

The logic of the CAP: *Politics or Economics?*

Christian H.C.A. Henning*, Carsten Struve*
and Martina Brockmeier**

*University of Kiel; **FAL, Braunschweig
chenning@ae.uni-kiel.de

Agricultural Distortions Working Paper 77, November 2, 2008

* Prepared for the World Bank's Conference on the Political Economy of Distortions to Agricultural Incentives, Washington DC, 23-24 May 2008. We like to thank participants of this workshop for their helpful comments.

This Working Paper series is designed to promptly disseminate the findings of work in progress for comment before they are finalized. The views expressed are the authors' alone and not necessarily those of the World Bank and its Executive Directors, nor the countries they represent, nor of the institutions providing funds for this research project.

The logic of the CAP: *Politics or Economics?*

Christian H.C.A. Henning*, Carsten Struve*
and Martina Brockmeier**

*University of Kiel; **FAL, Braunschweig

This paper derives an applied general political economy model incorporating a model of political decision-making into a computable general economic equilibrium model. Political decision-making among a set of legislators is modeled via a *mean voter decision rule* derived from a *modified non-cooperative legislative bargaining game of a Baron-Ferejohn type*. The model allows a simultaneous analysis of political and economic factors determining policy outcome and is applied to simulate future Common Agricultural Policy (CAP) under various political and economic scenarios.

1 Introduction

Although economic theory of politics or new political economy underlines the interconnection between politics and the economy for a long time (Weber, 1921; Commons, 1931; Schneider et al., 1981; Miller, 1997), existing applied political economy models assigned politics only a minor role and focused mainly on modeling the economic sector. For example, most existing applied political economy studies apply classical (Stigler (1971); Peltzman (1976); Becker (1983); Downs (1957); Hinich (1977) or more recently developed public choice models, e.g. Magee et al. (1989); Grossman (1994) to analyze policy choices in the framework of partial or general equilibrium models.

In particular, in the field of quantitative analysis of agricultural policy, public choice approaches have been further developed to a very interesting range of quantitative political economy models based on partial economic equilibrium models ((Gardner, 1987; Tyers and Anderson, 1992; Anderson, 1995; Fafchamps et al., 1993). See also the literature overview from DeGorter and Swinnen (2002)). Beyond partial equilibrium models also very interesting approaches analyzing agricultural policy choice in a general equilibrium framework have been developed (Anderson, 1995; Fafchamps et al., 1993).

Since these public choice approaches assume an unitary political agent maximizing a political support, popularity or preference function, these studies focus on the importance of economic framework conditions for the formulation of economic policy, while political institutions are largely neglected¹

In contrast more recent approaches focus on modeling the political decision-making process as an interaction between a set of individually rational political actors. Within these new political economy approaches, biased policies result as specific incentive problems, where political institutions are considered as key factors influencing individual incentives of political actors. Thus, in the light of these new approaches, beyond economic factors determining deadweight costs and demographic factors determining cost of interest organization, political institutions are main factors in explaining observed variances of economic policies across countries (Persson and Tabellini, 2002).

For example, Persson and Tabellini or Milesi-Ferretti et al. nicely demonstrate how the electorate system and the organization of legislature determine general macroeconomic policies (Persson and Tabellini, 2002; Milesi-Ferretti et al., 2002). But, although these new approaches nicely explain the role of political institutions in determining policy choice they focus on modeling the political sector, while a sound modeling of the economic sector is generally not provided by these approaches. Moreover, very often an abstract uni-dimensional policy choice set is assumed, while the simultaneous choice of many different policy instruments as observed for real political systems is not analyzed.

Taking particularly the case of agricultural policy, both theoretical and empirical political economy some recent studies exists taking explicitly political institutions into account (for example, see Beghin and Kherallah, 1994; Beghin et al., 1996; Olper, 2001; Swinnen et al., 2001; Henning, 2004, 2008b; Olper and Raimondi, 2008). Most of these studies analyze the general impact of democracy on agricultural protectionism, comparing agricultural protection levels in democratic and autocratic countries. Moreover, most studies apply a heuristic approach based on quasi-reduced form estimation, while they do not provide an explicit theory of how political institutions influence agricultural protection². Finally, all of these existing new approaches focus on agricultural protection as an aggregate measure of agricultural policy outcome, while a model allowing a quantitative prediction of a large set of various product specific agricultural policy in-

¹A notable exception in this regard is Magee et al. (1989) who in their seminal work consider two parties and two interest groups in a probabilistic voter environment, but still also Magee et al. do not consider explicitly the role of political institutions as determinants of policy choices.

²Notable exemptions are Henning (2004, 2008b).

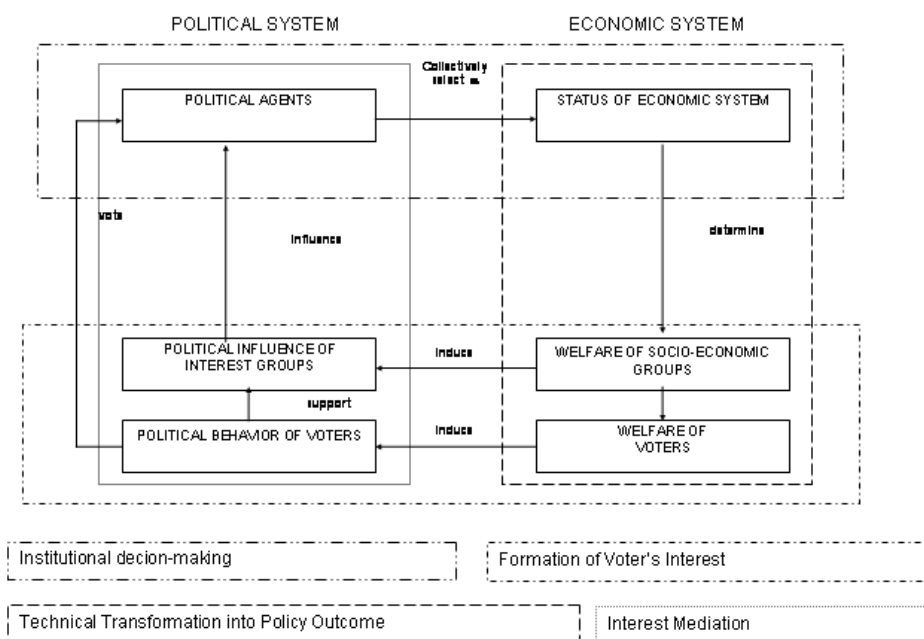
struments corresponding to the policy output of real existing agricultural policy systems has not been provided yet.

Therefore, it is still fair to conclude that no applied political economy approach exists, yet that includes a comprehensive quantitative modeling of both the economic and the political sector. This is regrettable since such approaches are especially desired by practical politicians to identify effective options for a more efficient future policy design. Nowadays it is not only commonly accepted that political institutions have a significant impact on policy (especially agricultural) policy outcomes (Miller, 1997; Binswanger and Deininger, 1997) , but also international organizations such as the World Bank and International Monetary Fund take governance criteria increasingly into account when granting financial aid.

In this regard this paper aims to contribute to closing this gap. In detail, a computable general political economy equilibrium model (CGPE) is theoretically derived and *pars pro toto* empirically applied to simulate the future European Common Agricultural Policy under different economic and constitutional scenarios.

The CGPE model integrates an general economic equilibrium model (GTAP) with a modified legislative bargaining model based on that of BARON AND FEREJOHN. Based on a specified version of this CGPE model the impact of different constitutional rules, international trade agreements (WTO) as well as economic framework conditions on specific CAP policy instruments is analyzed.

