the estimated scales, we are able to allocate the summed disposable income to both households and obtain artificial disposable incomes.⁴⁵

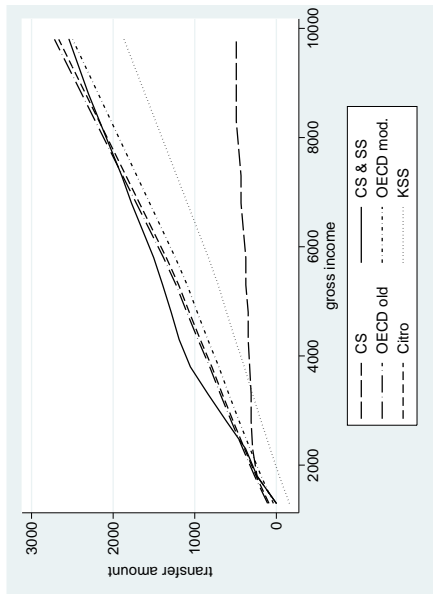
⁴⁵As an example, assume the scenario that both parents are in employment and the actual post-tax-post-public-transfer incomes sum up to 3,000 €. The estimated corresponding equivalence scale amounts to 2.14. In order to allocate equivalent incomes, a share of 46.7% ($1/2.14 = 0.467$), that equals 1,401 €, has to be attributed to the custodial and a share of 53.3% ($1.14/2.14 = 0.533$), that equals 1,599 €, to the non-custodial parent. Assuming the actual post-tax-post-public-transfer income amounts to 1,890 €, the KSS scale predicts a support payment of 291 € ($1,890 € - 1,599 €$).



(a) CP-household: AC

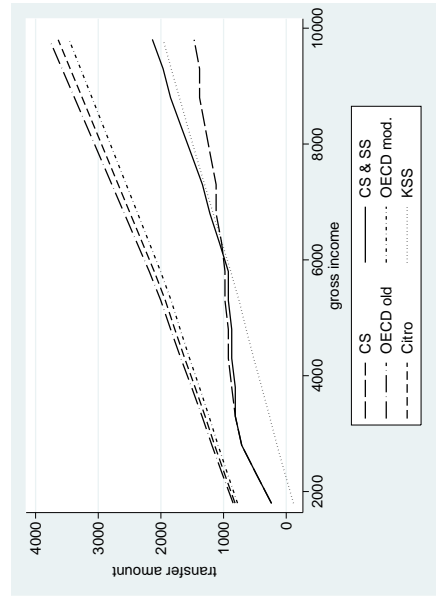


(b) CP-household: ACC

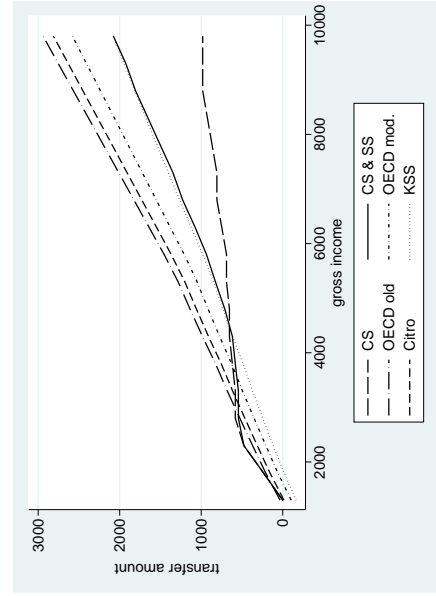


(c) CP-household: ACCE

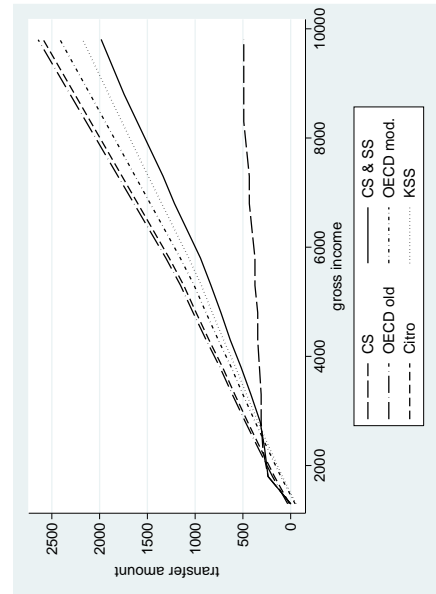
Figure 5.9: Transfer Amounts: CP draws UEB II



(a) CP-household: AC

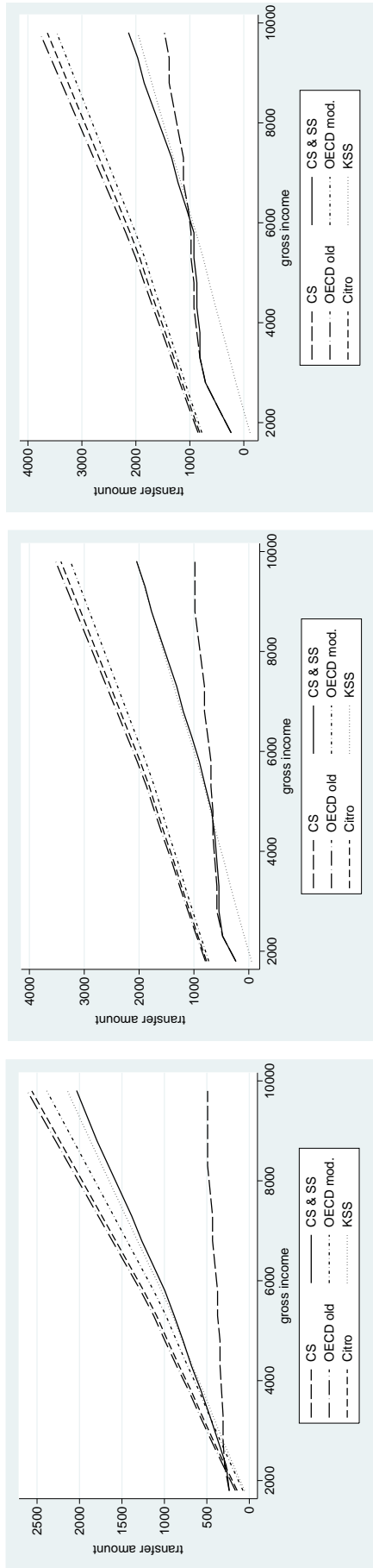


(b) CP-household: ACC



(c) CP-household: ACCE

Figure 5.10: Transfer Amounts: CP draws a monthly gross income of 800 €

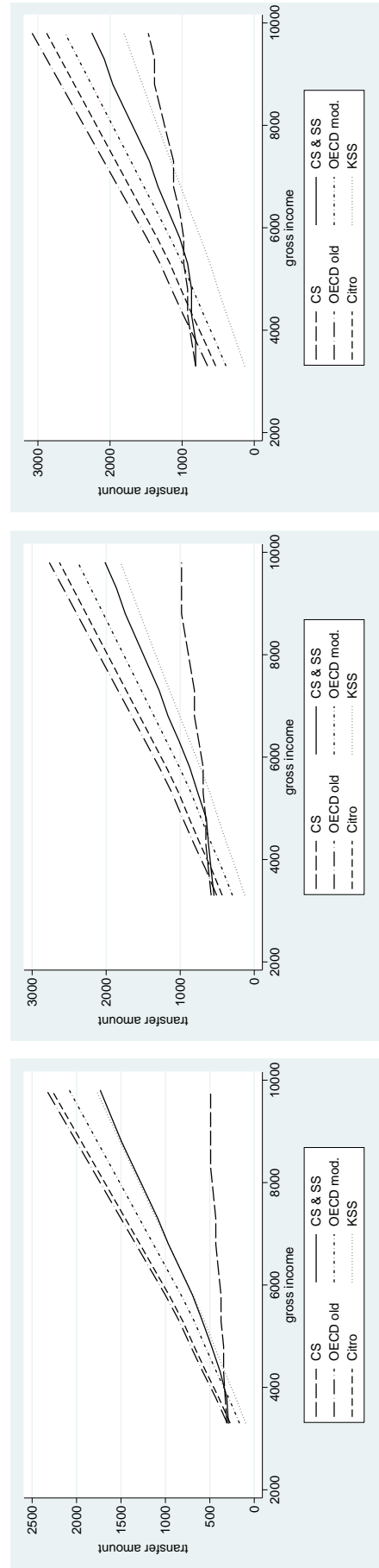


(a) CP-household: AC

(b) CP-household: ACC

(c) CP-household: ACCC

Figure 5.11: Transfer Amounts: CP draws a monthly gross income of 1,800 €

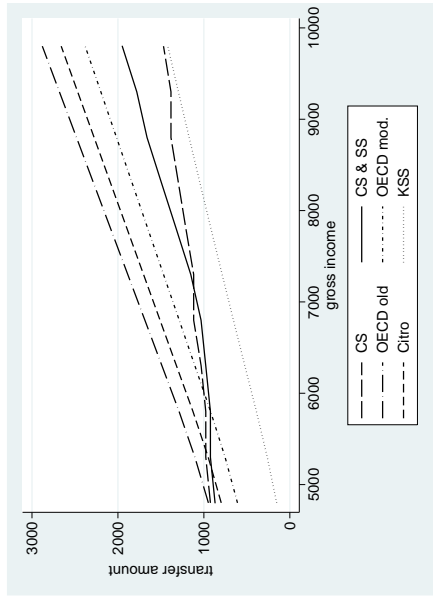


(a) CP-household: AC

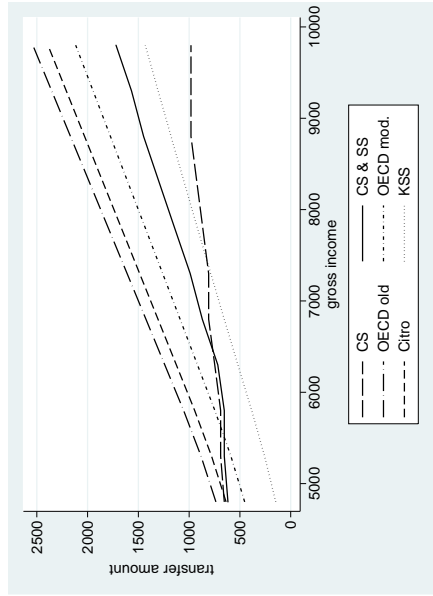
(b) CP-household: ACC

(c) CP-household: ACCC

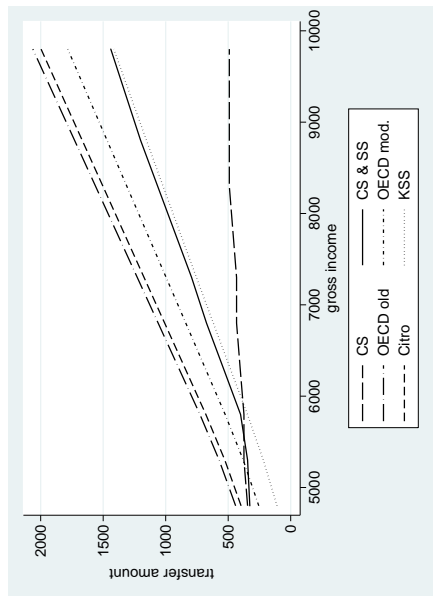
Figure 5.12: Transfer Amounts: CP draws a monthly gross income of 3,300 €



