

Aus dem Institut für Agrarökonomie  
der Christian-Albrechts-Universität zu Kiel

# Role of Political Institutions and Networks in Agricultural Policies: A Quantitative Assessment

Dissertation  
zur Erlangung des Doktorgrades  
der Agrar- und Ernährungswissenschaftlichen Fakultät  
der Christian-Albrechts-Universität zu Kiel

vorgelegt von  
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Kiel, 2012

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Tag der mündlichen Prüfung: 12. Juli 2012

Gedruckt mit Genehmigung der Agrar- und Ernährungswissenschaftlichen Fakultät  
der Christian-Albrechts-Universität zu Kiel

Diese Dissertation kann als elektronisches Medium  
über den Internetauftritt der Universitätsbibliothek Kiel  
([www.ub.uni-kiel.de](http://www.ub.uni-kiel.de); [eldiss.uni-kiel.de](http://eldiss.uni-kiel.de))  
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## Danksagung

Mein herzlicher Dank gilt meinem Doktorvater, Prof. Henning, für die Überlassung des interessanten und vielseitigen Themas. Sein stets offenes Ohr für Fragen hat wesentlich dazu beigetragen, dass meine Promotion mir große Freude bereitet hat. Auch möchte ich mich dafür bedanken, dass er mir zahlreiche, interessante Reisen ermöglicht und immer engagiert über die Modellierung und Analyse politischer Prozesse diskutiert hat. Besonderer Dank gilt auch Christian Aßmann für die wertvollen Diskussionen über empirische Analysen und die humorvollen Telefonate rund um das Promovieren.

Meine Arbeit wäre nicht zustande gekommen, wenn das IFPRI mich nicht bei der Politiknetzwerkstudie in Malawi unterstützt hätte. Daher möchte ich mich bei Regina Birner, Michael Johnson, Klaus Droppelmann, Noora-Lisa Aberman und Peter Gaff für den wunderbaren Aufenthalt in Malawi und die tatkräftige Unterstützung bei den Interviews bedanken.

Herzlicher Dank gebührt Laura, die ich als Diskussionspartner, Freundin und Reisebegleitung nicht mehr missen möchte. Vielen Dank für die lustigen, musikalischen und auch stillen Momente in unserem Büro und auf Reisen! Danken möchte ich aber auch all meinen anderen Arbeitskollegen in der Abteilung Agrarpolitik, die immer für eine sehr angenehme Arbeitsatmosphäre gesorgt haben.

Schließlich richtet sich mein Dank an meine Freunde und meine Familie. Ohne Sie, Ihren Rückhalt und die gemeinsamen lustigen Stunden hätte ich sicher nicht eine so wundervolle Promotionszeit verbracht.

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## Chapter 1

### Introduction and Summary

The identification and implementation of welfare increasing policy programs are key challenges for every government. While the first challenge clearly depends on society's ability to learn about policies and on the availability and distribution of policy-oriented research results, political institutions and policy processes determine the implementation challenge. Understanding the impact of different political institutions and policy processes on policy decisions will thereby help governments to understand and face the implementation challenge.

Regarding the impact of political institutions on policy outcomes, it is widely recognized that the seminal work of Persson and Tabellini contributes to understand how a country's constitution and thereby formal political institutions affect economic policy decisions (Persson and Tabellini, 1999, 2000, 2003). They show theoretically as well as empirically that electoral systems and the form of government determine, for instance, central government spending. However, supporting theoretical models about the impacts of political institutions with empirical analyses demands for advanced econometric methods. Such methods are needed to solve estimation issues caused by time-series cross-section data which are typically used in comparative political economy. In particular, estimation problems arise due to unobserved heterogeneity among countries and dynamic processes in the endogenous variable (see e.g. Beck, 2001; Baltagi, 2005). In addition to this, the non-random choice of political institutions in countries, i.e. the endogeneity of political institutions, demands adequate econometric techniques to guarantee a valid analysis of the causal effects of formal political institutions (see e.g. Persson and Tabellini, 2003; Angrist and Krueger, 2001). Regarding the quantitative impact analysis of political institutions on agricultural protection, theoretical models as well as a sound empirical analysis are still missing.

With regard to policy processes, participatory policy-making is a specific type of policy processes through which stakeholders influence and share control over priority setting and policy-making (World Bank, 2011). Donor organizations recently engaged in promoting these processes as a tool for designing efficient policy programs. The implementation of these processes in developing countries is promoted in order to guarantee that local non-governmental and governmental organizations feel responsible for formulating and implementing efficient development programs. Further, it is widely assumed that the ownership and commitment to programs due to participation in their formulation will lead to the adoption of pro-poor growth policy programs in countries. In terms of pro-poor growth policy programs, agricultural policy programs are perceived as an option for stimulating economic growth. Hence, understanding the nature of participatory policy processes is key for international organizations to efficiently support partner countries in formulating effective agricultural policy programs. But so far, literature about policy processes provides neither a theoretically founded framework to analyze participatory policy processes

nor a quantitative assessment of these processes. However, policy network analysis as already applied to, for instance, legislative decision-making in the European Union, is a promising approach to derive a framework that makes a theoretically founded quantitative evaluation of these policy processes possible (e.g. Pappi et al., 1995).

In this context, two main goals of the thesis can be characterized. First, studies aim at a quantitative impact analysis of political institutions on agricultural protection. Hence, Chapters 2 to 4 present an empirical analysis of the impact of political institutions on agricultural protection. Hypotheses for the empirical analysis are derived from theoretical models of voter behavior and legislative bargaining. The centerpiece of the theories is interaction between formal and informal political institutions in determining agricultural policy decisions. Further, Chapter 2 and Chapter 3 also consider lobbying as another determinant of policy choices. At the empirical level, studies consider the endogeneity of political institutions as well as estimation issues inherent in time-series cross-section data. Further, econometric models capture the theoretically derived latent policy regimes in countries that are determined by political and socio-economic framework conditions.

Secondly, studies in Chapters 5 and 6 pursue the quantitative network analysis of policy processes in developing countries using the example of a participatory policy process in Malawi. In particular, a policy process framework based on social influence and legislative bargaining theory is introduced that allows evaluating participatory policy processes comprehensively. Further, advanced network estimation derives detailed insights into factors that determine communication relations among a pair of organizations. Such insights are valuable in terms of designing and understanding mechanisms that influence information diffusion in participatory policy processes.

The Chapter proceeds as follows. First, I summarize and discuss literature related to the topic of quantitative impact analysis of political institutions. Summaries of each of the studies presented complete this part. Next, I introduce literature and research questions that are concerned with the quantitative network analysis of policy processes. This part finishes again with summaries of each of the studies presented under this topic. Table 1.1 classifies the studies presented in this thesis according to their theoretical and empirical focus.

Table 1.1: Classification of articles

Chapter	Theory			Empirical analysis	
	Formal institutions	Informal institutions	Interaction effects of institutions	Econometric analysis	Social network analysis
2	++	+	+	+	
3	+	+	++	+	
4	++	+	+	+	
5	+	++	+		+
6	+	++		++	+

Notes: + denotes that a study considers the respective research topic, ++ denotes the main focus of the study.

**Quantitative impact analysis of political institutions** Reviewing the literature to date, several questions about the determinants of agricultural protection or taxation, respectively, are still unsolved. A case in point is the still missing theoretical and empirical explanation for the observed variation in agricultural protection among countries similar in standard polit-economic determinants of protection levels. However, two main strands of literature exist that contribute to the understanding of international agricultural policy patterns.

A first strand corresponds to models of agricultural protection that understand final policy outcomes as the result of political bargaining among various social groups for income redistribution. While socio-demographic country characteristics shape these bargaining results, another important factor influencing policy outcomes are political institutions (Persson and Tabellini, 2003). While the electoral system shapes legislators' preferences in parliament, the form of government as laid down in a country's constitution determines the formal rules according to which legislators' policy preferences will be aggregated to reach a final policy decision.

With regard to agricultural policy decisions, Beghin et al. (1996), Swinnen et al. (2001), Thies and Porche (2007) and Olper and Raimondi (2009a) provide an econometric analysis of political institutions as determinants of agricultural protection, while including socio-economic factors as control variables, based on the well-known work of Beghin and Kherallah (1994). Olper and Raimondi (2009b), for instance, show that the increase in agricultural protection rates depends on the choice of the electoral system in a democratic country. According to their empirical analysis, adopting proportional representation leads to a significant increase in protection levels when compared to adopting majority rule as electoral system. Although present studies derive first insights into political institutions as determinants of agricultural protection, they neither base their empirical analyses on a well-grounded theory nor do they use a sound empirical approach. In fact, they have the following empirical drawbacks.

First, they mostly use narrow data sets provided the OECD or focus on country or product specific protection patterns. One exception are Olper and Raimondi (2009a) who use the encompassing data set by Anderson et al. (2008). Second, studies fail to consider that political institutions and policy outcomes might be affected by the same factors (see Persson and Tabellini, 2003; Acemoglu and Johnson, 2005; Boix, 1999; Benoit, 2007). Persson and Tabellini (2003) already suggested considering endogeneity of political institutions for identifying the true causal effects of political institutions. Amongst other methods, they promote to solve the endogeneity problem via an instrument variable estimation approach (IV) (see also Angrist and Krueger, 2001). Third, previous studies always define the electoral system as dichotomous with one system defined by single-member districts, i.e. majority rule, and the other one defined by multi-member district, i.e. proportional representation. Consequently, they neglect the heterogeneity within multi-member systems and employ solely one dummy variable for the electoral system in empirical analysis. Finally, they even disregard that the influence of electoral systems on agricultural protection might differ with latent policy regimes determined by a country's socio-economic framework.

A second strand of literature that lays the basis for analyzing international pat-

terns of agricultural protection analyzes agricultural protection and political institutions in the European Union (e.g. Runge and v. Witzke, 1987; Bilal, 2000; Thies and Porche, 2007; de Gorter et al., 1998). Agricultural protection in the European Union is, on the one hand, an issue in international agreements about trade and, on the other hand, covers roughly about 40% of the EU-Budget. Nevertheless, there hardly exist a comprehensive political economy theory that explains the empirically observed high protection levels and the declining rates of protection after 1987. However, as the European Union is considered as an unique political system in comparative political economy (see Hix, 1999), the specific institutional settings in the EU might be an important determinant of protection levels that clearly exceed protection levels in countries with other national or supranational political systems, respectively. So far, a comprehensive empirical analysis of determinants of agricultural protection in the EU is also missing in the literature. Present studies neglect to analyze whether agricultural protection rates differ over time by employing just one time-constant dummy variable for EU member countries, even if time-series data on agricultural protection rates in the EU provide evidence for time-dependent protection levels (see Thies and Porche, 2007).

In this context, the contribution of Chapters 2 to 4 for a better understanding of international agricultural policy patterns is twofold. First, all three Chapters provide a micro-political founded theory to understand the effect of political institutions on the level of agricultural protection or taxation, respectively. The theoretical models explicitly focus on the phenomenon of "clustered" institutions as put forward by Acemoglu et al. (2002). Hence, they derive hypotheses about the interaction of formal and informal political institutions in determining agricultural policy choices. Second, the empirical parts of Chapters 2 to 4 analyze determinants of agricultural protection rates by using the new data set of "Nominal Rates of Assistance to the agricultural sector" by Anderson et al. (2008) and advanced econometric methods. Results from such an advanced empirical analysis based on a large data set allow evaluating political institutions as determinants of agricultural protection comprehensively. In fact, these theoretical and empirical analyses explain variation in protection among countries similar in socio-economic attributes with their divergent political institutions.

*Chapter 2: Interaction Effects of District Magnitude, Voter Beliefs and Protectionism: Evidence from Agriculture*

Chapter 2 is concerned with developing a micro-political founded theory to understand the interaction of formal political institutions and voter beliefs in determining the level of agricultural protection in industrialized countries. The theoretical part explicitly derives legislators' policy preferences from electoral competition and final policy outcomes from postelection bargaining in legislatures.

In detail, the model derives legislators' policy preferences within a probabilistic voting environment where agrarian voters are less ideologically committed than non-agrarian voters in industrialized countries (Lohmann, 1998). Hence, legislators maximize political support functions that depend on the share of agricultural population in total population of their constituency. It follows that legislators' preferences vary with the composition of population in their constituency and also with the electoral system that determines the size and thereby the population composi-



tion of electoral districts. Given legislators' preferences, we further model legislative decision-making in parliamentary systems to capture the effect of coalition discipline on agricultural protection. Consider here, that our model implies a conflict between the prime minister and her parliamentary majority, as majority members favor different agricultural policies than the prime minister due to divergent political support functions and voter belief formation. In such a case, coalition discipline is another determinant, besides electoral rules and voter belief formation, of the final agricultural policy level. But consider first, that voters expect a pro-agrarian policy, if the communication process is dominated by agricultural interest groups and an anti-agricultural policy, if non-agricultural interest groups dominate political communication. Hence, we show that the prime minister will support pro-agricultural policies in the first case and anti-agricultural policies in the latter. In bargaining at the legislature, this generates a conflict between the prime minister and the decisive majority member that holds policy preferences in opposition to the prime minister according to his political support function. As district size grows and the electoral system converges to a pure proportional system, both of these biases are attenuated. That is, an inverse u-shaped relationship between district size and agricultural subsidies results if agricultural interest groups dominate political communication and if the prime minister is able to discipline her coalition. If anti-agricultural interest groups influence highly voters' beliefs and again given that the prime minister exerts coalition discipline, an u-shaped relationship results.

Second, the hypothesis of the non-linear relation between agricultural protection and district size is tested empirically using the data set of "Nominal Rates of Assistance to the agricultural sector" by Anderson et al. (2008). This data set allows us to include 23 parliamentary democracies into our analysis where observations cover the years between 1966 and 2005. The empirical model bases on a two-way fixed effect error component model as adapted by Wallace and Hussain (1969) to control for country- and time-specific unobserved heterogeneity. In detail, country specific heterogeneity is modeled in two ways. First, country fixed effects are included into the model specification. Second, heterogeneity is accounted for via including a dummy variable for a set of countries that is derived from an out-of-sample prediction test as proposed by Beck (2001) into the model. Further, we control for model dynamics and serial correlation in error terms by including the lagged dependent variable into the model. Finally, the potential endogeneity of political institutions is also checked using a two-step approach as advocated and discussed by Angrist and Krueger (2001), which accounts for the discrete nature of our measurement of the electoral systems. Inference is based on cluster robust standard errors while the downward bias of these errors in samples with a small number of countries is corrected by a wild cluster residual based bootstrap suggested by Cameron et al. (2008).

Empirical results confirm the suggested nonlinear relationship between the electoral system and agricultural protection. Agricultural protection first increases and then decreases significantly with district size c.p. . However, although estimation results are stable over different model specifications in favor of the suggested relationship and imply that valid instruments are used for the instrument variable estimation, interpretation of estimated coefficients as causal effects is still problematic.

The idea of clustered institutions put forward by Acemoglu and Johnson (2005) and well captured within the developed theory implies an interaction effect between formal electoral rules and coalition discipline. However, variables that identify coalition discipline are not available. Thus, the documented link can just be interpreted as a causal effect of clustered institutions combining electoral rules, coalition discipline and interest groups.

*Chapter 3: Constitutional Rules, Informal Institutions and Agricultural Protection in Developing and Industrial Countries: Theory and Empirical Evidence*

This Chapter extends the analysis of political institutions as determinants of agricultural protection presented in Chapter 2. In fact, it derives more detailed insights by considering also a presidential form of government and by deriving explicitly the impact of lobbying on legislators' policy preferences. Furthermore an advanced econometric model permits the empirical analysis of the impact of electoral rules dependent on latent policy regimes.

The major theme of the Chapter is the effect of "clustered" institutions in determining agricultural protection. The phenomenon of "clustered institutions" is put forward by Acemoglu and Johnson (2005) to describe the fact that formal and informal institutions evolve jointly and influence policy outcomes altogether. Hence, we model the interaction of electoral rules, legislative organization, lobbying and demographic country characteristics in order to derive hypotheses about the role of political institutions in agricultural protection based on well-grounded micro-political model of policy-making. In detail, we introduce a probabilistic voting model to deduce legislators' policy preferences from electoral competition. Following Lohmann (1998), the general assumption within this voting model is that agricultural and non-agricultural voters differ in their ideological commitment to an incumbent depending on their relative group size. Hence, legislators maximize political support functions that depend on the share of agricultural population in total population of their constituency. It follows that legislators' preferences vary with the composition of population in their constituency. Even though policy preferences now differ among legislators, they have to agree on a mutually accepted agricultural policy in parliament. Such legislative bargaining in parliament is reflected by models capturing the essential characteristics of parliamentary and presidential systems, respectively. In detail, the subunits of a legislative system that have conflicting policy preferences over agricultural policy differ with the legislative organization in a country. In a parliamentary system, the conflict occurs between the prime minister, who will tend to favor rural or urban districts, and her parliamentary majority, where the opposite policy preferences will dominate. In a presidential system, the conflict arises between the median of the agricultural committee, who will tend to favor rural (urban) districts and the floor median, who tends to favor the opposite urban (rural) districts in industrialized (developing) countries, respectively. As the electoral system determines preference heterogeneity among legislators, where increasing district sizes lead to more homogenous preferences, the conflict among subunits of government is shaped by distinct types of the electoral system.

In essence, this paper contributes to the understanding of agricultural protection in that way that it introduces policy regime dependent effects of the electoral system. Policy regimes are considered to depend on socio-economic and political framework

conditions according to our model. In detail, theory predicts an inverse u-shaped relation between district size and agricultural protection in industrialized countries, while an u-shaped relation would result for developing countries. The discrepancy in the relationship between these types of countries results due the fact that we observe a share of agricultural population in total population below 50% in industrialized countries and above 50% in developing countries.

Further, our model considers that campaign spending of parties financed by interest groups determines voter behavior, as voters' policy preferences are swayed by such activities. Campaign spending can be understood as the result from a lobbying game played by interest groups and the party leader. Hence, the usual legislator assumes campaign spending as given when forming her optimal policy position from political support maximization, while the party leader will consider them to maximize his political support. Hence, campaign spending is another reason why policy positions differ between legislators and party leader. However, lobbying has not any impact on the relation between district size and agricultural protection according to our model. It solely determines the absolute protection or taxation level, respectively, while the share of agricultural population in total population determines how electoral rules influence agricultural policy decisions.

In the second part of the paper, our hypotheses are tested empirically using the data set on agricultural protection by Anderson et al. (2008). This data set allows us to consider 52 countries between 1961 and 2005. The theoretical considerations given above imply for the impact of electoral rules to depend on an unobserved policy regime induced by socio-economic and political framework conditions. Therefore, we apply a switching regression model to account for different latent policy regimes where information criteria suggest the modeling of six latent policy regimes. As regimes are unobserved, the probability to be in either regime depends on country specific characteristics and is parameterized as a logit-type probability. Note that the results are robust with respect to the use of the lagged dependent variable in order to account for serial correlation endemic to time-series cross-section data. Further, robustness of empirical results with respect to potential endogeneity of political institutions is checked using a two-step approach as advocated and discussed by Angrist and Krueger (2001). The empirical results support our main hypothesis that the relation between district size and agricultural protection is non-linear. In fact, we find significant inverse u-shaped relations between district size and agricultural protection.

#### *Chapter 4: How the European Union works: Theory and Empirical Evidence from EU Agricultural Policy*

This Chapter develops a spatial model of political decision-making in the EU. The centerpiece of the model is informal political exchange. Modeling this vote trading process among political agents is extremely helpful for explaining pork-barrel politics. In particular, different cooperative legislative bargaining procedures, i.e. legislative norms, are identified that facilitate informal political exchange (Weingast, 1979). To complete the theoretical model, legislators' preferences are derived from political support functions that vary for members of specific subunits of the legislative system.

The contribution to understanding EU agricultural protection rates is twofold.

First, the model allows determining the effect of joining the EU that is in fact an institutional regime switch in a country, on redistributive politics. Agricultural protection rates observed for member countries will significantly differ from their counterfactual levels under parliamentary or presidential systems, respectively, due to the informal legislative norms in the supranational system. Second, the model shows that agricultural policy outcomes vary systematically across informal legislative bargaining procedures and for each bargaining procedure with the number of EU member countries. Hence, the theoretical model derives informal institutional rules that enable legislators to reform the CAP as observed after 1986.

Our hypotheses are tested empirically using the data set of protection measures provided by Anderson et al. (2008). Overall, data on 58 countries between 1961 and 2005 is available for estimation. In a first step, the treatment effect of institutional change, which occurs in countries joining the EU and in EU member states due to rearrangements within the Council, is analyzed with a two-way fixed effect error component model with a lagged dependent variable. To capture both effects, a country-political regime interaction variable that is one for years after a country has joined the EU and a time-political regime interaction variable that indicates with one the institutional regime switch after 1986 in EU member countries are employed in the model.

Second, cross-section estimations for five time periods are used to determine whether the EU supranational decision-making process compared to different national political systems influences agricultural protection rates significantly. The time periods are defined by the EU enlargements. The yearly available data is averaged for the estimation over the periods 1961-1972 (EU-6), 1973-1984 (EU-9), 1985-1993 (EU-12), 1994-2002 (EU-15) and 2003-2005 (EU-25). Note that we cannot differentiate between the EU-9 and EU-10 because data is not available for Greece. Furthermore, country-specific unobserved heterogeneity is ascertained via an out-of-sample prediction experiment (Stone, 1974; Beck, 2001). Based on the experiment results, a dummy variable for a group of countries that are less well predicted than all other countries is employed in the estimations. This strategy allows capturing local unobserved factors boosting the demand for agricultural protection, for which we do not control with explaining variables, in the models.

Results support our main theoretical implications for the influence of informal legislative bargaining rules on agricultural protection. Both, the time-political regime interaction variable and the country-political regime interaction variable are statistically significant and show the theoretically expected sign. That is joining the EU has a positive impact on protection rates for the new member country and a regime switch in informal institutions leads to lower rates of protection after 1986 for EU members. In addition to this, results from the cross-section estimations reveal a positive impact on agricultural protection for the supranational political system of the EU compared to other national political systems. However, results are solely significant for the period of the Luxembourg Compromise.

Overall, this study contributes to the understanding of the observed high and time-varying protection levels in the EU at the theoretical and empirical level.

**Quantitative network analysis of policy processes** Based on the Paris Declaration on Aid Effectiveness, we observe a growing demand for research studies that examine the origins and consequences of political systems in developing countries (see OECD, 2005). Such studies would enable policy consultants in donor countries to identify institutional framework conditions of efficient policy program design and implementation. One example of this new strand of research is the research programme "Africa power and politics" by the Overseas Development Institute. The program aims to discover institutional features that provide a positive and distinctively African approach to governance for development. At the methodological level, it predominantly bases on qualitative in-depth country studies and cross-country comparisons.<sup>1</sup>

Regarding agricultural policies, a good case in point to study participatory policy processes is the Comprehensive Africa Agriculture Development Programme (CAADP). On the one hand, the African Union promotes agriculture-led economic growth with this program, because previous programs neglected the potential of the agricultural sector in contributing to poverty reduction and economic well-being. On the other hand, a key principle of the program is the inclusion of local stakeholder organizations into planning, formulating and evaluating sector specific growth policies (see NEPAD, 2010). However, a CAADP working group on non-state actor participation recently assessed the ability of stakeholders to use the newly created opportunities of participation critically. Using information gathered by a qualitative stakeholder survey and desk research, they point out that CAADP has not consistently achieved high quality inclusion of non-state actors at national, regional and local levels (see Randall, 2011).

While both, the presented case study and the research program, provide insights into policy processes in Africa, a quantitative evaluation of participatory policy processes and a comprehensive policy process framework based on micro-political theories is still missing. Nevertheless, at the methodological level, one policy analysis framework -the Advocacy Coalition Framework by Sabatier and Jenkins-Smith (1993)- has gained wide attention by political scientists. This framework explicitly identifies beliefs as drivers of policy-making and of advocacy coalitions. Hypotheses of the framework mainly relate to policy learning and coalition dynamics. Further, the framework contributes to the understanding of policy processes as a mechanism that involves a broad a set of actors to reach a final policy decision. That is the framework clearly proposes to disregard the familiar political iron triangle as a unit of policy process analysis. Nevertheless, the framework provides neither a theoretical model how the actors agree on a mutually accepted policy decision nor a theoretical model of belief formation among actors involved in policy-making.

Regarding the latter, consider the strand of social influence theory and policy network analysis (e.g. Friedkin and Johnsen, 1990; Laumann and Knoke, 1987; Pappi et al., 1995). Policy network is a term used to label entities consisting of public and private actors interested in a specific policy and considered by others as influential players (Pappi and Henning, 1998). Within these networks, an actor exchanges information on impacts of specific policy decisions on the state of world with others actors. Such information processes enable actors to change policy beliefs and

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<sup>1</sup>See for further information on the program <http://www.institutions-africa.org/>.

thereby the preferred policy strategy of political agents in favor of their own interests. Hence, formally powerless actors gain influence on policy decisions through their embeddedness in policy networks. Final policy decisions will then reflect the knowledge of formally powerless but well-embedded actors. Consider now that social influence theory essentially models the effect of communication within a network on an actor's final position (e.g. Friedkin and Johnsen, 1990, 1997; Pappi et al., 1995). Hence, integrating social influence theory into a policy process framework allows for an advanced framework that includes belief formation according to an actor specific embeddedness in policy networks. Such a network-based approach models policy processes theoretically founded and close to reality.

The contribution of Chapters 5 and 6 is twofold. First, two distinct methods both focusing on policy networks are introduced to analyze participatory policy processes. One method corresponds to a micro-political founded framework enabling a quantitative analysis of participatory policy processes with regard to the inclusion of stakeholder organization into the process and consensus building in these processes. The other method refers to an advanced econometric network estimation technique that allows for insights into determinants of political communication to design participatory policy processes. Second, both methods are applied empirically using a participatory policy process in Malawi as an example. However, data collection must consider several issues for an efficient empirical application of the framework. First, the boundaries of the policy networks must be consistently specified to gain adequate information about the complete network. Second, to ensure the comparability of actor's policy positions and interests, interviewees must be interviewed with standardized questionnaires where questions permit assigning actors locations in the policy space in order to assess metric distances between them empirically. Here, all studies use quantitative survey data of the project "Policy Network Analysis of Malawi's Agricultural Policy Programme" that has collected data via face-to-face interviews with Malawi's political elite in 2010.<sup>2</sup> In general, a policy network study involves questions about policy positions and interests as well as communication networks.<sup>3</sup> The central theme of the survey used in this thesis is the policy process leading to the approval of the sector investment program "Agricultural Sector Wide Approach" (ASWAp) in April 2010, which is based on the principles of CAADP (The Ministry of Agriculture and Food Security, Republic of Malawi, 2010).

Since policy networks are the centerpiece of the models used to analyze participatory policy process, the study collected data about different networks among actors: i) Reputation, ii) Monitoring, iii) Expert information, iv) Social Relations and v) Membership in Organizations. In line with our theoretical framework, the following studies use the network about expert information on agricultural policy. Expert

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<sup>2</sup>This network study in Malawi would not have been possible without the assistance and funding of the International Food Policy Research Institute (IFPRI). I wish to thank all stakeholders who participated in the interviews for their cooperation. I also greatly appreciate the kind research support offered by the whole project team. The findings, interpretations and conclusions expressed in studies presented here are entirely those of the authors and should not be attributed to the International Food Policy Research Institute.

<sup>3</sup>The questionnaires are based on a method that was used to identify policy preferences, policy interests and policy networks of relevant actors of the Common Agricultural Policy of the European Union. See for more information Pappi et al. (1995).

information is not necessarily available in public but circulates among persons interested in or working in the specific policy field. Further expert information on how policy instruments relate to policy goals is a valuable resource to influence policy beliefs of political agents. The reputation network predominantly helps to identify interview partners during the interview rounds, while the membership in organizations network is used to explain the formation of expert information networks. So far, the monitoring network is not used to analyze policy processes because our theory focuses on participatory policy process as a knowledge transmission mechanism, while monitoring networks reflect information flows regarding policy proposals to be approved soon. Further, we decided to focus on networks among organizations and not among individuals because information for policy design is mainly provided by organizations interested in the specific policy domain and not by individuals. Respondents are considered as corporative actors, i.e. experts of their organization for the specific policy field, if they answered policy network and policy preference questions during the interviews (see Coleman, 1990). Overall, the project team interviewed the top ten of most influential players in Malawi and further 27 highly influential organizations. Finally, such a policy network study in combination with the proposed methodological approach allows deriving comprehensive insights into the participatory policy process in Malawi.

*Chapter 5: A Network Based Approach to Evaluate Participatory Policy Processes: An Application to CAADP in Malawi*

This Chapter introduces a theoretical framework to analyze participatory policy processes. The framework combines policy networks which enable policy belief formation among members of a country's political elite with a cooperative legislative decision-making model. While the belief formation part builds on work by Friedkin and Johnsen (1990), Friedkin and Johnsen (1997) and Pappi et al. (1995), the legislative decision-making part uses the mean-voter rule by Henning (2000). The combination of both strands of theories enables us to model the policy process as a set of political institutions and policy networks. That is the framework reflects the policy process as mechanism aggregating policy preferences of divergent actors to a distinct final policy decision, even if some of the actors with vested interests in the specific policy domain are not endowed with formal political power by constitution. In fact, formally powerless actors gain influence through their embeddedness in policy networks because these networks enable them to convey information on the impact of policy decisions on the state of the world to political agents. This information in turn changes the agent's beliefs and thereby their preferred policy strategy. Hence, a final policy decision considers the knowledge and the positions of formally powerless actors.

Further, the framework permits modeling final policy decisions by taking into account informal political institutions that shape power distributions among political agents (see e.g. Shepsle and Weingast, 1987). The legislative decision-making rule is able to capture the informal political games because a final policy decision is modeled as the weighted sum of agents' ideal positions where the weights can be defined according to an agent's observed informal or formal political power. A case in point for the latter is the phenomenon of "Big Man" presidentialism in African countries (Bratton, 2007; van der Walle, 2003). At methodological level, weights can

be calculated according to the classical Banzhaf power index. This index first counts all possible winning coalitions among actors and for each actor all winning coalitions where the vote of the actor is critical for winning (Banzhaf, 1965; Coleman, 1971). Second, the Banzhaf index is defined as the number of an actor's winning coalitions to the total of winning coalitions. By defining the threshold of votes to be met for a collective decision and identifying whose vote is compulsory for a final decision calculated Banzhaf indices reflect different voting power distributions among agents.

In summary, the proposed framework reflects essential components of policy processes by combining policy network research with formal legislative bargaining theory. Thereby it provides a theoretically founded methodology that, on the one hand, models policy processes close to reality and, on the other hand, allows capturing country-specific attributes of policy processes.

In the second part of the chapter, the framework is used to empirically analyze the participatory policy process in Malawi that has led to the approval of the "Agricultural Sector Wide Approach" (ASWAp) in 2010. We use data obtained via the network study "Policy Network Analysis of Malawi's Agricultural Policy Programme" that was conducted in Malawi in 2010 in joint cooperation of the International Food Policy Research Institute and the University of Kiel. Three main results of the comprehensive analysis of participatory policy processes can be summarized as follows. First, the proposed framework is able to reflect policy processes in Malawi. Second, Malawi specific policy network structures facilitate consensus building on agricultural policy issues. Third, government highly influences the policy beliefs of stakeholder and donor organizations. Hence, the policy process in Malawi resembles a top-down instead of a bottom-up process as advocated by international organizations.

Hence, the framework can be used as a theoretical basis for future research on policy processes in different countries. However, while participatory policy processes promote national consensus on agricultural policy programs, the policy process still resembles a top-down instead of a bottom-up process in Malawi.

#### *Chapter 6: The Formation of Elite Communication Networks in Malawi: A Bayesian Econometric Approach*

Chapter 6 delivers detailed insights into determinants of communication networks. Communication networks are an essential component of belief formation models and thereby of the framework proposed in Chapter 5. They constitute an important means by which stakeholders who are (well-)informed about impacts of policy decisions on the state of the world can contribute to efficient policy choices (see for example Ball, 1995; Lohmann, 1993; Austen-Smith, 1993). At the same time, participatory policy processes can lead to distorting policy choices, if communication is biased in favor of a specific interest group. However, such a bias in communication can be rational for the receiver of information because communication ties with organizations similar interests to oneself reduce biased information signals and allow for an individually efficient communication process.

Our approach explicitly analyzes the information/distortion potential of participatory policy processes by employing two variables in the empirical analysis. First, we use an external measure of an actor's knowledge about policy impacts derived from a Computable General Equilibrium Model and survey data of actor's policy



preferences to analyze information diffusion in the network. Second, we employ an index of homophily in policy interests between a pair of organizations to describe the distortion potential. Insights about this tradeoff are valuable in order to evaluate the potential of participatory policy processes in increasing the likelihood of approving welfare increasing or distorting policy programs.

In addition to these variables, we employ in the empirical analysis variables according to theories explaining an actor's communication choices by structural factors. These factors describe communication opportunities due to his political influence, structural embeddedness and human resources (see Moody, 2001; Knoke et al., 1996). Thus, variables enter the empirical model that describes an actor's political reputation, number of staff and overlapping membership in organizations with the communication partner. We use empirical data obtained via the network study "Policy Network Analysis of Malawi's Agricultural Policy Programmes".

At the methodological level, a Bayesian estimation approach is used to analyze the network generating process. Estimation is based on MCMC methodology namely Gibbs sampling. This estimation technique is well suited to deal with missing values in explaining factors and missing values in the binary network relationship via incorporation of a sequential regression algorithm.

Results from the Bayesian estimation suggest the importance of structural factors for the probability to observe a tie between a pair of organizations. We especially observe that the network is clearly driven by the reputation of the information receiver. With regard to designing a political communication process, the high quantitative impact of overlapping membership in organizations on the probability to communicate suggests promoting umbrella organizations as a means to increase information diffusion among actors. Finally, estimated parameters for the determinants knowledge and political homophily are of special interest to evaluate the information/distortion trade off in participatory policy processes. The significant and relatively high quantitative impact of the sender's level of knowledge is highly appreciated in terms of well-informed policy decisions. However, marginal effects reveal that structural embeddedness of actors has a higher quantitative impact on the probability to communicate. That is accumulating knowledge is not as valuable as investing into network relations. Nevertheless, empirical findings suggest that participatory policy processes do not suffer from special-interest bias as indicated by the insignificant parameter estimate of political homophily.

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## Chapter 2

# Interaction Effects of District Magnitude, Voter Beliefs and Protectionism: Evidence from Agriculture

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Paper presented at the Second World Congress of the Public Choice Societies, Miami, Florida March 8-11, 2012

### Abstract

This paper analyzes how electoral rules and legislative bargaining determine the political success of agriculture in attracting government transfers in industrialized parliamentary systems based on a probabilistic voting environment. Assuming voters expect a proagrarian policy, rural districts are pivotal in determining if the coalition obtains a majority, whereas urban districts are pivotal within the majority itself. In bargaining at the legislature, this generates a conflict between the prime minister, who will tend to favor rural districts, and the parliamentary majority, which will be dominated by urban concerns. As district size grows and the electoral system converges to a pure proportional system, both of these biases are attenuated. Overall, the result is an inverse u-shaped relationship between district size and agricultural subsidies. However, when voter beliefs tend toward a liberal agricultural policy, an u-shaped relationship results. Based on a dynamic econometric panel model using time-series cross-country data for 23 parliamentary democracies since 1966 our theory is empirically validated. The findings remain stable under various robustness checks including a test of potential endogeneity of electoral rules.

*Keywords:* comparative political economy; agricultural protection; electoral rules; endogeneity of political institutions; time-series cross-country data

## 2.1 Introduction

Since the seminal papers of Persson and Tabellini (1999, 2000, 2003) the question how constitutional rules influence economic policies and hence economic performance is on top of the research agenda in comparative political economy. In particular, Persson and Tabellini are interested in identifying the causal effects of formal political institutions on economic and political outcomes. However, Acemoglu and Johnson (2005) demonstrate that identifying causal effects of formal constitutional rules is a complex undertaking. For example, disentangling the impact of formal constitutional rules from the impact of informal institutions is often plagued by the problem of "clustered" institutions. "Clustered" institutions describe the fact that a combination of mutually reinforcing formal and informal institutions evolve jointly (Acemoglu and Johnson, 2005). Thus, observed political outcomes are the result of informal and formal rules of political games. In this context identifying true causal effects of constitutional rules demands for a comprehensive theory that reflects the interaction of formal and informal political institutions. Additionally, adequate econometric techniques must be used to guarantee a valid empirical analysis of the causal effects of formal constitutional rules.

A case in point to analyze the effects of constitutional rules is special interest politics, i.e. policy biases in favor of a specific voter group at the expense of the general public. Pars pro toto this paper focuses on the political success of agricultural voters in attracting government transfers. Reviewing the literature to date important questions on how and why constitutional rules determine special interest politics, i.e. agricultural protection, are still unsolved. In particular, two strands of literature exist. A first strand corresponds to classical political economy models of agricultural protection. While these models explain observed differences in agricultural protection comparing industrialized and developing countries (Gardner, 1987; Swinnen, 1994; Tyers and Anderson, 1992; Miller, 1991; Zusman, 1976), these approaches fail to shed light on observed large cross-country differences in agricultural protection among industrialized or developing countries, respectively. As these models neglect political institutions, they might be the missing link. More recently, based on the well-known work of Beghin and Kherallah (1994), Beghin et al. (1996) and Swinnen et al. (2000), Thies and Porche (2007) as well as Olper and Raimondi (2009) provide a comprehensive econometric analysis of the political determinants of agricultural protection, including socio-economic factors as control variables. Neither Thies and Porche (2007) nor Olper and Raimondi (2009), however, provide a political economy theory of agricultural protection, that explains the observed effects of political determinants on agricultural protection. They derive their hypotheses rather ad hoc applying various existing political economy theories on protection.

A second strand of literature this paper is related to corresponds to theoretical and empirical studies analyzing the impact of the electoral system as constitutional rule on policy outcomes. However, apparently conflicting theories exist in the literature regarding special interest politics and electoral rules.<sup>1</sup> Scholars such as Persson

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<sup>1</sup>In particular, the effects of two archetypical electoral systems, labeled "majoritarian" and "proportional", on general economic policy outcomes are contrasted. Scholars mostly neglect mixed electoral systems in their analysis

and Tabellini (2003) or Grossman and Helpman (2005) argue that special interest politics, occur more frequently in majoritarian than in proportional representation systems. Other scholars such as Milesi-Ferretti et al. (2002) or Rogowski and Kayser (2002) state that distributional policies are less likely in majoritarian than in proportional systems. Interestingly, Hee Park and Jensen (2007) criticize already the use of a simple majoritarian-proportional dichotomy to explain distributive politics and suggest the Cox-threshold as the relevant indicator to measure the impact of electoral rules on distributive policy outcomes (see Cox, 1987; Myerson, 1993). The Cox-Myerson theory, however, does not provide a complete model of political decision making. The latter necessarily incorporates a model of post-election legislative bargaining among legislators representing different constituencies with heterogeneous interests.

In this context the paper tries to make the following contributions. First, this paper develops a micro-political founded theory to understand the interaction of formal and informal political institutions in determining the level of agricultural protection. In our theory we explicitly derive legislators' policy preferences from electoral competition and final policy outcomes from post-election bargaining in legislatures. Assuming voters expect a pro-agrarian policy, rural districts are pivotal in determining the coalition obtaining a majority, whereas urban districts are pivotal within the majority itself. In bargaining at the legislature, this generates a conflict between the prime minister, who will tend to favor rural districts, and the parliamentary majority, which will be dominated by urban concerns. As district size grows and the electoral system converges to a pure proportional system, both of these biases are attenuated. Overall, an inverse u-shaped relationship between district size and agricultural subsidies results. Assuming, however, voter beliefs tend toward a liberal agricultural policy, the prime minister tends to favor urban concerns and a rural legislator becomes decisive within his parliamentary majority. Accordingly, a u-shaped relationship results. Hence, in contrast to classical approaches, our theory is able to explain observed large cross-country differences in agricultural protection among industrialized countries.

Second, these hypotheses are tested empirically. Based on a two-way fixed effect error component model as adapted by Wallace and Hussain (1969) empirical results confirm the suggested nonlinear relationship between the electoral system and agricultural protection. Note that the results are robust with respect to different specifications of country specific heterogeneity, serial correlation. Also robustness of empirical results with respect to potential endogeneity of political institutions is checked using a two-step approach as advocated and discussed by Angrist and Krueger (2001), which accounts for the discrete nature of our measurement of the electoral systems. However, although our estimation results provide stable evidence in favor of the suggested relationship and imply that we are using valid instruments, interpretation of estimated coefficients as causal effects is still problematic. The idea of clustered institutions put forward by Acemoglu and Johnson (2005) well captured within the developed theory implies an interaction between formal electoral rules and coalition discipline, as well as the influence of interest as informal institutions. Thus the documented link may not be interpreted as a causal relationship.

This paper starts in Section 2 introducing the theoretical model, while Section 3

provides our empirical analysis, including the derivation of the applied econometric estimation strategy and description of used data. Further, we test potential endogeneity of electoral rules in this Section. Finally, Section 4 summarizes our main results and gives an outlook on future research.

## 2.2 Theoretical model

### 2.2.1 The population and economy

Consider a society is divided into two sectors: agricultural and non-agricultural. The group of voters economically active in the agricultural sector are denoted with  $A$ .  $M$  represents the group of voters economically active in the non-agricultural sector. If government does not engage in agricultural policy, the equilibrium per capita income of the agricultural and non-agricultural population is  $I_0^A$  and  $I_0^M$ , respectively. The share of each group in total population is denoted by  $\alpha^A$  or  $\alpha^M$ , respectively.

Agricultural policy is characterized by redistributive transfers from the non-agricultural to the agricultural sector. For simplicity we assume that income redistribution occurs via subsidization of agricultural and taxation of non-agricultural sectors. Let  $s$  denote the resulting per capita subsidization of the agricultural population, while  $t$  denotes the per capita taxation of the non-agricultural population. Any feasible policy must satisfy the following budget constraint:

$$\alpha^A \tilde{\Gamma}(s) = \alpha^M t \quad \Leftrightarrow \quad t = \frac{\alpha^A}{\alpha^M} \tilde{\Gamma}(s) = \Gamma(s) \quad (2.1)$$

The function  $\Gamma$  includes deadweight costs. In particular, we assume  $\Gamma$  to be strictly convex and increasing in the level of subsidization, i.e.,  $\Gamma' > 0$  and  $\Gamma'' > 0$ .<sup>2</sup> Assuming identical individuals for both groups implies the following welfare function of each member given the policy  $s$ :

$$W^J = \begin{cases} I_0^A + s & \text{if } J = A \\ I_0^M - \Gamma(s) & \text{if } J = M \end{cases} \quad (2.2)$$

Equation 2.2 implies a conflict of interest between the agricultural and non-agricultural population about the right level of redistributive transfers  $s$ . In the following Sections we derive how different electoral systems interacting with informal political institutions determine the accepted level of agricultural protection.

### 2.2.2 Legislative decision making

For our theoretical model of legislative bargaining in parliamentary systems, we suggest a rather simple legislative majority bargaining game that is based on the existence of a stable ex ante majority coalition and on the principle of proposal

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<sup>2</sup>Deadweight costs significantly vary across various agricultural policy instruments. However, we do not focus on the choice of economically efficient redistribution instruments, although discussion on agricultural policy is to a large extent concerned about this issue (see e.g. de Gorter and Swinnen, 2002; Becker, 1983; Lohmann, 1998).



power of the government. As has been demonstrated by Huber (1996) and Diermeier and Feddersen (1998), stable ex ante majority coalition built among legislators essentially characterize parliamentary systems. Legislators who are members of this majority coalition make legislative decisions exclusively. The rationale of ex ante majority coalition building corresponds to the fact that this coalition at least weakly increases the utility of all majority members when compared to their utilities derived under a default policy outcome that would result from non-cooperative behavior of legislators. In particular, ex ante fixed parliamentary majorities are able to guarantee their members higher utilities due to additional rent legislators realize from being part of a stable majority (Huber, 1996).

We formally define a legislative system as a finite set of political agents,  $N$ , where  $i = 1, \dots, n$  denotes a generic element of the legislative system. Within the legislative system specific institutions are defined as subsets of  $N$ : the prime minister ( $PM$ ), the majority ( $P_{inc}$ ) and the opposition ( $P_{opp}$ ). In general,  $P_{inc}$  could correspond to a multi-party coalition or a single majority party. To simplify following analyses at the election stage, we assume a two-party set-up, i.e.  $P_{inc}$  corresponds to the majority party and  $P_{opp}$  denotes the opposition party. Further,  $P_{inc}$  is a finite subset of legislators  $g \in N$  and  $g$  is a generic element of  $P_{inc}$ . Moreover, we assume that the party leader of the majority party coincides with the  $PM$ . Following Huber (1996) as well as Diermeier and Feddersen (1998), we can concentrate on the prime minister,  $PM$ , and her parliamentary majority  $P_{inc}$  that is ex ante identifiable for modeling legislative decisions.

The model has two stages. At the first stage, we model the default policy outcome  $\bar{s}$ . For simplicity we assume that agricultural policy is one-dimensional and that parliament decides about agricultural policy by simple majority voting.<sup>3</sup> We denote the uni-dimensional policy space by  $S$ . Further, we assume that policy preferences of a legislator can be represented by a single-peaked function  $U_i(s)$ . Let  $Y_i$  denote the ideal point of legislator  $i$ . Obviously, under these assumptions the well-known median voter theorem applies. The unique equilibrium outcome of the non-cooperative legislative decision-making game neglecting any ex ante coalition building is the ideal point of the floor median (Black, 1958).

At the second stage, legislators, who are members of the majority  $P_{inc}$ , and the  $PM$  bargain over policy to improve their utility derived under the default outcome. In detail, they proceed in two steps. First, the  $PM$  proposes a policy,  $s_{PM}$ , to her parliamentary majority and announces side payments  $\gamma$  being paid to the majority in case it admits the governmental proposal. Regarding content we interpret these side payments as rent the  $PM$  can pay to the majority due to specific formal legislative procedures, like issuing a confidence vote, or informal procedures, like the possibility to generate favors in terms of political career for party members. We are not specifically interested in modeling exactly how the  $PM$  can generate rent valuable to her majority, but generally subsume this under the term party (coalition)

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<sup>3</sup>Of course we could also assume more complex legislative decision-making procedures including agenda setting power of the parliamentary committees or the government. However, this would not change our major results and therefore we keep analyses as simple as possible at this point and leave the analysis of more complex legislative institutions for future work.

discipline that is exerted by the *PM*.<sup>4</sup>

At the second step each individual majority member can decide whether or not to accept the proposal of the *PM*. For their decision, legislators maximize the sum of actual rent,  $\gamma$ , and the utility derived from policy,  $U_g(s)$ . If all majority members agree to the proposal, the proposed policy,  $s_{PM}$ , passes parliament and all majority members receive the announced rent. Otherwise, the default policy  $\bar{s}$  becomes the legislative decision and no rent is paid.

**Proposition 1.** *Assuming a one-dimensional agricultural policy choice  $s$ , there exists a unique subgame perfect Nash equilibrium for our legislative majority bargaining game defined above. The equilibrium outcome,  $s^*$ , depends on the rent,  $\gamma$ , the default policy outcome,  $\bar{s}$ , and the policy preferences of the *PM* and the majority members,  $g$ .*

1. *In equilibrium agricultural policy choice,  $s^*$  results from the following maximization<sup>5</sup>:*

$$s^* = \arg \max_s U_{PM}(s) \quad s.t. \quad s \in \bigcap_g S_g, \quad (2.3)$$

where  $S_g = \{s \in S \mid U_g(s) + \gamma \geq U_g(\bar{s})\}$ .

2. *In particular, it holds that the outcome of the legislative bargaining game corresponds to the minimal distance between the ideal point of the *PM* and the interval  $[s^-, s^+]$ :*

$$s^* = \arg \min_s \|Y^{PM} - s\| \quad s.t. \quad s \in [s^-, s^+] \quad (2.4)$$

where  $s^- = \min_g \bigcap S_g$  and  $s^+ = \max_g \bigcap S_g$ .

If the rent  $\gamma$  is sufficiently large or if legislators' preferences are sufficiently homogeneous, the final agricultural policy outcome corresponds to the ideal point of the prime minister. Under this condition our model corresponds to pre-election political models, which generally assume that governmental policy simply corresponds to political preferences of the party leader who becomes the omnipotent head of government after elections. If party discipline, i.e. the rent  $\gamma$ , is not sufficiently high or analogous, policy preferences of the *PM* and her parliamentary majority are sufficiently heterogeneous, agricultural policy outcome is no more fully determined by the *PM*'s policy preferences. Under this assumption policy outcome is also determined by the intersection set of the subsets  $S_g$  that is determined by the policy preferences of the majority members, the rent  $\gamma$  and the default policy,  $\bar{s}$ .

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<sup>4</sup>Note further that we assume that at this stage the *PM* can commit to paying the rent. However, this assumption is not necessary; in a richer modeling set-up including the specific procedures it is possible to get essentially the same result without assuming this kind of commitment.

<sup>5</sup>Note that the maximization problem always has a unique solution, as long as the utility functions of legislators are strictly concave. Note that all sets  $S_g$  are compact and convex subsets of  $S$ .

### 2.2.3 Election stage

We derive policy preferences of legislators from electoral competition using a probabilistic voting model (see Persson and Tabellini, 2000). For explaining special interest politics, these approaches basically argue that specific groups, such as farmers, are less ideologically biased relative to other groups and therefore become a natural target for politicians who vie for electoral support. Electoral support is important for politicians because their future rents depend on the probability of being reelected. Generally legislators are modeled as rent-seeking actors who maximize the sum of actual and future rent while making policy choices. Obviously, voters hold legislators accountable through retrospective voting.

Electoral competition and hence the preferences of the legislators are moderated by the electoral rule used to elect parliament. Voters elect legislators in electoral districts where the size of a district is determined by the electoral rule laid down in the constitution. Every electoral district  $d_k$  contains the same share of voter population,  $\alpha_{d_k}$ , and the sum of voter population over all districts covers total population eligible to vote. Usually, proportional representation (*PR*) and a majoritarian election system (*MS*) are distinguished as ideal-typical electoral systems if electoral systems are characterized by the number of legislators elected in a constituency, i.e. by the district magnitude. In *PR* systems incumbents are elected in a multiple-member national electoral district, while they are elected in one-member constituencies in pure majoritarian systems. Denoting the total number of parliamentary seats by  $n$ , the district magnitude of *PR* systems is  $n$  and of pure *MS* systems 1, respectively. In general, the district magnitude of a specific electoral system  $k$  ranges from 1 to  $n$ . In this paper we study if electoral rules determine agricultural protection in a nonlinear way conditional on the interaction with informal political institutions. Thus, we refrain from explaining the heterogeneity in agricultural protection among countries through the simple majoritarian-proportional dichotomy.

#### 2.2.3.1 Voter behavior

An individual incumbent  $g \in P_{inc}$  is re-elected in a generic voting district  $d$ . In principle, a voter votes for an incumbent if the utility she has derived under the implemented policy,  $s^*$ , is higher than her specific reservation utility. However, beyond economic welfare derived under observed policies,  $W^J(s^*)$ , voters care for another dimension, which generally is referred to as ideological preferences for parties, although this dimension could include other characteristics of parties or candidates, e.g. competence or appearance. The crucial point is that ideological preferences are exogenous in the sense that ideology is a permanent attribute of parties, i.e. cannot be changed at will during election campaign (see Persson and Tabellini, 2000).

In this paper we do not further analyze ideological preferences of voters; we only assume that ideological preferences can be subdivided into three components: a group-specific relative importance of ideology compared to economic well-being,  $K^J$ ; a voter specific component  $\mu_{jd}$  that has a district specific mean  $\bar{\mu}_d$ ; and a national component,  $\delta$ . Thus, a voter  $j \in J$  votes for the incumbent  $g$  if the utility she observes under the agricultural policy  $s^*$  is higher than a specific reservation utility,

$W^J(s^0)$ , corrected by the ideological preferences for the incumbent party  $P_{inc}$ :

$$W^J(s^*) > W^J(s^0) + K^J(\mu_{jd} + \delta). \quad (2.5)$$

Parameters  $\mu_{jd}$  and  $\delta$  can take negative and positive values and measure the ideological bias of voter  $j$  toward the opposition party  $P_{opp}$ . A positive value implies that voter  $j$  has a bias in district  $d$  in favor of party  $P_{opp}$ .

The voter-specific ideological preferences are uncertain at the time political agents have to make their policy decisions. In detail, we assume that the parameter  $\mu_{jd}$  has district-specific uniform distribution on  $\left[\bar{\mu}_d - \frac{1}{2\chi}, \bar{\mu}_d + \frac{1}{2\chi}\right]$ . Thus, two parameters,  $\bar{\mu}_d$  and  $\chi$ , fully characterize the distribution of ideological preferences in an electoral district.

Moreover, we assume that the relative importance of ideology  $K^J$  differs across groups. In particular, we assume that the agricultural population has less relative interest in ideology, i.e.  $K^A < K^M$ . Note that assuming a different relative importance of ideological preferences implies that groups generally differ in their effective ideological homogeneity, i.e. have different effective densities  $\phi^J = \frac{\chi}{K^J}$ . Thus, it results that the agricultural population is more ideologically homogeneous than the non-agricultural population, i.e.  $\phi^A > \phi^M$ .

### 2.2.3.2 Legislators' preferences and the electoral system

Political agents know the distribution of regional and group-specific ideological components,  $\bar{\mu}_d$  and  $\phi^J$ , when they decide on agricultural policy, while the electoral uncertainty derives from the uncertainty of the national component,  $\delta$ . The parameter  $\delta$  measures the average popularity of party  $P_{opp}$  in comparison to party  $P_{inc}$ . Here, we assume a uniform distribution on  $\left[-\frac{1}{2\psi}, +\frac{1}{2\psi}\right]$ . Thus, the national ideological shock is unbiased on average.

Given the assumption above the total vote share candidates of an incumbent party  $P_{inc}$  receive in district  $d$  after regional and national ideological shocks have been realized follows as:

$$\Pi_d = \sum_J \alpha_d^J \phi^J \omega^J - \chi [\bar{\mu}_d + \delta] + \frac{1}{2}, \quad (2.6)$$

where  $\omega^J = (W^J(s^*) - W^J(s^0))$ . Assuming that all  $k$  candidates of party  $P_{inc}$  running for election in the  $k$ -member district  $d_k$  have the same chance,  $\frac{1}{k}$ , to get a parliamentary seat won by party  $P_{inc}$  in this district, the re-election probability of a majority member  $g \in P_{inc}$  in an electoral system  $k$ ,  $\tilde{\pi}_g^k$ , conditional on the national shock  $\delta$  is given by:

$$\tilde{\pi}_g^k(\delta) = \frac{1}{k} \Pi_{d_k} = \frac{1}{k} \left[ \sum_J \alpha_{d_k}^J \phi^J \omega^J - \chi [\bar{\mu}_{d_k} + \delta] + \frac{1}{2} \right] \quad (2.7)$$

The expected re-election probability after national ideological shocks have been

realized,  $\pi_g^k$ , results in:

$$\pi_g^k = \int_{-\frac{1}{2\psi}}^{\frac{1}{2\psi}} \tilde{\pi}_g^k(\delta) \psi d\delta = \frac{1}{k} \left[ \sum_J \alpha_{d_k}^J \phi^J \omega^J - \chi \bar{\mu}_{d_k} + \frac{1}{2} \right] \quad (2.8)$$

Overall, maximizing the expected probability of re-election taking the groups' reservation utilities as given corresponds to maximizing an additive social welfare function, where the weight of group  $J$ ,  $\bar{\beta}_{d_k}^J$ , results as:

$$\bar{\beta}_{d_k}^J = \alpha_{d_k}^J \phi^J \quad (2.9)$$

Thus, obviously legislators have different policy preferences as long as electoral districts are demographically heterogeneous. To cover the heterogeneity of electoral districts in our model we use a common approach in electoral studies (Lipset and Rokkan, 1967). We divide the population in classes of individuals who share characteristics that predominantly affect their vote. In particular, beyond employment in the agricultural and non-agricultural sector, respectively, we further assume that generally living conditions in urban versus rural living areas impact on voting behavior. We differentiate two types of districts, rural districts ( $D^R$ ) and urban districts ( $D^U$ ), where the population share of the agricultural voter group  $\alpha_{d_k}^A$  is higher for rural when compared to urban districts. Accordingly, the weight of the agricultural voter group  $\bar{\beta}_{d_k}^A$ , is higher implying a higher preferred subsidization level of the elected legislator for the former. Thus, legislator's preferences for protectionism vary systematically depending on their re-election in a rural or urban district, respectively. In more specific terms, let  $s_k^u$  and  $s_k^r$  denote the preferred subsidization level of urban and rural legislators, respectively, it holds for any electoral system  $k$ :  $s_k^u \leq s_k^r$ .

Consider now the case that district magnitude increases. The electoral districts become demographically more homogeneous. Thus, we can state the following for  $k = 1, \dots, n$ :

$$\alpha_{d_k}^A \leq \alpha_{d_{(k-1)}}^A \quad \forall d \in D^R \quad \text{and} \quad \alpha_{d_k}^A \geq \alpha_{d_{(k-1)}}^A \quad \forall d \in D^U. \quad (2.10)$$

Because agrarian population shares in rural and urban districts, respectively, converge to the national share with increasing district magnitude  $k$ , the subsidization levels preferred by rural and urban legislators converge toward a common national level (compare Figure 2.1). It holds:

$$s_k^r \geq s_{k+1}^r \quad \text{and} \quad s_k^u \leq s_{k+1}^u \quad \text{and} \quad s_n^u = s_n^r \quad (2.11)$$

### 2.2.3.3 Deriving the re-election probability of the PM

In contrast to a majority member, the *PM* is only re-elected if party  $P_{inc}$  wins the election, thus only if party  $P_{inc}$  wins the majority of total seats. To formally derive the probability of re-election of party  $P_{inc}$  as the governmental party, we define the

following stochastic variable  $\Lambda_{d_k}$  for each electoral district:

$$\Lambda_{d_k} = \begin{cases} k & \text{with probability } \Pr_{d_k}^k \\ k-1 & \text{with probability } \Pr_{d_k}^{k-1} \\ \vdots & \\ 1 & \text{with probability } \Pr_{d_k}^1 \\ 0 & \text{with probability } (1 - \sum_k \Pr_{d_k}^k) \end{cases} \quad (2.12)$$

Given the definition of  $\Lambda_{d_k}$  the probability that party  $P_{inc}$  wins the election or rather that the  $PM$  is re-elected in an electoral system  $k$ ,  $\pi_{PM}^k$ , results:

$$\pi_{PM}^k = \Pr \left[ \sum_{d_k} \Lambda_{d_k} \geq 0.5(n+1) \right] \quad (2.13)$$

Formally, the ideal position of the party leader,  $Y^{PM}$ , is the policy position that maximizes the re-election probability of the  $PM$  and results from the following mixed-integer maximization problem:

$$Y^{PM} = \arg \max_{s, \Lambda_{d_k}, \delta} \delta \quad (2.14)$$

subject to

$$\left[ \sum_J \alpha_{d_k}^J \phi^J \omega^J - \chi(\bar{\mu}_{d_k} + \delta) + 0.5 \right] k \geq \Lambda_{d_k} \quad \text{and} \quad (2.15)$$

$$\sum_{d_k} \Lambda_{d_k} \geq 0.5(n+1). \quad (2.16)$$

Despite assuming perfectly homogeneous electoral districts or a pure proportional system with only one national district (i.e.  $k = n$ ), it is generally difficult to characterize the solution of eq. 2.14, i.e., the preferred policy position of the  $PM$ . Obviously,  $Y^{PM}$  will always lie in the interval  $[s_k^u, s_k^r]$ , as outside of this interval the expected vote shares of all districts monotonically increase or decrease with  $s$ . But beyond this interval it is tedious to characterize  $Y^{PM}$ . However, especially regarding the final outcome of legislative bargaining, it is crucial if the  $PM$  prefers a higher or a lower subsidization level when compared to the default outcome  $\bar{s}_k$ .

Therefore, we basically follow Persson and Tabellini (2000) and introduce additional assumptions that allow a further characterization of the equilibrium for our electoral competition set-up. We assume that electoral districts can be grouped into three different clusters  $D^1$ ,  $D^2$  and  $D^3$ , respectively, according to the ideological bias of the specific district  $\bar{\mu}_{d_k}$ . This corresponds to the real world phenomenon of party strongholds observed under democratic elections. Moreover, we assume that none of the clusters includes the majority of voter population, while any two clusters together include the majority of voters. Districts of cluster  $D^1$  are biased in favor of party  $P_{inc}$ , while districts of cluster  $D^3$  are biased in favor of the opposition party

$P_{opp}$ :

$$\bar{\mu}_{d_k} = \bar{\mu}_k^{P_{inc}} < 0 \quad \forall \quad d \in D^1 \quad \text{and} \quad \bar{\mu}_{d_k} = \bar{\mu}_k^{P_{opp}} > 0 \quad \forall \quad d \in D^3. \quad (2.17)$$

Overall, districts are unbiased, i.e. it holds:

$$\sum_{d_k \in D^R} \alpha_{d_k} \bar{\mu}_{d_k} = \sum_{d_k \in D^U} \alpha_{d_k} \bar{\mu}_{d_k} = 0. \quad (2.18)$$

In particular, we assume that the ideological biases toward party  $P_{inc}$  in districts of cluster  $D^1$ , and toward party  $P_{opp}$  in districts of cluster  $D^3$  are sufficiently large that electoral competition only takes place in the unbiased districts of cluster  $D^2$ . It follows that party  $P_{inc}$  wins the election if and only if it wins the majority of parliamentary seats in the unbiased electoral districts of cluster  $D^2$ , that might be dominated by rural or urban districts, respectively. In general, PM's policy position maximizing the probability that the majority party wins the majority of seats in  $D^2$  can be derived from eq. 2.14.

To understand how the ideal position results denote the number of seats the majority party wins in unbiased urban and rural districts by  $k_u$  and  $k_r$ , respectively. Obviously, if the  $PM$  wins elections it holds:

$$k_u sh_u + (1 - sh_u)k_r \geq 0.5(k + \frac{1}{\#_{D^2}}), \quad (2.19)$$

where  $sh_u$  is the share of urban districts in  $D^2$  and  $\#_{D^2}$  is the total number of districts in  $D^2$ . Accordingly, let  $WD$  denote the set of all pairs  $(k_u, k_r)$  that guarantee that the  $PM$  wins. Denoting  $\Pi_l(s, k_l)$ ,  $l = u, r$ , the probability that the party  $P_{inc}$  wins at least  $k_l$  seats in the unbiased district  $l = r, u$ , it follows:

$$\Pi_l(s, k_l) = \left[ \sum_J \alpha_{d_k}^J \phi^J \omega^J + 0.5 - \frac{k_l}{k} \right] \frac{\psi}{\chi} + 0.5 \quad (2.20)$$

Moreover, the ideal position of the  $PM$  results from the maximization of his winning probability as follows:

$$Y^{PM} = \arg \max_{s, (k_u, k_r) \in WD} \{ \min \{ \Pi_u(s, k_u), \Pi_r(s, k_r) \} \}, \quad (2.21)$$

Denoting by  $s^{PM}, k_l^*$  the solution of the  $PM$ 's optimization problem we can separate the following three cases:

- (1)  $\Pi_u(s, k_u^*) \geq \Pi_r(s, k_r^*) \quad \forall s \in [s^u, s^r]$
- (2)  $\Pi_u(s, k_u^*) \leq \Pi_r(s, k_r^*) \quad \forall s \in [s^u, s^r]$
- (3) else

Obviously, the first two cases are trivial in the sense, that in the first case only rural districts are decisive, e.g. the  $PM$  prefers  $s^r$ , while in the latter only urban districts are decisive, i.e. the  $PM$  prefers  $s^u$ . Thus, the most interesting cases are

the one where neither rural nor urban districts are solely decisive. In this case it follows for the ideal position of the  $PM$ ,  $Y^{PM} = s^{PM}$ :

$$\Pi_u(s^{PM}, k_u^*) = \Pi_r(s^{PM}, k_r^*) \quad (2.22)$$

$$\Leftrightarrow \sum_J (\alpha_{r_k}^J - \alpha_{u_k}^J) \phi^J \omega^J - \frac{(k_r^* - k_u^*)}{k} = 0 \quad (2.23)$$

After some rearrangements the above equation results in:

$$(\alpha_{r_k}^A - \alpha_{u_k}^A) (\Delta W(s^{PM}) - \Delta W(s^0)) - \frac{\Delta k}{k} = 0, \quad \text{where} \quad (2.24)$$

$$\Delta W(s^{PM}) = \phi^A W^A(s^{PM}) - \phi^M W^M(s^{PM}),$$

$$\Delta W(s^0) = \phi^A W^A(s^0) - \phi^M W^M(s^0) \quad \text{and}$$

$$\Delta k = k_r^* - k_u^*.$$

#### 2.2.3.4 Voter belief formation and PM's policy position

From eq. (2.24) it follows that the position of the PM depends on voter's reservation utilities  $W^J(s^0)$  and on  $\Delta k$ , i.e. the difference in the number of seats the majority party wins in equilibrium in rural and urban districts, respectively. As will be explained in more detail below, voters' reservation utilities depend on voter beliefs, i.e. protection levels expected by voters. Understanding determinants of  $\Delta k$  is more complex. Therefore, in this paper we will focus our analysis on the interaction effect of voter beliefs, electoral rules and agricultural protection. Accordingly, to simplify further analysis we assume that  $\Delta k = 0^6$ , i.e. in equilibrium the  $PM$  tries to win a bar majority of seats in both unbiased rural and urban districts, respectively.<sup>7</sup>

Further, it is easy to show that it holds from eq. (2.24):

$$s^{PM} = s^0 \quad \text{for} \quad \Delta k = 0, \quad \frac{\partial s^{PM}}{\partial s^0} \geq 0 \quad \text{and} \quad \frac{\partial s^{PM}}{\partial \Delta k} \geq 0. \quad (2.25)$$

The reservation utilities of agricultural and non-agricultural voters  $W^J(s^0)$  depend on the policy outcome  $s^0$  expected by voters, i.e. on voters' beliefs. Understanding  $s^0$  as voter's common beliefs the PM position results ceteris paribus as a function of

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<sup>6</sup>Please note that essentially our theoretical results will not change if we drop this assumption. Furthermore, it can be shown that for any non-zero share of rural districts in  $D^2$ , there exists a finite positive value for  $K^J$  such that the solution of the maximin problem eq.(2.21) implies  $\Delta k = 0$ , i.e. assuming ideology is sufficiently important for voters' electoral choices, it follows that the PM wins election if and only if his party wins the majority of seats in both unbiased urban and rural district, respectively.