The rest of the paper is structured as follows. In section 2 a description of the theoretical model is provided. In section 3 the empirical application of the CGPE to simulate future CAP is described. In particular, the derivation of policy preferences of relevant legislators and the empirical specification of the legislative decision-making model is provided in subsections 3.2 and 3.3, while subsection 3.4 described the simulated scenarios. Key results of the simulation analyzes are discussed in section 4, while section 5 critically discussed the potential contribution of the suggested CGPE approach and gives a brief outlook on future research.



Source: Henning (2000, S.118)

Figure 1: Schematic representation of a political economy equilibrium

2 The theoretical model

2.1 Background and motivation: The interplay between politics and economics

The basic structure of the political economy equilibrium model is represented in figure 1. Political agents are interested in maximizing their level of political support. In doing so, the political support, S , depends on the state of the economic system, z : $S = S(z)$. In turn, the state of the economic system depends on the policy, (α) : $T(z, \alpha) = 0$. Policy preferences of the political representatives $U(\alpha)$ are the result of the maximization of political support $S(z)$ restricted by the political technology $T(z, \alpha)$ (Rausser and Freebairn, 1974; Zusman, 1976).

Accordingly, political economy equilibrium models include simultaneous an economic equilibrium model $T(z, \alpha)$, relating exogenous policy instruments (α) with relevant state variables of the economic system, z , as well as a legislative decision-making model deriv-

ing policy choice, α , endogenously from legislator's policy preferences, $u(\alpha)$ and given formal constitutional rules, e.g. $\alpha^* = \Gamma [u(\alpha)]$.

While $T(z, \alpha)$ corresponds to a economic partial or general equilibrium model, $\Gamma [u(\alpha)]$ corresponds to a formal legislative decision-making model. Although at theoretical level political economy equilibrium has been fully characterized, applied political economy models existing in the literature have however not yet even come close to being able to model both levels simultaneously.

In contrast, classical economic analysis of policy intervention focus on modeling the impact of exogenous policy on the state of the economy using a specific functional form of $T(z, \alpha)$ (Tinbergen, 1956), while in political science formal models of legislative decision-making focus on the analysis of policy choice under various constitutional rules based on a specific form of $\Gamma [u(\alpha)]$.

An integration of these two approaches to a general political economy equilibrium model results when legislators' policy preferences, $u(\alpha)$, entering into the legislative decision-making model are endogenously derived from political support maximization:

$$u(\alpha) = \text{Max} \{S(z) | T(z, \alpha) \equiv 0\}$$

One of the first formal approaches to such an integrated political economy equilibrium model is Schneider et al. (1981). However, Schneider et al. (1981) first assumed only one omnipotent political agent (the government) and second used reduced forms for both the economic model as well as the political model. More advanced CGPE's have been suggested by Magee et al. (1989), Fafchamps et al. (1993) as well as Anderson (1995).

Magee et al. used a two-party set-up within a probabilistic voter environment including endogenous lobbying activities and integrate their political model with a simple two sector general equilibrium model. However, Magee et al. used an pre-election model, that is they assume that parties can ex ante commit to their party platform and the platform of the winning party becomes the final policy outcome.

Fafchamps et al. (1993) as well as Anderson (1995) integrate a political choice models with a general economic equilibrium model. However, both approaches assumed an omnipotent government as a modeling framework for political decision-making. Fafchamps et al. (1993) used an extended interest group theory of Becker, while Anderson (1995) used a voter support function.

Hence, all of these existing advanced CGPE approaches have in common that in their framework political institutions play no role determining final policy choices. Fundamental pioneering work in the field of the importance of political institutions for economic

policy and economic development can be accredited to Douglas North, Barry Weingast and Ken Shepsle (North, 1990; Weingast and Marshall, 1988; Shepsle, 1989). Moreover, probabilistic voter theory (Hinich, 1977; Ledyard, 1984) provides central theoretical instruments for analyzing political institutions together with the development of formal legislative decision-making models, especially the *structure-induced equilibrium* model Shepsle (1979) as well as *Noncooperative Legislative Bargaining* model from Baron and Ferejohn (1989) and the *agenda setting model* (Romer and Rosenthal, 1978) should be named.

Following the basic logic of a general political economy equilibrium explained above in the this section a own CGPE approach is derived, that in contrast to existing CGPE's allows a simultaneous analysis of the impact of economic framework conditions and constitutional rules on policy choice.

While regarding economic modeling various applied general equilibrium models are available in the literature, the crucial bottleneck of an applied CGPE corresponds to the modeling of legislative decision-making. In particular, a legislative decision-making model should be able to include multiple heterogeneous legislators and multidimensional policy choices. These two properties are already a challenge at theoretical level, as most formal legislative decision-making models are rather abstract including very few legislators and assuming an uni-dimensional policy space. However, in the framework of applied political economy modeling an additional challenges results, since the model needs to be specified empirically.

As will be described in more detail below we suggest a specific cooperative legislative bargaining model derived from a modified Baron-Ferejohn model of non-cooperative legislative bargaining model, while for we use an extended GTAP-version as economic model.

Since especially our cooperative legislative bargaining model is not standard in political economy theory, we will derive this model in more detail in the following, while we will only briefly described our used GTAP-model as this is already fully established in the literature.

2.2 A modified Baron-Ferejohn legislative bargaining model

Following Baron and Ferejohn (1989) we consider a legislature comprising of a set N of n legislators, where $l = 1, \dots, n$ denotes the index of legislator l , and a constitutionally fixed majority voting rule φ . Legislature has collectively to choose an policy α out of a compact and convex subset R^m of the m -dimensional cube $(0, 1)^m$. Each legislator $l \in N$

has a complete, transitive binary preference relation defined for all $\alpha, \alpha' \in R^m$, that is represented by a concave utility function $U_l(\alpha)$. Formally, the rule φ corresponds to a binary choice procedure, which determines legislature choice among two alternatives α and α' , and a random recognition rule that determines which legislator can make a proposal.

In general, the random recognition rule can be represented by a vector of individual probabilities $q = q_1, \dots, q_{n_L}$, where q_l denotes the probability that legislator l is chosen to make a proposal. For simplicity we assume in the following that $q_l = 1/n$ for all $l \in N$.

The choice procedure can be represented by a set of winning coalitions, G . A winning coalition $g \in G$ is defined as an element of the superset 2^N , for which the following holds: if all members of g vote for an alternative α in comparison to an alternative α' , then legislature chooses the alternative α .

If s denotes the status-quo policy a necessary condition for a change of the status-quo policy is the existence of a winning coalition g whose members uniquely prefer an alternative to the status quo SQ. Let $W(SQ) \subseteq R^m$ denote the subset of alternatives α , for which a winning coalition exists that prefers α to SQ. A general characteristic of legislative decision-making is that $W(s)$ is generally a large subset of R^m and there exists a large number of different winning coalitions preferring different alternatives to the status quo. Moreover, constitutional rules do neither determine which winning coalition has to form nor which element of $W(SQ)$ has to be proposed.

In this context Baron and Ferejohn (1989) model legislature's choice of a policy $\alpha \in R^m$ as a infinite horizon non-cooperative bargaining game among legislators determined by the following rules. At a first stage an individual legislator $l \in N_L$ is selected according to the randomized recognition rule to propose a policy and at a second stage all legislators vote on the made proposal. If the proposed policy received sufficient votes, i.e. a winning coalition forms for the proposal, this proposal is the new policy, otherwise a new legislator is selected and the procedure starts from the beginning. Assuming individual preferences are common knowledge Baron and Ferejohn (1989); Banks and Duggan (1998) have shown that the non-cooperative bargaining game has a stationary subgame perfect Nash equilibrium even for multidimensional policies and multiple legislators, i.e. $m, n > 1$.