(a) CP-household: AC

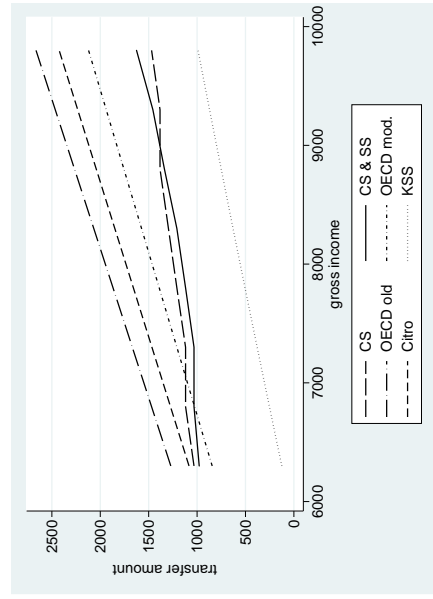


(b) CP-household: ACC

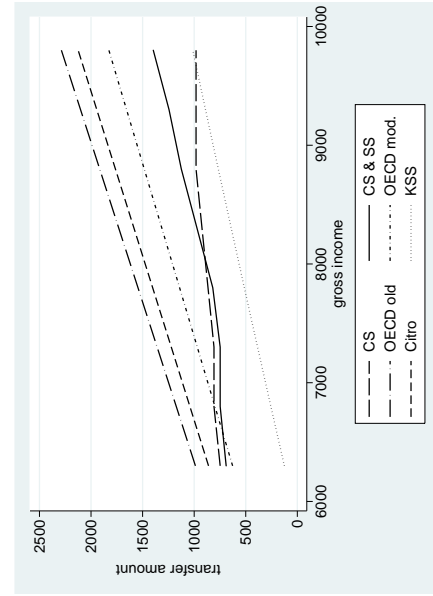


(c) CP-household: ACCC

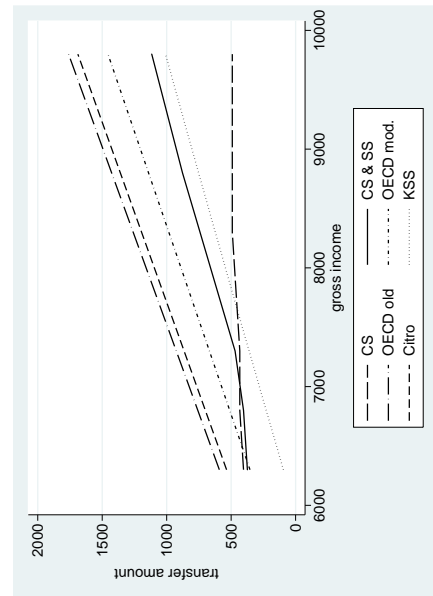
Figure 5.13: Transfer Amounts: CP draws a monthly gross income of 4,800 €



(a) CP-household: AC

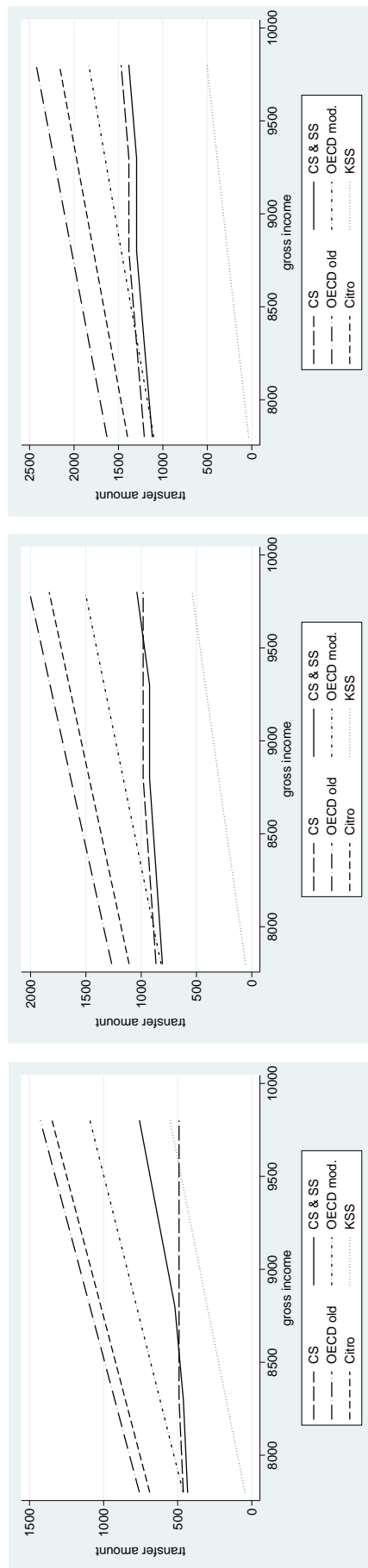


(b) CP-household: ACC



(c) CP-household: ACCC

Figure 5.14: Transfer Amounts: CP draws a monthly gross income of 6,300 €



(a) CP-household: AC

(b) CP-household: ACC

(c) CP-household: ACCC

Figure 5.15: Transfer Amounts: CP draws a monthly gross income of 7,800 €

Results on the deviations of the actual support payment from the predicted payments, are visualized by means of seven Figures (5.9 to 5.15), each is composed of three subfigures (a), (b) and (c). Any of the figures refers to a different annual pre-tax-pre-transfer income of the custodial parent. The corresponding subfigures display different custodial parent household types, formerly associated with the non-custodial parent; (a) refers to AC, (b) to ACC and (c) to ACCC. Thereby an A indicates that there lives one adult, the custodial parent in the household and the number of C s points to the number of children in the household. Any of the subfigures displays the actual as well as the artificial payments as a function of pre-tax-pre-transfer income of the non-custodial parent. Hence, the single subfigures comprise six graphs: Two for our scenarios under investigation ('child support only' and 'child and spousal support'), and additional four relating to the employed equivalence scales (old-OECD, modified-OECD, CITRO and KSS).⁴⁶

At first, we direct the attention to the expert scales. As to be expected, payments predicted by the old-OECD scale exceed those of the other two expert scales. Whereas in turn, the CITRO payments exceed those of the modified-OECD. The old-OECD scale involves the lowest economies of scale, thus, awards the highest artificial disposable incomes to the household of the custodial parent. As a consequence, support payments amount to the highest values.

Concerning the KSS scale, we observe lower payments than those predicted by the expert scales. Whereas the vertical difference between the expert scales themselves keeps relatively constant over all scenarios under investigation, the position of the KSS scale, in relation to the expert scales, is dependent (a) on the household type of the custodial parent and (b) on the income level of the non custodial parent. For a given income level of the custodial parent, we observe, that the expert graphs exceed the KSS graph the more, the higher the number of household members of the custodial parent and the higher the income level of the non-custodial parent. The reasons for this observation are twofold. First, the deflators of the old-OECD and the CITRO scale exceed the maximum deflators of the KSS scale (see Table 5.3). Hence, for a given income of the custodial parent, the upward shift of the expert graphs associated with a rise in household members is observed to be higher than that of the KSS graph. The second reason is the income independency of the expert scales in comparison to the KSS scales. A rise in income of the non-custodial parent affects a further decrease in the KSS scale, whereas the expert scales keep constant. Thus, the expert scales predict even higher payments. This relation holds all the more, the higher is the income level of the non-custodial parent. As a consequence, graphs slightly diverge.

⁴⁶Tables C.8–C.10 in Appendix C provide additional information on the results. The tables state for different income combinations of the parents the corresponding actual payable support amounts. In addition, predicted payments are displayed as percentage deviation from the amount, payable in the scenario 'child and spousal support'.

As to be expected, the graphs for ‘child support only’ and ‘child and spousal support’ concur for low incomes of the non-custodial parent, or for small differences between the incomes of the custodial and non-custodial parent. This observation relates to those cases, in which no spousal support has to be paid.⁴⁷ For cases, in which the non-custodial parent could not even meet the claims to child support, graphs exactly lie on the top of each other. For cases, where the difference between the incomes of the custodial and non-custodial parent is small, the graph for ‘child and spousal support’ lies below the graph for ‘child support only’. This observation can be ascribed to Section A, Remark 1 Düsseldorf Table, hence, is caused by the downgrading of the non-custodial parent, in consequence of the increased number of entitled persons.⁴⁸ Starting with the additional payment of spousal support, both graphs diverge with an increase in the income of the non-custodial parent. Whereas we observe a slight increase associated with the upgrading within the Düsseldorf Table, for the graph of ‘child support only’, the increase in ‘child and spousal support’ is greater and the graphs display slopes similar to the predicted payments.

