Constitutional Rules, Informal Institutions and Agricultural Protection in Developing and Industrial Countries:

Theory and Empirical Evidence

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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 characteristic political as well as demographic framework constellation, 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 implies specific different patterns of how these interaction effects impact on agricultural protection levels in developing and industrialized countries. Using time-series-cross-section (TSCS) data, this paper tackles the quantitative assessment of the theoretical implications. We estimate the latent regime of agricultural protection and assess the opposing quantitative relationships. 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.

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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.

A second strand of literature this paper is related to 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, 2000a, 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 only demands, therefore, 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 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 implying heterogenous agricultural policy preferences for legislators being elected in urban or rural dominated constituencies. Following Lohmann (1998) ideological bias of agrarian population will be relative higher the higher the share of the latter in total population. Accordingly, in bargaining at the legislature, this generate a conflict between legislators. 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, while 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, while the latter is attenuated, when district size grows and the electoral system converges to a pure proportional representation, since district populations become more homogenous. Moreover, at legislative bargaining political exchange 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 characteristic political as well as demographic framework constellation, 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. Moreover, we identify monotonically decreasing or increasing as well as constant relations as special cases of these two regimes. Further, we show that characteristic political, economic and demographic framework condition found in developing and industrialized countries, respectively, imply specific different patterns of how the interaction of electoral rules, formal and informal legislative norms and lobbying influence impact on agricultural protection levels in these two country types.

Second, our hypotheses are tested empirically using the data set of protection measures provided by Kym Anderson and Ernesto Valenzuela including cross-country panel data for 64 countries over the time period 1965-2005. Since based on our theory the impact of district size on agricultural protection depends on an unobserved policy regime induced by demographic, economic and political framework conditions. We consider up to six policy regimes and 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. Note that the results are robust with respect to different specifications of country specific heterogeneity and serial correlation endemic to time-series cross-section data. 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.

2 Theoretical model

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:

$$t_M = \frac{\alpha_A}{\alpha_M}\tilde{\Gamma}^S(s_A) \Leftrightarrow t_M = \Gamma^S(s_A) \tag{1}$$

$$s_M = \frac{\alpha_A}{\alpha_M}\tilde{\Gamma}^T(t_A) \Leftrightarrow s_M = \Gamma^T(t_A) \tag{2}$$

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; **?**; **?**).

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

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

Y_A^0 and Y_M^0 denote the equilibrium income of rural and urban population, respectively, without any agricultural policy intervention.

Not 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, analyzing agricultural policy we can focus on the net subsidization $s = s_A - t_A$, while a net-subsidization $s > 0$ corresponds to a subsidization level $s_A = s$ and a taxation of $t_A = 0$ and vice versa a net-subsidization $s < 0$ implies a subsidization of $s = 0$ and a taxation level of $t_A = -s$.

2.2 The Political System

2.2.1 Legislative decision-making

A legislative system of a country consists of a finite set of political agents, N, where $i = 1, \ldots, n$ 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[1]. 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.[2]

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. [3]

[1] Although in most democratic systems members of the parliament can initiate legislation if there is no proposal of the government.

[2] Note that in general government, floor and the agricultural committee consist of multiple members.

[3] 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

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 this majority coalition. The rational of ex ante majority coalition building correspond 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. we can concentrate on the prime minister, PM, and her majority in the parliament, P_{inc}. 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 assumptions 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 γ 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

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 more traceable.

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 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 simple modeling strategy[4].

At the second stage 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 γ offered by the prime minister, i.e. overall we assume that legislators maximize the sum of actual rent, γ, 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, γ, 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^{par} results from the following maximization[5]:*

$$s^{par} = \arg\max_{s} \quad U_{PM}(s) \quad s.t. \quad s \in \bigcap_{g} S_g, \tag{3}$$

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

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 $[s^-, s^+]$:*

$$s^{par} = \arg\min_{s} \left\| Y^{PM} - s \right\| \quad s.t. \quad s \in \left[s_1^-, s_1^+\right] \tag{4}$$

where $s_1^- = \min \bigcap_g S_g = Y^F - \gamma$ and $s_1^+ = \max \bigcap_g S_g = Y^F + \gamma$.

Proof: see appendix.

[4]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 **?**.

[5]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.

If the rent γ 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 γ, 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 γ and the default policy, $\bar{s} = Y^F$.

Regarding the policy preferences of legislators, it is generally assumed these reflect agents' interest in political support by politically responsive interests located in their constituencies (see for example Weingast and Marshall (1988); Persson and Tabellini (2000b)). 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 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.

2.2.2 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 characterized by more dispersed proposal powers, where proposal power over specific policy domains resides with corresponding parliamentary committees (Persson and Tabellini, 2000b). In particular, we assume when formulating an agricultural policy proposal s the agricultural committee exerts agenda setting power vis-a-vis the floor. 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:*

$$\begin{aligned} s^{pre*} &= \arg\max_{s} \quad U^{C_A}(s) \quad s.t.\ s \in S_F & (5) \\ with \quad S_F &= \left\{ s \in S |\, U^F(s) \geq U^F(SQ) \right\} & (6) \end{aligned}$$

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 $\left[s_2^-, s_2^+\right]$:*

$$s^{par} = \arg\min_{s} \left\| Y^{C_A} - s \right\| \quad s.t. \quad s \in \left[s_2^-, s_2^+\right] \tag{7}$$

where $s_2^- = Y^F - \left\| Y^F - SQ \right\|$ and $s^+ = Y^F + \left\| Y^F - SQ \right\|$.

Proof: see appendix.

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, 2000a).

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 μ_{jd}, a district specific δ_d and a national component, δ. 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}:

$$W^J(s) > \bar{W}^J + K^J(\mu_{jd} + \delta_d + \delta - hC^{inc}). \tag{8}$$

Parameters μ_{jd}, δ_d and δ 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 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 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 μ_{jd} within each district is uniform distributed on the interval $\left[-\frac{1}{2\chi}, +\frac{1}{2\chi}\right]$. Thus, the parameter χ fully characterizes the distribution of ideological preferences in an electoral district[6].

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 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 $\bar{W}^J$.

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.[7]

[6]This assumption implies that votes shares are linear functions of policy based utilities, which greatly simplifies our analysis.

[7]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 fccus analysis on district

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 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 $1 < k < n$(**?**)[8].

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, ϕ^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 cannot be predicted either 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, expect that the support of δ and δ_d are bounded suitable relative to the support of the voter specific shocks, to enable 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., χ 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:

$$\Pi_d = \omega_d^{inc} - \chi\left[\delta_d + \delta\right] + \frac{1}{2}, \tag{9}$$

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

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:

$$G^\delta\left(\frac{\omega_d^{inc}}{\chi}\right) \equiv Prob\left[\omega_d^{inc} - \chi\left(\delta_d + \delta\right) \geq 0\right] \tag{10}$$

size.

[8]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.

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

Each incumbent's objective is assumed to be to maximize 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):

$$\sum_J \alpha_d^J \phi^J (W^J(s_d^{inc}) - \bar{W}^J) + hC^{inc} \tag{11}$$

Accordingly, maximizing his expected probability of re-election in district d an incumbent 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:

$$SWF_d(s) = \sum_J \beta_d^J W^J(s) \tag{12}$$

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 incumbents 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:

$$\frac{1}{k}\sum_{r=1}^{k} G^{\delta}\left(\frac{1}{\chi}\left(\omega_{d_k}^{inc} - \frac{r}{k}\right)\right) \equiv \frac{1}{k}\sum_{r=1}^{k} Prob\left[\omega_{d_k}^{inc} - \chi\left(\delta_{d_k} + \delta + \frac{1}{2}\right) \geq \frac{r}{k}\right] \tag{13}$$

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 $k = 1, ..., n$.

Hence, legislators' agricultural policy preferences crucially depend on the demographically composition of their constituency in comparison to the demographic composition of total society 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 **??**.

Proposition 3 *Let $U^{g_d}(s)$ denote the agricultural policy preferences of an legislator g_d who is reelected in the electoral district d* [9]. *Then the following holds:*

[9] 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

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

(ii) $\frac{\partial Y^(g_d)}{\partial \alpha_d^A} > 0$

(iii) $\frac{\partial Y^(g_d)}{\partial \frac{K^M}{K^A}} > 0$

(iv) $Y^{g_d} > 0$ *if and only if it holds:* $K^M > K^A \vee \frac{\alpha_d^A}{\alpha_d^M} > \frac{\alpha^A}{\alpha^M}$

(v) $Y^{g_d} < 0$ *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.