<sup>7</sup>Please note further, that at this stage we do not explicitly verify to what extend specific conditions discussed above hold true empirically. Analyzing empirically if the PM prefers a higher or a lower agricultural protection when compared to the median is an interesting question, which we leave for future research. But, in our empirical analyses below we do not make any ex ante assumptions regarding the ideal position of the PM. Nevertheless, we have to admit that in our empirical analyses we implicitly assume, that at least in our sample countries the position of the PM lies homogeneously below or above the median position, respectively.



voters' beliefs, i.e.  $Y^{PM} = Y^{PM}(s^0)$ . Moreover, the final policy outcome  $s^*$  results from legislative bargaining and, therefore, is also determined by voters' policy beliefs, i.e.,  $s^* = s^*(s^0)$ . Thus, assuming rational expectations implies that voters' beliefs  $s^0$  result in a final policy outcome that corresponds with voters' initial beliefs, i.e.  $s^*(s^0) = s^0$ .

Now, for any position of the  $PM$  the outcome of legislative bargaining is restricted to the interval  $[s_k^-, s_k^+]$ , where  $s_k^-$  and  $s_k^+$  are solely determined by the demographic composition of the electoral system and the party discipline  $\gamma$ . Therefore, assuming voters form rational expectations implies that voters form common beliefs that lie in the interval  $s^0 \in [s_k^-, s_k^+] \cap [s_k^u, s_k^r]$ .

The question that arises is how voters form their common beliefs. Belief formation of voters is a very interesting subject in itself, where classical work goes back to Fiorina (1981). Nevertheless, we leave this interesting topic for future work and provide only an intuitive model of voters' belief formation. Following the interesting work of Golub and Jackson (2009), we assume belief formation results from a social communication process among voters. Belief formation might be biased to the extent that communication is dominated by specific central actors. In this regard interest groups are often central players dominating stakeholder communication.

Given the fact that the  $PM$ 's preferred policy position resulting from the rationale in eq.(2.24) is increasing in voters' beliefs, agrarian interest groups have an interest to influence voters' beliefs toward high agricultural subsidization, while non-agrarian interest groups have an interest to influence voters' beliefs toward low agricultural subsidization levels. Taken into account that at least in industrialized democracies political communication is strongly dominated by agrarian interest groups, it seems plausible that voters' initial beliefs correspond to high agricultural protection levels in these countries. Formally, we assume that voters' common beliefs result as a weighted mean of preferred policy outcomes of rural and urban legislators, respectively, i.e.  $s^0 = C_A s_k^r + (1 - C_A) s_k^u$ , with  $0 \leq C_A \leq 1$ . Thus,  $C_A$  measures the relative influence of agrarian interest groups. Rational expectations, however, imply that voter take legislative bargaining into account, e.g. voters' common beliefs result as:  $s^0 = \max(\min(C_A s_k^r + (1 - C_A) s_k^u, s^+), s^-)$ , with  $0 \leq C_A \leq 1$ . Please note that voters' rational expectation beliefs imply  $s^{PM}(s^0) = s^0$  and also:  $s^*(s^0) = s^0$ .<sup>8</sup>

#### 2.2.4 Policy outcomes under different electoral systems

Overall, it follows from our theory that legislators' policy preferences systematically change with the electoral system, in which the preferred agricultural subsidization levels decrease with the district magnitude  $k$  for rural and increase for urban legislators. For pure proportional representation systems ( $k = n$ ), all legislators and the  $PM$  have identical political preferences (see also Figure 2.1 below.). We denote  $\bar{s}_n$  as the common ideal point of all legislators under proportional representation that trivially becomes also the unique policy outcome. Assuming further that initial voter beliefs in industrialized countries correspond to high agricultural support implies that under mixed and majority rules ( $k < n$ ) the  $PM$  also tends toward

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<sup>8</sup>This only holds for  $\Delta k = 0$ , but please note that also for  $\Delta k \neq 0$  a similar non-linear relationship between district size, protection levels and voter beliefs results.

rural preferences.<sup>9</sup> Next, we are able to summarize the overall equilibrium of our legislative bargaining game under different electoral systems in *proposition 2*. (The proof is given in the appendix.)

**Proposition 2.** *Let  $s_k^*$  and  $\bar{s}_k$  denote the equilibrium and default policy outcome, respectively, of the majority bargaining game defined in proposition 1 assuming an electoral system  $k = 1, \dots, n$ . Then the following holds:*

1. *The equilibrium policy outcome is defined by:*

$$\begin{aligned}
 s_k^* &= \arg \min_s \|Y_k^{PM} - s\| \quad \text{s.t.} \quad s \in [s_k^-, s_k^+] \\
 s_k^+ &= \max \left\{ s_k \in \bigcap_g S_{g_k} \left| \sum_J \beta_{u_k}^J w^J(s) + \gamma \geq \sum_J \beta_{u_k}^J w^J(\bar{s}_k) \right. \right\} \\
 s_k^- &= \min \left\{ s_k \in \bigcap_g S_{g_k} \left| \sum_J \beta_{r_k}^J w^J(s) + \gamma \geq \sum_J \beta_{r_k}^J w^J(\bar{s}_k) \right. \right\}
 \end{aligned} \tag{2.26}$$

where  $\beta_{u_k}^J$  and  $\beta_{r_k}^J$  denote the group weights of an additive SWF corresponding to the electoral competition equilibrium in urban and rural districts, respectively, defined by the electoral system  $k$ .

2. *In particular, it holds for the equilibrium outcome  $s_k^*$ :*

$$\begin{aligned}
 s_k^* &= \max \{s_k^-, Y_k^{PM}\} \leq \bar{s}_k \quad \text{if} \quad Y_k^{PM} \leq \bar{s}_k \\
 s_k^* &= \min \{s_k^+, Y_k^{PM}\} \geq \bar{s}_k \quad \text{if} \quad Y_k^{PM} \geq \bar{s}_k.
 \end{aligned} \tag{2.27}$$

3. *Let  $s^0 = \max [\min [C_A * s_k^r + (1 - C_A)s_k^u, s_k^+], s_k^-]$  denote the common beliefs of voters regarding the agricultural policy outcome, then it holds:*

$$\begin{aligned}
 Y_k^{PM} &= s^0 \leq \bar{s}_n \quad \text{for} \quad C_A \quad \text{sufficiently close to 0} \\
 Y_k^{PM} &= s^0 \geq \bar{s}_n \quad \text{for} \quad C_A \quad \text{sufficiently close to 1,}
 \end{aligned} \tag{2.28}$$

where  $\bar{s}_n$  is the unique common ideal position of all legislators under proportional representation, i.e.,  $k=n$ .

4. *There always exists a  $k^*$  with  $1 \leq k^* \leq n$  and it holds:*

- (i) *For  $C_A$  sufficiently close to 1:*

$$[s_k^* \leq s_{k+1}^* \quad \forall k < k^* \quad \text{and} \quad s_k^* \geq s_{k+1}^* \quad \forall k \geq k^*]$$

- (ii) *For  $C_A$  sufficiently close to 0:*

$$[s_k^* \geq s_{k+1}^* \quad \forall k < k^* \quad \text{and} \quad s_k^* \leq s_{k+1}^* \quad \forall k \geq k^*]$$

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<sup>9</sup>However, please note that even if we would assume other voter beliefs implying urban preferences of the *PM* our main theoretical implication that agricultural policy outcomes systematically change with the electoral system would still result.

Three things are worth noting. First, assuming the non-agrarian population is sufficiently more ideologically biased when compared to the agrarian population, i.e.  $\phi^M \ll \phi^A$  both rural and urban legislators prefer a subsidization of the farm sector for any electoral system  $k$ . Second, in extreme cases of perfect party discipline, the restriction of the decisive (urban or rural) majority member is never binding, i.e., the equilibrium outcome is solely determined by the preferences of the  $PM$ . In this case  $k^*$  equals 1. Third, if this restriction is binding, the equilibrium is solely determined by the preferences of the decisive majority member being re-elected in an urban or rural district and the rent  $\gamma$ . Note, in particular, that under this condition the equilibrium would not change with changed preferences of the  $PM$  as long as the  $PM$  prefers a sufficiently high (low) subsidization level, i.e., a level that is higher (lower) than the maximum (minimum) level the decisive urban (rural) majority member is willing to accept in exchange for the rent  $\gamma$ . This last point is crucial regarding the impact of the electoral system on agricultural policy. In contrast to existing pre-election models, in our approach the impact of an increased district magnitude on agricultural protection is ambiguous and depends on the interplay of formal constitutional rules and informal institutions, i.e., party discipline and relative strength of agrarian interest groups.

In particular, if political communication is dominated by agrarian interest groups, voters believe in protectionist agricultural policy and electoral competition pushes the  $PM$  to take pro-agrarian policy positions. In this case legislative bargaining occurs between a pro-agrarian  $PM$  and an urban legislator that tends to be biased against agrarian interest. A contrario, if political communication is dominated by non-agrarian interest groups, voter beliefs tend toward a liberal agricultural policy. Hence, the  $PM$  tends to favor non-agrarian interests and legislative bargaining occurs among a pro-urban  $PM$  and a pro-agrarian rural legislator as a decisive government member. As district magnitude grows and the electoral system converges to a pure proportional system, policy biases among rural and urban districts are attenuated. Accordingly, in the first case there is an inverse u-shaped relation, while in the second case a u-shaped relation between district magnitude and agricultural protection results as shown in Figure 2.1.

## 2.3 Empirical Analysis

### 2.3.1 Data and estimation strategy

According to our theory we focus on parliamentary democracies to empirically analyze political determinants of agricultural protection.<sup>10</sup> A country is defined as a parliamentary democracy if the country has a *polity* score, provided by the Polity IV data set, above zero (see database of Marshall et al., 2008) and if the constitution provides the presence of a vote of confidence and the separation of the head of state and the head of government (see database of Lundell and Karvonen (2003) and of

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<sup>10</sup>These countries include: Australia, Austria, Canada, Czech Republic, Denmark, Estonia, Hungary, Iceland, India, Japan, Latvia, Lithuania, Malaysia, New Zealand, Norway, Poland, Portugal, Romania, Slovak Republic, Slovenia, Sweden, Switzerland, Turkey.

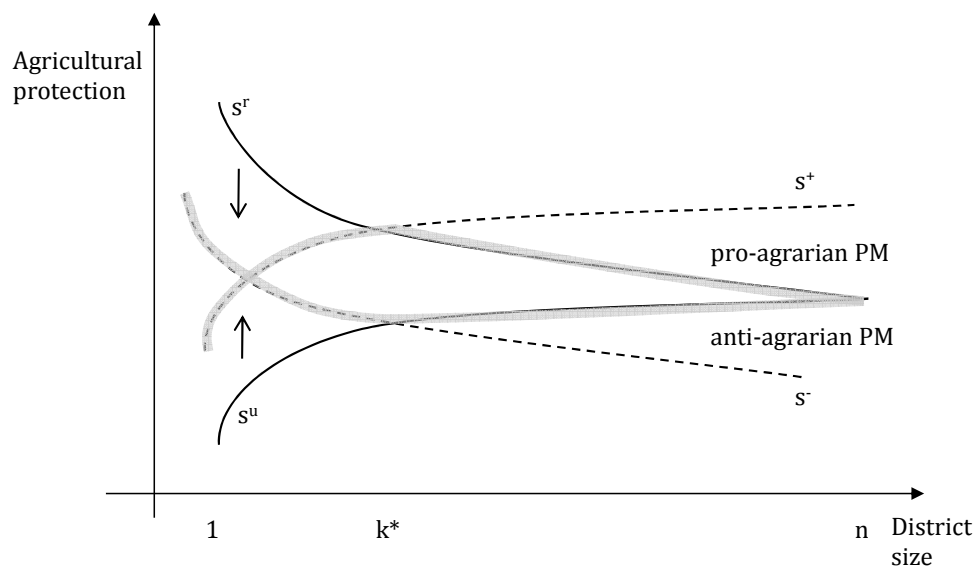


Figure 2.1: Legislator's ideal points (black thin lines), legislator's ideal points with rent  $\gamma$  (black dashed lines) and policy outcomes (grey bold lines) conditional on district magnitude

Source: Authors.

Beck et al. (2001)).<sup>11</sup> All country-years where both requirements were fulfilled are included into our analysis. But countries belonging to the European Union (EU) are excluded from our analysis, because the European Common Agricultural Policy (CAP) is negotiated at the supranational level by EU institutions thus not meeting the prerequisites of our theoretical approach.<sup>12</sup>

As dependent variable we use the Nominal Rate of Assistance to Agriculture (*NRA*), which is an advanced measure of agricultural protection provided by Anderson and Valenzuela (2008). The *NRA* is calculated as a weighted average of commodity-specific *NRA*s using the undistorted production values of the commodities as weights. Analogously to the commonly used Producer Support Estimate (PSE) published yearly by the OECD, the *NRA* includes indirect market interventions such as direct transfer payments or exchange rates distortions, respectively.

Related to our main theoretical conclusions we define the following three electoral systems based on the principle of district size: (1) a majoritarian system where only one legislator gets elected in a district, (2) a mixed system where on average 2 up to 9.9 legislators are elected per district and (3) a proportional representation system where 10 or more legislators get elected per district on average in a country. This results in two binary indicator variables as set of institutional variables  $I = \{maj, prop\}$ , where  $maj=1$  indicates a majoritarian and  $prop=1$  indicates a pro-

<sup>11</sup>If these data sets differ in their classification or if countries are not clearly coded as parliamentary or presidential, we use further information by Ismayr (2002a), Ismayr (2002b), Lijphart (1999) and Armingeon et al. (2008).

<sup>12</sup>Note that countries are dropped from our sample one year before their EU accession in order to account for a possible impact of anticipated CAP.

portional electoral rule, while  $maj = prop=0$  indicates a mixed system. Information on district size is taken from data sets of Lundell and Karvonen (2003) and of Beck et al. (2001). The data sets are supplemented by data of the Inter-Parliamentary Union (2008). Such classification particularly allows to analyze the impact of an intermediate system between a pure majoritarian and a pure proportional representation system on special interest politics.

We also use  $distr$  as a continuous measure of district size for robustness checks.  $distr$  is defined as the relation of total number of electoral districts divided by total number of parliamentary seats. By construction  $distr$  ranges between 0 and 1, taking a value of 1 for pure majority systems and a value close to 0 for pure PR systems. Because our theory implies a non-linear relationship between district size and agricultural protection, our set of institutional variables  $I$  consists of the variables  $distr$  and  $distr2$ , the squared district size, for the robustness checks.

Following existing studies the set of macroeconomic controls, denoted as  $X$  for the time varying and  $Z$  for the country specific variables, includes the initial gross domestic product (GDP) per capita ( $initialgdppc$ ), the real GDP per capita growth ( $gdppcgrowth$ ) (included to capture in combination the state of economic development), the logarithm of agricultural share in employment ( $empll$ ) to account for differences in economic structure and industrialization, the ratio of the agricultural share in value-added and the agricultural share in employment ( $compad$ ) to proxy comparative advantages in agriculture, and arable land per farm worker ( $factorend$ ) to take the relative incomes of agricultural farmers into account (see for information on this variables Tyers and Anderson, 1992; Beghin and Kherallah, 1994; Swinnen, 1994; Olper, 2001; Anderson, 2008). Following Beghin and Kherallah (1994) we define  $budget$  as the net agricultural export per capita in order to account for governmental budget constraints. In particular, budget costs due to agricultural trade policy crucially depend on the country's agricultural net trade position. All used economic and demographic control variables were calculated using data available from the World Bank database of development indicators and the database of the Food and Agriculture Organization of the United Nations (FAOSTAT, 2008; World Bank, 2008).

Overall, our sample corresponds to unbalanced time-series cross-section data including 23 countries with an average time period of 17.7 years per country.<sup>13</sup> In response to the given data structure, the modeling of country specific heterogeneity and the consideration of model dynamics need to be addressed by the econometric specifications in order to provide a valid assessment of the influence of political institutions on the level of agricultural protection. Note that the issue of possible endogeneity of institutional variables is discussed in detail in Section 2.3.3.

We start with the following baseline two-way fixed effects specification, which is related to the model proposed, among others, by Wallace and Hussain (1969):

$$NRA_{it} = \rho X_{it} + \nu I_{it} + \varphi_t + \xi_i + \epsilon_{it}, \quad i = 1, \dots, N, \quad t = D(i), \dots, T(i), \quad (2.29)$$

with  $N$  denoting the number of countries,  $D(i)$  the first and  $T(i)$  the last observation for country  $i$ , where  $NRA_{it}$  denotes the measure of agricultural protection,  $X_{it}$

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<sup>13</sup>Summary statistics of all variables are presented in Table 2.2 in the appendix.

refers to the set of macroeconomic control variables (including a constant, when the model does not include country specific effects),  $I_{it}$  denotes the set of institutional indicators, and  $\varphi_t$  and  $\xi_i$  represent time and country specific effects, respectively.

This baseline specification in eq.(2.29) addresses the issues of country specific heterogeneity via consideration of country specific effects  $\xi_i$  and accounts for year effects with time fixed effects. The latter are included into the regression to consider the impact of year specific events like an oil crisis. However, this specification hinders the direct incorporation of country specific time-invariant variables (see Greene, 2010). Given the fact that our used institutional indicators are time-variant, though rarely changing, a regression with country fixed effects is applicable, though not necessarily optimal. Therefore, we follow an alternative modeling of country specific heterogeneity providing as a byproduct possibly more efficient estimation results.<sup>14</sup> Based on a cross validation experiment discussed by Stone (1974) and adapted to time-series cross-section data by Beck et al. (2001), we test whether heterogeneity is related to groups of countries. Therefore we estimate the model specification of eq. (2.29) neglecting country specific fixed effects, but including initial GDP per capita as a time invariant variable, i.e.

$$NRA_{it} = \rho X_{it} + \nu I_{it} + \varphi_t + \xi Z_i + \epsilon_{it}. \quad (2.30)$$

We estimate the specification of eq. 2.30  $N$ -times with  $N-1$  countries and predict the  $NRA$  of the left out country to identify country specific heterogeneity via computed mean squared forecast errors (MSFE). Based on the comparison of country specific MSFE's with average MSFE, we were able to identify countries that are less well predicted via pooled regression. With this information at hand we construct a dummy variable for the less well predicted countries and introduce it into eq. (2.30) to capture identified unobserved heterogeneity. Now,  $Z_i$  incorporates country specific information as well as a group indicator. This specification puts more emphasis on the cross-section variation, which may be preferable to analyze the impact of rarely changing political institutions in terms of estimation efficiency.

After controlling for country specific heterogeneity we deal with specifying model dynamics. It is well-known in the literature that significance testing in specifications as given in specifications 2.29 and 2.30 is possibly subject to substantially inflated  $t$ -values, when the issue of model dynamics and autocorrelation is not properly addressed (see Bertrand et al., 2004). To deal with this issue, we check the robustness of results via the inclusion of the lagged dependent variable,  $NRA(t-1)$ , as an explaining factor.

Note that inference for these specifications is based on cluster robust standard errors defining countries as clusters as suggested by White (1980). However, as noted by Cameron et al. (2008) these standard errors although controlling for both heteroscedasticity and general correlation patterns within clusters will generally still be

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<sup>14</sup>As a possible alternative Plümper and Troeger (2007) suggest a three-step procedure to estimate time invariant and slowly changing variables in the presence of country heterogeneity. However, several authors have criticized this approach, recommending instead the application of a standard Hausman-Taylor model or a shrinkage estimator combining the Hausman-Taylor and the Plümper and Tröger approach (Greene, 2010; Mitze, 2009; Breusch et al., 2010). Estimation of these alternative models, however, essentially reproduced results presented here.

biased downwards. We hence adapt the proposed wild cluster residual based bootstrap of Cameron et al. (2008) in order to perform a robust test of the hypothesis that electoral rules influence agricultural protection as suggested by theory.<sup>15</sup> Note that this strategy is accompanied by a careful check of the adequate model specification incorporating features of latent heterogeneity and serial correlation as outlined above based on the Akaike (*AIC*) and Schwarz (*BIC*) information criteria.

### 2.3.2 Results

Following our estimation strategy, we present in Table 2.1 five model specifications corresponding to the different approaches discussed above. Model 1 corresponds to the standard fixed effects specification in eq.(2.29). Specification 2 is based on eq.(2.30) to perform out-of-sample predictions as described above. By comparing the country specific MSFEs, we see that Norway, Iceland and Switzerland are less well predicted by a pooled model with country specific time invariant variables than other countries. These three countries can be seen as peripheral European countries with high GDP per capita and a highly specialized agricultural sector. Thus, we include a dummy *Protec*<sup>+</sup> in specification 3 as an additional Z-variable to tackle this group related unobserved heterogeneity. The positive coefficient of this country group dummy reveals that these countries tend to more highly subsidize their agricultural sector compared to other parliamentary democracies. To compare non-nested model specifications 1 to 3, we refer to the standard information criteria, the *AIC* and *BIC*. Both criteria indicate that specification 1 is preferable when compared to specification 2. However, according to the *BIC* criterion, model 3 is preferred when compared to the standard fixed effect model 1. Note that the *AIC* often prefers overparameterized model specifications. After checking the correct modeling of country heterogeneity, we next deal with model dynamics endemic to our type of data.

In Table 2.1 specification 4 reports estimation results from a dynamic specification including a lagged dependent variable into model specification 3. The coefficient of the lagged dependent variable turns out to be highly significant. Intuitively, the use of a lagged *NRA* can be explained by a slow annual speed of adjustment of agricultural policies to changing socio-economic framework conditions. Altogether model 4 is our preferred model.<sup>16</sup> Finally, we perform in model specification 5 a first robustness check of our results replicating specification 4 with  $I = \text{distr}, \text{distr}2$ . Further robustness checks are postponed to Section 2.3.3, where we discuss the problem of possibly endogenous institutions in more detail.

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<sup>15</sup>In detail, we follow the strategy outlined in Appendix B of Cameron et al. (2008) based on the Wald type test statistic for assessing the hypothesis  $\nu = 0$ , i.e.

$$W_\nu = \hat{\nu}' \tilde{\Sigma}_\nu^{-1} \hat{\nu},$$

where  $\hat{\nu}$  denote the estimate of  $\nu$  and  $\tilde{\Sigma}_\nu$  the corresponding covariance matrix.

<sup>16</sup>Please note, however, that our central results are unaffected by model specifications as proposed and discussed by Greene (2010). We also examined a dynamic specification of model 1, but both information criteria reveal that a specification with modeling group related heterogeneity and a lagged dependent variable is preferred. Estimation results for all model specifications are available from the authors upon request.

We start with interpreting the standard controls.<sup>17</sup> As predicted by Olson's theory, we find a negative and highly significant impact of the agricultural employment share *emplln* on agricultural protection for all model specifications except specification 2. A low share of employment in agriculture indicates low costs of collective action for agricultural voter groups due to a decreasing free-riding problem and, thus, implies *ceteris paribus* higher agricultural protection. The negative sign for the variable *compad* is in line with the theory and empirical finding of Honma and Hayami (1986), where lower comparative advantages in agriculture increase the demand for agricultural protection. This parameter is only statistically significant for model specifications 1 and 3. Analogously, the negative coefficient of *factorend* estimated for all model specifications corresponds to the relative income hypothesis of Tyers and Anderson (1992) and de Gorter and Tsur (1991), predicting decreasing rates of assistance with increasing relative income of the agricultural sector. This variable turns out to be statistically significant in all specifications.

For the control variables *inititalgdppc*, *gdppcgrowth* and *budget*, however, some variations in the significance and sign of estimated parameters can be observed across model specifications. In particular, following the development-paradox hypothesis a positive parameter for both *inititalgdppc* and *gdppcgrowth* is expected. As can be seen from Table 2.1 according to our estimation all model specifications display a positive sign for *gdppcgrowth*, which is in line with the development paradox by Tyers and Anderson (1992), but the impact is not significant for model 2 and 3, while for *inititalgdppc* a significant and positive parameter is only found for model 2. The estimated *budget* parameter displays the correct negative sign for the specifications 2-5, but it is only significant for model 2, while for model 1 it is even significantly positive contradicting Beghin and Kherallah (1994), who state that increasing budget expenditures to finance agricultural protection *c.p.* reduce protection levels. However, also Beghin and Kherallah (1994) got mixed results for this variable.

Now we turn to our central explaining variables, *maj* and *prop*, describing electoral rules. For all model specifications we find highly significant and negative coefficients for both variables *maj* and *prop*. Interpreting the estimated parameters of our preferred specification as causal effects would imply that the maximum increase in agricultural protection induced by a shift from a majoritarian to a mixed system amounts to 0.11 in the short run and 0.34 in the long run. Analogously, a change from a pure proportional representation to a mixed system induces an increase in the NRA measure of 0.07 in the short run and 0.22 in the long run (see specification 4, Table 2.1). The performed Wald test assessing the hypothesis  $\nu = 0$  indicates, except for specification (1), that a simple majoritarian-proportional dichotomy is not sufficient to explain agricultural protection as a special case of redistributive politics.<sup>18</sup> Agricultural protection first increases and then decreases with district

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<sup>17</sup>Note that estimating all models without time fixed effects and with a dummy for the effect of the Uruguay negotiations in 1994 revealed similar results.

<sup>18</sup>As noted above, the high multicollinearity between fixed effects and the rarely changing institutional variables may cause the failure to reject the null hypothesis in specification (1). To investigate this issue further, we regress the estimated country fixed effects on country specific variables and the institutional variables. To deal with the occurring time variation within institutions, we classified a country according to its modal institutional setting. Regressing esti-



Table 2.1: Political Institutions and Agricultural Protection: Results

	(1)	(2)	(3)	(4)	(5)	(6)
constant	--	-0.3311 (0.3072)	0.1793 (0.1392)	0.0387 (0.0402)	-0.0698 (0.0807)	0.0514 (0.0383)
$NRA(t-1)$	--	--	--	0.6830*** (0.0356)	0.6843*** (0.0337)	0.6747*** (0.0356)
$initialgdppc$	--	0.086 *** (0.0215)	-0.0237 (0.0188)	-0.0074 (0.0063)	-0.0075 (0.0062)	-0.0125*** (0.0053)
$gdppcgrowth$	0.0130*** (0.0043)	0.0108 (0.0100)	0.0040 (0.0053)	0.0070*** (0.0027)	0.0068*** (0.0026)	0.0076*** (0.0028)
$factorend$	-0.3959** (0.1946)	-0.6793*** (0.1517)	-0.3438*** (0.1407)	-0.0981* (0.0503)	-0.0985** (0.0507)	-0.0934* (0.0505)
$budget$	0.4941* (0.2792)	-0.6327*** (0.1284)	-0.0354 (0.1078)	-0.0148 (0.0366)	-0.0156 (0.0369)	-0.0175 (0.0370)
$compad$	-0.3418* (0.2074)	0.0258 (0.3674)	-0.2333* (0.1250)	-0.0507 (0.0457)	-0.0426 (0.0451)	-0.0217 (0.0476)
$empln$	-1.0575*** (0.2818)	0.0239 (0.2179)	-0.4248*** (0.1169)	-0.1244*** (0.0379)	-0.1241*** (0.0383)	-0.1423*** (0.0385)
$maj$	-0.9982*** (0.3034)	-0.4443** (0.2011)	-0.2968** (0.1492)	-0.1090** (0.0517)	--	-0.0909** (0.0447)
$prop$	-0.9269*** (0.1902)	-0.6576** (0.2894)	-0.2086** (0.1034)	-0.0699* (0.0385)	--	-0.0691** (0.0348)
$distr$	--	--	--	--	0.5908* (0.3541)	--
$distr^2$	--	--	--	--	-0.6035* (0.3213)	--
$PROTEC^+$	--	--	2.1313*** (0.2567)	0.6428*** (0.0892)	0.6701*** (0.0869)	0.7613*** (0.0885)
Wald test $\nu = 0$	26.5915	26.3663***	13.2202*	14.3666*	13.1563*	11.3214*
AIC	-2.4531	-1.7381	-2.2745	-2.9642	-2.9617	-2.9653
BIC	-1.7636	-1.2554	-1.7821	-2.4618	-2.4593	-2.4630
Country fixed effects	yes	no	no	no	no	no
Time fixed effects	yes	yes	yes	yes	yes	yes
# of regressors	69	48	49	50	50	50
# of observations	407	407	407	407	407	407

Notes: Bootstrapped cluster robust standard errors with countries defined as clusters are given in parentheses. \* indicates significance at the 10 percent level, \*\* indicates significance at the 5 percent level, and \*\*\* indicates significance at the 1 percent level. Source: Authors.

magnitude if we control for the impact of standard control variables and address different model specifications concerning country heterogeneity and dynamic issues. Protection is *ceteris paribus* the highest for mixed electoral systems when compared to both pure majoritarian and pure proportional representation systems.

Our main findings remain robust against the specification of the electoral system (see specification 5). We substitute our dummy variables by a continuous measure of district magnitude and include the squared district magnitude in our specification. Again, estimation results support a non-linear (inverse u-shaped) relationship between district magnitude and agricultural protection.

In summary, these estimation results clearly support our theory. But the idea of endogenous electoral rules gives reason to question the identification of causal effects via model 4 in Table 2.1 and lead us to a further robustness check of our results via the implementation of instrument variable estimation as suggested by Angrist and Krueger (2001).<sup>19</sup> Strategy and results are discussed in more depth below.

### 2.3.3 Endogeneity and causal effects of electoral rules

There is a consensus among scholars of comparative political economy that political institutions and economic performance might be affected by the same factors (e.g. Acemoglu, 2005; Persson and Tabellini, 2003). Accordingly, the literature stresses the importance to control for potential endogeneity of political institutions if the goal is the identification of causal effects (see Persson and Tabellini, 2003; Acemoglu et al., 2001; Acemoglu and Johnson, 2005). Especially Persson and Tabellini (2003) have promoted to solve the endogeneity problem and to identify the causal effects of political institutions on economic performance via appropriate econometric strategies. A common approach in micro-econometrics to solve endogeneity is the instrument variable estimation (see Angrist and Krueger, 2001). The critical part within an IV estimation is to find variables that on the one hand are sufficiently correlated with the endogenous variable, but not with the error term of the explained variable, i.e. valid instruments. Otherwise the IV strategy will not solve the endogeneity problem. This leads us to discussing the origin and choice of electoral rules in more detail.

Despite the consensus about the non-random choice of political institutions in the comparative politics literature, many scholars criticize the lack of theory explaining the choice and development of political institutions (see Shugart, 2005; Benoit, 2007; Boix, 1999). The latter would especially facilitate the identification of reliable instruments. Acemoglu (2005) even argues that often instrument variables can

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mated country specific effects on a constant, *inititalgdppc*, *maj* and *prop* revealed the following results (overall  $R^2 = 0.1905$ )

$$\hat{\xi}_i = -0.9029 + 0.0292inititalgdppc_i + -0.4182maj_i + -0.0842prop_i + e_i.$$

Results clearly indicate that cross country variation within fixed effects can be explained via the considered institutions.

<sup>19</sup>Note that the possible endogeneity of macroeconomic controls has also been subject to robustness checks. We adapt the common approach in macroeconometrics which uses lagged variables as instruments. With lagged macroeconomic controls no changes with respect to significance and direction in parameter estimates occurred. Results are provided upon request by the authors.

only explain the quality of general institutional set-ups, but not the specific design of political institutions. In this case IV-estimations are unable to identify causal effects of specific political institutions. Accordingly, we refrain from using the Hall-Jones-Variables as instruments, as we are convinced by the criticism of Acemoglu (2005) that these variables are at best valid instruments for a bundle of institutions, but not for electoral rules as a specific institution. In our specific case the use of the Hall-Jones instruments is further limited due to the fact that these variables show no sufficient variance in our sample. Moreover, there is reasonable doubt on the exogeneity of colonial history, as it is correlated with other factor influencing agricultural protection, e.g. preference for a liberal trade policy for former British colonies.

Therefore, identifying potential instruments, we follow Aghion et al. (2004), Horowitz (1985), and Rokkan (1970) suggesting that social cleavages mainly determine the choice of electoral rules. In particular, we include ethnic fragmentation (*ethnic*) and the squared term of *ethnic* into our set of instrument variables, where data on ethnicity is provided by Alesina et al. (2003). Second, society's demand for political representation impacts on the choice of an electoral system (Blais and Massicotte, 1997). Accordingly, the logarithm of the geographic size of a country (*lngeo*) is included as an instrument in our model. Finally, the choice of electoral rules is at least partly also an epoch phenomenon, which leads us to consider constitutional timing variables as additional instrument variables. In particular, we define three timing dummies indicating whether a country adopted its electoral rule after 1981 (*CON81*), between 1951 and 80 (*CON5180*) or between 1921 and 50 (*CON21*), where an adoption before 1921 represents the omitted category (see Persson and Tabellini, 2003). All proposed instrument variables are theoretically unrelated to agricultural protection and are available for our sample of countries.

Based on this variable set, we estimate an instrument variable model for our preferred specification 4 in Table 2.1. We estimate a linear model for district magnitude and use forecast trajectories thereof to obtain expected values of the two institutional dummies *maj* and *prop*. These expected values are obtained as the frequencies for the forecast trajectories given as point estimates plus noise following a normal distribution with estimated variance exceeding the corresponding thresholds defining the institutional regimes, see Section 2.3.1.<sup>20</sup> Specification (6) in Table 2.1 presents the results of the main stage, results of the first stage can be found in Table 2.3 in the Appendix.

Overall, our central estimation results are robust when endogeneity is taken into account. The estimated parameters still imply an inverse u-shaped relation of district magnitude and agricultural protection. Furthermore, coefficients of the instrument variables are in line with theory and statistically significant on conventional levels, except *con2150*. The validity of our instrument variable approach is checked on the basis of a Wu-Hausman test implemented as a *F*-Test for joint significance of the expectations of institutional dummies and an Overidentification test checking whether the assumed instrument variables possess any explanatory power for the

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<sup>20</sup>Note that an alternative approach instrumenting directly the institutional dummies based on a multinomial logit model as proposed by Hirano et al. (2000) yields similar results. Results are provided by authors upon request.

residuals of the main equation and thus should be included directly.<sup>21</sup> Both tests indicate that the chosen instrument variable approach is valid. Furthermore, the Wu-Hausmann test reveals that electoral rules are not endogenous to agricultural protection. At a theoretical level this finding corresponds to Benoit (2007) who promoted the idea that especially the choice of district size is significantly driven by pure technocratic motivations, e.g. administrative costs. Of course, the latter should not be correlated with agricultural protection, thus endogeneity should not be a problem.

However, can we now really interpret estimated parameters as causal effects of electoral rules? Here, Acemoglu and Johnson (2005) have nicely pointed out that political, economic, social and legal institutions are likely evolving jointly, i.e., reinforcing each other and thus can only be observed in specific clusters. Accordingly, even if we are confident that our instruments were able to identify correct parameters, an interpretation of these parameters as a causal effect of a specific institution might still be problematic due to the fact of *clustered institutions*. Interestingly, it follows directly from our theoretical model that the specific impact of electoral rules on agricultural protectionism crucially depends on the relative political influence of agrarian when compared to non-agrarian interest groups. In specific terms only if agrarian interest groups are sufficiently strong to dominate political communication inducing voters to expect high protection outcomes a switch from majoritarian to a mixed system implies an increase in protection. In contrast, assuming agrarian interest groups are comparatively weak implies voters expect low agricultural protection levels and, hence, the same switch implies a decrease in protection. Thus, our theory of agricultural protection is a good example of Acemoglu's *clustered institutions* argument. Therefore, overall we conclude that based on our theory estimated parameters are causal effects of clustered institutions combining electoral rules, party discipline and interest groups' influence on voter beliefs. Accordingly, these can be at best interpreted as conditional causal effects of electoral rules.

## 2.4 Conclusion

Despite numerous bilateral and multilateral agreements on trade liberalization, agriculture remains highly protected in many but not all industrialized countries. Thus, inspired by new comparative political economy studies of Persson and Tabellini (2003) and others, our main aim in this article is to explain how agricultural protection levels are systematically tied to different modes of political representation in industrialized countries. To this end, this paper suggests a political economy

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<sup>21</sup>The corresponding value of the Wu-Hausman  $F$ -test statistic is 0.5685, where bootstrapped critical values suggest no joint significance of the expected institutional dummies when the observed institutional regimes are included within the regression, whilst the corresponding test statistic for checking the exogeneity of the instrument variables given as

$$R^2 \sum_{i=1}^N (T(i) - D(i) + 1) = 0.2262,$$

where  $R^2$  denotes the coefficient of determination of the regression of the residuals on the assumed exogenous instrument variables.

model that focus on the interaction effect between formal electoral rules, coalition discipline and the influence of interest groups on voters' beliefs in determining agricultural protection.

In detail, our model derives legislators' policy preferences within a probabilistic voting environment where agrarian voters are less ideologically committed when compared to non-agrarian voters. As a consequence our theory implies that, while all electoral systems tend to protect agricultural interests at the expense of the general public, especially mixed systems when compared to majoritarian or proportional systems, respectively, induce high governmental incentives to protect agriculture. Assuming agrarian interest groups have a strong influence on voters' beliefs implies voters expect a pro-agrarian policy. In this case electoral competition drives the prime minister to favor high agricultural protection, whereas urban districts are pivotal within the parliamentary majority. In bargaining within the legislature, this generates a conflict between the prime minister and the parliamentary majority, where the bargaining result mainly depends on coalition discipline. As district size grows and the electoral system converges to a pure proportional system, both of these biases are attenuated. Overall, an inverse u-shaped relationship results between district size and agricultural subsidies. Assuming, however, voter beliefs tend toward a liberal agricultural policy the prime minister tends to favor urban concerns and a rural legislator becomes decisive within his parliamentary majority. Accordingly, a u-shaped relationship results. Hence, in contrast to classical political economy approaches, our theory can explain observed large cross-country variation of agricultural protection levels even within industrialized countries. Using a dynamic panel estimation based on time-series cross-country data for 23 parliamentary democracies since 1966, our theory is confirmed empirically. Interpreting estimated parameters as causal effects would imply that electoral rules have an important impact on agricultural protection levels, e.g. quantitatively a switch from a majority to a mixed system implies an increase in protection by 34%.

However, we consider our theory of agricultural protection as a good example of Acemoglu's "clustered institutions" argument. Although our IV estimations imply that we are able to find valid instruments for electoral rule variables, estimated parameters have to be interpreted as causal effects of clustered institutions combining electoral rules, coalition discipline and interest groups. Therefore, we conclude that identified effects can be at best interpreted as conditional causal effects of formal electoral rules. Please note further that homogeneity of countries included in the data sample in regard to unobserved informal institutions is crucial for the identification of causal effects of clustered institutions. We tried to take care of this problem by following a conservative strategy that just allows to include industrialized countries protecting agriculture into our country sample. However, future research might focus on more advanced estimation techniques, e.g. applying switching regression models with latent regimes that allow identification of causal effects even within a more heterogeneous sample comprising of industrialized and developing countries.

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## 2.A Appendix

### 2.A.1 Proof of proposition 2

Part (1) and (2) follow directly from proposition 1 given the assumption that only two types of legislators' preferences, rural and urban, exist. These preferences correspond to an additive SWF characterized by specific relative weights of the agricultural population,  $\beta_{u_k}^A$  and  $\beta_{r_k}^A$ , which depends on the relative shares of the agricultural population in the rural and urban district, respectively.

Proof of Part (3): Note that for any common voter belief  $s^0 \in S_k$  it holds:

$$\Pi_u(s^0) = \Pi_r(s^0) = 0.5. \quad (2.31)$$

Note further that it holds:

$$\begin{aligned} \Pi_u(s) > 0.5 \quad \Pi_r(s) < 0.5 & \quad \text{for } s_k^- \leq s < s^0 \\ \Pi_u(s) < 0.5 \quad \Pi_r(s) > 0.5 & \quad \text{for } s_k^+ \geq s > s^0 \end{aligned} \quad (2.32)$$

Therefore, it follows that  $Y_k^{PM} = s^0$  delivering directly part 3. Finally, to prove part (4) assume electoral competition implies that  $Y_k^{PM} > \bar{s}_k$ . For simplicity we assume  $C_A = 1^{22}$ , then it follows:

$$Y_k^{PM} = \min \{s_k^+, s_k^r\} \quad (2.33)$$

Then using part (2) the final policy outcome results as:

$$s_k^* = \min \{Y_k^{PM}, s_k^+\} \quad (2.34)$$

By assumption it holds:

$$\alpha_{d_k}^A \leq \alpha_{d_{(k-1)}}^A \quad \forall d \in D^R \quad \text{and} \quad \alpha_{d_k}^A \geq \alpha_{d_{(k-1)}}^A \quad \forall d \in D^U \quad (2.35)$$

Thus, it directly follows:

$$s_k^r \geq s_{k+1}^r, \quad s_k^u \leq s_{k+1}^u, \quad s_k^- \geq s_{k+1}^-, \quad s_k^+ \leq s_{k+1}^+ \quad (2.36)$$

Therefore, it follows that if there exists a  $k^+ = 1, \dots, n$  such that it holds:  $s_{k^+}^r \leq s_{k^+}^+$ , then it already holds:

$$s_k^r \leq s_k^+ \quad \forall k \geq k^+ \quad (2.37)$$

Obviously, there always exists such a  $k^+$ , i.e., eq. 2.37 holds for  $k^+ = n$ . We define  $k^*$  as the minimum of all  $k^+$ 's for which eq. 2.37 holds. Trivially,  $k^*$  always exists and it follows:

$$\begin{aligned} Y_k^{PM} &= \min \{s_k^+, s_k^r\} = s_k^+ \quad \forall k < k^* \\ Y_k^{PM} &= \min \{s_k^+, s_k^r\} = s_k^r \quad \forall k \geq k^* \end{aligned} \quad (2.38)$$

Therefore, it follows that  $s_k^*$  equals  $s_k^+$  for all  $k < k^*$  and  $s_k^*$  equals  $s_k^r$  for all  $k \geq k^*$ .

<sup>22</sup>Please note that the proof will not change substantially if we assume that  $C_A$  is lower, but sufficiently close to 1.

Thus, the first statement of part (4) is proven. The proof of the second statement is perfectly analogous (assuming  $C_A = 0$ ) and therewith *proposition 2* is proven.

*Q.E.D.*

## 2.A.2 Data description

Table 2.2: Summary statistics

Variable	Mean	Standard Deviaton	Minimum	Maximum
NRA	0.713	0.938	-0.244	4.239
initialgdppc	14.094	6.956	1.583	33.295
gdppcgrowth	2.570	3.181	-15.840	12.507
compad	0.652	0.277	0.219	1.991
factorend	0.209	0.337	0.004	1.255
budget	0.024	0.390	-0.926	1.547
emplln	-2.340	0.729	-4.142	-0.502
distr	0.383	0.411	0.007	1.000

## 2.A.3 Endogeneity of district magnitude

Table 2.3: Instrument variable estimation: first step

	(1)
con	-2.0705*** (0.4635)
ethnic	3.8067*** (0.8445)
ethnic2	-4.5112*** (1.1580)
lngeo	0.1644*** (0.0331)
con2150	-0.0445 (0.1060)
con5180	0.1804** (0.0889)
con81	-0.4534*** (0.1548)
R <sup>2</sup>	0.8382

Notes: Cluster robust standard errors are given in parentheses. \* indicates significance at the 10 percent level, \*\* indicates significance at the 5 percent level, and \*\*\* indicates significance at the 1 percent level. Source: Authors.

## Chapter 3

# Constitutional Rules, Informal Institutions and Agricultural Protection in Developing and Industrial Countries: Theory and Empirical Evidence

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Selected Paper prepared for presentation at the Agricultural & Applied Economics Association's 2012 AAEA Annual Meeting, Seattle, Washington, August 12-14, 2012.

### Abstract

This paper empirically investigates the interaction of formal and informal political institutions as well as lobbying in determining the ability of agriculture to avoid taxation or attract government transfers. Based on our theory, we identify specific interaction effects between district size and political as well as demographic framework constellations that determine two different regimes, e.g. an u-shape and an inverse u-shape relation between district size and the level of agricultural protection. Further, our theory predicts different patterns of how these interaction effects impact on agricultural protection levels in developing and industrialized countries. Using time-series cross-section data, this paper tackles the quantitative assessment of the theoretical implications. We estimate latent regimes of agricultural protection and assess the role of political institutions in agricultural policy. We check our results for robustness concerning dynamic specification issues and latent heterogeneity. Furthermore, we gauge the possible endogeneity of institutions via an extended treatment framework.

*Keywords:* comparative political economy; agricultural protection; political institutions; lobbying; latent policy regimes; endogeneity of political institutions

### **3.1 Introduction**

Reviewing the literature to date important questions about the determinants of agricultural protection or taxation, respectively, are still unsolved. In particular, two strands of literature exist that contribute to the understanding of international agricultural policy patterns.

A first strand corresponds to classical political economy models of agricultural protection that understand final policy outcomes as the result of political bargaining among various social groups for income redistribution. While these models explain observed differences in agricultural protection comparing industrialized and developing countries (i.e. explaining agricultural protection with the development paradox), these approaches fail to shed light on observed large cross-country differences in agricultural protection among industrialized or developing countries, respectively. As these models neglect political institutions, they might be the missing link. More recently, based on the well-known work of Beghin and Kherallah (1994), Beghin et al. (1996) and Swinnen et al. (2000b), Thies and Porche (2007) as well as Olper and Raimondi (2009) provide a comprehensive econometric analysis of the political determinants of agricultural protection, including socio-economic factors as control variables. Neither Thies and Porche (2007) nor Olper and Raimondi (2009), however, provide a comprehensive political economy theory of agricultural protection that explains the observed effects of political determinants on agricultural protection. They derive their hypotheses rather ad hoc applying various existing political economy theories on protection.

The second strand of literature corresponds to theoretical and empirical studies analyzing the impact of the constitutional rules on policy outcomes. Since the seminal papers of Persson and Tabellini (1999, 2000, 2003) the question how constitutional rules influence economic policies and hence economic performance is definitely on top of the research agenda in comparative political economy. In this context, Acemoglu and Johnson (2005) demonstrate that identifying causal effects of formal constitutional rules is a complex undertaking. In particular, Acemoglu and Johnson (2005) argue that disentangling the impact of formal constitutional rules from the impact of informal institutions, like for example legislative norms or lobbying influence, is often plagued by the problem of "clustered" institutions. "Clustered" institutions describe the fact that a combination of mutually reinforcing formal and informal institutions evolve jointly (Acemoglu and Johnson, 2005). Thus, observed political outcomes are the result of both informal and formal rules of the political game. Identifying true causal effects of formal constitutional rules demands therefore for a comprehensive theory reflecting the interaction of formal and informal political institutions. Additionally, adequate econometric techniques must be used to guarantee a valid empirical identification of these disentangled theoretical effects.

In this regard, this paper analyzes the impact of electoral rules on agricultural protection levels where we especially focus on the question how this impact is influenced by the specific legislative organization in presidential versus parliamentary systems as well as by lobbying and the demographic composition of a society. In particular, we make the following theoretical and empirical contributions to the understanding of agricultural protection patterns around the world.

First, we develop a micro-political founded theory to understand the interaction of formal and informal political institutions in determining the level of agricultural protection or taxation, respectively. In our theory, we explicitly derive legislators' policy preferences from electoral competition and final policy outcomes from postelection bargaining in legislatures. In detail, our model derives legislators' policy preferences within a probabilistic voting environment assuming different electoral rules, where, depending on their relative group size, agrarian and non-agrarian voters are differently ideologically committed. This implies heterogeneous agricultural policy preferences for legislators being elected in urban or rural dominated constituencies. Following Lohmann (1998) ideological bias of agrarian population will be higher the higher the share of the latter in total population. Accordingly, this generates a conflict between legislators in bargaining at the legislature. In a parliamentary system, this conflict is generated between the prime minister, who will tend to favor rural or urban districts, and her parliamentary majority that will be dominated by the opposite urban or rural concerns. Legislative bargaining in a presidential system is characterized by a conflict between the median of the agricultural committee, who will tend to favor rural (urban) districts, and the floor median, who tends to favor the opposite urban (rural) districts in industrialized (developing) countries, respectively.

At the election stage, asymmetric lobbying activities amplify preference heterogeneity. Since district populations become more homogenous with increasing district size, the heterogeneity in preferences is attenuated, when district size grows and the electoral system converges to a pure proportional representation. Moreover, political exchange in legislative bargaining translates legislators' preference heterogeneity in more extreme policy results. Based on our theory, we are able to identify specific interaction effects between district size and distinct political as well as demographic framework constellation. In fact, two different regimes can be characterized, i.e. an u-shape and an inverse u-shape relation between district size and the level of agricultural protection. Moreover, we identify monotonically decreasing or increasing as well as constant relations as special cases of these two regimes. Further, we show that political, economic and demographic framework differing between developing and industrialized countries, respectively, imply specific different patterns of how the interaction of electoral rules, formal and informal legislative norms and lobbying impacts on agricultural protection levels in these two country types.

Second, our hypotheses are tested empirically using the data set of protection measures provided by Anderson et al. (2008). Our sample includes cross-country panel data for 52 countries over the time period 1961-2005. Since our theory derives an impact of district size on agricultural protection dependent on an unobserved policy regime induced by demographic, economic and political framework conditions, we apply a switching regression model to account for different latent policy regimes. As regimes are unobserved, the probability to be in either regime depends on country specific characteristics and is parameterized as a logit-type probability. We consider up to six policy regimes. Our results are robust with respect to considering serial correlation endemic to time-series cross-section data via a lagged dependent variable. Also robustness of empirical results with respect to potential endogeneity of political institutions is checked using a two-step approach as advocated and discussed by

Angrist and Krueger (2001).

This paper starts in Section 2 with introducing the theoretical model. While Section 3 describes the applied econometric estimation strategy and used data sets, Section 4 summarizes our main results and tests for the potential endogeneity of political institutions. Section 5 concludes and gives an outlook on future research.

## 3.2 Theoretical model

### 3.2.1 The population and economy

Consider an economy that is subdivided into two sectors, agriculture and manufacture. The group of voters economically active in the agricultural sector is the rural population denoted by  $A$ , while the urban population corresponds to the group of voters economically active in the non-agricultural sector denoted by  $M$ . Agricultural policy is considered as a redistribution between the agricultural and non-agricultural sector. For simplicity we assume that income redistribution occurs via subsidization and taxation, where two different policy regimes are considered. In particular, let  $s_A$  and  $s_M$  denote the per capita subsidy paid to rural and urban population, while  $t_A$  and  $t_M$  denote corresponding per capita tax. Accordingly,  $s_A - t_A$  is the net-subsidization of rural population, where a positive net subsidy, i.e.  $s_A - t_A > 0$  indicates a *agricultural subsidy regime* and vice-versa a negative net-subsidy,  $s_A - t_A < 0$  indicates a *agricultural tax regime*.

Any feasible agricultural policy,  $(s_A, t_A)$  must satisfy the following budget constraint:

$$t_M = \frac{\alpha_A}{\alpha_M} \tilde{\Gamma}^S(s_A) \Leftrightarrow t_M = \Gamma^S(s_A) \quad (3.1)$$

$$s_M = \frac{\alpha_A}{\alpha_M} \tilde{\Gamma}^T(t_A) \Leftrightarrow s_M = \Gamma^T(t_A) \quad (3.2)$$

The functions  $\tilde{\Gamma}^S$  and  $\tilde{\Gamma}^T$  include per capita deadweight costs (Becker, 1983), where it holds:  $\tilde{\Gamma}^S(s_A) > s_A, s_A > 0$  and  $\tilde{\Gamma}^T(t_A) < t_A, t_A > 0$ . Moreover, we assume increasing per capita deadweight costs, i.e.  $\tilde{\Gamma}^S$  is strictly convex and increasing in the level of subsidization, while  $\tilde{\Gamma}^T$  is strictly concave and decreasing in the level of taxation. Deadweight costs significantly vary across various agricultural policy instruments. However, we do not focus on the choice of economically efficient redistribution instruments, although discussion on agricultural policy is to a large extent concerned about this issue (de Gorter and Swinnen, 2002; Becker, 1983; Lohmann, 1998).

Assuming identical individuals for both groups implies the following welfare function of each member given agricultural policy  $(s_A, t_A)$ :

$$W^A = Y_A^0 + s_A - t_A; \quad W^M = Y_M^0 + \Gamma^T(t_A) - \Gamma^S(s_A)$$

$Y_A^0$  and  $Y_M^0$  denote the equilibrium income of rural and urban population, respectively, without any agricultural policy intervention. Note further, that due to deadweight costs efficient agricultural policy implies:  $t_A * s_A = 0$ . That is efficient net-subsidization of agriculture implies that agricultural taxation is zero, and vice



versa, efficient net-taxation of agriculture implies that agricultural subsidy is zero. Accordingly, we can focus on the net subsidization  $s = s_A - t_A$  analyzing agricultural policy. A net-subsidization  $s > 0$  corresponds to a subsidization level  $s_A = s$  and a taxation level of  $t_A = 0$  and vice versa a net-subsidization  $s < 0$  implies a subsidization of  $s = 0$  and a taxation level of  $t_A = -s$ .

## 3.2.2 The political system

### 3.2.2.1 Legislative decision-making

A legislative system of a country consists of a finite set of political agents  $N$  where  $i = 1, \dots, n$  denotes a generic element of the legislative system. Within the legislative system specific institutions can be defined as subsets of  $N$ . In democratic regimes the government,  $G$ , and parliament,  $P$  are known as common subsets of the legislative system  $N$ . Furthermore, democratic legislative systems are characterized by separating government and parliament into further subunits, i.e. governmental departments or ministries and committee systems, respectively. According to the division-of-labor argument, different committees and governmental departments are usually responsible for different policy domains (Shepsle, 1979). In particular, we denote  $C_A$  as the agricultural committee and  $G_A$  as the agricultural department, respectively.

The legislative process in democratic systems typically begins when the government submits a bill to the parliament.<sup>1</sup> Then the responsible committee works on the bill to present parliament the government proposal including their recommended amendments. On the floor, there is a final vote on the entire bill, where additional amendments might be submitted or not. Beyond this general structure, the organization of legislative procedures varies, where in the political science literature two ideal typical regimes, a presidential and a parliamentary system, are defined. Thus, to analyze the impact of the organization of legislative decision-making under these two regimes on agricultural protection, we can focus on the interaction between the government,  $G$ , the agricultural committee,  $C_A$ , and the floor,  $F$ .<sup>2</sup>

For our formal analysis we consider the net-subsidization of agriculture  $s \in S$  as the relevant agricultural policy outcome, where  $S$  is the interval  $[-1, 1]$ , where  $s = -1$  implies maximal taxation and  $s=1$  maximal subsidization of agriculture.<sup>3</sup>

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<sup>1</sup>Although in most democratic systems members of the parliament can initiate legislation if there is no proposal of the government.

<sup>2</sup>Note that in general government, floor and the agricultural committee consist of multiple members.

<sup>3</sup>For simplicity we focus our analysis on a unique net-subsidization level, although in reality net-subsidization levels vary across agricultural commodities. However, it is straightforward to extend our analysis to multiple agricultural commodities. In this case  $s \in S$  is a convex compact subset of the  $m$ -dimensional cube  $(-1, 1)^m$ , where  $m$  is the number of agricultural commodities.  $s_r$  is the  $r$ 's component of  $s$  and denotes the protection level of the commodity  $r$ .  $s_r = -1$  implies maximal taxation, while  $s_r = 1$  corresponds to some maximal protection level for commodity  $r$ . Assuming protection levels are separately decided for each agricultural commodity  $r$  implies that our results derived for the one-dimensional case can be directly applied to the multidimensional case. Please note that as matter of fact in most countries agricultural protection levels are decided in separate legislative acts for each commodity. However, the assumption of separability is not essential for our theoretical results, but rather make analyses

### 3.2.2.2 Parliamentary system

It has been nicely demonstrated by Huber (1996) as well as Diermeier and Feddersen (1998) that parliamentary systems are characterized by a stable ex ante majority coalition built among legislators, where legislative decision-making occurs solely within the majority coalition. The rationale of ex ante majority coalition building corresponds to the fact that this coalition at least weakly increases the utility of all majority members when compared to their utilities derived under a default outcome  $\bar{s}_I, I = A, M$  resulting under non-cooperative behavior of legislators. In particular, ex ante fixed parliamentary majorities are able to guarantee their members higher utilities due to an additional rent legislators realized from being part of a stable majority (Huber, 1996).

Following Huber (1996) as well as Diermeier and Feddersen (1998), we suggest a rather simple legislative majority bargaining game that captures the essential characteristics of legislative bargaining in parliamentary systems. In particular, we can concentrate on the prime minister,  $PM$ , and her parliamentary majority  $P_{inc}$  that is ex ante identifiable for modeling legislative decisions.  $P_{inc}$  is a finite subset of the set of all legislators  $N$  and  $g \in P_{inc}$  is a generic element of  $P_{inc}$ .  $P_{inc}$  could correspond to a multi-party coalition or a single majority party. However, to simplify following analyses at the election stage we assume a two-party set-up, i.e.  $P_{inc}$  corresponds to all parliamentary members of the majority party, where  $P_{opp}$  denotes the opposition party. Moreover, we generally assume that  $PM$  is also the party leader of the majority party.

The model of legislative bargaining in parliamentary systems has two stages. At the first stage, we model the default policy outcome  $\bar{s}$ . Agents' policy preferences can be represented by a single-peaked function  $U_i(s)$ . Please note that we will explicitly derive legislators' single-peaked preferences from political support maximization applying a probabilistic voter model incorporating interest group activities below.

Let  $Y^i$  denote the ideal point of legislator  $i$ , i.e.  $Y^i$  is the maximum of  $U_i(s)$ . According to their single-peaked policy preferences each political agent desires to achieve policy outcomes that are as close as possible to her ideal position  $Y_i$ . Obviously, under this assumption the well-known median voter theorem applies, i.e. the unique equilibrium outcome of the non-cooperative legislative decision-making game neglecting any ex ante coalition building is the ideal point of the floor median (Black, 1958), i.e. denoting the latter by  $Y^F$  the default policy results as  $\bar{s} = Y^F$ .

At the second stage, the bargaining improving legislators utility derived under the default outcome within the majority occurs. In detail we assume two steps. At a first step the PM proposes a policy,  $s^{par}$ , to her parliamentary majority and announces side payments  $\gamma$  being paid to each member of the majority in case it admits the governmental proposal. Regarding content, we interpret these side payments as a rent the  $PM$  can pay to the majority due to specific formal legislative procedures, e.g. issuing a confidence vote, or informal procedures, i.e. the possibility to generate favors in terms of political career for party members. In this paper, we are not specifically interested in modeling exactly how the  $PM$  can generate this rent, but generally subsume this under the term party or coalition discipline, that is exerted

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more traceable.

by the *PM*. In fact, the specific procedures for exerting party or coalition discipline vary across political systems. Our major point is that these procedures allow the *PM* to extract political favors from its majority and that is what we capture, introducing some party discipline in our modeling strategy<sup>4</sup>.

At the second step, each individual majority member can decide whether or not to accept the governmental proposal. If all majority members accept the governmental proposal, the proposed policy,  $s^{par}$ , is the final legislative decision, and all majority members receive the announced rent. Otherwise, the default policy  $\bar{s}$  is the legislative decision and no rent is paid.

We assume that legislators value the rent  $\gamma$  offered by the prime minister, i.e. overall we assume that legislators maximize the sum of actual rent,  $\gamma$ , and the utility derived from policy,  $U_g(s)$ .

Under these assumptions the legislative majority bargaining game has a unique subgame perfect Nash equilibrium, where  $s^{par}$  denotes the equilibrium outcome that is characterized in *proposition 1*.

**Proposition 1.** *Assuming a one-dimensional agricultural policy choice  $s$ , there exists a unique subgame perfect Nash equilibrium for our legislative majority bargaining game defined above. The equilibrium outcome,  $s^{par}$ , depends on the rent,  $\gamma$ , the default policy outcome,  $\bar{s}$ , and the policy preferences of the *PM* and of the majority members,  $g$ .*

1. *In equilibrium, agricultural policy choice  $s^{par}$  results from the following maximization:*<sup>5</sup>

$$s^{par} = \arg \max_s U_{PM}(s) \quad s.t. \quad s \in \bigcap_g S_g, \quad (3.3)$$

where  $S_g = \{s \in S \mid U_g(s) + \gamma \geq U_g(\bar{s})\}$ .

2. *In particular, it holds that the outcome of the legislative bargaining game corresponds to the minimal distance between the ideal point of the *PM* and the interval  $[s_1^-, s_1^+]$ :*

$$s^{par} = \arg \min_s \|Y^{PM} - s\| \quad s.t. \quad s \in [s_1^-, s_1^+] \quad (3.4)$$

where  $s_1^- = \min_g \bigcap S_g = Y^F - \gamma$  and  $s_1^+ = \max_g \bigcap S_g = Y^F + \gamma$ .

*Proof: see appendix.*

If the rent  $\gamma$  is sufficiently large or if legislators' preferences are sufficiently homogeneous, the final agricultural policy outcome corresponds to the ideal point of

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<sup>4</sup>Note further that we assume that at this stage the *PM* can commit to paying the rent. However, this assumption is not necessary; in a richer modeling set-up including the specific procedures it is possible to get essentially the same result without assuming this kind of commitment Ashworth and de Mesquita (2004).

<sup>5</sup>Note that the maximization problem always has a unique solution, as long as the utility functions of legislators are strictly concave. Note that all sets  $S_g$  are compact and convex subsets of  $S$ .

the prime minister. Under this condition, our model corresponds to pre-election political models, which generally assume that governmental policy simply corresponds to political preferences of the party leader who becomes the omnipotent head of government after elections. If party discipline, i.e. the rent  $\gamma$ , is not sufficiently high or analogous, policy preferences of the *PM* and her parliamentary majority are sufficiently heterogeneous, agricultural policy outcome is no more fully determined by the *PM*'s policy preferences. Under this assumption, policy outcome is also determined by the intersection set of the subsets  $S_g$  that is determined by the policy preferences of the majority members, the rent  $\gamma$  and the default policy,  $\bar{s} = Y^F$ .

Regarding the policy preferences of legislators, it is generally assumed that they reflect agents' interest in political support by politically responsive interests located in their constituencies (see for example Weingast and Marshall, 1988; Persson and Tabellini, 2000). Electoral competition induces political agents, at least in part, to represent the interest of their constituents. Since economic importance of the farm sector is not uniformly distributed across constituencies, farm interests also are not uniformly distributed over constituencies. We will explicitly derive legislators' policy preferences from electoral competition in subsection 3.2.4. In particular, we will demonstrate that the electorate system has significant implications on legislators preferences and thus on the final policy outcome of our legislative decision-making game.

However, before we analyze the election stage, we first derive a model of legislative decision-making for presidential systems.

### 3.2.2.3 Presidential systems

In contrast to parliamentary systems, presidential systems are not characterized by a stable ex ante coalition or legislative cohesion, respectively. Presidential systems are characterized by more dispersed proposal powers, where proposal power over specific policy domains resides with corresponding parliamentary committees (Persson and Tabellini, 2002). In particular, we assume that the agricultural committee exerts agenda setting power vis-a-vis the floor, when formulating an agricultural policy proposal  $s$ . Accordingly, to model legislative bargaining in presidential systems on agricultural policy, we focus on the floor median  $F$  and the agricultural committee median  $C_A$  (Weingast et al., 1981; Krehbiel, 1991). Let  $U^F(s)$  denote the policy preferences of the floor median regarding the net-subsidization level of the agriculture and let  $U^{C_A}(s)$  denote the corresponding policy preferences of the median of the agricultural committee.

In essence legislative procedure starts with the committee submitting a policy proposal  $s^{C_A}$  to the floor and the floor chooses the final policy based on the committee proposal. Voting in the floor on the committee proposal can follow different procedures. In particular, the floor can operate under the closed or open rule, respectively. Under the closed rule the floor can only vote on the committee proposal vis-a-vis the status quo, while under the open rule the floor can make any amendment to the committee proposal and vote on amended proposals. We assume in the following that the floor operates under the closed rule granting agenda setting power to committee (Krehbiel, 1991). As we show in *proposition 2* below, the game has a

unique subgame perfect Nash equilibrium,  $s^{pre}$ .