Having a comparative look at the payments, it becomes apparent that those payments referring to the scenario ‘child support only’ lie below the predicted payments of the expert scales almost in each of the subfigures. Since the graphs of the KSS payments likewise lie below those of the expert scales, but feature a greater slope, the KSS payments intersect actual child support payments in most of the subfigures. Relating this observation to the issue of distributive justice, we can conclude the following: When referring to the expert scales, the present German tax-benefit system discriminates against the household of the custodial parent, which receives ‘child support only’. When referring to the KSS scale, the conclusion is more complex. The present German tax-benefit system discriminates against the household of the custodial parent especially in those cases, the non-custodial parent has payment liabilities only against one child and the income of the custodial parent is relatively low. The higher the number of children and the higher the income of the custodial parent, the later the KSS graph intersects the graph of ‘child support only’. Even for very high incomes of the custodial parent, the KSS graph lies – over the whole income interval – below the graph of ‘child support only’. Hence, actual child support payments exceed those recommended by the KSS scale (see e.g. Figure 5.15).

We now focus on the scenario of ‘child and spousal support’ in comparison to the predicted payments.⁴⁹ At first, we focus on the case of parents at the bottom tail of the income distribution. This situation is displayed in Figures 5.9 and 5.10. In Figure 5.9 the custodial parent is unemployed and draws unemployment benefit II. The actual payments concur with those predicted by the expert scales. Figure 5.10 displays a

⁴⁷For reasons for the case that spousal support equals to zero see Section 5.3.4.

⁴⁸For a more detailed explanation see Section 5.3.4.

⁴⁹When referring to ‘actual’ support payments in the following, we consider the case of ‘child and spousal support’.

similar financial situation of the custodial parent, since it still qualifies for unemployment benefit II. However, the custodial parent is employed and has some additional income at disposal (see §11b GTC). The comparative analysis shows two issues worth mentioning. The expert payments experience an upward shift, caused by the elevated sum of disposable household incomes. The actual payments experience a downward shift, caused by the diminished difference between the incomes from employment from the custodial and the non-custodial parent.⁵⁰ As a consequence, in Figure 5.10 actual payments fall below those suggested by the experts.⁵¹

The KSS scale relates rather different to the actual payments than the expert scales in both the scenarios the custodial parent qualifies for unemployment benefit II. In the ‘pure’ unemployment benefit II case (see Figure 5.9), KSS payments are lower than the actual payments. And when the custodial parent starts minor employment (see Figure 5.10), the payments recommended by the KSS scale rise, since the KSS scales account for the employment status (see Section 5.2.3). This rise in KSS payments on the one hand, and the above mentioned drop in actual payments on the other hand, cause a concurrence of the actual with KSS payments for the case the custodial parent is in minor employment. Hence, in case the custodial parent is unemployed, actual support payments are mirrored quite well by those payments, predicted by the expert scales (the old-OECD scale in particular). Nevertheless, this conclusion does not hold anymore, if the custodial parent starts working. For this case, the KSS payments ensure a better fit to actual payments.

Looking at the evolution of the payments associated with an increase in gross income of the custodial parent reveals some further interesting findings. Expert scales result in payments that always exceed actual payments, whereas the KSS payments recommend payments lower than the actual ones. However, in some of the scenarios, the KSS scales fit the actual payments rather well. This applies all the more, the higher the difference in income between the custodial and the non-custodial parent and additionally, the less household members are assigned to the custodial parent household.⁵²

Conclusively, we find that the support payments, generated by the German tax-benefit system, are not mirrored by a certain equivalence scales. Rather it depends on four determinants how well the single scales fit the actual payments. The determinants are (a) the number of children the non-custodial parent is liable for, (b) the income level of the non-custodial parent, (c) the employment status and (d) the income level of the custodial parent. In the case of an unemployed custodial parent all alternative scales recommend lower than the actual payments. Thus, the scale with the lowest

⁵⁰See Section B, Remark I.1.a) OBERLANDESGERICHT DÜSSELDORF (2011).

⁵¹As an example, see e.g. Table C.9 in Appendix C, the non-custodial parent is liable for a spouse and two children. Assume the non-custodial parent draws a gross income of 6,300 €. In case the custodial parent is unemployed, spousal and child support amounts to 1,822 €, this amount drops to 1,075 € the custodial parent starts minor employment.

⁵²This relationship is an indicator for the income dependence of the KSS scale.

economies of scale, the old-OECD scale, fits best. In case the custodial parent is in employment and lives in a household with just one child, the KSS scale – on average – displays actual payments most likely. In addition, the KSS scale fits best even for a custodial parent with two and three children, albeit only for those cases the custodial parent draws a low income.

5.6 Conclusion

In this chapter we have studied the equity perceptions that are inherent in the German tax-benefit system. Thereby we focus in particular on the support legislation, as we are interested in those equity perceptions the increasing share of persons living in separated family forms is confronted with. We generate an artificial dataset that comprises various combinations of separately living families. That means, in each case of a separated family we consider a single household of the non-custodial parent and an associated single-parent household of the custodial parent, which comprises one to three dependent children. Our analysis is done for varying annual gross incomes of both households. The data runs through a simulation model comprising the German tax-benefit system, which includes the German legislation on taxes, social security contributions, unemployment benefits and support payments.

We analyze the equity perceptions by means of equivalence scales which are employed in two different applications. First, we reverse the commonly applied equivalence scale methodology by assuming that horizontal equity is satisfied by the German tax-benefit system. Hence, we investigate the equity perceptions by means of implicit equivalence scales that are inherent in the interplay of the comprehensive tax-benefit system. Finally, we contrast the implicit scales to equivalence scales discussed in the literature. Second, we employ equivalence scales in order to provide distributive justice in a more ‘applied’ manner. We investigate to what extents the actual support payments differ from those payments that would be ‘recommended’ by commonly used equivalence scales.

Both applications of equivalence scales reveal that the equity perceptions that are inherent in the German tax-benefit system are very complex. They cannot be specified by equivalent scales commonly discussed in the literature or used in distributional analyses. Rather it depends on four determinants and the multitude of combination possibilities of how well the single scales fit the implicit scales or actual payments. The determinants are (a) the number of children the non-custodial parent is liable for, (b) the income level of the non-custodial parent, (c) the employment status and (d) the income level of the custodial parent. However, we find some generalities. We discover for situations in which both households belong to the bottom tail of the income distribution that the commonly used expert scales fit rather well actual equity perceptions. Furthermore we find that an increase in income of the reference household – the non-custodial parent – causes a decrease in the implicit scales. This observation indicates that the scales inherent in the German tax-benefit system are dependent on income. Out of the four employed scales only the KSS scale displays this feature. The survey based KSS scale comprises a further feature which reflects the implicit scales rather well. This refers to a dependence on the employment status of the concerned persons. Both the KSS scale and the implicit scales compensate for the loss of household

production and the harm associated with employment.

Hence, under two assumptions one could infer that in some features the legislature in Germany reaches the preferences of the society rather well. First, we have to agree with ATKINSON (1995) in assuming that implicit equivalence scales mirror the population's preferences revealed through the electoral process. Second, we have to assume that the KSS scale, which is based on a survey conducted in Germany, represents the preferences of the Germany society well. However, the implicit scales display some properties that should be reconsidered by the legislature. This includes for example the re-ranking of scales in cases the custodial parent draws a relative low income and the non-custodial parent is liable for child and spousal support.

Besides its contribution to the political debate on distributive justice, this study contributes to the economic literature by applying the framework of implicit equivalence scales to the context of support payments. Additionally, the study is engaged in the discussion on an appropriate design of equivalence scales in order to reflect transfer systems that are observed in practice. We find that actual scales are more complex than those scales commonly used in distributional analyses. With respect to the actual scales we observe an income dependence of the scales. Hence we agree with MUELLBAUER and VEN (2002, 2004) that the assumption of base dependency may be necessary in order to reflect actual transfer systems. Additionally, we point to the fact that in future research on equivalence scales the employment status of persons should explicitly be taken into account.

Chapter 6

Conclusion

This thesis contributes to the literature and to the political debate on social policy in Germany in different dimensions. From the content point of view the thesis is concerned with the economic consequences of two current aspects of the changing structure of the German society, the aging of society (Part I) and the shifting household composition from ‘classic’ families to single parent households (Part II). The aim of the single chapters is to give deeper insights into the structure of the German pension (Chapter 2–4) and support legislation (Chapter 5) in order to reveal possible weaknesses and to allow for possible interventions. From a methodological point of view the investigations are based on the analysis of survey and simulated data.

In Chapter 2 and Chapter 3 we analyze the evolution of the financial situation, the changes in income composition and the evolution of income distribution of the elderly on the basis of two different datasets. Whereas we employ the EVS in Chapter 2, we employ the SOEP in Chapter 3. This procedure enables us to analyze a wide period, reaching from the late 70s up to current years. Methodologically, both chapters are similar. The elderly population, defined as people of age 55 and older, is decomposed by people that resident in the Old and New Federal States. Furthermore, we distinguish non-pensioner and pensioner households. We use the Gini index as measure of inequality since it is additively decomposable into single income components, and by means of the Gini elasticity we are able to quantify the impact of changes of the relative share of single income components on inequality.

For the whole period under observation we find an improvement of the financial situation of the elderly. However, the increase in mean equivalent income was relatively strong for the first years and diminished subsequently. Hence, for the last decade, our results document stagnation, and for the pensioner households even a slightly worsening of the financial situation. Referring to the subsamples we find higher mean equivalent incomes for the non-pensioners than for the pensioners and the elderly in the Old Laender exhibit higher incomes than their eastern counterparts. Inequality, measured by the Gini index, remained almost constant for the pensioners as well as for the

non-pensioners in the Old Laender over the whole observation period. Right after the German reunification, when the subsamples of the New Laender entered the analysis, inequality was significantly lower in the eastern than in the western part of Germany. However, in the following years inequality increased in the New Laender; slightly for the pensioner, sharply for the non-pensioner. The increase in case of the latter was so sharp, that inequality almost converged for this subsample in both, the Old and New Laender.