2.4.1 Multiple districts and heterogeneity of legislators' preferences

Consider an electoral system comprising of n_k districts with $n_k = 1, ..., n$. 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 α_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 β_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 $k = 1, ..., n$, then we assume the following property:

$$\alpha_{d_k}^A \leq \alpha_{d_{(k-1)}}^A \quad \forall \quad d_k \in D_k^R \quad \text{and} \quad \alpha_{d_k}^A \geq \alpha_{d_{(k-1)}}^A \quad \forall \quad d_k \in D_k^U. \tag{14}$$

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:

$$Y_k^r \geq Y_{k+1}^r \quad \text{and} \quad Y_k^u \leq Y_{k+1}^u \quad \text{and} \quad Y_n^u = Y_n^r = Y_n \tag{15}$$

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

2.4.2 Electoral competition and lobbying at the national level

Deriving policy preferences of the majority party leader PM

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:

$$\Pi_{PM} = \omega_n^{inc} - \chi\left[\delta_d + \delta\right] + \frac{1}{2}, \tag{16}$$

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

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

$$\sum_J \alpha^J \phi^J (W^J(s) - \bar{W}^J) + \chi h C^{inc} \tag{17}$$

Regarding campaign spending the assumption of the model is that there exists two lobbying groups, representing the agricultural and the non-agricultural population indicated by the index $J = A, M$, respectively. For each group fr_J is an exogenous fraction that actively contribute 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: at the first stage 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. At the second stage the PM selects a policy to maximize the national vote share of her party, i.e. the PM selects a policy that maximizes $SWF_n(s) + h\sum_J C_J^{inc}(s)$.

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:

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

where R_J is a constant determined in equilibrium Grossman (1994)[10].

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

$$\begin{aligned} SWF_{PM}(s) &= \sum_J \beta_{PM}^J(s) W^J(s) \\ \beta_{PM}^J &= \alpha_J \frac{\frac{\theta^J}{\theta_n} + \frac{h}{\theta_n} fr_J}{1 + \frac{h}{\theta_n} FR} \quad FR = \sum_J \alpha_J fr_J \end{aligned} \tag{18}$$

Form the perspective of the PM the relevant political weights of a voter group J β_{PM}^J deviate from their corresponding population shares α_J the larger the ideological preferences of the groups, i.e. the larger the absolute difference between K^A and K^M and the higher free-riding varies across groups, where 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 θ_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, where 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 form 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 most 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 drives his policy choices from maximizing the welfare function SWF_{PM}, while all other legislators derive their preferences form maximizing the welfare function SWF_n, where for latter different relative weights of groups result when compared to the former as long as lobbying takes place.

[10] Basically, the constant R_J guarantees that the 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).

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 tentative Persson and Tabellini (2000a); **?**. Therefore, following **?** 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 $d \in D^U$. μ_d is independent and identically distributed across districts, with zero mean following a uniform distribution on a wide enough range $\left[-\frac{1}{2z}, \frac{1}{2z}\right]$.

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:

$$\Pi_{ty} = \omega_{ty}^{inc} - \chi \left[\delta_{ty} + \mu_d + \delta\right] + \frac{1}{2}, \tag{19}$$

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

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

Hence, it follows:

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

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

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

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

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

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

$$Prob\left[\sum_{ty}\Omega_{ty}E(k^{ty})>\frac{k}{2}\right]=G^{\delta}\left(\frac{1}{\chi}\left(\sum_{ty}\Omega_{ty}\omega_{ty}^{inc}-\frac{1}{2}\right)\right) \tag{20}$$

Hence, assuming an electoral system of a mixed or majoritarian type implies that political behavior of the incumbent party leader PM results form 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:

$$\sum_{ty}\Omega_{ty}\sum_{J}\alpha_{ty}^{J}\phi^{J}(W^{J}(s)-\bar{W}^{J})+hC^{inc} \tag{21}$$

where α_{ty}^{J} denotes the population share in the district type ty, i.e. a rural and urban district, respectively. Defining $\alpha_{PM}^{J}=\sum\limits_{ty}\Omega_{ty}\alpha_{ty}^{J}$ implies that weighted sum of the rural and urban SWFs can be equivalently represented by one SFW^{PM} with the group weights equal to α_{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:

$$\begin{aligned} &SWF_{PM}(s)=\sum_{J}\beta_{PM}^{J}(s)W^{J}(s)\\ &\beta_{PM}^{J}=\alpha_{PM}^{J}\frac{\frac{\theta^{J}}{\theta_n}+\frac{h}{\theta_n}fr_J}{1+\frac{h}{\theta_n}FR} \quad FR=\sum_{J}\alpha_{PM}^{J}fr_J \end{aligned} \tag{22}$$

Following the relevant literature, e.g. **?**Bardhan and Mookherjee (2002), we have sofar derived policy preferences of the PM assuming that political behavior of the PM can be derived form maximization of the probability that she is reelected as the head of government. **?**Bardhan and Mookherjee (2002) assume that the latter probability corresponds to the 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 to conditions have to be fulfilled, the incumbents 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 eq.s (20) and (13):

$$
\begin{aligned}
Prob^2(s) &= \frac{1}{k}\sum_{r=1}^{k} G^{\delta}\left(\frac{1}{\chi}\left(\omega_{d_k}^{inc} - \frac{r}{k}\right)\right) \\
Prob^1(s) &= G^{\delta}\left(\frac{1}{\chi}\left(\sum_{ty}\Omega_{ty}\omega_{ty}^{inc} - \frac{1}{2}\right)\right)
\end{aligned}
\tag{23}
$$

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

$$
\sum_{ty}\Omega_{ty}\sum_{J}\beta_{PM'}^{J}(W^J(s) - \bar{W}^J) + hC^{inc} \tag{24}
$$

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 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: $Prob^1(Y^{PM}) \geq Prob^2(Y^{PM})$ [11]

Finally, incorporating lobbying the policy preferences of the PM result from the maximization of a SFW resulting from eq.(22) substituting α_{PM}^J by $\alpha_{PM'}^J$ [12].

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 $\beta_{ty_{d_k}}^J$ derived form electoral competition in the constituency of the PM assuming a change in district size.

2.5 Policy outcomes

Sofar 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 want to analyze how these difference impact on agricultural policy outcomes, i.e. how district size impacts on agricultural protection levels.

[11] This follows as long as we assume that G^{δ} is locally concave over the interval [0.5,1]. The latter holds for example for a logistic or a probit function.

[12] Please note that in contrast to α_{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

In particular, we focus our analyses on the question how or to what extend the impact of district size on agricultural protection levels 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 specific interaction effects between district size and characteristic political as well as demographic framework constellation, 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, we show that characteristic political, economic and demographic framework condition found in developing and industrialized countries, respectively, imply specific different patterns of how the interaction of electoral rules, formal and informal legislative norms and lobbying influence impact on agricultural protection levels in these two country types.

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

Proposition 4 *Consider the society and economy as described above. Let* $k_1, .k_t., k_l$ *denote a sequence of electoral rules characterized by the district size of* k_t*, with:* $k_1 = 1 < k_2 <, k_l = n$*.* n *is the number of parliamentary seats to be elected.* $\alpha^J_{d_{k_i}}$ *denote the share of the voter group J=A,M in district* d_{k_i}*, while* α^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 = A, M) districts, where rural districts are characterized by a relative higher share of non-agrarian population, i.e.* $\alpha^M_{k_i} \geq \alpha^M$*, vice versa rural districts are characterized by a relative higher district share of the agrarian population when compared to the national share, i.e.* $\alpha^A_{k_i} \geq \alpha^A$*. Districts of each type are assumed to be demographically homogenous, where* $\alpha^J_{d_{k_i}} = \alpha^J_{d_{ty_k i}}$ *for* $d_{k_i} \in D^{ty}$*, where* $D^R_{k_i}$ *and* $D^U_{k_i}$ *denote the set of rural and urban districts for the electoral system* k_i*which are assumed to be non-empty. Further, let* $\gamma^{ty}_{k_i}$ *denote the share 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.:

$$\begin{array}{c} \alpha^M_{k_1} > \alpha^M_{k_2} > .... > \alpha^M_{k_i} > \alpha^M_{k_(i+1} > \alpha^M_{k_l} = \alpha^M \\ \alpha^A_{k_1} < \alpha^A_{k_2} < .... < \alpha^A_{k_i} < \alpha^A_{k_(i+1} < \alpha^A_{k_l} = \alpha^A \end{array} \tag{25}$$

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) we generally assume for* $POPB = 0$ *a lower free-rider problem for the non-agricultural lobby group results, i.e.*$fr_M > fr_A$*, awhile 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.* $fr_M < fr_A$ *13.*

[13] Basically, this assumption excludes empirically irrelevant cases form our theoretically analysis and

Let $s^*_{k_t}(PS, POP)$ denote the agricultural policy outcome resulting in equilibrium of the legislative bargaining game assuming a policy system PS and the 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 to 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:*

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

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

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

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

(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.*

hence makes our analysis more traceable. For interested reader analysis of the excludes cases is also available form the authors up-on request.