Moreover, Baron (1994) pointed out that in contrast to classical political exchange theory (see for example Buchanan and Tullock (1967); Weingast and Marshall (1988)) non-cooperative legislative bargaining theory does no more have the instability problem of social choice theory and in contrast to political exchange theory does not require mechanisms to enforce trades. Nevertheless, although Baron claims that their theory

does not assume away the fundamental problems of political exchange theory, it is a matter of fact that the nice property of sequential equilibrium crucially depends on the assumption that individual policy preferences are common knowledge. This assumption seems hardly realistic.³ For example, the CAP-reform decision from 1992 included all together 67 policy dimensions in 6 regulations. Given the limited mental capacities of human beings it is quite obvious that legislators impossibly could perfectly know spatial preferences of all other legislators in a 67-dimensional policy space. In contrast, to deal with imperfect information legislators simplify real world phenomena, i.e. apply low-dimensional ideological spaces to approximate legislators true preferences. For example, 'a position in favor or against a multi-functional orientation of the CAP' might be a relevant ideological dimension of the CAP. Based on the ideological approximation of the true policy space legislators are able to anticipate other legislators' response to policy proposals. Of course, since information is imperfect this anticipation is also only imperfect, i.e. legislators can only estimate the probability that other legislators will agree with their proposal.

To include imperfect knowledge of other legislators' preferences we suggest a modified legislative bargaining game via relaxing the assumption of noise free perfect rational behavior of legislators (Henning et al., 2005b, 2008).

In particular, we assume that voting on a policy proposal at the second stage of the game is probabilistic rather than deterministic, i.e. legislators do not always "best respond" according to their expected utilities, since there is some noise in their choices. This noise can be due to errors in terms of perception biases, distractions or miscalculations that lead to non-optimal decisions or it can be due to unobserved utility shocks that make rational behavior look noisy to an outside observer. Regardless of the source of the noise choice becomes stochastic, and the distribution of the random variables determine the form of the choice probabilities. Following the interesting work of McKelvey and Palfrey (1998, 1995) a quantal response equilibrium can be defined, as a vector of individual response probabilities that is a stochastic best response to itself (Goeree and Holt, 2005).

³For example, Blin and Satterthwaite (1977) underline "[T]herefore, a realistic analysis of voting behavior must accept that a member's true preferences are private", and Wilson (1967) even stronger concludes that most of the legislative institutions would be superfluous if individual policy preferences were common knowledge. Moreover, Blin and Satterthwaite (1977) demonstrated that assuming only imperfect information noncooperative legislative bargaining can lead to extremely inefficient policy outcomes.

To simplify derivation of our model we assume for the moment that legislators' proposals are exogenously determined, that is whenever a legislator k is selected according to the random recognition rule he will suggest his proposal x_k .

To formalize the probabilistic behavior we follow Goeree and Holt (2005). Thus, assuming probabilistic voting the total utility of legislator l received from a vote in favor or not in favor of the proposal x_k , is received by adding a stochastic utility term $\xi\omega_i$ to the spatial utility, where $\xi > 0$ is an error parameter and ω_i represent identically and independently distributed realizations of a random variable for the decision to vote for the party platform, $i = 1$, or against it, $i = 2$. Total utility to vote for the proposal is greater than total utility from voting against it, if it holds:

$$U(x_k) + \xi\omega_1 > \delta W_l + \xi\omega_2.$$

ξ is a parameter determining the level of agents' rationality, the larger ξ the more agents' voting behavior becomes stochastic and independent of agents' policy preferences. Assuming a double exponential distribution for ω results in the following choice probability (Goeree and Holt, 2005):

$$\pi_{lk} = \frac{e^{\xi U(x_k)}}{e^{\xi U(x_k)} + e^{\xi \delta W_l}} \quad (1)$$

Of course, legislators always vote for their own proposal, i.e.:

$$\pi_{kk} = 1 \quad \forall k$$

Further, let W_l denote the continuation value of a legislator l playing the modified infinite horizon non-cooperative legislative bargaining game, and let Π_{gk} denote the probability that the winning coalition g is formed to support the proposal x^k , while Π_k denotes the probability that the proposal x^k is accepted, then it follows:

$$\begin{aligned} \Pi_{gk} &= \prod_{l \in g} \pi_{lk} \prod_{l' \notin g} (1 - \pi_{l'k}) \\ \Pi_k &= \sum_{g \in G} \Pi_{gk} \end{aligned} \quad (2)$$

Given the definition above and let δ denote the common discount factor of legislators, the continuation value of the infinite legislative bargaining game is defined as follows:

$$\begin{aligned}
W_l &= \sum_p q_p \Pi_p U_l(x^p) + \delta W_l \sum_p q_p (1 - \Pi_p) \\
&\Leftrightarrow \\
W_l &= \frac{\sum_{k'} q_{k'} \Pi_{k'}}{1 - \delta + \delta \sum_{k'} q_{k'} \Pi_{k'}} \sum_k \frac{q_k \Pi_k}{\sum_{k'} q_{k'} \Pi_{k'}} U_l(x_k)
\end{aligned} \tag{3}$$

Finally, if we denote the vector of probabilities that legislators vote for a party proposal k by $\pi_k = \{\pi_{1k}, \dots, \pi_{nk}\}$ and define the vector $\pi = \{\pi_1, \dots, \pi_k, \dots, \pi_n\}$, then, given the exposition above it follows that π is defined as a function of itself: $\pi = h(\pi)$.

Accordingly, we define π^* as a fix point of h . Then π^* can be considered as a (stationary) quantal response equilibrium (QRE) of the game as it is the best stochastic response to itself in every bargaining period.

Sofar we have assumed that legislators proposals are exogenously given. However, in real legislative bargaining this is obviously not the case. A contrario when formulating a proposal legislators try to formulate a policy that guarantees the support of a winning coalition while maximizing legislators own policy preferences.

Accordingly, define $\pi^*(x)$ as the QRE implied by the proposal vector x , then the formulation of a policy proposal corresponds to the following expected utility maximization:

$$x_k^* = \underset{x_k}{Max} C(x_k, x_{-k}) U_k(x_k)$$

,where x_{-k} denotes the vector of legislators' proposals without the proposal of legislator k .

Thus, assuming a simple Nash equilibrium for legislators' endogenous proposal formulation an overall equilibrium for the modified non-cooperative legislative bargaining game can be stated as in *Proposition 1*:

Proposition 1: A vector of policy proposals, x^ , and a vector of legislators' choice probabilities, π^* , correspond to an equilibrium of the modified infinite legislative session game with endogenous proposal formulation if the following condition hold: (a) π^* is a QRE for the given proposal vector x^* , i.e it holds: $\pi^* = h(\pi^*, x^*)$, and b) it holds for all x_k^* :*

$$x_k^* = \underset{x_k}{Max} C(x_k, x_{-k}^*) U_k(x_k)$$

Moreover, in equilibrium the expected policy outcome corresponds to a weighted mean of legislator's ideal points, $E(z) = \sum_k C_k^* x_k^*$, where the weight of a party k corresponds to the *ex ante* probability that its platform will be the final policy outcome. In particular, it holds:

$$C_k^* = \frac{q_k \Pi_k(\pi^*, x^*)}{\sum_p q_p \Pi_p(\pi^*, x^*)} \quad (4)$$

The proof of proposition 1 follows directly from Goeree and Holt (2005) and therefore is omitted here.