With respect to the political applicability the results on the Gini elasticities display interesting findings in particular: For all subsamples under investigation it turns out, that an increase in the share of employment and capital income raises inequality, whereas an increase in transfer and pension income reduces inequality. Considering the reforms that have been undertaken in the last decade, like the rise in retirement age ('Rente mit 67') and the simultaneously strengthening of self-reliance for old-age provision ('Riester-' and 'Rürup-Reform'), a twofold effect is to be expected. On the one hand it refers to the income level and on the other hand to the income distribution between the elderly in society. The reform 'Rente mit 67' is actually accompanied by a reduction of the effective pension level. Referring to the Gini elasticities, the reduction of the pension level is associated with a rise in inequality among the elderly. A similar impact on inequality is to be expected by the strengthening of self-reliance for old-age provision. The outstanding positive Gini elasticity of capital income for pensioner in both parts of Germany and the simultaneously increase in the share of capital income for some subsamples may foster inequality between the elderly.

In Chapter 4 this thesis seizes on the increasing importance of self-reliance for old-age provision and examines whether the German market for private old-age provision is organized efficiently. Thereby, the focus lies on market failure caused by adverse selection in the private pension insurance market. Methodologically, we use the 2005 wave of the SAVE survey data and estimate a probit model of insurance holdings. Referring to the research focus, subjective life-expectancy is the core determinant in investigating the uptake of private old-age insurance. And indeed, we find that subjective life-expectancy is positively related with the probability of having supplementary private pension insurance. This indicates that the German market for private pension insurance is in fact characterized by adverse selection. Furthermore, the selected estimation model allows us to examine further determinants for the uptake. Therewith, the chapter contributes to the discussion on the low uptake of annuities, the so-called 'annuity puzzle'. For Germany we find that pre-existing entitlements to benefits from the public pension system tend to be a substitute to private insurance. Additionally, financial literacy enhances the uptake of private pension insurance. We also find evidence for a bequest motive in old-age provision, but we see no indication for pooling longevity risk within couples.

From a policy point of view, Part I of this thesis refers to aspects in the matter of

old-age security that may foster inequality between the elderly of the German society. Private old-age provision seems to gain more and more importance for financial security in old-age (see Chapter 2 and 3). However, the market for private pension insurance is characterized by inefficiencies related to adverse selection. Hence, difficulties may arise for low risk individuals for whom insurance in the private pension market is prohibitively expensive (see Chapter 4). Policy makers may therefore keep in mind that strengthening the role of private old-age provision is not without difficulty for different parts of the society: Those parts that are not aware of the importance, those who financially cannot take part and those for whom private old-age insurance seem less attractive because of expensive premiums.

Chapter 5 is dedicated to the equity perceptions that are inherent in the German tax-benefit system. Thereby we specially focus is on the support legislation, as we are interested in those equity perceptions the increasing share of persons living in separated family forms is confronted with. We generate a synthetic dataset which only comprises two kinds of households, single households and single-parent households with one up to three dependent children. Single households represent households of the non-custodial parent and single-parent households those of the custodial parent. The data runs through a simulation model comprising the German tax-benefit system, which includes the German legislation on taxes, social security contributions, unemployment benefits and support payments. Methodologically, the analysis is based on the use of equivalence scales. Those are applied in two different manners. First, we determine the equivalence scales which are implicit in the German tax-benefit system. Second, we compare actual support payments with those payments commonly used equivalence scales would predict.

Chapter 5 contributes to a deeper understanding of redistribution within the German tax-benefit system. When interpreting the government according to ATKINSON (1995), who points out that in democratic countries implicit equivalence scales are normally the result of the population's preferences revealed through the electoral process, the results could be used by the legislature in order to compare actual with desired redistribution.

A comparison of the implicit scales with equivalence scales that are discussed in economic literature unveils some interesting findings: Those implicit equivalence scales referring to situations in which both households belong to the bottom tail of the income distribution fit rather well with the commonly used expert scales. Furthermore, we find that an increase in income of the reference household – the non-custodial parent – causes a decrease in the implicit scales. This observation indicates that the scales inherent in the German tax-benefit system are dependent on income. Out of the four employed scales only the KSS scale displays this feature. The survey based KSS scale comprises a further feature which reflects the implicit scales rather well. This refers to a dependence on the employment status of the concerned persons. Both the KSS scale

and the implicit scales compensate for the loss of household production and the harm associated with employment.

Hence, under two assumptions one could infer that in some features the legislature in Germany reaches the preferences of the society rather well. First, we have to agree with ATKINSON (1995) in assuming that implicit equivalence scales mirror the population's preferences revealed through the electoral process. Second, we have to assume that the KSS scale, which is based on a survey conducted in Germany, represents the preferences of the Germany society well. However, the implicit scales display some properties that should be reconsidered by the legislature. This includes for example the re-ranking of scales in cases the custodial parent draws a relative low income and the non-custodial parent is liable for child and spousal support.

Besides the political applicability, Chapter 5 contributes to the economic literature on equivalence scales. First, to the best of our knowledge, this is the first study which introduces the methodology of implicit equivalence scales in order to reveal equity perceptions that are inherent in the support legislation. Second, the chapter contributes to the discussion on an appropriate configuration of equivalence scales in order to reflect transfer systems that are observed in practice. We find that actual scales are more complex than those scales commonly used in distributional analyses. With respect to the actual scales we observe an income dependence of the scales. Hence we agree with MUELLBAUER and VEN (2002, 2004) that the assumption of base dependency may be necessary in order to reflect actual transfer systems. Additionally we point to the fact that in future research on equivalence scales the employment status of persons should explicitly be taken into account.

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Appendix A

Appendix to Chapter 2

Income Concept: pre-tax-post-transfer equivalent income

Definition

The income concept used throughout Chapter 2 is the pre-tax-post-transfer equivalent income in year 2003 prices. For years 1978 to 1998, incomes have been adjusted by consumer price indices, reported in Table A.1, provided in GERMAN FEDERAL STATISTICAL OFFICE (2009). Pre-tax-post-transfer equivalent income comprises five income components: (a) *employment income*: earned income and self-employed income; (b) *retirement income*: retirement pensions from public pension fund, civil servant's pensions, company pensions, and other pensions; (c) *transfer income*: benefits related to former employment, social assistance, family-related benefits, and other transfers; (d) *investment income*; (e) *other income*: which is a residual component that cannot unambiguously be assigned to the previous five income concepts. For each cross-section, each income component has been constructed from several EVS variables. Table A.2 summarizes the EVS variables pertaining to each income source. Pre-tax-post-transfer income is the sum of all individual incomes of elderly persons living in a household unit plus a fraction of incomes reported at the household level only, with individual incomes of other household members being ignored. To derive equivalent pre-tax-post-transfer income, we apply the OECD-modified equivalence scale.

Interpretation

The number of elderly persons in a household unit not necessarily complies with the household size of the original EVS household units. Particularly, in our sample all non-elderly persons and their individual incomes have been discarded from our sample. As a result, we might underestimate the true level of household-size economies and the access of elderly people to financial resources. For example, elderly living with younger

Table A.1: Consumer price indices for Germany

Year	OL	NL
1978	54.36	–
1983	68.92	–
1988	73.05	–
1993	86.08	85.09
1998	93.54	94.62
2003	100.00	100.00

Source: Own calculations from data of German Federal Statistical Office (2009).

high income recipients may benefit from intra-household income pooling. In this sense, our income concept is a lower bound for their ‘true’ level of material comfort. A benefit of our income definition is that it ‘controls’ for changes in household arrangements or changes in non elderly household members’ incomes. One might also argue that a pre-tax-post-transfer income concept is a biased estimate of peoples ‘true’ living standards, as consumption ultimately depends on post-tax-post-transfer income. Yet, observations in our database usually cannot be treated as tax units, and computing post-tax-post-transfer income (especially for different income sources) would urge us to make strong assumptions on individual tax liabilities. Finally, pre-tax-post-transfer income is less sensitive to changes in the tax code, and thus might be a better indicator for assessing the impacts of previous pension reforms on the financial situation of the elderly.

Table A.2: EVS income variables (80 percent sample)

Income Component	Sub Components	EVS Field-Identification Number in Year					
		2003	1998	1993	1988	1983	1978
Employment Inc.	Earned Income ^a	99; 100; 102; 103; 104; 108; 133	251-256; 258-263; 272-277; 279-284; 286-291; 314-319; 405-410	303-308; 429-434	186; 188; 190; 192; 299-304	187; 189; 191; 193; 300-305	149; 151; 153; 155; 262-267
		122; 123; 124	328-333; 335-340; 342-347	324-329; 331-336; 338-343; 345-351; 352-357; 359-364	194-199; 201-206; 208-213; 215-220; 222-227; 229-234	195-200; 202-207; 209-214; 216-221; 223-228; 230-235	157-162; 164-169; 171-176; 178-183; 185-190; 192-197
		125; 126; 127	349-354; 377-382; 356-361	366-371; 373-378; 380-385	236-241; 243-248; 250-255	237-242; 244-249; 251-256	199-204; 206-211; 213-218
Retirement Inc.	Civil Servant's Pensions	158; 159	566-571; 573-578	520-525; 527-532; 534-539	383-388; 390-395; 397-402	377-382; 384-389; 391-396	332-337; 339-344; 346-351
		160; 130; 131	580-585; 384-389; 391-396	541-546; 548-553; 387-392; 394-399; 401-406	404-409; 411-416; 278-283; 285-290; 292-297	398-403; 405-410; 279-284; 286-291; 293-298	353-358; 241-246; 248-253; 255-260
		132; 147; 150; 156	398-403; 503-508; 524-529; 559-564	408-413; 415-420; 422-427; 485-490; 492-497; 513-518	257-262; 264-269; 271-276; 362-367; 369-374	258-263; 265-270; 272-277; 356-361; 363-368	220-225; 227-232; 234-239; 290-295; 297-302; 304-309
Transfer Inc.	Former Empl. Related Benefits	135; 136; 137; 138; 146; 155	419-424; 426-431; 433-438; 440-445; 496-501; 552-557	436-441; 443-448; 450-455; 592; 593; 478-483; 506-511	306-311; 313-318; 320-325; 455; 466; 334-339; 348-353	307-312; 314-319; 321-326; 448; 459; 328-333; 342-347	269-274; 276-281; 283-288; 394; 410; 325-330; 311-316
		141; 143; 144; 157	461-466; 475-480; 482-487	589; 464-469; 596; 597	452; 355-360; 456; 467	445; 349-354; 449; 460	391; 318-323; 395; 411
		139; 140; 142; 145	447-452; 454-459; 468-473; 489-494	588; 457-462; 471- 476	451; 341-346; 327- 332	444; 335-340	390
Investment Inc. Other Inc.	Other Transfers	151 ^b ; 152; 153; 154	531-536 ^b ; 538-543; 545-550	499-504; 600; 601	376-381; 459; 470	370-375; 452; 463	325-330; 398; 414
		47; 177; 162	121; 617; 594-599	103; 614; 625	24; 453; 488	33; 446; 481	388; 389; 392; 426