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 ,where the former should be observed for developing countries for which the agrarian population is still the majority, i.e. it holds $POP = 0$, 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 $K^A > K^M$. As explained above following Lohmann (1998) ideological voting is correlated with demographic compositions, where we assume $K^A > K^M$, if and only if $POP = 0$, i.e. according to our theory 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 only occurs in developing countries, when the agricultural committee is dominated by urban interests, while in contrast in industrialized countries gridlock only occurs when the agricultural committee is dominated by rural interest. Following the seminal contribution of **?** to the political exchange theory it follows that gridlock only results if legislators engaged 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 (**??**). 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 **?**. Since a informal non-market organization of political exchange implies a specific level of trust among legislators one would expect this form of cooperation occurs 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 implying a monotonically increasing relation for industrialized and a monotonically decreasing relation for developing countries [14].

Thus, excluding political exchange our theory implies that regardless of the concrete governmental system agricultural protection levels are lower under a pure majority system when compared to a pure PR-system in industrialized countries, while for developing countries with an agrarian population share above 50% the opposite results, i.e. 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 an informal political exchange. For parliamentary systems a non-market organization of political exchange as suggested by **?** for the presidential system of the USA corresponds to the so-called , i.e. the fact that within governmental 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 to assume that the PM is reelected in an rural district

[14] 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 system 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.

for $POP = 1$, while the PM is reelected in an urban district for $POP = 0$. Hence, under these assumption 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 neither the agenda setting power of the committee in presidential regimes nor the party discipline in parliamentary regimes is perfect or neglectable.

Finally, please note that according to our theory lobbying has no impact on the specific regime implied for relation between district size and agricultural protection levels in developing and industrialized countries, respectively [15].

Lobbying has, however, a significant 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, but not how absolute protection level vary while following our theory this contour is independent from lobbying.

3 Empirical Analysis

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 meausures 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

[15] 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 (**?**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, however, available from the authors up-on request.

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.[16] In addition to autocratic countries and unstable democracies, the sample excludes countries belongig 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. Furhter, 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. accession to consider policy decisions due to the approaching EU accession. Furhter, 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 *NRAs* using the undistorted production values of the commodities as weights. In general, the NRA is the unit value of production at the distorted 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, ed (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.

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

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 strenght 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, ed, 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 (*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*. *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 1.

Table 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 per districts
prop	0.254	0.435	Electoral system: more than 10 members per districts
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
emplln	-1.756	0.947	Log. of agr. share in economically active population
compad	0.600	0.289	Comparative advantage of agricultural 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	Agricultural exports in total merchandise exports
urround	0.384	0.487	Post-Uruguay round dummy
agrivalue	13.195	11.130	Agricultural share in value added

Source: Calculated by authors based on different data sets.

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,

$$p_{it} = \beta x_{it} + \gamma y_{it} + \epsilon_{it}, \quad i = 1, \ldots, N, \quad t = S(i), \ldots, T(i), \tag{26}$$

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

$$p_{it} = \beta x_{it} + \gamma y_{it} + \varphi p_{it-1} + \kappa y_{it-1} + \epsilon_{it}, \quad i = 1, \ldots, N, \quad t = S(i), \ldots, T(i), \tag{27}$$

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 (27). Under the restriction

$$\varphi\gamma + \kappa = 0 \tag{28}$$

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

$$\epsilon_{it} = \rho\epsilon_{it-1} + u_{it}, \quad \text{where} \quad u_{it} \sim \mathcal{N}(0, \sigma^2). \tag{29}$$

Testing for this common factor approach is performed via generalized Wald test of the restriction given in Equation (28), 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 κ.

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 $R_{it} = \{0, \ldots, L\}$ with $L \leq \bar{L}$. As regimes are unobserved, we model the regression as follows

$$p_{it}^{(R_{it})} = \alpha + \beta_{(R_{it})} x_{it} + \gamma y_{it} + \epsilon_{it}, \tag{30}$$

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 is has to be integrated out. Hence, assumptions concerning the process of regime states have to be made.[17] We assume a time and country specific mixture. The probability to be in either 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

$$\Pr(R_{it} = \ell | z_{it}) = v_{it}^{(\ell)}, \qquad \ell = 1, \ldots, L. \tag{31}$$

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

$$v_{it}^{(\ell)} = \frac{\exp\{z_{it}\phi_\ell\}}{\sum_{\ell=1}^{L} \exp\{z_{it}\varphi_\ell\}}, \qquad \ell = 1, \ldots, L, \tag{32}$$

where ϕ_L is restricted to zero for identification reasons. The model is estimated via Maximum Likelihood on the basis of assuming normally distributed errors ϵ_{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

$$\mathcal{L}(\theta; P, X, Y, Z) = \prod_{i=1}^{N} \prod_{t=S(i)}^{T(i)} f(p_{it} | P_{it-1}, X_{it}, Y_{it}, Z_{it}, \theta), \tag{33}$$

[17] Assuming a Markov process for regime states would be reasonable too, since state dependence is likely to be present, since a ountry 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.

[18] 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.

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

$$f(p_{it}|P_{it-1}, X_{it}, Y_{it}, Z_{it}, \theta) = \sum_{\ell=1}^{L} \frac{\exp\{z_{it}\phi_\ell\}}{\sum_{\ell=1}^{L}\exp\{z_{it}\phi_\ell\}} \frac{1}{\sqrt{2\pi}\sigma} \exp\left\{-\frac{1}{2\sigma^2}\left(p_{it} - \beta_\ell x_{it} - \gamma y_{it}\right)^2\right\}, \tag{34}$$

where ϕ_0^L is set for identification to a vector of zeros.

As a further 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.

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 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.[19] Consider $x_{it} = \{f_{it}, d_{it}\}$, where f_{it} denotes a binary variable (form of government) and d_{it} denotes a ordered categorical variable taking values $\{0, 1, 2\}$. We set up a two equation model given as

$$g_1(f_{it}) = {}_1x^*_{it} = {}_1z_{it}\delta_1 + \nu_{it}, \tag{35}$$
$$g_2(d_{it}) = {}_2x^*_{it} = {}_2z_{it}\delta_2 + \xi_{it}, \tag{36}$$

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

$${}_1x_{it} = \begin{cases} 0, & \text{if } {}_1x^*_{it} < 0, \\ 1, & \text{if } 0 \leq {}_1y^*_{it} \leq \varrho, \\ 2, & \text{if } {}_1x^*_{it} > \varrho, \end{cases} \tag{37}$$

$${}_2x_{it} = \begin{cases} 0, & \text{if } {}_2x^*_{it} < 0, \\ 1, & \text{if } {}_2x^*_{it} \geq 0 \end{cases} \tag{38}$$

and

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

[19]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 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.

Thereby, the range of the errors ν_{it} and ξ_{it} is restricted as follows

$$
\begin{aligned}
A_1 &= \{(\nu_{it}, \xi_{it}) : - {}_1 z_{it}\delta_1 \leq \nu_{it}, - {}_2 z_{it}\delta_2 \geq \xi_{it}\} \quad \text{if} \quad f_{it} = 1, d_{it} = 0, \\
A_2 &= \{(\nu_{it}, \xi_{it}) : - {}_1 z_{it}\delta_1 \geq \nu_{it}, - {}_2 z_{it}\delta_2 \geq \xi_{it}\} \quad \text{if} \quad f_{it} = 0, d_{it} = 0, \\
A_3 &= \{(\nu_{it}, \xi_{it}) : - {}_1 z_{it}\delta_1 \leq \nu_{it}, - {}_2 z_{it}\delta_2 \leq \xi_{it} \leq \ - {}_2 z_{it}\delta_2 + \varrho\} \quad \text{if} \quad f_{it} = 1, d_{it} = 1, \\
A_4 &= \{(\nu_{it}, \xi_{it}) : - {}_1 z_{it}\delta_1 \geq \nu_{it}, - {}_2 z_{it}\delta_2 \leq \xi_{it} \leq \ - {}_2 z_{it}\delta_2 + \varrho\} \quad \text{if} \quad f_{it} = 0, d_{it} = 1, \\
A_5 &= \{(\nu_{it}, \xi_{it}) : - {}_1 z_{it}\delta_1 \leq \nu_{it}, \xi_{it} \geq \ {}_2 z_{it}\delta_2 + \kappa\} \quad \text{if} \quad f_{it} = 1, d_{it} = 2, \\
A_6 &= \{(\nu_{it}, \xi_{it}) : - {}_1 z_{it}\delta_1 \geq \nu_{it}, \xi_{it} \geq \ {}_2 z_{it}\delta_2 + \kappa\} \quad \text{if} \quad f_{it} = 0, d_{it} = 2.
\end{aligned}
$$