2.3 Cooperative legislative bargaining

Note that given the noise of legislators' choices at the voting stages as well as due to the random recognition rule, policy outcome is uncertain *ex ante*. Therefore, as long as it is assumed that legislators are risk averse, policy outcome is inefficient, i.e. there always exists certain policy outcomes which are commonly preferred by all legislators. Thus, legislators have incentives to agree on informal decision making procedures, if these informal procedures lead *ex ante* to more efficient outcome. Weingast (1979) was one of the first scholars who emphasized the role of self-enforcing informal procedures in legislative decision-making. Based on Weingast Henning (2000) suggests a mean voter decision rule, as a self-enforcing informal procedure of legislative decision-making derived in the shadow of the uncertain outcome of non-cooperative legislative bargaining. According to the mean voter decision rule, legislature directly formulate a common proposal, which corresponds to the weighted mean of legislator's policy proposal's, where the weights of individual proposals equal legislators' *ex ante* probabilities that their proposals will be the final outcome of the formal non-cooperative decision making procedure. Thus, formally the mean voter decision rule is defined as:

$$\alpha^m = \sum_k C_k x_k \quad (5)$$

Given the concavity of legislators' utility functions it follows directly that the mean voter decision rule implies for every legislator a higher *ex ante* expected utility when

compared to the non-cooperative outcome of the modified Baron-Ferejohn legislative bargaining game.⁴ Hence, the mean voter decision rule is self-enforcing.⁵

Note, that although applying the mean voter decision rule leads to policy outcomes that are *ex ante* Pareto dominant vis-a-vis the non-cooperative legislative bargaining, a winning coalition of legislators might have an incentive to deviate from this procedure. That is applying the mean voter decision rule is a 'legislative norm' that only becomes self-enforcing, if legislators do not discount future gains from cooperation too much. In this regard we argue that in contrast to legislative decision-making in US-legislature characterized by a large set of independent individual legislators with a relative low rate of "political" survival, legislative decision-making in the EU-system involves a stable set of national member states and the commission, which can be considered as corporate actors with infinite time horizon. Accordingly, the shadow of the future triggers cooperation in the EU-system, even if it might not in the US-system.

Furthermore, while the mean voter decision rule is *ex ante* Pareto dominant vis-a-vis noncooperative bargaining, it is in general neither Pareto optimal nor necessarily Pareto dominant when compared to the status quo. Accordingly, Henning (2007) elaborates further cooperative bargaining procedures that in particular guarantee that policy outcomes are always ex post Pareto dominant vis-a-vis the status quo. However, since these procedures are based on the mean voter procedure, we will focus on the mean voter procedure in the framework of this paper to keep analyses more traceable.

Finally, as will be demonstrated in the next section another advantage of our cooperative legislative bargaining model when compared to the Baron-Ferejohn model is that it can be directly applied empirically to real political systems like the EU including multiple heterogeneous actors and multi-dimensional policy decisions.

2.4 Derivation of a Computable General Political Economy Equilibrium Model (CGPE)

Obviously, the final Mean Voter decision depends on both legislators' ex ante probabilities, C_i , and legislators' policy preferences determining legislators' policy proposals. Note that probabilities, C_i , depend on the set of winning coalitions which are solely

⁴Note that even in the original BF-model assuming perfect knowledge of legislator' preferences policy outcome is ex ante inefficient from legislators point of view due to legislators' uncertainty to be a member of the winning coalition.

⁵In a more general version it can also be considered that the process of legislative decision making includes always finite sessions ex post, i.e. it is possible that no proposal will be accepted and thus, the status quo remains as the final policy outcome (Henning, 2004).

determined by constitutional rules of legislative decision-making. Legislators' policy preferences result, as already previously mentioned, from the maximization of individual political support: $U_i(\alpha) = \max_{\alpha} S_i \quad s.t. \quad T_i(z_i, \alpha_j) = 0$.

T_i covers the economic system of the constituency which is relevant for the agent i and $S_i(z)$ corresponds to the individual support function. Political support is determined by the state of the economic system, where the latter depends on a vector of indicator variables, z_i . The political support function reflects voters behavior and can be analytically derived as additive or Nash welfare functions from corresponding pre- or postelection probabilistic voting models (see Persson and Tabellini (2002)). These models assume that voter behavior is driven by anticipated or observed welfare gains induced by governmental policies. However, in contrast to these existing approaches we argue in the following that voters are confronted with a fundamental uncertainty regarding the political technology $T(z, \alpha)$ and therefore use specific observable indicator variables (z) to evaluate policy induced welfare changes. Please note that under these assumptions political support maximization does generally not lead to Pareto-optimal policies, since voters do not perfectly respond according to their true policy induced welfare changes.

Spatial policy preferences of individual political agents can be derived as a second order Taylor approximation of the support maximization ⁶ :

$$U^i(\alpha) = S_{WED}^i(\alpha) = S_{opt}^i + \sum_j \sum_k \theta_{jk}^i (\alpha_j^{real} - Y_{ij}) \cdot (\alpha_k^{real} - Y_{ik}) \quad (6)$$

Y_{ij} is the individual ideal point of agent i for the policy j for which the maximal individual support, S_{opt}^i is achieved. θ_{jk}^i is the weighting factor of the interaction term of the deviation of the policies j and k . Based on equation 6 spatial political preferences are derived endogenously from the political support maximization and are then incorporated in the legislative bargaining model. ⁷ On the basis of this CGPE approach the significance of political institutions as well as economic framework conditions can be both theoretically and empirically analyzed.

To demonstrate this, we apply our CGPE approach to the quantitative analysis of future European agricultural policy with due regard to different economic and institutional scenarios in the next section.

⁶Due to the fact that the optimum is approximated, the first partial differentials are all zero and thus the linear term $\beta' \cdot (\alpha_j^{real} - \alpha_j^{opt})$ can be eliminated.

⁷Please note that similar approaches to derive endogenous policy positions exists in the literature (see, for example, DeGorter and Rausser (1989); Fafchamps et al. (1993)). However, these approaches do not derive complete endogenous policy preferences for individual political agents and integrate them directly in a legislative decision-making model.

3 Empirical application of a CGPE to simulate future CAP

As we explained in the previous section to apply our CGPE approach empirically we need to specify three modules: (1) a economic model, (2) individual political support functions (3) the legislative decision-making model.

3.1 Specification of the economic model

To model the technical transformation of CAP-policies into policy concerns we needed an economic model that is able to incorporate both first and second pillar policies. Moreover, the model should be a general equilibrium model including relevant interaction and spill-over effects of agricultural policies to non-agricultural sectors as well as interactions with international markets (see Fafchamps et al. (1993).

Therefore we applied an extended version of a GTAP model developed by Brockmeier (2003). In the following we describe only briefly the main structures of the model, while a detailed description of the used GTAP model is provided by Struve (2006).

The model set-up comprises of 28 regions, of which 24 regions correspond to EU-member states (Luxembourg and Belgium as well as Malta, Cypres and Greece were represented by one common economic model, respectively) and separates 13 commodities of which 8 are agricultural products. The model was calibrated using data from 2001. However, since all simulations refer to the year 2013 projections until the year 2013 were compiled which incorporate the complete implementation of the agenda 2000, the resolutions of the agricultural reform from 2003 and the expansion of the EU-27 and the reform of the sugar sector as well as the agreed results of WTO negotiations. Further the “Everything but arms”-agreement has also been incorporated.

Further, we considered the following 12 policy instruments (α). Nominal protection rates for milk, beef, sugar and grain, as well as decoupled direct payments were considered as first pillar polices. Moreover, we considered milk and sugar quota as specific output restrictions as well as cross compliance and obligatory set-aside as input restrictions. As specific second pillar policies we considered expenditures for rural development programs, for multi-functionality and for agricultural social and structural policy. While price policies, quotas as well as decoupled direct payments and set-aside have already been implemented in GTAP-model of ?, cross compliance as well as second pillar policies had to be incorporated into the GTAP model. In detail, we incorporated cross

compliance restrictions via a shifter decreasing productivity of purchased agricultural inputs in corresponding agricultural production functions, while expenditures under the second pillar are incorporated as direct transfers to national farm sectors or direct payments to national households, respectively. The share of transfers paid to farms and households, respectively, varies across specific second pillar policies, i.e. payments for multi-functionality and structural policy payments are paid per hectare and completely transferred to farms, while 20% of RD-payments are transferred to households. Furthermore, specific national co-financing shares have been implemented for all expenditures related to second pillar policies.