**Proposition 2.** *Assuming an unidimensional policy choice  $s$ , there exists a unique subgame perfect Nash equilibrium for our legislative bargaining game in a presidential system as defined above. The equilibrium outcome,  $s^{pre*}$ , depends on the default policy outcome,  $SQ$ , and the policy preferences of the committee median ( $C_A$ ) and floor median ( $F$ ).*

1. *In equilibrium policy choice,  $s^{pre}$ , results from the following maximization:*

$$s^{pre} = \arg \max_s U^{C_A}(s) \quad s.t. \quad s \in S_F \quad (3.5)$$

$$\text{with } S_F = \{s \in S \mid U^F(s) \geq U^F(SQ)\} \quad (3.6)$$

2. *In particular, it holds that the outcome of the legislative bargaining game corresponds to the minimal distance between the ideal point of the committee median  $C_A$  and the interval  $[s_2^-, s_2^+]$ :*

$$s^{pre} = \arg \min_s \|Y^{C_A} - s\| \quad s.t. \quad s \in [s_2^-, s_2^+] \quad (3.7)$$

$$\text{where } s_2^- = Y^F - \|Y^F - SQ\| \quad \text{and } s_2^+ = Y^F + \|Y^F - SQ\|.$$

*Proof: see appendix.*

### 3.2.3 Voter behavior

An individual incumbent  $g \in P_{inc}$  is re-elected in a generic voting district  $d$ . In principle, a voter votes for an incumbent, if the utility she has derived under the implemented policy  $s$  is higher than her specific reservation utility. However, beyond economic welfare derived under observed policies,  $W^J(s)$ , voters care for another dimension, which generally is referred to as ideological preferences for parties, although this dimension could include other characteristics of parties or candidates, e.g. competence or appearance. The crucial point is that ideological preferences are exogenous in the sense that ideology is a permanent attribute of parties, i.e. cannot be changed at will during election campaign (see Persson and Tabellini, 2000).

In this paper, we do not further analyze ideological preferences of voters; we only assume that ideological preferences can be subdivided into three components: a group-specific relative importance of ideology compared to economic well-being,  $K^J$ ; a voter specific component  $\mu_{jd}$ , a district specific  $\delta_d$  and a national component  $\delta$ . Thus, a voter  $j \in J$  votes for the incumbent  $g$ , if the utility she observes under the agricultural policy  $s$  is higher than a specific reservation utility,  $\bar{W}^J$ , corrected by the ideological preferences for the incumbent party  $P_{inc}$ :

$$W^J(s) > \bar{W}^J + K^J(\mu_{jd} + \delta_d + \delta - hC^{inc}). \quad (3.8)$$

Parameters  $\mu_{jd}$ ,  $\delta_d$  and  $\delta$  can take negative and positive values and measure the ideological bias of voter  $j$  toward the opposition party  $P_{opp}$ . A positive value implies that voter  $j$  has a bias in favor of party  $P_{opp}$ . We assume that all three components

are mutually independent, and that the number of voters in any given district is large enough to permit the application of the law of large numbers. Without loss of generality, both district and voter specific components have zero means, representing deviations from the nationwide average.

The voter-specific ideological preferences are uncertain at the time political agents have to make their policy decisions. In detail, we assume that the distribution of the voter specific preferences  $\mu_{jd}$  within each district is uniform distributed on the interval  $\left[-\frac{1}{2\chi}, +\frac{1}{2\chi}\right]$ . Thus, the parameter  $\chi$  fully characterizes the distribution of ideological preferences in an electoral district<sup>6</sup>.

Moreover, we assume that the relative importance of ideology  $K^J$  differs across groups. Note that assuming a different relative importance of ideological preferences implies that groups generally differ in their effective ideological homogeneity, i.e. have different effective densities  $\phi^J = \frac{\chi}{K^J}$ . Thus, it results that the group with the lower weight  $K^J < K^I$  is more ideologically homogeneous than the other, i.e.  $\phi^J > \phi^I$ .

Voters are swayed by campaign spending  $C^{inc}$ . These may reflect the influence of election advertisements, or other efforts made to mobilize support, e.g. election rallies, door-to-door visits by campaign workers, etc.. Please note that we assume that voters are only swayed by campaign spending to the extend voters base their vote on ideological preferences, i.e.  $K^J h$  where  $h > 0$  is the effectiveness of campaign spending in securing votes from group  $J$ . Of course, the effectiveness of campaign spending of the governmental party,  $C^{inc}$ , also depends on the campaign spending of the opposition party. For example, Bardhan and Mookherjee (2002) assume that voters preferences for the governmental party depends on the difference in campaign spending of the governmental and opposition party, i.e.  $h(C^{inc} - C^{opp})$ . However, to simplify our analyses, we implicitly include the impact of campaign spending of the opposition party, in the groups' reservation utility  $\bar{W}^J$ .

### 3.2.4 Electoral competition and legislators' preferences in a local district

The simplest case of election is the one where only one candidate is elected in a district. However, depending on electoral rules the number of candidates elected in a single district can also be higher than one. In comparative politics the number of candidates to be elected in a voting district is defined as district size (Lijphart, 1984). Based on the district size scholars of comparative politics define proportional representation (PR) and a majoritarian election systems (MS) as ideal-typical election systems.<sup>7</sup>

Focusing on the district size, PR systems are characterized by candidates that are elected in one multiple-member national electoral district, while pure majoritarian systems are characterized by one-member districts. Thus, denoting the total number

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<sup>6</sup>This assumption implies that votes shares are linear functions of policy based utilities, which greatly simplifies our analysis.

<sup>7</sup>Beyond district size an electoral system is commonly defined via the following two additional components: electoral formula, i.e., the mechanism by which cast votes are transformed into parliamentary seats; and the electoral threshold, i.e., the minimum number of votes a party has to receive to be represented in the parliament (Lijphart, 1984). However, in this paper we focus analysis on district size.

of parliamentary seats by  $n$ , PR systems correspond to one national district with a district size of  $n$ , while pure MS-systems correspond to  $n$  districts with a district size of 1.

Accordingly, mixed electoral systems are characterized by multiple multi-member districts with a district size  $1 < k < n$  (Lijphart, 1984)<sup>8</sup>.

Consider first the case of the reelection of one incumbent  $g \in P_{inc}$  in a single district  $d$  with district size  $k = 1$ .

Political agents know the distribution of the group-specific ideological component  $\phi^J$  when they decide on agricultural policy, while the electoral uncertainty derives from the uncertainty of the national and regional component,  $\delta_d + \delta$ . The parameter  $\delta_d + \delta$  measures the average popularity of party  $P_{opp}$  in comparison to party  $P_{inc}$  in district  $d$ . The ideological party preferences of voters may arise from incumbency, personal characteristics of candidates nominated by different parties, or random events that cause voters to evaluate past policy positions differently, e.g. events in financial markets or foreign countries (Bardhan and Mookherjee, 2002). These events occur between the time government formulates and implements its' policy and the time the next election take place. Hence the voter swings can be predicted neither by parties nor by lobbies when deciding on their policy platforms and campaign spending. Therefore, they render election outcomes inherently uncertain.

Regarding the distribution of the sum of the regional and national popularity shock,  $\delta_d + \delta$ , we make no further assumptions, with exception for the support of  $\delta$  and  $\delta_d$  being bounded suitable relative to the support of the voter specific shocks. This enables us to avoid corner solutions for vote shares. Therefore, following Bardhan and Mookherjee (2002) we assume that voter specific shocks are widely enough dispersed, i.e.  $\chi$  is close enough to zero. Then for the range of governmental policy there will always be people in each district who will vote for any given party ensuring interior vote shares.

Given the assumption above, the total vote share candidates of an incumbent party  $P_{inc}$  receive in district  $d$  after regional and national ideological shocks as well as campaign spending have been realized follows as:

$$\Pi_d = \omega_d^{inc} - \chi [\delta_d + \delta] + \frac{1}{2}, \quad (3.9)$$

$$\text{where } \omega_d^{inc}(s_d^{inc}, C^{inc}) = \sum_J \alpha_d^J \phi^J (W^J(s_d^{inc}) - \bar{W}^J) + \chi h C^{inc}.$$

Now, assuming only one candidate is elected in the district  $d$  implies that the *ex ante* probability of the incumbent to be reelected is given by:

$$G^\delta \left( \frac{\omega_d^{inc}}{\chi} \right) \equiv Prob [\omega_d^{inc} - \chi (\delta_d + \delta) \geq 0] \quad (3.10)$$

where  $G^\delta$  is the distribution function of  $\delta_d + \delta$  and is a strictly increasing function of the electoral strategy of the incumbent party,  $\omega_d^{inc}$ .

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<sup>8</sup>Normalization delivers an election system index corresponding to a normalized relative district size,  $RDS = \frac{k-1}{n-1}$ , measuring the extent to which a given system corresponds to a pure PR or a pure MS-system, respectively. In particular, this index is 0 for MS systems and 1 for PR systems.

Each incumbent's objective is assumed to be maximizing the probability of being reelected. Accordingly, incumbent  $g_d$ 's behavior can be represented simply by maximization of weighted sum of the welfare of the voting groups  $J$  represented in district  $d$  and campaign spending (Bardhan and Mookherjee, 2002):

$$\sum_J \alpha_d^J \phi^J (W^J(s_d^{inc}) - \bar{W}^J) + hC^{inc} \quad (3.11)$$

Accordingly, maximizing his expected probability of re-election in district  $d$  an incumbent's  $g_d$  preferred policy platform,  $Y^{g_d}$ , results from maximizing an additive social welfare function ( $SWF_d$ ) taking the groups' reservation utilities as well as the campaign spending as given:

$$SWF_d(s) = \sum_J \beta_d^J W^J(s) \quad (3.12)$$

where the weight of group  $J$ 's welfare equal  $\bar{\beta}_d^J = \alpha_d^J \phi^J$ .

As will be shown in detail below, the level of campaign spending depends on lobbying strategies at the national level.

Assuming that more than one candidate is elected in the district  $d$ , i.e. a district size of  $k > 1$ , does not change an incumbent's behavior as long as we assume that all candidates of party  $P_{inc}$  running for election in the  $k$ -member district  $d_k$  have the same chance,  $\frac{1}{k}$ , to get a parliamentary seat won by party  $P_{inc}$  in this district. Under this assumption the re-election probability of a majority member  $g \in P_{inc}$  is given by:

$$\frac{1}{k} \sum_{r=1}^k G^\delta \left( \frac{1}{\chi} \left( \omega_{d_k}^{inc} - \frac{r}{k} \right) \right) \equiv \frac{1}{k} \sum_{r=1}^k Prob \left[ \omega_{d_k}^{inc} - \chi \left( \delta_{d_k} + \delta + \frac{1}{2} \right) \geq \frac{r}{k} \right] \quad (3.13)$$

Therefore, it follows directly that all incumbents running for election in a multi-member district  $d_k$ , i.e.  $k > 1$ , prefer the same party platform that results from the maximization of an additive social welfare function taking the groups' reservation utilities as well as the campaign spending as given, where the weight of a group  $J$  equals  $\beta_{d_k}^J = \alpha_{d_k}^J \phi^J$ , where  $\alpha_{d_k}^J$  denotes the population share of group  $J$  in the district  $d_k$  with district size  $k = 1, \dots, n$ .

Hence, legislators' agricultural policy preferences crucially depend on the demographically composition of their constituency as well as on relative ideological preferences of agricultural and non-agricultural voter groups,  $K^A/K^M$ . In particular, these relations are summarized in proposition 3.

**Proposition 3.** *Let  $U^{g_d}(s)$  denote the agricultural policy preferences of a legislator  $g_d$  who is reelected in the electoral district  $d^g$ . Then the following holds:*

- (i)  $U^{g_d}(s)$  is a strictly single-peaked function, where legislators' ideal point result as:  $Y^{g_d} = \arg \max_s SWF_d(s) = \arg \max_s \sum_J \beta_d^J W^J(s)$ , with  $\beta_d^J = \alpha_d^J \phi^J$

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<sup>9</sup>For notational convenience we drop the index  $k$  in proposition, while it is clear that proposition 3 applies for a district with any district size  $d$



- (ii)  $\frac{\partial Y^{gd}}{\partial \alpha_d^A} > 0$   
 (iii)  $\frac{\partial Y^{gd}}{\partial \frac{K^M}{K^A}} > 0$   
 (iv)  $Y^{gd} > 0$  if and only if it holds:  $K^M > K^A \vee \frac{\alpha_d^A}{\alpha_d^M} > \frac{\alpha^A}{\alpha^M}$   
 (v)  $Y^{gd} < 0$  if and only if it holds:  $K^M < K^A \vee \frac{\alpha_d^A}{\alpha_d^M} < \frac{\alpha^A}{\alpha^M}$

*Proof: see appendix.*

### 3.2.4.1 Multiple districts and heterogeneity of legislators' preferences

Consider an electoral system comprising  $n_k$  districts with  $n_k = 1, \dots, n$ . Keeping the number of parliamentary seats  $n$  constant implies an average district size of  $k = \frac{n}{n_k}$ .

Thus, assuming  $n_k > 1$  and demographically heterogeneous electoral districts implies that legislators have heterogeneous policy preferences. To cover the heterogeneity of electoral districts in our model, we use a common approach in electoral studies (Lipset and Rokkan, 1967). We divide the population in classes of individuals who share characteristics that predominantly affect their vote. In particular, beyond employment in the agricultural and non-agricultural sector, respectively, we further assume that generally living conditions in urban versus rural living areas impact on voting behavior. We differentiate two types of districts, rural districts  $D^R$  and urban districts  $D^U$ , where the population share of the agricultural voter group  $\alpha_d^A$  is higher for rural and lower for urban districts when compared to the national population share. Accordingly, the relative weight of the agricultural voter group  $\beta_d^A$ , is higher implying a higher preferred subsidization level of a legislator being reelected in a rural when compared to a legislator being reelected in an urban district. Let  $Y_k^u$  and  $Y_k^r$  denote the ideal points of urban and rural legislators, respectively, for an electoral system  $k$ , it holds for any electoral system  $k$ :  $Y_k^r - Y_k^u \geq 0$ .

Consider now the case that district size increases. The larger the district size the lower ceteris paribus the number of electoral districts and hence the larger is c.p. the voting population of an electoral district. Accordingly, with increasing district size  $k$ , the voting population of an individual district approximates the demographic composition of the society. Hence, for a given society electoral districts become demographically more homogeneous with an increased district size. Formally, we capture this observation in the following assumption:

Let the index  $d_k$  denote an electoral district of size  $k$  corresponding to the electoral system  $k = 1, \dots, n$ , then we assume the following property:

$$\alpha_{d_k}^A \leq \alpha_{d_{(k-1)}}^A \quad \forall d_k \in D_k^R \quad \text{and} \quad \alpha_{d_k}^A \geq \alpha_{d_{(k-1)}}^A \quad \forall d_k \in D_k^U. \quad (3.14)$$

where  $\alpha_{d_k}^A$  is the agrarian population share in district  $d_k$ , while  $D_k^R$  and  $D_k^U$  are the corresponding sets of rural and urban districts defined for the electoral system  $k$ , respectively.

Because agrarian population shares in rural and urban districts, respectively, converge to the national share with increasing district size  $k$ , the ideal points of rural and

urban legislators converge toward a common national level with increasing district size:

$$Y_k^r \geq Y_{k+1}^r \quad \text{and} \quad Y_k^u \leq Y_{k+1}^u \quad \text{and} \quad Y_n^u = Y_n^r = Y_n \quad (3.15)$$

Moreover, let  $\Omega_k^r$  denote the share of rural districts, while  $\Omega_k^u = 1 - \Omega_k^r$  is the corresponding share of urban districts.

### 3.2.4.2 Electoral competition and lobbying at the national level

In contrast to a majority member, the *PM* is only re-elected as the head of government if party  $P_{inc}$  wins the election, thus only if party  $P_{inc}$  wins the majority of total seats. The simplest case to derive the re-election probability of the *PM* is to assume a PR-system, i.e. all candidates are elected in one national  $n$ -member district. In this case, the vote share of the incumbent party just results as:

$$\Pi_{PM} = \omega_n^{inc} - \chi [\delta_d + \delta] + \frac{1}{2}, \quad (3.16)$$

where  $\omega_n^{inc}(s_n^{inc}, C^{inc}) = \sum_J \alpha^J \phi^J (W^J(s_n^{inc}) - \bar{W}^J) + hC^{inc}$ .

Accordingly, the probability that party  $P_{inc}$  wins the national elections is  $G^\delta(\omega_n^{inc})$  and hence political behavior of the incumbent party leader *PM* results from the maximization of the following weighted sum of a social welfare function for the total society,  $SWF_n(s)$  and campaign spending:

$$\sum_J \alpha^J \phi^J (W^J(s) - \bar{W}^J) + \chi h C^{inc} \quad (3.17)$$

With regard to campaign spending, the model assumes that there exist two lobbying groups representing the agricultural and the non-agricultural population, respectively. For each group,  $fr_J$  is an exogenous fraction that contributes financially to their corresponding lobby group, while remaining members of this group free-ride on contributions.

Following the seminal model of Grossman (1994), the lobby game is as follows. First, both lobby groups offer nonnegative contribution schedules  $C_A^{inc}(s)$  and  $C_M^{inc}(s)$ , to the party leader of the incumbent party, *PM*. Then, the *PM* selects a policy to maximize the national vote share of her party, i.e. the *PM* selects a policy that maximizes

$$SWF_n(s) + h \sum_J C_J^{inc}(s). \quad (3.18)$$

Following Grossman (1994), we assume truthful strategies, i.e. interest group  $J$ 's contribution schedule  $C_J^{inc}(s)$  correspond to the expected utility of lobby  $J$ 's contributing members derived from the policy  $s$ . Hence, it follows in equilibrium that support schedules offered by the interest group  $J$  result as:

$$C_J^{inc}(s) = fr_J \alpha^J h W^J(s) + R_J, \quad (3.19)$$

where  $R_J$  is a constant determined in equilibrium Grossman (1994).<sup>10</sup>

Overall, policy choices of the  $PM$  including lobbying follow from maximization of this  $SFW_{PM}$  (see Grossman, 1994):

$$SFW_{PM}(s) = \sum_J \beta_{PM}^J(s) W^J(s) \quad (3.20)$$

$$\beta_{PM}^J = \alpha_J \frac{\frac{\theta^J}{\theta_n} + \frac{h}{\theta_n} fr_J}{1 + \frac{h}{\theta_n} FR} \quad FR = \sum_J \alpha_J fr_J$$

From the perspective of the  $PM$ , the relevant political weights of a voter group  $J$   $\beta_{PM}^J$  deviate from their corresponding population shares  $\alpha_J$ : (i) the larger the ideological preferences of the groups, i.e. the larger the absolute difference between  $K^A$  and  $K^M$  and (ii) the higher free-riding varies across groups. Lower ideological preferences and lower free-riding imply c.p. a relative higher political weight of a group. Moreover, the more efficient political campaigning (the higher  $h$ ) and the higher average ideological preferences of voters (the lower  $\theta_n$ ), the more important is effective lobbying for the political representation of a group.

In particular, following the seminal theory of Olson (1965) the problem of free-riding inherent in the agrarian and non-agrarian voter group, respectively, is correlated with the relative size of these population groups. Relative small groups have c.p. a lower free-riding population. Moreover, Lohmann (1998) nicely demonstrated that the relative importance of ideological preferences is also correlated with relative group size, where relative small voter groups are c.p. better informed and hence put a lower weight on ideological preferences when casting their votes.

Please note that we assume that the lobbying game is played between the party leader and the lobbying group, while individual party members may free-ride on agreements made by their party leader with the lobbying groups. Formally, the latter follows from the fact that individual incumbents  $g_d \in P_{inc}$  consider campaign distributions as exogenous when deriving their preferred policy platform from the maximization of their reelection probability in their electoral district  $d$ .

Hence, even for the simplest case, assuming national election is organized in a PR-system, the  $PM$  has different policy preferences when compared to her regular party members as long as lobbying takes place. Technically, this follows from the fact that the  $PM$  derives his policy choices from maximizing the welfare function  $SFW_{PM}$ , while all other legislators derive their preferences from maximizing the welfare function  $SFW_n$ . For the latter, different relative weights of groups result when compared to the former if lobbying takes place.

While a PR-system will be used for small countries, large countries normally elect their representatives in more than one electoral district. For example, the United States as well as United Kingdom have a pure majority system, while many other countries use a mixed electoral system,  $1 < k < n$ . Therefore, we next derive the political behavior of the majority party leader,  $PM$ , assuming the electoral system corresponds to mixed or a pure majority system  $k < n$ . Dealing with this problem is

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<sup>10</sup>Basically, the constant  $R_J$  guarantees that the probability of the incumbent party resulting from the lobbying game including the lobby group  $J$  will be at least as high as the corresponding probability derived from a lobbying game excluding the support schedule of lobbying  $J$ . For details see Grossman (1994).

tentative (Persson and Tabellini, 2000; Bardhan and Mookherjee, 2002). Therefore, following Bardhan and Mookherjee (2002), we introduce further assumptions to simplify our analysis. In particular, we assume that all rural and also all urban districts are perfectly homogenous, respectively. Moreover, we assume that the number of districts is large enough to allow the application of the law of large numbers. In particular, we assume that all districts of the same type are ex ante homogenous with respect to party loyalty, in the sense that the swing for the incumbent opposition party  $P_{opp}$  in districts  $d \in D^R$  is given by  $\delta + \delta_r + \mu_d$ , while it is given by  $\delta + \delta_u + \mu_d$  in districts  $d \in D^U$ .  $\mu_d$  is independent and identically distributed across districts, with zero mean following a uniform distribution on a wide enough range  $[-\frac{1}{2z}, \frac{1}{2z}]$ .

Then the vote share of the incumbent party in a district of type  $ty$  (where  $ty = r$  indicates rural and  $ty = u$  urban districts) results as:

$$\Pi_{ty} = \omega_{ty}^{inc} - \chi [\delta_{ty} + \mu_d + \delta] + \frac{1}{2}, \quad (3.21)$$

Accordingly, the probability that the incumbent party wins at least  $k_r$  seats, with  $0 \leq k_r \leq k$  follows as:

$$Prob \left[ \Pi_{ty} \geq \frac{k_r}{k+1} \right] = \frac{z}{\chi} \left[ \omega_{ty}^{inc} - \chi [\delta_{ty} + \delta] + \frac{1}{2} - \frac{k_r}{k+1} \right] \quad (3.22)$$

Hence, it follows:

$$\begin{aligned} Prob(k^r = k) &= \frac{z}{\chi} \left[ \omega_{ty}^{inc} - \chi [\delta_{ty} + \delta] - \frac{k}{k+1} \right] + \frac{1}{2} \\ Prob(k^r = 0) &= \frac{1}{2} - \frac{z}{\chi} \left[ \omega_{ty}^{inc} - \chi [\delta_{ty} + \delta] - \frac{1}{k+1} \right] \\ Prob(k^r = k - i) &= \frac{z}{\chi} \left[ \frac{1}{k+1} \right], \quad \text{if } 0 < i < k \end{aligned} \quad (3.23)$$

Under this assumption, the expected number of seats that the incumbent party wins in a district of type  $ty$  results as:

$$E(k^{ty}) = \sum_{i=0}^k Prob(k^r = k - i)(k - i) = \frac{k}{2} \left( 1 + \frac{z}{\chi} \left[ 2 (\omega_{ty}^{inc} - \chi [\delta_{ty} + \delta]) - 1 \right] \right) \quad (3.24)$$

Therefore, overall the number of seats the incumbent party wins in a national election conditional on the national and regional popularity shocks results as:

$$\sum_{ty} \Omega_{ty} E(k^{ty}) = \frac{k}{2} \left( 1 + \frac{z}{\chi} \left[ 2 \left( \sum_{ty} (\Omega_{ty} \omega_{ty}^{inc}) - \chi \sum_{ty} (\Omega_{ty} \delta_{ty}) + \chi \delta \right) - 1 \right] \right) \quad (3.25)$$

Thus, it follows for the probability that the incumbent party wins the national election:

$$Prob \left[ \sum_{ty} \Omega_{ty} E(k^{ty}) > \frac{k}{2} \right] = G^\delta \left( \frac{1}{\chi} \left( \sum_{ty} \Omega_{ty} \omega_{ty}^{inc} - \frac{1}{2} \right) \right) \quad (3.26)$$

Hence, assuming an electoral system of a mixed or majoritarian type implies that political behavior of the incumbent party leader  $PM$  results from the maximization of the following weighted sum of the social welfare function of a rural district

$SWF_r(s)$  and an urban district  $SWF_u(s)$  and campaign spending:

$$\sum_{ty} \Omega_{ty} \sum_J \alpha_{ty}^J \phi^J (W^J(s) - \bar{W}^J) + hC^{inc}, \quad (3.27)$$

where  $\alpha_{ty}^J$  denotes the population share in the district type  $ty$ , i.e. a rural and urban district, respectively. Defining  $\alpha_{PM}^J = \sum_{ty} \Omega_{ty} \alpha_{ty}^J$  implies that the weighted sum of the rural and urban SWFs can be equivalently represented by  $SFW^{PM}$  with the group weights equal to  $\alpha_{PM}^J$ . By construction, it always holds  $\alpha_{PM}^J = \alpha^J$ . Accordingly, ignoring lobbying the  $PM$ 's ideal point would always equal the common ideal point  $Y_n$  derived for all legislators in a PR-system. Hence, ignoring lobbying the ideal point of the  $PM$  would always take a middle ground between the ideal points derived for urban and a rural legislators, respectively, assuming a mixed or majority system.

However, incorporating lobbying the policy preferences of the  $PM$  result from the maximization of the following  $SFW$ :

$$\begin{aligned} SWF_{PM}(s) &= \sum_J \beta_{PM}^J(s) W^J(s) \\ \beta_{PM}^J &= \alpha_{PM}^J \frac{\frac{\theta^J}{\theta_n} + \frac{h}{\theta_n} fr_J}{1 + \frac{h}{\theta_n} FR} \quad FR = \sum_J \alpha_{PM}^J fr_J \end{aligned} \quad (3.28)$$

Following the relevant literature, e.g. Persson and Tabellini (2000); Bardhan and Mookherjee (2002), we have so far derived policy preferences of the  $PM$  assuming that political behavior of the  $PM$  can be derived from maximization of the probability that she is reelected as the head of government. Persson and Tabellini (2000); Bardhan and Mookherjee (2002) assume that the latter probability corresponds to the probability that the incumbent party wins the national elections.

In fact, however, winning the national elections is only a necessary, but not a sufficient condition for a  $PM$  to be reelected as the head of government. This follows from the fact that in most parliamentary democracies the head of government has to be a member of the parliament. Thus, to become reelected as the head of government two conditions have to be fulfilled, the incumbent's party has to win national elections and the  $PM$  has to be reelected in her constituency. Thus, let  $Prob^1$  denote the first, while  $Prob^2$  denotes the second probability, than the overall probability of the  $PM$  to be reelected as the head of government results as:  $Prob^1(s)Prob^2(s)$ , where it follows from eqs. (3.26) and (3.13):

$$\begin{aligned} Prob^2(s) &= \frac{1}{k} \sum_{r=1}^k G^\delta \left( \frac{1}{\chi} (\omega_{d_k}^{inc} - \frac{r}{k}) \right) \\ Prob^1(s) &= G^\delta \left( \frac{1}{\chi} \left( \sum_{ty} \Omega_{ty} \omega_{ty}^{inc} - \frac{1}{2} \right) \right) \end{aligned} \quad (3.29)$$

Therefore, taking the fact into account that a  $PM$  has to be a member of the parliament implies that political behavior of the  $PM$  results from the maximization of the following weighted sum of a social welfare function  $SFW^{PM'}$  and campaign spending:

$$\sum_{ty} \Omega_{ty} \sum_J \beta_{PM'}^J (W^J(s) - \bar{W}^J) + hC^{inc} \quad (3.30)$$

The social welfare function  $SFW^{PM'}$  is a weighted sum of the social welfare function  $SWF^{ty}$  corresponding to the maximization of the reelection of a legislator in an electoral district of type  $ty$ , in which the PM is reelected as a member of parliament, and the social welfare function  $SWF^n(s)$  corresponding to the reelection of the incumbent party in national election. The weight of  $SWF^{ty}$  just equals  $Prob^1(Y^{PM})$  while the weight of  $SWF^n$  equals  $Prob^2(Y^{PM})$ . Thus, the lower the probability that the  $PM$  is reelected in her constituency compared to the probability that the incumbent party wins the national election the more policy preferences of the PM are biased towards special interest of her constituency, i.e. rural or urban interest, respectively. Assuming that based on voters' pure ideological preferences the probability of the incumbent party to win the national election as well as to win the majority of seats in the constituency of the  $PM$  is higher or equal than one half implies:  $Prob^1(Y^{PM}) \geq Prob^2(Y^{PM})$  <sup>11</sup>

Finally, incorporating lobbying, the policy preferences of the PM result from the maximization of a SFW resulting from eq.(3.28) substituting  $\alpha_{PM}^J$  by  $\alpha_{PM'}^J$  <sup>12</sup>.

In contrast to  $SWF^{PM}$  for  $SWF^{PM'}$ , the relative political weights  $\beta_{PM'_k}^J$  vary with district size, where the direction of the variation corresponds to the variation of the corresponding political weights  $\beta_{ty_{a_k}}^J$  derived from electoral competition in the constituency of the PM assuming a change in district size.

### 3.2.5 Policy outcomes

Our theoretical considerations imply that electoral rules, namely district size, have an impact on legislators' policy preferences derived from electoral competition at national and district level. In this section, we focus our analysis on the question how or to what extent the impact of district size on agricultural protection is influenced by the specific legislative organization in presidential versus parliamentary systems as well as by lobbying and the demographic composition of a society. Based on our theory, we are able to identify interaction effects between district size and political as well as demographic framework constellations. Briefly, these framework constellations determine whether the relation between district size and agricultural protection is u-shaped or inverse u-shaped. Further, we show that differences in political, economic and demographic framework condition between developing and industrialized countries, imply different patterns of how electoral rules, formal and informal legislative norms and lobbying impact on agricultural protection levels.

We first summarize our main findings in proposition 4. Afterwards we discuss major implications for the different influence patterns of formal and informal political institutions on agricultural protection levels in developing and industrialized countries, respectively.

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<sup>11</sup>This follows as long as we assume that  $G^\delta$  is locally concave over the interval  $[0.5,1]$ . The latter holds for example for a logistic or a probit function.

<sup>12</sup>Please note that in contrast to  $\alpha_{PM}^J$  the political weights  $\alpha_{PM'}^J$  are not a constant, but depend on the level of agricultural protection, i.e. the  $SWF^{PM'}$  becomes a non-linear function in  $s$ .

**Proposition 4.** Consider the society and economy as described above. Let  $k_1, \dots, k_t, \dots, k_l$  denote a sequence of electoral rules characterized by the district size of  $k_t$ , with:  $k_1 = 1 < k_t < \dots, k_l = n$ .  $n$  is the number of parliamentary seats to be elected.  $\alpha_{d_{k_i}}^J$  denote the share of the voter group  $J=A, M$  in district  $d_{k_i}$ , while  $\alpha^J$  denotes the corresponding share of the voter group  $J$  in the total population. Based on the relative population shares districts are subdivided in two types, rural ( $ty = A$ ) and urban ( $ty = M$ ) districts. Urban districts are characterized by a relative higher share of non-agrarian population,  $\alpha_{k_i}^M \geq \alpha^M$ , and vice versa rural districts are characterized by a relative higher district share of the agrarian population when compared to the national share,  $\alpha_{k_i}^A \geq \alpha^A$ . Districts of each type are assumed to be demographically homogenous, where  $\alpha_{d_{k_i}}^J = \alpha_{d_{ty_{k_i}}}^J$  for  $d_{k_i} \in D^{ty}$ .  $D_{k_i}^R$  and  $D_{k_i}^U$  denote the set of rural and urban districts for the electoral system  $k_i$  which are assumed to be non-empty. Further, let  $\gamma_{k_i}^{ty}$  denote the share of districts of type  $ty$  for the electoral system  $k_i$ .

In particular, we assume that the demographic composition of districts approximates the national demographic composition with increasing district size, i.e.:

$$\begin{aligned} \alpha_{k_1}^M &> \alpha_{k_2}^M > \dots > \alpha_{k_i}^M > \alpha_{k_{(i+1)}}^M > \alpha_{k_l}^M = \alpha^M \\ \alpha_{k_1}^A &< \alpha_{k_2}^A < \dots < \alpha_{k_i}^A < \alpha_{k_{(i+1)}}^A < \alpha_{k_l}^A = \alpha^A \end{aligned} \quad (3.31)$$

Moreover, define  $PS, POP$  as binary variables, where  $PS = 0$  indicates a parliamentary system and  $PS = 1$  indicates a presidential system while  $POP = 0$  indicates a rural society, i.e.  $\alpha^A > \alpha^M$  and vice versa  $POP = 1$  indicates an urban society, i.e.  $\alpha^A < \alpha^M$ . Following the famous theory of Olson (1965) it results for  $POP = 0$  a lower free-rider problem for the non-agricultural lobby group, i.e.  $fr_M > fr_A$ , while vice-versa for urban societies  $POP = 1$  the agricultural lobby group observes a lower free-rider problem when compared to the non-agricultural group, i.e.  $fr_M < fr_A$ <sup>13</sup>.

Let  $s_{k_i}^*(PS, POP)$  denote the agricultural policy outcome resulting in equilibrium of the legislative bargaining game assuming a policy system  $PS$  and a demographic composition  $POP$ . Then it holds:

- (i) For any political system ( $PS$ ) the relation between district size,  $k_i$ , and agricultural protection level,  $s_{k_i}^*$ , corresponds to one of the following two regimes depending on the demographic composition of society:

If  $POP = 0$  the following u-shape relation R1 results:

**R1. U-shape relation:** it exists a  $1 \leq k_{i\#}(PS, POP) \leq n$  such that it holds:

$$\left[ s_{k_i}^* \geq s_{k_{i+1}}^* \quad \forall k_i < k_{i\#} \quad \text{and} \quad s_{k_i}^* \leq s_{k_{i+1}}^* \quad \forall k_i \geq k_{i\#} \right]$$

If  $POP = 1$  the following inverse u-shape relation R1 results:

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<sup>13</sup>Basically, this assumption excludes empirically irrelevant cases from our theoretical analysis and hence makes our analysis more traceable. For interested reader analysis of the excluded cases is also available from the authors upon request.

**R2. Inverse u-shape relation:** *it exists a  $1 \leq k_{i\#}(PS, POP) \leq n$  such that it holds:*

$$\left[ s_{k_i}^* \leq s_{k_{i+1}}^* \quad \forall k_i < k_{i\#} \quad \text{and} \quad s_{k_i}^* \geq s_{k_{i+1}}^* \quad \forall k_i \geq k_{i\#} \right]$$

(ii) *Special cases:*

**Monotonic decreasing relation:** *A monotonic decreasing relation between district size and agricultural protection level results as a special case of the u-shape or inverse u-shape relation in a parliamentary system  $PS = 0$ , if for  $POP = 0$  the party leader is reelected in an agricultural district or if for  $POP = 1$  a PM reelected in a rural district observes a perfect party discipline of her party members. Analogously a monotonic decreasing relation results for presidential systems  $PS = 1$ , if  $POP = 0$  and the agricultural committee median ( $C_A$ ) is reelected in a rural district or if  $POP = 1$  and a rural committee median exerts perfect agenda setting power vis-a-vis the urban dominated floor, i.e.  $SQ$  is sufficiently larger than  $Y_n$ .*

**Monotonic increasing relation:** *A monotonic increasing relation between district size and agricultural protection level results as a special case of the u-shape or inverse u-shape relation in a parliamentary system  $PS = 0$ , if for  $POP = 1$  the party leader is reelected in a urban district or if for  $POP = 0$  a PM reelected in a urban district observes a perfect party discipline of her party members. Analogously, a monotonically increasing relation results for presidential systems  $PS = 1$ , if  $POP = 1$  and the agricultural committee median ( $C_A$ ) is reelected in a urban district or if  $POP = 0$  and a urban committee median exerts perfect agenda setting power vis-a-vis the rural dominated floor, i.e.  $SQ$  is sufficiently smaller than  $Y_n$ .*

**Constant relation** *A constant relation applying that district size has no impact on agricultural protection levels results as a special case of u-shape and inverse u-shape relations only for the presidential system ( $PS=1$ ). The latter is the case if a gridlock situation occurs, i.e.  $SQ = Y_n$ , and for  $POP = 0$  the agricultural committee median is reelected in an urban district or for  $POP = 1$  the committee median is reelected in a rural district.*

*Proof: see appendix.*

Overall, our theory has many interesting implications for the impact of electoral rules on the pattern of agricultural protection in developing and industrialized countries that go far beyond the well-known development paradox.

First, since for industrialized countries the share of the agrarian population is below 50% for this country type generally a R2-regime results, i.e. an inverse u-shape relation between agricultural protection and district size should be observed. In contrast, for developing countries both a u-shape relation and an inverse u-shape relation should be observed. The former should be observed for developing countries



for which the agrarian population is still the majority, while the latter should be observed for developing countries with an agrarian population share below 50%.

Please note that the impact of electoral rules on agricultural protection levels across country types is generally independent from the absolute level of protection. As explained within our theory, the absolute level, in particular if a net-tax or net-subsidy regime results, depends on the relative importance of ideological voting, i.e.  $Y_n < 0$  if  $K^A > K^M$  and vice-versa  $Y_n > 0$  if  $K^A < K^M$ . Lohmann (1998) already state that ideological voting is correlated with demographic compositions. That is we assume  $K^A > K^M$ , if and only if  $POP = 0$ . According to our theory, it follows that the probability to observe a net-taxation of agriculture is comparatively higher for developing countries with an agrarian population share above 50%, while it continuously decreases with the share of the non-agricultural population and hence net-subsidization is the dominant regime for industrialized countries.

Second, it exists a strong interaction between the impact of electoral rules on the one hand and formal and informal organization of legislature as well as lobbying on the other hand, where these interaction effect, at least partly, differ systematically for developing when compared to industrialized countries.

In particular, a constant relation, i.e. no impact of electoral rules on protection, can only be expected for a presidential system, while for parliamentary systems agricultural protection should always vary with district size, though effects might be rather small, if party discipline is low, but not zero. Interestingly, gridlock occurs in developing countries only if the agricultural committee is dominated by urban interests, while on the contrary gridlock occurs in industrialized countries only if the agricultural committee is dominated by rural interest. Following the seminal contribution of Weingast and Marshall (1988) to the political exchange theory, it follows that gridlock only results if legislators engage in political exchange implying that in developing countries urban legislators have a relative higher interest to control agricultural protection when compared to rural legislators and hence have higher incentives to sit in the agricultural committee. Vice-versa in industrialized countries rural legislators have a relative higher interest to subsidize agriculture when compared to their urban colleagues and hence have higher incentives to control the agricultural committee. For example, for the USA there is convincing empirical evidence that the agricultural committee is dominated by rural interests (see Weingast and Marshall, 1988; Krehbiel, 1991). Therefore, a gridlock situation implying no impact of district size on agricultural protection can only occur in presidential systems where legislators engage in an informal non-market organization of political exchange as described by Weingast and Marshall (1988). Since an informal non-market organization of political exchange implies a specific level of trust among legislators, one would expect this form of cooperation to occur with a higher probability within older democracies. Accordingly, if empirically a gridlock and hence no impact of electoral rules on agricultural protection levels will be observed, this should be especially the case in industrialized countries, but far less in developing countries.

If we exclude informal political exchange, the committee and the floor median are both elected in the same type of district, which will be a rural district in developing and an urban district in industrialized countries. Therefore, in both country types

policy preferences of the floor and committee medians will have the same contour with regard to district size. The relation is monotonically increasing for industrialized and monotonically decreasing for developing countries<sup>14</sup>.

Thus, excluding political exchange and regardless of the concrete governmental system, we derive from theory for industrialized that the agricultural sector is less protected in countries with pure majority systems when compared to countries with a pure PR-system and for developing countries with an agrarian population share above 50% that agricultural protection levels are c.p. higher under a pure majority when compared to a pure PR-system.

Further, strong non-monotonic relations between district size and agricultural protection only result if legislative organization is characterized by informal political exchange. For parliamentary systems, a non-market organization of political exchange, as suggested by Weingast and Marshall (1988) for the presidential system of the USA, corresponds to the so-called principle of departmental responsibility. Departmental responsibility describes the fact that decisions within the cabinet are transferred to the cabinet member who is mainly responsible for a particular policy. Including the principle of departmental responsibility as a non-market mechanism to implement political exchange in our model implies assuming that the PM is reelected in a rural district for  $POP = 1$ , and in an urban district for  $POP = 0$ . Under these assumptions it follows that regardless of the governmental system informal political exchange implies a strong u-shape relation in developing countries, while it implies a strong inverse u-shape relation in industrialized countries. Please note, however, that strong monotonic relations only result from political exchange if we assume that either the agenda setting power of the committee in presidential regimes or the party discipline in parliamentary regimes is perfect.

Finally, please note that according to our theory, lobbying has no impact on the specific relation between district size and agricultural protection levels in developing and industrialized countries, respectively.<sup>15</sup> Lobbying has, however, a significant

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<sup>14</sup>Please note that as long as we exclude lobbying activities, policy preferences of the floor and committee median are the same if we assume both are reelected in the same district type. Of course, it is conceivable that lobbying groups influence directly individual legislators. In fact, there is convincing empirical evidence for lobbying activities on individual legislators for the United States. However, including lobbying of individual legislators would only imply that legislators reelected in the same district type have different ideal points, but the change of ideal points induced by a different district size would still be the same. Therefore, the fact that we de facto excluded lobbying influence on agricultural policy for presidential systems to simplify our analysis has no impact on our main results regarding the relation between district size and protection levels. It has of course an impact on the absolute protection levels resulting in equilibrium. But here our main argument is that compared to parliamentary systems lobbying is less effective in presidential systems due to the fact that individual legislators have no party discipline as a mechanism to reduce free-riding among legislators.

<sup>15</sup>This basically follows from our assumption that the relative strength of agrarian and non-agrarian lobbying groups is determined by the relative size of these groups. If we drop this assumption, lobbying would also have an impact on the regime implied for the relation between electoral rules and agricultural protection. Interestingly, also other non-monotonic regimes beyond u-shape and inverse u-shape relations could result. Given the unique theoretical support (Olson, 1965; Becker, 1983) and the strong empirical evidence (Tyers and Anderson, 1992; Swinnen et al., 2000a) for the strong correlation of relative group size and relative strength of lobbying, we do not present these results here. These are available from the authors up-on request.

impact on the absolute level of protection following our theory. This result has a positive implication for the empirical testing of our theory, because the relative strength of lobbying groups can hardly be observed. Hence, testing our main theoretical implications regarding the impact of district size on agricultural protection levels, the problem of unobservable heterogeneity due to imperfectly observed lobbying strength becomes far less severe. The latter follows from the fact that our main hypotheses apply to the contour how protection levels vary with district size and this contour is independent from lobbying activities.

### 3.3 Empirical Analysis

#### 3.3.1 Data

Since our theory is based on democratic institutions, we select a sample of countries with clear democratic status for our empirical analysis. To judge about the democratic status of a country, Freedom House (2008) and Eckstein and Gurr (1975) provide two different but highly correlated measures of democracy. As the latter data set provides for a consistent measure for more years and countries than the first, we choose the measures *polity* and *polity2* of Eckstein and Gurr (1975) to select our country-year observations. Both indicators measure the net-authority quality of a country on a 21-point scale ranging from -10 to +10. Thus, these measures summarize autocratic and democratic characteristics of governing institutions to one index with higher values indicating better democracies. In a first step, we define a democratic country by a *polity2*-score above zero according to the definition given by Eckstein and Gurr (1975). However, as this definition would also include countries in our sample that are relatively unstable democracies, we use further a combination of a smoothed five-year average of *polity* and the *polity2*-score to filter unstable democratic countries. Countries are included into our sample if the five-year average is greater or at least equal to 1 and if *polity2* is greater than zero.<sup>16</sup> In addition to autocratic countries and unstable democracies, the sample excludes countries belonging to the European Union, because the European Common Agricultural Policy (CAP) is negotiated at the supranational level by EU institutions thus not meeting the prerequisites of our theoretical approach (see e.g. Henning and Krampe 2012). Member states are dropped from the sample even one year before accession to consider policy decisions due to the approaching EU accession. Further, countries that just control one agricultural sector, in this case their cotton sector, by policy interventions are not considered for analyzing the impacts of political institutions on general agricultural policy, i.e. Benin, Togo, Burkina Faso, Chad and Mali are excluded from our analysis.

We use the Nominal Rate of Assistance to Agriculture (*NRA*), which is an advanced measure of agricultural protection provided by Anderson and Valenzuela (2008), as dependent variable. The *NRA* is calculated as a weighted average of commodity-specific *NRA*s using the undistorted production values of the commodities as weights. In general, the *NRA* is the unit value of production at the distorted

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<sup>16</sup>As *polity2* is not reported for Iceland, we refer to the Gastil-Index by Freedom House (2008) that defines Iceland as a democracy.

price less its value at the undistorted price expressed as a fraction of the undistorted price. Analogously to the commonly used Producer Support Estimate (PSE) published yearly by the OECD, the *NRA* includes indirect market interventions such as direct transfer payments. Further it considers exchange rates distortions. This new data set allows for expanding the analysis of the first published paper by Henning (2008), because the data set by Anderson (2008) covers about 75 countries since 1955.

Related to our main theoretical conclusions, we define the following three electoral systems based on the principle of district size: (1) a majoritarian system where only one legislator gets elected in a district, (2) a mixed system where on average 2 up to 9.9 legislators are elected per district and (3) a proportional representation system where 10 or more legislators get elected per district on average in a country. This results in three binary indicator variables *maj*, *mix*, and *prop*, where *maj*=1 indicates a majoritarian, *mix* = 1 a mixed system and *prop*=1 proportional electoral rule. Note that *maj* = *prop*=0 if *mix*=1. Information on district size is taken from data sets of Lundell and Karvonen (2003) and of Beck et al. (2001). The data sets are supplemented by data of the Inter-Parliamentary Union (2008). Such a classification particularly allows analyzing the impact of an intermediate system between a pure majoritarian and a pure proportional representation system on special interest politics. As the form of government is another determinant of agricultural protection due to our theory, *formgov* is used to indicate whether a country's constitution provides for a presidential system (*formgov*=1) or not. Again we use data provided by Beck et al. (2001) and Lundell and Karvonen (2003).

Further, as our theory predicts that agricultural protection will depend on unobserved latent policy regimes, we use two variables for estimating the probability that agricultural policy decisions in a country are influenced by a specific latent policy regime. Such a latent regime is determined by the strength of agricultural interest groups. Thereby we follow Olson (1965) and use the logarithm of agricultural share in employment (*emplln*) to account for ability of farmers in different countries to organize and to lobby for political support. In addition to this, we employ a variable indicating the agricultural share in value-added (*agrivalue*) to reflect the farmer's incentive to organize for income redistribution. Data on these selection variables is provided by the database of World Development Indicators and by the database of the Food and Agriculture Organization of the United Nations (FAOSTAT, 2008; World Bank, 2008).

We follow the standard literature on the political economy of agricultural protection for selecting interesting controls (see Beghin and Kherallah, 1994; Swinnen et al., 2000a; Swinnen, 1994; Balisacan and Roumasset, 1987; Olper, 2001; Tyers and Anderson, 1992; Anderson, 2008). Data on economic and sociodemographic controls are taken from the database of World Development Indicators by the World Bank and from the database of the Food and Agriculture Organization of the United Nations (FAOSTAT, 2008; World Bank, 2008). Thus, our set of controls includes the initial gross domestic product (GDP) per capita (*initialgdppc*) and the real GDP per capita growth (*gdppcgrowth*) to capture in combination the state of economic development, the ratio of agricultural share in value-added and agricultural share in employment (*compad*) to proxy comparative advantages in agriculture and arable

land and land under permanent crops per farm worker (*factorend*) to take the relative incomes of agricultural farmers into account. We further include the share of agricultural exports in total merchandise exports (*tax\_agri*) to consider the tax collection constraints that governments face especially in developing countries to provide e.g. public goods. Following Beghin and Kherallah (1994) we define *budget* as the net agricultural export per capita in order to account for governmental budget constraints that depend on the country's agricultural net trade position. Furthermore we use the logarithm of agricultural share in employment (*empll*) to account for differences in economic structure and industrialization that reflect the ability of farmers to organize and to lobby for political support. To account for international agreements influencing domestic producer support, we include a period dummy *urround*. *urround* is one for high income countries after 1994 with high income countries defined by an Human Development Index above 0.8 (United Nations Development Program, 2008) and zero otherwise.

Overall, our sample corresponds to unbalanced time-series cross-section data including 52 countries with an average time period of 20 years per country. Summary statistics of all variables are presented in Table 2.2.

Table 3.1: List of variables

Variable	Mean	Std. dev.	Definition
NRA	0.365	0.737	Nominal rate of assistance
formgov	0.393	0.489	Form of government
maj	0.364	0.481	Electoral system: single-member districts
mix	0.384	0.487	Electoral system: 2-9.9 members/district
prop	0.254	0.435	Electoral system: $\geq 10$ members/district
gdppcgrowth	2.427	3.696	Annual growth of real GDP per capita
initialgdppc	10.011	8.459	GDP in first available period for country $i$
empll	-1.756	0.947	Log. of agr. share in eco. active population
compad	0.600	0.289	Comparative advantage of agr. sector
budget	0.023	0.262	Netto agricultural trade position to GDP
factorend	0.119	0.240	Relative income of farmers
tax_agri	23.699	24.195	Agr. exports in total merchandise exports
urround	0.384	0.487	Post-Uruguay round dummy
agrivalue	13.195	11.130	Agr. share in value added

Source: Summary statistics are calculated by authors based on different data sets.

### 3.3.2 Estimation Strategy

We use the following static regression model for testing the prediction of theory concerning the influence of institutions with respect to agricultural protection,

$$p_{it} = \beta x_{it} + \gamma y_{it} + \epsilon_{it}, \quad i = 1, \dots, N, \quad t = S(i), \dots, T(i), \quad (3.32)$$

where  $p_{it}$  denotes the measure of agricultural protection,  $x_{it}$  denotes the set of institutional variables,  $y_{it}$  a set of macroeconomic control variables. The indexation refers to an unbalanced panel, where  $S(i)$  denotes the first observation available for

country  $i$  and  $T(i)$  denotes the last. Since the correct assessment of the influence of the institutional variables on the policy outcome critically depends on the dynamic specification of the regression model as noted by Beck and Katz (1996), we provide specification tests on issues of dynamics within the more general framework

$$p_{it} = \beta x_{it} + \gamma y_{it} + \varphi p_{it-1} + \kappa y_{it-1} + \epsilon_{it}, \quad i = 1, \dots, N, \quad t = S(i), \dots, T(i), \quad (3.33)$$

where the inclusion of the lagged dependent and the lagged control variables allow for a general form of first order dynamics as to be necessarily model in the context of cross-section-time-series data. On the basis of this regression framework, we test for the dynamic specification providing the best representation for the analysis under consideration. As discussed by Achen (2000) and Beck and Katz (1996), several dynamic specifications arise from the general regression model given in Equation (3.33). Under the restriction

$$\varphi\gamma + \kappa = 0 \quad (3.34)$$

the dynamic specification is terms of a common factor approach. The common factor dynamics can also be modeled via serially correlated errors

$$\epsilon_{it} = \rho\epsilon_{it-1} + u_{it}, \quad \text{where } u_{it} \sim \mathcal{N}(0, \sigma^2). \quad (3.35)$$

Testing for this common factor approach is performed via generalized Wald test of the restriction given in Equation (3.34), described in Harvey (1992). Given the test indicates the validity of the common factor approach, we performed estimation of this dynamic specification on the basis of the Praist-Whinston transformation using ordinary least squares. Given the common factor approach is rejected, we resort to modeling dynamics via the lagged dependent variable and test furthermore, whether a more parsimonious representation is preferred via testing via a F-test for joint significance of the parameters summarized within  $\kappa$ .

The theoretical considerations given above imply for the institutional impact to depend on an unobserved regime  $R$  interpreted as level of agricultural protection. We consider up to six protection regimes, hence  $R_{it} = \{0, \dots, L\}$  with  $L \leq \bar{L}$ . As regimes are unobserved, we model the regression as follows

$$p_{it}^{(R_{it})} = \alpha + \beta_{(R_{it})} x_{it} + \gamma y_{it} + \epsilon_{it}, \quad (3.36)$$

where  $R_{it}$  is the state variable indicating what kind of protection regime prevails in country  $i$  at time  $t$ . Since the current state is not observed, it has to be integrated out. Hence, assumptions concerning the process of regime states have to be made.<sup>17</sup> We assume a time and country specific mixture. The probability to be in either

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<sup>17</sup>Assuming a Markov process for regime states would be reasonable too, since state dependence is likely to be present, since a country will not change incidentally among institutional regimes. This specification of latent regimes has been extensively used in the empirical literature on business cycle dynamics, see the seminal papers of Hamilton (1989) and Hamilton (1990). However modeling and estimation of higher number of regimes with Markovian state probabilities is cumbersome as it runs into a curse of dimensionality since the number of parameters ruling the transition probabilities is then quadratic in the number of regimes.

regime is likely to depend on country specific characteristics captured via variables  $z_{it}$ . The state probabilities are hence modeled to depend on variables  $z_{it}$  and take the form

$$\Pr(R_{it} = \ell | z_{it}) = v_{it}^{(\ell)}, \quad \ell = 1, \dots, L. \quad (3.37)$$

This modeling of state probabilities has been introduced by Diebold et al. (1994).<sup>18</sup> To incorporate country specific characteristics  $z_{it}$  explicitly,  $v_{it}^{(\ell)}$  is parameterized as a logit type probabilities

$$v_{it}^{(\ell)} = \frac{\exp\{z_{it}\phi_{\ell}\}}{\sum_{\ell=1}^L \exp\{z_{it}\phi_{\ell}\}}, \quad \ell = 1, \dots, L, \quad (3.38)$$

where  $\phi_L$  is restricted to zero for identification reasons. The model is estimated via Maximum Likelihood on the basis of assuming normally distributed errors  $\epsilon_{it}$ . Summarizing all parameter as  $\theta = \{\{\beta^{(\ell)}\}_{\ell=1}^L, \gamma, \sigma, \{\phi_{\ell}\}_{\ell=1}^{L-1}\}$  and all available data as  $P, X, Y, Z$ , the likelihood of the considered model can be written as

$$\mathcal{L}(\theta; P, X, Y, Z) = \prod_{i=1}^N \prod_{t=S(i)}^{T(i)} f(p_{it} | P_{it-1}, X_{it}, Y_{it}, Z_{it}, \theta), \quad (3.39)$$

where  $P_{it}$  denotes the set of all observations  $\{p_{iw}\}_{w=S(i)}^t$  up to period  $t$  for country  $i$  (define  $X_{it}$ ,  $Y_{it}$ , and  $Z_{it}$  accordingly). Thereby each likelihood contribution at time  $t$  of country  $i$  has the form of a finite mixture with  $L$  components

$$f(p_{it} | P_{it-1}, X_{it}, Y_{it}, Z_{it}, \theta) = \sum_{\ell=1}^L \frac{\exp\{z_{it}\phi_{\ell}\}}{\sum_{\ell=1}^L \exp\{z_{it}\phi_{\ell}\}} \frac{1}{\sqrt{2\pi}\sigma} \exp\left\{-\frac{1}{2\sigma^2} (p_{it} - \beta_{\ell}x_{it} - \gamma y_{it})^2\right\}, \quad (3.40)$$

where  $\phi_0^L$  is set for identification to a vector of zeros.

As an approach to assess the robustness of estimation results furthermore, we adapt the strategy described in Beck (2001). Via a cross section experiment, where estimation is performed  $N$  times on the basis of shortened subsample containing  $N - 1$  cross-section members, where one country is dropped, the homogeneity of the sample is assessed via the in-sample mean squared forecast error (MSFE). Thereby, the MSFE of the dropped country is compared to the mean of the MSFE's of the countries employed within the estimation, where approximation confidence bands are based to multiple of the standard deviation of the MSFE for the countries employed within estimation. This cross validation experiment allows to investigate, to what extent the estimation results are possibly driven by single observations or countries.

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<sup>18</sup>Note that this formulation of a mixture is a restricted version of the considered regime switching model considered within the business cycle literature, which implies state dependence of regime probabilities.

### 3.3.3 Endogeneity of political institutions

There is a consensus among scholars of comparative political economy that political institutions and economic performance might be affected by the same factors (e.g. Acemoglu, 2005; Persson and Tabellini, 2003). Accordingly, the literature stresses the importance to control for potential endogeneity of political institutions if the goal is the identification of causal effects (see Persson and Tabellini, 2003; Acemoglu et al., 2001; Acemoglu and Johnson, 2005). Especially Persson and Tabellini (2003) have promoted to solve the endogeneity problem and to identify the causal effects of political institutions on economic performance via appropriate econometric strategies. A common approach in micro-econometrics to solve endogeneity is the instrument variable estimation (see Angrist and Krueger, 2001). The critical part within an IV estimation is to find variables that on the one hand are sufficiently correlated with the endogenous variable, but not with the error term of the explained variable, i.e. valid instruments. Otherwise the IV strategy will not solve the endogeneity problem.

We use the age of democracy, an ethnic fragmentation index by Alesina et al. (2003) and colonial history as instrument variables. For including an ethnic fragmentation index into our instrument variable set, we follow Aghion et al. (2004) suggesting that social cleavages mainly determine the choice of electoral rules. We include the age of a democracy, because the choice of political institutions is at least partly also an epoch phenomenon. The inclusion of colonial history relates to the fact that colonial rulers highly influenced the design of constitutions after countries became independent. To calculate the age of democracy (*age*) for a specific country, we define the first year of democratic rule as the first year with a positive smoothed average of the *polity* and a positive value of *polity2* given that the country stays continuously in our sample. Then, *age* is defined as the difference between the first year, where a country is defined as democracy and the year 2008 standardized by the oldest democracy in our sample, i.e. the United States. Ethnic fragmentation, *ethnic* is provided by Alesina et al. (2003). *ethnic* basically leans on the concept of a Herfindahl index, with greater values referring to a more fragmented population. *col\_uk* denotes with 1 British colonial origin, *col\_espp* defines Spanish or Portuguese colonial origin with 1.

Table 3.2: Summary statistics: Instrument variables

Variable	Mean	Std. dev.	Definition
age	0.336	0.263	Age of democracy in a country
col_uk	0.356	0.479	British colonial history
col_espp	0.149	0.356	Spanish/Portuguese colonial history
ethnic	0.377	0.247	Ethnic fragmentation in a country

Source: Calculated by authors based on different data sets.

To resolve the problem of endogenous institutions, we consider a two-step approach.<sup>19</sup> Consider  $x_{it} = \{f_{it}, d_{it}\}$ , where  $f_{it}$  denotes a binary variable (form of

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<sup>19</sup>Since the macroeconomic character of the data asks for specification of (latent) serial correlation structures, a one-step approach would require the numerical solution of a high dimensional



government) and  $d_{it}$  denotes a ordered categorical variable taking values  $\{0, 1, 2\}$ . We set up a two equation model given as

$$g_1(f_{it}) = {}_1x_{it}^* = {}_1z_{it}\delta_1 + \nu_{it}, \quad (3.41)$$

$$g_2(d_{it}) = {}_2x_{it}^* = {}_2z_{it}\delta_2 + \xi_{it}, \quad (3.42)$$

with  $g_1(\cdot)$  and  $g_2(\cdot)$  being functions of the observed variables given as

$${}_1x_{it} = \begin{cases} 0, & \text{if } {}_1x_{it}^* < 0, \\ 1, & \text{if } 0 \leq {}_1y_{it}^* \leq \varrho, \\ 2, & \text{if } {}_1x_{it}^* > \varrho, \end{cases} \quad (3.43)$$

$${}_2x_{it} = \begin{cases} 0, & \text{if } {}_2x_{it}^* < 0, \\ 1, & \text{if } {}_2x_{it}^* \geq 0 \end{cases} \quad (3.44)$$

and

$$\begin{pmatrix} \nu_{it} \\ \xi_{it} \end{pmatrix} \sim \mathcal{N} \left( \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \Sigma = \begin{pmatrix} 1 & \psi \\ \psi & 1 \end{pmatrix} \right).$$

Thereby, the range of the errors  $\nu_{it}$  and  $\xi_{it}$  is restricted as follows

$$A_1 = \{(\nu_{it}, \xi_{it}) : -{}_1z_{it}\delta_1 \leq \nu_{it}, -{}_2z_{it}\delta_2 \geq \xi_{it}\} \quad \text{if } f_{it} = 1, d_{it} = 0,$$

$$A_2 = \{(\nu_{it}, \xi_{it}) : -{}_1z_{it}\delta_1 \geq \nu_{it}, -{}_2z_{it}\delta_2 \geq \xi_{it}\} \quad \text{if } f_{it} = 0, d_{it} = 0,$$

$$A_3 = \{(\nu_{it}, \xi_{it}) : -{}_1z_{it}\delta_1 \leq \nu_{it}, -{}_2z_{it}\delta_2 \leq \xi_{it} \leq -{}_2z_{it}\delta_2 + \varrho\} \quad \text{if } f_{it} = 1, d_{it} = 1,$$

$$A_4 = \{(\nu_{it}, \xi_{it}) : -{}_1z_{it}\delta_1 \geq \nu_{it}, -{}_2z_{it}\delta_2 \leq \xi_{it} \leq -{}_2z_{it}\delta_2 + \varrho\} \quad \text{if } f_{it} = 0, d_{it} = 1,$$

$$A_5 = \{(\nu_{it}, \xi_{it}) : -{}_1z_{it}\delta_1 \leq \nu_{it}, \xi_{it} \geq {}_2z_{it}\delta_2 + \kappa\} \quad \text{if } f_{it} = 1, d_{it} = 2,$$

$$A_6 = \{(\nu_{it}, \xi_{it}) : -{}_1z_{it}\delta_1 \geq \nu_{it}, \xi_{it} \geq {}_2z_{it}\delta_2 + \kappa\} \quad \text{if } f_{it} = 0, d_{it} = 2.$$

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integration problem within the likelihood. Furthermore, strategies for checking robustness of estimates are not directly at hand within an one-step approach, or become computationally burdensome.

Based on maximum likelihood estimation, where the likelihood function is

$$\begin{aligned}
 L = & \prod_{i=1}^N \prod_{\{t:f_{it}=1,d_{it}=0\}} \iint_{A_1} \frac{1}{2\pi} |\Sigma|^{-.5} \exp\left\{-\frac{1}{2} \begin{pmatrix} \xi_{it} \\ \nu_{it} \end{pmatrix} \Sigma^{-1} \begin{pmatrix} \xi_{it} \\ \nu_{it} \end{pmatrix}\right\} \\
 & \prod_{\{t:f_{it}=0,d_{it}=0\}} \iint_{A_2} \frac{1}{2\pi} |\Sigma|^{-.5} \exp\left\{-\frac{1}{2} \begin{pmatrix} \xi_{it} \\ \nu_{it} \end{pmatrix} \Sigma^{-1} \begin{pmatrix} \xi_{it} \\ \nu_{it} \end{pmatrix}\right\} \\
 & \prod_{\{t:f_{it}=1,d_{it}=1\}} \iint_{A_3} \frac{1}{2\pi} |\Sigma|^{-.5} \exp\left\{-\frac{1}{2} \begin{pmatrix} \xi_{it} \\ \nu_{it} \end{pmatrix} \Sigma^{-1} \begin{pmatrix} \xi_{it} \\ \nu_{it} \end{pmatrix}\right\} \\
 & \prod_{\{t:f_{it}=0,d_{it}=1\}} \iint_{A_4} \frac{1}{2\pi} |\Sigma|^{-.5} \exp\left\{-\frac{1}{2} \begin{pmatrix} \xi_{it} \\ \nu_{it} \end{pmatrix} \Sigma^{-1} \begin{pmatrix} \xi_{it} \\ \nu_{it} \end{pmatrix}\right\} \\
 & \prod_{\{t:f_{it}=1,d_{it}=2\}} \iint_{A_5} \frac{1}{2\pi} |\Sigma|^{-.5} \exp\left\{-\frac{1}{2} \begin{pmatrix} \xi_{it} \\ \nu_{it} \end{pmatrix} \Sigma^{-1} \begin{pmatrix} \xi_{it} \\ \nu_{it} \end{pmatrix}\right\} \\
 & \prod_{\{t:f_{it}=0,d_{it}=2\}} \iint_{A_6} \frac{1}{2\pi} |\Sigma|^{-.5} \exp\left\{-\frac{1}{2} \begin{pmatrix} \xi_{it} \\ \nu_{it} \end{pmatrix} \Sigma^{-1} \begin{pmatrix} \xi_{it} \\ \nu_{it} \end{pmatrix}\right\}
 \end{aligned}$$

we calculate expectations of errors as further explaining variables (extended Mills' ratios) (see Appendix 3.A.5). The probabilities of the bivariate normal distribution involved within the likelihood function and the expectations are calculated via the GHK-simulator of Geweke (1989), Hajivassiliou (1990), and Keane (1994) using trajectories for involved common random numbers (CRN) of size 100, see Greene (2003) for an introductory review.

## 3.4 Empirical results

### 3.4.1 Controlling for endogeneity of political institutions

The estimation results point at significant relationships for several determinants of political institutions. The electoral system as described by district size in this case is negatively related to British colonial origin and positively to Spanish and Portuguese colonial origin. This result is line with expectation, because British colonial rulers installed the electoral system used in their home country, i.e. the majority system, in their colonies. Ethnic fragmentation and age of democracy are negatively related to district size. The higher these variables are, the smaller are the district sizes. That is old democracies choose more frequently majority systems than younger democracies who tend to adopt mixed or proportional representation systems. In terms of ethnic fragmentation, countries, which are ethnically diverse, are more likely to choose single-member district systems than ethnically homogenous countries. This finding is in line with Aghion et al. (2004).