Based on maximum likelihood estimation, where the likelihood function is

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

we calculate expectations of errors as further explaining variables (extended Mills' ratios). These expectations have to be considered for six cases. Define $h_1 = - {}_2 z_{it}\delta_2, \quad h_2 = - {}_2 z_{it}\delta_2 + \varrho, \quad h_3 = - {}_1 z_{it}\delta_1$. Following Rosenbaum (1961) the expectations are hence given as

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

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

$$E\left[\left(\begin{array}{c}\nu_{it}\\ \xi_{it}\end{array}\right)|f_{it}=0,d_{it}=1\right]=$$

$$\left(\begin{array}{c}\frac{\left\{-\phi(h_3)[1-\Phi(\frac{h_1-\psi h_3}{\sqrt{1-\psi^2}})]+\psi\phi(h_1)[\Phi(\frac{h_3-\psi h_1}{\sqrt{1-\psi^2}})]+\phi(h_3)[1-\Phi(\frac{h_2-\psi h_3}{\sqrt{1-\psi^2}})]-\psi\phi(h_2)[\Phi(\frac{h_3-\psi h_2}{\sqrt{1-\psi^2}})]\right\}}{\Pr(R_3)}\\ \frac{\left\{-\psi\phi(h_3)[1-\Phi(\frac{h_1-\psi h_3}{\sqrt{1-\psi^2}})]+\phi(h_1)[\Phi(\frac{h_3-\psi h_1}{\sqrt{1-\psi^2}})]+\psi\phi(h_3)[1-\Phi(\frac{h_2-\psi h_3}{\sqrt{1-\psi^2}})]-\phi(h_2)[\Phi(\frac{h_3-\psi h_2}{\sqrt{1-\psi^2}})]\right\}}{\Pr(R_3)}\end{array}\right),$$

$$E\left[\left(\begin{array}{c}\nu_{it}\\ \xi_{it}\end{array}\right)|f_{it}=1,d_{it}=1\right]=$$

$$\left(\begin{array}{c}\frac{\left\{\phi(h_1)[1-\Phi(\frac{h_3-\psi h_1}{\sqrt{1-\psi^2}})]+\psi\phi(h_3)[1-\Phi(\frac{h_1-\psi h_3}{\sqrt{1-\psi^2}})]-\phi(h_2)[1-\Phi(\frac{h_3-\psi h_2}{\sqrt{1-\psi^2}})]-\psi\phi(h_3)[1-\Phi(\frac{h_2-\psi h_3}{\sqrt{1-\psi^2}})]\right\}}{\Pr(R_4)}\\ \frac{\left\{\phi(h_3)[1-\Phi(\frac{h_1-\psi h_3}{\sqrt{1-\psi^2}})+\psi\phi(h_1)[1-\Phi(\frac{h_3-\psi h_1}{\sqrt{1-\psi^2}})]-\phi(h_3)[1-\Phi(\frac{h_2-\psi h_3}{\sqrt{1-\psi^2}})]-\psi\phi(h_2)[1-\Phi(\frac{h_3-\psi h_2}{\sqrt{1-\psi^2}})]\right\}}{\Pr(R_4)}\end{array}\right),$$

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

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

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 introductive review.

4 Empirical results

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 younger democracies who tend to adopt mixed or proportional representation systems. In terms of ethnic fragmentation, countries, which 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.

Table 3: Maximum Likelihood Estimation Results – Endogeneity of political institutions

	3 categories		
	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)
ϱ_1	1.2760 (20.5489)		–
ρ		0.2510 (5.0763)	
ℓ		-1314.4	

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

An English colonial history decreases the likelihood of a presidential system. These results are in line with the results by Persson et al. (2003).

4.2 Political institutions and latent protection regimes

Table 4 provides the maximum likelihood estimates for the preferred model specification containing 6 regimes described in Equations (30)-(32) describing agricultural protection by means of latent regimes. Figure (4.2) shows the fitted regimes, while Table (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 (7) 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 (6) 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 where considered as the information criteria do not prefer uniquely more than 6 regimes.[20]

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 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

[20]Note that the AIC criterion tends to overparametrization as noted by Smith et al. (2006).

for *empplln*, 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.[21] The Wald test statistic for testing the common factor restriction is 18.61 with a corresponding p-value of 0.0049 (χ^2 distribution with degrees of freedom). 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 *inititalgdppc* and *gdppcgrowth* is expected. As can be seen from Table 4, our model specification displays a positive and significant sign for *gdppcgrowth* and *inititalgdppc*, 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 as impact of the form of government independly from the underlying latent regimes. Results reveal a signficant negative impact of presidential systems on agricultural protection. That is independet from the latent protection regime and electoral system, presidential systems favor farmers less than other forms of government. Further results suggest endogeneity of form of government. For results on the first step that controls for this endogeneity see Section...

[21] This is due to the analytical intractability of the common factor approach within the mixture model.

Table 4: Maximum Likelihood Estimation Results for Controls and Latent Regimes – Second Step

variable	θ	s.e.	t-statistic	Sandwich	panel robust t-statistic
p_{it-1}	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			
maj_I^1	-0.0160	0.0594	-0.2692	0.0447	-0.3579
mix_I^2	1.0708***	0.0718	14.9080	0.1196	8.9501
$prop_I^3$	-0.2766***	0.0819	-3.3778	0.0919	-3.0108
Regime II (light blue)		# observations in Regime II: 182			
maj_{II}^1	-0.0326	0.0303	-1.0769	0.0429	-0.7606
mix_{II}^2	-0.1090	0.0378	-2.8837	0.0823	-1.3242
$prop_{II}^3$	-0.0534	0.0516	-1.0347	0.0576	-0.9271
Regime III (red)		# observations in Regime III: 78			
maj_{III}^1	-0.0229	0.0359	-0.6366	0.0389	-0.5876
mix_{III}^2	0.3795***	0.0474	8.0120	0.0766	4.9521
$prop_{III}^3$	0.0895	0.0551	1.6252	0.0788	1.1358
Regime IV (green)		# observations in Regime IV: 748			
maj_{IV}^1	-0.0161	0.0167	-0.9601	0.0255	-0.6303
mix_{IV}^2	0.0251***	0.0118	2.1290	0.0121	2.0794
$prop_{IV}^3$	0.0168	0.0209	0.8016	0.0291	0.5756
Regime V (black)		# observations in Regime V: 8			
maj_V^1	0.4084***	0.1371	2.9779	0.0393	10.3827
mix_V^2	2.0321***	0.1494	13.6012	0.2531	8.0303
$prop_V^3$	0.4571***	0.1520	3.0080	0.0463	9.8712
Regime VI (yellow)		# observations in Regime VI: 6			
maj_{VI}^1	-0.0259	0.0751	-0.3455	0.0418	-0.6211
mix_{VI}^2	-0.6735***	0.1041	-6.4675	0.1815	-3.7107
$prop_{VI}^3$	0.3226***	0.1345	2.3985	0.0935	3.4497
σ	1.1362	0.0305	37.3052	0.0982	11.5730
AIC	3.5269				
BIC	3.6410				
MSC	4.2854				
log lik	-1811.3				

Source: Authors.

.

For the effect of electoral systems on protection rates, we obtain mixed 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 regimes II. However, the relationship is not significant for regime II. Inverse u-shapes follow if protection rates under 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. Figure 4.2 plots the .... 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.

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 than 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 than 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 re-estimated 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 (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.