3.2 Specification of support functions

Specifying individual support functions we considered seven policy concerns as relevant indicators for the status of the economic systems (z). In detail included policy concerns are standard welfare measures of socio-economic groups, i.e. welfare of farmers, consumers, agribusiness as well as taxpayers (budgetary expenditures). Moreover, we considered induced international trade conflicts, environmental protection and income differences between rural and urban population as relevant z -variables.

While welfare measures as well as the income gap between rural and urban population could be straightforwardly derived from our GTAP model, some of the z -variables could only be calculated via proxies. In particular, we used the level of commercial farm inputs as proxy for environmental protection, while we used the induced decrease of export earnings of foreign countries as a proxy for international trade conflicts.

Please note in general individual policy concerns are derived from agents' relevant constituency. Accordingly, for national council members welfare measures of corresponding national socio-economic groups as well as national environmental protection and rural-urban income differences are derived, while for supranational agents the corresponding concerns for the total EU are derived. Only international trade conflicts are considered as a global policy concern taking the same value for all political agents.

Given the relevant agricultural policy instruments and z -variables the individual spatial policy preferences $U_i(\alpha)$ could be in general derived from political support maximization.

However, to do this the individual political support function $S_i(\alpha)$ needs to be specified. In particular, we assumed a simple Cobb-Douglas form for individual support functions:

$$S_i = \prod_j Z_{ij}^{\mu_{ij}} \quad (7)$$

Based on the specified individual support functions and based on the specified individual political technologies, $T_i(z, \alpha)$, the spatial preferences could be derived as second order Taylor approximations as described above. Thus, relative interests in different policy concerns, μ_{ij} , could be estimated based on the first order condition of support maximization given agents' preferred policy positions. The latter were collected in personal interviews undertaken with all relevant political agents (Krause, 2005).

However, this procedure still turned out to be a rather complex computational process. To specify individual spatial preferences we would have to derive a second order Taylor approximation of the political support maximization for each individual political agent. This includes an explicit derivation of second order partial derivatives of the complete GTAP model. Moreover, in this way we would only generate a local approximation of the GTAP model, which would not allow us to simulate the impact of changed economic framework conditions.

Therefore, we decided to apply a different procedure. In particular, we approximate the original GTAP model using a set of reduced form equations, i.e. $z = z(\alpha, \gamma)$. To specify these functions we simulated the GTAP equilibrium for randomly drawn parameter sets (α, γ) , and calculated for each induced GTAP equilibrium the corresponding z -variables. In this way we constructed a set of (z, α, γ) values that we could use to estimate the reduced form functions $z(\alpha)$ econometrically. In detail we conducted 1000 random draws, e.g. estimations could be based on 1000 observations. In detail we estimated the following quadratic form using the software **R** (R Development Core Team, 2005) for 25 regions and seven policy concerns z as a function of the 12 policies α_j and three general economic conditions γ_r . In particular, we considered a higher demand for agricultural commodities on international markets (γ_1), technical progress in the agri-

cultural sector of new member states (γ_2) and different co-finance shares for new member states (γ_3) as γ -variables.⁸

$$Z_{i,\omega} = k + \sum_{j=1}^{12} (\beta_{i,\omega,j} \cdot \alpha_j) + \sum_{r=1}^3 (\beta_{i,\omega,r} \cdot \gamma_r) + \sum_{j=1}^{12} \sum_{r=1}^3 (\eta_{i,\omega,j,r} \cdot \alpha_j \cdot \gamma_r) \quad (8)$$

The parameter β stands for linear interrelationship and η for the parameters of the cross term.

Obviously, the function in eq. 8 is linear in policy instruments, α , where the framework conditions are shifters of the constant term, k_i^r , as well as the partial impact of policy instruments on policy concerns, β_{irj} :

$$Z_{i,\omega} = k_i^r + \sum_j (\beta_{irj} \cdot \alpha_j) \quad (9)$$

where $k_i^r = k + \sum_r (\beta_{i,\omega,r} * \gamma_r)$ and $\beta_{irj} = \beta_{i,\omega,j} + \sum_r (\eta_{i,\omega,j,r} * \gamma_r)$.

As explained above the forenamed parameters are specific to the constituency r of each political agent, e.g. national council members are concerned by the welfare of social groups in their country as well as by environmental protection in their country. However, trade conflicts are considered as a global variable which takes the same value for each agent.

3.3 Specification of the cooperative bargaining model for the EU

To apply our cooperative legislative bargaining game empirically to model CAP choices we have first to calculate the equilibrium of the modified Baron-Ferejohn noncooperative legislative bargaining game (Π^*, x^*). Since an explicit calculation of this equilibrium is tentative⁹, we applied a simpler approach to approximate the equilibrium of the modified Baron-Ferejohn game.

In particular, we calculated agents' policy proposals, x , using the simplified support maximization problem as specified in eq. 10. When formulating policy proposals agents maximize their support by taking external restrictions of the parameters, e.g. due to

⁸A detailed description of the simulation and estimation procedure is given in Struve (2006). For all estimation an extremely high fit could be achieved, i.e. for all 2100 estimations adjusted R^2 -values ranged above 0.9. However, not all estimated parameters were statistically significant. Nevertheless we used all estimated parameters for our simulation.

⁹We have derived an sequential algorithm which in general allows a approximatively calculation of this equilibrium. But, convergence of this algorithm is not always achieved, especially for larger systems

WTO commitments, as well as the necessity to achieve the support of a winning coalition into consideration.

$$S_i(\alpha) \text{ Max} = \prod_h Z_h(\alpha)^{\mu_{ih}} \quad (10)$$

$$s.t. \Theta(\alpha) \leq \kappa^{WTO}; s.t. \psi(\alpha) \geq 0$$

$\Theta(\alpha)$ reflects restrictions resulting from WTO agreements. Basically we assume that the sum of protection rates for all four commodities (cereal, milk, beef and sugar) can not exceed the threshold $\kappa^{WTO} = 8$. $\psi(\alpha)$ reflects the restriction that policy proposals needs the support of a winning coalition. Technically, $\psi(\alpha)$ corresponds to a set of n-1 restrictions, where each restrictions reflects the utility gain by an individual agent form the policy proposal of an agent i when compared to the status-quo. If agents expect a positive gain from a suggested policy proposal, they will agree to this. $\psi(\alpha)$ implies that policy proposal are supported by a winning coalition. In technical terms, due to the large number of coalition possibilities ¹⁰ for each agent the winning coalition with the lowest average ideological distance to the ideological position of the agent is calculated. Ideological distances between relevant political agents have been calculated based on a factor analysis undertaken on interview data regarding preferred CAP-outcomes (Henning et al., 2005a). Thus, only for the members of the coalition with the minimal distance to the ideological position of the agent formulating a proposal the restriction $\psi(\alpha)$ explicitly applies. The complete set of winning coalitions is calculated and minimum ideological distance coalitions are determined for each agent under the consultation and the co-decision procedures, respectively.

Overall, agents' individual proposals, x , are influenced by both economic framework conditions, WTO commitments and constitutional rules of legislative decision-making.

Analogous legislators' ideal positions, y , can also be calculated based on eq. 10. However, to derive legislators' ideal points the restrictions $\psi(\alpha)$ are neglected. Thus, individual ideal points depend on WTO commitments and economic framework conditions (γ), but not on constitutional rules.