With respect to form of government, a Spanish colonial history, ethnic heterogeneity, and a great age of democracy increase the likelihood of adopting a presidential system. An English colonial history decreases the likelihood of a presidential system. These results are in line with the results by Persson et al. (2003).

Table 3.3: Results: Endogeneity of political institutions

	$d_{it}$	$f_{it}$
$c$	1.3292 (12.5649)	-1.1695 (-11.0578)
colonial history (UK)	-1.9602 (-17.9853)	-0.1885 (-1.6673)
colonial history (ESP)	0.0570 (0.5308)	4.3178 (3.2654)
ethnic	-0.4787 (-2.6094)	1.8334 (9.3927)
age of democracy	-0.2614 (-1.3538)	0.0509 (0.2654)
$\varrho_1$	1.2760 (20.5489)	-
$\rho$		0.2510 (5.0763)
$\ell$		-1314.4

Notes: Asymptotic  $t$ -statistics are given in parentheses. Source: Authors.

### 3.4.2 Political institutions and latent protection regimes

Table 3.4 provides the maximum likelihood estimates for the preferred model specification containing 6 regimes. Figure 3.4.2 shows the fitted regimes, while Table 3.8 gives the estimated classification of each country and time period into the considered clusters. With respect to factors influencing the latent class membership, Table 3.6 provides the parameter estimates for logit type state probabilities and corresponding marginal effects.

We choose the number of latent regimes to describe the influence of the institutional settings on the level of agricultural protection via comparing information criteria providing measures of model fit. Table 3.7 shows the model fitness criteria for 1 to 7 regimes. Models specifications are compared using the information criterion of Akaike (AIC), the Schwarz criterion (BIC) and the information criterion developed by Smith et al. (2006) in the context of Markov-switching models, which uses the informational content of state probabilities to construct a penalty term to gauge against overparameterization. The results suggest the use of six latent regimes to model the influence of institutions on protection level, where no further latent regimes were considered as the information criteria do not prefer uniquely more than 6 regimes.<sup>20</sup>

The selection in regimes *II* and *IV*, which are the two most frequently observed regimes and correspond to the theoretically predicted  $u$  and inverse  $u$  shaped influence of institutional settings, are adversely affected by the employment share and the value added in agriculture. Thereby, the higher the value added in agriculture the higher (lower) is the probability to be in regime *II* (*IV*). An opposing relationship is estimated for  $empln$ , where a higher employment share reduces (increases) the probability for a country to be classified in regime *II* (*IV*).

The dynamic specification testing is solved within the linear regression framework ignoring the cluster structure.<sup>21</sup> The Wald test statistic for testing the common

<sup>20</sup>Note that the AIC criterion tends to overparametrization as noted by Smith et al. (2006).

<sup>21</sup>This is due to the analytical intractability of the common factor approach within the mixture

factor restriction is 18.61 with a corresponding  $p$ -value of 0.0049. Hence, the model contains dynamics, which cannot be adequately represented via autocorrelated residuals. Next issue is to test whether the dynamics can be represented via a lagged dependent variable alone via testing for joint significance of the lagged explanatory control variables. The corresponding  $F$ -test (test statistic 1.6346 with corresponding  $p$ -value 0.1343 with  $F(6, 970)$ ) cannot reject the joint insignificance of the lagged explanatory variables. Hence, modeling of the dynamics within the level of agricultural protection is pursued via inclusion of the lagged nominal rate of assistance ( $p_{t-1}$ ).

We start with interpreting the standard controls. In particular, following the development-paradox hypothesis a positive parameter for both *initialgdppc* and *gdppcgrowth* is expected. As can be seen from Table 3.4, our model specification displays a positive and significant sign for *gdppcgrowth* and *initialgdppc*, which is in line with the development paradox by Tyers and Anderson (1992). Analogously, the negative coefficient of *factorend* corresponds to the relative income hypothesis of Tyers and Anderson (1992) and de Gorter and Tsur (1991), predicting decreasing rates of assistance with increasing relative income of the agricultural sector. This variable turns out to be highly statistically significant. The estimated *budget* parameter displays the correct negative sign following Beghin and Kherallah (1994), who state that increasing budget expenditures to finance agricultural protection c.p. reduce protection levels. The negative sign for the variable *compad* is in line with the theory and empirical finding of Honma and Hayami (1986), where lower comparative advantages in agriculture increase the demand for agricultural protection. However, this parameter is not statistically significant. As predicted by Olson's theory, we find a negative but not significant impact of the agricultural employment share, *emplln*, on agricultural protection. A low share of employment in agriculture indicates low costs of collective action for agricultural voter groups due to a decreasing free-riding problem and, thus, implies ceteris paribus higher agricultural protection. The negative sign of *tax\_agri* supports the theory that highly export oriented countries will not protect their agricultural sector. The estimated parameter is highly significant. Finally, we find that the Uruguay round negotiations lowered agricultural protection. But the negative effect is not significant.

Now, we turn to our central theory about the impact of political institutions on agricultural protection. According to our theory, we estimated the impact of the form of government independently from the underlying latent regimes. Results reveal a significant negative impact of presidential systems on agricultural protection. That is independent from the latent protection regime and electoral system, presidential systems favor farmers less than other forms of government. Further results suggest that the form of government is endogenous, while we found no endogeneity for electoral rules. For results on the first step that controls for this endogeneity, see Table 3.3.

For the effect of electoral systems on protection rates, we obtain results in line with our theory. An inverse  $u$ -shape is documented for latent regimes *III* and *IV*, while an  $u$ -shaped relationship is estimated for regime *II*. However, the relationship is not significant for regime *II*. Inverse  $u$ -shapes follow if protection rates under

Table 3.4: Results: Influence of political institutions on agricultural protection

variable	$\theta$	s.e.	<i>t</i> -stat.	Sandwich s.e.	panel rob. <i>t</i> -stat.
<i>pit</i> <sub><i>t</i>-1</sub>	0.8261***	0.0114	72.6915	0.0312	26.4869
initialgdppc	0.5969*	0.1476	4.0445	0.3155	1.8918
gdppcgrowth	0.3460***	0.1069	3.2357	0.1414	2.4475
factorend	-0.0812***	0.0310	-2.6150	0.0294	-2.7629
budget	-0.0636**	0.0209	-3.0424	0.0285	-2.2317
compad	0.5170	0.2314	2.2347	0.5605	0.9225
emplln	-0.0719	0.1019	-0.7054	0.1507	-0.4769
tax_agri	-0.9422***	0.2212	-4.2600	0.1992	-4.7304
formgov	-0.1902	0.0984	-1.9324	0.1202	-1.5824
uuround	-0.0554	0.0906	-0.6120	0.1306	-0.4244
$E[\nu_{it}]$	0.1076*	0.0431	2.4949	0.0566	1.8998
$E[\xi_{it}]$	-0.1408	0.0927	-1.5196	0.1160	-1.2137
Regime I (dark blue)			# observations in Regime I: 19		
<i>maj</i> <sub>I</sub> <sup>1</sup>	-0.0160	0.0594	-0.2692	0.0447	-0.3579
<i>mix</i> <sub>I</sub> <sup>2</sup>	1.0708***	0.0718	14.9080	0.1196	8.9501
<i>prop</i> <sub>I</sub> <sup>3</sup>	-0.2766***	0.0819	-3.3778	0.0919	-3.0108
Regime II (light blue)			# observations in Regime II: 182		
<i>maj</i> <sub>II</sub> <sup>1</sup>	-0.0326	0.0303	-1.0769	0.0429	-0.7606
<i>mix</i> <sub>II</sub> <sup>2</sup>	-0.1090	0.0378	-2.8837	0.0823	-1.3242
<i>prop</i> <sub>II</sub> <sup>3</sup>	-0.0534	0.0516	-1.0347	0.0576	-0.9271
Regime III (red)			# observations in Regime III: 78		
<i>maj</i> <sub>III</sub> <sup>1</sup>	-0.0229	0.0359	-0.6366	0.0389	-0.5876
<i>mix</i> <sub>III</sub> <sup>2</sup>	0.3795***	0.0474	8.0120	0.0766	4.9521
<i>prop</i> <sub>III</sub> <sup>3</sup>	0.0895	0.0551	1.6252	0.0788	1.1358
Regime IV (green)			# observations in Regime IV: 748		
<i>maj</i> <sub>IV</sub> <sup>1</sup>	-0.0161	0.0167	-0.9601	0.0255	-0.6303
<i>mix</i> <sub>IV</sub> <sup>2</sup>	0.0251***	0.0118	2.1290	0.0121	2.0794
<i>prop</i> <sub>IV</sub> <sup>3</sup>	0.0168	0.0209	0.8016	0.0291	0.5756
Regime V (black)			# observations in Regime V: 8		
<i>maj</i> <sub>V</sub> <sup>1</sup>	0.4084***	0.1371	2.9779	0.0393	10.3827
<i>mix</i> <sub>V</sub> <sup>2</sup>	2.0321***	0.1494	13.6012	0.2531	8.0303
<i>prop</i> <sub>V</sub> <sup>3</sup>	0.4571***	0.1520	3.0080	0.0463	9.8712
Regime VI (yellow)			# observations in Regime VI: 6		
<i>maj</i> <sub>VI</sub> <sup>1</sup>	-0.0259	0.0751	-0.3455	0.0418	-0.6211
<i>mix</i> <sub>VI</sub> <sup>2</sup>	-0.6735***	0.1041	-6.4675	0.1815	-3.7107
<i>prop</i> <sub>VI</sub> <sup>3</sup>	0.3226***	0.1345	2.3985	0.0935	3.4497
$\sigma$	1.1362	0.0305	37.3052	0.0982	11.5730
# observations				1041	
AIC	3.5269				
BIC	3.6410				
MSC	4.2854				
log lik	-1811.3				

Notes: \* indicates significance at the 10 percent level, \*\* indicates significance at the 5 percent level, and \*\*\* indicates significance at the 1 percent level. Cluster-robust standard errors are used to indicate significance. Source: Authors. Source: Authors.

a mixed electoral system significantly exceed protection levels under majority rule and proportional representation. *u*-shaped regimes form if protection rates under a mixed electoral system are significantly lower to protection levels under majority rule and proportional representation. Interpreting the estimated parameters for regime *IV* implies that a shift from majority rule to mixed rule increases protection rates by 0.04 percentage points, while a shift from mixed rule to proportional representation decreases protection rates by 0.01 percentage points c.p. in the short run. Note that the regimes *I*, *V* and *VI* provide some kind of outlier detection. Countries with high and relatively volatile agricultural protection rates predominantly constitute these regimes. In fact, these countries are Finland, Iceland, Norway, Sweden and Switzerland (see Table 3.8) . Figure 3.4.2 plots the pseudoresiduals of each country with colors indicating the specific latent policy regime. Pseudoresiduals denote the part of the observed *NRA* of a country that cannot be explained by standard polit-economic controls. The Figure nicely depicts the *u*- and *inverse u*- shaped relations between agricultural protection and electoral system. Note that horizontal line denote the regime dependent parameter estimates of the dummy variables indicating the electoral system.

Our results reveal that a simple majoritarian-proportional dichotomy is not sufficient to explain agricultural protection as done by previous studies. On contrary, we observe that agricultural protection rates predominantly differ between mixed and majority rule and between mixed rule and proportional representation, while protection rates do often not significantly vary between majority rule and proportional representation. Overall, results suggest, that protection rates first increase and then decrease with district magnitude if we control for the impact of standard control variables given a specific latent inverse *u*-shaped protection regime. In case of an *u*-shaped relationship, protection rates first decrease and then increase with district magnitude, if we control for the impact of standard control variables.

Results are derived by controlling for the endogeneity of political institutions, latent policy regimes and the dynamic structure of data. In order to check the results against possible underlying latent heterogeneity, we perform an out-of-sample experiment as suggested by Beck (2001). Hence, we reestimate the preferred model specification leaving out a single country each. Based on the estimates obtained from the remaining sample of 51 countries we compute the mean absolute forecasting error for the dropped country. The results are shown in Table (3.5) and indicate homogeneity of the regression relationship. Notable exception are Iceland, Korea, Norway and Switzerland. Leaving out these countries however does not alter the recognized pattern of agricultural protection in relation to political institutions. Consideration of relative mean absolute errors suggest the presence of differences in the country specific volatility. Therefore, we resort to panel robust standard errors to gauge significance of estimates.

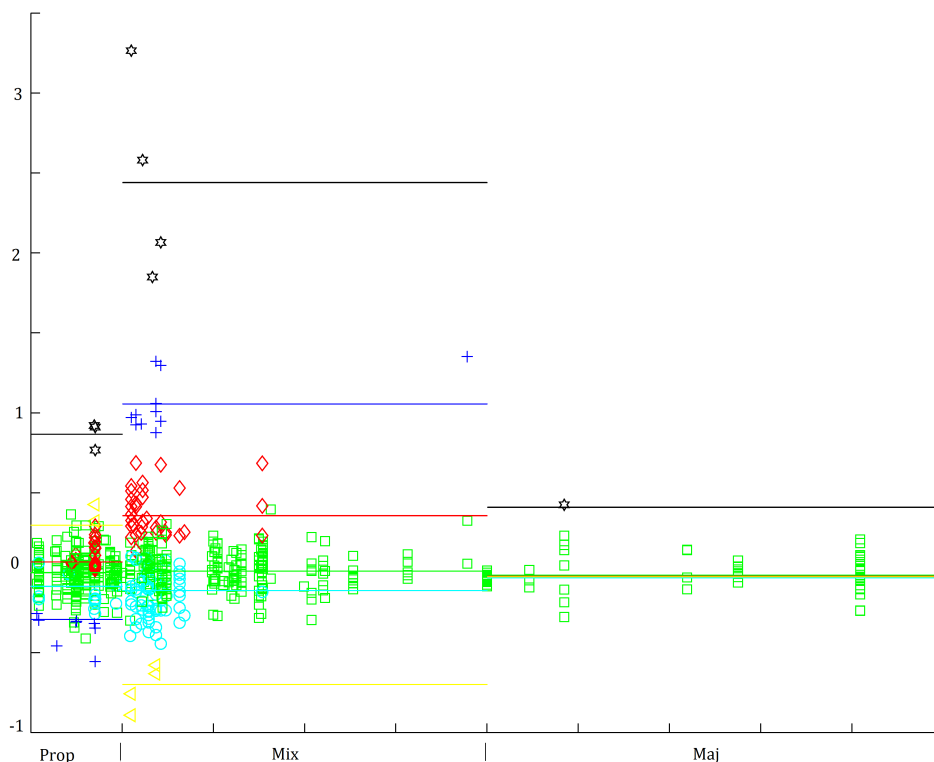


Figure 3.1: Latent policy regimes and electoral systems  
Source: Authors

### 3.5 Conclusion

Nowadays agricultural protection is certainly still one of the prominent examples of special interest politics biases. Moreover, it is not a trivial one giving the high global welfare benefits calculated assuming agricultural policy is liberalized around the world. Understanding the political economy of agricultural protection, however, is still a theoretical and empirical challenge.

In this regard, this paper provides a theoretical and empirical analysis of the impact of formal and informal constitutional rules as well as lobbying on agricultural protection level in developing and industrialized countries. We especially focus our analyses on the question how this impact is influenced by the specific legislative organization in presidential versus parliamentary systems as well as by lobbying and the demographic composition of a society. Overall, this paper makes the following theoretical and empirical contributions to the understanding of agricultural protection patterns around the world.

First, we develop a micro-political founded theory to understand the interaction of formal and informal political institutions in determining the level of agricultural protection or taxation, respectively. In our theory, we explicitly derive legislators' policy preferences from electoral competition and final policy outcomes from post-election bargaining in legislatures. Further, we show that legislators' preferences vary with district size.

In detail, our model derives legislators' policy preferences within a probabilistic voting environment. We assume, following Lohmann (1998), that, depending on their relative group size, agrarian and non-agrarian voters differ in their ideological commitment. This implies heterogeneous agricultural policy preferences between two legislators, if one is elected in an urban district and the other one in an rural constituency. Accordingly, in bargaining at the legislature, the differences in preferred policies generate a conflict between legislators. In a parliamentary system, the conflict is generated between the prime minister, who will tend to favor rural or urban districts, and her parliamentary majority, that will be dominated by the opposite urban or rural concerns. Legislative bargaining in presidential system is characterized by a conflict between the median of the agricultural committee, who will tend to favor rural (urban) districts and the floor median, who tends to favor the opposite urban (rural) districts in industrialized (developing) countries, respectively.

At the election stage, asymmetric lobbying activities amplify preference heterogeneity. Heterogeneity is attenuated, when district size grows and the electoral system converges to pure proportional representation, because district populations become more homogenous. With regard to legislative bargaining, political exchange translates legislators' preference heterogeneity in more extreme policy results.

Based on our theory, we are able to identify interaction effects between district size and specific political as well as demographic framework constellations. Two basic regimes are detected: an u-shape and an inverse u-shape relation between district size and the level of agricultural protection. Moreover, we identify monotonically decreasing or increasing as well as constant relations as special cases of these two regimes. Further, we show that the political, economic and demographic framework conditions found in developing and industrialized countries, respectively, imply different patterns of how the interaction of electoral rules, formal and informal legislative norms and lobbying impact on agricultural protection levels in these two country types.

Second, we provide a comprehensive empirical analysis of our theoretical hypotheses regarding the quantitative relationship between political institutions and agricultural protection. The theoretical considerations imply for the impact of electoral rules to depend on an unobserved policy regime induced by the strength of agricultural interest groups. Therefore we apply a switching regression model to account for different latent policy regimes. Information criteria suggest the modeling of six latent policy regimes. Further, based on theoretical concerns about the endogeneity of political institutions with regard to the decision on the level of agricultural protection, the estimation strategy is extended in order to control for such endogeneity of political institutions via an instrument variable approach. Our results confirm the theoretically derived non-linear relationship between agricultural protection and district size. However, we mainly find significant inverse *u*-shaped relationships. Significance is assessed using panel robust standard errors. Besides endogeneity, our results are also robust against the specification of dynamics.



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### 3.A Appendix

#### 3.A.1 Proof of proposition 1

By assumption legislators' preferences are strict single-peaked which already implies that utility functions of all legislators are strict quasi concave. Hence, all sets  $S_g$  are compact and convex subsets of  $S$  and accordingly the intersection set  $\bigcap_g S_g$  is also a compact and convex subset of  $S$ . Accordingly, it follows directly from well-known theorem of quasi-concave programming Arrow et al. (1961) that the maximization of the PM's policy preferences has a unique solution, since  $U^{PM}(s)$  is strictly quasi concave.

*q. e. d.*

#### 3.A.2 Proof of proposition 2

From proposition 1 we know that the utility functions of all legislators are strict quasi concave. Therefore, the set  $S_F$  is compact and convex subsets of  $S$ . Accordingly, it follows directly from well-known theorem of quasi-concave programming Arrow et al. (1961) that the maximization of the committee median's policy preferences has a unique solution since  $U^{CA}(s)$  is strictly quasi concave.

*q. e. d.*

#### 3.A.3 Proof of proposition 3

- (i): Single-peakedness of  $U_{g_d}(s)$  follows directly from the fact the weighted social welfare function  $SWF_d(s)$  is strict quasi-concave in  $s$ , while the latter follows from the fact that by assumption  $\tilde{\Gamma}^S$  is strictly convex in  $s_A$  and  $\tilde{\Gamma}^T$  is strictly concave in  $t_A$ .
- (ii): and (iii) Applying the implicit function theorem to the first order condition of the maximization of the social welfare function  $SWF_d$  results:

$$\frac{\partial Y(g_d)}{\partial \beta_d^A} = -\frac{1}{\frac{\partial^2 W^{inc}}{\partial s^2}} = \frac{1}{\frac{\partial^2 \tilde{\Gamma}^S}{\partial s_A^2}} > 0, \quad \text{for } s > 0$$

$$= -\frac{1}{\frac{\partial^2 \tilde{\Gamma}^T}{\partial t_A^2}} > 0, \quad \text{for } s < 0$$

Thus,  $\frac{\partial \beta_d^A}{\partial \alpha_d^A} = \phi^A >$  implies (ii), while  $\frac{\partial \beta_d^J}{\partial K^J} = -\frac{\beta_d^J}{K^J} < 0$  implies (iii).

iv and (v): It follows from the FOC of the maximization of the  $SWF_d$  :

$$(*) \quad \begin{aligned} \frac{\partial \tilde{\Gamma}^S}{\partial s} &= \frac{\beta_d^A \alpha^M}{(\beta_d^M \alpha^A)} > 1, & \text{if } Y_{gd} > 0 \\ \frac{\partial \tilde{\Gamma}^T}{\partial s} &= \frac{\beta_d^A \alpha^M}{(\beta_d^M \alpha^A)} < 1, & \text{if } Y_{gd} < 0 \end{aligned}$$

The first part of (\*) follows from the strict convexity of  $\tilde{\Gamma}^S$  and the property  $\tilde{\Gamma}^S(s_A) > s_A$ , which implies for some  $0 < \psi_s < 1$ :

$$1 < \frac{\tilde{\Gamma}^S(s)}{s_A} = \frac{\partial \tilde{\Gamma}^S(\psi_s s_A)}{\partial s_A} < \frac{\partial \tilde{\Gamma}^S(s_A)}{\partial s_A}, \quad \text{for } s_A = s \geq 0$$

while the second part follows from the strict concavity of  $\tilde{\Gamma}^T$  and the property  $\tilde{\Gamma}^T(t_A) > t_A$ , which implies for some  $0 \leq \psi_t \leq 1$ :

$$1 > \frac{\tilde{\Gamma}^T(T)}{t_A} = \frac{\partial \tilde{\Gamma}^T(\psi_t t_A)}{\partial t_A} > \frac{\partial \tilde{\Gamma}^T(t_A)}{\partial t_A}, \quad \text{for } t_A = -s \geq 0$$

(iv) and (v) follow directly from (\*).

*q.e.d.*

### 3.A.4 Proof of proposition 4

Let  $Y_{k_i}^{ty}$  denote the ideal point of a legislator reelected in a district of type  $ty$ .

*Proposition 1* implies:

$$\begin{aligned} Y_{k_1}^M &< Y_{k_2}^M < \dots < Y_{k_i}^M < Y_{k_{i+1}}^M < Y_{k_l}^M = Y_n \\ Y_{k_1}^A &> Y_{k_2}^A > \dots > Y_{k_i}^A > Y_{k_{i+1}}^A > Y_{k_l}^A = Y_n \end{aligned} \quad (3.45)$$

where  $Y_n$  is the unique common ideal position of all legislators under proportional representation.

Case 1: *Parliamentary systems*, ( $PS = 0$ ).

By *proposition 2* it holds for the equilibrium outcome  $s_k^*$  in a parliamentary system:

$$\begin{aligned} s_{k_i}^* &= \max \{s_{k_i}^-, Y_{k_i}^{PM}\} \leq \bar{s}_{k_i} & \text{if } Y_{k_i}^{PM} \leq \bar{s}_{k_i} \\ s_{k_i}^* &= \min \{s_{k_i}^+, Y_{k_i}^{PM}\} \geq \bar{s}_{k_i} & \text{if } Y_{k_i}^{PM} \geq \bar{s}_{k_i} \end{aligned} \quad (3.46)$$

If  $POP = 0$  it follows  $\bar{s}_{k_i} = Y_{k_i}^A$ . Hence,  $\bar{s}_{k_i}$  and thus also  $s_{k_i}^+$  and  $s_{k_i}^-$  decreases with  $k_i$ , while from proposition ?? we have  $Y_{k_i}^{PM}$  increases with  $k_i$  if the PM is reelected in an urban districts and decreases with  $k_i$  if the PM is reelected in an urban district. Moreover, by assumption it holds  $fr_A < fr_M$  implying  $Y_{k_i}^{PM} \leq \bar{s}_{k_i}$ . Therefore, it already follows  $s_{k_i}^* = \max \{s_{k_i}^-, Y_{k_i}^{PM}\}$ .  $s_{k_i}^*$  obviously decreases with  $k_i$  if the PM is reelected in

an rural district since in this case both  $s_{k_i}^-$  and  $Y_{k_i}^{PM}$ , respectively, decrease with  $k_i$ . If, however, the  $PM$  is reelected in a urban district it follows from *proposition ??* that  $Y_{k_i}^{PM}$  increases with  $k_i$ . Therefore, we have the following three cases: (1)  $Y_n^{PM} < s_n^-$  or (2)  $Y_1^{PM} > s_1^-$  or (3) neither (1) nor (2). In the first case it follows that  $s_{k_i}^* = s_{k_i}^-$ ,  $\forall i = 1, \dots, l$ . Thus, a monotonically decreasing relation results. In the second case it follows that  $s_{k_i}^* = Y_{k_i}^{PM}$ ,  $\forall i = 1, \dots, l$ , i.e. a monotonically decreasing relation results. In the third case we define  $K^{##}$  as a set of all  $1 \leq k^{##} \leq n$  for which the following relation holds:  $s_{k_i}^- \leq Y_{k_i}^{PM}$ , *for*  $k_i \geq k^{##}$ . Obviously, since (1) does not hold it follows  $k_l \in K^{##}$ , i.e.  $K^{##}$  is always not empty. Therefore, there always exists a minimal  $k_i$  that is an element of  $K^{##}$ . It is straightforward to show that this minimal  $k_i$  just corresponds to a  $k^\#$  for which R1 holds.

If  $POP = 1$  it follows  $\bar{s}_{k_i} = Y_{k_i}^M$ . Hence,  $\bar{s}_{k_i}$  and thus also  $s_{k_i}^+$  and  $s_{k_i}^-$  increase with  $k_i$ , while from *proposition ??* we have  $Y_{k_i}^{PM}$  increases with  $k_i$  if the  $PM$  is reelected in an urban districts and decreases with  $k_i$  if the  $PM$  is reelected in an urban district. Moreover, by assumption it holds  $fr_A > fr_M$  implying  $Y_{k_i}^{PM} \geq \bar{s}_{k_i} \forall i = 1, \dots, l$ . Therefore, it already follows  $s_{k_i}^* = \min \{s_{k_i}^+, Y_{k_i}^{PM}\}$ .  $s_{k_i}^*$  obviously increases with  $k_i$  if the  $PM$  is reelected in an urban district since in this case both  $s_{k_i}^+$  and  $Y_{k_i}^{PM}$ , respectively, increase with  $k_i$ .

If, however, the  $PM$  is reelected in a rural district it follows from *proposition ??* that  $Y_{k_i}^{PM}$  decreases with  $k_i$ . Therefore, we have the following three cases: (1)  $Y_n^{PM} > s_n^+$  or (2)  $Y_1^{PM} < s_1^+$  or (3) neither (1) nor (2) holds. In the first case it follows that  $s_{k_i}^* = s_{k_i}^+$ ,  $\forall i = 1, \dots, l$ . Thus, an monotonically increasing relation. In the second case it follows that  $s_{k_i}^* = Y_{k_i}^{PM}$ ,  $\forall i = 1, \dots, l$ , i.e. a monotonically decreasing relation results. In the third case we define  $K^{##}$  as a set of all  $1 \leq k^{##} \leq n$  for which the following relation holds:  $s_{k_i}^+ \geq Y_{k_i}^{PM}$ , *for*  $k_i \geq k^{##}$ . Obviously, since (1) does not hold it follows  $k_l \in K^{##}$ , i.e.  $K^{##}$  is always not empty. Therefore, there always exists a minimal  $k_i$  that is an element of  $K^{##}$ . It straightforwardly follows that this minimal  $k_i$  just corresponds to a  $k^\#$  for which R2 holds.

Case 2: Presidential systems,  $PS = 1$ .

By *proposition 3* it holds for the equilibrium outcome  $s_k^*$  in a presidential system:

$$\begin{aligned} s_{k_i}^* &= \max \{s_{k_i}^-, Y_{k_i}^{CA}\} \leq SQ & \text{if } Y_{k_i}^{CA} \leq SQ \\ s_{k_i}^* &= \min \{s_{k_i}^+, Y_{k_i}^{CA}\} \geq SQ & \text{if } Y_{k_i}^{CA} \geq SQ \end{aligned} \quad (3.47)$$

If  $POP = 0$  it follows  $Y_{k_i}^F = Y_{k_i}^A$ . Hence,  $Y_{k_i}^F$  decreases with  $k_i$ , while from *proposition 1* we have  $Y_{k_i}^{CA}$  decreases with  $k_i$  if the median of the agricultural committee,  $C_A$ , is reelected in a rural district and increases with  $k_i$  if  $C_A$  is reelected in an urban district. Therefore, it already follows

$s_{k_i}^* = Y_{k_i}^A$  and therefore monotonically decreasing in  $k_i$  if the committee median is reelected in an rural district.

If, however, the the committee median is reelected in an urban district it follows from *proposition 1* that  $Y_{k_i}^{CA} = Y_{k_i}^M \leq Y_n$  increases with  $k_i$ . Therefore, assuming SQ is sufficiently large implies perfect agenda setting power of the urban committee and hence  $s_{k_i}^* = Y_{k_i}^M$  and a monotonically increasing relation follows. If, however,  $SQ > Y_n$ , but SQ is not sufficiently large implies the urban committee median has only imperfect agenda setting power vis-a-vis the rural dominated floor, i.e. it holds:  $Y_1^M < s_1^-$ , while it also holds:  $Y_n^M > s_n^-$ . Further, by definition  $s_{k_i}^-$  is decreasing in  $k_i$ . Therefore, by the same argumentation as above we define  $K^{##}$  as a set of all  $1 \leq k^{##} \leq n$  for which the following relation holds:  $s_{k_i}^- \leq Y_{k_i}^M$ , for  $k_i \geq k^{##}$ . It straightforwardly follows that a minimal  $k_i$  of this set always exists and corresponds to a  $k^{\#}$  for which R1 holds. Finally, if  $SQ > Y_n$ , but SQ approximates  $Y_n$  from above implies that there exist an  $\epsilon$ , such that  $s_{k_i}^- = SQ \forall k_i \leq k_n - \epsilon(SQ - Y_n)$ . Hence, for  $SQ$  sufficiently close to  $Y_n$  the u-shape relation approximates a constant relation in the sense that for all district sizes  $k_i < n$  the status quo prevails, i.e. only for a pure PR-system legislators are able to circumvent a gridlock situation, while for  $SQ = Y_n$  a gridlock results for all election systems.

If  $POP = 1$  it follows  $Y_{k_i}^F = Y_{k_i}^M$ . Hence,  $Y_{k_i}^F$  increases with  $k_i$ , while from proposition 1 we have  $Y_{k_i}^{CA}$  decreases with  $k_i$  if the median of the agricultural committee,  $C_A$ , is reelected in a rural district and increases with  $k_i$  if  $C_A$  is reelected in an urban district. Therefore, it already follows  $s_{k_i}^* = Y_{k_i}^M$  and is therefore monotonically increasing in  $k_i$  if the committee median is reelected in an urban district.

If, however, the the committee median is reelected in a rural district it follows from *proposition 1* that  $Y_{k_i}^{CA} = Y_{k_i}^A \geq Y_n$  increases with  $k_i$ . Therefore, assuming SQ is sufficiently lower than  $Y_n$  implies perfect agenda setting power of the rural committee and hence  $s_{k_i}^* = Y_{k_i}^A$  and a monotonically decreasing relation follows. If, however,  $SQ < Y_n$ , but SQ is not sufficiently lower than  $Y_n$  implies the rural committee median has only imperfect agenda setting power vis-a-vis the urban dominated floor, i.e. it holds:  $Y_1^A > s_1^+$ , while it also holds:  $Y_n^A < s_n^+$ . Further, by definition  $s_{k_i}^+$  is weak monotonically increasing in  $k_i$ . Therefore, by the same argumentation as above we define  $K^{##}$  as a set of all  $1 \leq k^{##} \leq n$  for which the following relation holds:  $s_{k_i}^+ \geq Y_{k_i}^A$ , for  $k_i \geq k^{##}$ . It straightforwardly follows that a minimal  $k_i$  of this set always exists and corresponds to a  $k^{\#}$  for which R2 holds. Finally, if  $SQ < Y_n$ , but SQ approximates  $Y_n$  from below implies that there exist an  $\epsilon$ , such that  $s_{k_i}^+ = SQ \forall k_i \leq k_n - \epsilon(Y_n - SQ)$ . Hence, for  $SQ$  sufficiently close to  $Y_n$  the inverse u-shape relation approximates a constant relation in the sense that for all district sizes  $k_i < n$  the status quo prevails, i.e. only for a pure PR-system legislators are able to circumvent a gridlock situation, while for  $SQ = Y_n$  a gridlock results



for all election systems.

*q. e. d.*

### 3.A.5 Derivation of extended Mill's ratios

The expectations of errors have to be considered for six cases. Define  $h_1 = -{}_2z_{it}\delta_2$ ,  $h_2 = -{}_2z_{it}\delta_2 + \varrho$ ,  $h_3 = -{}_1z_{it}\delta_1$ . Following Rosenbaum (1961) the expectations are hence given as

$$E \left[ \begin{pmatrix} \nu_{it} \\ \xi_{it} \end{pmatrix} \middle| f_{it} = 0, 0 = d_{it} \right] = \begin{pmatrix} \frac{\left\{ -\phi(h_1) - \psi\phi(h_3) + \phi(h_1)[1 - \Phi(\frac{h_1 - \psi h_3}{\sqrt{1 - \psi^2}})] + \psi\phi(h_3)[1 - \Phi(\frac{h_1 - \psi h_3}{\sqrt{1 - \psi^2}})] \right\}}{\Pr(R_1)} \\ \frac{\left\{ -\psi\phi(h_1) - \phi(h_3) + \phi(h_3)[1 - \Phi(\frac{h_1 - \psi h_3}{\sqrt{1 - \psi^2}})] + \psi\phi(h_1)[1 - \Phi(\frac{h_3 - \psi h_1}{\sqrt{1 - \psi^2}})] \right\}}{\Pr(R_1)} \end{pmatrix},$$

$$E \left[ \begin{pmatrix} \nu_{it} \\ \xi_{it} \end{pmatrix} \middle| f_{it} = 1, 0 = d_{it} \right] = \begin{pmatrix} \frac{\left\{ \psi\phi(h_3) - \phi(h_3)[1 - \Phi(\frac{h_3 - \psi h_1}{\sqrt{1 - \psi^2}})] - \psi\phi(h_3)[1 - \Phi(\frac{h_3 - \psi h_1}{\sqrt{1 - \psi^2}})] \right\}}{\Pr(R_2)} \\ \frac{\left\{ \phi(h_3) - \phi(h_2)[1 - \Phi(\frac{h_1 - \psi h_3}{\sqrt{1 - \psi^2}})] - \psi\phi(h_1)[1 - \Phi(\frac{h_3 - \psi h_1}{\sqrt{1 - \psi^2}})] \right\}}{\Pr(R_2)} \end{pmatrix},$$

$$E \left[ \begin{pmatrix} \nu_{it} \\ \xi_{it} \end{pmatrix} \middle| f_{it} = 0, d_{it} = 1 \right] = \begin{pmatrix} \frac{\left\{ -\phi(h_3)[1 - \Phi(\frac{h_1 - \psi h_3}{\sqrt{1 - \psi^2}})] + \psi\phi(h_1)[\Phi(\frac{h_3 - \psi h_1}{\sqrt{1 - \psi^2}})] + \phi(h_3)[1 - \Phi(\frac{h_2 - \psi h_3}{\sqrt{1 - \psi^2}})] - \psi\phi(h_2)[\Phi(\frac{h_3 - \psi h_2}{\sqrt{1 - \psi^2}})] \right\}}{\Pr(R_3)} \\ \frac{\left\{ -\psi\phi(h_3)[1 - \Phi(\frac{h_1 - \psi h_3}{\sqrt{1 - \psi^2}})] + \phi(h_1)[\Phi(\frac{h_3 - \psi h_1}{\sqrt{1 - \psi^2}})] + \psi\phi(h_3)[1 - \Phi(\frac{h_2 - \psi h_3}{\sqrt{1 - \psi^2}})] - \phi(h_2)[\Phi(\frac{h_3 - \psi h_2}{\sqrt{1 - \psi^2}})] \right\}}{\Pr(R_3)} \end{pmatrix},$$

$$E \left[ \begin{pmatrix} \nu_{it} \\ \xi_{it} \end{pmatrix} \middle| f_{it} = 1, d_{it} = 1 \right] = \begin{pmatrix} \frac{\left\{ \phi(h_1)[1 - \Phi(\frac{h_3 - \psi h_1}{\sqrt{1 - \psi^2}})] + \psi\phi(h_3)[1 - \Phi(\frac{h_1 - \psi h_3}{\sqrt{1 - \psi^2}})] - \phi(h_2)[1 - \Phi(\frac{h_3 - \psi h_2}{\sqrt{1 - \psi^2}})] - \psi\phi(h_3)[1 - \Phi(\frac{h_2 - \psi h_3}{\sqrt{1 - \psi^2}})] \right\}}{\Pr(R_4)} \\ \frac{\left\{ \phi(h_3)[1 - \Phi(\frac{h_1 - \psi h_3}{\sqrt{1 - \psi^2}})] + \psi\phi(h_1)[1 - \Phi(\frac{h_3 - \psi h_1}{\sqrt{1 - \psi^2}})] - \phi(h_3)[1 - \Phi(\frac{h_2 - \psi h_3}{\sqrt{1 - \psi^2}})] - \psi\phi(h_2)[1 - \Phi(\frac{h_3 - \psi h_2}{\sqrt{1 - \psi^2}})] \right\}}{\Pr(R_4)} \end{pmatrix},$$

$$E \left[ \begin{pmatrix} \nu_{it} \\ \xi_{it} \end{pmatrix} \middle| f_{it} = 0, d_{it} = 2 \right] = \begin{pmatrix} \frac{\left\{ \phi(h_2)[\Phi(\frac{h_3 - \psi h_2}{\sqrt{1 - \psi^2}})] + \psi\phi(h_3)[1 - \Phi(\frac{h_2 - \psi h_3}{\sqrt{1 - \psi^2}})] \right\}}{\Pr(R_5)} \\ \frac{\left\{ \phi(h_3)[1 - \Phi(\frac{h_2 - \psi h_3}{\sqrt{1 - \psi^2}})] + \psi\phi(h_2)[\Phi(\frac{h_3 - \psi h_2}{\sqrt{1 - \psi^2}})] \right\}}{\Pr(R_5)} \end{pmatrix},$$

$$E \left[ \begin{pmatrix} \nu_{it} \\ \xi_{it} \end{pmatrix} \middle| f_{it} = 1, d_{it} = 2 \right] = \begin{pmatrix} \frac{\left\{ \phi(h_2)[1 - \Phi(\frac{h_3 - \psi h_2}{\sqrt{1 - \psi^2}})] + \psi\phi(h_3)[1 - \Phi(\frac{h_2 - \psi h_3}{\sqrt{1 - \psi^2}})] \right\}}{\Pr(R_6)} \\ \frac{\left\{ \phi(h_3)[1 - \Phi(\frac{h_2 - \psi h_3}{\sqrt{1 - \psi^2}})] + \psi\phi(h_2)[1 - \Phi(\frac{h_3 - \psi h_2}{\sqrt{1 - \psi^2}})] \right\}}{\Pr(R_6)} \end{pmatrix}.$$

## 3.A.6 Empirical Analysis

Table 3.5: List of countries and available time periods

Number	Country	First period	Last period	# periods	MAE
1	Argentina	1984	2006	23	0.2458
2	Australia	1972	2006	35	0.1669
3	Austria	1972	1994	23	0.4411
4	Bangladesh	1992	2005	14	0.3422
5	Brazil	1986	2006	21	0.2751
6	Bulgaria	1993	2006	14	1.0171
7	Canada	1962	2006	45	0.3920
8	Chile	1990	2006	17	0.4742
9	Colombia	1966	2006	41	0.4656
10	Czech Rep.	1994	2003	10	0.5511
11	Denmark	1967	1972	6	0.1006
12	Dominican Rep.	1979	2006	28	0.7229
13	Ecuador	1980	2004	25	0.5212
14	Estonia	1993	2003	11	0.7749
15	Ethiopia	1996	2006	11	0.5635
16	Finland	1962	1994	33	0.8816
17	Ghana	1998	2005	8	0.2215
18	Hungary	1993	2003	11	0.4024
19	Iceland	1980	2006	27	1.5348
20	India	1966	2005	40	0.9672
21	Indonesia	2000	2005	6	0.2119
22	Japan	1966	2006	41	0.8590
23	Korea, Rep.	1990	2006	17	1.8649
24	Latvia	1994	2003	10	0.2556
25	Lithuania	1993	2003	11	0.5272
26	Madagascar	1994	2006	13	0.4064
27	Malaysia	1962	2005	44	0.2707
28	Mexico	1995	2006	12	0.2761
29	Mozambique	1995	2006	12	0.2671
30	New Zealand	1972	2006	35	0.8616
31	Nicaragua	1995	2005	11	0.3252
32	Nigeria	2001	2005	5	0.4133
33	Norway	1972	2006	35	1.6181
34	Pakistan	1989	1999	11	0.4628
35	Philippines	1988	2005	18	0.7099
36	Poland	1993	2003	11	0.3173
37	Portugal	1977	1985	9	0.2347
38	Romania	1993	2006	14	0.7116
39	Russia	1995	2006	12	0.2873
40	Senegal	2001	2005	5	0.2882

continued on next page

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Number	Country	First period	Last period	# periods	MAE
41	Slovak Rep.	1998	2003	6	0.4927
42	Slovenia	1993	2003	11	0.6931
43	South Africa	1962	2006	45	0.5488
44	Spain	1979	1985	7	0.4088
45	Sri Lanka	1962	2005	44	0.6486
46	Sweden	1972	1994	23	0.7910
47	Switzerland	1991	2006	16	2.0813
48	Thailand	1989	2005	17	0.3547
49	Turkey	1970	2006	37	0.6031
50	Ukraine	1995	2006	12	1.0913
51	United States	1972	2006	35	0.6124
52	Zambia	1993	2005	13	1.0037

Source: Authors.

Table 3.6: Maximum Likelihood Estimation Results for Regime Probabilities – First Step

Variable	$\theta$	s.e.	$t$ -stat.	Sandwich s.e.	Pan. rob. $t$ -stat.	# observations in Regime $I$ : 19	Marg. effect	s.e.	$t$ -stat.	Sandwich s.e.	pan. rob. $t$ -stat.	
Regime $I$												
$c_1$	0.9161	0.6918	1.3242	0.6980	1.3125	–	–	–	–	–	–	
emplln	2.8275	2.2667	1.2474	2.4081	1.1741	0.3307	0.2190	1.5101	0.2190	0.2190	1.5096	
agri value	-0.1475	0.1844	-0.8002	0.1426	-1.0344	-0.0209	0.0131	-1.5888	0.0180	0.0180	-1.1627	
Regime $II$												
$c_2$	-0.6467	0.6164	-1.0491	0.6317	-1.0238	–	–	–	–	–	–	
emplln	-2.6561	1.9400	-1.3691	1.8896	-1.4056	-1.1378	0.5686	-2.0012	0.6372	0.6372	-1.7855	
agri value	0.2659	0.1677	1.5857	0.1677	1.5857	0.0992	0.0534	1.8574	0.0558	0.0558	1.7797	
Regime $III$												
$c_3$	0.4979	0.6324	0.7873	0.5750	0.8659	–	–	–	–	–	–	
emplln	0.7103	2.0104	0.3533	1.8536	0.3832	0.1000	0.2652	0.3770	0.2917	0.2917	0.3427	
agri value	-0.1523	0.1796	-0.8481	0.1526	-0.9982	-0.0302	0.0193	-1.5650	0.0231	0.0231	-1.3046	
Regime $IV$												
$c_4$	2.8360	0.9294	3.0515	1.2855	2.2061	–	–	–	–	–	–	
emplln	9.2546	3.2590	2.8397	4.7339	1.9550	0.3997	0.1174	3.4051	0.0822	0.0822	4.8611	
agri value	-0.4765	0.2227	-2.1394	0.2883	-1.6527	-0.0219	0.0068	-3.2196	0.0067	0.0067	-3.2814	
Regime $V$												
$c_5$	1.3206	0.8063	1.6378	0.6386	2.0680	–	–	–	–	–	–	
emplln	4.6870	2.7290	1.7175	2.2204	2.1109	0.3309	0.1171	2.8263	0.1338	0.1338	2.4725	
agri value	-0.2825	0.2098	-1.3464	0.1485	-1.9016	-0.0222	0.0076	-2.9093	0.0108	0.0108	-2.0576	
Regime $VI$												
$c_6$	–	–	–	–	–	–	–	–	–	–	–	
emplln	–	–	–	–	–	-0.0234	0.1177	-0.1986	0.0792	0.0792	-0.2951	
agri value	–	–	–	–	–	-0.0041	0.0078	-0.5271	0.0057	0.0057	-0.7264	

Notes: Marginal effects are evaluated at 50% quantile.

Table 3.7: Information Criteria for Model Selection

Regime	Information criteria / Log-Likelihood	
1	AIC	4.5637
	BIC	4.6777
	MSC	5.5156
	log lik	-2351.4
2	AIC	4.0837
	BIC	4.1987
	MSC	5.1021
	log lik	-2101.6
3	AIC	3.9719
	BIC	4.0859
	MSC	5.0987
	log lik	-2043.4
4	AIC	3.6970
	BIC	3.8110
	MSC	4.8519
	log lik	-1864.0
5	AIC	3.5807
	BIC	3.6948
	MSC	4.6437
	log lik	-1839.8
6	AIC	3.5269
	BIC	3.6410
	MSC	4.2854
	log lik	-1811.3
7	AIC	3.5341
	BIC	3.6482
	MSC	4.5896
	log lik	-1810.2

Table 3.8: Latent regime classification of countries and periods

Year	Countries numbered according to Table 3.5																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1961							4										5
1962							4										4
1963							4										4
1964							4										4
1965							4		4								4
1966							4		4		4						4
1967							4		4		4						4
1968							4		4		4						4
1969							4		4		4						4
1970							4		4		4						4
1971		3	4				3		4		4						4
1972		2	4				3		4								4
1973		2	1				3		4								4
1974		2	4				3		4								4
1975		2	4				3		4								4
1976		2	4				3		4								4
1977		3	4				3		4								4
1978		2	4				3		4			4					4
1979		2	4				3		4			4	4				4
1980		2	4				3		4			4	4				1
1981		2	4				3		4			4	4				4
1982		3	4				3		4			4	4				4
1983	4	2	4				3		4			4	4				4
1984	4	2	4				3		4			4	4				4
1985	4	2	4		4		3		4			4	4				6
1986	4	2	4		4		2		4			4	4				5
1987	4	2	4		4		2		4			4	4				3
1988	4	2	4		4		2		4			4	4				4
1989	4	2	4		4		2	4	4			4	4				4
1990	4	3	3		4		2	4	4			4	4				6
1991	4	3	4	4	4		2	4	4			4	4				3
1992	4	3	3	4	4	2	2	4	4			4	4	2			4
1993	4	2	3	4	4	4	2	4	4	4		4	4	4			3
1994	4	3		4	4	2	2	4	4	4		4	4	4			
1995	4	2		4	4	2	2	4	4	4		4	4	4	2		
1996	4	2		4	4	2	2	4	4	4		4	4	4	2		
1997	4	2		4	4	2	2	4	4	4		4	4	4	2		4
1998	4	2		4	4	2	2	4	4	4		4	4	4	2		4
1999	4	2		4	4	2	2	4	4	4		4	4	4	2		4
2000	4	2		4	4	2	2	4	4	4		4	4	4	2		4
2001	4	2		4	4	2	2	4	4	4		4	4	4	2		4
2002	2	2		4	4	2	2	4	4	4		4	4	4	4		4
2003	2	2		4	4	2	2	4	4			4	4		4		4
2004	2	2		4	4	2	2	4	4			4			2		2
2005	2	2			4	2	2	4	4			4			2		

to continue table 3.8

Year	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
1961										4								
1962										4								
1963										4								
1964										4								
1965			4		4					4								
1966			2		4					4								
1967			2		4					4								
1968			2		4					4								
1969			2		4					4								
1970			2		4					4								
1971			4		4					4			4			5		
1972			4		4					4			2			4		
1973			2		4					4			4			4		
1974			4		4					4			4			4		
1975			4		4					4			4			4		
1976			4		4					4			4			4		
1977			4		4					4			4			4		
1978			4		4					4			4			4		
1979		5	4		4					4			4			5		
1980		3	4		4					4			4			4		
1981		2	4		4					4			4			3		
1982		1	4		4					4			4			3		
1983		4	4		4					4			4			3		
1984		3	4		4					4			4			3		
1985		1	4		4					4			4			1		
1986		2	4		3					4			4			2		
1987		1	4		4					4			4			3		4
1988		2	4		4					4			4			2	4	4
1989		2	4		4	1				4			4			2	4	4
1990		1	4		4	4				4			4			1	4	4
1991		1	4		4	4				4			4			3	4	4
1992	4	2	4		3	4		1		4			4			2	4	4
1993	4	6	4		4	4	1	4	4	4			4			3	4	4
1994	4	2	4		3	4	4	4	4	4	4	4	4	4		3	4	4
1995	4	4	4		2	4	4	4	4	4	4	4	4	4		2	4	4
1996	4	2	4		2	4	4	4	4	4	4	4	4	2		2	4	4
1997	4	2	4		2	4	4	4	4	4	4	4	4	2		3	4	4
1998	4	1	4		2	4	4	4	4	4	4	4	4	4		3	4	4
1999	4	3	4	4	3	5	4	4	4	4	4	4	4	4		3		4
2000	4	6	4	4	3	4	4	4	4	4	4	4	2	4	4	2		4
2001	4	2	4	4	2	4	4	4	4	4	4	4	2	4	2	2		4
2002	4	3	4	4	2	4	4	4	4	4	4	4	4	4	2	1		4
2003		4	4	4	2	4			4	4	4	4	4	4	4	2		4
2004		4	4	4	3	3			4	4	4	4	3	4	4	2		4
2005		3			2	2			4		4	4	3			3		



to continue table 3.8

Year	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
1961								4		4							
1962								4		4							
1963								4		4							
1964								4		4							
1965								4		4							
1966								4		4							
1967								4		4							
1968								4		4							
1969								4		4				2			
1970								4		4				4			
1971								4		4	5			4		2	
1972								4		4	2			4		2	
1973								4		4	1			4		2	
1974								4		4	2			4		2	
1975								4		4	3			4		2	
1976		4						4		4	3			4		2	
1977		4						4		4	3			4		2	
1978		4						4	4	4	3			4		2	
1979		4						4	4	4	3			4		2	
1980		4						4	4	4	1			4		2	
1981		4						4	4	4	3			4		2	
1982		4						4	4	4	3			4		2	
1983		4						4	4	4	3			4		2	
1984		4						4	4	4	2			4		2	
1985								4		4	3			4		2	
1986								4		4	3			4		2	
1987								4		4	3			4		2	
1988								4		4	2		4	4		2	
1989								4		4	2		4	4		2	
1990								4		4	3	5	4	4		2	
1991								4		4	3	3	4	4		2	
1992	4		4				3	4		4	2	6	4	4		2	4
1993	4		4				2	4		4	2	1	4	4		2	4
1994	4		2	4			2	4		4		3	4	4	4	2	4
1995	4		2	4			2	4		4		6	4	4	4	2	4
1996	4		2	4			2	4		4		3	4	4	4	2	4
1997	4		2	4		4	2	4		4		3	4	4	4	2	4
1998	4		3	4		4	3	4		4		3	4	4	4	2	4
1999	4		2	1		4	2	4		4		3	4	4	4	2	4
2000	4		4	4	4	4	2	4		4		2	4	4	2	2	4
2001	4		3	4	4	1	2	4		4		2	4	4	2	2	4
2002	4		4	4	4	4	2	4		4		3	4	4	2	2	4
2003			4	4	4			4		4		2	4	4	4	2	4
2004			4	4	4			4		4		2	4	4	4	2	4
2005			4	4				4				2		4	4	2	

## Chapter 4

# How the European Union Works: Theory and Empirical Evidence from EU Agricultural Policy

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Paper presented at the 4th Annual Conference on the Political Economy of International Organizations, Zurich, Switzerland, January 27-29, 2011

Selected Poster prepared for presentation at the Agricultural & Applied Economics Association's 2012 AAEA Annual Meeting, Seattle, Washington, August 12-14, 2012.

### Abstract

In this paper we propose a spatial model of political decision-making in the European Union that primarily explains why agricultural protection in EU member countries is systematically higher when compared to their counterfactual unobserved protection level under national forms of government. The center-pieces of our model are cooperative legislative bargaining procedures that influence highly the level of agricultural protection in a supranational system like the European Union. Further, we show that outcomes under the different procedures vary with increasing number of member states. Accordingly, EU enlargements drive legislators' incentives to adopt specific cooperative legislative bargaining procedures, if the rule in practice would lead to inefficient agricultural policy decisions. Hence, we derive secondly the institutional foundation of radical reforms of the CAP. Historically, we observe a strong incentive for these institutional rearrangements due to the increasing inefficiency and costs of the Luxembourg Compromise, the first cooperative rule in practice. We argue that after 1987 Council members prefer to decide CAP under Weingast's universalism. A dynamic panel estimation based on time-series cross-country data for 58 democracies since 1961 confirms our theoretical conclusions.

*Keywords:* comparative political economy; agricultural protection; legislative norms; political exchange; time-series cross-country data; dynamic fixed effect model

## **4.1 Introduction**

In the literature of comparative politics the European Union (EU) is generally described as a unique political system (see for example Hix, 1999). The uniqueness of the system does not only apply to its emergence out of a process of voluntary economic and political integration between nation-states of Western Europe, but also or even especially to the European political system. Obviously the European way of governance does not compare to standard democratic political systems like parliamentary systems. Accordingly, scholars of comparative politics as well as politicians around the world are interested in "How the European Union works". But to the best of our knowledge present, studies in comparative politics mainly describe fundamental features of the EU constitution and political phenomena neglecting to study how constitutional rules shape economic policies (Hix, 1999; Napel, 2006; Tsebelis, 1994). Even if the latter is also of particular interest for political economists, political-economic studies that systematically consider political institutions as determinants of EU policy choices are rare.

A good case in point to study the specific impact of the EU-system on policy outcomes is certainly the Common European Agricultural Policy (CAP), which until today is the most important EU-policy covering roughly 40% of the EU-budget. Since its establishment in the 60tees the CAP has been criticized as an extremely protectionist policy. Empirical analyses also underline that agricultural protection is higher in the European Union compared to non European countries reporting a significant and positive EU-dummy in their econometric analyses of cross-country agricultural protection rates (Honma and Hayami, 1986; Thies and Porche, 2007). While the pro-agricultural bias exists until today, several reforms, e.g. the MacSharry-Reform in 1992, have cut down the assistance to the agricultural sector.

Nevertheless there does hardly exist a comprehensive political economy theory that explains the empirically observed high protection level and that analyzes institutional conditions allowing for radical reforms of the CAP. Most scholars intuitively regard high EU protection levels as a consequence of the so called restaurant table effect, a political phenomenon of supranational policy formulation with financial solidarity (de Gorter et al., 1998; Bilal, 2000; Thies and Porche, 2007). But this concept is not able to explain the observed differences in protection levels between the United States and the European Union (compare Figure 4.1), as it would also apply to policy formulation in the United States. Further they refer to external factors like a budget crisis to explain the reforms of the CAP failing to analyze institutional conditions that enable political actors to reform the status quo.

Hence, we develop a spatial model of policy decision-making in the EU below that includes endogenous policy preferences. The center-piece of our model is informal political exchange that is often neglected by political economists, when they try to explain pork-barrel politics. In particular, we identify different cooperative legislative bargaining procedures that facilitate informal political exchange. Technically, self-enforcing cooperative legislative decision-making procedures correspond to Weingast's concept of legislative norms. These norms promote, at least from the viewpoint of legislators, collective efficiency of legislative decision-making (Weingast, 1979). Our legislative norms reflect different degrees of cooperation among

an ex ante fixed majority coalition that might or might not include the European Commission. In case the European Commission does not belong to the coalition, the Council of Agricultural Ministers unanimously determines agricultural policy. This norm corresponds to the so-called Luxembourg Compromise which is the legislative norm in practice for agricultural policy-making until 1987. But provided that the fixed ex ante coalition includes the European Commission, decisions are made by the Council under qualified majority with granting agenda setting power to the European Commission. We argue that this norm corresponds to Weingast's universalism.

Our model allows determining the effect of joining the EU, which is in fact an institutional regime switch in a country, on redistributive politics. We show that agricultural protection rates observed for member countries will significantly differ from their counterfactual levels under parliamentary or presidential systems, respectively. Further, we argue that agricultural policy outcomes vary systematically across informal legislative bargaining procedures and for each bargaining procedure with the number of EU member states. Consequently, our model also delivers insights into institutional conditions that enable legislators to reform the CAP as observed after 1987.

To complete our paper, we prove the theoretical implications using time-series cross-section data of 58 countries for the time period 1961-2005. We analyze the treatment effect of institutional change due to joining the EU and due to rearrangements within the Council. In both cases, we use a dynamic fixed effect model that controls for time- and country-specific heterogeneity. In addition to this, cross-section estimations deliver the impact of EU decision-making rules compared to different national political systems on the level of agricultural protection.

The remainder of the paper is organized as follows. First, we briefly describe the logic and history of agricultural policy-making in the EU in Section 4.2. In Section 4.3, we present theoretical models of legislative decision-making in parliamentary, presidential and the supranational system, i.e. the EU system. Further, we derive legislator's policy preferences. We end the theoretical part with comparing the policy outcomes across political systems and legislative norms in Section 4.4. The empirical assessment of the theoretical hypotheses is done in Section 4.5. We conclude and discuss future research in Section 4.6.

## **4.2 The logic of legislative decision-making of the CAP**

Since the establishment of the CAP in the early 60tees, the CAP has been always decided according to the same constitutional rule laid down by the Treaty of Rome, the so-called consultation procedure (Hix, 1999). In essence, the Council decides under qualified majority on a policy proposal of the European Commission. If a qualified majority of Council members accepts the Commission's proposal, it is the new policy, otherwise the Council can unanimously accept any amendment of the Commission's proposal. If no proposal is approved, the status quo policy remains. Although the European Parliament formally also participates in CAP decision-making under the consultation procedure, members of parliament are dummy players in legislative bargaining. As their comments on the proposal are not binding for the Council,

they are never a decisive member of a winning coalition. Thus, legislative bargaining over CAP only involves the Council of Agricultural Ministers and the European Commission.

However, scholars of EU-politics agree that European policies are often decided applying informal legislative bargaining rules. Analogously to parliamentary regimes, informal legislative procedures in the EU are best defined via identifying *ex ante* fixed winning coalitions that commonly agree on a cooperative decision procedure. For an unanimous acceptance, a procedure must assure a higher pay-off for all coalition members in comparison to the default outcome that would be derived under non-cooperative legislative decision-making. The Luxembourg Compromise, a legislative rule for CAP decision making until 1987, is such a cooperative legislative bargaining procedure. Under the Luxembourg Compromise, the Council of Agricultural Ministers excluding the Commission decide on political intervention prices for all agricultural commodities applying unanimity rule (de Gorter and Swinnen, 2002; Runge and v. Witzke, 1987). Overall, this informal procedure results in time-consuming negotiations to reach consensus about complex package deals. Such package deals satisfy in turn member countries' diverse interests, which are determined by the heterogeneous structure of agricultural production among them. France, for example, tends to demand high levels of support for wheat and accepts, in return, demands from Greece for substantial support on olives. The final result is extremely high protection under the Luxembourg Compromise.

Well-known literature about the CAP explains these high protection levels solely with the restaurant table effect, an immanent effect of supranational policy formulation with financial solidarity. In essence, the restaurant table effect can be explained as follows. Consider that sharing the bill in a restaurant while allowing individual meals to be ordered creates strong incentives to consume too much. Translating this example to policy decision making in the EU leads to the following argument. The principle of financial solidarity among member countries creates individual incentives to prefer levels of agricultural support that are much higher than the levels preferred under a system of national policy formulation with national financial solidarity. Net beneficiaries of policies will demand high support for their "pet commodity" that is financed by a common pool of resources. Since Ministers of Agriculture are usually more interested in receiving support on commodities for which they are net beneficiaries than in restraining support to commodities for which they are net contributors, package deals are commonly observed. Thereby each member state receives the support demanded. Note that one can assume that every member country is a net beneficiary for at least one agricultural commodity during the time of the Luxembourg Compromise. For empirical evidence look at the protection rates in Figure 4.1 before 1987. However, Figure 4.1 depicts also that the protection level in the United States is clearly lower compared to the EU, although the United States also have a supranational system of policy formulation with financial solidarity. Hence, we motivate our theoretical model that contradicts the assumption of the restaurant table effect as a sufficient explanation for the observed protection levels in the European Union, by this picture.

Furthermore, Figure 4.1 confronts us with the fact that although formal constitutional rules remain unchanged, protection rates significantly decrease after 1986.

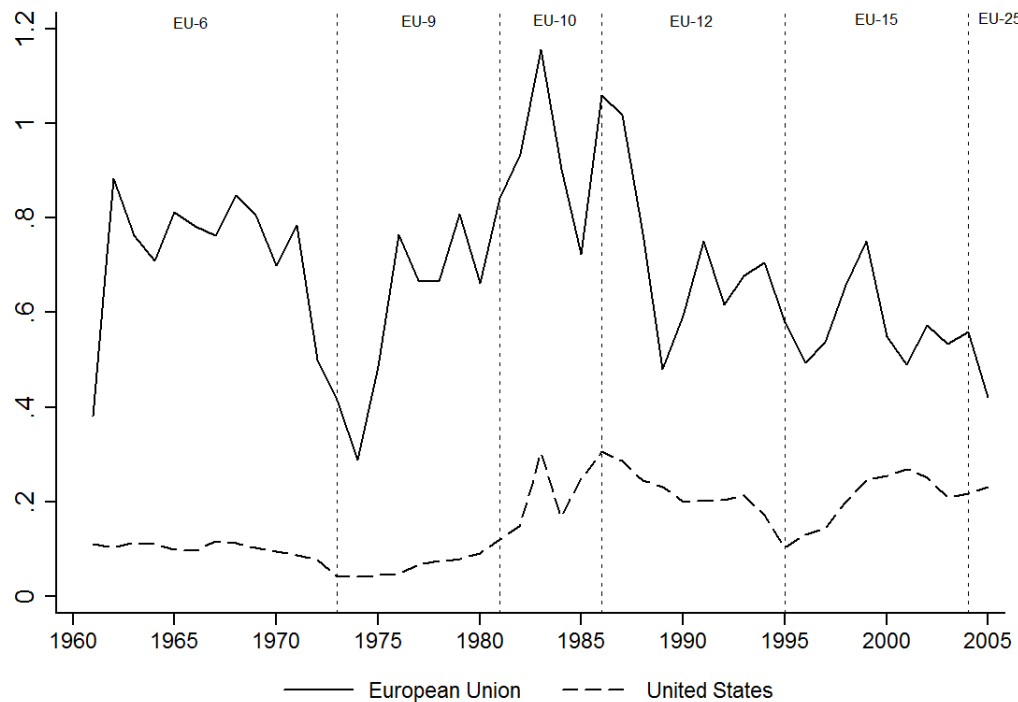


Figure 4.1: Nominal rate of assistance to agriculture (NRA) in the EU and the United States from 1961-2005.

Source: Calculated by authors using data by Anderson et al. (2008).

In this context, Hix (1999) have already mentioned that informal bargaining rules in the EU vary over time. Further, Runge and v. Witzke (1987) argue that economic and political forces will drive demand for institutional change after 1986. In case of the CAP, they consider the increased costs, i.e. decision and budget costs, of the unanimity rule due to increasing divergence of national interest with EU enlargement as primary drivers of inefficient CAP policies. Inefficient policy choices in turn lead Council members to unanimously demand for institutional rearrangement. Hence, we derive theoretically a legislative norm replacing the Luxembourg Compromise that will promote more efficient policy decisions due to informal legislative bargaining rules. Not surprisingly, the inclusion of the moderate Commission into the decision-making process, as even laid by the constitution, is favored by Council members. In our view, the new legislative decision-making procedure corresponds to Weingast's universalism. Universalism stands for deciding policy by a universal coalition instead of a minimum-winning coalition. Here, the coalition of all Council members and the Commission, where Council members grant the Commission some limited agenda setting power, is such an universal coalition. Finally the new legislative norm would result in lower agricultural protection when compared to the Luxembourg Compromise due to the inclusion of the moderate Commission. Consider the decreasing rates of protection after 1986 as empirical support of this informal institutional change.

## 4.3 Modeling agricultural policy decision-making

### 4.3.1 The legislative process in democracies

A legislative system of a country consists of a finite set of political agents ( $N$ ) where  $i = 1, \dots, n$  denotes a generic element of the legislative system. According to the constitution we can define specific institutions as subsets of  $N$  that have formal legislative power. In democratic regimes subsets of the legislative systems  $N$  are the government ( $G$ ) and parliament ( $P$ ). Furthermore, government and parliament are separated into further subunits, the governmental departments or ministries and committee systems, respectively. According to the division-of-labor argument, different committees and governmental departments are usually responsible for different policy domains (Shepsle, 1979). In particular, we denote  $C_A$  as the agricultural committee and  $G_A$  as the agricultural department, respectively.