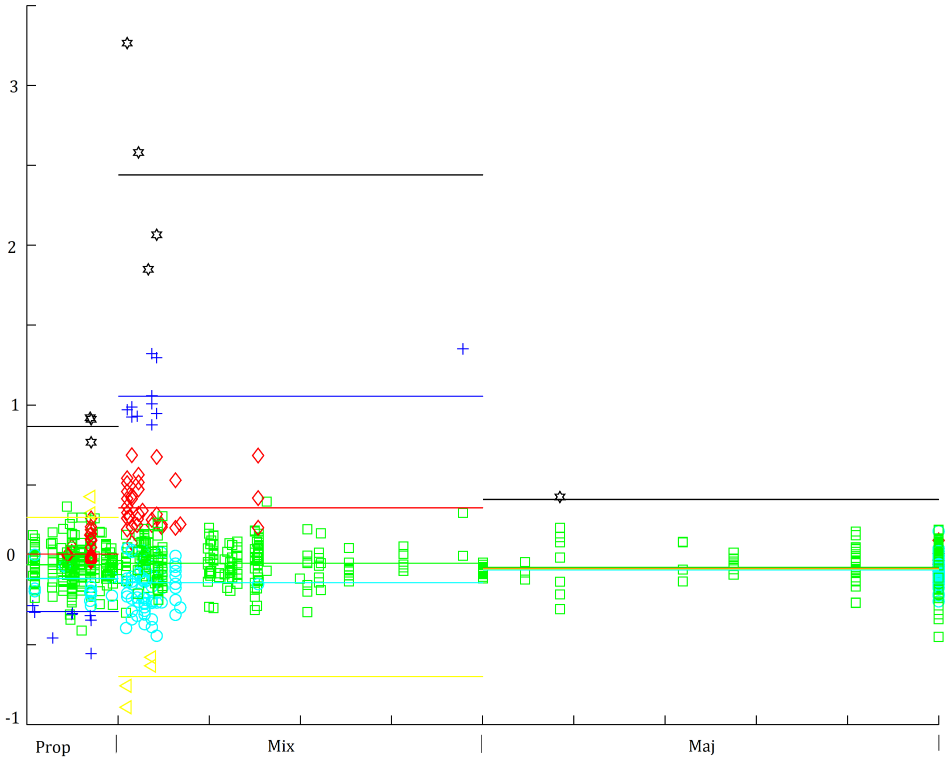

Figure 1: Latent policy regimes and electoral systems
Source: Authors

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 analyzes 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 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 implying heterogenous agricultural policy preferences for legislators being elected in urban or rural dominated constituencies. Following Lohmann (1998) ideological bias of agrarian population will be relative higher the higher the share of the latter in total population. Accordingly, in bargaining at the legislature, this generate a conflict between legislators. 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, while 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, while the latter is attenuated, when district size grows and the electoral system converges to a pure proportional representation, since district populations become more homogenous. Moreover, at legislative bargaining political exchange 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 characteristic political as well as demographic framework constellation, 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. Moreover, we identify monotonically decreasing or increasing as well as constant relations as special cases of these two regimes. Further, we show that characteristic political, economic and demographic framework condition found in developing and industrialized countries, respectively, imply specific different patterns of how the interaction of electoral rules, formal and informal legislative norms and lobbying influence impact on agricultural protection levels in these two country types.

Second, we provide a comprehensive empirical analysis of our theoretical hypotheses regrading the quantitative relationship between political institutions and measurements of agricultural protection. Based on theoretical considerations, the estimation strategy is extended in order to allow controlling the possibly endogeneity of political institutions with regard to the decision on the level of agricultural protection. The opposing relationships between agricultural protection and district sizes are broadly confirmed. The finding of an inverse u-shaped relationship between industrialized countries and an u-shaped relationship for developing countries are checked for robustness against different dynamic specifications and considerations of latent heterogeneity. Whilst assessment of significance via panel robust standard errors is confirmatory for the suggested relationship, consideration of latent heterogeneity via latent cluster slightly renders the empirical findings. However, the finding of endogenous political institutions is robust against different dynamic specifications and considerations of latent heterogeneity. Hence, as a major finding this endogeneity of political institutions point at future research on the role of institutional setting in developing economies.

References

Acemoglu, Daron, "Constitutions, Politics, and Economics: A Review Essay on Persson and Tabellini's The Economic Effects of Constitutions," *Journal of Economic Literature*, 2005, *XLIII*, 1025–1048.

_ **and Simon Johnson**, "Unbundling Institutions," *Journal of Political Economy*, 2005, *113* (5), 949–995.

_ **,** _ **, and James A. Robinson**, "The Colonial Origins of Comparative Development: An Empirical Investigation," *American Economic Review*, December 2001, *91* (5), 1369–1401.

Achen, Christopher H., "Why Lagged Dependent Variables Can Supress the Explanatory Power of Other Independent Variables," 2000. Presented at the Annual Meeting of the Society for Political Methodology, UCLA.

Aghion, Philippe, Alberto Alesina, and Francesco Trebbi, "Endogenous Political Institutions," *The Quarterly Journal of Economics*, May 2004, *119*, 565–611.

Alesina, Alberto, Arnod Devleeschauwer, William Easterly, Sergio Kurlat, and Romain Wacziarg, "Fractionalization," *Journal of Economic Growth*, 2003, *8*, 155–194.

Anderson, Kym and Ernesto Valenzuela, "Estimates of Global Distortions to Agricultural Incentives, 1955 to 2007," World Bank, Washington DC, `http://go.worldbank.org/YA039F35E0` October 2008.

___ , **ed.**, *Distortions to Agricultural Incentives: Global Perspective*, World Bank, 2008.

Angrist, Joshua D. and Alan B. Krueger, "Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments," NBER Working Paper Series, National Bureau of Economic Research, Cambridge, MA 2001.

Arrow, Kenneth J., B. H. Chenery, B. S. Minhas, and R. M. Solow, "Capital-Labor Substitution and Economic Efficiency," *The Review of Economics and Statistics*, 1961, *43* (3), 225–250.

Balisacan, Arsenio M. and James A. Roumasset, "Public Choice of Economic Policy - The Growth of Agricultural Protection," *Weltwirtschaftliches Archiv*, 1987, *123*, 232–248.

Bardhan, Pranab and Dilip Mookherjee, "Relative Capture of Local and Central Governments: An Essay in the Political Economy of Decentralization," Working Paper C99-109, Center of International and Development Economics Research CIDER 2002.

Beck, Nathaniel, "Time-Series-Cross-Section Data: What Have We Learned in the Past Few Years?," *Annual Review of Political Science*, 2001, *4*, 271–293.

___ **and Jonathan N. Katz**, "Nuisance vs. Substance: Specifying and Estimating Time-Series-Cross-Section Models," *Political Analysis*, 1996, *6*, 1–36.

Beck, Thorsten, George Clarke, Alberto Groff, Philip Keefer, and Patrick Walsh, "New Tools in Comparative Political Economy: The Database of Political Institutions," *World Bank Economic Review*, 2001, *15* (1), 165–176.

Becker, Gary S., "A Theory of Competition Among Pressure Groups for Political Influence," *The Quarterly Journal of Economics*, 1983, *98* (3), 371–400.

Beghin, John C. and Mylene Kherallah, "Political Institutions and International Patterns of Agricultural Protection," *The Review of Economics and Statistics*, 1994, *76* (3), 482–489.

___ **, William E. Foster, and Mylene Kherallah**, "Institutions and Market Distortions: International Evidence for Tobacco," *Journal of Agricultural Economics*, 1996, *47* (3), 355–365.

Black, Duncan, *The Theory of Committees and Elections*, London and New York: Cambridge University Press, 1958.

de Gorter, Harry and Johan F. M. Swinnen, "Political Economy of Agricultural Policy," in G.C. Rausser and B.L. Gardner, eds., *Handbook of Agricultural Economics*, Vol. 2B, North-Holland, 2002, chapter 36, pp. 1893–1943.

___ **and Yacov Tsur**, "Explaining Price Policy Bias in Agriculture: The Calculus of Support-Maximizing Politicans," *American Journal of Agricultural Economics*, 1991, *73* (4), 1244–1254.

Diebold, Francis X., Joon-Haeng Lee, and Gretchen C. Weinbach, "Regime Switching with Time-Varying Transition Probabilities," in C. Hargreaves, ed., *Nonstationary Time Series Analysis and Cointegration*, Oxford: Oxford University Press, 1994, pp. 284–302.

Diermeier, Daniel and Timothy J. Feddersen, "Cohesion in Legislatures and the Vote of Confidence Procedure," *American Political Science Review*, 1998, *92*, 611–621.

Eckstein, Harry and Ted Robert Gurr, *Patterns of Authority: A Structural Basis for Political Inquiry*, New York: John Wiley, 1975.

FAOSTAT, "Various Timeseries," available at: `http://faostat.fao.org/default.aspx` 2008.

Freedom House, "Freedom in the World," available at: `http://www.freedomhouse.org/template.cfm?page=351&ana_page=342&year=2008` 2008.

Geweke, J., "Bayesian Inference in Econometric Models Using Monte Carlo Integration," *Econometrica*, 1989, *57*, 1317–1340.

Greene, William H., *Econometric Analysis*, 5th ed., Prentice Hall, 2003.

Grossman, Jean Baldwin, "Evaluating Social Policies: Principles and U.S. Experience," *The World Bank research observer*, 1994, *9* (2), 159–180.