Note: *Other income* is the income residual that cannot be assigned to the eleven other income sources. ^aIn 1978, 1983 and 1988 *earned income* is reported for the household head, the spouse (if present), and children (if present). For other household members, only an aggregate amount is reported. In this case, we divide the aggregate amount by the number of other household members and assign this ratio to each household member age 55 and above that is not the household head and not his/her spouse. ^bAlthough this position should be classified as other pensions we reclassified it for reasons of better comparison as other transfers.

Source: German Sample Survey of Income and Expenditures (1978-2003).

Reforms

Table A.3: Main pension reforms in the period 1978–2003

Year of Passing	Coming Into Effect	Reform Act	Individual Pension Entitlement
1977	01/1978 – 01/1979	20nd Rentenanpassungsgesetz	Reduction of creditable periods (education and training periods) for future pension entitlements
1978	07/1978 – 12/1981	21nd Rentenanpassungsgesetz	Pension entitlements are unlinked from growth of gross wages
1982	01/1983	Haushaltsbegleitgesetz 1983	Further reduction of creditable periods (education and training periods) for future pension entitlements
1985	01/1986	Gleichstellung von Männern und Frauen bei den Hinterbliebenenrenten	Equal treatment of widows and widowers, and reduction of surviving dependants' pension entitlement
1989	01/1992	Rentenreformgesetz 1992	Further reduction of creditable periods (education and training periods) for future pension entitlements Stepwise increase of mandatory retirement age Increase of minimal insurance period qualifying for entitlement Change of pension adjustment procedure to net pension adjustment Introduction of penalties in case of retirement before age 65
1996	10/1996 – 01/1997	Wachstums- und Beschäftigungsförderungsgesetz	Further reduction of creditable periods (education and training periods) for future pension entitlements
1997	07/1998 – 01/2000	Rentenreformgesetz 1999	More rapid increase of retirement age Introduction of a demographic factor: adjustment of pension entitlements to demographic changes Increase of retirement age and lowering of pension levels for several insurant segments (in particular for highly disabled and surviving dependants) Adjournment of the Rentenreformgesetz 1999 until Dec. 31, 2000
1998	04/1999 – 06/1999	Rentenkorrekturgesetz	Tax exceptions for active pensioners
1999	04/1999	Gesetz zur Neuregelung der geringfügigen Beschäftigungsverhältnisse	Change of pension adjustment procedure to adjustment equal to inflation rates
1999	01/2000	Gesetz zur Sanierung des Bundeshaushalts	No pension adjustment for year 2001
2001	01/2001 – 01/2002	Altersvermögensergänzungsgesetz	Increase of surviving dependants pensions
2001	01/2002	Gesetz zur Verbesserung des Hinterbliebenenrechts	

Source: Own compilation.

Research Sample and Adjustment of EVS Sampling Weights

The database underlying our calculations is a subset of the EVS waves 1978–2003. The non-weighted number of household units in this subset is 103,205. One problem with the EVS database is the fact that it oversamples people in their 70s on the account of the cohort age 80 and older. To fit the German microcensus statistics, we have adjusted EVS sample weights according to the entropy based minimum information loss principle. The minimum information loss principle satisfies a positivity constraint on the sampling weights to be computed. The software we have made use of is *Adjust* (see MERZ, 1994, for further information), it incorporates a numerical solution by means of a modified Newton-Raphson procedure with a global exponential approximation. Official statistics on the absolute numbers of persons in Germany by age and year have been taken from the online database of the German Federal Statistical Office downloadable from <http://www.destatis.de/jetspeed/portal/cms/>.

Results From the Stratified Bootstrap Approach

Tables A.4 to A.9 correspond with Tables 2.2–2.7 in Chapter 2.

Table A.4: Intertemporal changes in CPI-adjusted mean equivalent incomes (stratified bootstrap)

	OL				NL			
	1983 %1978	1988 %1983	1993 %1988	1998 %1993	2003 %1998	1998 %1993	2003 %1998	2003 %1998
Pensioners								
$\Delta\hat{\mu}$	215	1,708*	1,938*	1,866*	1,981*	3,774*	2,108*	
(95% CI)	(-220; 557)	(1,283; 2,133)	(1,570; 2,400)	(1,371; 2,319)	(1,395; 2,466)	(3,249; 4,333)	(1,619; 2,549)	
Non-pensioners								
$\Delta\hat{\mu}$	-1,580*	4,041*	2,482*	2,379*	359	5,856*	1,756*	
(95% CI)	(-3,009; -354)	(2,519; 5,623)	(644; 3,883)	(917; 3,859)	(-1,383; 1,910)	(4,029; 7,313)	(-3,844; -160)	

Notes: $\Delta\hat{\mu}$ is the observed change in mean equivalent income between periods t and $t - 5$. All numbers rounded to full € amounts. CI denotes Hall's confidence interval. *Change is significantly different from zero at the 5% level.

Source: German Sample Survey of Income and Expenditures (1978–2003).

Table A.5: Intertemporal changes in factor shares (stratified bootstrap)

	OL					NL	
	1983 %1978	1988 %1983	1993 %1988	1998 %1993	2003 %1998	1998 %1993	2003 %1998
Pensioners							
Employment							
$\Delta\hat{w}_1$	-0.75	-1.59*	0.07	-2.05*	-1.04*	3.75*	-4.97*
(95% CI)	(-1.89; 0.13)	(-2.66; -0.73)	(-1.24; 1.19)	(-3.14; -0.97)	(-1.85; -0.28)	(2.08; 5.89)	(-6.38; -3.46)
Retirement							
$\Delta\hat{w}_2$	-1.18	0.50	-2.13*	-3.92*	2.05*	-8.49*	4.46*
(95% CI)	(-2.13; 0.13)	(-0.55; 1.74)	(-3.40; -0.86)	(-5.05; -2.69)	(0.83; 3.01)	(-10.86; -6.82)	(2.83; 6.33)
Transfers							
$\Delta\hat{w}_3$	-0.68*	0.00	0.01	-0.03	-0.29*	1.21*	-1.41*
(95% CI)	(-0.97; -0.41)	(-0.16; 0.22)	(-0.19; 0.19)	(-0.23; 0.15)	(-0.51; -0.06)	(0.48; 1.78)	(-2.26; -0.60)
Investments							
$\Delta\hat{w}_4$	2.62*	0.21	5.13*	1.38*	-1.57*	1.27*	1.07*
(95% CI)	(2.05; 3.19)	(-0.54; 0.70)	(4.54; 5.80)	(0.76; 2.11)	(-2.45; -0.89)	(0.36; 2.18)	(0.09; 1.63)
Other							
$\Delta\hat{w}_5$	-0.01	0.87*	-3.08*	4.62*	0.85*	2.25*	0.85
(95% CI)	(-0.41; 0.39)	(0.42; 1.21)	(-3.43; -2.74)	(4.07; 5.00)	(0.37; 1.64)	(1.93; 2.68)	(-0.12; 1.63)
Non-pensioners							
Employment							
$\Delta\hat{w}_1$	-1.68	-1.53*	-0.34	-8.94*	-3.03*	18.71*	-5.70*
(95% CI)	(-3.42; 0.20)	(-3.01; -0.11)	(-1.59; 1.30)	(-10.98; -7.42)	(-4.82; -1.38)	(15.37; 23.13)	(-10.23; -1.19)
Retirement							
$\Delta\hat{w}_2$	-1.15*	0.99*	-0.16	-1.87*	5.78*	-38.35*	4.28*
(95% CI)	(-1.74; -0.57)	(0.38; 1.56)	(-0.80; 0.58)	(-2.43; -1.42)	(4.42; 6.65)	(-41.74; -35.29)	(2.78; 5.47)
Transfers							
$\Delta\hat{w}_3$	-0.03	1.26*	1.12*	0.29	-0.89*	10.96*	-0.88
(95% CI)	(-0.39; 0.44)	(0.57; 1.75)	(0.40; 1.88)	(-0.60; 0.87)	(-1.48; -0.17)	(8.37; 13.42)	(-3.45; 2.32)
Investments							
$\Delta\hat{w}_4$	2.82*	-0.26	2.46*	1.79*	-1.44*	0.55	2.29*
(95% CI)	(1.38; 3.94)	(-1.57; 1.16)	(1.29; 3.46)	(0.69; 2.81)	(-2.43; -0.74)	(-1.03; 1.87)	(0.50; 4.11)
Other							
$\Delta\hat{w}_5$	0.05	-0.46	-3.08*	8.74*	-0.43	8.13*	0.02
(95% CI)	(-0.69; 0.81)	(-1.05; 0.30)	(-3.59; -2.63)	(7.94; 9.40)	(-1.56; 0.75)	(5.65; 9.55)	(-2.43; 2.84)

Note: $\Delta\hat{w}_i$ denotes the observed change in the share of income component i in total household income between periods t and $t - 5$.