Furthermore, the probabilities, C_i , are calculated applying a generalized voting power index suggested by (Henning et al., 2005a). As we demonstrated in another paper (see Henning et al. (2005a) beyond constitutional rules individual voting power indices depend on agents policy proposals and ideological preferences. However, to simplify

¹⁰In the EU-27 there are more than 1.2 million possible winning coalitions for the consultation procedure and about 300 million for the co-decision-procedure.

calculation we assumed that all political agents have the same ideological preferences, i.e. technically this implies that for all pairs of legislators i and k the probability π_{ki} equals 0.5. Accordingly, voting power is solely determined by constitutional rules.¹¹ Calculated power indices are reported in table 3 in the appendix. In detail, power indices have been calculated for the consultation procedure which is up to now the standard procedure of CAP legislative decision-making and for the the co-decision procedure, which according to the Treaty of Nice is foreseen to become the new legislative decision-making procedure of the CAP¹².

Finally, given agents' policy proposals, x^* , and political power, c^* , final policy outcome results from the mean voter decision rule as indicated in eq. 5.

3.4 Simulation Scenarios

In detail we simulated CAP outcomes for the following scenarios.

Scenario 1 is the base-run scenario. It depicts politics, as expected, based upon generally accepted forecasts for the year 2013, namely forecasted world market developments, forecasts of productivity and factor endowments in the agricultural and nonagricultural sectors. Moreover, it is assumed in the base-run scenario that the EU includes 27 members, while legislative decision-making still follows the consultation procedure. This base-run scenario provides the point of reference for evaluating other scenarios.

Scenario 2 corresponds to the base-run scenario, but assumes an increasing demand from third world countries for agricultural commodities implying an increase of agricultural world market price by 5 percent.

In scenario 3 the agricultural productivity in Eastern Europe is assumed to be 5 percent higher when compared to the base-run, while in scenario 4 the level of co-financing of Eastern Europe is increased to the level in Western Europe, e.g. national contributions increase from 25 to 50 percent.

In scenario 5 the reduction of protectionism by at least 20 percent in each sector compared to the base-run is assumed to simulated further and more strict WTO commitments.

¹¹However, please note that it is generally possible to calculate voting power indices taking agents ideological preferences into account (see Henning et al. (2005a)), and it is also possible to derive the QRE implied by given policy proposals x^* applying a iterative approximation procedure Henning et al. (2008).

¹²An exact description of these procedures can be found in Hix (1999) and Napel (2006). The abbreviations are explained in table ??.

In scenario 6 assumptions correspond completely to the one of the base-run scenario. However, in contrast to the base-run it is assumed that the CAP is decided according to the co-decision procedure, i.e. the European Parliament instead of the Commission commands legislative power.

In scenario 7 we exogenously set CAP instruments to the levels observed in 2003 and only model how this policy translates into policy concerns, z , and political support of different political agents under the new economic framework conditions of the year 2013. Thus, under scenario 7 we see how policy implications look like if no further reforms were to take place.

4 Results

4.1 CAP outcomes under different scenarios

The detailed simulated policy outcomes resulting under the different scenarios are reported in table 1.

If we first compare the base run scenario to the status quo scenario we can conclude that the MTR-reform from 2003 will not be stable in the enlarged EU-27, but future CAP reforms can be expected.

In particular, these reforms will correspond to a further shift of financial resources from the first to the second pillar, where total expenditures in the second pillar raise by 2 billion Euros from 12 to 14 billion Euros (see table 1).

Within first pillar policies a further shift from trade policies towards decoupled direct payments will occur, where protection will be significantly reduced by 60 percent for grain and 45 percent for beef, while protection for milk and especially for sugar will be only moderately reduced by 23 and 11 percent, respectively (see table 1).

Within second pillar policies financial resources will be concentrated on rural development programs, while both programs targeted to improve competitive agricultural structures as well as increasing multi-functional services will be of less importance when compared to the status quo in 2003.

Interestingly, according to the prediction of our CGPE model production constraints in terms of milk and sugar quota as well as cross compliance and set-aside are significantly higher in the base-run scenario when compared to the status quo. Please note that tabled values correspond to the percentage share in total production that will be cut by applied quota, cross compliance or set-aside restrictions. Therefore, our model fore-

Table 1: Policy results of the scenarios

Szenario		Basis	World market-price	Productivity Eastern Europe	Cofinancing	WTO	Parliament	SQ
NPR (%)	Grain	7,15	10,51	7,30	9,32	7,16	7,82	18,33
	Beef	46,48	60,40	48,66	54,91	36,17	46,82	84,53
	Milk	23,55	19,35	22,60	20,04	20,77	26,48	30,64
	Sugar	52,03	55,29	54,16	49,66	24,71	49,70	58,49
Mrd. \$	Direct payments	54,62	50,36	57,98	66,83	53,83	60,67	50,70
	Rural development	13,26	14,65	10,52	7,27	11,06	11,06	12,4
	Structural policy	0,00	0,04	0,00	0,00	0,00	0,00	5,89
	Multi-functionality	1,00	1,70	2,19	1,01	0,99	0,94	2,58
%Output reduction	Cross compliance	14,97	15,46	15,00	14,71	14,80	14,98	5,00
	Milk quota	59,81	59,99	59,92	59,93	59,78	59,82	30,00
	Sugar quota	55,26	52,21	54,66	57,62	51,62	55,58	30,00
	Set-aside	15,71	16,12	15,51	16,06	15,08	15,30	10,00

Source: Own calculation

casts contradict commonly expected policy developments that correspond to a complete abolishment of the milk quota system until 2013.

How can these developments be explained?

In general explaining simulated policy developments it is useful to analyze comparative statics of the political economy equilibrium. For our CGPE approach comparative static effects are rather complex taking the interplay of political and economic framework conditions in the different members states, as well as strategically interdependence of agents in legislative bargaining into account. Analytically comparative static effects of our CGPE model can be separated into three different components. First, legislator's direct political response adopting their ideal positions (y) to changed framework conditions. Second legislators indirect political response adopting their proposals made in legislative bargaining to the changed policy preferences of their coalition partners. Both direct and indirect responses are captured in the comparative static effects of legislators

policy proposal, x. Third, the impact of changed framework conditions on legislators' political power, c.

Formally comparative static effects $\left[\frac{d\alpha}{d\gamma}\right]$ of our political economy equilibrium can be derived from total differentiation of the first order condition of the support maximization problem in eq. 10 and the mean voter voter decision in eq. 5¹³:

$$\frac{d\alpha}{d\gamma} = \sum_{i \in N} C_i \frac{dX_i}{d\gamma} + \sum_{i \in N} X_i \frac{dC_i}{d\gamma}$$

with

$$\begin{bmatrix} [S_{\alpha\alpha} + \lambda_{\Theta}\Theta_{\alpha\alpha} + \lambda_{\psi}\psi_{\alpha\alpha}] & \Theta_{\alpha} & \psi_{\alpha} \\ \Theta_{\alpha} & 0 & 0 \\ \psi_{\alpha} & 0 & 0 \end{bmatrix} \begin{bmatrix} \frac{d\alpha}{d\gamma} \\ \frac{d\lambda_{\Theta}}{d\gamma} \\ \frac{d\lambda_{\psi}}{d\gamma} \end{bmatrix} = - \begin{bmatrix} S_{\alpha\gamma} + \lambda_{\Theta}\Theta_{\alpha\gamma} + \lambda_{\psi}\psi_{\alpha\gamma} \\ \Theta_{\gamma} \\ \psi_{\gamma} \end{bmatrix}$$

$$\begin{aligned} S_{\alpha\alpha} &= \left[\frac{\partial^2 S}{\partial \alpha_i \partial \alpha_j} \right] = \left[\sum_r \sum_s \frac{\partial^2 S}{\partial Z_r \partial Z_s} \frac{\partial Z_r}{\partial \alpha_i} \frac{\partial Z_s}{\partial \alpha_j} + \sum_r \frac{\partial S}{\partial Z_r} \frac{\partial^2 Z_r}{\partial \alpha_i \partial \alpha_j} \right] \\ S_{\alpha\gamma} &= \left[\frac{\partial^2 S}{\partial \alpha_i \partial \gamma} \right] = \left[\sum_r \sum_s \frac{\partial^2 S}{\partial Z_r \partial Z_s} \frac{\partial Z_r}{\partial \alpha_i} \frac{\partial Z_s}{\partial \gamma} + \sum_r \frac{\partial S}{\partial Z_r} \frac{\partial^2 Z_r}{\partial \alpha_i \partial \gamma} \right] \\ \psi_{\alpha\alpha} &= \begin{bmatrix} S_{\alpha\alpha}^1 \\ \vdots \\ S_{\alpha\alpha}^n \end{bmatrix} & \psi_{\alpha\gamma} &= \begin{bmatrix} S_{\alpha\gamma}^1 \\ \vdots \\ S_{\alpha\gamma}^n \end{bmatrix} \end{aligned} \tag{11}$$