Hajivassiliou, V., "Smooth Simulation Estimation of Paneldata LDV Models," Discussion paper, Department of Economics, Yale University, New Haven, CT 1990.

Hamilton, J.D., "A New Approach to Economic Analysis of Nonstationary Time Series and the Busniss Cycle," *Econometrica*, 1989, *57*, 357–389.

_ , "Analysis of Time Series Subject to Changes in Regime," *Journal of Econometrics*, 1990, *45*, 37–70.

Harvey, Andrew C., *The Econometric Analysis of Time Series* LSE Handbooks in Economics, Philip Allan, 1992.

Henning, Christian H. C. A., "The Health Check: A Starting Point of the End of the "Old CAP"?," *Agrarwirtschaft*, 2008, *57* (3/4), 149–154.

Honma, Masayoshi and Yujiro Hayami, "Structure of Agricultural Protection in Industrial Countries," *Journal of International Economics*, 1986, *20*, 115–129.

Huber, John D., "The Vote of Confidence in Parliamentary Democracies," *American Political Science Review*, 1996, *90*, 269–282.

Inter-Parliamentary Union, "PARLINE database on national parliaments," `http://www.ipu.org/parline-e/parlinesearch.asp` 2008.

Keane, M., "Computationally Practical Simulation Estimator for Panel Data," *Econometrica*, 1994, *62*, 95–116.

Krehbiel, Keith, *Information and Legislative Organization*, Ann Arbor: University of Michigan Press, 1991.

Lijphart, Arend, *Democracies: Patterns of Majoritarian and Consensus Government in Twenty-One Countries*, New Haven: Yale University Press, 1984.

Lipset, S.M. and S. Rokkan, *Party Systems and Voter Alignments. Cross-national Perspectives*, New York: The Free Press, 1967.

Lohmann, Susanne, "An Information Rationale for the Power of Special Interests," *American Political Science Review*, 1998, *92*, 809–27.

Lundell, Krister and Lauri Karvonen, "A Comparative Dataset on Political Institutions," Occasional Papers Series 19/2003, Department of Political Science, Abo Akademi University 2003.

Olper, Alessandro, "Determinants of Agricultural Protection: The Role of Democracy and Institutional Setting," *Journal of Agricultural Economics*, 2001, *52* (2), 75–91.

_ and Valentina Raimondi, "Constitutional Rules and Agricultural Policy Outcomes," May 2009.

Olson, Mancur, *The Logic of Collective Action*, Cambridge (Mass.): Harvard University Press, 1965.

Persson, Torsten and Guido Tabellini, "The Size and Scope of Government: Comparative Politics with Rational Politicians," *European Economic Review*, 1999, *43*, 699–735.

_ and _ , *Political Economics - Explaning Economic Policy*, Cambridge: MIT Press, 2000.

_ and _ , *Political Economics - Explaning Economic Policy* in .

_ and _ , *The Economic Effects of Constitutions*, Cambridge, Massachusetts: MIT Press, 2003.

_ , _ , and Francesco Trebbi, "Electoral Rules and Corruption," *Journal of the European Economic Association*, 2003, *1* (4), 958–989.

Rosenbaum, S., "Moments of a Truncated Bivariate Normal Distribution," *Journal of the Royal Statistical Society, Series B*, 1961, *23* (2), 405–408.

Shepsle, Kenneth A., "Institutional Arrangements and Equilibrium in Multidimensional Voting Models," *American Journal of Political Science*, 1979, *23* (1), 27–59.

Smith, Aaron, Prasad A. Naik, and Chih-Ling Tsai, "Markov-Switching model selection using Kullback-Leibler divergence," *Journal of Econometrics*, 2006, *134*, 553–577.

Swinnen, J.F.M., L. Dries, and K. Macours, "Transition and Agricultural Labor," Policy Research Group Working Paper 16, Department of Agricultural and Environmental Economics, Katholieke Univeriteit, Leuven 2000.

Swinnen, Johan F. M., "A Positive Theory of Agricultural Protection," *American Journal of Agricultural Economics*, 1994, *76*, 1–14.

_ , Harry de Gorter, Gordon C. Rausser, and Anurag N. Banerjee, "The Political Economy of Public Research Investment and Commodity Policies in Agriculture: an Empirical Study," *Agricultural Economics*, 2000, *22*, 111–122.

Thies, Cameron G. and Schuyler Porche, "The Political Economy of Agricultural Protection," *The Journal of Politics*, February 2007, *69* (1), 116–127.

Tyers, Rod and Kym Anderson, *Disarray in World Food Markets*, Cambridge, New York, Melbourne: Cambridge University Press, 1992.

United Nations Development Program, "HDI Trends and Indicators (1980-2008)," `http://hdr.undp.org/en/statistics/` 2008.

Weingast, Barry R. and William J. Marshall, "The Industrial Organization of Congress; or, Why Legislatures, Like Firms, Are Not Organized as Markets," *Journal of Political Economy*, 1988, *96*, 132–163.

_ , Kenneth A. Shepsle, and Christopher Johnsen, "The Political Economy of Benefits and Costs: A Neoclassical Approach to Distributive Politics," *Journal of Political Economy*, 1981, *89*, 642–664.

World Bank, "World Development Indicators," Washington D.C.: The World Bank 2008.

Appendix

6 Proofs of Propositions

6.1 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.

6.2 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 an unique solution since $U^{C_A}(s)$ is strictly quasi concave.

q.e.d.

6.3 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:

$$\frac{\partial Y_{(g_d)}}{\partial \beta_d^A} = -\frac{1}{\frac{\partial^2 W^{inc}}{\partial s^2}} = \begin{array}{l} \frac{1}{\frac{\partial^2 \Gamma^S}{\partial s_A^2}} > 0 \,, \quad for\ s > 0 \\ -\frac{1}{\frac{\partial^2 \Gamma^T}{\partial t_A^2}} > 0 \,, \quad for\ s < 0 \end{array}$$

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 :

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

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 $0 < \psi_s < 1$:

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

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 $0 \leq \psi_t \leq 1$:

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

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

q.e.d.

6.4 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:

$$\begin{array}{l} Y_{k_1}^M < Y_{k_2}^M < .... < Y_{k_i}^M < Y_{k(i+1}^M < Y_{k_l}^M = Y_n \\ Y_{k_1}^A > Y_{k_2}^A > .... > Y_{k_i}^A > Y_{k(i+1}^A > Y_{k_l}^A = Y_n \end{array} \tag{39}$$

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:

$$\begin{aligned} s_{k_i}^* &= \max\left\{s_{k_i}^-, Y_{k_i}^{PM}\right\} \leq \bar{s}_{k_i} \quad \text{if} \quad Y_{k_i}^{PM} \leq \bar{s}_{k_i} \\ s_{k_i}^* &= \min\left\{s_{k_i}^+, Y_{k_i}^{PM}\right\} \geq \bar{s}_{k_i} \quad \text{if} \quad Y_{k_i}^{PM} \geq \bar{s}_{k_i} \end{aligned} \tag{40}$$

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 $s_{k_i}^* = \max\left\{s_{k_i}^-, Y_{k_i}^{PM}\right\}$. $s_{k_i}^*$ 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 $s_{k_i}^* = s_{k_i}^-, \quad \forall i = 1,..,l$. Thus, a monotonically decreasing relation results. In the second case it follows that $s_{k_i}^* = Y_{k_i}^{PM}, \quad \forall i = 1,..,l$, 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: $s_{k_i}^- \leq Y_{k_i}^{PM}, \quad for k_i \geq k^{\#\#}$. 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 $Y_{k_i}^{PM} \geq \bar{s}_{k_i} \forall i = 1,..,l$. Therefore, it already follows $s_{k_i}^* = \min \left\{ s_{k_i}^+, Y_{k_i}^{PM} \right\}$. $s_{k_i}^*$ 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 $Y_{k_i}^{PM}$ deceases 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 $s_{k_i}^* = s_{k_i}^+, \quad \forall i = 1,..,l$. Thus, an monotonically increasing relation. In the second case it follows that $s_{k_i}^* = Y_{k_i}^{PM}, \quad \forall i = 1,..,l$, 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:$s_{k_i}^+ \geq Y_{k_i}^{PM}, \quad for k_i \geq k^{\#\#}$. 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:

$$\begin{aligned} s_{k_i}^* &= \max \left\{ s_{k_i}^-, Y_{k_i}^{C_A} \right\} \leq SQ \quad \text{if} \quad Y_{k_i}^{C_A} \leq SQ \\ s_{k_i}^* &= \min \left\{ s_{k_i}^+, Y_{k_i}^{C_A} \right\} \geq SQ \quad \text{if} \quad Y_{k_i}^{C_A} \geq SQ \end{aligned} \tag{41}$$