The legislative process in democratic systems typically begins when the government submits a bill to parliament.<sup>1</sup> Then the responsible committee works on the bill to present parliament the government proposal including their recommended amendments. On the floor, there is a final vote on the entire bill, where additional amendments might be submitted or not. Thus, to analyze the impact of the organization of legislative decision-making on agricultural protection, we can focus on the interaction between the government ( $G$ ), the agricultural committee ( $C_A$ ), and the floor ( $F$ ).<sup>2</sup>

For our formal analysis we denote  $s \in S$  as the agricultural policy outcome.  $S$  is a convex compact subset of the  $m$ -dimensional cube  $(0, 1)^m$ , where  $m$  is the number of agricultural commodities.  $s_r$  is the  $r$ 's component of  $s$  and denotes the protection level of the commodity  $r$ .  $s_r = 0$  implies no protection, while  $s_r = 1$  corresponds to some maximal protection level for commodity  $r$ . Agents' policy preferences can be represented by the following separable spatial utility function  $U_i(s)$ :

$$U_i(s) = - \sum_r \beta_{ir} (Y_{ir} - s_r)^2, \quad (4.1)$$

where  $Y_{ir}$  denotes the ideal point of legislator  $i$ .  $Y_{ir}$  is the maximum of  $U_i(s_r, \bar{s}_{-r})$ .

For simplicity we assume that according to formal constitutional rules protection levels are separately decided for each agricultural commodity  $r$ .<sup>3</sup>

### 4.3.2 Decision-making in national systems

#### 4.3.2.1 Parliamentary systems

For our theoretical model of legislative bargaining in parliamentary systems, we suggest a rather simple legislative majority bargaining game that is based on the

<sup>1</sup>Although in most democratic systems members of the parliament can initiate legislation if there is no proposal of the government.

<sup>2</sup>Note that in general government, floor and the agricultural committee consist of multiple members.

<sup>3</sup>Please note that as matter of fact in most countries including the EU agricultural protection levels are decided in separate legislative acts for each commodity. However, this assumption is not essential for our theoretical results, but rather make analyses more traceable.

existence of a stable ex ante majority coalition and on the principle of proposal power of the government. As has been demonstrated by Huber (1996) and Diermeier and Feddersen (1998), stable ex ante majority coalition built among legislators essentially characterize parliamentary systems. Legislators who are members of this majority coalition make legislative decisions exclusively. The rationale of ex ante majority coalition building corresponds to the fact that this coalition at least weakly increases the utility of all majority members when compared to their utilities derived under a default policy outcome that would result from non-cooperative behavior of legislators. In particular, ex ante fixed parliamentary majorities are able to guarantee their members higher utilities due to additional rent legislators realize from being part of a stable majority (Huber, 1996).

For the parliamentary legislative system, we define the following specific institutions as subsets of  $N$ : the prime minister ( $PM$ ), the majority ( $P_{inc}$ ) and the opposition ( $P_{opp}$ ). In general,  $P_{inc}$  could correspond to a multi-party coalition or a single majority party. Further,  $P_{inc}$  is a finite subset of legislators  $i \in N$ . Moreover, we assume that the party leader of the majority party coincides with the  $PM$ . Following Huber (1996) as well as Diermeier and Feddersen (1998), we can concentrate on the prime minister and her parliamentary majority that is ex ante identifiable for modeling legislative decisions in parliamentary systems.

The model has two stages. At the first stage, we model the default policy outcome  $\bar{s}_r$ . For simplicity we assume that agricultural policy is  $m$ -dimensional and that parliament decides about agricultural policy by simple majority voting dimension by dimension.<sup>4</sup> Obviously, under these assumptions the well-known median voter theorem applies. The unique equilibrium outcome of the non-cooperative legislative decision-making game neglecting any ex ante coalition building is the ideal point of the floor median (Black, 1958).

At the second stage, legislators, who are members of the majority  $P_{inc}$ , and the  $PM$  bargain over policy to improve their utility derived under the default outcome. In detail, they proceed in two steps. First, the  $PM$  proposes a policy  $s_r^{PM}$  to her parliamentary majority and announces side payments  $\gamma$  being paid to the majority in case it admits the governmental proposal. Regarding content we interpret these side payments as rent the  $PM$  can pay to the majority due to specific formal legislative procedures like issuing a vote of confidence, or informal procedures like promising political career for party members. We are not specifically interested in modeling exactly how the  $PM$  can generate rent valuable to her majority, but generally subsume this under the term party (coalition) discipline that is exerted by the  $PM$ .<sup>5</sup>

At the second step each individual majority member  $i \in P_{Inc}$  can decide whether or not to accept the proposal of the  $PM$ . For their decision, legislators maximize the sum of actual rent  $\gamma$  and the utility derived from policy  $U_i(s_r, s_{-r}^{par*})$ . If all

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<sup>4</sup>Of course we could also assume more complex legislative decision-making procedures including agenda setting power of the parliamentary committees or the government. However, this would not change our major results and therefore we keep analyses as simple as possible at this point and leave the analysis of more complex legislative institutions for future work.

<sup>5</sup>Note further that we assume that at this stage the  $PM$  can commit to paying the rent. However, this assumption is not necessary; in a richer modeling set-up including the specific procedures it is possible to get essentially the same result without assuming this kind of commitment.



majority members agree to the proposal, the proposed policy  $s_r^{PM}$  passes parliament and all majority members receive the announced rent. Otherwise, the default policy  $\bar{s}_r$  becomes the legislative decision and no rent is paid.

**Proposition 1.** *Assuming an  $m$ -dimensional agricultural policy choice  $s$ , there exists a unique subgame perfect Nash equilibrium for our legislative majority bargaining game defined above. The equilibrium outcome  $s^{par*}$  depends on the rent  $\gamma$  the default policy outcome  $\bar{s}$  and the policy preferences of the PM and the majority members,  $i \in P_{Inc}$ .*

1. *In equilibrium agricultural policy choice  $s_r^{par*}$  results from the following maximization:<sup>6</sup>*

$$s_r^{par*} = \arg \max_{s_r} U_{PM}(s_r, s_{-r}^{par*}) \quad s.t. \quad s_r \in \bigcap_i S_{ir}, \quad (4.2)$$

$$\text{with } S_{ir} = \{s_r \in S \mid U_i(s_r, s_{-r}^{par*}) + \gamma \geq U_i(\bar{s}_r, s_{-r}^{par*}) \forall i \in P_{Inc}\}. \quad (4.3)$$

2. *In particular, it holds that the outcome of the legislative bargaining game corresponds to the minimal distance between the ideal point of the PM and the interval  $[s_r^-, s_r^+]$ :*

$$s_r^{par*} = \arg \min_{s_r} \|Y_{PMr} - s_r\| \quad s.t. \quad s_r \in [s_r^-, s_r^+], \quad (4.4)$$

$$\text{where } s_r^- = \min_i \bigcap_i S_{ir} \text{ and } s_r^+ = \max_i \bigcap_i S_{ir} \text{ and } i \in P_{Inc}. \quad (4.5)$$

3. *Obviously given the equilibrium policy choices  $s_r^{par*}$  of the subgames overall policy choice in parliamentary systems results in:  $s^{par*} = \{s_r^{par*}\}$ .*

If the rent  $\gamma$  is sufficiently large or if legislators' preferences are sufficiently homogeneous, the final agricultural policy outcome corresponds to the ideal point of the prime minister. Under this condition our model corresponds to pre-election political models, which generally assume that governmental policy simply corresponds to political preferences of the party leader who becomes the omnipotent head of government after elections. If party discipline, i.e. the rent  $\gamma$ , is not sufficiently high or analogous, policy preferences of the PM and her parliamentary majority are sufficiently heterogeneous, agricultural policy outcome is no more fully determined by the PM's policy preferences. Under this assumption policy outcome is also determined by the intersection set of the subsets  $S_{ir}$  that is determined by the policy preferences of the majority members  $i \in P_{Inc}$ , the rent  $\gamma$  and the default policy  $\bar{s}_r$ .

#### 4.3.2.2 Presidential systems

In contrast to parliamentary systems presidential systems are not characterized by a stable ex ante coalition or legislative cohesion, respectively. Presidential systems are

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<sup>6</sup>Note that the maximization problem always has a unique solution, as long as the utility functions of legislators are strictly concave. Note that all sets  $S_{ir}$  are compact and convex subsets of  $S$ .

characterized by more dispersed proposal powers, where proposal power over specific policy domains resides with corresponding parliamentary committees (Persson and Tabellini, 2002). In particular, we assume that the agricultural committee exerts agenda setting power for agricultural policies  $s_r$ . Accordingly, to model agricultural legislative bargaining in presidential systems we focus on the commodity specific medians of the floor  $F_r$  and of the agricultural committee  $C_{Ar}$  (Weingast et al., 1981; Krehbiel, 1991; Henning et al., 2004). Let  $U_{F_r}(s_r, \bar{s}_{-r})$  denote the policy preferences of the floor median regarding subsidization of the agriculture commodity  $r$  and  $U_{C_{Ar}}(s_r, \bar{s}_{-r})$  the policy preferences of the agricultural committee.

Legislative procedure starts with the committee submitting a policy proposal  $s^{C_{Ar}}$  to the floor and the floor chooses the final policy based on the committee proposal. Policy choice in the floor can be regulated by different rules granting different agenda setting power to the committee vis-à-vis the floor. For example, in the US-system the floor can operate under the closed or open rule. Under the closed rule the floor can only choose between the committee proposal and the status quo, while under the open rule the floor can make an amendment to the committee proposal and select among amended proposals. We assume in the following that the floor operates under the closed rule granting maximal agenda setting power to the floor. Thus, if the floor disagrees on the proposal, the status quo policy  $SQ_r$  remains.

By our constitutional assumptions the decisions on subsidizing agriculture commodities can be considered as separate legislative bargaining games. As we show in *proposition 2* below each game has a unique subgame perfect Nash equilibrium  $s^{pre*}$ .

**Proposition 2.** *Assuming an  $m$ -dimensional policy choice  $s$ , there exists a unique subgame perfect Nash equilibrium for our legislative bargaining game in a presidential system as defined above. The equilibrium outcome  $s^{pre*}$  depends on the status quo  $SQ = (SQ_1, \dots, SQ_r, \dots, SQ_m)$  and the policy preferences of the corresponding commodity specific committee ( $C_{Ar}$ ) and floor medians ( $F_r$ ).*

1. In equilibrium policy choice  $s_r^{pre*}$  results from the following maximization:<sup>7</sup>

$$s_r^{pre*} = \arg \max_{s_r} U_{C_{Ar}}(s_r, s_{-r}^{pre*}) \quad \text{s.t. } s_r \in S_{F_r} \quad (4.6)$$

$$\text{with } S_{F_r} = \{s_r \in S \mid U_{F_r}(s_r, s_{-r}^{pre*}) \geq U_{F_r}(SQ_r, s_{-r}^{pre*})\} \quad (4.7)$$

2. Obviously given the equilibrium policy choices  $s_r^{pre*}$  of the subgames overall policy choice in presidential systems results in:  $s^{pre*} = \{s_r^{pre*}\}$ .

Given the assumption of separable preferences the proof of *proposition 2* is straightforward and thus is omitted here.

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<sup>7</sup>Note that for each commodity the maximization problem is independent of the solution of the other commodities, since we assume separable policy preferences. Note further that even relaxing the assumption of separable policy preferences a solution of the supergame still exists. However, this might not be unique (Shepsle, 1979). Given the policy choices for other commodities the maximization problem always has a unique solution for each commodity, as long as the utility functions of legislators are strictly quasi concave. Note that all sets  $S_{F_r}, S_{C_r}$  are compact and convex subsets of  $S$ .

### 4.3.3 Supranational systems: The case of the EU

#### 4.3.3.1 The consultation procedure

To understand the logic of the consultation procedure as laid down by the Treaty of Rome, we define the following extended open rule procedure. The legislative process starts with the Commission  $G^{EU}$  formulating a proposal  $s_r^{G^{EU}}$  and presenting this proposal to the Council of Agricultural Ministers. Based on the proposal of the Commission each member of the Council can propose an individual proposal  $s_r^i$   $i \in C_A$ . The committee then selects one proposal out of the set of these individual proposals. The selection is done according to the following voting procedure:

- i. The set of individual proposals is randomly ordered. According to this random order, the committee votes pairwise on made proposals. Within a vote, the lower ordered proposal wins if no qualified majority  $M1$  exists that prefers the higher ordered proposal. The winner of a pairwise vote will be put against the next ordered proposal until no proposal is left.
- ii. In a second step, the selected proposal is put vis-à-vis the governmental proposal  $s_r^{G^{EU}}$  in a majority vote  $M2$ . If a majority  $M2$  prefers this proposal, it is the winner proposal, otherwise the government proposal is the winner proposal.
- iii. Finally the winner proposal of the second step is put vis-à-vis the status quo under a majority vote  $M1$ . The winner proposal will be the final committee proposal, if it defeats the status quo under  $M1$ , otherwise the status quo will be the final committee proposal.

Please note that under the consultation procedure the majority  $M2$  always corresponded to unanimity, while the qualified majority  $M1$  has been changed with EU-enlargement. Roughly qualified majority  $M1$  corresponds to 71 percent of total votes in the Council. However, member countries have different votes. In the EU-15 total sum of Council votes was 87, where national votes ranged from 2 (Luxembourg) to 10 (Germany, France, United Kingdom and Italy) and a qualified majority needs at least 62 votes. In the EU-25 total sum of Council votes are 321 ranging from 3 (Malta) to 29 (Germany) and a qualified majority is defined by more than 232 votes.<sup>8</sup> Consider further, that although the European Parliament formally participates in CAP decision-making under the consultation procedure, members of the parliament are dummy players in legislative bargaining. The Council is not bound by Parliament's position and in practice ignores suggestions of Parliament.

As we show in *proposition 3* below each commodity specific EU-game has a unique subgame perfect Nash equilibrium  $s_r^{EU*}$ .

**Proposition 3.** *Assuming an  $m$ -dimensional policy choice  $s$ , there exists a unique subgame perfect Nash equilibrium for our legislative bargaining game in the EU-system under the consultation procedure as defined above. The equilibrium outcome*

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<sup>8</sup>According to the Treaty the consultation procedure is in fact more complex than described above, e.g. specific additional rules like a specific threshold of member states apply to characterize a qualified majority. However, in essence qualified majority results from national Council weights as described above.

$s^{EU*}$  depends on the status quo  $SQ = (SQ_1, \dots, SQ_r, \dots, SQ_m)$  and the policy preferences of the Council members and the Commission, respectively.

1. In equilibrium policy choice  $s^{EU*}$  results from the following maximization:<sup>9</sup>

$$s_r^{EU*} = \arg \max_{s_r} U_{G^{EU}}(s_r, s_{-r}^{EU*}) \quad \text{s.t. } s_r \in WS_r^{CA} \cap PS_r^{CA} \quad (4.8)$$

with

$$\begin{aligned} WS_r^{CA} &= \{s_r \in S \mid U_i(s_r, s_{-r}^{EU*}) \geq U_i(SQ_r, SQ_{-r}) \forall i \in C_A\} \text{ and} \\ PS_r^{CA} &= \{s_r \in S \mid \nexists s_r^\# : U_i(s_r^\#, s_{-r}^{EU*}) \geq U_i(s_r, s_{-r}^{EU*}) \forall i \in C_A\} \end{aligned} \quad (4.9)$$

2. Obviously given the equilibrium policy choices of the subgames  $s_r^{EU*}$  overall policy choice in the EU system results as:  $s^{EU*} = \{s_r^{EU*}\}$ .

Given the assumption of separable preferences the proof of *proposition 3* is straightforward and thus is omitted here.<sup>10</sup>

#### 4.3.3.2 Cooperative legislative bargaining in the EU-system

To give an intuitive explanation how the Luxembourg Compromise as well as the EU-universalism works consider that the Agricultural Council consists of members from two perfectly homogeneous groups  $W$  and  $B$ . Farmers supporting Council members of group  $W$  are specialized in crop production, while Council members of group  $B$  get their support from farmers specialized in animal production (see section 4.3.4 for detailed information on deriving preferences of legislators). Thus, the European Commission and the Council have to decide upon subsidy payments paid for two agricultural commodities, cereals  $W$  and animal  $B$ . In particular, let  $s_B$  and  $s_W$  denote the level of subsidy payments for animal and crop production, respectively.

Under the assumption of spatial policy preferences (see eq. 4.1) group  $B$  prefers a high subsidy level for animal and a low subsidy level for crop production and vice versa group  $W$  prefers a high subsidy level for crop and a low for animal production. Without loss of generality we assume that the common ideal point of group  $B$  is  $Y_B = (1, 0)$  and the common ideal point of group  $W$  is  $Y_W = (0, 1)$ . The European Commission prefers a moderate subsidy level for both commodities, say  $Y_{G^{EU}} = (0.5, 0.5)$ . Here, we neither analyze why the preferences of the European Commission diverge from preferences of Council members nor how much they differ in their policy preferences, but see section 4.3.4 for further information on policy preferences of legislators and the Commission. Assuming further that the status quo policy  $SQ$  just equals  $(0, 0)$ . We derive directly from *proposition 3* the policy outcome of non-cooperative legislative bargaining under the consultation procedure. The policy outcome corresponds to the ideal point of the Commission, i.e.  $s^{EU*} = (0.5, 0.5)$ .

<sup>9</sup>Note again that for each commodity the maximization problem is independent of the solution of the other commodities, since we assume separable policy preferences. Moreover, there always has a unique solution, as long as the utility functions of legislators are strictly quasi concave.

Note that all sets  $PS_r^{CA}, WS_r^{CA}$  are compact and convex subsets of  $S$ .

<sup>10</sup>All proofs are available from the authors upon request.

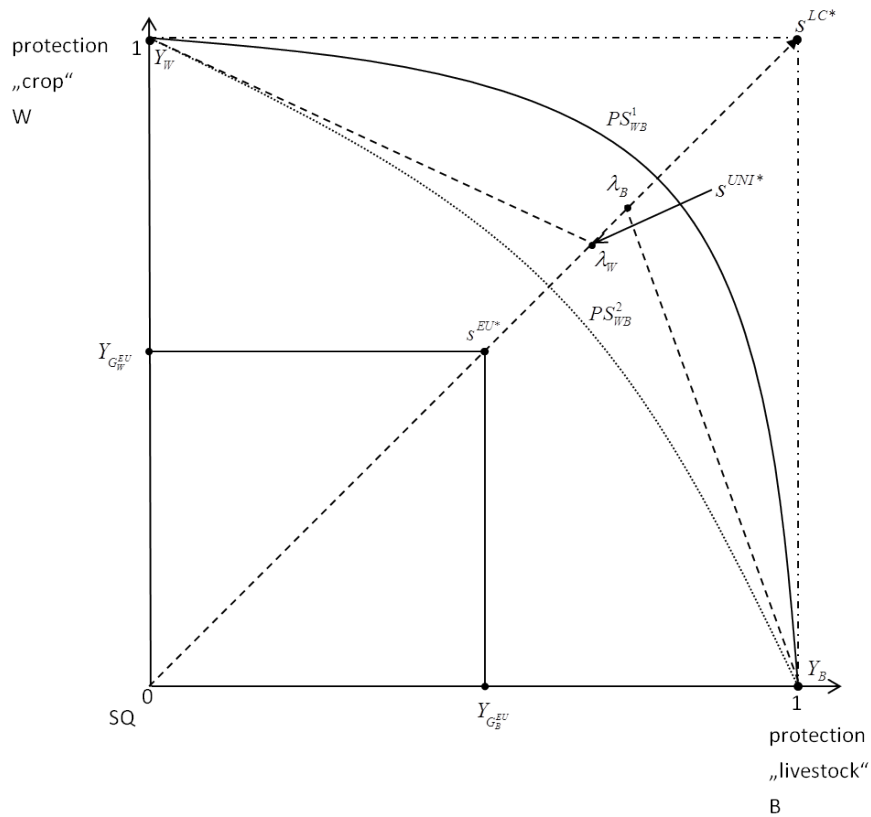


Figure 4.2: Legislative bargaining in the EU  
Source: Authors.

This outcome is *ex ante* rather inefficient from the perspective of both groups of Council members  $W$  and  $B$  if we further consider that preferences for commodity specific high protection involves also high interests in the respective subsidy, i.e.  $\beta_{WW} \gg \beta_{WB}$  and  $\beta_{BB} \gg \beta_{BW}$ . Thus, ellipsoide indifference curves result for the Council members, while legislator  $G^{EU}$  puts the same weight on both policies and hence indifference curves are circles. Given the set of winning coalitions Council members  $W$  and  $B$  could cooperate and significantly improve their utility derived from the policy outcome by forming an *ex ante* coalition. But they face the problem to find a procedure that is incentive compatible and guarantees for all Council members a collectively Pareto dominant outcome vis-à-vis the outcome of the non-cooperative legislative bargaining game.

A simple and incentive compatible procedure would be that Council members grant each other mutual agenda setting power over the policy dimension they prefer most. This procedure is known as the Luxembourg Compromise that institutionalized unanimity rule for agricultural policy decisions. Providing agenda setting power to both Council groups legislators would suggest their ideal position for the subsidy level of the commodity they are highly concerned about. The equilibrium policy outcome in our example results in  $s^{LC*} = (1, 1)$  under perfect knowledge of policy preferences. In essence this procedure of granting mutual agenda setting power corresponds to the political exchange of rights as suggested by Weingast and Marshall (1988).

**Proposition 4.** *Assuming an  $m$ -dimensional agricultural policy choice  $s$ , there exists a unique subgame perfect Nash equilibrium for our legislative majority bargaining game under the Luxembourg Compromise as defined above. The equilibrium outcome  $s^{LC*}$  depends on the non-cooperative policy outcome under the consultation procedure  $s^{EU*}$  and the policy preferences of the Council members.*

1. *In equilibrium agricultural policy choice  $s_r^{LC*}$  results from the following maximization:*

$$s_r^{LC*} = \arg \max_{s_r} U_{d_r}(s_r, s_{-r}^{LC*}) \quad s.t. \quad s \in \bigcap_i S_i^{LC} \quad (4.10)$$

with  $S_i^{LC} = \{s \in S \mid U_i(s_r, s_{-r}^{LC*}) \geq U_i(s^{EU*}) \forall i \in C_A\}$  and

$$d_r = \arg \max_i \{i \in C_A \mid Y_{ir}\}$$

2. *Obviously given the equilibrium policy choices,  $s_r^{LC*}$ , of the subgames overall policy choice in the EU system results as:  $s^{LC*} = \{s_r^{LC*}\}$ .*

As long as preferences intensities of Council members are sufficiently high the outcome of the cooperative bargaining procedure is collectively preferable to all Council members, that is group  $W$  and  $B$  in our simple example. If legislators' preferences are less intense, for example assume that the Pareto frontier of legislators  $W$  and  $B$  corresponds to  $PS_{WB}^2$  instead of  $PS_{WB}^1$  in figure 4.2, cooperation among Council members via granting mutual agenda setting power is less attractive as it implies an overshooting of subsidies, while non-cooperative legislative bargaining implies an undershooting. Please note that in Figure 4.2 there exists a non-empty winset of the point (1,1), where the set is the larger the less preferences intensity are biased, i.e. the more indifference curves are circles.

For this situation, the question arises again how a bargaining procedure, that is incentive compatible, leads to more efficient outcomes. Here we suggest the following two step direction-distance procedure which corresponds to Weingast's universalism. Like the Luxembourg Compromise this bargaining procedure relies upon cooperative behavior of actors involved in proposal formulation. In contrast to the Luxembourg Compromise, this procedure includes the Commission into the ex ante fixed majority coalition as follows.

At a first step the direction towards which the status quo is going to be shifted is determined. In detail, under this procedure legislators agree that the status quo is shifted along the line between the status quo  $SQ$  and the outcome of the Luxembourg Compromise  $s^{LC*}$  (as indicated in Figure 4.2). Given the direction  $s^{LC*} - SQ$  legislators vote at a second step on the distance  $\lambda$  to which the status quo will be shifted. This voting procedure corresponds to the formal voting procedure defined under the consultation procedure. The Commission suggests a distance, which can be accepted by a qualified majority in the Council or any other distance can be unanimously accepted by the Council.

As regards content the two step common proposal procedure implies that determining the direction at the first step corresponds to legislators common choice of the relative subsidy level of crop and animal production. Determining the distance at the second step Council members decide upon the total budget allocated for

subsidy payments. Note that once the direction is fixed each legislator has single peaked preferences regarding the distance. Therefore, majority voting at the second stage always delivers a unique solution (see Figure 4.2). To see this please note that legislator  $i$ 's preferred distance,  $\lambda_i$ , results as:

$$\begin{aligned}
 \lambda_i &= \arg \max_{\lambda} U_i(SQ + \lambda_i(s^{LC*} - SQ)) & (4.11) \\
 &= \arg \max_{\lambda} - \sum_{r=W,B} \beta_{ir}(Y_{ir} - \lambda_i s^{LC*})^2 \\
 \Rightarrow \lambda_i^* &= \frac{\sum_r \beta_{ir} Y_{ir} s^{LC*}}{\sum_r \beta_{ir} (s^{LC*})^2}
 \end{aligned}$$

As long as we assume that the Commission prefers the lowest distance compared to all Council members, the equilibrium outcome at the second stage will be the lowest preferred distance of the Council member who is pivot under qualified majority. In Figure 4.2 this is Council member  $W$ .

Please note that in general the Council members could also apply the two stage direction-distance proposal procedure excluding the Commission. But first it would be unclear how Council member would unanimously agree/vote on a specific distance at the second stage. Second, obviously comparing policy outcomes under these two procedures neither would be Pareto dominant vis-à-vis the other. Third, the less preferences of legislators are biased towards a specific agricultural commodity the higher are c.p. temptations of Council members to break mutual agreements with other Council members and struck a deal with the Commission. Thus, overall the less policy preferences are biased the less stable are any cooperative procedures among Council members excluding the Commission, thus the only stable cooperative procedures are the one which are ex ante Pareto dominant for all Council members when compared to non-cooperative bargaining outcomes, i.e. the ones that explicitly include the Commission.

**Proposition 5.**<sup>11</sup> *Assuming an  $m$ -dimensional agricultural policy choice  $s$ , there exists a unique subgame perfect Nash equilibrium for our legislative majority bargaining game under the EU-Universalism as defined above. The equilibrium outcome  $s^{UNI*}$  depends on the non-cooperative policy outcome under the consultation procedure  $s^{EU*}$  and the policy preferences of the Council members and the Commission.*

*In equilibrium agricultural policy choice  $s^{UNI*}$  results from the following maximization:*

$$\begin{aligned}
 s^{UNI*} &= \arg \max_s U_{GEU}(s) \quad s.t. \quad s \in \bigcap_i S_i^{UNI} & (4.12) \\
 \text{with } S_i^{UNI} &= \{s \in S^{UNI} \mid U_i(s) \geq U_i(s^{EU*}) \forall i \in C_A\} \text{ and} \\
 S^{UNI} &= \{s \in S \text{ and } \lambda_i \in R \mid SQ + \lambda_i(s^{LC*} - SQ)\}
 \end{aligned}$$

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<sup>11</sup>The proofs of *proposition 4* and *5* are straightforward and therefore also omitted here. Of course, the proofs are available from the authors upon request.

#### 4.3.4 Deriving endogenous policy preferences

We derive legislator's preferences in two settings. First we model the preferences of legislators if their country is part of the European Union. Note here that the preferences of the European Commission will differ from the preferences of Council members. Secondly we show how legislator's preferences emerge under national political systems.

In the European Union legislators' policy preferences can be represented by the net gain of policies in their member country  $c$ :

$$U_i(s) = S_i(s) - \omega_c \sum_{r=W,B} \kappa_c(s_r), \quad (4.13)$$

where  $S_i(s)$  denotes the political support received from subsidizing crop and animal production.  $\kappa_c(s_r)$  denotes the costs of subsidizing crop ( $r = W$ ) or animal production ( $r = B$ ).  $\omega_c$  denotes the cost share of the member country  $c$  of legislator  $i$ . This cost share corresponds to the member country's share in EU-budget, which is determined, according to the financial rules of the CAP, by the share of member country's GDP in total EU-GDP. For simplicity we assume the following support and cost functions for each member country:

$$S_i(s) = \sum_{r=W,B} T_{rc} \delta_c s_r^\sigma \quad \text{with } \sigma \leq 1 \quad (4.14)$$

$$\kappa_c(s) = \sum_{r=W,B} \sum_c T_{rc} s_r^\eta \quad \text{with } \eta > 1. \quad (4.15)$$

$T_{rc}$  denotes the size of the crop and animal production sector in country  $c$ , e.g.  $T_{rc}$  could correspond to agricultural land used for crop and animal production, respectively.  $\delta_c$  covers specific characteristics of member countries that also have an impact on generation of political support. For example, these characteristics include institutional settings of the electoral system, average national farm size, the organization of farm and non-farm interest, etc..<sup>12</sup>

In contrast to national Council members the relevant constituency of a supranational institution, i.e. the European Commission, corresponds to the set of all member countries. Accordingly, the policy preferences of a supranational legislator  $i = G^{EU}$  are represented as follows:

$$U_{G^{EU}}(s) = \sum_r \sum_c T_{rc} \delta_c s_r^\sigma - \sum_r \sum_c T_{rc} s_r^\eta \quad (4.16)$$

Hence, we assume that a supranational legislator gets political support from all member countries, i.e. from any subsidies paid to national farmers, but also bears total cost of subsidization, i.e. has a cost share of 1. As local approximation legislators

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<sup>12</sup>A detailed theoretical and empirical analysis of economic and institutional factors determining political support of rural and urban population is provided for example by Henning et al. (2007); Henning (2008) or Thies and Porche (2007); Hee Park and Jensen (2007); Olper and Raimondi (2009).



preferences can be equivalently expressed by the following spatial utility function:

$$U_i(s) = - \sum_r \beta_{ir} (Y_{ir} - s_r)^2, \quad (4.17)$$

where agents'  $i$  ideal points  $Y_{ir}$  correspond to the policy implying maximal support, i.e. it holds:

$$Y_{ir} = \left[ \frac{\sigma}{\eta} \delta_c \frac{t_{rc}}{\omega_c} \right]^{\frac{1}{\eta-\sigma}}, \quad (4.18)$$

where  $t_{rc}$  is the production share of constituency  $c$  in production of the agricultural commodity  $r$ . Obviously, legislator  $i$ 's preferred subsidy level for an agricultural commodity  $r$  increases with a high production share,  $t_{rc}$ , of this commodity in his total agricultural production and declines with an increasing cost share  $\omega_c$  of his constituency  $c$ . Thus, if a country is specialized in crop production it prefers high subsidy for crops and relatively low subsidies for animal production. This holds vice versa for countries specialized in animal production. Note further that for the Commission cost and production shares equal 1. Thus, for both agricultural commodities the Commission takes a middle ground between the high subsidy level preferred by specialized member countries and the low subsidy level preferred by less or not specialized member countries. Further, we assume that all members of the crop group prefer the status quo subsidies for animal production and vice versa all members of the animal group prefer status quo subsidies for crops. Moreover, we assume without loss of generality that the original status quo  $SQ$  equals  $(0, 0)$ .

Interpreting the spatial utility function as a second order Taylor approximation of the original net political support function developed at the maximum results in:

$$\beta_{ir} = \frac{\partial^2 S_i}{\partial s_r^2} - \frac{\partial^2 \kappa_c}{\partial s_r^2} = - \left[ \sigma (1 - \sigma) \delta_c T_{cr} s_r^{\sigma-2} + \eta (\eta - 1) \sum_c T_{cr} \omega_c s_r^{\eta-2} \right]. \quad (4.19)$$

Assuming without loss of generality that for all legislators the  $\beta$ -parameters are normalized to one, the size of  $\beta_{ir}$  determines how national legislators evaluate subsidy payments according to the specialization of their country's agricultural sector. Overall they compare subsidy payments for the agricultural commodity their constituency is specialized in to budgetary outlays for subsidies paid to agricultural commodities their constituency is not specialized in. Here, it holds for  $s_r = Y_{ir}$ :

$$\frac{\beta_{iB}}{\beta_{iW}} = \left( \frac{s_{iB}}{s_{iW}} \right)^{\sigma-2} \frac{\left[ \frac{(1-\sigma)}{(\eta-1)} \frac{\sigma^2}{\eta^2} \delta_c^2 \left( \frac{\omega_c}{s_{iB}} \right)^2 + 1 \right]}{\left[ \frac{(1-\sigma)}{(\eta-1)} \frac{\sigma^2}{\eta^2} \delta_c^2 \left( \frac{\omega_c}{s_{iW}} \right)^2 + 1 \right]}. \quad (4.20)$$

Please note that for the Commission the relative interest in crop and animal subsidies is always 0.5 as long as we assume that the relative electoral bias in favor of farmers is in average of all EU-member countries the same for crop and animal

farmers, i.e. it holds:

$$\delta_{G^{EU_B}} = \frac{\sum_c \delta_c t_{cB}}{\sum_c t_{cB}} = \frac{\sum_c \delta_c t_{cW}}{\sum_c t_{cW}} = \delta_{G^{EU_W}} \quad (4.21)$$

Next we derive the policy preferences of members of the parliament in national political systems, i.e.  $i \in P$ . In general legislators represent national agricultural interest to a different degree depending on their election in urban versus rural constituencies. A common feature of industrialized countries like EU member countries is the advanced urbanization. Thus the majority of parliamentary seats are elected in urban districts and only a minority of parliamentary seats are elected in rural districts (Henning et al., 2007). Accordingly, the commodity specific floor median in regard to any agricultural policy  $F_r$  will always represent urban interests. But in terms of the representation of special interests in parliament (Krehbiel, 1991) argued that preference outliers hold positions in specific partitions of the parliament, the governmental departments as well the parliamentary committees. Further the political exchange theory of Weingast and Marshall (1988) suggests that legislators representing rural interest have higher incentives to control the agricultural department of government  $G_A$  as well as the parliamentary committee of agriculture  $C_A$ . It follows:

$$\delta_{F_r} \leq \delta_i \forall i \in C_A \text{ and } \forall i \in G_A. \quad (4.22)$$

Consider now that all member countries build one parliament. Introducing national partitions of floor members  $F_c$ , then a specific subset  $F_c$  includes all members of the parliament belonging to the member country  $c$ . Since member countries are specialized in the production of at least one commodity,  $F_c$  is a preference outlier for this particular commodity. As the floor median  $F_r$  represents the median constituency across all member countries which will not be specialized in production of commodity  $r$ , it holds:

$$\delta_{F_r} \leq \delta_i \forall i \in F_c, \quad (4.23)$$

if  $c$  is specialized in the production of  $r$ . Hence, the floor median prefers a significantly lower protection level for commodity  $r$  when compared to the preferred protection level of specialized member country.

In terms of the Commission, we assume that the Commission represents the interest of an average constituency across all member countries. It also follows that the commodity specific floor median prefers also significantly lower protection levels when compared to the European Commission.

$$\delta_{F_r} < \delta_{G^{EU_r}} \quad \forall r \quad (4.24)$$

Accordingly, political support maximization according to eq. 4.17 results in:

$$Y_{F_r} < Y_{G^{EU_r}} \quad \forall r, \quad (4.25)$$

$$Y_{F_r} < Y_{F_c} \quad \forall r \text{ and} \quad (4.26)$$

$$Y_{F_r} < Y_i \forall i \in C_A \text{ and } \forall i \in G_A. \quad (4.27)$$

## 4.4 Comparison of policy outcomes under different governmental regimes

Using *propositions 1-5* and derived policy preferences of legislators, we are now able to compare policy outcomes under the EU-system, parliamentary and presidential systems. The comparison is summarized in *proposition 6*.

**Proposition 6.** *Assuming an  $m$ -dimensional agricultural policy space and assuming (spatial) policy preferences of agents are derived from political support maximization as specified above, the following statements hold true:*

- i. The policy outcome under the formal consultation procedure is always higher or equal when compared to the outcome under a parliamentary system, i.e.  $s^{EU*} \geq s^{par*}$ . Moreover the absolute difference between policy outcomes is higher the more heterogeneous policy preferences among member countries are.*
- ii. Comparing outcomes under the formal consultation procedure and presidential system, the outcome depends on the relative agenda setting power of the agricultural committee vis-à-vis the floor. If and only if it holds  $Y_{F_r} - SQ_r \leq Y_{rGEU} - Y_{F_r}$ , then  $s_r^{EU*} \geq s_r^{pre*}$ . Moreover, the difference  $s^{EU*} \geq s^{pre*}$  increases with the heterogeneity of policy preferences among member countries.*
- iii. Comparing outcomes under the formal consultation procedure and the informal Luxembourg Compromise it directly follows that:  $s^{EU*} - s^{LC*} \leq 0$ , where this difference increases with the heterogeneity of policy preferences among national Council members.*
- iv. Comparing outcomes under the formal consultation procedure and the informal EU-universalism it directly follows that:  $s^{EU*} - s^{UNI*} \leq 0$ , where this absolute difference decreases with heterogeneity of national Council members.*
- v. Comparing outcomes under the Luxembourg Compromise and EU-universalism it directly follows that:  $s^{UNI*} - s^{LC*} \leq 0$ , where this absolute difference increases with heterogeneity of national Council members.*

Part (i) and (ii) follow directly from proposition 1-3 and derived policy preferences of member countries, the Commission and the floor assuming some heterogeneity in the agricultural structure across member countries, e.g.  $s_{iB} > s_{iW} \forall i \in B$  and  $s_{iW} > s_{iB} \forall i \in W$ . Analogously, the first statements of parts (iii), (iv) and (v) follow directly from proposition 3-5 assuming again heterogeneous preferences of member countries and a status quo policy of (0, 0). Only the second statements of parts (iii)-(v) regarding the absolute difference of policy outcomes remain to be proven. Generally, this can be done by using comparative static results for the model described above. However, instead of deriving these comparative statics explicitly, we provide a graphical representation of equilibrium outcomes under different regimes assuming different degrees of heterogeneity in Figure 4.3.

In terms of the influence of heterogeneous preferences on policy outcomes consider that in general heterogeneous policy preferences result from diversified agricultural sector structures according to eq. 4.18. The variance or span of preferred policy positions  $Y_{ir}$  across member countries gets c.p. larger with a larger variance or span

of the relation  $\frac{t_{ir}}{w_c}$  across member countries. Thus, the maximal preferred protection level within the Council of Agricultural Ministers  $Y_{d_r}$  increases with increasing heterogeneity. However, assuming a mean preserving increase of heterogeneity implies that the policy position of the European Commission  $Y_{GEU_r}$  remains constant, while the position of the commodity specific floor median  $Y_{F_r}$  decreases. Thus, four major points already follow for the equilibrium policy outcomes.

First assuming a constant coalition discipline implies that the equilibrium outcomes under parliamentarism decrease c.p. with increasing heterogeneity. Note that it is impossible for the Commission as a supranational government to perfectly discipline her coalition under high heterogeneity. Hence the Commission has to compromise by accepting a lower protection level than preferred. It holds that the outcomes under a parliamentary regime are always lower or equal to the preferred position of the government, where the latter just results as the outcome under the consultation procedure. Second, in contrast to the parliamentary regime the consultation procedure provides the Commission sufficient agenda setter power vis-à-vis a heterogeneous Council as the agricultural committee to vote its preferred protection levels through (see Figure 4.3). Third, equilibrium outcomes also decrease with increasing heterogeneity in presidential regimes because the impact of the agenda setter power of the agricultural Council as the agricultural committee vis-à-vis the floor on the final policy decision decreases with more heterogeneous policy preferences. The latter results from the fact that the commodity specific floor medians tend to move towards the corresponding status-quo levels with increasing heterogeneity while the power of the committee is limited. However, please note that in contrast to a parliamentary regime policy outcomes under presidentialism can result in higher protection levels than preferred by the Commission as the supranational government (see Figure 4.3). Fourth, it also follows straightforward from comparative statics of eq.4.18 and proposition 5 that equilibrium policy outcomes under the Luxembourg Compromise increase with more heterogeneous policy preferences of Council members.

In summary, equilibrium outcomes under both parliamentary and presidential regimes decrease ceteris paribus with more heterogeneous policy preferences, while the equilibrium outcome of cooperative legislative bargaining under the Luxembourg Compromise increases. However equilibrium outcome of non-cooperative legislative bargaining under the consultation procedure remains unchanged.

Until now we left out to discuss equilibrium outcomes of the EU-universalism. Please note that under universalism the linear relation between the heterogeneity of policy preferences and agricultural protection levels in equilibrium as observed in the other governmental regimes does not hold. In fact an inverse u-shape relation results from comparative statics. If the preferences among national Council members are relatively homogeneous, an increase of heterogeneity implies an increase of equilibrium agricultural protection levels, while high heterogeneity at the start leads to the opposite comparative static effect (see Figure 4.3). To understand this relationship intuitively note that increased heterogeneity has an effect on both, the preferred protection level regarding the country specific agricultural commodity,  $Y_{ir_c}$ , and the relative intensity to receive own high protection levels vis-à-vis the intensity to keep protection levels of other member countries commodities at a bay,  $\frac{\beta_{ir_c}}{(1-\beta_{ir_c})}$ . Accordingly, the more heterogeneous policy preferences, the larger is c.p. agents incentive

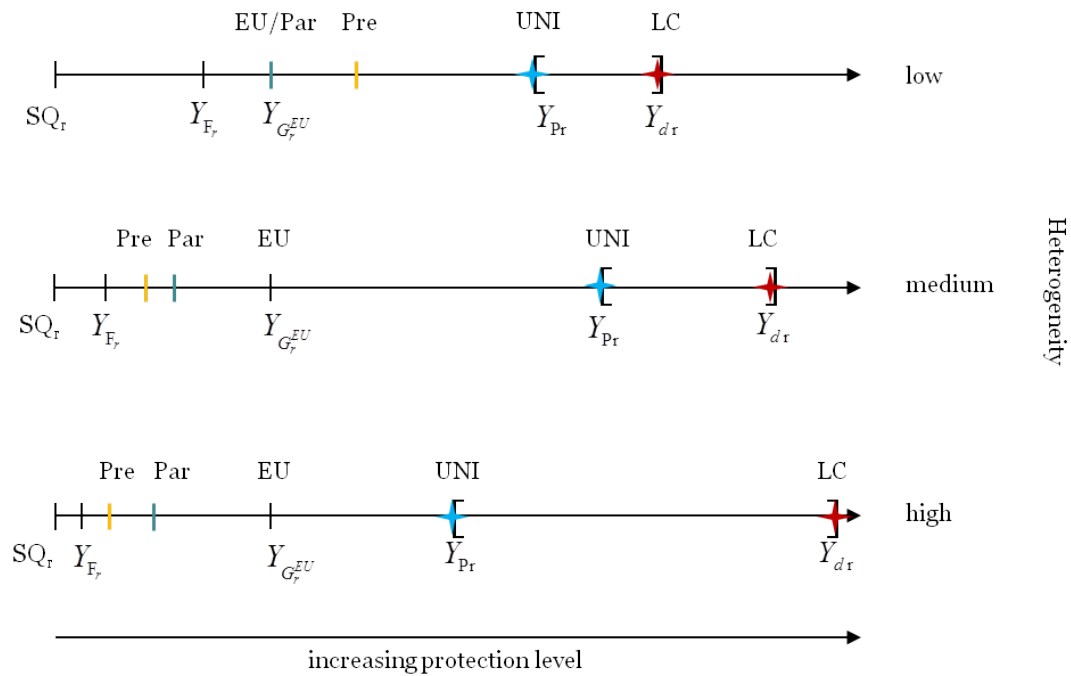


Figure 4.3: Agricultural policy outcomes under different governmental regimes  
Source: Authors.

to keep overall protection at a bay. Formally, this follows from the comparative statics of  $\lambda_{i*}$  with regard to increased heterogeneity, which is positive for low levels of heterogeneity, but negative for high levels of heterogeneity.

Finally, please note that if heterogeneity is sufficiently high, Council members unanimously prefer lower protection levels resulting under universalism when compared to extreme high protection levels received under the Luxembourg Compromise (see Figure 4.3). Note further that the latter becomes extremely inefficient for high heterogeneity, e.g. equilibrium outcome under the Luxembourg Compromise are extremely distant from the Pareto-frontier of the Council, while policy outcomes under universalism always lie on the Pareto-frontier of the Council. (*q.e.d.*)

Overall, it follows from *proposition 1-6* that Council members of the EU-6 initially preferred policy outcomes derived under the Luxembourg Compromise when compared to the formal consultation procedure. Further, under the application of the Luxembourg Compromise EU agricultural protection levels are significantly higher, when compared to protection levels that would have been derived under a parliamentary or presidential regime, respectively. Since agricultural structures of EU-member countries become more heterogeneous in an enlarged EU, agricultural protection increases in an enlarged EU under the Luxembourg Compromise. However, assuming increasing heterogeneity of member countries through continuing enlargements implies that Council members unanimously prefer lower protection levels derived under universalism when compared to extremely high protection levels resulting under the Luxembourg Compromise. Thus, a regime switch from the Luxembourg Compromise to the EU-universalism occurred, since this switch is a Pareto-dominant move from the viewpoint of all relevant political agents (Council members and Commission) and hence corresponds to a unanimous constitutional preference. Note that it

directly follows that this regime switch implies a significant reduction in EU agricultural protection levels. However, it still follows from proposition 1-3 that even under EU-universalism protection levels remain significantly higher when compared to protection levels resulting under a parliamentary or presidential regime.

In essence the legislative bargaining procedures in the EU permit higher agricultural protection levels when compared to standard national procedures. Due to the constitutional rules specified under the consultation procedure the agricultural Council, i.e. the agricultural committee, has an extremely high agenda setting power vis-à-vis the floor available. Therefore, agricultural preference outliers which naturally are members of the agricultural committee in all governmental regimes have the political power to bias policies in favor of rural and at the expense of urban interest.

## 4.5 Empirical evidence

### 4.5.1 Data description

Data for a comprehensive analysis of the effect of political institutions on agricultural protection were scarce, until Anderson and Valenzuela (2008) published recently agricultural protection measures for about 75 countries since 1955. Until then researchers could not empirically validate theories concerned with events before 1986. The broadly used Producer Support Estimate (PSE) by the OECD does simply not provide protection measures for these years. The time-series of protection rates as reported by Anderson and Valenzuela (2008), the Nominal Rates of Assistance to the agricultural sector (NRA), are calculated as a weighted average of commodity-specific NRAs using the undistorted production values of the commodities as weights. In contrast to the concept of the PSE, the unit value difference of production between the world and domestic market is expressed as a fraction of the undistorted product value and not as a fraction of the distorted product value. Analogously to the PSE, the NRA considers indirect market interventions, e.g. direct transfer payments. Furthermore, the NRA is corrected for exchange rates distortions. By far Anderson and Valenzuela (2008)'s data set is the most encompassing data collection of agricultural protection rates we know.

Given the fact that our theory focuses on the impact of political institutions on agricultural protection in democracies, we select country years out of available observations according to a country's democratic performance in the specific year. To judge about the democratic status of a country, Freedom House (2008) and Eckstein and Gurr (1975) provide two different but highly correlated measures of democracy. As the latter data set provides for a consistent measure for more years and countries than the first, we choose the measures *polity* and *polity2* of Eckstein and Gurr (1975) to select our country-year observations. Both indicators measure the net-authority quality of a country on a 21-point scale ranging from -10 to +10. Thus, these measures summarize autocratic and democratic characteristics of governing institutions to one index with higher values indicating better democracies. In a first step, we define a democratic country by a *polity2*-score above zero according to the definition given by Eckstein and Gurr (1975). However, as this definition would

also include countries in our sample that are relatively unstable democracies, we use further a combination of a smoothed five-year average of *polity* and the *polity2*-score to filter unstable democratic countries. Countries are included into our sample if the five-year average is greater or at least equal to 1 and if *polity2* is greater than zero.<sup>13</sup>

Further, we define a dummy variable *EU* indicating EU membership. *EU* switches from 0 to 1 if a country joins the European Union. Since countries might be anticipating the accession in their policy decisions on protection, the dummy even codes the year before accession with 1. This dummy reflects the institutional regime switch experienced by new member states when joining the European Union. To analyze the effect of institutional rearrangements within the European Union, we define another dummy variable *LC*. The dummy codes country-years with 1, if the country is a member of the EU after 1987, and with zero for non member countries after 1987 and for all countries before 1987, respectively. Hence, *LC* captures the effect of the new informal legislative bargaining procedure in practice for CAP decision-making after 1987 compared to the effect of the Luxembourg Compromise.

We follow the standard literature on the political economy of agricultural protection for selecting interesting controls (see Beghin and Kherallah, 1994; Swinnen et al., 2000; Swinnen, 1994; Balisacan and Roumasset, 1987; Olper, 2001; Tyers and Anderson, 1992; Anderson, 2008). Data on economic and sociodemographic controls are taken from the database of World Development Indicators by the World Bank and from the database of the Food and Agriculture Organization of the United Nations (FAOSTAT, 2008; World Bank, 2008). Our set of controls includes the logarithm of real GDP per capita (*gdppc1n*) to capture the state of economic development, the ratio of agricultural share in value-added and agricultural share in employment (*compad*) to proxy comparative advantages in agriculture and arable land, and land under permanent crops per farm worker (*factorend*) to take the relative incomes of agricultural farmers into account. We further include the share of agricultural exports in total merchandise exports (*tax\_agri*) to consider the tax collection constraints that governments face especially in developing countries to provide e.g. public goods. Following Beghin and Kherallah (1994), we define *budget* as the net agricultural export value per GDP per capita in order to account for governmental budget constraints to protect the agricultural sector. Furthermore, we use the logarithm of agricultural share in employment (*emplln*) to account for differences in economic structure and industrialization that reflect the ability of farmers to organize and to lobby for political support. To account for international agreements influencing domestic producer support, we include a period dummy *urround*. Here, *urround* considers the impact of the Uruguay Round Agreement on Agricultural on agricultural protection in high developed countries. We code the dummy with one for high income countries after 1994 with high income countries defined by an Human Development Index above 0.8 (United Nations Development Program, 2008) and zero otherwise.

Finally, our sample covers 58 countries from 1961-2005 due to scarcity of data for some of the polit-economic controls and non-democratic status.

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<sup>13</sup>As *polity2* is not reported for Iceland, we refer to the Gastil-Index by Freedom House (2008) that defines Iceland as a democracy.

### 4.5.2 Estimation strategy

To ensure a valid analysis of our hypotheses concerning the impact of legislative organization in the European Union on agricultural protection, we need to address some problems inherent to time-series cross-section data: i. country specific unobserved heterogeneity, ii. time shocks common to all countries and iii. the dynamics of political decision-making. Thus, we employ a dynamic two-way fixed effects specification (DFE):

$$NRA_{i,t} = \alpha + \rho NRA_{i,t-1} + \beta x_{i,t} + \nu z_{i,t} + \varphi_t + \xi_i + \epsilon_{i,t}, \quad (4.28)$$

$$i = 1, \dots, N; t = 1, \dots, T$$

with the subscripts  $i$  denoting countries and  $t$  years.  $NRA_{i,t}$  denotes the measure of agricultural protection and  $x_{i,t}$  denotes a set demographic and economic controls that are well-known to impact agricultural policies.  $z_{it}$  is a set of our dummy variables that indicate EU membership and institutional settings specific to the European Union.  $\alpha$  is a constant and  $\epsilon_{it}$  is an error term.

In terms of the above described methodological aspects, this specification addresses the issue of country specific heterogeneity via consideration of country specific effects  $\xi_i$  (estimated by  $N - 1$  countries dummies). In fact  $\xi_i$  includes local time-invariant factors like political institutions. Consequently, this approach would hinder analyzing the impact of different constitutional settings on agricultural protection if political institutions show no time variance in countries. But in our case the fixed effect approach allows for assessing the impact of constitutional change, which is indeed joining the European Union and the informal institutional rearrangement, while controlling correctly for unobserved country heterogeneity. Further, consider that our set of dummy variables indicating EU membership or institutional settings specific to the European Union, respectively, is allowed to be systematically correlated with the fixed effects  $\xi_i$  without rendering the model in eq. 4.28 inconsistent (see Wooldridge, 2002). Hence, the proposed fixed effect model enables us to estimate the effect of an institutional regime switch consistently, even if time-invariant, unobserved characteristics would affect the regime switch as well as the endogenous variable.

For the case of country-invariant time-specific shocks, we include time fixed effects  $\varphi_t$  (estimated by  $T - 1$  time dummies). By further including a period dummy for high income countries, i.e. *urround*, the specification picks up time trends that will differ among countries due to their economic characteristics.

Further, the model includes the lagged endogenous variable  $NRA_{i,t-1}$  to capture that governments do not reform policies in democracies immediately, if conditions change. Policy processes can rather be seen as partial adjustment processes over time. As noted above instant political interventions due to crisis are modeled via the inclusion of time dummies. In fact, past socio-economic conditions explicitly influence contemporary policy decisions because they drive the incentives and possibilities for groups, i.e. farmers in our case, to organize and to lobby for income redistribution. Moreover, the lagged dependent variable appears in the model to remove autocorrelation in the error terms. We test serial correlation in the error



terms via a Lagrange multiplier test proposed by Baltagi (2005, p. 93ff.).<sup>14</sup>

However, estimating eq. 4.28 by OLS renders the estimators biased and inconsistent, although the common within-transformation to estimate fixed effect models will solve the endogeneity of the lagged dependent variable caused by its correlation with the country fixed effect. But demeaning introduces a new correlation between the demeaned lagged dependent variable and the demeaned error term. Nickell (1981) has shown that the resulting bias in dynamic fixed models is decreasing in  $T$ . Thus, we might dismiss this bias as insignificant in our sample. Further, the application of corrected fixed effect estimators or GMM estimation procedures, respectively, when  $T$  is large, is discussed by Beck and Katz (2009), Beck and Katz (2011) and Judson and Owen (1999). Monte-Carlo simulations presented by these authors compare the efficiency and consistency of alternative estimators to the standard OLS estimator. They conclude that standard LSDV estimation should be used with unbalanced time-series cross-section data. Nevertheless, we run robustness checks on our data using different approaches to correct for the bias (Arellano and Bond, 1991; Bruno, 2005).<sup>15</sup>

Note that inference is based on cluster-robust standard errors with countries defined as clusters (see White, 1980).

While the model in eq. 4.28 delivers the treatment effect of EU institutions on agricultural protection, we turn to a pure cross-section approach to analyze their impact on the level of agricultural protection compared to non member countries:

$$\overline{NRA}_i = \alpha + \beta \bar{x}_i + vEU_i + \lambda Protec_i^+ + \epsilon_i, \quad (4.29)$$

where  $\overline{NRA}_i$  denotes the mean of agricultural protection over a specific period,  $\bar{x}_i$  denotes the set of the same controls as above averaged over a specific period,  $EU_i$  is a dummy variable that indicates EU membership,  $Protec_i^+$  is a set of country dummy variables and  $\epsilon_i$  is an error term. The specific periods are defined by the time periods between the enlargements. This approach ensures a consistent sample of EU countries for which agricultural protection is decided by supranational institutions for the whole period under observation. We average our yearly available data over the periods 1961-1972 (EU-6), 1973-1984 (EU-9), 1985-1993 (EU-12), 1994-2002 (EU-15) and 2003-2005 (EU-25).<sup>16</sup>

We further care for unobserved country heterogeneity that is not captured by our independent variables by countries dummies  $Protec_i^+$ . Information on countries for which a pooled model predicts agricultural protection rates poorly is derived from a cross-validation experiment with pooled dynamic OLS regressions (Stone, 1974; Beck et al., 2001). In detail we estimate the specification of eq. 4.28  $N$ -times

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<sup>14</sup>The LM test statistic for first order serial correlation in the fixed effects model is 27.02. The test statistic is asymptotically distributed as  $\chi_1^2$ . That is we have serially correlated error terms, even if the fixed effects might solve a substantial share of serial correlation due to time-invariant omitted variables.

<sup>15</sup>Results are available from the authors upon request. In fact, we used the Arellano-Bond estimator and the Kiviet's corrected LSDV estimator extended for unbalanced panels by Bruno (2005). Our main results remain unchanged.

<sup>16</sup>Note that we cannot differentiate between the EU-9 and EU-10 because data is not available for Greece.

with  $N - 1$  countries and without country-fixed effects. Then we predict the *NRA* of the left out country with the estimated coefficients and compute mean squared forecast errors (MSFE) to identify country specific heterogeneity. In particular, we compare country specific MSFEs with average MSFE (0.036) plus one standard deviation (0.073). Following our analyses, we employ a group dummy for Iceland (MSFE=0.359), Norway (MSFE=0.206) and Switzerland (MSFE=0.418). Inference relies again upon corrected standard errors as suggested by White (1980) but without clustering at the country level.

### 4.5.3 Results

Table 4.1 reports the results applying the estimation strategies outlined above to our data set. Model 1 estimates the impact of supranational decision-making on agricultural protection within a dynamic fixed effect model. Models 2-6 show the results of the cross-section estimations.

#### 4.5.3.1 Dynamic fixed effect model

Focusing firstly on model 1 the explanatory power of the model (within  $R^2$ ) is 0.604. This suggests that our model reflects determinants of agricultural protection within a country quite well. Regarding model dynamics, the lagged dependent variable has an estimated coefficient of 0.630, which signals a moderate time persistence of agricultural protection rates.<sup>17</sup> Further,  $F$  tests on the joint significance of country- or time-fixed effects, respectively, recommend the use of both to estimate determinants of agricultural protection rates.

For model 1, we notice that the estimation results for the standard political economy factors determining agricultural protection are consistent with the results of well-known studies (for an overview on these studies see Swinnen et al., 2001)). All classical variables enter the model with the expected signs, if they are statistically significant at a 10 percent level or higher. In detail, the negative estimate of *empll<sub>n</sub>* confirms Olson's theory that lower cost of collective action due to a decreasing free-riding problem for smaller farm groups implies c.p. higher agricultural protection. Similarly the positive estimate of *gdppcl<sub>n</sub>* supports the hypothesis of the so-called development paradox (Tyers and Anderson, 1992). The development paradox describes the phenomenon that countries increase domestic protection for their agricultural sector with upward economic development to reduce rising income disparities among the agricultural and industrial sector. Another finding that is in line with literature is the negative coefficient of *tax\_agri*. That is an increasing share of agricultural exports in merchandise exports decreases domestic support of the agricultural sector c.p.. This finding is in line with the theoretical expectation that developing countries will tax their agricultural sector with increasing export orientation of the sector to generate government revenue. Further, with regard to

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<sup>17</sup>Note that we run robustness checks on our data using different approaches to correct for the Nickell bias (Arellano and Bond, 1991; Bruno, 2005). Results are available from the authors upon request. In fact, we used the Arellano-Bond estimator and the Kiviet's corrected LSDV estimator extended for unbalanced panels by Bruno (2005). Our main results remain unchanged, if we apply these models.

Table 4.1: Results

	(1)	(2)	(3)	(4)	(5)	(6)
	DFE	EU-6	EU-9	EU-12	EU-15	EU-25
$\alpha$	-.466** (.237)	-.156 (.242)	.229 (.178)	.040 (.130)	.024 (.109)	.047 (.107)
$NRA_{t-1}$	.630*** (.040)					
gdppcIn	.125** (.058)	.267** (.131)	.015 (.069)	.159 (.100)	.044 (.077)	.047 (.080)
compad	-.048 (.046)	.890* (.530)	-.014 (.299)	-.063 (.188)	-.206 (.130)	-.105 (.120)
factorend	.016 (.093)	-.558** (.247)	-.423** (.196)	-.417** (.186)	-.436** (.184)	-.324** (.160)
budget	.001 (.040)	-.756 (.977)	.640*** (.239)	.024 (.180)	-.052 (.126)	-.069 (.098)
tax_agri	-.001*** (.0005)	-.007** (.003)	-.008*** (.002)	-.007** (.003)	-.004 (.002)	-.005** (.003)
empl	-.121** (.058)	.186 (.210)	-.097 (.101)	-.061 (.106)	-.183* (.096)	-.139 (.090)
EU	.137*** (.032)	.173 (.185)	.324** (.144)	.228 (.145)	.085 (.103)	.020 (.093)
LC	-.090** (.037)					
urround	-.086* (.045)					
Protec <sup>+</sup>			2.485*** (.244)	2.580*** (.241)	1.688*** (.174)	1.473*** (.186)
# obs.	1487	21	30	49	57	57
# countries	58	21	30	49	57	57
$R^2$	.604	.716	.955	.867	.843	.817
C-FE ( $F(57,1475)$ )	4.876***					
T-FE ( $F(44,1475)$ )	7.212***					

Notes: Cluster-robust standard errors are given in parentheses for model 1, robust standard errors are given in parentheses for model 2-6, \* indicates significance at the 10 percent level, \*\* indicates significance at the 5 percent level, and \*\*\* indicates significance at the 1 percent level. Source: Authors.

developed countries protecting agriculture, agricultural protection of agricultural exports will threaten budgetary solvency and is thereby reduced with increasing export orientation. The effect of the WTO negotiations is, as expected, negative but just significant at the 10% level. Overall the Agreement on Agriculture of the Uruguay Round reduces protection in high income countries by 8.6 percentage points.

All other classical determinants of agricultural protection remain insignificant in our model. With regard to the variable *budget*, Beghin and Kherallah (1994) have still mentioned the difficulty in previous studies to find strong empirical evidence on the revenue motive of government.

So far we have dealt with the general theory of the political economy of agricultural protection to show that our model fits well-known studies. Next we turn to the interpretation of the coefficients we are most interested in. Concerning the impact of supranational decision-making on agricultural protection, our estimation predicts that joining the EU significantly increases agricultural protection levels by 13.7 percentage points c.p.. The impact of joining the EU in the long-run is even about 37 percentage points.<sup>18</sup> Thus, our theoretical prediction that the institutional change immanent to joining the EU increases agricultural protection is empirically supported. Regarding our second hypothesis that informal institutional decision-making rules have changed over time, the negative sign of  $LC$  supports our theory. Institutional rearrangements after 1987 affect significantly agricultural protection. Indeed, the new legislative norm in practice for the Common Agricultural Policy is the starting point for a cutback of agricultural protection. The institutional reform leads to a decrease of protection of about 24.3 percentage points in the long-run. Further, joining the EU after 1987 will increase domestic support for agriculture by 4.7 percentage points in the short-run and 12.7 percentage points in the long-run.

#### 4.5.3.2 Evidence from cross-country estimations

Although results of model 1 clearly argue for a treatment effect of the EU decision-making process on agricultural protection, the DFE does not reveal the level impact of the EU institution in comparison to all other countries. Therefore we extend our empirical analysis by running pure cross-section estimations. Consider as motivation for these estimations, studies that argue for the European Union as an outlier regarding agricultural protection (Thies and Porche, 2007; Bilal, 2000). However, our theoretical model does not provide a well-founded theory that argues for the increase of protection compared to other countries due to EU institutions. The model solely predicts the treatment effect of joining the EU inducing an institutional regime switch for a country and a time-political regime interaction effect that corresponds to a switch in informal legislative decision-making rules over time in the EU. Thus, the following empirical analysis delivers just empirical evidence on determinants of agricultural protection across countries during specific periods. Overall, the explanatory power of the cross-country estimations according to eq. 4.29 is always quite well with an R-squared above 0.7 for each of the regressions. The cross-section estimation rely on country-time observations available for the five periods 1961-1972 (EU-6), 1973-1984 (EU-9), 1985-1993 (EU-12), 1994-2002 (EU-15) and 2003-2005 (EU-25).

Starting with the controls, the overall picture is relatively robust and in line with theory. Independent from the time period under analysis, we find that an increase in the relative income of farmers (*factorend*) and in the share of agricultural exports in total merchandise exports (*tax\_agri*) lowers agricultural protection. The coefficients for these factors are highly significant except for *tax\_agri* in model 5. Regarding the impact of the gross domestic product, an increase in economic development increases protection rates but significantly solely in model 2. Concerning the ability to lobby, represented by *empln*, model 2 argues for a positive relation between small groups and agricultural support but this effect is not statistically significant. For all other

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<sup>18</sup>Long-run estimates are calculated by  $\frac{v}{(1-\rho)}$ .

models Olson's theory holds.

For some of the variables, we observe a counter-theoretical sign, if they are statistically significant. In model 2 an increase in the comparative advantage (*compad*) is associated with an increase in protection. Theory would suggest that the higher the comparative advantages in agriculture the lower is the demand for protection. Similarly, an increase in budget costs due to a net-export situation (*budget*) boosts agricultural support in model 3. Note that the EU subsidized the agricultural sector during this period highly although facing an agricultural netto-export situation.

Focusing now on the dummy indicating EU membership, the picture is clear-cut: agricultural protection exceeds always protection levels of other countries as indicated by the positive EU dummy across all models while controlling for political-economic determinants of agricultural protection. However, agricultural protection increases until the third enlargement and decreases afterwards. Hence, results again suggest that the informal Luxembourg Compromise raised agricultural protection in the EU significantly and even above levels in other countries. See also model 1, where we estimated explicitly the time-political regime interaction effect in EU member countries. Hence, although our theory solely predicts an individual level treatment effect, results argue also for a positive effect of the supranational system compared to other national political systems.