Discrepancies in comparative statics of our model compared to existing CGPE approaches result first from the fact that economic effects of policies, that is $\partial Z_r / \partial \alpha_i$, $\partial^2 Z_r / \partial \alpha_i \partial \alpha_j$ are different for different economic models. Fafchamps et al. (1993) nicely demonstrated that partial equilibrium models neglect general equilibrium effects, for example the impact of price policies on the domestic labor wage or world market prices. However, in their model world market prices are exogenous, while these are endogenous in our applied GTAP model. Moreover, in our CGPE model the relevant constituencies vary across political agents, thus agents consider different economies, T^i , as relevant. Therefore, policy responses of national council members to common exogenous shocks normally differ from each other as well as compared to responses of the commission or EP groups, respectively.

¹³In general a subscript of a function in eq. 11 indicates the first derivation, while a double subscript indicates the second order derivation of this function

Second different comparative static effects results due to different specifications of the political support function. For example, in our model political support does not only depend on standard economic welfare of relevant society groups, but we assume that relevant policy concerns of voters' include beyond monetary income also non-monetary values such as environmental concerns, equality or international conflicts. As we explained in section 2 in our approach individual support maximization does generally not lead to Pareto-optimal policies, since voters do not perfectly respond according to their true policy induced welfare changes.

Additionally, in contrast to most of the existing CGPE (for example Fafchamps et al. (1993)) our approach includes legislative bargaining. Thus, our CGPE takes into account that legislators have to form coalitions with other legislators to fight their policy proposal through. Technically, this is captured by the constraint $\psi(\alpha)$ which reflects that legislators policy proposal also consider other legislators' preferences. Thus, also constitutional rules determine legislators' policy proposals. Finally, for given policy proposals final policy final outcome crucial depends on legislators political power, which again is determined by constitutional rules.

Overall, it should have become clear from our expositions above that political responses go far beyond the simple reasoning of partial equilibrium models like the PPF approach. Moreover, individual responses to the same changed framework conditions might fundamentally differ across agents (see also next subsection). Therefore, despite form special cases it seems generally not possible to derive stable stylized facts regarding comparative static effects of given economic shocks. A contrary comparative statics are rather sensitive to explicit economic and political framework conditions, captured by the function S^i and T^i .

Given these general remarks, we discuss relevant factors determining observed policy changes for the base-run when compared to the status-quo scenario.

A first important factor is EU-enlargement. Enlargement has basically two different impacts. On the one hand it shifts policy preferences of old member states, since policy impacts on relevant z-variables, e.g. budget or international trade conflicts, differ in an enlarged EU-27 when compared to an EU-15. On the other hand enlargement changes the legislative bargaining game since new member states enter the game. For example, the political trade-off of first versus second pillar instruments changed fundamentally from the viewpoint of the old EU-member states. This follows directly from the specific financial rules applied to first and second pillar policies. In an enlarged EU protection via first pillar instruments is much more expensive for old rich EU-member state, as

partly it has to finance protection in new member states, while financial spillovers are significantly lower for second pillar policies due to co-financing (for a further elaboration of this argument see Henning (2008a)). For the same reasoning a majority of new members states prefer *ceteris paribus* first versus second pillar policies. Thus, overall impact of EU-enlargement depends on relative political bargaining power of old and new member states, where enlargement logically implies a significant power outflow from the old to the new member states.

A second important factor explaining policy adoption in the base-run scenario correspond to the implementation of more strict WTO commitments. WTO commitments imply further restriction of trade protections, accordingly farm support is more shifted towards decoupled payments in the first pillar as well as support programmes in the second pillar.

A third factor inducing observed policy adoptions in the base run scenario are changed economic framework conditions, i.e. increased technical progress and increased demand of the rest of Non-EU countries for agricultural commodities inducing higher world market prices. However, as we already explained above and as we will demonstrate in the next subsection political responses of national council members to these changes can be quite heterogenous.

Finally, observed development of quotas and set-aside is *contra intuitive*. As a matter of fact this is partly induced by specific properties of the GTAP model. In particular, foreign and domestic supply of agricultural commodities are aggregated applying the Armington approach, where elasticities of substitution are locally approximated to match observed trade patterns. However, the Armington approach turns out to be a rather restrictive modeling adjustment of trade patterns to new relations of domestic and foreign prices. Therefore, in GTAP simulations strict quotas induce a significant increase of domestic prices even in the absence of high protection rates. Given the fact that domestic and foreign agricultural commodities are almost perfect substitutes we consider these results as an artefact. Therefore, predicted quota policies and also predicted cross compliance and set-aside policy have to be interpreted with caution.

In general policy trends of the base run scenario can be observed for all other scenarios. In particular, predicted developments of quota, cross compliance and set-aside policies turn out to be remarkably stable across scenarios, which we again take as an indicator that this is an artefact induced by specific properties of the GTAP model.

However, for scenario 2 assuming increased world market prices the reduction of protection rates is significantly attenuated for grain, sugar and beef, while interestingly for

milk a higher reduction of protection is predicted. Accordingly, a lower increase of direct payments is observed, as less compensation is needed, while saved financial resources of the first pillar are shifted to the second pillar for which a higher increase to over 15 billion Euros can be observed.

Please note that observed adoption of agricultural protection rates to increased world market prices are contra intuitive applying a simple partial equilibrium framework like a PPF approach. However, as explained above in our CGPE political economy responses are more complex taking general equilibrium effects, i.e. induced changes of domestic wage rates or world market prices in to account. Moreover, induced changes of other relevant z-variables are explicitly considered in our model. For example, trade protection has a lower negative impact on international trade conflicts, when world market prices are higher. Nevertheless, this contra intuitive policy response once again demonstrates that political economy processes are far more complex than intuitive logic would predict confirming the importance of quantitative political economy equilibrium models.

Analogous to scenario 2 an increase in productivity in Eastern Europe as assumed in scenario 3 leads also to slightly higher levels of protectionism when compared to the base-run scenario. However, in contrast to scenario 2, for scenario 3 the expenditure for rural development goes down, while direct payments are increased (see table 1). Intuitively this follows if one takes into account that the first in comparison to the second pillar policies are c.p. politically the more attractive the higher the agricultural productivity of a member state. Accordingly, for East European member states trade protection becomes politically more attractive. In contrast, for old members c.p. trade protection becomes less attractive assuming a more productive agricultural sector for East European member states. Nevertheless, partly also Western European member states prefer higher trade protection and less rural development spending. In our CGPE this contra intuitive finding follows from the logic of legislative bargaining, i.e. West member states prefer higher trade protection, because under scenario 3 pivotal Eastern European coalition partners shift their policy preference towards trade protection.