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 $Y_{k_i}^{C_A}$ 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 $Y_{k_i}^{C_A} = Y_{k_i}^M \leq Y_n$ increases with k_i. Therefore, assuming SQ is sufficiently large implies perfect agenda setting power of the urban committee and hence $s^*_{k_i} = Y^M_{k_i}$ 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: $Y^M_1 < s^-_1$, while it also holds: $Y^M_n > s^-_n$. 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:$s^-_{k_i} \leq Y^M_{k_i}, \quad for k_i \geq k^{\#\#}$. 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 ϵ, 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 $Y^F_{k_i} = Y^M_{k_i}$. Hence, $Y^F_{k_i}$ increases with k_i, while from proposition 1 we have $Y^{C_A}_{k_i}$ 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 $s^*_{k_i} = Y^M_{k_i}$ 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 $Y^{C_A}_{k_i} = Y^A_{k_i} \geq Y_n$ increases with k_i. Therefore, assuming SQ is sufficiently lower than Y_n implies perfect agenda setting power of the rural committee and hence $s^*_{k_i} = Y^A_{k_i}$ 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: $Y^A_1 > s^+_1$, while it also holds: $Y^A_n < s^+_n$. 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:$s^+_{k_i} \geq Y^A_{k_i}, \quad for k_i \geq k^{\#\#}$. 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 ϵ, 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.

Tables

Table 5: List of countries and available time periods

	Country	First period	Last period	# periods	MAE	Relative MAE
1	Argentina	1984	2006	23	0.2458	0.2686
2	Australia	1972	2006	35	0.1669	0.7127
3	Austria	1972	1994	23	0.4411	0.1781
4	Bangladesh	1992	2005	14	0.3422	0.6051
5	Brazil	1986	2006	21	0.2751	0.1886
6	Bulgaria	1993	2006	14	1.0171	0.6407
7	Canada	1962	2006	45	0.3920	0.2705
8	Chile	1990	2006	17	0.4742	1.6169
9	Colombia	1966	2006	41	0.4656	0.3289
10	Czech Rep.	1994	2003	10	0.5511	0.4344
11	Denmark	1967	1972	6	0.1006	0.3266
12	Dominican Rep.	1979	2006	28	0.7229	0.3210
13	Ecuador	1980	2004	25	0.5212	0.5587
14	Estonia	1993	2003	11	0.7749	0.3660
15	Ethiopia	1996	2006	11	0.5635	1.0844
16	Finland	1962	1994	33	0.8816	0.2330
17	Ghana	1998	2005	8	0.2215	1.0061
18	Hungary	1993	2003	11	0.4024	0.3118
19	Iceland	1980	2006	27	1.5348	0.1979
20	India	1966	2005	40	0.9672	0.6265
21	Indonesia	2000	2005	6	0.2119	0.6002
22	Japan	1966	2006	41	0.8590	0.2405
23	Korea, Rep.	1990	2006	17	1.8649	1.0335
24	Latvia	1994	2003	10	0.2556	0.1028
25	Lithuania	1993	2003	11	0.5272	0.1818
26	Madagascar	1994	2006	13	0.4064	1.0758
27	Malaysia	1962	2005	44	0.2707	0.4408
28	Mexico	1995	2006	12	0.2761	0.2134
29	Mozambique	1995	2006	12	0.2671	0.2136
30	New Zealand	1972	2006	35	0.8616	0.7945
31	Nicaragua	1995	2005	11	0.3252	0.6499
32	Nigeria	2001	2005	5	0.4133	1.9755
33	Norway	1972	2006	35	1.6181	0.2051
34	Pakistan	1989	1999	11	0.4628	0.6898
35	Philippines	1988	2005	18	0.7099	0.6545
36	Poland	1993	2003	11	0.3173	0.3173
37	Portugal	1977	1985	9	0.2347	0.3530
38	Romania	1993	2006	14	0.7116	0.2933
39	Russia	1995	2006	12	0.2873	0.2478
40	Senegal	2001	2005	5	0.2882	0.3861
41	Slovak Rep.	1998	2003	6	0.4927	0.4405
42	Slovenia	1993	2003	11	0.6931	0.4309
43	South Africa	1962	2006	45	0.5488	0.5476
44	Spain	1979	1985	7	0.4088	0.3626
45	Sri Lanka	1962	2005	44	0.6486	0.3951
46	Sweden	1972	1994	23	0.7910	0.4266
47	Switzerland	1991	2006	16	2.0813	0.4225
48	Thailand	1989	2005	17	0.3547	0.7167
49	Turkey	1970	2006	37	0.6031	0.2816
50	Ukraine	1995	2006	12	1.0913	0.7619
51	United States	1972	2006	35	0.6124	0.7430
52	Zambia	1993	2005	13	1.0037	0.7865
# observations				1041		

Source: Authors.

Table 6: Information Criteria for Model Selection

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

Table 7: Maximum Likelihood Estimation Results for Regime Probabilities – First Step

variable	θ	s.e.	t-statistic	Sandwich	pan. rob. t-statistic	marginal effect	s.e.	t-statistic	Sandwich	pan. rob. t-statistic
Regime I						# observations in Regime I: 19				
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	1.5096
agri value	-0.1475	0.1844	-0.8002	0.1426	-1.0344	-0.0209	0.0131	-1.5888	0.0180	-1.1627
Regime II						# observations in Regime II: 182				
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	-1.7855
agri value	0.2659	0.1677	1.5857	0.1677	1.5857	0.0992	0.0534	1.8574	0.0558	1.7797
Regime III						# observations in Regime III: 78				
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	0.3427
agri value	-0.1523	0.1796	-0.8481	0.1526	-0.9982	-0.0302	0.0193	-1.5650	0.0231	-1.3046
Regime IV						# observations in Regime IV: 748				
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	4.8611
agri value	-0.4765	0.2227	-2.1394	0.2883	-1.6527	-0.0219	0.0068	-3.2196	0.0067	-3.2814
Regime V						# observations in Regime V: 8				
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	2.4725
agri value	-0.2825	0.2098	-1.3464	0.1485	-1.9016	-0.0222	0.0076	-2.9093	0.0108	-2.0576
Regime VI						# observations in Regime VI: 6				
c_6	–	–	–	–	–	–	–	–	–	–
emplln	–	–	–	–	–	-0.0234	0.1177	-0.1986	0.0792	-0.2951
agri value	–	–	–	–	–	-0.0041	0.0078	-0.5271	0.0057	-0.7264

Notes: Marginal effects are evaluated at 50% quantile.