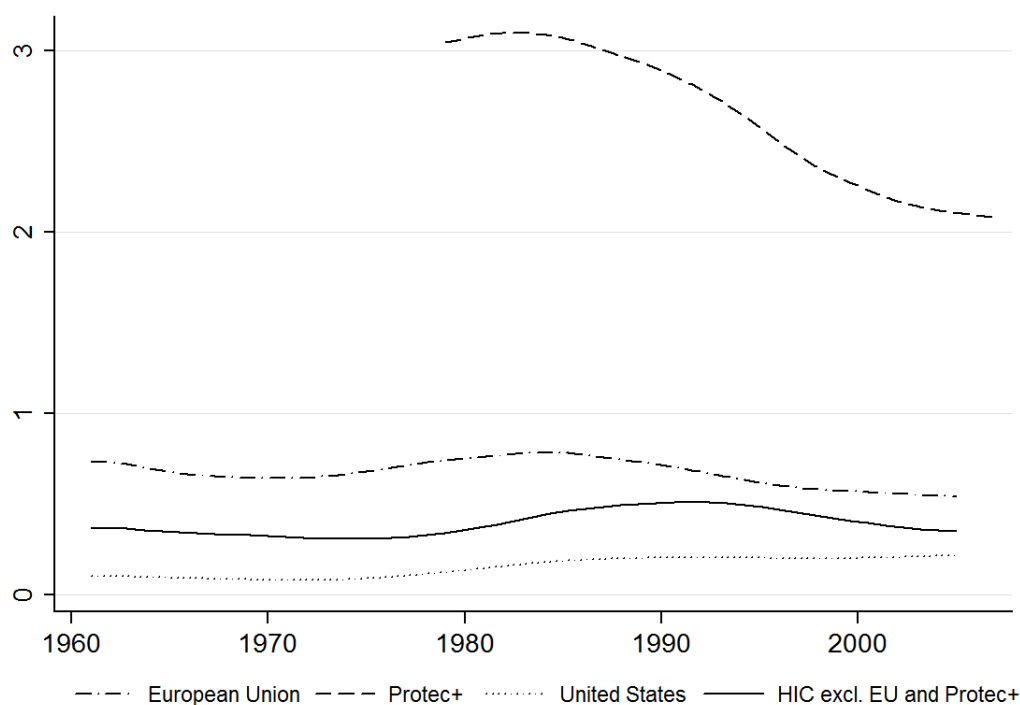


Figure 4.4: Nominal rates of assistance to the agricultural sector (NRA) over time in selected countries

Notes: Lines plot the smoothed average of NRA using the Stata command *lpoly* with bandwidth 5 and degree 0. High income countries are countries defined by an Human Development Index above 0.8. *NRA* is not available for Iceland, Norway and Switzerland before 1979. Source: Calculated by authors using data by Anderson et al. (2008).

The regressions also include a dummy for a set of countries -Iceland, Norway and Switzerland- that are well-known protection outliers. We used an out-of-sample prediction experiment described in Section 4.5.2 to determine outliers in our sample. In addition to the experiment, we plot agricultural protection rates for the European Union, the United States, the Protec<sup>+</sup>-countries and high income countries excluding the EU member and Protec<sup>+</sup>-countries in Figure 4.5.3.2 to depict graphically patterns of agricultural protection across these countries and time. The figure shows clearly that the Protec<sup>+</sup> countries highly subsidize their agricultural sector even compared to other high income countries. This pattern of agricultural protection explains the highly positive sign of the dummy coefficient. Hence the dummy enables us to capture local unobserved factors boosting the demand for agricultural protection, for which we do not control with the explaining variables.

## 4.6 Conclusion

This paper provides a theoretical model of political decision-making for explaining agricultural protection in the supranational political system of the European Union. The model compares policy outcomes under the EU-system with the counterfactual policy outcomes that would be observed under a parliamentary and a presidential regime, respectively. Further, we demonstrate that agricultural policy outcomes depend systematically on informal legislative bargaining procedures and vary for each bargaining procedure with the number of EU member countries. Accordingly, EU enlargements drive legislators' incentives to adopt specific cooperative legislative bargaining procedures. Thus, our theory not only explains higher protection levels for countries, if they join the EU, but furthermore the specific dynamic development of agricultural protection in the EU as shown in Figure 4.1.

In particular, member countries of the EU-6 have a strong incentive to formulate CAP under the so-called Luxembourg Compromise. Under this procedure, they form a stable ex-ante coalition in the Council excluding the European Commission and grant each other agenda setting power over policies, if a member country has a particular interest in a specific agricultural commodity. Consequently, government finances protection for all member countries' "pet commodities". We observe extremely high agricultural protection levels, if the Luxembourg Compromise is the legislative rule in practice for agricultural policy decision-making. Further, we show that this situation generates incentives to change the informal bargaining procedure with an increasing number of member countries. Accordingly, member countries of the EU-15 and especially the EU-25 agree on an informal legislative decision-making rule ensuring lower domestic support. In fact, granting agenda setting power to the Commission would result in lower protection rates, because the Commission supports moderate protection levels according to their political support function. Thus, Council members agree on a new legislative norm that includes the Commission into an ex ante fixed majority coalition. That is the new legislative norm corresponds to Weingast's universalism. Finally, this norm enables Council members to reform agricultural policy significantly resulting in a sharp decline of protection levels compared to the levels under the Luxembourg Compromise. However, this new legislative norm does still not correspond to the formal consultation as laid down in the constitu-

tion but relies upon cooperative behavior of Council members. In addition to this, we also show that universalism as well as the formal consultation procedure imply significantly higher protection levels when compared to counterfactual agricultural protection levels derived under parliamentary or presidential regimes, respectively.

Our theoretical work is also empirically tested with a dynamic fixed effect model using data of 58 countries over the period 1961-2005. Estimation results nicely support our theory. Controlling for standard economic and demographic factors as well as for unobserved country- and time-specific heterogeneity, a highly significant positive impact of the EU-system on agricultural protection results. Hence, an institutional regime switch from national forms of government to a supranational system increases support of the agricultural sector in a country c.p. significantly.

Moreover, a time-regime interaction dummy variable that discriminates the periods under Luxembourg Compromise and Universalism has a highly significant and negative coefficient. As suggested by theory, this indicates a decrease in protection rates due to institutional rearrangements within the Council. In detail, including the moderate Commission into an ex ante fixed majority coalition enabled the Council to reform the CAP towards lower protection rates. We further provide empirical insights for the level impact of the EU decision-making system when compared to non EU countries. Again, these cross-section estimations argue for decrease in protection due to an institutional regime switch. More important is that we also observe a cross-country effect of the EU regime when controlling for standard controls and unobserved heterogeneity. But we see clearly that the difference in protection decreases after the informal institutional change in 1987. Nevertheless, these results motivate for future research on cross-country effect of the EU system on agricultural protection.

Finally, we admit that the EU dummy will also capture other characteristics of the European Union than the unique institutional system. That is agricultural protection and the EU dummy will be affected by the same factors for which we do not control here. In particular, the dummy might also cover the agricultural lobby system of the EU. Hence, the dummy is just a proxy for the supranational institutional system of EU. However, while adequate econometric techniques, for instance an instrument variable approach, are known to efficiently disentangle the effect of the lobby system from the institutional system, variables that would allow for an instrument variable estimation are still missing. In detail, to the best of our knowledge, data about the strength of national agricultural lobby groups are not available. So far the dummy is the best approach to estimate the impact of the EU political decision-making system on agricultural protection keeping in mind that the estimated coefficients cannot be interpreted as true causal effects. Nevertheless, in combination with our theory we state that the informal legislative bargaining rules induce high agricultural protection in EU member countries that clearly differ from their unobserved counterfactual protection levels in parliamentary or presidential systems, respectively.

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## 4.A Appendix

Table 4.2: List of countries included into analysis

DFE	EU-6	EU-9	EU-12	EU-15/-25
Argentina	Australia	Argentina	Argentina	Argentina
Australia	Austria	Australia	Australia	Australia
Austria	Canada	Austria	Austria	Austria
Bangladesh	Colombia	Canada	Bangladesh	Bangladesh
Brazil	Denmark	Colombia	Brazil	Brazil
Bulgaria	Finland	Denmark	Bulgaria	Bulgaria
Canada	France	Dominican Rep.	Canada	Canada
Chile	Germany	Ecuador	Chile	Chile
Colombia	India	Finland	Colombia	Colombia
Czech Rep.	Ireland	France	Czech Rep.	Czech Rep.
Denmark	Italy	Germany	Denmark	Denmark
Dominican Rep.	Japan	Iceland	Dominican Rep.	Dominican Rep.
Ecuador	Malaysia	India	Ecuador	Ecuador
Estonia	Netherlands	Ireland	Estonia	Estonia
Ethiopia	New Zealand	Italy	Ethiopia	Ethiopia
Finland	South Africa	Japan	Finland	Finland
France	Sri Lanka	Malaysia	France	France
Germany	Sweden	Netherlands	Germany	Germany
Ghana	Turkey	New Zealand	Hungary	Ghana
Hungary	United Kingdom	Norway	Iceland	Hungary
Iceland	United States	Portugal	India	Iceland
India		South Africa	Ireland	India
Indonesia		Spain	Italy	Indonesia
Ireland		Sri Lanka	Japan	Ireland
Italy		Sweden	Korea, Rep.	Italy
Japan		Switzerland	Latvia	Japan
Korea, Rep.		Thailand	Lithuania	Korea, Rep.
Latvia		Turkey	Madagascar	Latvia
Lithuania		United Kingdom	Malaysia	Lithuania
Madagascar		United States	Netherlands	Madagascar
Malaysia			New Zealand	Malaysia
Mexico			Norway	Mexico
Mozambique			Pakistan	Mozambique
Netherlands			Philippines	Netherlands
New Zealand			Poland	New Zealand
Nicaragua			Portugal	Nicaragua
Nigeria			Romania	Nigeria
Norway			Slovenia	Norway
Pakistan			South Africa	Philippines
Philippines			Spain	Poland
Poland			Sri Lanka	Portugal
Portugal			Sweden	Romania
Romania			Switzerland	Russia

continued on next page

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DFE	EU-6	EU-9	EU-12	EU-15/-25
Russia			Thailand	Senegal
Senegal			Turkey	Slovak Rep.
Slovak Rep.			Ukraine	Slovenia
Slovenia			United Kingdom	South Africa
South Africa			United States	Spain
Spain			Zambia	Sri Lanka
Sri Lanka				Sweden
Sweden				Switzerland
Switzerland				Thailand
Thailand				Turkey
Turkey				Ukraine
Ukraine				United Kingdom
United Kingdom				United States
United States				Zambia
Zambia				

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Source: Authors.

## Chapter 5

# A Network Based Approach to Evaluate Participatory Policy Processes: An Application to CAADP in Malawi

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Accepted for publication as book chapter in "Modeling and Evaluation of CAADP-Policies: Theory, Methods and Applications", Ousmane Badiane and Christian H.C.A. Henning (Editors)

### Abstract

International organizations like the African Union or The World Bank increasingly promote participatory policy processes as a tool in order to design efficient policy programs for pro-poor growth. A good case in point for this development is the Comprehensive Africa Agriculture Development Programme (CAADP) initiated by the African Union. Besides fostering agriculture-led development, this programs aims at increasing the involvement of stakeholder organizations into the political decision-making process. Participatory policy processes are justified as a mechanism to increase ownership and commitment to policy programs, while neither a quantitative assessment nor a comprehensive micro-political foundation of participatory policy processes has been provided in the literature, yet. In this context, we introduce a theoretical framework to evaluate policy processes involving governmental, international and local stakeholder organizations. Basically our model incorporates the process of policy belief formation in communication networks into a legislative decision-making model. This approach allows for a quantitative evaluation of participatory policy processes as well as of the resulting political influence of non-governmental organizations on national policy decisions. Based on this framework, we analyze the participatory policy process in Malawi leading to the adoption of an agricultural sector investment program based on the principles of CAADP empirically. A network study collecting quantitative network data and policy positions via face-to-face interviews in Malawi in 2010 provides the empirical database for the evaluation.

*Keywords:* participatory policy processes; policy networks; belief formation; informal political institutions; quantitative network analysis

## **5.1 Introduction**

Donor organizations recently engaged in promoting participatory policy processes as a tool for designing efficient policy programs. Participatory policy-making is a process through which stakeholder influence and share control over priority setting and policy-making (World Bank, 2011). The implementation of these processes in developing countries is promoted in order to guarantee that local non-governmental and governmental organizations feel responsible for formulating and implementing efficient development programs. Further, it is widely assumed that the ownership and commitment to programs due to participation in the formulation will lead to the adoption of pro-poor growth policy programs in countries. Hence, understanding the nature of participatory policy processes is key for international organizations to efficiently support partner countries in formulating effective policy programs.

For the agricultural sector, the Comprehensive Africa Agriculture Development Programme (CAADP) initiated by the African Union is a good case in point for these new developments. A key principle of the program is the inclusion of local stakeholder organizations into planning, formulating and evaluating sector specific growth policies (see NEPAD, 2010). However, a CAADP working group on non state actor participation critically assesses the ability of stakeholders to use the newly created opportunities of participation. Using information gathered by a qualitative stakeholder survey and desk research, they point out that CAADP has not consistently achieved high quality inclusion of non-state actors at national, regional and local levels (see Randall, 2011, p.2).

While this presented case study provides insights into participatory policy processes, a quantitative evaluation of participatory policy processes and a comprehensive policy process framework based on micro-political theories is still missing. Nevertheless, at the methodological level, one policy analysis framework -the Advocacy Coalition Framework by Sabatier and Jenkins-Smith (1993)- has gained wide attention by political scientist. This framework explicitly identifies beliefs as drivers of policy-making and especially of advocacy coalitions and provides a systematic approach for a stakeholder analysis. But the framework provides neither a theoretical model how actors of a policy subsystem agree on a mutually accepted policy decision nor a theoretical model of belief formation among actors involved in policy-making.

Hence, we introduce a theoretically founded framework to analyze participatory policy processes. Basically our framework enables us to consider the impact of political institutions as well as of policy networks on the final policy decision. Political institutions can be either formal or informal. A case in point for informal political institutions in Africa is the "Big Man" presidentialism (Bratton, 2007; van der Walle, 2003). Political institutions determine especially the procedure which shapes legislative bargaining and thereby, the result of the bargaining process. Policy networks enable actors to provide valuable information on policy impacts to political agents. That is non-governmental actors acquire political influence by providing expert information that changes policy beliefs of powerful actors in line with their own interests. Overall, we embed a belief formation model based on policy networks into a theoretical model reflecting political bargaining in the legislative system. The framework enables us to evaluate, on the one hand, the quality and nature of policy

processes, and, on the other hand, the influence of stakeholder organizations on final policy decisions.

Turning to the theoretical basis of our model, consider first the strand of social influence theory. Regarding these theories, our policy process framework builds upon a theoretical model of belief formation suggested by Friedkin and Johnsen (1990) and Friedkin and Johnsen (1997). Independently, Pappi et al. (1995) used a very similar model to empirically analyze political decision-making in national labor policy of USA, Germany and Japan. In summary, individuals form their policy belief in our model by taking weighted averages of the beliefs of individuals with whom they communicate about impacts of policy decisions on the state of the world and their own belief. For modeling the legislative bargaining process, that leads to the final policy decision, we use the mean voter rule developed by Henning (2000) as theoretical legislative decision-making model. The mean voter rule is a cooperative legislative bargaining procedure where final decisions result from package deals among political agents.

We apply our framework to the policy process of agricultural policy reform in Malawi. Malawi approved a policy reform based on the principles of CAADP - the sector investment program "Agricultural Sector Wide Approach" (ASWAp)- in 2010. A Network study collecting quantitative network data and policy positions via face-to-face interviews in Malawi in 2010 provides the empirical database for the application of the framework to Malawi's policy processes. Interviews were conducted with relevant local stakeholder organizations, donors and politicians. Final results suggest that our proposed framework is able to reflect participatory policy processes in Malawi. Hence, the framework can be used as a theoretical basis for future research on policy processes in different countries. With regard to Malawi, the policy network facilitates consensus building on agricultural policy issues. However, the participatory policy process resembles a top-down instead of a bottom-up policy process as government highly influences the beliefs of stakeholders and vice-versa according to our results.

The Paper proceeds as follows. In Section 5.2 we briefly introduce the theoretical framework for modeling participatory policy processes. The network study is described in detail in Section 5.3. Section 5.4 presents the results from applying our framework to policy processes in Malawi. We conclude in Section 5.5.

## **5.2 A theoretical framework to model policy processes**

A policy decision  $\alpha$  is the result of a bargaining process about policy strategies to reach a specific state of the world  $z$ . This bargaining process is determined by linked formal and informal political institutions and policy networks. Formal institutions correspond to rules of policy games as defined in the constitution, while informal institutions enable agents to play political games within the official rules of the game. Such games determine either an agent's formal or informal political power over legislation. Policy networks extend political games by permitting actors to influence policy decision via information provision on policy impacts. Therefore a valid theoretical model of policy processes consists of modules that capture the effects of both components of the policy process on policy decisions.



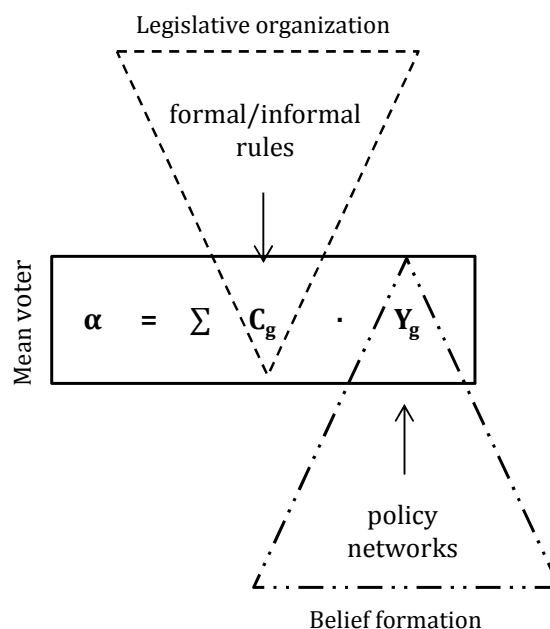


Figure 5.1: Overview about the framework.  
Source: Authors.

We consider mainly two strands of literature to build a policy process framework that combines all essential features of participatory policy processes (see Figure 5.1). First, we use the workhorse model for legislative decision-making, the non-cooperative legislative bargaining model of Baron and Ferejohn (1989), as basis for our model of legislative decision-making. Our model, the mean voter rule, is given by the equation in the rectangle in Figure 5.1. In essence the mean voter rule reproduces final policy decisions as the result of a voting power distribution among agents with individual ideal positions  $Y$ . Second, we integrate a belief formation model into our framework to reflect the influence of policy networks on policy decisions and to enable non-governmental organizations to influence final policy decisions (lower triangle in Figure 5.1). In summary, our model considers the policy process as an aggregation mechanism for different policy positions according to voting procedures in parliament and to belief formation in networks. These voting procedures, either determined by formal or informal institutions, constitute the political power  $C$  of a legislator  $g$  (upper triangle in Figure 5.1) and determine to what extent final legislation represents an agent's individual preferences.

### 5.2.1 Legislative bargaining

The legislative decision-making module of the framework bases upon the mean voter decision rule developed by Henning (2000). This theoretical model corresponds to a Baron-Ferejohn-game extended by the rational cooperative behavior of political agents. According to the mean voter rule, final policy choices result from package deals among agents that are determined by agents' ideal positions ( $Y_g$ ) and agents' political power ( $C_g$ ). Agent-specific ideal policy positions correspond to the governmental policy the agent likes to be implemented. Political power results from

an agent's probability to succeed in forming a winning coalition. Agents need the support of such winning coalitions to vote their ideal policy position through. The probability to be member of a coalition depends on constitutional rules and the embeddedness of an actor in the institutional system. Indeed, political bargaining corresponds to a competition in the formation of winning coalitions among political agents. Non-cooperative political bargaining would result in uncertain policy choices as it corresponds to a lottery over agents' ideal positions. Assuming risk averse politicians, non-cooperative legislative bargaining is rather inefficient. Hence, agents have an incentive to agree ex ante on cooperative policy formulation mechanisms -the mean voter rule- that guarantee each political agent a higher pay-off. The mean voter decision rule is self-enforcing as long as legislators do not discount future gains from cooperation too much.

In detail, the final policy decision corresponds to the weighted mean of legislators' ideal positions  $Y_g$ :

$$\alpha = \sum_g C_g Y_g \text{ with } \sum_g C_g = 1. \quad (5.1)$$

The weight  $C_g$  of agent's  $g$  ideal position correspond to her voting power which is determined by political institutions. Technically, under specific assumptions  $C_g$  equals the ratio of the number of winning coalitions of which an agent  $g$  is a member and the sum of all winning coalitions all relevant political agents are members of. Please note that under this assumption political power  $C_g$  is quite similar to the classical Coleman-Banzhaf voting power index, which measures the ability of an actor to change a vote (Banzhaf, 1965; Coleman, 1971).

By defining the threshold of votes to be met for a collective decision and identifying whose vote is compulsory for a final decision, voting power indices can be calculated that reflect different power distributions in policy-making. In general, either formal or informal voting power games can be defined. Formal power games reflect the usual legislative process in democratic systems. This process typically begins with government submitting a bill to parliament. Then the responsible committee works on the bill to present parliament the government proposal including recommended amendments. At last, there is a final vote on the entire bill on the floor. Here, additional amendments might be submitted or not. In general, agenda setting power within government lies with the ministry responsible for the specific sector policy.

Informal political power distributions relate to the concept of internally enforced standards of legislative power. Shepsle and Weingast (1987) already stated that observed power distributions cannot be explained by formal institutional rules. Further, Bratton (2007) argues that the rule of law is often weakly developed, even if it is not completely absent in developing countries. One major informal institution that influences political life in Africa heavily is "Big Man" presidentialism. That is political power is intensely concentrated around the president which leads to an increase in power of his cabinet (see also van der Walle, 2003). In summary, these internally enforced standards grant all political power to the cabinet and the president and exclude the final vote on the floor.

While this model captures the essential effects of legislative bargaining, it does not characterize the ideal policy positions of political agents. Hence, we explain how political agents form their ideal policy position in the next Section.

### 5.2.2 Belief formation

To understand how agents form their ideal positions, consider three processes. First, it is widely recognized that legislators maximize their political support when deciding on policy programs that impact on the state of the world  $z$  in a country. The state of the world determines the utility  $U_s(z(\alpha))$  of a member of society  $s$ . Then,  $S_g(U_s(z(\alpha)))$  denotes the political support function of a specific political agent  $g$ , which relates the welfare of a society's member to the political support an agent receives from this member. Second, the political technology  $T(z, \alpha)$  determines the relation between  $\alpha$  and the state of the world  $z$ . Thus, an agent's ideal policy position  $Y_g$  results from political support maximization given a specific political technology:

$$Y_g = \arg \max_{\alpha} S_g(U_s(z(\alpha))), \quad \text{s.t. } T(z, \alpha) = 0. \quad (5.2)$$

Thirdly, agents have no perfect information about the true impact of a specific policy decision on the state of the world, i.e. the political technology  $T(z, \alpha)$ , but form policy beliefs about this relation. To maximize now their political support, they try to increase their knowledge about the relation by exchanging information with members of their communication network. That is they update their policy beliefs according to some specific process that provides them information on policy positions of other agents and that finally leads them to form one specific own policy position.<sup>1</sup>

One approach to model belief formation in networks that is highlighted by literature is a non-Bayesian model. Non-Bayesian approaches specify that belief formation processes follow simple rules of thumb. We suggest a non-Bayesian model similar to the model of Friedkin and Johnsen (1990). Independent from the work of Friedkin and Johnsen, Pappi et al. (1995) have developed a social influence model to analyze political decision-making in the USA, Germany and Japan. Summarizing our model with a few words, individuals form their final policy position by taking weighted averages of the policy positions of individuals from whom they receive information about impacts of policy decisions via communication and their own initial policy position.

**The theoretical model** More specifically, belief formation has three key components. The first component is the communication network that is the channel of information through which senders provide new information. We denote the defined set of actors that provides information about policy impacts and that constitutes thereby the relevant network, as the country's political elite ( $E$ ) where  $i$  denotes a generic element of  $E$ . The political elite comprises political agents  $g$ , who by constitution collectively determine national policy, and a subset of non-governmental actors, who by constitution have no legislative power but who are linked with agents endowed with political power in the network. Whether non-governmental actors are members of such a network relies upon overcoming the collective action problem

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<sup>1</sup>How individuals form their beliefs is discussed and analyzed by several scholars from sociology, mathematics and economics (Friedkin and Johnsen, 1990; Acemoglu and Ozdaglar, 2010; Golub and Jackson, 2009; Jackson, 2008; Knoke et al., 1996; Laumann and Knoke, 1987)

determined by socio-economic framework conditions (Olson, 1965). It follows, that rarely each actor is able to form ties with influential actors but that the set of actors, whose policy positions influence the final policy decision, is restricted.

Then, we define the overall communication network as a binary network  $T$ , where  $T_{ij} = 1$  indicates that actor  $i$  and actor  $j$  have an established communication tie. In addition, we define the subset  $E_i = \{j \in E, T_{ij} = 1\}$  as the neighborhood of actor  $i$ , where it holds:

$$\sum_{j \in E_i} t_{ij} = 1 \text{ with } t_{ij} = \frac{T_{ij}}{\sum_{j \in E_i} T_{ij}}. \quad (5.3)$$

Accordingly,  $T = [t_{ij}]$  denotes the communication network, where  $t_{ij} > 0$  indicates that actor  $i$  pays attention to actor  $j$ .  $T$  is a stochastic matrix, i.e. for each actor the sum of total weights equals 1.

The second component is the initial position  $Y_i^0$  of an actor  $i$  which reflects all exogenous influences on his position but not the influence of the political communication process. Political agents form their initial position according to eq. 5.2. Non-governmental actors, i.e. interest groups, build here a special case. They also maximize a political support function given a specific political technology to develop their initial policy position. However, they do not want to gain votes but want to attract members with their policy position. If they are also not perfectly informed about policy impacts, better information on policy impacts would enable them to lobby more efficiently. In consequence, their number of members and thereby their budget available for providing information in line with an organization's own interests to political agents increases. Hence, information gathering via communication with elite members is rational for them.

Finally, we must specify the rule how individuals combine their own positions with positions communicated by others to form their final policy position. We suggest that individuals update their political position  $Y_i^0$  via taking weighted averages of their neighbors' positions  $Y_j^0$  with  $t_{ij}$  being the weight or trust that actor  $i$  places on the current position of actor  $j$  and  $t_{ii}$  being the weight of actor's own position (see Jackson, 2005):<sup>2</sup>

$$\begin{aligned} Y_i^* &= t_{ii}Y_i^0 + \sum_{j \neq i} t_{ij}Y_j^0 \\ \Rightarrow Y_i^* &= t_{ii}Y_i^0 + (1 - t_{ii}) \sum_j \hat{t}_{ij}Y_j^0 \quad \text{with} \quad \hat{t}_{ij} = \frac{t_{ij}}{(1 - t_{ii})}. \end{aligned} \quad (5.4)$$

$Y_i^*$  denotes the position of agent  $i$  after communication. Own control describes to what extent an actor relies upon own information on policy impacts while forming his final position. As  $T$  is row normalized to one,  $(1 - t_{ii})$  is the aggregated weight for all neighbors' positions on actor  $i$ 's position. Let  $\gamma$  denote the diagonal matrix with diagonal elements  $t_{ii}$  than writing eq. 5.4 in matrix notation results after further

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<sup>2</sup>Friedkin and Johnsen (1997) assume that all actors attribute the same weight to their own initial position. However, we make no prior assumptions about the weight that actors place on beliefs of others in our belief formation module but ascertain their own control empirically. Note, that heterogeneous weights among actors will still deliver an unambiguous final policy decision.

rearrangements in:

$$y^* = \left[ I - (1 - \gamma) \hat{T} \right]^{-1} \gamma y^0, \quad (5.5)$$

with  $M = [I - (1 - \gamma) T]^{-1} \gamma$  being the network multiplier matrix which is similar to the Hubbell index (Hubbell, 1965). An element of the multiplier matrix  $m_{ij}$  defines the field strength of actor  $j$ 's initial position operating on actor  $i$ 's final position. If  $i = j$ , the element  $m_{ii}$  of the multiplier matrix  $M$  equals the weight that an actor  $i$  puts on his own initial position. That is the final network multiplier matrix is denoted by  $M = [m_{ij}]_{i,j \in E}$ . Note that a network multiplier includes all communication loops among actors, i.e. all direct and all indirect effects of  $j$ 's initial position on  $i$ 's position resulting from communication.

For any row stochastic matrix the belief formation process described in eq. 5.5 delivers an unambiguous final policy position  $y^*$  as an weighted average of the initial position of all agents before communication  $y^0$ , where the weight of actor  $j$ 's initial position for actor  $i$ 's final position just equals the element  $m_{ij}$  of the multiplier matrix  $M$ .<sup>3</sup>

**Belief formation, final policy decision and generalized political power** Based on the above described belief formation among actors and the mean voter rule from eq. 5.1, the final policy decision  $\alpha^*$  after elite members have communicated with each other follows from:

$$\alpha^* = \sum_g C_g \left( \sum_j m_{gj} Y_j^0 + m_{gg} Y_g^0 \right), \text{ with } j \neq g, \quad (5.6)$$

where  $m_{gj}$  is the weight that agent  $g$  puts in the initial position of actor  $j$  and  $m_{gg}$  denotes the weight that he puts in his own initial position. Eq. 5.6 constitutes the theoretical model of our policy process framework which reflects now the policy process as an aggregation mechanism for different policy positions  $Y_i$  according to belief formation in networks and to voting power distributions in parliament  $C_g$ .

Further, the belief formation model enables us to introduce a new concept of political power, the generalized power index. This power index results from combining the model of belief formation with (in)formal political power indices as described in Section 5.2.1. In detail, generalized power summarizes i) the political influence of actors without any original voting power according to their information provision to actors endowed with formal or informal political power and ii) the political influence of actors with original power who give off original power when they rely on information provided by elite members to form their final policy position. The lower the number of actors having access to an information receiver, the higher is the influence of the sender's position on the final position of the receiver. While actors might be able to contact influential players directly, they might also gain indirect access to influential players via policy brokers. Thus, the generalized power of an actor follows from the weight of actor  $j$ 's initial position for agents  $g$ 's final position

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<sup>3</sup>Please note that the belief up-dating in eq. 5.5 is similar, but still differs from the DeGroot model analyzed by Jackson (2005). In particular, our model includes the DeGroot and the Friedkin model as a special case.

$(m_{gj})$  and an agent's original voting power  $C_g$ :

$$C_j = \sum_g m_{gj} C_g. \quad (5.7)$$

**Policy networks and consensus building** Whether communication enables consensus building among actors depends on the embeddedness of actors with clashing beliefs in the communication network and the openness of actors to other opinions, i.e. the level of own control. Firstly, consider that the communication network is a connected component. A connected component says that any two agents are connected to each other by direct or indirect communication ties. Assuming  $\gamma = 0$  our belief formation process would now result in a perfect consensus (Golub and Jackson, 2009). In practice the assumption of the communication network as a connected component cannot be hold easily. Communication is actually structured and restricted, e.g. agents communicate directly only with a small subset of the total population (see Chapter "The Role of Knowledge in the Formation of Political Elite Communication Networks in Malawi: A Bayesian Econometric Approach" in this book). If these subsets of the population have clashing beliefs, communication will not enable consensus building among elite members.

Further, it follows from equation 5.5 that the trust actors put in the beliefs of other actors determines the level of consensus within reach by communication. Assuming  $\gamma > 0$  implies that communication still converges to an equilibrium, but agents will hold heterogeneous policy positions. In our more general model, actors might differ regarding the relative trust they put in their own position and on that of other actors, respectively. For example, different levels of own control might reflect an actors' information level. Poorly informed actors might put more weight in the communicated positions of other actors than experts. Consequently, consensus building is not self-evident in our model but relies upon country specific attributes of the elite communication network.

### 5.3 An empirical application of the framework: The case of Malawi

To analyze participatory policy processes using the proposed framework, data collection must consider several issues. First, the boundaries of the policy network must be consistently specified to guarantee an efficient empirical analysis. Second, to ensure the comparability of actor's policy positions and interests, interviewees must be interviewed with standardized questionnaires where questions allow assigning actors locations in the policy system in that way that metric distances between them can be assessed empirically. Here, we use quantitative survey data collected via face-to-face interviews with Malawi's political elite in 2010.<sup>4</sup> Such a survey is called a policy network study in the following. In general, a network study involves questions about

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<sup>4</sup>The questionnaires are based on a method that was used to identify policy preferences, policy interests and policy networks of relevant actors of the Common Agricultural Policy of the European Union. See for more information Pappi et al. (1995).

policy positions and interests as well as about communication networks. The central theme of the survey used in this analysis is the policy process leading to the approval of the sector investment program "Agricultural Sector Wide Approach" (ASWAp) in April 2010, which is based on the principles of CAADP. Main goals of the program are achieving agricultural growth and poverty reduction through investments in the agricultural sector and harmonization of policy programs. Moreover, the Government of Malawi follows the comprehensive approach of CAADP with inviting local stakeholder organizations to design, monitor and evaluate policies under ASWAp. Thus, beyond political actors and donor organizations, the umbrella organizations of the food security civil society organizations and farmer organizations, CISANET and FUM, respectively, signed the CAADP Compact in April 2010. All questions in the interviews about agricultural policy positions and interests relate to this agricultural policy program, see The Ministry of Agriculture and Food Security, Republic of Malawi (2010), while questions about positions and interests in the state of the world were developed according to information from the Malawi Growth and Development Programme and ASWAp, respectively (Government of Malawi, 2006).

Preparing such a network study will always follow three steps:

Step 1: Identify rules of legislative decision-making

Step 2: Set boundaries of the communication network

Step 3: Define the relevant policy space

The first two steps are linked because step 1 identifies network members with formal or informal political power. Step 2 extends the set of influential agents by important private and civil sector organizations (see Section 5.3.1). Finally, questions about policy positions and interests are designed according to results of step 3 (see Section 5.3.4).

The Section proceeds with a detailed description of the survey and voting power distributions in Malawi.

### **5.3.1 Relevant actors**

For a valid assessment of the policy process, we need to consistently specify the set of actors relevant for policy-making in a country, i.e. the boundaries of the policy network. A policy network is a special case of a social network which is defined as a specific set of linkages among a defined set of actors, while the linkages give information about the social behavior of actors involved (Mitchell, 1969). In case of a policy network, the defined set of actors corresponds to actors with formal political power or vested interests in the policy domain under consideration (see Pappi and Henning, 1998). Note, that we decided to focus on a defined set of organizations and not among individuals because organizations interested in or formally responsible for a specific policy domain instead of individual persons spread and hold information about efficient policy formulation. Hence, we collect data on relevant organizations to identify the boundaries of the policy network and respondents are considered as corporative actors, i.e. experts of their organization for the specific policy field, if

they answer policy network and policy preference questions during the interviews (see Coleman, 1990).

To identify formal influential members of the network, we used the position method. The position method is a quite simple method of desk research that allows identifying organizations with formal political power and organizations that have access to formal powerful actors due to their institutional position. In Malawi, members of the following public bodies will have formal political power or at least access to members endowed with formal political power:

1. the executive,
2. the legislative,
3. local government institutions and
4. public sector agencies.

While the relevance of the executive and the legislative are self-explaining for a democracy, an argument for the relevance of public sector agencies and local government institutions is their linking of the legislative and executive bodies with society. Due to their closeness to society, these groups gain valuable insights on how specific policies translate into policy outcomes. Members of the executive and parliament can profit from this information while designing policy programs. In this context, Sabatier and Jenkins-Smith (1999) already emphasized that a comprehensive analysis of policy processes comprises all levels of government active in policy formulation and administration as done in our empirical concept.

According to our theory, policy analysts who enable politicians to choose political strategies compatible with their goals and who thereby influence policy decisions must also be considered for a comprehensive reflection of policy processes (see also Sabatier and Jenkins-Smith, 1999). Thus, we identified two other key categories of organizations for Malawi: donor organizations and research organizations. As donor organizations support developing countries with budget assistance and political expertise, they are obviously highly important members of the network. Research organizations can assist governments in choosing policy strategies to realize government's preferred state of the world.

To complete the set of relevant actors, we need to identify relevant private and civil sector organizations. Such a simple identification procedure as the position method cannot be applied in this case. Thus, we decided to rely on information on agricultural policy workshop participation and information from an interview round with stakeholders, donors and politicians engaged in the formulation of the Farm Input Subsidy Programme (FISP) in 2010. Based on this information, we include about 60 stakeholder organizations into our set of potential relevant actors. That is our final network of relevant actors in agricultural policy making in Malawi consists of 98 organizations. Finally, this information is used in the interviews, when actors are asked to specify actors with whom they maintain a specific relation. To facilitate orientation and to gain information about the complete network among actors, we created a list of organizations based on the above that is organized by the type of organization or branch of interest represented by the respective organizations, respectively (see Table 5.1).



Table 5.1: Classification of organizations

Category	Group	Subgroup
Political actor	Government (GOV)	President
		Ministries
	Public Sector (PUB)	Public Sector Agencies
		Local Government
Legislative (LEG)	Parties	Parliamentary committees
		International
		National
Donor	Donor (DON)	International
Research organization	Research (RES)	International
		National
Interest group	Agricultural Industry and Trade (AGIND)	Agricultural Producer Organizations and Cooperatives (FARM)
		Economic governance (ECOGOV)
		Trade Unions and Consumer Organizations (CONSUM)
		Church
		Media

Source: Authors.

### 5.3.2 Sample of interviewed organizations

Starting the network study, we interviewed 6 organizations mentioned as extremely influential by the prior network study or having formal political power. At first, interviewees were asked to nominate all organizations that they think of as being influential in Malawi's agricultural policy process. With these reputation nominations at hand, further organizations were selected to be interviewed, if they were mentioned at least twice. We used this snowball system with increasing number of nominations after each interview round to choose the next interview partners. This mechanism allows interviewing the most important organizations within a relatively short time frame. Furthermore, with the first round of interviews at hand, we tested if influential organizations were missing on our list. Interviewees were always allowed adding names of organizations, if the interviewee judges the organizations as influential for agricultural policy decisions or if the interviewee maintains a question specific relation to the missing organization. As we learned during our interviews, our proposed set of relevant actors represents influential actors in policy-making in Malawi quite well.

Overall, we interviewed 37 organizations. As we decided to interview only those organizations that were highly influential for agricultural policy formulation, i.e. that were identified as influential with our snowball procedure, we did not interview all organizations of the list but a highly relevant subset of actors. Table 5.2 lists all interviewed organizations and their indegree centrality. The indegree centrality is calculated from the reputation network where all interviewees were asked to mention

the most influential players in Malawi and to check them on the provided list. This measure indicates all nominations standardized by possible nominations. Table 5.2 shows that we were able to interview the top-ten of most influential players in Malawi and further highly influential organizations. The top ten of interviewed actors with outstanding reputation makes intuitively sense. Donors providing budget support and being involved in financing agricultural policy programs are named. Further, leading ministries are judged as being influential. And finally, organizations representing farmers and especially smallholder farmers have high reputation. Hence, our sample of interviewed organizations reflects all governmental and non-governmental actors that will strongly influence final agricultural policy decisions.

Table 5.2: Overview about interviewed organizations

Organization	Type	IDC	Organization	Type	IDC	Organization	Type	IDC
MoAFS	GOV	1.00	STAM	IG	0.61	CAMA	IG	0.52
EU	DON	0.85	GTA	IG	0.61	OPC	GOV	0.48
DFID	DON	0.82	NORAD	DON	0.58	MoDPC	GOV	0.45
WB	DON	0.82	CISANET	IG	0.58	SFFRFM	PUB	0.45
BC	RES	0.82	IMF	DON	0.55	ECAMA	IG	0.39
MoF	GOV	0.79	FW	IG	0.55	MCC	IG	0.39
FUM	IG	0.79	MEJN	IG	0.55	ELDS	IG	0.36
USAID	DON	0.73	CADECOM	IG	0.55	MCP	LEG	0.33
NASFAM	IG	0.73	DADO	PUB	0.52	ILO	IG	0.33
DPP	LEG	0.70	MUB	IG	0.52	LU	PUB	0.30
MoIWD	GOV	0.67	TAM	IG	0.52	RB	PUB	0.27
ADD	PUB	0.67	TAMA	IG	0.52	RAB	IG	0.27
Irish Aid	DON	0.67						

Notes: GOV: Government, IG: Civil society or private sector organization, PUB: Public sector agency or local government organization, LEG: Political party, DON: Donor organization, RES: Research organization. Source: Calculated by authors from own data.

### 5.3.3 Policy networks and own control

Since policy networks are the centerpiece of the belief formation model, the study also collects data about different networks among actors: i) Reputation, ii) Monitoring, iii) Expert information, iv) Social relations and v) Membership in Organizations. To collect the complete network among actors, we designed our network questions in a form that we found extremely helpful in earlier network studies (see Pappi and Henning, 1999). That is interviewees were asked to check those organizations with which they maintain a specific relation on a list compiled in advance and handed out to the interviewee (see Section 5.3.1). In this empirical analysis, we use data from the question about the demand and supply of expert information on agricultural policies, as the network about expert information on agricultural policy is essential to model participatory policy processes according to our framework. Expert information is not necessarily available in public but circulates among persons interested in or working in the specific policy field. Further expert information on

how policy instruments relate to policy goals is a valuable resource to influence beliefs.<sup>5</sup> In detail, interviewees will check those organizations on our prepared list of relevant organizations with which they share information about the consequences of agricultural policies. Such kind of expert information is, for instance, the knowledge of the effects of farm input subsidies on the welfare of different social groups.

Regarding eq. 5.5 another key input factor to analyze belief formation processes is the weight, which an actor puts in his own initial position. Here, we used two different types of questions to identify an actor's level of own control. Interest groups were asked to mention their effort spent on mediating members' interest to relevant political actors compared (active lobbying) to their effort spent on providing solely information about new bills or policies to their members (monitoring). Political actors and donors were asked to ascertain to what extent they use externally provided expertise compared to internal expertise of their own organization to formulate policy strategies. An interest group's own control is then defined by his effort put in active lobbying, while the own control of political actors and donors is given by their level of own internal expertise.

#### **5.3.4 Agricultural policy positions and interests**

All questions in the questionnaire about agricultural policy positions ( $Y$ ) and interests ( $X$ ) relate to the three focus areas and the key support services described in ASWAp:

- I. Food security and risk management,
- II. Agri-business and market development,
- III. Sustainable land and water management
- IV. Technology generation and dissemination/Institutional strengthening and capacity building.

Table 5.3 presents the conflicting and common policy preferences within the pillars.<sup>6</sup> The first pillar addresses policies to achieve food security and to manage risks associated with food reserves at the national level. According to the document, this will be achieved by increasing maize productivity, reducing post-harvest losses, diversifying food production and managing risks associated with food reserves at national level. Malnutrition will be reduced by agricultural diversification that for

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<sup>5</sup>The reputation network predominantly helps to identify interview partners during the interview rounds (see Section 5.3.1), while the membership in organizations network is used to explain the formation of expert information networks in the Chapter "The Role of Knowledge in the Formation of Political Elite Communication Networks in Malawi: A Bayesian Econometric Approach". So far, the monitoring network is not used to analyze policy processes, because our theory focuses on participatory policy process as a knowledge transmission mechanism, while monitoring networks reflect information flows regarding policy proposals to be approved soon.

<sup>6</sup>Further, we asked questions about positions and interests in eight dimensions of the state of the world, which we defined according to information from the Malawi Growth and Development Programme (Government of Malawi, 2006). However, data on these questions is not used in the following analysis of participatory policy processes.

Table 5.3: Description of political positions and interests

Pillar	Conflicting preferences	Common preferences	X (Ø)	Y (Ø)	Component	
					1	2
Food security & risk management	production structure	food security	38	4.50	0.519	0.175
Agribusiness & market development	traditional export crops vs. agro-processing	economic growth	29	5.47	0.535	0.218
Land & water management	soil fertility vs. irrigation systems	sustainable resource use	25	5.07	0.648	0.188
Institutional strengthening and capacity building	institutional conditions	efficient implementation of policy programs	23	4.26	0.157	0.941

Source: Calculated by authors from own data

example includes promoting production of vegetables. Therefore conflicts might arise about the right agricultural production structure for reaching food security.

The overall aim of policies summarized under the second pillar is to promote commercial agriculture, agro-processing and agricultural market development. Further, policies under this pillar aim at increasing agriculture-led economic growth and the foreign currency earning potential of the agricultural sector. Actors might differ in their view how to reach this aim. Either they will prefer to support the production of traditional export crops or they will stimulate access to new markets for processed agricultural products.

Within the third pillar policies will focus on the sustainable management of natural resources. Emphasis will be on conservation farming, afforestation, protection of fragile land and catchment areas, and rehabilitation of degraded agricultural land. Activities for water management will focus on water use efficiency and expanding the area under irrigation, e.g. through the Greenbelt Initiative. Actors might put divergent priority on land and water issues, while they prefer the conservation of natural resources for future generations and for a productive agricultural sector.

At least, policies under the fourth pillar or the key support services, respectively, will improve knowledge and information generation and dissemination to allow for efficient policy implementation under the above described three pillars. Here the main question is about the right institutional framework to guarantee an efficient program implementation.

To ensure the comparability of actor's policy positions and interests interviewees were interviewed with standardized questionnaires. With these standardized questionnaires, we are able to assign actors locations in a specific policy system in that way that metric distances between them can be assessed empirically. Like other scholars, we adopted the strategy to confront actors with 7-point ordinal scales of positions that have fixed and meaningful poles of scale anchor. Besides the valid

assessment of policy positions, we also identified the interviewee's interest in a specific policy. Here, we used the distribution of 100 points across the four pillars. We handed out questionnaires to the interviewees and also explained the questions to them. Further, questions were also framed with additional information on the topic of the question. Summary statistics are given in Table 5.3.

For evaluating the impact of a large number of policy instruments on different policy outcomes, actors reduce complexity by summarizing policy instruments into agropolitical strategies  $d$ . To reflect the complexity reduction in policies for ASWAp, we use a principal component analysis (PCA). A principal component analysis extracts a lower number of unobserved, uncorrelated variables from observed, correlated variables. For ASWAp, the analysis predicts that the four pillars can be summarized to two main strategies. Results of the PCA are given in last two columns in Table 5.3. The first component can be labeled as the strategy for designing the agricultural sector structure because all pillars relating to agricultural sector development project positively and relatively high on the first component. Higher values denote that an actor would like to invest in agricultural market development, irrigation and diversification of agricultural production. Regarding the second component, note that the last pillar highly associates with this component. Hence, the second component describes the strategy for implementing agricultural policy programs according to a distinct institutional organization of service deliveries. Higher values will indicate that an actor prefers the current institutional set up over institutional reforms. To model belief formation according to eq. 5.5, we use an actor's position within a specific policy strategy as his initial policy position  $Y_i^0$ .

### 5.3.5 Legislative power distributions

To ascertain the voting power of a political agent, we use the concept of Banzhaf Power indices. Banzhaf Power indices calculate the voting power of an agent by counting all winning coalitions and for each agent all winning coalitions where his vote is critical for winning (Banzhaf, 1965; Coleman, 1971). By defining the threshold of votes to be met for a collective decision and identifying whose vote is compulsory for a final decision, indices can be calculated that reflect different voting power distributions in policy-making. Table 5.4 summarizes the Banzhaf indices for specific voting power games in Malawi. The results from these games are employed in eq. 5.6 and in eq. 5.7 to predict policy decisions due to divergent power distributions and to compute the generalized power index of all actors, respectively. Voting power games were selected according to the constitution of Malawi and qualitative studies on politics in Malawi and in Africa in general. First, we argue in line with Bratton (2007) and van der Walle (2003) for "Big Man presidentialism" in Malawi. In addition to this, the constitution also endows the President with agenda setting power to initiate bills for submission to the National Assembly and especially his cabinet assists him in determining what international agreements are to be concluded or acceded to.<sup>7</sup> Second, we follow Patel and Tostensen (2006) who argue

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<sup>7</sup>Freedomhouse characterizes Malawi as an electoral democracy with a political right score of three and civil liberties score of four in 2011 (Freedom House, 2011). Since 1994 Malawi has a multi-party system and regularly legislative and executive elections. The constitution provides

that the parliament in Malawi plays a secondary role due to the presidential nature of Malawi’s political regime. Consequently, we solely consider political power distributions within the cabinet to reflect policy decision-making, even if the parliament would have formal voting power according to the constitution. Thus, power indices are calculated for four internally enforced power distributions: the principle of departmental responsibility (DPR), presidential authority (PA), committee authority by the President and the Ministry of Agriculture (CPA) and committee authority by the President, the Ministry of Agriculture and the Ministry of Finance (CPAF). The committee scenarios are selected according to a ministry’s vested interests in agricultural policy programs in Malawi and their possible veto power. Veto power might be especially assigned to the Ministry of Finance due to a weak governmental budget. All indices are calculated for the subset of formal influential agents that we were able to interview. Further, we assume for all these games that cabinet needs a simple majority to vote policies through, while agenda setting power lies by a specific institutional body as defined above.

Table 5.4: Banzhaf power indices

	DPR	PA	CPA	CPAF
President	0.1765	0.2941	0.2857	0.2727
MoAFS	0.2941	0.1765	0.2857	0.2727
MoF	0.1765	0.1765	0.1428	0.2727
MoDPC	0.1765	0.1765	0.1428	0.0909
MoIWD	0.1765	0.1765	0.1428	0.0909
$\Sigma$	1	1	1	1

Source: Calculated by authors with IOP 2.0 by Thomas Bräuninger and Thomas König.

## 5.4 The policy process in Malawi: Empirical facts

### 5.4.1 Evaluation of model fitness

To test the accuracy of our framework, we look for evidence that a final policy decision as predicted by our framework corresponds to the effective policy strategy laid down in the policy document. Here, the effective policy decision is extracted from the official policy document published on behalf of the Ministry of Agriculture and Food Security in 2010 (The Ministry of Agriculture and Food Security, Republic of Malawi, 2010). Then, by using the scoring coefficients of the principal component analysis, the decision is mapped into the two-dimensional policy space (see Table 5.3). The effective policy strategy (ASWAp) is thereby described by a value of -1.025 for the agricultural sector development strategy and by a value of 0.548 for the institutional organization strategy. Regarding content, Malawi aims at developing the agricultural traditional export sector, maize self-sufficiency and spending

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for a presidential form of government with a unicameral parliament. The president is directly elected for a five-year term. Since the 2009 election the Democratic Progressive Party which is also the President’s party rules by a clear majority in parliament holding 113 of the 193 seats.

more budget on current agricultural institutions. To compare predicted and effective policy strategies, we use the Euclidean distance between the predicted and the effective strategy as a measure of the forecasting quality of different scenarios. The distance is calculated for each voting power distribution, strategy-wise and for the entire policy decision.<sup>8</sup> Results are given in Table 5.5.

As can be seen from Table 5.5 model fitness depends on the used power distributions and on the specific policy strategy. For the policy process framework (see eq. 5.6), presidential authority (departmental responsibility) power distributions perform better than committee power distributions perform. Reflecting the Ministry of Agriculture (and in case of Malawi also the President) as agenda setter vis-à-vis the cabinet yields by far the best predictions for the final policy decision regarding the agricultural sector development strategy. Nevertheless, the same power distribution performs well, but not best, for the strategy of institutional organization. Here, results based on a the triangle -President, Ministry of Agriculture and Ministry of Finance- as agenda setter vis-à-vis the cabinet comes closest to the effective strategy. Overall, assuming departmental responsibility as political power distribution performs best in predicting the final policy decision.

Table 5.5: Effective and predicted policy strategies

	Szenario	Agr. sector development		Inst. organization		Fitness
		Decision	Deviation	Decision	Deviation	
ASWAp	SQ	-1.025		0.548		
Policy process framework	DPR/PA	-0.959	0.066	0.528	0.020	0.069
	CPA	-1.192	0.167	0.528	0.020	0.168
	CPAF	-1.199	0.174	0.540	0.008	0.174
Legislative bargaining framework	DPR/PA	-1.357	0.331	0.632	0.084	0.342
	CPA	-1.684	0.659	0.658	0.110	0.668
	CPAF	-1.678	0.653	0.665	0.117	0.663

Source: Calculated by authors from own data.

As a second approach to prove the fitness of the policy process framework, we use a reduced version of the framework and compare, results from the reduced framework with results from the policy process framework. The reduced version neglects belief formation in policy networks and thereby the influence of non-governmental actors. That is the reduced version just models results according to the mean voter rule assuming divergent legislative standards of decision-making. We denote this model with legislative bargaining framework (see eq. 5.1). To evaluate the fitness of this framework, we again compare the predicted strategies with the effective policy strategy (see Table 5.5). If there would be a better model fitness without belief formation, communication among actors plays no important role in policy processes. But the high deviations of predicted from effective strategies under the legislative bargaining framework argue for belief formation as an essential feature of the policy process framework. Consequently, the policy process framework performs better in terms of

<sup>8</sup>Note that in 2010 the President was also the head of the Ministry of Agriculture and Food Security in Malawi. Thus results are the same for the power distributions DPR and PA.

overall model fitness for each of the three power distributions than the legislative bargaining framework. With regard to the participation of non-governmental actors in policy formulation, results suggest, that they effectively participated in formulating ASWAp. Modeling the final decisions without them leads to minor predictions of the policy strategy than including their information provision via communication into the model. Thus, next sections give further insights into the nature participatory policy process in Malawi.

#### **5.4.2 Stakeholder participation in policy formulation**

Our central questions in terms of stakeholder participation in policy processes are as follows: i) Do interest groups heavily influence government? That is, is information a valuable resource to gain political power? and ii) Which stakeholder organizations do have significant generalized power to influence legislation? To answer these questions, we use the generalized power index described in eq. 5.7 and the network multipliers described in eq. 5.5 (see Table 5.6).

We start with the first part of Table 5.6, which presents the network multipliers. Multipliers are summarized over the ten groups defined by Table 5.1. However, media organizations are excluded from our analysis because they do not participate directly in policy processes. Table 5.6 can be read row- or column-wise. Reading row-wise, one finds the power of the row actor to influence the column actor's beliefs. And vice versa the values in the columns reflect the weight that the column actor puts on the initial belief of the row actors. Diagonal values are the average weight kept by the specific group on their own initial beliefs. Note, that these values are not equal to the own control of these actors. On contrary, they also consider information exchange among the set of actors within this group. The numbers sum up to 1 for each column. Values given are averages over actors of the specific pair of groups.

Concerning our first question, Table 5.6 depicts three interesting features of the policy process. First, government influences heavily positions of donor organizations as well as of local stakeholder organizations as indicated by high network multipliers in row 1. To form their own beliefs, government relies too a great extent on own information for designing policy programs. Secondly, results suggest that agricultural industry and farmer organizations have a relatively low influence on government's final beliefs. This finding depends on the fact that government retains control over their beliefs by about 80%, even if they have contacts with stakeholder organizations. However, their total weight is slightly above the trust government puts in donor's proposed policy strategies. Third, there is just a negligible tendency that government is influenced by other than agricultural interest groups.



Table 5.6: Network multiplier and generalized political power

a. Network multiplier										
	GOV	PUB	LEG	DON	RES	AGIND	FARM	ECOGOV	CONSUM	CHURCH
GOV	0.818	0.101	0.114	0.112	0.065	0.088	0.087	0.072	0.132	0.067
PUB	0.054	0.694	0.106	0.048	0.091	0.094	0.085	0.124	0.039	0.092
LEG	0.016	0.011	0.734	0.002	0.003	0.004	0.003	0.007	0.003	0.003
DON	0.044	0.070	0.013	0.661	0.109	0.071	0.068	0.044	0.028	0.071
RES	0.008	0.016	0.006	0.034	0.531	0.032	0.039	0.017	0.080	0.146
AGIND	0.021	0.063	0.007	0.073	0.069	0.660	0.056	0.022	0.017	0.027
FARM	0.025	0.026	0.010	0.046	0.058	0.038	0.633	0.157	0.026	0.026
ECOGOV	0.006	0.010	0.006	0.010	0.010	0.005	0.021	0.513	0.092	0.034
CONSUM	0.003	0.001	0.001	0.002	0.017	0.002	0.002	0.020	0.514	0.026
CHURCH	0.004	0.008	0.004	0.012	0.047	0.005	0.006	0.023	0.070	0.508
Total	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
b. Generalized political power										
DPR	0.793	0.059	0.012	0.054	0.010	0.027	0.035	0.005	0.002	0.004
CPA	0.782	0.061	0.010	0.058	0.010	0.030	0.040	0.004	0.002	0.003
CPAF	0.798	0.056	0.008	0.057	0.009	0.028	0.037	0.004	0.001	0.003

Source: Calculated by authors from own data.

Consequently, the answer to our question is twofold. On the one hand, information in the hands of agricultural interest groups is not a valuable resource to gain political influence because government relies on own expertise heavily. On the other hand, we observe an agricultural interest bias in communication, if agricultural policy decisions are on top of the policy agenda. That is agricultural interest groups are better able to convey their information to government than non-governmental actors and donor organizations regarding agricultural policy issues. Nevertheless, network multipliers state that participatory policy processes in Malawi lean towards top-down instead of bottom-up processes.

The multipliers further suggest that agricultural industry organizations have far more influence on beliefs of donor organizations than farmer organizations ( $0.073 > 0.046$ ). This result is somewhat unexpected because international development agencies recently engaged in increasing the capacity of civil society and private sector organizations to actively participate in policy formulation. With this engagement, they aim at solving the collective action problem and increasing the political weight of marginalized groups in the policy process (see OECD, 2005). Thus, we expected a higher weight of smallholder organizations on their final policy position.

To analyze how much generalized power an actor gains from his inclusion into the elite's communication network, we combine the network multipliers with Banzhaf-power indices (see eq. 5.7). The lower part in Table 5.6 presents the average generalized power of each group. Due to their initially high informal voting power and their high own control, government remains the most powerful player. In general, they give off around 20% of their original voting power. However, government passes roughly 7% of their original power to public sectors agencies and the legislative, while they give the remaining 13% to stakeholder and donor organizations. Hence, Public sector agencies and donors are the second and third most powerful groups holding roughly 5-6% of generalized power. Smallholder farmer organizations are placed on the fourth position, followed by representatives of the agricultural industry. Hence, agricultural interest groups have together more power than donor organizations. Consequently, a final policy decision reflects information hold by local stakeholder organizations to a greater extent than information provided by donors. As Patel and Tostensen (2006) have already described, Malawi's parliament is unimportant for policy decisions in our case. Parliament does even not gain significant power over policy decisions due to their embeddedness in the communication network, i.e. due to forming ties with the executive directly or indirectly. In line with their low weight on government's final beliefs, non-agricultural organizations have no significant generalized political power. Overall, generalized political power of groups changes just slightly with internally enforced power distributions applied to calculate final power indices.

### 5.4.3 Communication networks as a means for consensus building

Figure 5.2 graphically depicts the potential of consensus building among elite members via communication. Policy positions of organizations are mapped before and after communication into the two-dimensional policy space via a principal component analysis (see Table 5.3). The arrow head points on actor *i*'s position after

he has updated his beliefs. The arrow tail marks the initial position of actor  $i$ . Overall, arrows point for each dimension predominantly in direction of one policy position. That is communication among actors builds consensus in Malawi, even if actors will not perfectly share the same position. Nevertheless, consider that final decisions always depend on political power distributions among actors. Thus, the final policy decision must not be placed in the centre of elite's policy positions after communication.

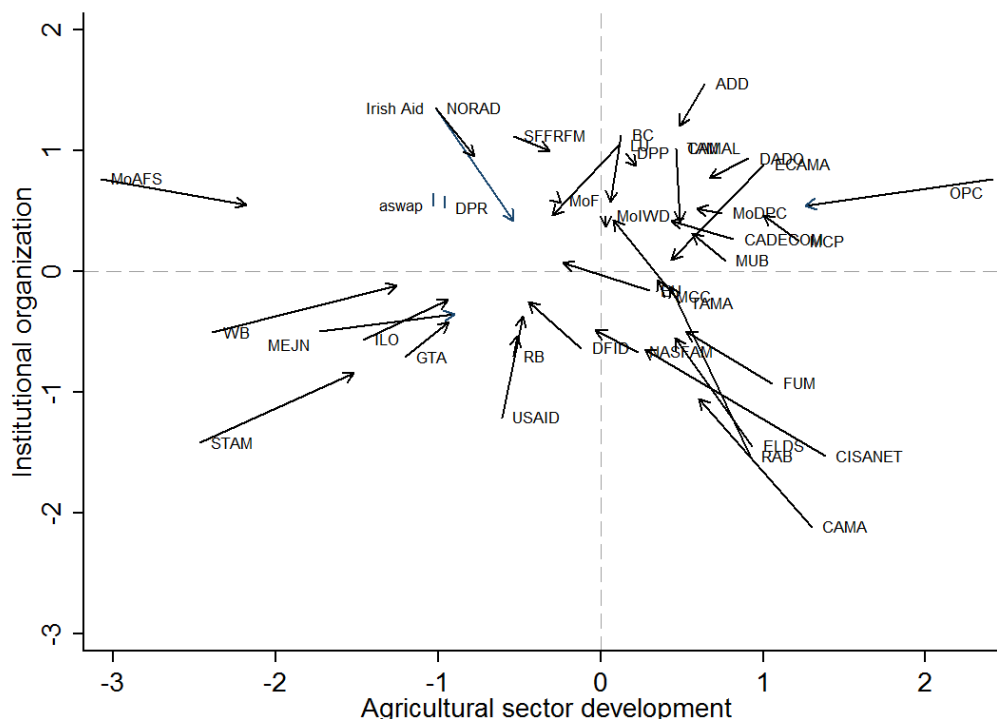


Figure 5.2: Consensus building about agro-political strategies  
Source: Calculated by authors from own data.

To support the graphical representation of consensus building in Malawi, we compute the direction of belief updating for each actor  $i$  for each policy strategy  $d$ :

$$DIR_{di} = (Y_{di}^* - Y_{di}^0) \cdot Y_{di}^0, \quad (5.8)$$

with  $Y_{di}^*$  denoting an actor's position after belief updating and  $Y_{di}^0$  an actor's initial position. A negative figure for the majority of actors indicates that policy positions converge to a common point after belief formation. Consider that a negative figure results in two cases: i)  $Y_{di}^0 > 0$  and  $Y_{di}^* > Y_{di}^0$ , or ii)  $Y_{di}^0 < 0$  and  $Y_{di}^* < Y_{di}^0$ . That is the difference in final policy positions between an actor  $i$  and actor  $j$  declines with communication, even if their initial positions are heterogeneous. Given that 84% (86%) of the calculated belief formation directions are negative for the agricultural development strategy (institutional organization strategy), policy positions converge towards a common point after communication. Thus, we can summarize for both dimensions that communication among actors builds consensus about agricultural policies. The convergence of policy positions is not presupposed by our model. On contrary, the convergence indicates that the network connects elite members with

diverging initial positions and that they are open to use information provided by other elite members to update their beliefs.

## **5.5 Conclusion**

This paper proposes a framework to analyze and evaluate participatory policy processes. The framework combines policy networks, which permit policy belief formation among members of a country's political elite, with a cooperative legislative decision-making model. While the belief formation part builds on work by Friedkin and Johnsen (1990), Friedkin and Johnsen (1997) and Pappi et al. (1995), the legislative decision-making part uses the mean-voter rule by Henning (2000). The combination of both strands of theories enables us to consider the influence stakeholder organization on final policy decision while still modeling legislative bargaining among political agents. In contrast to other social influence models, we make no prior assumptions about the weight that actors place on beliefs of others in our belief formation module but ascertain their own control empirically. Hence, our model is flexible in capturing an actor specific policy belief formation process. In summary, the framework reflects the policy process as a country-specific mechanism aggregating policy preferences of divergent actors to a distinct final policy decision, even if some of the actors with vested interests in the specific policy domain are not endowed with formal political power by constitution.

To apply the framework empirically, qualitative studies of country-specific policy processes and a country's constitution inform the legislative decision-making module about informal and formal voting power distributions among political agents. Qualitative studies about policy processes in Africa are, for instance, Bratton (2007) and van der Walle (2003), and in case of Malawi also Patel and Tostensen (2006). Further, the empirical application requires collecting policy positions and networks via a quantitative network study. Here, we use data from a network study conducted in Malawi in 2010. The central theme of the study was the policy process leading to the approval of the sector investment program "Agricultural Sector Wide Approach" (ASWAp) in April 2010, which is based on the principles of CAADP (The Ministry of Agriculture and Food Security, Republic of Malawi, 2010).

For testing the framework's ability to reflect policy processes, the policy prediction by the framework is compared to the effective policy decision made by actors in Malawi. The comparison shows that our theoretical framework is capable of reproducing the policy process that has led to the adoption of an agricultural policy program in line with CAADP principles. Further, results reveal that modeling belief formation processes is essential to understand effective policy processes. We also use the framework in order to evaluate the nature of the participatory policy process. Two major points of the empirical analysis are worth noting.

First, the policy network structure in Malawi facilitates consensus building on agricultural policy issues. Such consensus building might raise ownership of policy programs by local stakeholder organizations, which is indeed a goal pursued by donors via promoting participatory policy processes. Nevertheless, network multipliers imply that processes are dominated by government influencing local stakeholders and not vice versa as suggested by advocates of these processes. That is the policy

process still resembles a top-down instead of a bottom-up process in Malawi. As we have no information about interest groups' true level of knowledge about policy impacts, government's information gathering routines might be efficient for choosing and implementing welfare increasing policies. However, in terms of giving the marginalized groups a voice, higher network multipliers for these groups would be preferred.

Second, donors will not just impose their own idea about efficient development programs on government and local stakeholders, but will trust information provided by government and agricultural interest group to form their policy positions. According to the network multipliers, they further seem to act as policy brokers for agricultural industry organizations. This finding is unexpected with regard to the engagement of international development agencies to give marginalized groups a voice. Finally, results show that donors have less influence than public sector agencies and agricultural interest groups in total on agricultural policy decisions.

Even though providing a theoretically founded framework to analyze participatory policy processes in detail, the framework does not allow deriving conclusions about the efficiency of participatory processes in terms of choosing efficient, welfare increasing development strategies. Thus, the evaluation of Malawi's policy processes with regard to this topic is left for future research (see Chapter "Assessing political performance gaps: Application of an evolutionary CGPE-approach to CAADP in Malawi" in this Book). However, given the knowledge about pro-poor growth policy strategies, researchers can use the proposed framework to simulate a policy process that would allow governments to implement a research-based pro-poor growth policy strategy.