CI denotes Hall's confidence interval. *Change is significantly different from zero at the 5% level.

Source: German Sample Survey of Income and Expenditures (1978–2003).

Table A.6: Intertemporal changes in Gini indices (stratified bootstrap)

	OL				NL			
	1983 %1978	1988 %1983	1993 %1988	1998 %1993	2003 %1998	1998 %1993	2003 %1998	2003 %1998
Pensioners								
$\Delta\hat{G}$	-0.73	-1.62*	-0.18	0.27	0.26	3.25*	-0.66	
(95% CI)	(-1.56; 0.18)	(-2.76; -0.81)	(-1.03; 0.67)	(-0.59; 0.96)	(-0.44; 1.26)	(1.92; 4.81)	(-2.20; 0.56)	
Non-pensioners								
$\Delta\hat{G}$	3.31*	-3.54*	0.81	-1.12	1.41*	4.91*	0.39	
(95% CI)	(1.13; 5.61)	(-5.87; -1.58)	(-1.17; 2.89)	(-2.49; 0.29)	(0.08; 2.91)	(2.09; 7.59)	(-1.81; 3.68)	

Note: $\Delta\hat{G}$ is the observed change in the Gini index between periods t and $t - 5$. CI denotes Hall's confidence interval. *Change is significantly different from zero at the 5% level.

Source: German Sample Survey of Income and Expenditures (1978–2003).

Table A.7: Intertemporal changes in concentration coefficients (stratified bootstrap)

	OL				NL			
	1983 %1978	1988 %1983	1993 %1988	1998 %1993	2003 %1998	1998 %1993	2003 %1998	
Pensioners								
Employment								
$\Delta\hat{C}_1$	-2.12	0.54	-4.40*	0.36	-7.30*	-1.65	-6.62*	
(95% CI)	(-5.09; 1.08)	(-2.83; 4.07)	(-7.58; -1.26)	(-3.27; 4.44)	(-11.54; -2.75)	(-7.62; 3.57)	(-11.47; -0.40)	
Retirement								
$\Delta\hat{C}_2$	-0.82	-1.12*	-0.94*	-0.78	1.26*	-2.48*	2.87*	
(95% CI)	(-1.62; 0.07)	(-1.99; -0.39)	(-1.96; -0.06)	(-1.98; 0.35)	(0.26; 2.59)	(-4.64; -0.77)	(1.07; 4.34)	
Transfers								
$\Delta\hat{C}_3$	-23.09*	8.96	6.25	13.31*	-5.61	23.42*	5.71	
(95% CI)	(-32.53; -13.49)	(-0.56; 16.26)	(-1.83; 14.55)	(4.00; 22.34)	(-15.79; 4.55)	(9.05; 37.79)	(-8.92; 28.01)	
Investments								
$\Delta\hat{C}_4$	3.54*	-2.40*	3.71*	-1.07	-1.76	7.01	-2.74	
(95% CI)	(0.53; 6.80)	(-5.02; -0.04)	(1.03; 6.54)	(-3.75; 1.52)	(-4.50; 0.78)	(-0.26; 14.00)	(-7.83; 1.67)	
Other								
$\Delta\hat{C}_5$	-4.54*	-2.44	-16.99*	21.96*	12.42*	44.70*	5.17	
(95% CI)	(-8.90; -0.49)	(-6.37; 1.77)	(-23.30; -10.46)	(14.26; 27.76)	(5.54; 18.50)	(34.26; 55.38)	(-6.75; 15.17)	
Non-pensioners								
Employment								
$\Delta\hat{C}_1$	2.47	-1.81	1.61	-2.05	2.50*	-19.24*	2.00	
(95% CI)	(-0.15; 4.96)	(-4.70; 0.79)	(-0.79; 4.00)	(-4.23; 0.53)	(0.34; 4.17)	(-22.86; -14.45)	(-2.02; 6.53)	
Retirement								
$\Delta\hat{C}_2$	24.34*	-14.74	0.95	-9.53	23.40*	18.94	24.20	
(95% CI)	(3.45; 46.43)	(-36.54; 1.72)	(-15.84; 15.98)	(-26.46; 8.08)	(10.27; 36.08)	(-6.79; 55.28)	(-8.93; 50.34)	
Transfers								
$\Delta\hat{C}_3$	-1.96	-13.06*	1.25	5.97*	-8.79*	-5.40	-1.65	
(95% CI)	(-10.52; 5.12)	(-20.90; -4.14)	(-4.92; 7.35)	(0.12; 10.72)	(-13.92; -3.95)	(-18.18; 5.83)	(-8.41; 7.25)	
Investments								
$\Delta\hat{C}_4$	6.83	-1.73	-1.61	-1.99	0.19	7.14	2.72	
(95% CI)	(-0.75; 12.73)	(-8.70; 5.27)	(-9.19; 5.20)	(-6.79; 2.89)	(-4.44; 3.34)	(-1.53; 14.23)	(-4.16; 11.07)	
Other								
$\Delta\hat{C}_5$	-0.77	-1.22	5.57	12.62	5.37	38.26*	-9.35	
(95% CI)	(-8.89; 6.97)	(-8.20; 4.72)	(-7.81; 19.27)	(-1.13; 27.32)	(-1.01; 10.92)	(23.31; 51.58)	(-21.73; 2.68)	

Note: $\Delta\hat{C}_i$ denotes the concentration coefficient of income component i between periods t and $t - 5$. CI denotes Hall's confidence interval.

*Change is significantly different from zero at the 5% level.

Source: German Sample Survey of Income and Expenditures (1978–2003).

Table A.8: Concentration and share effects (stratified bootstrap)

	OL				NL		
	1983 %1978	1988 %1983	1993 %1988	1998 %1993	2003 %1998	1998 %1993	2003 %1998
Pensioners							
Concentration effect (95% CI)	-1.00* (-1.60; -0.16)	-1.03* (-1.85; -0.43)	-0.99* (-1.51; -0.33)	0.45 (-0.46; 1.28)	0.73* (0.05; 1.67)	-0.05 (-2.01; 1.66)	1.75* (0.33; 2.87)
Share effect (95% CI)	0.27 (-0.28; 0.73)	-0.59* (-1.12; -0.18)	0.81* (0.11; 1.37)	-0.19 (-0.80; 0.30)	-0.47* (-0.83; -0.06)	3.31* (2.37; 4.87)	-2.41* (-3.55; -1.58)
Non-pensioners							
Concentration effect (95% CI)	3.11* (1.01; 5.36)	-2.42* (-4.67; -0.12)	1.31 (-0.82; 3.31)	-0.94 (-3.01; 0.56)	2.68* (0.92; 4.35)	-5.76 (-13.58; 1.56)	1.04 (-2.86; 4.92)
Share effect (95% CI)	0.20 (-0.45; 0.62)	-1.12* (-1.60; -0.64)	-0.50 (-1.13; 0.22)	-0.18 (-1.01; 0.90)	-1.20* (-1.85; -0.48)	10.66* (3.75; 15.87)	-0.65 (-2.98; 1.36)

Note: Observed concentration and share effects between periods t and $t - 5$. CI denotes Hall's confidence interval. *Change is significantly different from zero at the 5% level.

Source: German Sample Survey of Income and Expenditures (1978–2003).

Table A.9: Gini elasticities in year 2003 (stratified bootstrap)

	OL	NL
Pensioners		
Employment		
$\hat{\eta}_1$	0.0728*	0.1480*
(95% CI)	(0.0639; 0.0821)	(0.1172; 0.1775)
Retirement		
$\hat{\eta}_2$	-0.1923*	-0.3361*
(95% CI)	(-0.2054; -0.1797)	(-0.3712; -0.2981)
Transfers		
$\hat{\eta}_3$	-0.0114*	0.0062
(95% CI)	(-0.0146; -0.0078)	(-0.0163; 0.0300)
Investments		
$\hat{\eta}_4$	0.0662*	0.1025*
(95% CI)	(0.0555; 0.0785)	(0.0833; 0.1137)
Other		
$\hat{\eta}_5$	0.0646*	0.0794*
(95% CI)	(0.0561; 0.0759)	(0.0562; 0.1042)
Non-pensioners		
Employment		
$\hat{\eta}_1$	0.1213*	0.2292*
(95% CI)	(0.1035; 0.1380)	(0.1782; 0.3036)
Retirement		
$\hat{\eta}_2$	-0.0345*	0.0034
(95% CI)	(-0.0488; -0.0196)	(-0.0163; 0.0226)
Transfers		
$\hat{\eta}_3$	-0.0956*	-0.2751*
(95% CI)	(-0.1047; -0.0854)	(-0.3112; -0.2371)
Investments		
$\hat{\eta}_4$	-0.0185*	-0.0088
(95% CI)	(-0.0271; -0.0098)	(-0.0223; 0.0100)
Other		
$\hat{\eta}_5$	0.0272*	0.0514*
(95% CI)	(0.0159; 0.0360)	(0.0181; 0.0687)
<i>Note:</i> $\hat{\eta}_i$ denotes the observed Gini elasticity of income component i . CI denotes Hall's confidence interval. *Elasticity is significantly different from zero at the 5% level.		
<i>Source:</i> German Sample Survey of Income and Expenditures (2003).		