Table 8: Latent regime classification of countries and periods – I

	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	20	1	2	3	4	5	6	7	8	9
61	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	4	0	0
62	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	4	0	0
63	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	4	0	0
64	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	4	0	0
65	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	4	0	0	0	4	0	4	0	0	0	0	4	0	0
66	0	0	0	0	0	0	4	0	4	0	4	0	0	0	0	4	0	0	0	2	0	4	0	0	0	0	4	0	0
67	0	0	0	0	0	0	4	0	4	0	4	0	0	0	0	4	0	0	0	2	0	4	0	0	0	0	4	0	0
68	0	0	0	0	0	0	4	0	4	0	4	0	0	0	0	4	0	0	0	2	0	4	0	0	0	0	4	0	0
69	0	0	0	0	0	0	4	0	4	0	4	0	0	0	0	4	0	0	0	2	0	4	0	0	0	0	4	0	0
70	0	0	0	0	0	0	4	0	4	0	4	0	0	0	0	4	0	0	0	2	0	4	0	0	0	0	4	0	0
71	0	3	4	0	0	0	3	0	4	0	4	0	0	0	0	4	0	0	0	4	0	4	0	0	0	0	4	0	0
72	0	2	4	0	0	0	3	0	4	0	0	0	0	0	0	4	0	0	0	4	0	4	0	0	0	0	4	0	0
73	0	2	1	0	0	0	3	0	4	0	0	0	0	0	0	4	0	0	0	2	0	4	0	0	0	0	4	0	0
74	0	2	4	0	0	0	3	0	4	0	0	0	0	0	0	4	0	0	0	4	0	4	0	0	0	0	4	0	0
75	0	2	4	0	0	0	3	0	4	0	0	0	0	0	0	4	0	0	0	4	0	4	0	0	0	0	4	0	0
76	0	2	4	0	0	0	3	0	4	0	0	0	0	0	0	4	0	0	0	4	0	4	0	0	0	0	4	0	0
77	0	3	4	0	0	0	3	0	4	0	0	0	0	0	0	4	0	0	0	4	0	4	0	0	0	0	4	0	0
78	0	2	4	0	0	0	3	0	4	0	0	4	0	0	0	4	0	0	0	4	0	4	0	0	0	0	4	0	0
79	0	2	4	0	0	0	3	0	4	0	0	4	4	0	0	4	0	0	5	4	0	4	0	0	0	0	4	0	0
80	0	2	4	0	0	0	3	0	4	0	0	4	4	0	0	1	0	0	3	4	0	4	0	0	0	0	4	0	0
81	0	2	4	0	0	0	3	0	4	0	0	4	4	0	0	4	0	0	2	4	0	4	0	0	0	0	4	0	0
82	0	3	4	0	0	0	3	0	4	0	0	4	4	0	0	4	0	0	1	4	0	4	0	0	0	0	4	0	0
83	4	2	4	0	0	0	3	0	4	0	0	4	4	0	0	4	0	0	4	4	0	4	0	0	0	0	4	0	0
84	4	2	4	0	0	0	3	0	4	0	0	4	4	0	0	4	0	0	3	4	0	4	0	0	0	0	4	0	0
85	4	2	4	0	4	0	3	0	4	0	0	4	4	0	0	6	0	0	1	4	0	4	0	0	0	0	4	0	0
86	4	2	4	0	4	0	2	0	4	0	0	4	4	0	0	5	0	0	2	4	0	3	0	0	0	0	4	0	0
87	4	2	4	0	4	0	2	0	4	0	0	4	4	0	0	3	0	0	1	4	0	4	0	0	0	0	4	0	0
88	4	2	4	0	4	0	2	0	4	0	0	4	4	0	0	4	0	0	2	4	0	4	0	0	0	0	4	0	0
89	4	2	4	0	4	0	2	4	4	0	0	4	4	0	0	4	0	0	2	4	0	4	1	0	0	0	4	0	0
90	4	3	3	0	4	0	2	4	4	0	0	4	4	0	0	6	0	0	1	4	0	4	4	0	0	0	4	0	0
91	4	3	4	4	4	0	2	4	4	0	0	4	4	0	0	3	0	0	1	4	0	4	4	0	0	0	4	0	0
92	4	3	3	4	4	2	2	4	4	0	0	4	4	2	0	4	0	4	2	4	0	3	4	0	1	0	4	0	0
93	4	2	3	4	4	4	2	4	4	4	0	4	4	4	0	3	0	4	6	4	0	4	4	1	4	4	4	0	0
94	4	3	0	4	4	2	2	4	4	4	0	4	4	4	0	0	0	4	2	4	0	3	4	4	4	4	4	4	4
95	4	2	0	4	4	2	2	4	4	4	0	4	4	4	2	0	0	4	4	4	0	2	4	4	4	4	4	4	4
96	4	2	0	4	4	2	2	4	4	4	0	4	4	4	2	0	0	4	2	4	0	2	4	4	4	4	4	4	4
97	4	2	0	4	4	2	2	4	4	4	0	4	4	4	2	0	4	4	2	4	0	2	4	4	4	4	4	4	4
98	4	2	0	4	4	2	2	4	4	4	0	4	4	4	2	0	4	4	1	4	0	2	4	4	4	4	4	4	4
99	4	2	0	4	4	2	2	4	4	4	0	4	4	4	2	0	4	4	3	4	4	3	5	4	4	4	4	4	4
00	4	2	0	4	4	2	2	4	4	4	0	4	4	4	2	0	4	4	6	4	4	3	4	4	4	4	4	4	4
01	4	2	0	4	4	2	2	4	4	4	0	4	4	4	2	0	4	4	2	4	4	2	4	4	4	4	4	4	4
02	2	2	0	4	4	2	2	4	4	4	0	4	4	4	4	0	4	4	3	4	4	2	4	4	4	4	4	4	4
03	2	2	0	4	4	2	2	4	4	0	0	4	4	0	4	0	4	0	4	4	4	2	4	0	0	4	4	4	4
04	2	2	0	4	4	2	2	4	4	0	0	4	0	0	2	0	2	0	4	4	4	3	3	0	0	4	4	4	4
05	2	2	0	0	4	2	2	4	4	0	0	4	0	0	2	0	0	0	3	0	0	2	2	0	0	4	0	4	4

Notes: Asymptotic t-statistics are given in parenthesis.

Table 9: Latent regime classification of countries and periods – *II*

	30	1	2	3	4	5	6	7	8	9	40	1	2	3	4	5	6	7	8	9	50	1	2
61	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	2	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	4	0	0	0
71	4	0	0	5	0	0	0	0	0	0	0	0	0	4	0	4	5	0	0	4	0	2	0
72	2	0	0	4	0	0	0	0	0	0	0	0	0	4	0	4	2	0	0	4	0	2	0
73	4	0	0	4	0	0	0	0	0	0	0	0	0	4	0	4	1	0	0	4	0	2	0
74	4	0	0	4	0	0	0	0	0	0	0	0	0	4	0	4	2	0	0	4	0	2	0
75	4	0	0	4	0	0	0	0	0	0	0	0	0	4	0	4	3	0	0	4	0	2	0
76	4	0	0	4	0	0	0	4	0	0	0	0	0	4	0	4	3	0	0	4	0	2	0
77	4	0	0	4	0	0	0	4	0	0	0	0	0	4	0	4	3	0	0	4	0	2	0
78	4	0	0	4	0	0	0	4	0	0	0	0	0	4	4	4	3	0	0	4	0	2	0
79	4	0	0	5	0	0	0	4	0	0	0	0	0	4	4	4	3	0	0	4	0	2	0
80	4	0	0	4	0	0	0	4	0	0	0	0	0	4	4	4	1	0	0	4	0	2	0
81	4	0	0	3	0	0	0	4	0	0	0	0	0	4	4	4	3	0	0	4	0	2	0
82	4	0	0	3	0	0	0	4	0	0	0	0	0	4	4	4	3	0	0	4	0	2	0
83	4	0	0	3	0	0	0	4	0	0	0	0	0	4	4	4	3	0	0	4	0	2	0
84	4	0	0	3	0	0	0	4	0	0	0	0	0	4	4	4	2	0	0	4	0	2	0
85	4	0	0	1	0	0	0	0	0	0	0	0	0	4	0	4	3	0	0	4	0	2	0
86	4	0	0	2	0	0	0	0	0	0	0	0	0	4	0	4	3	0	0	4	0	2	0
87	4	0	0	3	0	4	0	0	0	0	0	0	0	4	0	4	3	0	0	4	0	2	0
88	4	0	0	2	4	4	0	0	0	0	0	0	0	4	0	4	2	0	4	4	0	2	0
89	4	0	0	2	4	4	0	0	0	0	0	0	0	4	0	4	2	0	4	4	0	2	0
90	4	0	0	1	4	4	0	0	0	0	0	0	0	4	0	4	3	5	4	4	0	2	0
91	4	0	0	3	4	4	0	0	0	0	0	0	0	4	0	4	3	3	4	4	0	2	0
92	4	0	0	2	4	4	4	0	4	0	0	0	3	4	0	4	2	6	4	4	0	2	4
93	4	0	0	3	4	4	4	0	4	0	0	0	2	4	0	4	2	1	4	4	0	2	4
94	4	4	0	3	4	4	4	0	2	4	0	0	2	4	0	4	0	3	4	4	4	2	4
95	4	4	0	2	4	4	4	0	2	4	0	0	2	4	0	4	0	6	4	4	4	2	4
96	4	2	0	2	4	4	4	0	2	4	0	0	2	4	0	4	0	3	4	4	4	2	4
97	4	2	0	3	4	4	4	0	2	4	0	4	2	4	0	4	0	3	4	4	4	2	4
98	4	4	0	3	4	4	4	0	3	4	0	4	3	4	0	4	0	3	4	4	4	2	4
99	4	4	0	3	0	4	4	0	2	1	0	4	2	4	0	4	0	3	4	4	4	2	4
00	2	4	4	2	0	4	4	0	4	4	4	4	2	4	0	4	0	2	4	4	2	2	4
01	2	4	2	2	0	4	4	0	3	4	4	1	2	4	0	4	0	2	4	4	2	2	4
02	4	4	2	1	0	4	4	0	4	4	4	4	2	4	0	4	0	3	4	4	2	2	4
03	4	4	4	2	0	4	0	0	4	4	4	0	0	4	0	4	0	2	4	4	4	2	4
04	3	4	4	2	0	4	0	0	4	4	4	0	0	4	0	4	0	2	4	4	4	2	4
05	3	0	0	3	0	0	0	0	4	4	0	0	0	4	0	0	0	2	0	4	4	2	0

Notes: Asymptotic t-statistics are given in parenthesis.