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## 5.A Appendix

Table 5.7: Organizations in Malawi: Acronym, type and name

Acronym	Type	Name
MoF	GOV	Ministry of Finance
MoAFS	GOV	Ministry of Agriculture and Food Security
MoIWD	GOV	Ministry of Irrigation and Water Development
MoDPC	GOV	Ministry of Development Planning and Cooperation
RB	PUB	Reserve Bank
OPC	GOV	Office of the President and the Cabinet
SFFRFM	PUB	Smallholder Farmers Fertilizer Revolving Fund
LU	PUB	Logistics Unit
DPP	LEG	Democratic Progressive Party
MCP	LEG	Malawi Congress Party
ADD	PUB	Agricultural Development Divisions
DADO	PUB	District Agricultural Development Offices
DFID	DON	Department for International Development UK
Irish Aid	DON	Irish Aid
NORAD	DON	Norwegian Agency for Development Cooperation
USAID	DON	USAID
EU	DON	EU
IMF	DON	International Monetary Fund
WB	DON	World Bank
BC	RES	Bunda College
FW	IG	Farmer's World
ILO	IG	Ilovo Sugar
RAB	IG	Rab Processors
STAM	IG	Seed Trade Association of Malawi
MUB	IG	Mulli Bros.
GTA	IG	Grain Trader Association
FUM	IG	Farmers Union Malawi
NASFAM	IG	National Smallholder Farmers' Association of Malawi
CISANET	IG	CISANET
TAM	IG	Tea Association of Malawi
TAMA	IG	Tobacco Association Malawi
MEJN	IG	Malawi Economic Justice Network
ECAMA	IG	Economics Association of Malawi
CAMA	IG	Consumers Association of Malawi
MCC	IG	Malawi Council of Churches
ELDS	IG	Evangelical Lutheran Development
CADECOM	IG	Catholic Development Commission

Source: Authors.



## Chapter 6

# The Role of Knowledge in the Formation of Political Elite Communication Networks in Malawi: A Bayesian Econometric Approach

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Accepted for publication as book chapter in "Modeling and Evaluation of CAADP-Policies: Theory, Methods and Applications", Ousmane Badiane and Christian H.C.A. Henning (Editors)

### Abstract

With this paper, we present an approach to empirically analyze determinants of elite communication networks. We use an advanced binary regression framework, which can deal with missing values inevitably occurring within survey data. Estimation of model parameters is thereby done in a Bayesian framework using MCMC techniques. In fact, results from such a model enable us to evaluate participatory policy processes by explicitly deriving insights into their information/distortion nature. Empirical results from an application of our model to survey data collected in Malawi suggest that the structural embeddedness of organizations into the network mainly determines the formation of elite communication ties, while knowledge is an important but not leading determinant of communication. We find no significance of homophily in policy interests and summarize thereby that, in the case of Malawi, participatory policy processes do not distort policy decisions in favor of special interests.

*Keywords:* policy networks; political homophily; distortion-information tradeoff; Bayesian network estimation

## 6.1 Introduction

Lobbying is commonly recognized as a public mechanism to induce policy makers to follow the interests of well-organized groups. Thereby lobbying is criticized as distorting policies with respect to the favor of specific interests at the expense of society. Nevertheless, such political influence activities can be also understood as a mechanism by which interests groups signal their policy preferences. That is lobbying conveys socially valuable information about the consequences of policies from society to political agents. If better-informed political agents now choose social welfare increasing policies, the strategic information provision through lobbying can be expected to outweigh the negative distortionary effects (see Ball (1995) and literature cited therein). Such arguments for informational benefits of lobbying are also in line with the so-called *wisdom of the crowd effect*. *Wisdom of the crowd* describes the idea that a group of relatively uninformed individuals would collectively have much more knowledge than any single member of a group has, see Galton (1907)). Such a situation would allow choosing better policies if the individual information is spread via communication in elite networks and attained by political agents.

The major factor determining whether the informational benefits in fact outweigh the distortionary costs is the structure of the political elite's communication network. An important issue here is the tradeoff between efficient policy learning of decision-makers and a potential policy bias inducing negative effects on overall economic performance. Political agents learn efficiently about the impacts of policy decisions on the economic system if they choose communication partners similar in political interests to themselves. Festinger (1954) still argued that similar others offer relevant information and that thereby similarity in interests is a well-known determinant of, for instance, friendship. In terms of policy learning, communication ties with organizations that have similar interests to oneself reduce biased information signals and allow for an individually efficient communication process. However, such individually rational information gathering routines clash obviously with gathering routines that reduce policy distortion in favor of a specific interest group.

With this study, we provide an empirical analysis to shed light on the determinants of information gathering routines within a country's political elite, i.e. of local stakeholders, donors and politicians. Such insights are valuable information for designing participatory policy processes and for increasing knowledge based policy formulation. In addition to this, results would reveal the nature of participatory policy processes in terms of increasing special-interest bias in policies or transmitting valuable information on policy impacts to political decision-makers. At the methodological level, a sound empirical assessment of participatory policy processes calls for sophisticated econometric models to estimate determinants of communication networks efficiently. Further, empirical analysis requires quantitative survey data collected via face-to-face interviews with a country's political elite. Such surveys involve questions about policy positions and interests as well as about communication networks. Here, we analyze data collected within a series of face-to-face interviews in Malawi. The central theme of the survey is the policy process leading to the approval of the sector investment program "Agricultural Sector Wide Approach" (ASWAp) in April 2010, which is based on the principles of the Comprehensive Africa Agri-

culture Development Programme (CAADP) (The Ministry of Agriculture and Food Security, Republic of Malawi, 2010).

Since data collected via face-to-face interviews is almost inevitably subject to item and unit non-response despite the highest efforts in fieldwork, we suggest an advanced probit framework for analyzing elite network generating processes based on policy network data. In fact, our estimation strategy overcomes the above-mentioned data features by an adaptation of the Bayesian estimation scheme for binary probit models based on Markov Chain Monte Carlo (MCMC) methodology, namely Gibbs sampling, as suggested by Albert and Chib (1993). Based on a sample from the posterior distribution of the model parameters obtained via iterative sequential sampling from the full conditional distributions, parameter estimates are given as sample moments. This estimation technique is well suited to deal with missing values in explaining factors and missing values within the dependent network relationship using the device of data augmentation proposed by Tanner and Wong (1987). The vector of model parameters subject to posterior inference is augmented to include also the missing values of explaining variables and missing network relationships, where draws for the missing values within explaining factors are then obtained via sequential regression trees providing non parametric approximations of the underlying full conditional distributions, Burgette and Reiter (see 2010). The proposed modeling thereby accounts for the uncertainty within parameter estimation due to missing values, as discussed in Butts (2003). A model fitness criterion is provided to allow for gauging the predictive capability of the suggested empirical framework and for model comparison.

Determinants of political communication can be summarized according to two main strands of literature -the preference driven models and the structure driven models. First given the results of signaling games between interest groups and politicians, we consider knowledge as a driving force of network development. Further, as information provided by an interest group is seldom sincere but biased in favor of a group's interests, we introduce political homophily as another determinant of communication ties (see for example Austen-Smith, 1993; Ball, 1995; Lohmann, 1993). With regard to structural approaches, we suggest three factors that determine tie formation between a pair of organizations. These factors describe meeting opportunities among organizations and an organization's perceived political power (see Knoke, 1990; Knoke et al., 1996; Moody, 2001). We include the determinants as dyad specific characteristics into our econometric model, i.e., sender and receiver specific individual variables are transformed into pair-wise distances. In addition, the individual determinants enter the model as sender and receiver specific variables.

Empirical results suggest structural embeddedness and political influence as important determinants of the probability to observe a tie between a pair of organizations, while knowledge is an important but not leading determinant of communication. In terms of designing a political communication process, the results suggest umbrella organizations as an opening key for communication.

The paper proceeds as follows. Determinants of political communication and corresponding empirical data are reviewed in Section 6.2. Section 6.3 introduces the estimation strategy and the approach to model comparison. Section 6.4 provides the empirical results and Section 6.5 concludes.

## 6.2 Determinants of political communication networks

This section reviews determinants of elite communication structures from the literature about political influence of interest groups or social network formation, respectively. With regard to the econometric specification, we provide a description of variables used to assess determinants of communication empirically. Overall, we are interested in analyzing to what extent political homophily, knowledge and structural factors determine communication among elite members.

### 6.2.1 Theoretical considerations

As we observe that actors communicate directly only with a small subset of the elite, we propose three main categories of determinants of political communication: 1. Knowledge, 2. Political homophily and 3. Structural factors (see Figure 6.1).

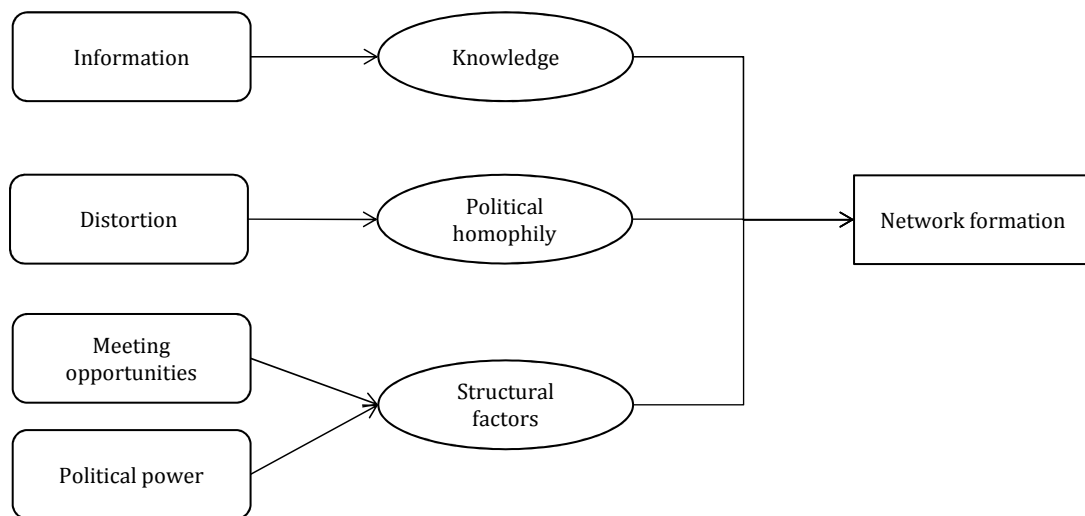


Figure 6.1: Determinants of network formation  
Source: Authors

Regarding the first two categories, it is important to consider the main attributes of lobbying. Several papers argue for the informational role of lobbying based on theoretical derivations from signaling games (see for example Austen-Smith, 1993; Ball, 1995; Lohmann, 1993). They emphasize that politicians were better able to choose efficient policies if they are being lobbied. Thus, it is rational for political agents with minor knowledge about the impacts of policy decisions on the state of the world to contact non-governmental organizations and especially those with high expertise in the specific policy.

Furthermore, it is well recognized that lobbying is always biased in favor of special interests. On the one hand, this leads at the policy outcome level to policy distortions at the expense of the public interest. On the other hand, the bias component of influence activities determines actor's individual information gathering routines. Therefore, we introduce the political homophily as driving factor of network formation. Political homophily leans on homophily used in social network research.

Generally homophily describes the fact that similarity between two actors increases their likeliness to interact. Here, political homophily means that a pair of organizations prefers the same state of the world, i.e. they are similar in policy interests, which increases their probability to communicate. The reason behind political homophily as determinant of political communication networks relates to the view that actors always communicate policy positions biased according to their policy interests. Thus, receiving information from actors similar in interests to oneself would lower the likelihood of receiving information that does not match own interests in the state of the world. That is political homophily as a determinant of political communication lowers the likelihood of biased signals for the receiver of information but increases the bias of communication in the overall network.

Concerning factors driving political homophily, for instance, in Malawi, official policy documents provide the basis to extract these factors. We identify policy concerns, which affect the formulation of major policy programs in a country recently passed through the legislative process. For the case of Malawi, consider the Malawi Growth and Development Strategy (MGDS) and the ASWAp as important policy programs (Government of Malawi, 2006; NEPAD, 2010). Table 6.1 describes which policy interests evolve in society that drive political behavior according to this two policy documents. Interests are listed in descending order of average interest over interviewed organizations. Overall, interests in food security, poverty reduction, economic growth and environmental sustainability may drive political homophily. Further Table 6.1 lists common interests and conflicting positions that occur within one specific dimension of the state of the world. While common interests will drive political homophily and thereby communication, conflicting positions increase the potential of policy deadlocks but allow also for policy learning. Consider for example the welfare of smallholders. Actors might be equally interested in reducing hunger and malnutrition but have different experiences and information about the political strategy to reach their common aim. One actor might favor input subsidies to increase maize yields, the other one might consider budget spending on extension services as a more efficient policy strategy. Information exchange between these two actors can help to choose the strategy that fit best their common interests. On the contrary to the behavioral theories, structural approaches argue that an actor's meeting opportunities and political influence determine his tie formation. Consider overlapping membership in organizations, i.e. structural embeddedness, political influence and human resources as structural determinants of communication choices. Theoretical arguments for overlapping membership in organizations as determinant are twofold. On the one hand, we lean on Moody (2001) who points out that meeting opportunity determines the formation of friendship in school. Transferring this idea to political communication, membership in umbrella organizations or common membership in organizations, respectively, as indicator for meeting opportunities increases the probability that a pair of organizations forms a communication tie. Umbrella organizations in Malawi are, for instance, the Malawi Economic Justice Network (MEJN) or the Civil Society Agriculture Network (CISANET), respectively. On the other hand, a common view on states of world might determine the membership in (umbrella) organizations and thereby increase the trust an organization puts on the information of another organization, which is member of the same orga-

Table 6.1: Description of preferences: state of the world

State of the world	Common interests	Conflicting positions	$\emptyset$ interest
Welfare of smallholders	reduce hunger and malnutrition	political market interventions	21
Poverty reduction	poverty reduction	achievable poverty level (short-term)	18
Welfare: agr. export sector	foreign currency earnings	political market intervention	14
Budget	development of the agricultural sector	share of agr. budget in total budget	13
Environmental sustainability	conservation of natural resources	budget priority of environmental sustainability	12
Gender issues	lessen the vulnerability of the poor	gender specific policy programs	10
Welfare: non-agr. industry	economic growth	political market intervention	6
Welfare: urban consumers	food provision to urban population	level of food prices	5

Source: The Ministry of Agriculture and Food Security, Republic of Malawi (2010), Government of Malawi (2006), own data.

nizations as herself. That is an organization will seek for information from another organization if a third organization links them both (see Holland and Leinhardt, 1971).<sup>1</sup>

Another important determinant is an actor's power to influence legislation (Knoke, 1990; Knoke et al., 1996). Given the purpose of lobbying as interest mediation mechanism, actors contact highly influential players within the political elite in order to ensure inclusion of their policy positions in final policy decisions. We thereby expect that the higher the receiver's perceived influence in a specific policy domain the more likely actors contact the receiver. We choose perceived influence and not formal political power because of two main arguments. First, we argue in line with Shepsle & Weingast that formal institutional rules cannot explain observed power distributions. In this context consider also the work of Bratton (2007) who argues that the rule of law is often weakly developed even if it is not completely absent in developing countries. Political power is intensely concentrated around the president which leads to an increase in power of his cabinet (van der Walle, 2003). Further, considering just formal political power would dismiss the informal influence of international organizations in developing countries. Second, as formal political power will be highly correlated with perceived influence for actors endowed with formal power, employing the concept of perceived influence has the advantage to

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<sup>1</sup>However the informational efficiency models contradicts the idea that a common link to third parties increases the likeliness of information exchange among a pair of organizations. On contrary this model states that organizations will drop ties to organizations with whom they are linked by a third party due to information redundancies (Carpenter et al., 2004).

reflect informal and formal political power distributions with one measure at the same time.

Finally, consider staff and thereby time as a scarce resource of an organization that can be spend to maintain relationships. Given the time-consuming nature of serious communication relationships, the number of staff therefore determines contact opportunities between a pair of organizations.

### 6.2.2 Empirical determinants of communication

According to our theoretical considerations, our set of empirical variables is differentiated into three classes: i) variables describing political homophily, ii) indicator variables of individual knowledge, and iii) variables related to structural factors. For further information on the study that collected data for these variables, see Section 6.3.1.

**Political homophily.** We approximate political homophily by a distance index of political interests (distance). Such an index provides dyad specific information on the probability to observe communication between elite members due to similarity in policy interests. The index summarizes the distances in interest between two actors concerning the preferred dimension of the state of the world. We selected eight dimensions for representing the state of the world that actors address with designing agricultural policy programs (see Table 6.1). The index is calculated as a Euclidean distance function based on actor's  $i$  and actor's  $j$  policy interests  $X$  in dimension  $z$  with  $z$ :

$$distance_{ij} = \sum_{z=1}^Z (X_i^{(z)} - X_j^{(z)})^2. \quad (6.1)$$

**Knowledge.** Our strategy to identify an organization's level of knowledge is twofold. First, as knowledge is hardly observable, we use the age of the organization (*age*) and the organization's degree of specialization in agriculture (*specialization*) to approximate political knowledge. In our setting age equals 2000 - *year of foundation*. *Specialization* relates to an organization's effort spent on agricultural issues.

Second, we use an alternative indicator that directly measures the technological knowledge of actors regarding the transformation of CAADP policies into policy outcomes based on a Computable General Equilibrium model (CGE). In particular, Henning et al. (2012) models the impact of different CAADP policies on the eight relevant policy concerns  $Z1, \dots, Z8$  within an extended CGE approach calibrated for Malawi. Based on this CGE approach, Henning et al. (2012) identified further the optimal CAADP policy positions from the viewpoint of different governmental and non-governmental organizations by maximizing the organizations' political support functions with respect to the technical translation of CAADP policies into policy concerns as defined by the extended CGE. Comparing these theoretically derived optimal policy positions with the policy positions organizations state in our interviews implies a measure of an organizations' political knowledge. In particular, Henning et al. (2012) calculated the Euclidean difference between the theoretically calculated and empirically stated policy position. We use this measure as a direct indicator of

the political knowledge of an organization (*expertise*) in our econometric analysis. In our sample, the Tobacco Association of Malawi (TAMA) is the best-informed organizations, while the Ministry of Agriculture and Food Security has the lowest level of knowledge about policy impacts according to our indicator.

**Structural factors.** As the perception of an organization as influential in policy-making will influence his probability to form ties, we use information from a reputation network in order to identify the political reputation (*reputation*) for each organization. This variable will further proxy the influence of an organization's legislative power. To account for the meeting opportunities between two organizations, we include the number of staff working on agricultural policy issues (*staff*) in our analysis. Based on information about organizational membership a dyad specific variable can be calculated that indicates how often two organizations were member of the same organization (*same*).

## 6.3 Study design and econometric model framework

### 6.3.1 Study design

To derive insights into communication structures, we collected networks, policy positions, policy interests and characteristics of organizations via face-to-face interviews in Malawi in 2010. We decided to focus on networks among organizations and not among individuals, because organizations interested in the specific policy domain instead of individual persons spread and hold mainly information about efficient policy design. That is respondents are considered as corporative actors, i.e. experts of their organization for the specific policy field, if they answered policy network and policy preference questions during the interviews (see Coleman, 1990) Table 6.2 lists all interviewed organizations and their indegree centrality. The indegree centrality (IDC) is calculated based on a reputation network question that asks all interviewees to mention the most influential players in Malawi's agricultural policy domain (detailed information on the questionnaire is given below). This measure summarizes all nominations standardized by possible nominations and is denoted by *reputation* in further empirical analysis. Overall, our sample represents the top ten of most influential players in Malawi and less but still influential organizations. To ensure the comparability of answers interviewees were interviewed with standardized questionnaires. The questionnaires consist of three parts: a) Policy network questions, in which organizational network data was collected, b) Policy preferences, where interviewees stated their policy interests and positions and c) Technical data that describe organizational characteristics, e.g. year of foundation. The organizational network questions were asked with a method that we have found especially helpful in earlier network studies (Pappi and Henning, 1999). That is interviewees were asked to check organizations on a list of relevant organizations with which they maintain a specific relation. Regarding this study, the relations were about the demand and supply of expert information on agricultural policies. Thus, interviewees were asked to check organizations on a list, which we compiled in advance, with whom they share information about the consequences of agricultural policies. Such



Table 6.2: Overview about the interviewed organizations

Organization	Type	IDC	Organization	Type	IDC	Organization	Type	IDC
MoAFS	GOV	1.00	STAM	IG	0.61	CAMA	IG	0.52
EU	DON	0.85	GTA	IG	0.61	OPC	GOV	0.48
DFID	DON	0.82	NORAD	DON	0.58	MoDPC	GOV	0.45
WB	DON	0.82	CISANET	IG	0.58	SFFRFM	PUB	0.45
BC	RES	0.82	IMF	DON	0.55	ECAMA	IG	0.39
MoF	GOV	0.79	FW	IG	0.55	MCC	IG	0.39
FUM	IG	0.79	MEJN	IG	0.55	ELDS	IG	0.36
USAID	DON	0.73	CADECOM	IG	0.55	MCP	LEG	0.33
NASFAM	IG	0.73	DADO	PUB	0.52	ILO	IG	0.33
DPP	LEG	0.70	MUB	IG	0.52	LU	PUB	0.30
MoIWD	GOV	0.67	TAM	IG	0.52	RB	PUB	0.27
ADD	PUB	0.67	TAMA	IG	0.52	RAB	IG	0.27
Irish Aid	DON	0.67						

Notes: GOV: Government, IG: Civil society or private sector organization, PUB: Public sector agency or local government organization, LEG: Political party, DON: Donor organizations, RES: Research organizations. Source: Calculated by authors from own data.

kind of expert information is, for instance, the knowledge of the effects of different policy instruments on the welfare of different social groups. This expert information can be very interesting for political organizations as well as for interest groups of the sector to choose efficient policies or to learn about policy impacts in order to change own policy positions. The list of organizations that we handed out to the interviewee is compiled with help of the position method and information on policy workshop participation. The latter strategy is especially useful to identify relevant private and civil sector organizations. The position method is a quite simple method of desk research that allows identifying organizations with formal political power. To simplify orientation, the list is organized by the formal type of organization for political organizations and the branch of interest represented by a specific interest group. Overall, the list contains 98 organizations for Malawi (for further information on study design see also the Chapter "A network based approach to evaluate participatory policy processes: An application to CAADP in Malawi" in this book).

All questions of part b) relate to documents published during the formulation of the ASWAp program in Malawi or rely on information from official policy documents, respectively (see e.g. NEPAD, 2010). In general, questions can be classified into two categories: questions about policy concerns and questions about policy programs. As political homophily (*distance*) relates to organizations' interests in specific policy concerns, we use in this study interview data from the questions about policy concerns and especially the question about the interest,  $X_i^{(z)}$ , in the eight policy concerns, which together describe an organization's preferred state of the world. Interests are ascertained by distributing 100 points across the eight dimensions of the state of world. For more information on these dimensions see Table 6.1. Information on data used to calculate expertise is given by Henning et al. (2012) in this

book. Questions about policy programs are described in more detail in Chapter "A network based approach to evaluate participatory policy processes: An application to CAADP in Malawi" in this book.

Part c) asks questions about organizational attributes that inform about an organization's degree of specialization in agriculture (*specialization*), the year of foundation to calculate age and number of staff engaged in agricultural issues (*staff*). Further, we asked organizations to name all organizations of which they are a member. With this information at hand, we calculate the dyad-specific variable *same*, which informs about overlapping membership in organizations between a pair of organizations. The mean of this variable reveals that two organizations in Malawi are on average jointly member of 1.3 organizations.

Summary statistics for all exogenous variables under consideration are provided in Table 6.3.

Table 6.3: Summary statistics

Variable	Description	Mean	Std. dev.
<i>specialization</i>	specialization in agriculture	0.652	0305
<i>age</i>	age of organization	26.027	20.288
<i>staff</i>	number of staff	19.625	34.753
<i>reputation</i>	indegree centrality	0.573	0.179
<i>same</i>	overlapping membership in organizations	1.267	0.708
<i>distance</i>	political homophily	0.314	0.146
<i>expertise</i>	political knowledge	0.641	0.177

Source: Calculated by authors from own data.

### 6.3.2 Econometric model

We setup an empirical model capturing key elements of the communication process between local elite members related to individual characteristics influencing the formation probability of a network tie. Individual characteristics are considered as important network determinants in terms of prevailing homophily of network agents. For analyzing the process which establishes communication ties  $\delta_{ji}$  or  $\delta_{ij}$  between local elite members  $i = 1, \dots, n$  and  $j = 1, \dots, n$  with  $i \neq j$  for the considered directed dichotomous network relationships, determinants of communication relationships are assessed within a probit framework, i.e.  $\delta_{ij} = 1$ , if  $\delta_{ij}^* > 0$  and  $\delta_{ij} = 0$  else. Following Hoff and Ward (2004), the latent variable  $\delta_{ij}^*$  relating determinants of communication with the observed network tie  $\delta_{ij}$  is thereby parameterized as

$$\delta_{ij}^* = W_{ij}\beta + W_i\kappa_s + W_i\kappa_r + h_{ij} + e_{ij} = Q_{ij}\theta + e_{ij}, \quad (6.2)$$

where  $W_{ij}$  is a set of dyad specific variables,  $W_i$  denotes a set of sender specific characteristics for individual  $i$ ,  $W_j$  is a set of receiver specific characteristics for individual  $j$  and  $\theta = \{\beta, \kappa_s, \kappa_r, \gamma\}$  summarizes all model parameters.  $h_{ij}$  is assumed to capture distance effects and thus homophily and is hence parameterized in such

a way to allow the aggregation of individual specific characteristics to the dyadic level, i.e.

$$h_{ij} = \sum_{k=1}^K \gamma^{(k)} |W_i^{(k)} - W_j^{(k)}|. \quad (6.3)$$

Using a probit link, which corresponds to the assumption of a standard normal distribution for the latent error, i.e.  $e_{ij} \sim N(0, 1)$ , allows for establishing a Bayesian estimation routine facilitated by Markov Chain Monte Carlo (MCMC) techniques. Parameter inference within a Bayesian setup is performed based on the posterior distribution given as

$$p(\theta|data) = L(data|\theta)\pi(\theta), \quad (6.4)$$

where  $L(data|\theta)$  denotes the model likelihood and  $\pi(\theta)$  the assumed prior distribution of model parameters. Parameter inference is based on moments and quantiles of the posterior distribution. These are obtained on the basis of sample trajectories drawn from the posterior distribution. Sampling of parameters from their joint posterior distribution is achieved via iterative sampling from the full conditional distributions. The model likelihood is then given as

$$L(data|\theta) \propto \prod_{i \neq j} \Phi((2\delta_{ij} - 1)(Q_{ij}\theta)), \quad (6.5)$$

Where  $\Phi(\cdot)$  denotes the cumulative standard normal distribution function. Given the above model structure, we adapt conjugate priors for all model parameters, i.e. a multivariate normal prior for parameter vector  $\beta$  with the corresponding mean set to zero and variance set to 100. More details on Bayesian estimation via Gibbs sampling for this kind of models are given in Aßmann and Boysen-Hogrefe (2011) Next to parameter estimates, interpretation of results is provided by calculation of marginal effects, where the corresponding uncertainty is directly accessible by means of the Gibbs output, see Aßmann and Boysen-Hogrefe (2011) for a more general discussion.

In addition, the use of Bayesian estimation allows a conceptually straightforward treatment of missing values within both, the observed network relationship and the explaining variables. As empirical network data is most often based on personal interviews and survey data, missing values occur despite tremendous effort in fieldwork and questionnaire design. Missing values are especially troublesome, as a single missing value for a considered explaining characteristic for individual  $i$  causes the potential loss of  $n - 1$  observed network relationships for assessing the link between the formation probability of a network tie and the considered individual characteristics as determinants thereof. Additionally, the parameter estimates would no longer reflect information on all network constituents. Thus proper estimation routines facilitating the use of variables with single missing observations are needed to perform proper statistical analysis incorporating the uncertainty in parameter estimation stemming from missing values. Dealing with missing values is performed using the MCMC device of data augmentation as suggested by Tanner and Wong (1987). The parameter vector is augmented to include the missing values in the ex-

plaining factors. Sampling from the full conditional distributions for these missing values is then incorporated within the iterative sampling scheme providing draws from the posterior distribution  $p(\theta|data)$ . For the considered probit model allowing for analysis of a directed dependent network relationship, the sampling proceeds by iterating the following basic steps (see Albert and Chib, 1993)

1. Sampling of the parameters  $\beta, \kappa_s, \kappa_r$  and  $\gamma$  from full conditional distributions underlying the linear regression setup for latent variable  $\delta_{ij}^*$  ( see Aßmann and Boysen-Hogrefe (2011) for details on the corresponding moments of this full conditional distribution ).
2. Sampling of the latent variable  $\delta_{ij}^*$  from truncated normal distributions with means given by the linear regression setup and variance of one. The truncation at zero from above is  $\delta_{ij} = 0$  and from below if  $\delta_{ij} = 1$  ( see Aßmann and Boysen-Hogrefe (2011) for details on the corresponding moments of this full conditional distribution ).
3. Sampling from the full conditional distributions of missing values. These are obtained using non-parametric approximations for the full conditional distributions as suggested by Burgette and Reiter (2010). Note that for this class of empirical network models, where the set of individual characteristics is assumed to explain the formation probability of a network tie, only few observations are at hand to provide a realistic approximation of the full conditional distribution. If the number of observations required by the non-parametric approach of Burgette and Reiter (2010) is not reached, draws for the missing values are obtained from the observed unconditional distribution as the only approximation of the full conditional distribution at hand to obtain draws for this variables.

Successive sampling from the outlined full conditional distributions establishes a sample from the posterior distribution facilitating inference with regard to parameters based on the empirical moments. Although parameter estimates allow for direct assessment of the direction in which explaining factors influence the formation probability of a communication tie, marginal effects provide a quantification of the effect of a change in determining factors on the probability of a communication relation. Marginal effects are conceptually given as  $\frac{\partial \Pr(\delta_{ij}=1|\tilde{Q})}{\partial w}$ , where  $\tilde{Q}$  denotes a particular state of the considered control variables, e.g., the mode. An estimate of the marginal effects is readily obtained from the output of the Gibbs sampling scheme as

$$\frac{1}{S} \sum_{i=1}^n \phi \left( \tilde{Q}^{\theta^{(s)}} \right) \theta^{(s)}, \quad (6.6)$$

where  $\phi(\cdot)$  denotes the standard normal density and  $\theta^{(s)}$ , , denote the sampled trajectories of all considered model parameters. In general estimates will be based on 10000 draws, i.e.,  $S = 10000$ , where discarding the initial 2000 draws have been found sufficient to mitigate the effect of burn-in.

However, whilst the necessity to deal with missing values within the explaining factors is inherent given the considered empirical network model for the surveyed

network data, it is nevertheless important to check carefully the adequacy of the considered empirical model. While valid point and interval estimates are readily available for the above suggested approach for dealing with missing values, other standard measures for gauging model fitness, like e.g.  $t$ -tests, are not readily available. Note that this applies also to alternative approaches allowing for handling of missing data, see Raghunathan et al. (2001). As a natural approach to gauge model fitness is based on the capability of the empirical network model to provide accurate forecasts, the following outlines one possibility to calculate an overall measure of model fitness. The situation of a network observed with missing values poses a methodological challenge, as the benchmark for assessing the prediction accuracy, i.e. the true relationship between network members, remains unobservable. As formal prediction criteria, we use the AUC measure derived from the ROC curve approach proposed by Egan (1975). In order to function as a valid criterion of model fitness, the AUC measure has to be combined with a pseudo out-of-sample experiment gauging against possible overparametrization, see Akßmann and Boysen-Hogrefe (2011) for a review of this approach in cross validation experiments for binary panel data. One possibility to design the out-of-sample is to split the network constituents into four quarters forming a partition of the set of network constituents, where other fractions are also possible. Parameter estimation is based on the network formed by three quarters of the network constituents, where parameter estimates are then used to predict the network formed by the left quarter of network constituents. Adapting a fourfold split yields a total of four possible combinations. Since in our situation the underlying network involves missing data, the predicted network resulting from complete sample estimation serves as a prediction reference. Note that this approach allows for a comparison of even non-nested model specifications.

## 6.4 Empirical Results

Estimation results concerning the explanatory factors suggested by theory are provided in Table 6.4 below. Although parameter estimates show the direction in which explanatory factors influence the probability of tie formation between two organizations, regression coefficients (columns 3 and 4) provide no correct quantitative description of the relationship between the probability of communication ties and changes within the explanatory factors. The relative importance of the different explanatory factors can be gauged based on marginal effects (columns 6 and 7). The in-sample AUC measure reveals that our approach to deal with missing values and the suggested model specification result in high predicting accuracy of communication ties between organizations. Using the random graph model as an illustrative benchmark corresponding AUC measure of 0.5), the out-of sample AUC measures point at the significantly increased prediction accuracy due to the considered set of explaining factors.

Since homophily is a key term of interest in this analysis, we calculate Euclidean distance measures between sender and receiver specific values of specialization, age, staff, reputation and policy concerns (distance). The larger the value of these distance measures, the more differ organizations in terms of the respective issue. A negative value of the parameter estimate thereby indicates that the probability to

Table 6.4: Estimation results

	Parameter estimates				Marginal effects	
	mean	sd	2.50%	97.50%	mean	sd
constant	-1.254	0.468	-2.185	-0.341	-	-
<b>homophily</b>						
<i>specialization</i>	-0.672	0.201	-1.068	-0.281	-0.223	0.065
<i>age</i>	0.001	0.004	-0.007	0.009	0.000	0.001
<i>expertise</i>	0.423	0.372	-0.315	1.147	0.144	0.128
<i>staff</i>	-0.009	0.003	-0.016	-0.004	-0.003	0.001
<i>reputation</i>	-0.949	0.346	-1.619	-0.266	-0.316	0.116
<i>distance</i>	0.410	0.366	-0.295	1.141	0.142	0.129
<b>dyad specific</b>						
<i>same</i>	0.814	0.116	0.585	1.043	0.274	0.054
<b>sender specific</b>						
<i>specialization</i>	-0.300	0.246	-0.776	0.189	-0.105	0.087
<i>age</i>	0.006	0.004	-0.002	0.013	0.002	0.001
<i>expertise</i>	-1.593	0.392	-2.329	-0.786	-0.530	0.128
<i>staff</i>	0.020	0.003	0.014	0.026	0.007	0.001
<i>reputation</i>	0.241	0.336	-0.413	0.896	0.078	0.111
<b>receiver specific</b>						
<i>specialization</i>	0.339	0.170	0.005	0.662	0.111	0.054
<i>age</i>	-0.007	0.003	-0.014	-0.001	-0.002	0.001
<i>expertise</i>	0.062	0.293	-0.517	0.642	0.023	0.099
<i>staff</i>	0.020	0.003	0.014	0.026	0.007	0.001
<i>reputation</i>	4.591	0.325	3.930	5.230	1.539	0.191
Predicted (rows)/ Observed (columns)		0			1	
0		240			43	
1		429			620	
AUC (in-sample/ out-of-sample)		0.7262/ 0.6724				

Source: Calculated by authors from own data

form a tie increases with homophily in the respective issue. A positive value would suggest that heterophily has positive impacts on the probability to communicate. In Table 6.4, estimated parameters and marginal effects show that homophily in organizations' attributes increases the probability to interact. All significant variables have a negative sign. If organizations are similar in terms of *specialization*, *staff* and *reputation*, the probability to form a tie increases. Inspection of the marginal effects reveals no high quantitative effect of an increase in the difference of staff between two organizations on the probability to form a communication tie, while increasing homophily in *reputation* and in *specialization* has a high quantitative impact. Hence, these findings point at the necessity to look not only at parameter estimates but also on marginal effects to assess the quantitative effects correctly. We find no significance for political homophily (*distance*) and homophily in *age* or *expertise*, respectively. Thus, political homophily is not an important determinant of communication. With regard to the distortionary costs of political homophily, this finding suggests less biased policy decisions. Nevertheless, organizations have to adopt efficient information processing routines to filter received information in terms of a sender's special-interest bias.

Next, we take a closer look at knowledge and structural factors as determinant of tie formation. We start with the results for variables that relate to knowledge as determinant of communication. We observe that communication is clearly driven by an organization's specialization in agriculture. A receiver's probability to gain information by communication clearly increases with his level of *specialization*. A sender's level of *specialization* is not significantly associated with tie formation. Further, the negative and significant sign of the difference in specialization implies that communication partners are likely to be similar in the level of specialization. With regard to expertise transmission in the network, this result points at isolated clusters of knowledge that prohibit the spread of knowledge. *Age* as another proxy reveals that the younger an organization, the higher is the probability to receive information from others. If we now put age on a high level with knowledge, the process enables transmission of knowledge from the elderly, more experienced organizations to the younger and less experienced ones. As these variables are at best proxies for knowledge, we consider a further indicator *expertise*. The results for this indicator suggest that the observed communication structure allows for information transmission within the elite network. Note that low values of *expertise* indicate a high level of knowledge about impacts of policy decisions on the state of the world. A sender's level of *expertise* is especially associated with tie probabilities. That is it is likely that better-informed organizations spread their knowledge in the network. Further, since homophily in *expertise* has no significant impact on the probability to form a communication tie, knowledge will not circulate within a cluster of highly informed organizations. Consequently, less informed organizations are able to receive information from experts *ceteris paribus*.

Turning now to structural factors as determinant of communication, we observe several significant variables. One factor that determines the probability to participate in elite communication is the number of staff (*staff*). For senders and receivers an increase in the number of staff increases the probability to communicate with others. We again observe homophily among organizations. That is organizations

of about the same size are more likely to communicate with each other. However, inspection of the marginal effects reveals no high quantitative effect of an increase in the number of staff or in the difference of *staff* between a pair of organizations, respectively, on the probability to form a communication tie. Further, the communication network is clearly driven by *reputation*. Consider here that reputation might be highly correlated with political power. Thereby senders try to increase the opportunity that legislation will favor their interests by contacting highly influential organizations. We expect that the higher the reputation of the receiver the more likely the receiver is contacted. The observed highly positive marginal effect of receiver specific *reputation* is in line with expectation. The negative sign on the difference in *reputation* suggests that organizations similar in reputation form communication clusters. Consequently, less influential organizations are less likely to form ties to powerful actors. Another determinant of communication is overlapping membership in organizations between a pair of organizations (*same*). The positive and significant sign of *same* shows that if two organizations are more often members of the same organizations, the more likely is tie formation. Inspection of marginal effects reveals a high quantitative impact of overlapping membership in organizations for the probability to communicate.

We summarize for knowledge as determinant of communication that young organizations receive information from older ones and that knowledge is spread among organizations with diverging levels of knowledge. In fact, the marginal effect of sender specific *expertise* states that knowledge highly influences the probability for senders to form ties. However, if specialization in agriculture is well correlated with knowledge, homophily in *specialization* would prohibit knowledge transmission. In our case, we observe the contrary. *Specialization* is not highly correlated with *expertise* ( $corr = 0.069$ ). Hence, we suggest discussing the variable *specialization* more generally in terms of an organization's main activity field. That is organizations with heterogeneous activity fields but high capacity can still be well-informed organizations. Good cases in point are donor organizations. It is well recognized that donors rarely specialize in a sector but handle several problem areas of a developing country. With this example in mind, the negative impact of homophily in *specialization* does not trigger information transmission but simply reveals that organizations with similar activity fields will form ties more often *ceteris paribus*.

Nevertheless, with regard to the structural determinants of communication, we suggest that overlapping membership in organizations and political influence are more important determinants of elite communication ties than knowledge. We do not infer that knowledge can be neglected as a determinant and that an elite network does not spread information among actors. But the high marginal effects of *same* and homophily in *reputation* narrow the impact of knowledge on tie formation, even if expertise significantly influences the probability to send information. For illustration, how overlapping membership in organizations (*same*) and the level of knowledge (*expertise*) influence the probability to form a tie for senders, the following calculations are performed. In fact, we calculate the effect of a change in *same* (*expertise*) from the minimum value to the maximal value observed in our sample. Thereby probabilities to communicate are computed for each of the two determinants at these extreme positions averaging over all other determinants observed within



the sample. The minimum of same corresponds to no overlapping organizations, the maximum to four overlapping organizations. The minimum level of knowledge is given by a value of 1.098 of *expertise* in our sample, while a value of 0.445 of *expertise* denotes the highest level of knowledge among the actors. Inspection of effects, see Table 6.5, reveals that increasing overlapping membership in organizations increases the probability to observe a tie between a pair of organizations by 29 percentage points. However, if an uninformed sender gains as much knowledge as the best informed actor in the sample, the probability to form ties, held all other determinants at their means except homophily in expertise, increases by 22 percentage points. Hence, joining other organizations would be *ceteris paribus* a better means than accumulating knowledge to increase the probability to send information.

Table 6.5: Simulation of marginal effects: *same* and *expertise*

<i>same</i>		<i>expertise</i>	
min/max	$Pr(\delta_{ij} = 1)$	min/max	$Pr(\delta_{ij} = 1)$
0	0.700	1.098	0.571
4	0.997	0.445	0.790

Notes: All other variables, except the distance in expertise for the effect of expertise, are fixed at their means. Source: Calculated by Authors.

In terms of the bias/information tradeoff of participatory policy processes, results show that political homophily is not a significant determinant of communication. Consequently, participatory policy processes allow for unbiased information diffusion in Malawi.

## 6.5 Conclusion

This paper analyzes the communication patterns among governmental, local stakeholder and international organizations in Malawi. We present an approach that is novel within network estimation as well as within political science. In terms of econometric analysis of surveyed network data, our approach bases on an extended binary regression framework. In fact, the model relies on a Bayesian estimation framework to handle missing data due to survey non-response. For political consultants, the framework allows learning about political communication processes in a country. Findings will enable them to design communication processes that influence efficient policy choices.

In addition to this, we explicitly analyze the information/distortion potential of participatory policy processes by employing two variables. First, we use an external measure of an actor's knowledge about policy impacts derived from a Computable General Equilibrium Model and survey data of actor's policy preferences to analyze information diffusion in the network. Second, we employ an index of homophily in policy concerns between a pair of organizations to describe the distortion potential. Insights about this tradeoff are valuable in order to evaluate the potential of participatory policy processes in increasing the likelihood of approving welfare increasing

or distorting policy programs.

Empirical findings are presented for a case study in Malawi based on data from face-to-face interviews that gathered policy positions, policy interests and political communication networks of local stakeholders, international organizations and politicians in 2010. We find strong support for explanatory factors suggested by the two strands of literature about determinants of communication - the preference driven and the structure driven models. Overall, the most influential determinants of communication processes are identified as an actor's reputation, overlapping membership in organizations and knowledge about policy impacts.

In terms of well-informed policy decisions, it is highly appreciated that knowledge about policy impacts increases a sender's probability to form communication ties. In addition to this, special interests will not bias policy decisions, because homophily in policy concerns turns out to be insignificant for communication relations in our analysis. Nevertheless, this positive result for the potential of participatory policy processes to increase well-informed policy choices is, firstly, narrowed by the high influence of homophily in reputation on the probability to form ties. Homophily in reputation will disable well-informed but less influential players to convey valuable information into the policy process. Secondly, joining other organizations increases the probability to communicate with elite members more than accumulating knowledge *ceteris paribus*. That is promoting membership in umbrella organizations is a means to design communication processes. As overlapping membership in organizations relates to sharing common communication platforms, the CAADP approach of creating working groups on priority issues that work on policy proposals for pro-poor growth policy programs is an adequate intervention in the communication process to increase the communication opportunities among organizations. However, at the time of the interview round, an effective institutional organization of dialogue among stakeholders and between government and stakeholders was still missing. Finally, the network is clearly reputation driven. That is organizations are more likely to be contacted, if they are highly influential. This finding is in line with the main goal of information provision, i.e. ensuring that the final policy decision considers own policy positions.

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## 6.A Appendix

Table 6.6: Organizations in Malawi: Acronym, type and name

Acronym	Type	Name
MoF	GOV	Ministry of Finance
MoAFS	GOV	Ministry of Agriculture and Food Security
MoIWD	GOV	Ministry of Irrigation and Water Development
MoDPC	GOV	Ministry of Development Planning and Cooperation
RB	PUB	Reserve Bank
OPC	GOV	Office of the President and the Cabinet
SFFRFM	PUB	Smallholder Farmers Fertilizer Revolving Fund
LU	PUB	Logistics Unit
DPP	LEG	Democratic Progressive Party
MCP	LEG	Malawi Congress Party
ADD	PUB	Agricultural Development Divisions
DADO	PUB	District Agricultural Development Offices
DFID	DON	Department for International Development UK
Irish Aid	DON	Irish Aid
NORAD	DON	Norwegian Agency for Development Cooperation
USAID	DON	USAID
EU	DON	EU
IMF	DON	International Monetary Fund
WB	DON	World Bank
BC	RES	Bunda College
FW	IG	Farmer's World
ILO	IG	Ilovo Sugar
RAB	IG	Rab Processors
STAM	IG	Seed Trade Association of Malawi
MUB	IG	Mulli Bros.
GTA	IG	Grain Trader Association
FUM	IG	Farmers Union Malawi
NASFAM	IG	National Smallholder Farmers' Association of Malawi
CISANET	IG	CISANET
TAM	IG	Tea Association of Malawi
TAMA	IG	Tobacco Association Malawi
MEJN	IG	Malawi Economic Justice Network
ECAMA	IG	Economics Association of Malawi
CAMA	IG	Consumers Association of Malawi
MCC	IG	Malawi Council of Churches
ELDS	IG	Evangelical Lutheran Development
CADECOM	IG	Catholic Development Commission

Source: Authors.

## Chapter 7

### Conclusion

Since the seminal work of Persson and Tabellini, it is common knowledge that political institutions affect economic policies. But comprehensive studies that explain observed variation in agricultural protection are still rare. However, studies within this thesis put forward the idea of "clustered" institutions as determinants of the level of agricultural protection. Hence, theoretically well-grounded hypotheses about the influence of interaction effects between formal and informal political institutions on agricultural policy choice are tested empirically. Results provide robust evidence on the influence of political institutions on agricultural policies.

Further, researchers have, so far, not quantitatively analyzed the role of policy networks as an essential component of participatory policy processes in determining development policy decisions at the country level in Africa. However, international organizations are highly interested in studies evaluating policy processes with regard to their consequences on stakeholder participation and development outcomes. This thesis contributes to a better understanding of participatory policy processes by deriving a framework to model policy processes well-grounded in theory and by applying the proposed evaluation framework on a policy process in Malawi.

Since the two parts of the thesis rely upon different strands of theories and quantitative methods, I will critically discuss each study on the following pages. One exception is the first two studies because the second study explicitly bases upon the study presented in Chapter 2.

#### **Interaction Effects of District Magnitude, Voter Beliefs and Protectionism: Evidence from Agriculture**

#### **Constitutional Rules, Informal Institutions and Agricultural Protection in Developing and Industrial Countries: Theory and Empirical Evidence**

Both studies focus on the interaction effects between formal and informal political institutions in determining agricultural protection. So far, Chapter 2 only considers parliamentary systems and the influence of voter beliefs, which are assumed to depend on a political communication process dominated by a special-interest group, on the policy preferences of the prime minister. However, the second study clearly deepens the analysis of agricultural protection across countries by taking the impact of presidential systems as another constitutional rule into account and by introducing legislators' policy preferences depending on lobbying activities of special interest groups.

At the methodological level, estimation techniques were applied to control for the potential of endogeneity of electoral rules and form of government. In fact, the instrument variable estimation approach reveals that valid instruments are employed to disentangle the effect of political institutions from other unobserved factors that determine both, political institutions and agricultural protection. However, at the moment, we use instrument variables that are time constant while we observe

slightly time-varying political institutions in countries. That is we lose predictive power of political variables after instrument variable estimation because the predictions of political variables of the two-step approach are time-constant. However, political theories about the endogeneity of political institutions do so far not provide a theoretical basis for choosing time varying instruments that permit explaining institutional reform in countries. Accordingly, our instrument variables consider the best set of available variables given the limited understanding of institutional reform.

Concerning the assumption of a uniform lag structure of the dependent variable across political regimes, consider that the proposed theory does so far not derive whether institutional settings shape government's reaction to changing socio-economic variables. However, the theory of veto players as drivers of policy gridlock or reform derived by Tsebelis (2002) might be an interesting framework to derive insights on determinants of government's reaction functions. Hence, future research might include this interesting topic in explaining agricultural reform within countries. Based on such theoretical consideration, heterogeneous lag structures in the endogenous variable depending on a country's institutional regime might be employed empirically in order to explain country specific agricultural protection patterns in more detail (Plümpner et al., 2005). However, the main focus of both papers is to derive evidence on political institutions as determinants of cross-country variation in agricultural protection that is left after controlling for classical polit-economic explaining factors. Hence, I leave this interesting topic for future research on within country variation of agricultural protection.

Finally, both studies assume that each vote has the same value and disregard malapportionment. Malapportionment refers to the issue of disproportion between the share of population in an electoral district and district size, i.e. legislative seats to be elected in a district, across electoral districts of a country (Lijphart, 1994). Hence, rural or urban voters might be over- or underrepresented in parliament which leads to biased legislative power distributions and thereby to policy decisions dependent on the degree of malapportionment in a country. Further, we also disregard unequal vote values across countries with the same electoral system. Future work based on the proposed theoretical model might consider this issue in order to explain agricultural protection patterns across countries.

### **How the European Union Works: Theory and Empirical Evidence from EU Agricultural Policy**

While Chapter 2 and Chapter 3 analyze the impact of national political institutions on agricultural domestic support, this Chapter focuses on the effect of legislative decision-making procedures on agricultural protection in supranational systems like the European Union. Such effects are essentially derived based on the concept of vote trading among agents according to their interests in protection for specific agricultural commodities, i.e. political exchange.

Even though political exchange provides a well-grounded theoretical model of CAP legislative decision-making, the empirical part has some drawbacks due to data scarcity. In fact, the estimation of true causal effects of legislative decision-making procedures on agricultural protection is not possible because the proposed dummies also capture other determinants of agricultural protection than legislative

decision-making rules common to all European member countries. In particular, the agricultural lobbying system in the EU might be another driver of agricultural protection captured by the dummy variables. With regard to this endogeneity problem, an instrument variable estimation approach is suggested by Greene (2003) to disentangle the effect of lobbying from the legislative system. However, to the best of my knowledge, data on valid instruments that would allow for such estimation is not available. A valid instrument would be correlated with the institutional system of the EU but not with agricultural protection. So far, modeling the effect of the EU specific institutional system using a dummy is the best approach. Although with caution, a well-grounded theory, as derived in this Chapter, permits to interpret estimated parameters as being highly dominated by legislative decision-making rules.

Finally, the presented results reveal an interesting pattern in the parameters of standard polit-economic controls. In detail, parameter estimates vary with time. Hence, future research might consider estimating heterogeneous parameter values of these controls in time-series cross-section models to capture the non-linear relationship between them and agricultural protection.

### **A Network Based Approach to Evaluate Participatory Policy Processes: An Application to CAADP in Malawi**

In contrast to the preceding Chapters, the focus of this Chapter lies on evaluating the role of policy networks for agricultural policy decisions. This is done via an in-depth country study using the example of Malawi. Further, a theoretically founded framework is introduced in order to analyze participatory policy processes empirically. The proposed methodological approach includes two essential components of policy processes, political institutions and policy networks. An empirical application of framework to reproduce a participatory policy process in Malawi shows that the proposed framework is able to reflect country-specific policy processes quite well. Nevertheless, follow up in-depth country studies would be a systematic approach to consolidate this finding.

Further, empirical results describing the nature of Malawi's policy process give rise to the concern that the effective consequences of participatory policy processes do not match goals of international organizations promoting such types of processes. In fact, results reveal a top-down instead of the preferred bottom-up policy process. However, I am not able to judge with the model at hand whether the a bottom-up policy process leads to better policy decisions in terms of pro-poor growth than resulting top-down policy process does. Consider here that governmental actors might be better informed about policy impacts than local stakeholder organizations due to a higher capacity in evaluating policies. Consequently, the fact that government provides mainly information to stakeholder organizations and not vice-versa could be efficient in order to choose welfare increasing. Hence, identifying the optimal pro-poor growth program for Malawi would lay the basis for an evaluation of the nature of participatory policy processes with regard to an efficient policy program choice. Combining this information with the proposed framework would further enable us to identify attributes of a policy process leading to the adoption of the optimal pro-poor growth policy programs via policy process simulations. In addition to this,



simulations of policy processes might also aim at identifying structures that increase the influence of stakeholder organizations on final policy decisions. Comparing both policy processes would reveal, whether one faces an efficiency-participation tradeoff when designing policy processes in a specific country.

Further, the outlier position of the Ministry of Agriculture and Food Security as depicted in the last figure of this Chapter -mapping actor's ideal policy positions into a two-dimensional space- involves the question whether participatory policy processes would undermine or support the accountability of government towards the electorate. In this case, the extreme position of the Ministry favoring especially maize subsidies might evolve due to an electorate that considers subsidizing maize as the right policy strategy to ensure food security. If now the participatory policy process induces the Ministry to choose a strategy, which does not match the policy position with which government has won election, promoting participatory policy processes falls into the trap of undermining democratic institutions and legitimating thereby policy decisions while greater legitimation was the aim of introducing such processes. Note that the Ministry of Agriculture has in fact a policy position after communication that differs from the initial policy position resulting from political support maximization in Malawi. That is future research on participatory policy processes might focus on the relation between democratic institutions, although they might be weak in developing countries, and participatory policy processes.

At the methodological level, the proposed belief formation model presents an approach much more flexible in capturing individual information gathering routines than the model of Friedkin and Johnsen because it allows the weights actors put in other policy beliefs to vary among actors. Nevertheless, the assumption that an actor puts equal trust in information provided by different communication partners might not hold in reality. Consider here that the assumption of a constant level of trust relies on homophily in policy interests as a determinant of an individual's communication choices. Homophily in interests would reduce an interest bias in communication for an actor because he solely receives information about policy impacts from actors similar in interests about the true state of the world. That is information received from other actors will always reflect a policy strategy capable from the information sender's point of view to reach the receiver's desired state of the world. Thereby, homophily in political interests allows for an individually efficient information gathering via communication and equal trust put in communication partners' policy beliefs. However, if actors do not choose communication partners according to common political interests, actor's information processing routine must account for the bias in communicated positions. In this case, the assumption of equal weights for all communication partners might not perfectly match with information processing routines in practice. However, in our case of Malawi the high predictive quality of our model in terms of the final policy decision argues for modeling the belief formation process in Malawi close to reality, even though we assume equal weights in the proposed belief formation model.

Further, readers familiar with policy processes in developing countries might argue that the model disregards donor conditionality, although it is widely perceived as relevant for policy-making in developing countries. However, the proposed model captures this attribute of policy processes by ascertaining the level of trust an actor

puts in information provided by other actors empirically. If donors would really neglect information on policy impacts on the state of world provided by local organizations and would instead attach conditions to budget support, the level of trust that they put in external information would reflect this. However, we learned from the empirical application of the framework to Malawi, that donors were relatively open to information provided by local interest groups and government.

A last criticism that will always hold, if quantitative methods are used to ascertain policy positions and interests, is that actors' stated policy positions and interests are not comparable to each other. In particular, researchers allege that each interviewed actor judges scalars used in questions to gather policy positions differently. However, I put much effort on the right framing of the questions in the policy network study used here to reduce this bias. In fact, I attached a specific policy strategy to each of the points on the Likert-scale used in the questions and scalar positions were also explained to the interviewees using information from official policy documents during the interviews.

### **The Formation of Elite Communication Networks in Malawi: A Bayesian Econometric Approach**

The study presented in this Chapter investigates the determinants of an elite communication network and thereby derives insights into the communication process that leads to final agricultural policy decisions in Malawi. At the methodological level, the study uses an advanced econometric estimation technique that allows estimating communication relations although item- or unit non-response can be found in the data.

While the study analyzes determinants of communication partner choices quite well, it still fails to link a specific network structure to final policy beliefs and decisions that result due to belief formation among actors in the network. Hence, it would be an interesting future research topic to simulate network structures based on the derived networks determinants that push policy beliefs and decisions into a distinct direction. In particular, identifying the network structure that enables a belief formation process resulting in policy decisions capable of promoting pro-poor growth would be interesting with regard to designing participatory policy processes.

Regarding structural factors as determinants of communication networks, it would be valuable for an advanced evaluation of policy processes leading to the adoption of CAADP in a country to gather information about an organization's affiliation to CAADP public working groups or committees. Such information would enable us to analyze the impact of CAADP's specific information mechanisms on the probability to exchange information between a pair of organizations. However, I was not able to gather such information in Malawi due to missing implementation of these communication platforms at time of the interviews.

Finally, the network used in this study might suffer from overreporting of less influential actors. Overreporting describes the fact that less influential information senders potentially name highly influential organizations as information receiver, although these organizations would not support the importance of their information in forming policy beliefs. Here, future research might focus on two different strategies to cope with this problem. First, network questions in future network studies can

be designed with regard to gathering an asymmetric communication relation that is confirmed by both, the sender and the receiver. Second, estimation techniques that explicitly account for measurement errors in network data might be used to estimate determinants of communication relations (see Butts, 2003). However, so far a reliable technique to estimate asymmetric networks with measurement errors does not exist. Hence, developing such an advanced estimation strategy would be an interesting future research topic.

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## Chapter 8

### Zusammenfassung

Jede Regierung steht der Aufgabe gegenüber Politikprogramme zu formulieren und zu implementieren, die die Wohlfahrt der Gesellschaft erhöhen. Jedoch wird sowohl die Formulierung als auch die Implementierung durch unterschiedliche Faktoren beeinflusst. Während die Formulierung der richtigen Politikprogramme deren Kenntnis vorausgesetzt, hängt die Implementierung stark von den politischen Institutionen und Netzwerken in dem jeweiligen Land ab. Daher trägt das Verständnis der Auswirkungen verschiedener politischer Institutionen und Netzwerke auf die finale Politikentscheidung dazu bei, einen politischen Entscheidungsprozess in einem Land aufzubauen, der die Implementierung wohlfahrtssteigernder Politiken ermöglicht.

Der Schwerpunkt dieser Arbeit liegt daher auf einer theoretisch fundierten quantitativen, empirischen Untersuchung des Einflusses von Wahl- und Regierungssystemen, als Beispiele formaler Institutionen, sowie von Politiknetzwerken, als zentrale informelle Determinanten, auf die agrarpolitische Entscheidung. Eine solide politökonomische Analyse setzt, neben einer mikropolitisch fundierten Ableitung theoretischer Hypothesen, insbesondere auch die Verwendung adäquater methodischer Ansätze zur empirischen Überprüfung eben dieser voraus. Die Wirkungsanalysen sind in zwei Bereiche gegliedert, die unterschiedliche Schwerpunkte und empirische Datengrundlagen aufweisen.

Innerhalb des ersten Bereiches, der quantitativen Wirkungsanalyse politischer Institutionen, bildet die ökonometrische Analyse theoretisch abgeleiteter Hypothesen über den Einfluss politischer Institutionen auf die Agrarpolitik den Schwerpunkt. Insbesondere, wird in diesem Teil der Arbeit die beobachtete Varianz im Agrarprotektionsniveau im internationalen Vergleich, die sich in die klassischen politökonomischen erklären lässt, durch die Varianz in den konstitutionellen Regeln und informellen Institutionen zwischen den Ländern erklärt. Mit Hilfe mikro-politisch fundierter theoretischer Modelle wird gezeigt, dass sowohl das Wahlsystem als auch bestimmte Merkmale von Regierungssystemen die Agrarprotektion bestimmen. Zudem zeigt die theoretische Modellierung, dass Interaktionseffekte zwischen politischen Institutionen und auch zwischen politischen Institutionen und Lobbying agrarpolitische Entscheidungen beeinflussen. Eine empirisch fundierte Analyse der Hypothesen bedarf dabei der Kenntnis innovativer ökonometrischer Methoden, die einerseits theoretisch abgeleitete latente Politikregime und auch die Eigenschaften von Zeitreihen- Querschnittsdaten berücksichtigen müssen. Außerdem muss für die Endogenität politischer Institutionen kontrolliert werden, um kausale Effekte der Institutionen bestimmen zu können.

Der zweite Bereich dieser Arbeit befasst sich mit der Modellierung und Evaluierung partizipativer politischer Prozesse in Afrika. An eben dieser zeigen seit einigen Jahren internationale Organisationen vermehrt Interesse, da sie mit der Paris Declaration on Aid Effectiveness aus dem Jahre 2005 Entwicklungsländern mehr Freiräume und Eigenverantwortung bei der Formulierung ihrer Politikstrategien zur Armutsre-

duzierung eingeräumt haben. Durch diesen Rückzug aus der tatsächlichen Formulierung der Politik bei gleichzeitiger Finanzierung von Politiken, die afrikanische Staaten nun möglichst eigenständig formulieren, haben sie Interesse an einem verbesserten Verständnis der politischen Entscheidungsprozesse vor Ort. Erkenntnisse aus wissenschaftlichen Studien können dabei die gezielte Gestaltung institutioneller Rahmenbedingungen ermöglichen, die die Implementierung und Formulierung von effizienten Entwicklungspolitiken in den Entwicklungsländern erlauben. Basierend auf den bisher fehlenden quantitativen Analysen in diesem Bereich wird daher in dieser Arbeit der politische Entscheidungsprozess sowohl theoretisch modelliert als auch empirisch beispielhaft an einem afrikanischen Land, Malawi, analysiert. Als methodischer Ansatz wird dabei die Politiknetzwerkanalyse gewählt, die einen geeigneten und innovativen methodischen Ansatz darstellt, partizipatorische politische Prozesse zu untersuchen, da sie die Beurteilung des Einflusses von Interessengruppen auf die Politikentscheidung ermöglicht.

### **Interaction Effects of District Magnitude, Voter Beliefs and Protectionism: Evidence from Agriculture**

Dieser Beitrag entwickelt ein theoretisches Modell, um das Zusammenwirken von Wahlsystemen und Wähler *beliefs*, die die Politikposition des Ministerpräsidenten in parlamentarischen Systemen beeinflussen, bei der politischen Entscheidungsfindung abzuleiten. Kernhypothese des Modells ist eine nicht-lineare Beziehung zwischen Wahlsystem und Agrarprotektion in den industrialisierten Ländern.

Um die politischen Präferenzen Abgeordneter zu bestimmen, wird ein probabilistisches Wählermodell verwandt, in dem ländliche Wähler weniger ideologisch als städtische Wähler wählen (Lohmann, 1998). Somit maximieren Abgeordnete unterschiedliche politische Unterstützungsfunktionen, die von dem Anteil der landwirtschaftlichen Bevölkerung an der Gesamtbevölkerung in ihrem Wahlkreis abhängen. Hinsichtlich des Einflusses des Wahlsystems auf die Politikpositionen von Abgeordneten lässt sich damit zeigen, dass sich mit zunehmender Wahlkreisgröße die Politikpositionen der Abgeordneten annähern.

Da die agrarpolitische Entscheidung letztendlich eine Verhandlungslösung im Parlament darstellt, wird die finale Politikentscheidung mit einem Modell der legislativen Entscheidungsfindung in parlamentarischen Systemen, in das die theoretisch abgeleiteten Politikpräferenzen der Abgeordneten eingehen, abgebildet. Innerhalb dieses Modells ist sowohl die Koalitionsdisziplin des Premierministers bei konfliktären Politikpräferenzen zwischen ihm und seiner parlamentarischen Mehrheit als auch das Wahlsystem für die Höhe der Agrarprotektion von Bedeutung. Der Konflikt hängt dabei von der Dominanz einer Interessengruppe in der politischen Kommunikation ab, die die *beliefs* der Wähler über die Höhe Agrarprotektion steuert. Die Wähler erwarten eine pro-landwirtschaftliche Politik, wenn die Kommunikation von landwirtschaftlichen Interessengruppen geprägt ist und eine liberale Agrarpolitik, wenn nicht-landwirtschaftliche Interessengruppen die Kommunikation über Politiken dominieren. Da die *beliefs* der Wähler nur die Politikposition des Premierministers beeinflussen, führen sie zu einem Konflikt zwischen dem Ministerpräsidenten und dem Pivotmitglied seiner Koalition, das immer andere politische Präferenzen als der Ministerpräsident vertritt. Mit steigender Wahlkreisgröße nähern sich die Politikpo-

sitionen des Premierministers und des Pivotmitglieds an, da die Bevölkerungsanteile in den Wahlkreisen immer mehr den nationalen Anteilen entsprechen und damit die Präferenzheterogenität im Parlament abnimmt. Es folgt, eine inverse u-förmige Beziehung zwischen Wahlkreisgröße und Agrarprotektion, wenn landwirtschaftliche Interessenverbände die politische Kommunikation dominieren. Dagegen folgt eine u-förmige Beziehung, wenn nicht-landwirtschaftliche Interessengruppen Wähler *beliefs* beeinflussen. Beide Beziehungen entstehen dadurch, dass der Premierminister gemäß seiner Koalitionsdisziplin seine präferierte Politik durchsetzen kann, die mit den *beliefs* der Wähler variiert.

Die theoretisch abgeleiteten Hypothesen werden anschließend mit Hilfe eines dynamischen *two way fixed effect error component* Modells empirisch überprüft (Wallace and Hussain, 1969). Zudem wird auch für die mögliche Endogenität politischer Institutionen mit Hilfe einer Instrumentvariablenschätzung kontrolliert. Die Datengrundlage für die empirische Analyse bildet die neue Datenbank zu Agrarprotektionsraten von Anderson et al. (2008), die eine umfassende Analyse von 23 parlamentarischen Demokratien seit 1966 ermöglicht. Die empirischen Ergebnisse bestätigen den nicht-linearen Zusammenhang zwischen Agrarprotektion und Wahlsystem. Das Protektionsniveau steigt zunächst mit steigender Wahlkreisgröße, die hier zur Klassifizierung von Wahlsystemen genutzt wird, an, um dann ab einer mittleren Wahlkreisgröße (2-9.9 Sitze je Wahlkreis) wieder zu sinken. Die Ergebnisse sind sowohl robust gegenüber verschiedenen Modellierungsweisen länderspezifischer Heterogenität als auch der Endogenität politischer Institutionen. Eine dynamische Spezifikation des Modells hat ebenfalls keinen Einfluss auf das empirische Ergebnis.