Appendix B

Appendix to Chapter 4

Table B.1: Derived variables and their underlying original variables

Derived Variable	Original Variables
PPI	f72m_4_imp
AVSLE	f06s_imp; f10s_imp; f90o1_imp; f90o2_imp; f91o1_imp; f91o2_imp; f91s_imp; f92o1_imp; f92o2_imp; f92s_imp
RISKAVERSE	f59a4_imp; f59a5_imp; f59a6_imp
IMPATIENT	f59c1_imp; f59c2_imp; f59c3_imp
FINLIT	f73eo6_imp; f73eo11_imp
CIVSERV	f24s1_imp; f24s2_imp; f54o1_imp; f54o2_imp
WORKER	f24s1_imp; f24s2_imp; f54o1_imp; f54o2_imp
SELFEMPL	f24s1_imp; f24s2_imp; f54o1_imp; f54o2_imp
NETWEALTHSEQ	f14o_imp; f18o_imp; f68o_imp; f70o_imp; f73eo1_imp; f73eo2_imp; f73eo3_imp; f73eo5_imp; f73eo6_imp; f73eo11_imp; f78o1_imp; f78o2_imp; f78o3_imp; f78o4_imp; f78o5_imp; f82o_imp; f84o_imp
OTHINSEQ	f14o_imp; f18o_imp; f73eo9_imp; f73eo10_imp
AVAGE	f07o_imp; f10s_imp; f11o_imp; year
AVAGESQ	f07o_imp; f10s_imp; f11o_imp; year
NRCHILD	f13o_imp
MARRIED	f09s_imp
PARTNER	f10s_imp
NETINCEQ	f14o_imp; f18o_imp; f54o1_imp; f54o2_imp
EAST	bula

Source: The German SAVE Study (2005).

Table B.2: Fraction of imputed observations per underlying variable in estimation sample

Variable	Fraction of imputed observations
f06s_ind	0.00
f07o_ind	0.02
f09s_ind	0.00
f10s_ind	0.00
f11o_ind	0.00
f13o_ind	0.01
f14o_ind	0.00
f18o_ind	0.01
f24s1_ind	0.03
f24s2_ind	0.02
f54o1_ind	0.15
f54o2_ind	0.13
f59a4_ind	0.04
f59a5_ind	0.04
f59a6_ind	0.04
f59c1_ind	0.01
f59c2_ind	0.02
f59c3_ind	0.03
f68o_ind	0.03
f70o_ind	0.03
f72m_4_ind	0.00
f73eo1_ind	0.14
f73eo2_ind	0.12
f73eo3_ind	0.15
f73eo5_ind	0.04
f73eo6_ind	0.09
f73eo9_ind	0.13
f73eo10_ind	0.08
f73eo11_ind	0.03
f78o1_ind	0.02
f78o2_ind	0.04
f78o3_ind	0.04
f78o4_ind	0.04
f78o5_ind	0.03
f82o_ind	0.02
f84o_ind	0.02
f90o1_ind	0.02
f90o2_ind	0.03
f91o1_ind	0.03
f91o2_ind	0.03
f91s_ind	0.02
f92o1_ind	0.03
f92o2_ind	0.03
f92s_ind	0.02
N	1320

Note: N is sample size (non-retired households).

Source: The German SAVE Study (2005). Own calculations.

Table B.3: Model summaries of probit estimations of the model without and with six different vectors of control variables for the five imputed datasets

	Dataset				
	1	2	3	4	5
Without control variables	Number of iterations: 3				
LR chi2(3)	12.89	12.98	12.7	13.65	13.01
Prob > chi2	0.0049	0.0047	0.0053	0.0034	0.0046
Pseudo R2	0.0113	0.0113	0.0111	0.0119	0.0114
Log likelihood	-565.2214	-565.1770	-565.3164	-564.8397	-565.1577
With control variables	Number of iterations: 4				
(1)					
LR chi2(15)	108.60	105.78	106.15	107.08	106.49
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.0950	0.0925	0.0928	0.0937	0.0931
Log likelihood	-517.3654	-518.7747	-518.5897	-518.1235	-518.4185
(2)					
LR chi2(15)	106.91	103.98	104.14	105.09	104.56
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.0935	0.0909	0.0911	0.0919	0.0915
Log likelihood	-518.209	-519.677	-519.593	-519.117	-519.385
(3)					
LR chi2(15)	108.71	105.93	106.26	107.33	106.59
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.0951	0.0926	0.0929	0.0939	0.0932
Log likelihood	-517.309	-518.701	-518.536	-517.999	-518.37
(4)					
LR chi2(15)	107.06	104.15	104.28	105.38	104.68
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.0936	0.0911	0.0912	0.0922	0.0916
Log likelihood	-518.135	-519.589	-519.526	-518.973	-519.324
(5)					
LR chi2(15)	108.11	105.26	105.59	106.48	105.96
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.0946	0.0921	0.0924	0.0931	0.0927
Log likelihood	-517.608	-519.033	-518.868	-518.426	-518.682
(6)					
LR chi2(14)	100.55	94.96	94.96	98.02	95.96
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.0879	0.0831	0.0831	0.0857	0.0839
Log likelihood	-521.391	-524.184	-524.187	-522.652	-523.686
<i>Source:</i> The German SAVE Study (2005). Own calculations.					

Table B.4: Marginal effects at the mean using Rubin's Rule for multiply imputed data for the model without control variables and six different specifications of the model with a vector of control variables

	Without control variables			With control variables																
	dy/dx	P > z	(1)	dy/dx	P > z	(2)	dy/dx	P > z	(3)	dy/dx	P > z	(4)	dy/dx	P > z	(5)	dy/dx	P > z	(6)		
AVSLE	0.0033**	0.013	0.0028**	0.0027**	0.041	0.0028**	0.0028**	0.035	0.0027**	0.042	0.0029**	0.032	0.0022*	0.091	0.0072	0.0031	0.032	0.0022*	0.091	
RISKAVERSE	0.0058	0.784	0.0076	0.0076	0.702	0.0075	0.0075	0.706	0.0075	0.706	0.0072	0.719	0.0072	0.872	0.0072	0.0031	0.719	0.0031	0.872	
IMPATIENT	-0.0804**	0.002	-0.0409	-0.0409	0.165	-0.0406	-0.0406	0.169	-0.0406	0.169	-0.0397	0.180	-0.0387	0.185	-0.0397	-0.0387	0.180	-0.0387	0.185	
FINLIT			0.0978**	0.1002**	0.000	0.0968**	0.0992**	0.000	0.0992**	0.000	0.1000**	0.000	0.0927**	0.001	0.1000**	0.000	0.0927**	0.001	0.001	
CIVSERV			0.1208**	0.1272**	0.010	0.1219**	0.1281**	0.009	0.1281**	0.006	0.1216**	0.009	0.1229**	0.008	0.1216**	0.009	0.1229**	0.008	0.008	0.008
WORKER			0.0801**	0.0842**	0.000	0.0803**	0.0844**	0.000	0.0844**	0.000	0.0816**	0.000	0.0911**	0.000	0.0816**	0.000	0.0911**	0.000	0.000	
SELFEMPL			0.1850**	0.1894**	0.000	0.1845**	0.1889**	0.000	0.1889**	0.000	0.1901**	0.000	0.1850**	0.000	0.1901**	0.000	0.1850**	0.000	0.000	
NETWEALTH/10 ⁶			-0.0041	-0.0039	0.843	-0.0036	-0.0036	0.799	-0.0036	0.815	-0.0041	0.829	-0.0355	0.064	-0.0041	-0.0355	0.064	-0.0355	0.064	
NETWEALTH/10 ⁶																				
NETWEALTH/10 ⁶																				
OTHINSEQ/10 ³			0.0013	0.0015	0.236	0.0012	0.0012	0.196	0.0010	0.203	0.0015	0.245	0.0004	0.632	0.0015	0.0004	0.245	0.0004	0.632	
OTHINS/10 ³																				
AVAGE			0.0236**	0.0238**	0.001	0.0239**	0.0241**	0.001	0.0241**	0.001	0.0239**	0.001	0.0239**	0.001	0.0239**	0.001	0.0239**	0.001	0.001	
AVAGESQ			-0.0003**	-0.0003**	0.001	-0.0003**	-0.0003**	0.001	-0.0003**	0.001	-0.0003**	0.001	-0.0003**	0.000	-0.0003**	0.000	-0.0003**	0.000	0.000	
NRCHILD			-0.0174**	-0.0178**	0.042	-0.0185**	-0.0188**	0.036	-0.0188**	0.031	-0.0165*	0.058	-0.0173**	0.036	-0.0165*	0.058	-0.0173**	0.036	0.036	
PARTNER			0.0230	0.0225	0.318	0.0195	0.0189	0.395	0.0189	0.410	0.0151	0.490	0.0342	0.118	0.0151	0.490	0.0342	0.118	0.118	
MARRIED																				
NETINCEQ/10 ³			0.0057	0.0060	0.272	0.0037	0.0037	0.283	0.0037	0.262	0.0061	0.275	-0.0005	0.973	0.0061	-0.0005	0.275	-0.0005	0.973	
NETINCEQSQ/10 ⁶																				
NETINC/10 ³			0.0499**	0.0496**	0.029	0.0500**	0.0500**	0.028	0.0497**	0.029	0.0500**	0.028	0.0484**	0.031	0.0500**	0.028	0.0484**	0.031	0.031	
EAST																				

Note: Dependent variable = PPI, sample size N = 1320 (non-retired households), * p < 0.1, ** p < 0.05, *** p < 0.01. Source: The German SAVE Study (2005). Own calculations.

Appendix C

Appendix to Chapter 5

Table C.1: Blanket allowances (2011)

Kind of Allowance	Tax Deductible Value	Entitled Persons
Work Related Standard Tax Deduction	920 € ^a	Each Employee
Blanket Allowance for Special Expenses	36 € ^b	Each Employee
Provisional Lump Sum	variable ^{c,d}	Each Employee
Single-Parent Lump Sum	1,308 € ^e	Single parent
Tax Exemption for Dependent Children	7,008 € ^f	If no Child Allowance

Source: ^a§9a sent. 1 no. 1a GTC; ^b§10c sent. 1 GTC; ^c§39a subp. 2 sent. 5 no. 3 GTC; ^ddepends on social security contributions, for details see Table C.5; ^e§24b GTC; ^f§32 subp. 2 GTC.