### **Constitutional Rules, Informal Institutions and Agricultural Protection in Developing and Industrial Countries: Theory and Empirical Evidence**

Dieses Kapitel erweitert das Modell, das in Kapitel 2 vorgestellt wurde, indem auch präsidentielle Systeme berücksichtigt werden. Außerdem zeigt das Modell detaillierter, wie Lobbying die Präferenzen der Abgeordneten determiniert und damit die agrarpolitische Entscheidung beeinflusst.

Das zentrale Thema dieses Kapitels ist die Wirkung von "clustered institutions" als Determinanten der Agrarpolitik in Industrie- und Entwicklungsländern. Das Phänomen von "clustered institutions" beschreibt die Tatsache, dass das Zusammenspiel formeller und informeller politische Institutionen die Politikentscheidungen beeinflusst Acemoglu and Johnson (2005). Hier wird daher modelliert wie Wahlsysteme, Regierungssysteme, Lobbying und auch demographische Charakteristika eines Landes zusammen die Agrarprotektion beeinflussen. Um solche Wechselwirkungen zu analysieren, wird ein probabilistisches Wählermodell als Grundlage zur Bestimmung der politischen Präferenzen Abgeordneter herangezogen. Dabei folgt die Grundannahme des Modells Lohmann (1998). Das heißt, es wird angenommen, dass Landwirte und Städter sich in Abhängigkeit ihrer relativen Größe in der Höhe ihrer ideologischen politischen Verzerrung unterscheiden. Daraus folgt, dass die Supportfunktion, die Abgeordnete bei Formulierung ihrer Politik maximieren, und damit auch ihre Politikpräferenz von dem Anteil der landwirtschaftlichen Bevölkerung an der Gesamtbevölkerung ihres Wahlkreises abhängen. Trotz heterogener Präferenzen müssen sie sich im Parlament auf eine von einer Mehrheit

akzeptierte Agrarpolitik einigen. Die Verhandlungen über die Agrarpolitik im Parlament werden durch legislative Entscheidungsmodelle modelliert, die die wesentlichen Merkmale parlamentarischer und präsidentieller Systeme abbilden. Dabei hängt es von dem Regierungssystem ab, welche legislativen Organe in Konflikt zueinander stehen. In einem parlamentarischen System besitzen der Premierminister, der entweder ländliche oder städtische Politikpositionen vertritt, und seine parlamentarische Mehrheit, die jeweils die im Gegensatz zu seinen Präferenzen stehenden Politikpositionen vertritt, konfliktäre Positionen. In einem präsidentiellen System ergibt sich der Konflikt zwischen dem Median des Agrarausschusses, dessen Wahlkreis eher einem ländlichen (städtischen) entspricht, und dem Median im Parlament, der städtische (ländliche) Präferenzen in den Industrieländern (Entwicklungs-)Ländern hat. Da das Wahlsystem die Heterogenität in den Präferenzen der Abgeordneten beeinflusst, wird der Konflikt zwischen den legislativen Organen durch verschiedene Wahlsysteme determiniert. Die Homogenität der Präferenzen nimmt dabei mit steigender Wahlkreisgröße zu.

Im Wesentlichen trägt dieser Beitrag zum Verständnis der Agrarprotektion im internationalen Vergleich bei, indem er den Einfluss des Wahlsystems auf die Agrarpolitik in Abhängigkeit länderspezifischer politischer Regime herleitet. Die Regime werden dabei sowohl von sozio-ökonomischen als auch politischen Rahmenbedingungen determiniert. Im Kern zeigt die Theorie einen inversen u-förmigen Zusammenhang zwischen Agrarprotektion und Wahlkreisgröße in Industrieländern auf, während eine u-förmige Beziehung für die Entwicklungsländer aus dem Modell resultiert. Die Diskrepanz zwischen den Ländertypen ergibt sich in unserem Modell aus der Tatsache, dass der Anteil der landwirtschaftlichen Bevölkerung an der Gesamtbevölkerung in Industrieländern unter 50% und in Entwicklungsländern über 50% liegt.

Des Weiteren bezieht unser Modell in die Abbildung des agrarpolitischen Willensbildungsprozesses mit ein, wie Wahlkampfspenden von Interessengruppen an Parteien das Wählerverhalten bestimmen. Wir nehmen an, dass Wähler sich durch Wahlkampfaktivitäten der Parteien, die durch Wahlkampfspenden finanziert werden, in ihren Politikpräferenzen beeinflussen lassen. Da die Höhe der Wahlkampfgelder jedoch aus einem Verhandlungsspiel zwischen Interessengruppen und dem Parteivorsitzenden folgt, berücksichtigt auch nur dieser die Höhe der Wahlkampfausgaben bei der Formulierung seiner Politikposition. Damit präferiert der Parteivorsitzende unter Lobbying eine andere Politikposition als die normalen Abgeordneten. Lobbying hat somit nur einen Effekt auf das Level der Agrarprotektion und nicht auf die Beziehung zwischen Wahlsystem und Agrarprotektion.

Im zweiten Teil des Beitrages werden unsere Hypothesen empirisch getestet. Als Datengrundlage dient dabei die Datenbank über Agrarprotektionsmaße von Anderson et al. (2008), wodurch 52 Länder in der Zeit zwischen 1961 und 2005 in der Analyse als unbalanciertes Panel Berücksichtigung finden. Da das theoretische Modell impliziert, dass die Wirkung eines Wahlsystems auf die Politik von latenten Politikregimen in einem Land abhängt, verwenden wir für die ökonometrische Analyse ein *switching regression model*. Da die Wahrscheinlichkeit für eine Länderbeobachtung, einem bestimmten Regime zugehörig zu sein, unbeobachtet ist, jedoch von sozio-ökonomischen Ländermerkmalen abhängt, wird sie mit Hilfe eines Logitmodells

geschätzt. Informationskriterien wie das AIC oder BIC schlagen die Berücksichtigung von 6 latenten Regimen zur Schätzung des Effektes von Wahlsystemen auf die Agrarprotektion vor. Die empirischen Ergebnisse unterstützen unsere Hypothese, dass die Beziehung zwischen Wahlkreisgröße und Agrarprotektion nicht-linear ist, da wir signifikante invers u-förmige Beziehungen in unserem Sample finden. Unsere Ergebnisse sind zudem robust gegenüber der Verwendung der verzögerten abhängigen Variablen zur Berücksichtigung von Autokorrelation in Zeitreihen- Querschnittsdaten. Außerdem kontrollieren wir für eine mögliche Endogenität des Wahlsystems mit Hilfe eines zweistufigen Instrumentvariablenansatzes Angrist and Krueger (2001).

### **How the European Union Works: Theory and Empirical Evidence from EU Agricultural Policy**

Dieser Beitrag fokussiert auf legislativen Entscheidungsregeln, die die Agrarpolitik in der Europäischen Union bestimmen. Kernstück dieser Regeln ist politischer Stimmentausch zwischen politischen Agenten gemäß ihres Interesses an einer spezifischen Politik (Coleman, 1966). Diese Modellierung europäischer Entscheidungsprozesse trägt in zweierlei Hinsicht zu einem besseren Verständnis der Gemeinsamen Europäischen Agrarpolitik (GAP) bei. Zunächst zeigt das Modell, dass sowohl die Konsultationsprozedur als auch informelle legislative Entscheidungsregeln eine theoretische Erklärung für den Anstieg der Protektionsraten in Ländern, die der EU beitreten, ist. Zum anderen kann die Modellierung informeller Regeln eine Reform der Entscheidungsregeln im Agrarministerrat abbilden, obwohl sich die formale, in der Verfassung festgelegte Entscheidungsregel nicht geändert hat. Das Sinken der Agrarprotektion nach 1986 weist dabei auf eine Reform des Luxemburger Kompromisses, der informellen legislativen Entscheidungsregel für die GAP seit den 60er Jahren, hin.

Die empirische Überprüfung der Hypothesen erfolgt mit einem dynamischen *two way fixed effect error component* Modell. Die Schätzung des Modells beruht vor allem auf der neuen Datenbank zu Agrarprotektionsraten von Anderson et al. (2008), die eine Analyse von 58 Ländern ab 1961 als unbalanciertes Panel ermöglicht. Um die theoretisch abgeleiteten Hypothesen zu überprüfen, werden in den Schätzungen zwei Dummies verwandt. Ein Dummy ist eine Länder-Zeit spezifische Interaktionsvariable, die mit Eintritt des Landes in die EU eins wird. Der andere Dummy ist eine Zeit-Regime Interaktionsvariable, die für ein EU-Mitgliedsland nach 1986 gleich eins ist, um die Reform der informellen Entscheidungsregel im Rat abzubilden. Die empirischen Ergebnisse unterstützen die theoretische Hypothese, dass Länder mit Eintritt in die EU durch das neue Regierungssystem, dem sie dann unterliegen, eine Erhöhung der Agrarprotektion erfahren. Außerdem kann empirisch validiert werden, dass eine Änderung der informellen Entscheidungsregel zu einem Absinken der Agrarprotektion nach 1986 führt. Die empirischen Ergebnisse jedoch mit Vorsicht als kausale Effekte zu interpretieren, da Parameterschätzer der Dummyvariablen ebenfalls den Einfluss anderer gemeinsamer Charakteristika von EU Ländern, z.B. des Lobbyingsystems, aufzeigen könnten. Eine Korrektur dieses Endogenitätsproblems ist jedoch auf Grund fehlender valider Instrumente zurzeit nicht möglich.



### **A Network Based Approach to Evaluate Participatory Policy Processes: An Application to CAADP in Malawi**

Innerhalb dieses Beitrages wird ein theoretisches Modell hergeleitet, das die politische Entscheidungsfindung in einem Land reflektiert. Das Modell lässt sich in zwei Komponenten teilen, die zum einen den legislativen Entscheidungsprozess und zum anderen die Aggregation unterschiedlicher Politikpräferenzen in Politiknetzwerken modellieren.

Der legislative Entscheidungsprozess wird mit Hilfe einer kooperativen Verhandlungsregel, der *mean voter* Regel, abgebildet (Henning, 2000). Diese Regel bildet die Politikentscheidung als einen gewichteten Mittelwert über die Idealpositionen der Akteure ab. Als Gewichte der Idealpositionen gehen Powerindizes gemäß der formalen oder informellen Machtverteilung zwischen politischen Agenten in die Modellierung ein. In Malawi, dessen politischer Prozess anhand dieses Modells empirisch analysiert wird, lassen sich vor allem informelle Machtverhältnisse feststellen. Diese sind durch die ausgeprägte Konzentration der Macht um den Präsidenten bestimmt. In der Literatur wird dieses Phänomen häufig mit *Big Man presidentialism* umschrieben (Bratton, 2007; van der Walle, 2003).

Die zweite Komponente bildet ein soziales Einflussmodell, das *belief formation* der relevanten Akteure durch Informationsaustausch über die Wirkung von Politikentscheidungen auf die Wohlfahrt sozio-ökonomischer Gruppen in Politiknetzwerken widerspiegelt. Die Zugehörigkeit zu einem solchen Politiknetzwerk ermöglicht somit Akteuren ohne formale legislative Entscheidungsmacht Teilnahme am politischen Entscheidungsprozess und Einfluss auf die Politikpräferenzen der politischen Agenten. Damit erlangen sie Einfluss auf die finale Politikentscheidung, obwohl sie formal keine legislative Abstimmungsmacht besitzen.

Die empirische Anwendung des vorgestellten Modells beruht auf selbst erhobenen Daten aus einer Politiknetzwerkstudie in Malawi im Jahr 2010. Zunächst zeigt die empirische Anwendung, dass das vorgeschlagene Modell sich sehr gut eignet, um partizipatorische Politikprozesse quantitativ zu modellieren und zu evaluieren. Des weiteren können Eigenschaften des politischen Prozesses in Malawi wie folgt charakterisiert werden. Kommunikation unter den für die Agrarpolitik relevanten Akteuren führt zu einem Konsensus über die Richtung der Agrarpolitik. Außerdem zeigt die Analyse politischer Machtverteilungen, die sowohl legislative Kontrolle als auch die Einbettung in Politiknetzwerke berücksichtigen, dass politische Akteure maßgeblich Interessengruppen beeinflussen. Damit spiegelt der Politikprozess in Malawi einen Top-down und nicht einen Bottom-up Prozess wieder. Letzter würde jedoch dem Ziel der Förderung eben solcher Prozesse durch internationale Organisationen entsprechen.

### **The Formation of Elite Communication Networks in Malawi: A Bayesian Econometric Approach**

Da Kommunikationsnetzwerke die Grundlage für den Informationsaustausch zwischen Akteuren bilden, analysiert dieser Beitrag Determinanten der Kommunikationsbeziehung zwischen zwei Akteuren. Im Vordergrund steht dabei zu untersuchen, ob Akteure ihren Kommunikationspartner gemäß seiner politischen Interessen oder gemäß seines Wissens über die Auswirkung politischer Entscheidungen

auf die Wohlfahrt der Gesellschaft wählen. Weitere Faktoren, die die Wahl des Partners beeinflussen können, sind strukturelle Faktoren wie die gemeinsame Mitgliedschaft in einer Organisation oder die politische Macht eines Akteurs (siehe zum Beispiel Moody, 2001; Knoke, 1990; Knoke et al., 1996).

Methodisch wird in diesem Beitrag ein Bayesianisches Modell verwendet, das die Berücksichtigung fehlender Werte sowohl in den exogenen Variablen als auch in der Netzwerkbeziehung erlaubt. Die empirische Anwendung dieses Modells beruht auf selbst erhobenen Daten aus einer Politiknetzwerkstudie in Malawi im Jahr 2010. Die Ergebnisse zeigen, dass vor allem strukturelle Faktoren die Wahl des Kommunikationspartners beeinflussen. Das Wissen des Kommunikationspartners über die ökonomischen Auswirkungen politischer Entscheidungen hat einen geringeren Effekt auf die Wahrscheinlichkeit zwischen zwei Akteuren eine Kommunikationsbeziehung zu beobachten als die gemeinsame Mitgliedschaft in Organisationen. Dennoch lässt sich empirisch belegen, dass eben solches Wissen die Wahrscheinlichkeit mit anderen Akteuren zu kommunizieren erhöht. Im Gegensatz dazu kann für eine Verzerrung der Kommunikation gemäß den politischen Interessen der Akteure keine empirische Evidenz gefunden werden. Mit Bezug auf die externe Beeinflussung von Kommunikationsstrukturen kann damit festhalten werden, dass der Aufbau von Dachorganisationen oder gemeinsamen Kommunikationsplattformen die Wahrscheinlichkeit, dass zwei Organisationen Informationen austauschen, erhöht wird, während Investitionen in die Akkumulierung von Wissen sich weniger stark in vermehrten Kommunikationsbeziehungen niederschlagen werden.

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## Appendix A

# Empirical Assessment of the Role of Political Institutions in Agricultural Policies

### A.1 Starting points of empirical analysis

Theories in comparative political economy focus on the effect of political institutions on economic policy choice and economic performance. The main questions that arise for empirical proofs of these theories are: i) Does theory predict effects of political institutions on policy outcomes that vary within countries or of institutions that vary solely between countries? and ii) Does theory predict effects of political institutions dependent on a specific (un)observed regime? Answers to these questions mainly determine the basic econometric framework used in the empirical analysis. If theory refers to the institutions with within country variation, fixed effect models are commonly used to estimate the treatment effect of institutional change on policy outcomes (see e.g. Chapter 4). If theory derives insights about the effect of institutions that are time-invariant within a country but show cross-country variation, cross-section models are preferred (see e.g. Chapter 4). Further, regarding the second question, econometric models considering latent regimes identified by observed country characteristics can be used to assess regime dependent effects of political institutions (see Chapter 3). Information on econometric methods which supports the decision on an econometric model can be found in Baltagi (2005) and Greene (2003), respectively. Further, this appendix refers to articles published by Beck and Katz that were often cited in political science (Beck et al., 2001; Beck and Katz, 2009, 2011).

Data used in comparative political economy are commonly denoted by time-series cross-section data (TSCS). Time-series cross-section data are repeated observations on a series of fixed (non-sampled) units where the units are of interest in themselves (see Beck et al., 2001). In the context of comparative political economy, one typically refers to countries as units  $i$  with  $i = 1, \dots, N$ , and years as time periods  $t$  with  $t = 1, \dots, T$ . Time-series cross-section data differ from panel data in the size of  $T$ , i.e. they have a relatively large  $T$ , and from time-series data in the size of  $N$ , i.e. they have a relatively small  $N$ . That is time-series cross section data are neither dominated by  $N$  nor by  $T$ .

In what follows, I assume different specifications of the following model:

$$y_{it} = \alpha + \beta x_{it} + u_{it}. \quad (\text{A.1})$$

Eq. A.1 denotes the standard pooled model where  $\alpha$  is a constant common to all units  $i$ ,  $y_{it}$  denotes the vector of the endogenous variable,  $x_{it}$  describes a vector of explanatory variables and  $u_{it}$  is an error term, which is independent and identically distributed  $IID(0, \sigma_v^2)$ . However, running pooled OLS on this model using TSCS data might cause biased results because, for instance, the presence of country and

time invariant factors not included into the vector of explaining variables are not considered by the model. Overall, the use of pooled OLS for TSCS leads to three main issues that are described in the following sections: i) heterogeneity, ii) dynamics and iii) robust inference.

## A.2 Heterogeneity

In terms of heterogeneity, one distinguishes between time- and country-specific heterogeneity. Country-specific heterogeneity is widely perceived as heterogeneity related to local time-invariant factors like geographic location. Time-specific and country-invariant factors are mostly considered as time shocks that affect policy choice in all countries in the same period. Prominent examples for such shocks are oil price shocks that disrupt economic production and growth. Both types of fixed effects are commonly not included into the vector of independent variables because they might be unobservable for researchers. However, estimation techniques like the fixed effect model allow considering unobservable heterogeneity among countries and years. In general, this is also the only heterogeneity researchers control for in political science. Nevertheless, there might be (even theoretically derived) parameter variation in explaining variables across countries or within countries across time (see Chapters 4 and 3). In such a case, considering just country- and time-specific intercepts will still lead to biased estimates (see Section A.2.3 for models that consider parameter heterogeneity).

Biased estimates arise in the presence of heterogeneity because pooling data neglects local- and time-invariant factors by setting  $\alpha = \alpha_{11} = \dots = \alpha_{nt}$ . This bias is also known as an omitted variable bias. Two common estimation techniques exist to control for unobserved heterogeneity, the random and the fixed effect model. Both models can be written as a two-way error component model (see Baltagi, 2005, p. 33ff.).

$$\begin{aligned} y_{it} &= \alpha + \beta x_{it} + u_{it}, \text{ with} \\ u_{it} &= \mu_i + \lambda_t + v_{it}. \end{aligned} \tag{A.2}$$

Here, the error term is split into country-specific parameters  $\mu_i$ , time-specific parameters  $\lambda_t$  and a remainder usual disturbance  $v_{it}$  that is independent and identically distributed  $IID(0, \sigma_v^2)$ . The difference between the fixed and random effect model lies in the underlying assumptions about the country- and time-specific parameters. While they are assumed to be random parameters,  $\mu_i \sim IID(0, \sigma_\mu^2)$  and  $\lambda_t \sim IID(0, \sigma_\lambda^2)$ , in the random effect model,  $\mu_i$  are assumed to be fixed parameters in the fixed effect model. Accordingly, inference in the fixed effect model is conditional on the observed units.

In comparative political economy, the fixed effect approach is mostly preferred over the random effect approach due to the assumption of fixed, non-sampled effects. Assuming fixed effects as country and time effects is the appropriate specification because countries, the units of interest, and years, the periods of interest, are not a randomized but fixed set. The reverse is true for micro panel data like household surveys that try to draw units at random from a large population to make the

panel representative.<sup>1</sup> Further, consider that a policy variable is allowed to be systematically correlated with the country effects without rendering the fixed effect model inconsistent (see Wooldridge, 2002). In particular, within-transformation, as explained in detail below, wipes out the country effects. Hence, correlation between the policy variable and the fixed effects does not lead to inconsistent parameter estimates. That is a fixed effect model enables researchers to estimate the effect of a policy variable, i.e. an institutional regime switch, consistently, even if time-invariant characteristics would affect the policy as well as the endogenous variable (see Chapter 4).

Nevertheless, the commitment to model heterogeneity via fixed parameters arises problems in estimating the effect of time-invariant variables. However, these effects are of substantial interest for political economist because they derive theories about the local time-invariant country characteristics, i.e. political institutions. Thus, Section A.2.1 discusses methods for analysing the effect of observable, time-invariant cross-country heterogeneity in presence of unobservable time-invariant heterogeneity.

Regarding the fixed effect model, eq. A.2 is estimated by a so called within transformation, which no longer uses between country variation to estimate parameters (Baltagi, 2005, p. 33ff.). Within transformation corresponds to time- and unit-demeaning data as described in eq. A.3:

$$\begin{aligned}
 (y_{it} - \bar{y}_i. - \bar{y}_t + \bar{y}..) &= \beta(x_{it} - \bar{x}_i. - \bar{x}_t + \bar{x}..) + (v_{it} - \bar{v}_i. - \bar{v}_t + \bar{v}..) & (A.3) \\
 \text{with } \bar{y}_i. &= \alpha + \beta\bar{x}_i. + \mu_i + \bar{v}_i. \text{ and} \\
 \bar{y}_t &= \alpha + \beta\bar{x}_t + \lambda_t + \bar{v}_t \text{ and} \\
 \bar{y}.. &= \alpha + \beta\bar{x}.. + \bar{v}.. .
 \end{aligned}$$

This procedure cancels the direct estimation of the fixed effects. Therefore, the assumption of no correlation between  $v_i$  and  $x_{it}$  to run OLS is not binding and one can estimate eq. A.2 using OLS. Dropping the assumption of no correlation is another advantage of the fixed effect model over the random effect model. The latter relies upon this assumption for an unbiased estimation. In general, the random effect model combines the fixed effect estimator with a between-estimator, i.e. an estimator that just relies on between-variation. The result is a weighted estimator with a weight  $\theta$  depending on the variance of  $\mu_i$ ,  $\lambda_t$  and  $v_{it}$ . If  $\theta$  is now less than one, the country-specific effects still persist in the model. Hence, OLS is biased, if the country-effects are correlated with the independent variables.

Instead of time-demeaning, including dummies for every  $i$  and every  $t$  would also delete between-country and between-time variation. That is, one uses  $N - 1$  country fixed effects and  $T - 1$  time fixed effects to estimate  $\mu_i$  and  $\lambda_t$  in eq. A.2. Thus, the total country-(time-)specific effects are  $\alpha + \mu_i(\lambda_t)$  with  $\alpha$  being the intercept of the first country and the first year.

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<sup>1</sup>Further there exist econometric tests that help to choose the right model for specific data sets. I do not go into detail here because random effects models are not the appropriate models in comparative political economy.

### A.2.1 Observed vs. unobserved time-invariant heterogeneity

The most known problem inherent to fixed effects models is the estimation of time-invariant variables.

$$\begin{aligned} y_{it} &= \beta x_{it} + \phi z_i + u_{it}, \text{ with} \\ u_{it} &= \mu_i + \lambda_t + v_{it}, \end{aligned} \tag{A.4}$$

where  $x_{it}$  now denotes the vector of time-varying variables and  $z_i$  the vector of time-invariant variables. By estimating this model, the individual fixed effect fully absorbs the effect of the time-invariant variables due to multicollinearity. Further, the within transformation will wipe out the time-invariant variables because it holds:

$$z_i = \frac{1}{T} \sum_{t=1}^T z_i = \bar{z}_i \tag{A.5}$$

and thus,

$$(z_i - \bar{z}_i) = 0. \tag{A.6}$$

But, given that political institutions are a predominantly time-invariant feature of countries, the impact of this observed heterogeneity is of particular interest in comparative political economy. Thus, one applies specific estimation techniques to empirically assess the impact of observed time-invariant heterogeneity on, e.g., policy outcomes in the presence of unobserved heterogeneity. All these techniques imply assumptions about the relationship between  $x_{it}$ ,  $\mu_i$  and  $z_i$ .

One approach suggested by Plümper and Troeger (2007) is the fixed effect vector decomposition model (FEVD). It is widely used by researchers<sup>2</sup> but also often criticized (see Greene, 2010; Breusch et al., 2010; Mitze, 2009). In general, the FEVD is a three step procedure with first running a common fixed effect model, second decomposing the vector of estimated fixed effects  $\hat{\mu}_i$  into a part explained by time-invariant variables  $z_i$  and an unexplained part  $h_i$  by OLS estimation and finally, employing  $h_i$  in eq. A.4 to estimate a model including unobserved and observed time-invariant country heterogeneity.

In particular, Plümper and Troeger's logic of country fixed effects as estimated by a common fixed effect model  $\hat{\mu}_i$  is that  $\hat{\mu}_i$  includes unobserved time-invariant heterogeneity, the country means of the residuals and time-varying variables as well as observable time-invariant heterogeneity characterized by  $z_i$ . Hence, one needs to disentangle the first two components of the fixed effect from observed heterogeneity for estimating the parameters of time-invariant variables with an unbiased model. Plümper and Troeger (2007) suggest regressing the  $\hat{\mu}_i$  on the observed time-invariant variables  $z_i$ :

$$\hat{\mu} = \gamma z_i + h_i, \tag{A.7}$$

where  $h_i$  now denotes the part of the estimated fixed effects which is unexplained by variation in  $z_i$ . That is their procedure now enables estimating a consistent model

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<sup>2</sup>A search by Google Scholar shows 414 citations of Plümper and Troeger (2007) (Date: 07.05.2012).

with unobserved and observed country-specific heterogeneity by including a vector of fixed effects that is uncorrelated with the time-invariant variables by assumption:

$$y_{it} = \beta x_{it} + \phi z_i + \delta h_i + \lambda_t + v_{it}. \quad (\text{A.8})$$

Note that the assumption of no correlation between  $z_i$  and  $h_i$  only holds true, if  $z_i$  is not correlated with the country means of the time-varying variables and the error term. Otherwise step 2 (and step 3) will yield biased estimates of  $z_i$ . In this case, Plümper and Troeger (2011) propose to use an instrument variable regression in step 2 with internal or external instrument variables.

A weakness of Plümper and Troeger’s article in 2007 is that it does not explicitly derive the variance-covariance matrix used to compute the standard errors in step 3. Here, Greene (2011b) argues that suggesting a pooled OLS in step 3 leads the applied researcher to use the standard variance-covariance matrix of OLS. Indeed this matrix would result in smaller standard errors than the appropriate matrix, i.e. the matrix of step 1 (Greene, 2011a,b). Based on this criticism, Plümper and Troeger have written a Stata ado-file that produces correct standard errors for  $\beta$  and  $\phi$ . In their recent paper in *Political Analysis*, they further test the performance of different standard error corrections used by themselves in an updated Stata ado-file and proposed by Greene (2011a) and Breusch et al. (2010) (Plümper and Troeger, 2011). Their simulation results reveal that their implemented matrix performs better than every other matrix, if N and T are above 20. Finally, the FEVD model estimates consistent parameters and reliable standard errors, if the assumptions of the model hold for the specific data generating process.

The FEVD is often compared to the commonly accepted model of Hausman-Taylor (Hausman and Taylor, 1981). Hausman and Taylor (HT) proposed an instrument variable approach using instrument variables from within the model. Thereby, HT is able to estimate consistent parameters, if time-varying as well as time-invariant variables are correlated with the unobserved country effects. Further, applying HT yields parameter estimates of time-invariant variables that cannot be derived from common fixed effect models. Overall, HT suggests the following model:

$$\hat{\Omega}^{-1/2} y_{it} = \hat{\Omega}^{-1/2} x_{it} \beta + \hat{\Omega}^{-1/2} z_i \phi + \hat{\Omega}^{-1/2} u_{it}, \text{ with} \quad (\text{A.9})$$

$$u_{it} = \mu_i + \lambda_t + v_{it},$$

where  $\hat{\Omega}^{-1/2}$  is unknown. To derive an estimate of  $\hat{\Omega}^{-1/2}$ , HT assumes that independent variables can be split into four sets: i)  $x_{1it}$  denotes the vector of exogenous time-varying variables, ii)  $x_{2it}$  denotes the vector of endogenous time-varying variables, iii)  $z_{1i}$  is the vector of exogenous time-invariant variables and iv)  $z_{2i}$  is the vector of endogenous time-invariant variables.  $\mu_i$  is estimated as a random effect with zero mean and finite variance. Based on these ex ante classified sets, HT is now able to estimate the variance components of  $\hat{\Omega}^{-1/2}$ , which are needed to apply standard random effects generalized least squares (GLS) on eq. A.9, via two auxiliary regressions. First, HT employs a fixed effect regression to obtain within residuals. These residuals are used to identify the variance of the idiosyncratic error component  $\sigma_{v_{it}}^2$ . Secondly, HT regresses the within residuals on the time-invariant



variables  $z_{1i}$  and  $z_{2i}$  instrumenting the endogenous time-invariant variables  $z_{2i}$  with the country means of  $x_{1i}$  and  $x_{2i}$  and the within changes of  $x_{1i}$  and  $z_{1i}$ . This second step enables HT to estimate the variance of the random effect  $\sigma_\mu^2$ . Hence, a variance-covariance matrix can be computed to obtain an GLS estimator,  $\hat{\Omega}^{-1/2}$ , of the regression coefficients.

Comparing now both models, it is important to note that the FEVD procedure also allows for instrument variable estimation in step 2.<sup>3</sup> In fact, using at step 2 the same (valid) instruments as used by HT would render the FEVD identical to HT (see Plümper and Troeger, 2011). But FEVD provides an extension that is not applicable to the HT model. FEVD allows including external instruments, while HT only considers the right hand side variables as instruments. Part of the discussion about using HT or FEVD respectively, is the assumption that right hand side variables are valid instruments for time-invariant variables. However, the final model choice will depend on, whether theory predicts a relationship between, for instance, the country mean of independent variables and time-invariant variables which would render them valid instruments in the HT (see Plümper and Troeger, 2011).

Further, the proposed models differ in their assumption about the country specific effects. While HT assumes a randomly distributed effect, Plümper and Troeger use a non-stochastic effect. In other words, Plümper and Troeger assume that all time-invariant heterogeneity is, even if unobserved, not randomly assigned to countries. Regarding comparative political economy, this assumption is plausible. Researchers agree on non-random country attributes as driving force behind country heterogeneity.

### A.2.2 Group related intercept heterogeneity

Usually, one can test with an  $F$  test the joint significance of included dummy variables in a fixed effect model, i.e. in case of country fixed effects  $H_0 = \mu_1 = \mu_2 = \dots = \mu_{N-1} = 0$ . In a two-way error component model, testing  $H_0 = \mu_1 = \mu_2 = \dots = \mu_{N-1} = 0$  allowing  $\lambda \neq 0$  the  $F$ -statistic is given as

$$F = \frac{(RRSS - URSS)/(N - 1)}{(URSS/(N - 1)(T - 1) - K)} \sim F_{(N-1), ((N-1)(T-1)-K)}, \text{ where} \quad (\text{A.10})$$

$RRSS$  denotes the restricted residual sums of squares of OLS with time dummies only,  $URSS$  is the unrestricted residual sum of squares from the within regression given by eq. A.3 and  $K$  is the number of explanatory variables.

However, such a test only reveals the joint significance of all country-fixed effects rejecting the null hypothesis potentially due to a few outlying countries. Here, Beck et al. (2001) propose a cross validation experiment discussed by Stone (1974) adapted to time-series cross-section. This experiment explicitly allows testing whether heterogeneity is just related to groups of countries or whether the sample is indeed completely heterogeneous. To run the experiment, one estimates eq. A.1  $N$ -times

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<sup>3</sup>Note that Plümper and Troeger (2007, 2011) and Breusch et al. (2011) provide results of extensive Monte-Carlo-Experiments comparing the efficiency and consistency of different estimation methods for estimating parameters of time-invariant variables in the presence of fixed effects.

with  $N - 1$  countries and calculates the prediction  $\hat{y}_{it}$  of the omitted country's dependent variable based on the coefficients of the pooled regression. Next, country specific heterogeneity can be identified via mean squared forecast errors (MSFE):

$$\text{MSFE} = (y_{it} - \hat{y}_{it})^2. \quad (\text{A.11})$$

Comparing the country specific MSFE's unveils countries that are less well predicted via pooled regression. With this information at hand, a dummy variable for each of the less well fitted countries (or for a set of less well fitted countries)  $D_i$  can be added to eq. A.1. It follows:

$$\begin{aligned} y_{it} &= \alpha + \beta x_{it} + D_i + u_{it}, \text{ with} \\ u_{it} &= \lambda_t + v_{it}. \end{aligned} \quad (\text{A.12})$$

To ensure a valid assessment of country specific heterogeneity, researchers might employ Akaike (AIC) and Schwarz (BIC) information criteria to compare partial-non pooled models with fixed effect models:

$$\text{AIC}(K) = \log\left(\frac{\text{RSS}}{n}\right) + \frac{2K}{n} \quad (\text{A.13})$$

$$\text{BIC}(K) = \log\left(\frac{\text{RSS}}{n}\right) + \frac{K \log(n)}{n}, \quad (\text{A.14})$$

with  $n$  denoting the number of observations,  $\text{RSS}$  the squared sum of residuals and  $K$  the number of explaining variables. These criteria are applicable in case models are non-nested due to consideration of time-invariant variables in the partial-non pooled model. A lower value of these criteria for the partial-non pooled model compared to the fixed effect model would indicate that heterogeneity appears solely due to some less fitted countries in the pooled case. That is the partial-non pooled model is a valid specification of country specific heterogeneity. Both measures support achieving a better fit with a lower number of parameters, as values of both criteria increase with a decreasing last term in eq. A.13 and eq. A.14.

Note that this approach only accounts for time-invariant country heterogeneity as considered in a fixed effect specification. The cross-validation experiment would also apply to detecting parameter heterogeneity. The following section gives a more detailed description of heterogeneity in parameter values.

### **A.2.3 Heterogeneous parameter values**

Most studies in comparative political economy assume that countries only differ in country specific intercept heterogeneity and apply fixed effects models. However, there can be theoretical reasons to go beyond this limited understanding of heterogeneity. Heterogeneity might also arise from variation of the effects of explanatory variables related to time, regimes or countries, respectively. In econometric models this type of heterogeneity is modelled via allowing the  $\beta$  to depend on the drivers of heterogeneity. Compared to standard TSCS methods, these methods do not only pass heterogeneity to the error term but consider the parameter heterogeneity for estimation (see also Western, 1998; Beck, 2007).

A commonly used method to model slope heterogeneity is the random coefficient model (RCM):

$$y_{it} = \alpha_i + \beta_i x_{it} + u_{it}, \quad (\text{A.15})$$

where

$$\beta_i = \beta + b_i \text{ and} \quad (\text{A.16})$$

$$E[b_i | X_i] = 0 \quad (\text{A.17})$$

$$E[b_i b_i' | X_i] = \Gamma \quad (\text{A.18})$$

Note, that the random coefficient model is identical to the random effects model, if only the constant term is assumed to be random in the RCM. Following eq. A.15  $\beta_i$  is the outcome of a random process with mean  $\beta$  and covariance matrix  $\Gamma$  under the assumption of no autocorrelation or cross-sectional correlation. Finally, an estimator of  $\Gamma$  is required to estimate the model. While Swamy (1971) provides in this context a feasible GLS estimator applicable to RCMs, these models can also be fitted by maximum likelihood or Bayesian methods (Greene, 2003).

With regard to determinants of heterogeneous parameter values, hierarchical approaches are applied estimating the parameters as a function of time-invariant variables  $z_i$  moderating the impact of  $x$  on  $y$  (see Western, 1998; Beck, 2007). However, such approaches do still not capture that the influence of explaining variables will vary with a country-time specific latent regime. In this case, one can use other advanced econometric methods to estimate consistent and theoretically founded parameters. If regimes are observed, sample selection models like Heckman's two step estimation procedure allow estimating regime dependent  $\beta$ s (see Greene, 2003, p. 780ff.). If regimes are unobservable, the estimation of regimes and thereby of consistent  $\beta$ s is not straightforward. Here, consistent  $\beta$ s can be estimated via a two-step procedure. This procedure first estimates the probability of observing a latent regime in a country depending on observable country characteristics. In a second step, regime-dependent parameters are estimated for the variables of interest. The model equation of such a latent regime model (LRM) is:

$$y_{it}^{R_{it}} = \alpha + \beta_{it}^{R_{it}} x_{it} + u_{it}, \quad (\text{A.19})$$

where  $R$  is the variable denoting the latent regime. Note that, while the RCM assumes a continuous distribution of  $\beta_i$ , LRMs suppose a discrete distribution with  $R$  regimes. To estimate now the regime dependent impact of  $x_{it}$  on  $y_{it}$ , one needs to identify the probability that an observation of the endogenous variables is determined by a specific latent regime. Since determinants  $w_{it}$  of the probability that an observation belongs to a specific regime can be derived theoretically, probabilities can be modelled in a logit type regression framework (Diebold et al., 1994). Further, probabilities to be in a specific regime are also determined by the recent regime state. That is the model considers both, regime switching of countries and regime persistence within a country. For further information on estimating regime switching models, see Section 3.3.2.

### A.3 Dynamics

Eq. A.1 is the common static specification of the relation between  $x$  and  $y$  where any change in the independent variable  $x$  effects  $y$  immediately. However, modelling just the immediate impacts might be misleading, because effects can also persist or decline over time. In this case the correct model includes lagged values of dependent variables. Here, researchers have different models at hand that can be used to specify the underlying dynamic process. Further, dynamic processes in data lead to biased standard errors because the usual applied estimator of the covariance matrix of the OLS estimator is inconsistent in case of serially correlated error terms. Hence, this section will discuss several ways to model serial correlation in independent variables and errors. These models will be special cases of the autoregressive distributed lag model ADL(M,K). The notation ADL(M,K) specifies the number of included lags of the endogenous variable (M) and of exogenous variables (K). However, consider first the general concept of dynamic processes.

In general, a dynamic regression model is characterized by the following equation:

$$\begin{aligned} y_{it} &= \alpha + \sum_{r=0}^{\infty} \beta_r L^r x_{it} + u_{it} \\ &= \alpha + B(L)x_t + u_{it}, \end{aligned} \tag{A.20}$$

where  $L^r$  is the standard lag operator  $L^r = x_{(t-r)}$  and  $B(L)$  a polynomial in  $L$ . From this model short- and long-run multipliers can be derived. If  $r = 0$ ,  $\beta_0$  describes the immediate effect of  $x$  on  $y$ . That is,  $\beta_0$  is the short-run multiplier. The long-run multiplier  $\beta$  is defined as the cumulated effect over time:

$$\beta = \sum_{r=0}^{\infty} \beta_r. \tag{A.21}$$

This general model can be differentiated regarding the assumption underlying the duration of lagged effects. If the effects of lagged variables gradually fade out over time, infinite lag models will be used. If theory suggests that the effect will die out after a short period of time, finite lag models are estimated. In both cases severe estimation problems arise (Greene, 2003). As eq. A.20 increases the number of parameters to be estimated, it reduces simultaneously the number of observations that are available for estimation. The reduction in degrees of freedom will be even more severe with increasing lag length, where the optimal lag length is mostly unknown to the researcher. Thereby, reducing lag length to increase degrees of freedom is no alternative. Further, the inclusion of lagged values of the same variable might rise the problem of multicollinearity. As infinite lag models are commonly used in comparative political economy, further notes will consider only solutions to estimate eq. A.20 for models of such type. Information on the estimation of finite lag models can be found in Greene (2003, p.565).

A well-known approach to estimate distributed lag models is the assumption of a

specific polynomial in the lag operator (Greene, 2003, p.563):

$$A(L) = \sum_{r=0}^{\infty} (\rho L)^r, \quad (\text{A.22})$$

where  $\rho$  describes the ratio between  $\beta_{r+1}$  and  $\beta_r$ . This ratio is constant for all  $r$ . Thus,  $\rho$  denotes the weight with that the influence of past values of  $x$  fade out. Equation A.22 reduces to

$$A(L) = \frac{1}{1 - \rho L}, \quad (\text{A.23})$$

if  $|\rho| < 1$  (convergence of geometric series). In general, this polynomial proposes that effects of  $x$  on  $y$  decay geometrically and for all variables in  $x$  at the same rate.

Replacing now the lag operator in eq. A.20 by the specific polynomial in eq. A.22

$$y_{it} = \alpha + \beta_0 \sum_{r=0}^{\infty} (\rho L)^r x_{it} + u_{it} \quad (\text{A.24})$$

and using eq. A.23 leads to

$$y_{it} = \alpha + \beta_0 \frac{1}{1 - \rho L} x_{it} + u_{it}. \quad (\text{A.25})$$

After some rearrangements, a model with a lagged dependent variable and without lagged independent variables results as follows:

$$y_{it} = \alpha(1 - \rho) + \rho y_{i,t-1} + \beta_0 x_{it} + (1 - \rho L)u_{it}, \quad (\text{A.26})$$

with  $0 < \rho < 1$ .  $\rho$  denotes the inertia of the process. Note that  $L\alpha = \alpha$  because  $\alpha$  is a constant. While  $\beta_0$  is still the short-run multiplier, the long run multiplier can be computed via:

$$\beta = \frac{1}{1 - \rho} \beta_0. \quad (\text{A.27})$$

Note that the model reduces the general dynamic model to a moving-average form. It follows that OLS estimation of eq. A.26 is inefficient due to serial correlation of the disturbances. However, in case of serially correlated error terms in a static model (eq. A.1), i.e.

$$u_{it} = o_{it} + \rho u_{i,t-1}, \quad (\text{A.28})$$

dynamic models eliminate this problem. Consider therefore that rearranging eq. A.28 leads to

$$u_{it} - \rho u_{i,t-1} = o_{it} = (1 - \rho L)u_{it}. \quad (\text{A.29})$$

That is, the error term in model eq. A.26 is no longer serially correlated.

### A.3.1 Partial adjustment model

Of special interest for estimating the effect of political institutions on policy outcomes like protection rates is the model of partial adjustment. This model is closely

related to the model in eq. A.26. However, on contrary to eq. A.26, the partial adjustment model is theoretically founded (see Greene, 2003). Overall, the model is an ADL model with  $K = 1$  and  $M = 0$ .

The partial adjustment model assumes a long-run equilibrium relation between the exogenous and endogenous variables:

$$y_{it}^* = \alpha + \beta x_{it} + u_{it}. \quad (\text{A.30})$$

$y_{it}^*$  describes the equilibrium response of  $y$  on  $x$ . This long-run equilibrium is not observed in each period because costs inhibit an immediate adjustment of  $y$  to changes in  $x$ . Thus, a second relation, the adjustment relation, results as follows:

$$y_{it} - y_{i,t-1} = (1 - \rho)(y_{it}^* - y_{i,t-1}), \quad (\text{A.31})$$

where  $(1 - \rho)$  determines to what extent  $y_t$  responds to a change in  $x_t$  immediately. Solving now eq. A.31 for  $y_{it}$  and inserting eq. A.30 for  $y^*$  yields:

$$\begin{aligned} y_{it} &= \alpha(1 - \rho) + \rho y_{i,t-1} + \beta(1 - \rho)x_{it} + (1 - \rho)u_{it} \\ &= \alpha' + \rho y_{i,t-1} + \beta' x_{it} + u'_{it} \\ \text{with } \alpha' &= \alpha(1 - \rho) \\ \beta' &= \beta(1 - \rho) \\ u'_{it} &= (1 - \rho)u_{it} \end{aligned} \quad (\text{A.32})$$

Overall, OLS estimation of eq. A.32 is consistent and efficient because the model is linear in parameters and the error terms are not autocorrelated by construction. Hence, this model suggests an approach to solve serially correlated error terms based on theoretical considerations.

### A.3.2 Serially correlated error models

Eq. A.28 and eq. A.29 already show that dynamic models with lagged dependent variables eliminate serial correlation in error terms. Another approach to solve this problem is the assumption of a first-order autoregressive process (AR1) in the error terms and to estimate a consistent covariance matrix of the OLS estimator dependent on the autocorrelation parameter  $\rho$ . However, as tests on the dynamics in agricultural protection rates support the use of the lagged dependent variable to capture model dynamics, I do not go into further detail here how consistent estimates of  $\Omega(\rho)$  can be obtained. Further information is given by Greene (2003, p. 273).

### A.3.3 Fixed effects and lagged dependent variables

Since the work of Nickell (1981) it is well-known that fixed effect models with lagged dependent variables are biased. First, a bias arises because the lagged endogenous variable of  $y_{i,t-1}$  is correlated with country fixed effects  $\mu_i$ . Secondly, even if within transformation eliminates this kind of bias, the transformation produces a new bias due to a correlation between  $\tilde{y}_{i,t-1}$  and  $\tilde{v}_{it}$ , where  $\tilde{y}_{i,t-1}$  denotes the demeaned  $y_{i,t-1}$

and  $\tilde{v}_{it}$  the demeaned  $v_{it}$ :

$$\begin{aligned}\tilde{y}_{i,t-1} &= y_{i,t-1} - \frac{1}{T_i} \sum_{t=1}^{T_i} y_{i,t-1} \\ \tilde{v}_{i,t} &= v_{i,t} - \frac{1}{T_i} \sum_{t=1}^{T_i} v_{i,t}.\end{aligned}\tag{A.33}$$

Consider that  $\tilde{y}_{i,t-1}$  contains  $v_{i,t-1}$  with weight  $1 - (1/T_i)$  and that  $v_{i,t-1}$  is part of  $\tilde{v}_{it}$  with weight  $1/T_i$ . Nickell estimates the bias of the within transformation to be of order  $(1/T_i)$ . Thus, the bias decreases with increasing  $T$ .

Three main approaches are discussed in literature about dynamics in micro- and macro panel data. First, the IV procedure of Anderson and Hsiao (1981) (AH) is mentioned to solve simultaneity in dynamic panel data estimation. They developed a model based on first differencing eq. A.26:

$$y_{it} - y_{i,t-1} = \rho(y_{it-1} - y_{i,t-2}) + \beta(x_{it} - x_{i,t-1}) + u_{it} - u_{i,t-1}.\tag{A.34}$$

This approach wipes out the country fixed effects that might be correlated with the exogenous variables and that are in fact correlated with the lagged endogenous variable. Thus  $\Delta y_{i,t-1}$  and  $\Delta u_{i,t}$ , where  $\Delta$  denotes the difference operator, are still correlated in this model. To solve the endogeneity, AH suggest to use  $\Delta y_{i,t-2}$  or  $y_{i,t-2}$  as instruments for the first difference of  $y$ ,  $\Delta y_{i,t-1}$ . Under the assumption of no serial correlation in the error terms  $v_{it}$ , these instruments are not correlated with the  $\Delta u_{i,t}$ . In terms of efficiency Arellano (1989) shows that using the levels instead of the differences as instruments will lead the efficiency gains.

Second, a wide range of procedures exist that use generalized methods of moment (GMM) to improve the AH-IV estimation. The basic idea behind these models is to exploit the number of instruments provided by the panel data structure. Increasing the number of instruments can lead to efficiency gains. Thus, Arellano and Bond (1991) showed that all variables dated two periods earlier are valid instruments for  $\Delta y_{i,t-1}$ . Consider the following reduced example with  $t = 4$  (Baltagi, 2005):

$$y_{i,4} - y_{i,3} = \rho(y_{i,3} - y_{i,2}) + \beta(x_{i,4} - x_{i,3})(u_{i,4} - u_{i,3})\tag{A.35}$$

Here,  $s_{it} = (y_{i,1}, y_{i,2})$  is the set of applicable instruments because both variables are correlated with  $(y_{i,3} - y_{i,2})$  and uncorrelated with the differenced error term. However, the latter holds only if the disturbances are not serially correlated. Thus, the AH-IV set of instruments is expanded by  $y_{i,1}$ . In terms of moment conditions it holds:

$$E[y_{i,t-r} \Delta u_{it}] = 0, \quad t = 3, \dots, T, \text{ and } r \geq 2,\tag{A.36}$$

depending on two assumptions. First, error terms  $u_{it}$  are serially independent:

$$E[u_{i,t} u_{i,r}] = 0, \quad i = 1, \dots, N, \text{ and } \forall t \neq r.\tag{A.37}$$

Second, the  $y$  observed in period one is not correlated with any disturbance in period

$t$ :

$$E[y_{i,1}u_{i,t}] = 0, \quad i = 1, \dots, N, \text{ and } t = 2, \dots, T. \quad (\text{A.38})$$

Under these assumptions, it is evident that all dependent variables dated two and more periods ago are not correlated with the first difference in disturbance at  $t$  and can thus serve as instruments for  $\Delta y_{i,t-1}$ .

Another GMM model is suggested by Blundell et al. (1998) building on the work of Arellano and Bover (1995) (AB-GMM estimator). This model relates to the work of Hausman and Taylor using a system of two equations, the difference equation and the level equation. The latter allows including more variables in the set of instruments due to imposing some more initial restrictions on the moment conditions. Blundell et al. (1998) derived this extended GMM-estimator because the AB-GMM estimator performs poorly if the autoregressive process is relatively persistent or if the ratio of the variance of country fixed effects to the variance of error term is too large (Blundell and Bond, 1998, p. 120).

Third, Kiviet (1995) has developed the idea of a bias corrected estimator. This alternative approach relies upon deriving a formula for estimation of the bias in dynamic LSDV models. In a second step, the estimated bias is subtracted from the estimated LSDV coefficients. With the work of Bruno (2005) the corrected estimator is now also applicable to the unbalanced panel data case. In Bruno (2005), the bias formula depend on the variance of the error terms  $\sigma_u^2$  and on the autocorrelation parameter  $\rho$ . To estimate the bias, the above explained GMM- or IV-estimators are used to obtain consistent estimates of  $\sigma_u^2$  and  $\rho$ . Finally, the bias terms are subtracted from the LSDV estimators.

Since Nickell (1981) has shown that the bias in dynamic fixed effect models is decreasing in  $T$ , it might be even insignificant in the time-series cross-section data case. The application of above described estimation procedures is discussed by Beck and Katz (2009, 2011) and Judson and Owen (1999) for large  $T$ . Monte-Carlo simulations presented by these authors compare the efficiency and consistency of alternative estimators to the standard OLS estimator. They conclude that standard LSDV estimation should be used with unbalanced time-series cross-section data if  $T$  is relatively large. However, information about the performance of the corrected LSDV estimator for unbalanced panel data is not given by these studies.

## A.4 Robust statistical inference

For valid statistical inference in OLS models, each disturbance is assumed to have the same finite variance  $\sigma^2$  and to be uncorrelated with every other disturbance. If these assumptions are fulfilled, the usual OLS standard error of an estimator can be derived as the square root of the  $k$ th diagonal element of the sample estimate of the variance matrix  $\{[s^2(X'X)^{-1}]_{kk}^{1/2}\}$ , where  $s^2$  is an unbiased estimate of  $\sigma^2$ . Note that this sample estimate can only be obtained if the assumption of homoskedasticity holds. In case the assumption fails, the final asymptotic variance will be different. Hence, a corrected form of the variance matrix must be derived to obtain asymptotically valid standard errors.

In terms of TSCS data, the assumptions of IID errors might be violated in many



cases. Three issues that hinder the use of standard OLS errors for robust inference might arise: i) heteroskedasticity, ii) panel-wise correlated errors and iii) serially correlated errors. The latter problem is also described in Section A.3 proposing the use of a lagged dependent variable or AR1 errors to solve serial correlation in the error terms. Regarding the first problem, consider that variances in errors might not be the same for different countries because the scale of the dependent variable varies between countries (compare protection rates in Iceland and the United States, for instance).

In case of heteroskedasticity, White (1980) has developed a heteroskedasticity-robust variance matrix of the estimator  $\beta$  using the law of large numbers:

$$\hat{V}_{HR}(\hat{\beta}) = (X'X)^{-1} \left( \sum_i^N \sum_t^T \hat{u}_{it}^2 x'_{it} x_{it} \right) (X'X)^{-1}, \quad (\text{A.39})$$

with  $\hat{u}_{it}$  denoting the OLS residual (Wooldridge, 2002). Again the  $k$ th diagonal element of the matrix provides the standard error. Based on the structure of the estimated variance-covariance matrix, the estimator is also well-known under the name "sandwich" estimator. If errors are correlated within countries

$$E[u_{it}u'_{jt}] = 0, \text{ for } i \neq j, \quad (\text{A.40})$$

one uses the following cluster-robust variance estimator:

$$\hat{V}_{CR}(\hat{\beta}) = (X'X)^{-1} \left( \sum_i^N X_i \tilde{u}_i \tilde{u}'_i X'_i \right) (X'X)^{-1}, \quad (\text{A.41})$$

where  $\tilde{u}_i$  are in the simplest case, the OLS residuals  $\hat{u}_i$ , and  $N$  is the number of clusters, i.e. countries. However, for accurate inference in case of clustered errors, the number of clusters has to be large. Otherwise, the assumption that

$$E[u_i u'_j] = \Omega \neq E[\hat{u}_i \hat{u}'_j] \quad (\text{A.42})$$

does not hold. Here, Kezdi (2004) explicitly shows that a number of clusters greater than 50 allows for unbiased standard errors using eq. A.41. Hence, in case of small cluster sizes ( $N < 50$ ) Cameron et al. (2008) suggest to use a wild bootstrap cluster-robust estimator. In particular, this method forms  $b$  pseudosamples by resampling the residuals from usual OLS to obtain new values of the dependent variable  $y$  with  $b$  indicating the number of resampling steps. That is the pseudovalues of  $y$  are calculated as:

$$\hat{y}_i^* = x_i \hat{\beta}_{ols} + \hat{u}_i^*, \quad (\text{A.43})$$

where  $\hat{u}_i^*$  is a resampled usual OLS residual. Both, the residuals and the  $\beta$ s, are obtained from restricted OLS on the original sample imposing  $H_0 : \beta_1 = 0$ . The resampling is carried out at cluster level. The residuals  $\hat{u}_i$  from OLS are assigned with probability 0.5 as  $+\hat{u}_i = \hat{u}_i^*$  and with probability 0.5 as  $-\hat{u}_i = \hat{u}_i^*$  to regressors  $x_i$  within each cluster to obtain the new values of  $y_i^*$ . Finally, Cameron et al. (2008)

use this pseudosample to obtain the Wald test statistic for an estimator  $\beta$ :

$$w_b^* = (\hat{\beta}_{1b}^* - \beta^0) / s_{\hat{\beta}_{1b}^*}, \quad (\text{A.44})$$

where  $\hat{\beta}_{1b}^*$  is obtained from unrestricted OLS estimation using the  $b$ th pseudo-sample and  $\hat{s}_{1b}^*$  is the cluster corrected standard error. They run this estimation for each of the generated pseudo-samples to obtain a respective distribution of the statistic of interest. Based on this distribution, inference about the original sample statistic calculated via the usual cluster-robust variance estimator is obtained.

## A.5 Endogeneity of political institutions

Further, consider that most empirical analyses in comparative political economy suffer from the non-existent or in part marginal, institutional variation in a country to isolate the theoretically derived effects. That is one can rarely observe the effect of the counterfactual institution for the policy choice or performance in a country. As noted by Persson et al. (2003) this would be no problem for estimating the causal effects of political institutions in a world of randomly assigned constitutions. Here, it would hold that the unobserved, counterfactual outcome in country  $i$  with political institution  $PI_1$  is equal to the observed, actual outcome in country  $j$  with political institution  $PI_2$ . Hence, one would estimate the effect of political institutions as the observed difference in the average policy outcome between country  $i$  and country  $j$  (see Persson et al., 2003, p.113ff.). However, political institutions are by far not randomly assigned. On contrary, there exist unobserved determinants that affect political institutions as well as policy outcome, i.e. it holds:

$$E(u_{it}|X) \neq 0. \quad (\text{A.45})$$

That is political institutions and policy outcomes are determined by the same factors. Hence, one cannot assume that the difference in observed outcomes between country  $i$  and country  $j$  just reflects the influence of the political institutions. Researchers therefore choose estimation techniques, for instance instrument variable models, to control for the selection bias in institutional choice.

The first step of an instrument variable approach is to derive an instrument  $ZV$  from the theory of constitutional choice that has high predictive power regarding the explanation of variance in constitutional rules  $S$  across countries. However, these variables need to be uncorrelated with the error term in the model equation. Overall it must hold:

$$1. \text{ Relevance : } Cov(ZV, S) \neq 0 \text{ and} \quad (\text{A.46})$$

$$2. \text{ Exogeneity : } Cov(ZV, u) = 0. \quad (\text{A.47})$$

A set of variables that fulfills the above requirements is denoted as a valid and exogenous set of instruments. However, identifying such variables is mostly a difficult undertaking. In fact, the case of weak instruments, i.e. instruments are only weakly correlated with constitutional rule, would hinder an efficient identification of the

endogenous and exogenous parts components. Several tests are proposed in literature to evaluate instrument variable strategies. First, consider the Hausman test on endogeneity. This test compares the estimated parameters and their variances of the instrumented and non-instrumented regression to test whether expected endogeneity in fact occurs in the model. Further, tests on overidentification can test on the exogeneity of instruments, if more than one instrument is available. However, this test relies on the assumption that at least one instrument is truly exogenous. Hence, a failure to reject the null hypothesis that all instruments are exogenous can be at best a slight hint of valid instruments, if theoretical considerations ensure to judge one of the instruments as truly exogenous.

In the studies presented here, controlling for the endogeneity of political institutions always relies on a two-step approach. That is in a first step the endogenous part of political institutions is disentangled from the exogenous part that is needed to identify causal effects of political institutions. While Angrist and Krueger (2001) argues for using linear probability models even though the instrumented variable is binary, we follow Hirano et al. (2000) and consider both a linear and a multinomial logit model in the first step. Following the estimation of the first step, predicted values of the instrumented variables are used in the model equation. Finally, standard errors must be corrected to obtain valid estimates of the covariance-variance matrix because usual OLS standard errors are composed of first and second stage residuals.

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## Appendix B

### Social Network Analysis

#### B.1 Starting points of network analysis

Social Network analysis is a methodological approach to describe relationships among actors instead of analyzing their attributes like race, gender and so on. Hence, social network analysis is especially concerned about deriving insights into the structure of relationships and how these structures impact on actor's behavior or on the outcome of an actor's behavior. According to quantitative social network analysis (SNA) a social network  $N^T$  is defined as a graph of  $N^2$ , e.g. any network is a subset of pairs  $(i, j) \in N^2$ , where  $i, j \in N$  are usually called vertexes and a pair  $(i, j)$  is called an edge or a node.  $N = \{1, \dots, n\}$  denotes a set of individual agents, where  $i$  or  $j$  denote a generic element of  $N$ .<sup>1</sup> Consider further that networks can be directed or undirected. As ties are oriented from one actor to another in directed graphs, they reflect an asymmetric relation between the two vertices. Such a relation might be an information exchange relation, where actor  $i$  provides valuable information to actor  $j$  although actor  $j$  does not return any information to actor  $i$ . As edges in undirected graphs have no specific orientation, the tie is either present or absent. In directed graphs reflect proximity relations like "is a blood relative of" or "works with". (Wasserman and Faust, 1994).

Studies using social network analysis can be classified according to their main research topics. First, early political sociology studies analyzed policy networks among governmental and non-governmental organizations in order to explain political decision-making (Parsons, 1963; Coleman, 1963). In particular, Laumann and Knoke (1987) and Knoke et al. (1996) put forward the idea to model opinion formation with social influence models that reflect a political communication process, where governmental actors partly adopt their policy positions to the positions communicated by other non-governmental organizations. That is such models were predominantly concerned about the distorting influence of lobbying on policy decisions. More recently, a new branch of network analysis started to highlight the role of social network structures as an aggregation mechanism of dispersed knowledge (Jackson, 2008; Golub and Jackson, 2009; Acemoglu and Ozdaglar, 2010). This perception of networks is widely recognized as the *wisdom of the crowd* effect (Jackson, 2008). *Wisdom of the crowd* describes the idea that a group of relatively uninformed individuals would collectively have much more knowledge than any single member of a group has, see Galton (1907). Such a situation would allow choosing better policies, if the individual information is spread via communication in elite networks and attained by political agents.

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<sup>1</sup>For a detailed information on the different indicators and concepts to analyze social networks, see Wasserman and Faust (1994). Most common global and local network indicators correspond to network density, size, centralization, clustering, transitivity and characteristic path length.

In the next two Sections, I briefly introduce two approaches that model belief formation among actors and econometric network estimation techniques.

## B.2 Different approaches to model belief formation

One of the first scholars who analyzed the issue of whether a group of agents who hold dispersed information can aggregate the information and reach a correct consensus was Marquis de Condorcet. His seminal work is now referred to as the *Condorcet's Jury Theorem*.

Generally, belief formation according to communication can be modeled as either Bayesian or Non-Bayesian up-dating processes (Acemoglu and Ozdaglar, 2010). While Bayesian approaches use Bayes rule to model how actors update their positions after receiving information, non-Bayesian approaches use simple rules of thumb. Related to the first, the general assumption is that individuals are able to update their beliefs optimally while using a reliable model of the world. To get an intuition how non-Bayesian updating works, consider the concept of imitation from biology (Acemoglu and Ozdaglar, 2010). However, non-Bayesian model might be also more complicated resembling the concept of replicator dynamics from evolutionary biology. Such approaches assume that alternatives which perform better get a greater weight in the belief formation and are thereby more likely to be adopted by others (Acemoglu and Ozdaglar, 2010). Comparing the non-Bayesian and Bayesian up-dating procedures, Golub and Jackson (2009) point out that Bayesian learning would imply that actors have extremely high mental capabilities and complete information. Hence, they suggest the much simpler Non-Bayesian models to reflect real world up-dating processes. A well-known case in point for such a model is the DeGroot model. Consider our model of belief formation presented in Chapter 5:

$$y^* = \left[ I - (1 - \gamma) \hat{T} \right]^{-1} \gamma y^0 \quad (\text{B.1})$$

with  $M = [I - (1 - \gamma) T]^{-1} \gamma$  being the network multiplier matrix which is similar to the Hubbell index (Hubbell, 1965). An element of the multiplier matrix  $m_{ij}$  defines the field strength of actor  $j$ 's initial position operating on actor  $i$ 's final position. If  $i = j$ , the element  $m_{ii}$  of the multiplier matrix  $M$  equals the weight that an actor  $i$  puts on his own initial position.

Under the assumption of  $\gamma = 0$ , our model corresponds perfectly to the DeGroot model. Note further that it corresponds to the model of Friedkin and Johnsen (1990) and Friedkin and Johnsen (1997), if we assume that all actors weight beliefs of other actors identically, i.e.  $\gamma_i = \gamma_j = \bar{\gamma} > 0$ . Regarding consensus building due to communication among actors, note that assuming the network as a strongly connected component, i.e. each actors forms ties with each other actor, and that at least some actors place some low weight on their own belief, i.e. assuming at least weak aperiodicity, communication according to the DeGroot model leads to a convergence of opinions. However, such consensus building is not a very realistic feature for political opinion formation as the assumption of the network as a strongly connected might fail. Consider for instance that highly influential actors like political agents

might not communicate with interest groups representing some marginalized group of society.

However, major drawbacks of the studies using these models are that they do neither provide an explanation of social influence nor information on the efficiency of belief formation in terms of the correspondence of final beliefs to a distinct correct belief, i.e. a policy position in line with a policy position proven to lead to economic growth.

### B.3 Estimation techniques in SNA

In contrast to the previous sections that are concerned with belief formation processes, this section gives a short overview on econometric network estimation methods. Consider first the issue of actor-wise correlation of error terms in dyadic data. This issue of the violated assumption of identically and independently distributed error terms already showed up in the time-series cross-section data case. With regard to network estimation, Krackhardt (1988) developed the quadratic assignment procedure (QAP) to correct for such a correlation in network data. QAP is a simulation based approach that corrects for correlation in the error terms of row and column actors. In particular, it uses permutations of dependent variable an empirical sampling distribution of parameter estimates. Comparing now the estimated coefficient with the simulated distribution reveals whether the variable has a significant influence on the relation among two actors (compare the wild cluster residual bootstrap in Chapter A).

Second, researchers might apply network estimations in order to detect whether structural tendencies, e.g. triads, in the network influence the probability to form a relation. In such a case, the exponential random graph model (ERGM) is the work horse model to estimate and analyze network generating processes (Wasserman and Faust, 1994).

A drawback of both methods is certainly that the complete social network data is needed to estimate the network generating process. However, field studies collecting network data might suffer from item- or unit non-response despite the highest efforts. Hence, the proposed econometric approach in Chapter 6 is an innovative method to estimate determinants of communication ties. Another promising estimation approach that explicitly allows imputation of missing network data is the latent space model of Hoff and Ward (2004).

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# Lebenslauf

## Persönliche Angaben

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## Beruflicher Werdegang

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09/2008 – heute      Forschungsarbeiten im Rahmen der Promotion  
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## Forschungsaufenthalte im Ausland

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05/2010              Interviews im Rahmen einer Politiknetzwerkstudie  
International Food Policy Research Institute,  
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## Schule & Studium

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01/2007 – 09/2008      Masterstudium der Agrarwissenschaften an der Christian-  
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