Table C.2: Determinants to calculate provisional lump sum (2011)

Lum Sum as to	Tax Deductible Value
SPI	44% of Employee's Contribution to SPI
SHI & SNI	Standard Employee's Contribution to SHI and SNI
	Minimum 12% of Gross Income
	Maximum 1,900 €

Note: SPI (Statutory pension insurance); SHI (Statutory health insurance); SNI (Statutory nursing insurance).
Source: §39b subp. 2 sent. 5 no. 3 GTC.

Table C.3: Income tax rate (2011)

Taxable Income	Income Tax
1. to 8,004 €	0
2. 8,005 € to 13,469 €	$(912.17 \cdot y + 1,400) \cdot y$
3. 13,470 € to 52,881 €	$(228.74 \cdot z + 2,397) \cdot z + 1,038$
4. 52,882 € to 250,730 €	$0.42 \cdot x - 8,172$
5. starting 250,731 €	$0.45 \cdot x - 15,694.$

Note: y equals the thousandth part of taxable income exceeding 8,005 €;
 z equals the thousandth part of taxable income exceeding 13,470 €;
 x equals taxable income.

Source: §32a GTC.

Table C.4: Determinants to calculate supplementary taxes (2011)

Solidarity Surcharge	
Assessment Basis	Income Tax ^a
Exemption Limit ^b	972,00 €
Transition Section ^{b,c}	972,01 €–1340,68 €
Complete Assessment ^b	1340,69 €

Note: ^aSubject to tax exemption for dependent children;
^brelated to the assessment basis; ^c Solitarly surcharge does not exceed 20% of the difference between the assessment basis and the exemption limit.

Source: §3 subp. 1 Solitary Surcharge Law (SSL).

Table C.5: Determinants to calculate social security contributions (2011)

	SPI	PUI	SHI	SNI
Contribution Assessment Basis	Gross Income			
Contribution Assessment Ceiling	66,000 € ^a	66,000 € ^a	44,500 € ^b	44,500 € ^b
Employee's Contribution	9.95%	1.5%	8.2%	0.975%

Note: SPI (Statutory pension insurance); PUI (Public unemployment insurance);
SHI (Statutory health insurance); SNI (Statutory nursing insurance).

Source: ^a§§161–167 GSC VI, ^b§6 subp. 6 GSC V.

Table C.6: Calculation of UEB II – applied reimbursement for Housing and Heating (Berlin and Kiel)

Household type	Regular payments ^a		Supplementary payments ^b	Housing & Heating		Total		Scale	
	A	C		Berlin ^c	Kiel ^d	Berlin	Kiel	Berlin	Kiel
<i>A</i>	364	0	8	378	385	750	757	1.000	1.000
<i>AC</i>	364	251	55	444	454	1,114	1,124	1.485	1.485
<i>ACC</i>	364	502	145	542	566	1,553	1,577	2.071	2.083
<i>ACCC</i>	364	753	148	619	642	1,884	1,907	2.512	2.519

Note: All amounts, except of two last columns (derived scales), are stated in €.

Source: ^a§§20 and 23 GSC II, ^b§21 GSC II, ^cJOBCENTER BERLIN (2011), ^dKN-ONLINE (03.05.2009) and BIRKNER (2008).
Own calculations.

Table C.7: Calculation of monthly subsistence level

Household type	Regular payments ^a		Supplementary payments ^b	Housing ^c	Heating ^d	Social participation ^e	Total
	A	C					
A	364	0	0	224	56	0	644
AC	364	251	44	250	71	19	999
ACC	364	502	131	321	86	38	1,442
ACCC	364	753	131	392	101	57	1,798

Note: All amounts are stated in €

Source: ^a§§20 and 23 GSC II and sec. 4.1.1, 5.1.1 DEUTSCHER BUNDESTAG (2011), ^b§21 GSC II, ^c§22 GSC II and sec. 4.1.2, 5.1.3 DEUTSCHER BUNDESTAG (2011), ^d§22 GSC II and sec. 4.1.3, 5.1.4 DEUTSCHER BUNDESTAG (2011), ^e§28 GSC II and sec. 5.1.2 DEUTSCHER BUNDESTAG (2011). Own calculations.

Table C.8: Actual and predicted support payments to AC

Gross income		AC					
CP	NCP	Actual payments ^a		Predicted payments ^b			
		Child Support	Ch. & Spous. Support	old OECD	modified OECD	CITRO	KSS
UEBII	2,300	291	377	9	-15	3	-80
	4,300	345	1,191	-19	-29	-22	-58
	6,300	404	1,639	-5	-15	-8	-41
	8,300	491	2,167	2	-7	0	-32
800	2,300	291	272	23	-12	15	-20
	4,300	345	632	40	20	35	11
	6,300	404	1,080	36	22	33	12
	8,300	491	1,608	33	21	30	10
1,800	2,300	291	272	13	-23	5	-32
	4,300	345	683	26	7	21	-2
	6,300	404	1,130	28	14	25	4
	8,300	491	1,658	28	15	25	5
3,300	2,300	-	-	-	-	-	-
	4,300	345	383	51	11	42	-13
	6,300	404	830	41	18	35	0
	8,300	491	1,358	35	18	31	1
4,800	2,300	-	-	-	-	-	-
	4,300	-	-	-	-	-	-
	6,300	404	537	66	27	57	-10
	8,300	491	1,065	47	23	41	-4
6,300	2,300	-	-	-	-	-	-
	4,300	-	-	-	-	-	-
	6,300	404	374	58	-5	43	-75
	8,300	491	741	70	33	61	-16
7,800	2,300	-	-	-	-	-	-
	4,300	-	-	-	-	-	-
	6,300	-	-	-	-	-	-
	8,300	491	462	100	34	85	-62

Note: ^avalues stated in €, ^bfigures denote the deviation to 'Child and Spousal Support' in percent.
Source: Own calculations.

Table C.9: Actual and predicted support payments to ACC

Gross income		ACC					
CP	NCP	Actual payments ^a		Predicted payments ^b			
		Child Support	Ch. & Spous. Support	old OECD	modified OECD	CITRO	KSS
UEBII	2,300	477	477	-9	-41	-20	-103
	4,300	654	1,299	-19	-35	-25	-66
	6,300	748	1,822	-7	-20	-11	-51
	8,300	924	2,400	2	-11	-3	-41
800	2,300	477	477	-22	-56	-34	-75
	4,300	654	618	59	25	47	-1
	6,300	748	1,075	53	28	44	5
	8,300	924	1,653	44	25	37	2
1,800	2,300	477	477	100	84	94	-83
	4,300	654	618	153	134	147	-7
	6,300	748	1,042	113	97	107	4
	8,300	924	1,620	83	69	78	1
3,300	2,300	-	-	-	-	-	-
	4,300	654	618	32	-7	18	-40
	6,300	748	1,012	45	17	35	-14
	8,300	924	1,590	39	17	31	-11
4,800	2,300	-	-	-	-	-	-
	4,300	-	-	-	-	-	-
	6,300	748	718	73	28	57	-28
	8,300	924	1,296	53	24	43	-19
6,300	2,300	-	-	-	-	-	-
	4,300	-	-	-	-	-	-
	6,300	748	690	43	-9	25	-82
	8,300	924	972	78	35	63	-34
7,800	2,300	-	-	-	-	-	-
	4,300	-	-	-	-	-	-
	6,300	-	-	-	-	-	-
	8,300	924	866	68	14	49	-79

Note: ^avalues stated in €, ^bfigures denote the deviation to 'Child and Spousal Support' in percent.
Source: Own calculations.

Table C.10: Actual and predicted support payments to ACCC

Gross income		ACCC					
CP	NCP	Actual payments ^a		Predicted payments ^b			
		Child Support	Ch. & Spous. Support	old OECD	modified OECD	CITRO	KSS
UEBII	2,300	477	477	1	-40	-17	-115
	4,300	924	1,305	-12	-32	-21	-70
	6,300	1,032	1,990	-7	-23	-14	-57
	8,300	1,296	2,599	2	-13	-5	-48
800	2,300	477	477	-11	-54	-30	-89
	4,300	924	870	25	-5	12	-36
	6,300	1,032	1,101	63	34	50	-3
	8,300	1,296	1,710	51	29	41	-6
1,800	2,300	477	477	114	96	106	-96
	4,300	924	870	93	77	86	-40
	6,300	1,032	1,068	123	105	115	-4
	8,300	1,296	1,677	90	74	83	-6
3,300	2,300	-	-	-	-	-	-
	4,300	924	870	13	-19	-1	-56
	6,300	1,032	1,183	43	14	30	-25
	8,300	1,296	1,793	39	16	29	-21
4,800	2,300	-	-	-	-	-	-
	4,300	-	-	-	-	-	-
	6,300	1,032	978	52	13	35	-46
	8,300	1,296	1,492	53	23	40	-30
6,300	2,300	-	-	-	-	-	-
	4,300	-	-	-	-	-	-
	6,300	1,032	978	30	-14	11	-87
	8,300	1,296	1,209	71	30	53	-48
7,800	2,300	-	-	-	-	-	-
	4,300	-	-	-	-	-	-
	6,300	-	-	-	-	-	-
	8,300	1,296	1,209	51	6	31	-87

Note: ^avalues stated in €, ^bfigures denote the deviation to 'Child and Spousal Support' in percent.
Source: Own calculations.

Eidesstattliche Erklärung

Ich erkläre hiermit an Eides Statt, dass ich meine Doktorarbeit “Essays on Social Policy in Germany: Analyses Based on Survey and Simulated Data” selbständig und ohne fremde Hilfe angefertigt habe und dass ich alle von anderen Autoren wörtlich übernommenen Stellen, wie auch die sich an die Gedanken anderer Autoren eng anlehnen- den Ausführungen meiner Arbeit, besonders gekennzeichnet und die Quellen nach den mir angegebenen Richtlinien zitiert habe.

Kiel, 7. Oktober 2011