By the same logic it also follows that the second in comparison to the first pillar is c.p. the more politically attractive, the lower the co-finance share of a member state. Therefore, in Scenario 4, which simulates a higher level of co-financing for second pillar policies by the new member states, an about-turn from general rural development to decoupled direct payments takes place (see table 1). In particular, for this scenario the lowest increase of expenditures in the second pillar can be observed, which is conceivable, since second pillar policies are less attractive for new member states assuming higher

co-finance shares. Accordingly, farm support is more allocated via the first pillar, i.e. beside higher direct payments also the level of trade protection for beef and grain would be slightly higher and for commodities restricted by quotas, i.e. milk and sugar, the level of protectionism would be a little lower.

As expected, more restrictive WTO regulations simulated in scenario 5 imply a direct and significant reduction of protection rates especially for commodities with a high status quo level of protectionism like beef, milk and especially sugar. Interestingly, the reduction of protection enforced by WTO restrictions is only partly compensated by higher decoupled direct payments. Moreover, expenditures for second pillar policies are also only slightly increased when compared to the status quo.

In the case of the implementation of the co-decision procedure as assumed in scenario 6 an increased protection for milk and an increase in direct payments, with an overall reduction in payment for rural development result. Overall, policy outcome is very much similar to the one observed for the base-run scenario, which makes sense since basically, the policy proposal of the commission is substituted by the policy proposals of the EP groups. Although individual policy positions of EP groups differ when compared to positions of the commission, overall policy outcome is not very much shifted under the co-decision scenario, since total political power of the EP groups vis-a-vis national council members is relatively low with 15% compared to 85%(see table 3). Moreover, opposing policy positions of EP groups partly compensate each other.

4.2 Are future CAP reforms induced by Politics or Economics?

A key question of this paper is whether CAP outcomes are more determined by politics or economics, i.e. whether a change in political institutions or economic framework conditions has a greater impact on CAP outcomes.

In order to be able to evaluate this question we first have to decide what is an adequate variable to measure policy outcomes. On the one hand we can obviously measure policy outcomes in terms of policy instruments, α . However, neither from the viewpoint of legislators nor from the viewpoint of society policy instruments are final objectives by themselves. In contrast, while legislators are interested in their final political support, $S(z(\alpha))$, society is interested in the state of the world, i.e. realization of policy concerns, z .

Therefore, in table 2 we present for each simulated scenario the average percentage change of policy instruments in comparison to the base-run scenario ¹⁴. Moreover, table 2 presents the mean of the absolute values of induced percentage change of relevant policy concerns and of induced individual support, respectively.

Table 2 shows that changed world market prices have the highest impact on both policy outcomes (α), policy concerns (z) as well as political support in comparison to all other scenarios. However, compared to changed world market prices a change of legislative institutions, i.e. changing constitutional rules from the consultation to the co-decision procedure, has only a minor impact on CAP outcomes as can be seen from table 2. In contrast, a change of financial rules, i.e. the increase of co-finance shares of new member states has a significant impact not only on policy instruments, but also on policy concerns and individual political support of political agents, while an increased agricultural productivity for East European member states as well as changed WTO rules have also comparatively low impact on CAP outcomes.

Table 2: Induced changes in agricultural policies, policy concerns and legislators' political support under different simulated scenarios*

Nr.	Scenario	Support $S(z(\alpha))$	policy concerns (z)	Policy (α)
2	World market prices	2,19	8,28	16,85
3	Prod.-east	0,82	1,74	13,79
4	Co-financing	1,71	4,47	12,37
5	WTO	1,44	6,16	9,11
6	Parliament	0,67	2,45	5,40

Source: Own calculation * =calculated as mean of the absolute values of induced percentage change of corresponding variables

Finally, to bring further evidence to our key questions whether CAP outcomes are mainly influenced by politics or economics we calculated the euclidian distance between the policy outcomes, α^k , observed for each scenario, $k=2,\dots,7$, and the base run scenario, α^1 :

$$d_k = \sqrt{\sum_j (\alpha_j^k - \alpha_j^1)^2} \quad (12)$$

The total distances d_k as well as distances calculated separately for first and second pillar policies as well as production constraints are represented in figure 2.

¹⁴ $\alpha_{k,j}^* = 100\% \cdot \left(\frac{\alpha_{k,j}}{\alpha_{1,j}^*} - 1 \right) \quad k = 2, \dots, 6$

insert figure 2

As can be seen from figure 2 by far the largest impact on CAP resulted from the EU enlargement as the largest euclidian distance is observed for the status quo in comparison to the base run scenario. Moreover, protection is most influenced by WTO commitments followed by increased world market prices, while in quantitative terms changed constitutional rules have only little impact on future agricultural protection. However, regarding second pillar policies a significant impact of changed constitutional rules can be observed. Moreover, changed financial rules have a significant impact on second pillar policies (see figure 2).

5 General versus partial political economy equilibrium modeling: Is it worse the effort?

Overall, simulated CAP outcomes for different scenarios on the basis of a specified CGPE provides an insight into the mechanics of CAP decision-making.

However, it definitely has become clear that application of CGPE is a rather complex process. Depending on the concrete decision-making procedure up to 35 relevant political agents decide on 12 policy instruments, which result in a total of 2,500 policy positions which are adapted under various scenarios.

Thus, the question that arises is: "Is this extremely high additional effort of CGPE modeling justified when compared to simple partial equilibrium models like for example a PPF approach.

In this regard a critical observer could argue that adaption of policy position to changed economic framework conditions basically follow the same stylized facts for all individual political agents and accordingly the final outcome of legislative bargaining will also adopt in the same direction. Thus, one might argue while the understanding and modeling of complex legislative bargaining processes have certainly a scientific value on its own, in the framework of applied political economy modeling it is not worth the effort, since in essence the systematic shift in legislative outcome can be derived from individual support maximization independently of complex legislative bargaining procedures.

Given the fact that it is always possible to approximate locally any policy output with a simple PPF approach neglecting legislative bargaining assuming an omnipotent unitary political agents, the crucial question is to what extend these simple political

economy models are able to mimic comparative statics of a more complex political economy equilibrium.

In this regard it might be instructive to analyze how individual policy positions of involved individual political agents change across scenarios.¹⁵

To this end we report *paris pro toto* individual adoption rates of decoupled payments for 27 national council members and the commission in figure 3.

insert figure 3

Without going into further details it can be clearly seen from these figures that, although some scenario specific adoption patterns can be observed, adaption of policy proposal is rather heterogenous between agents.

Finally, to test relevant contribution of CGPE even stronger we compare our CGPE results to policy predictions derived from a general equilibrium PPF approach. The latter derives policy outcome from support maximization of the European Commission under the restriction of the reduced form of the general equilibrium model (GTAP).

Thus, the only difference between the general equilibrium PPF approach and the CGPE is that the former neglects legislative bargaining assuming the commission is the omnipotent ruler of the CAP. As a matter of fact a similar approach has been suggested by Francois et al. (2008).

Figure 4 reports the equilibrium outcomes for all 12 policy instruments for scenario 1-5.¹⁶

insert figure 4

Since the scale of predicted policy instruments partly differs extremely we used a logarithmic transformation of original policy instruments ($\ln(1 + \alpha)$) to allow a better graphical presentation of the results.

Overall, figure clearly demonstrate that PPF approach delivers significantly different results for all scenarios, where policy outcomes not only differ for the same scenario, but partly predicted adaption of policies to changed framework condition also differ extremely in quantitative terms. This holds especially true for rural development policy

¹⁵Please note that individual ideal points (Y) as well as individual policy proposals (x) vary extremely across political agents (see Struve (2006)). However, given our expositions above here we focus on comparative statics of these positions

¹⁶Of course, for scenario 6 the PPF approach predicts exactly the same outcome as for scenario 1.

programmes, where the PPF approach not only predicts 23 times higher payments when compared to the CGPE, but also fundamentally different adaption for scenario 3 and 4, i.e. while the PPF predicts a significant increase of RD expenditure by a factor of roughly 2.6, the CGPE predicts of a decrease by a factor of -0.72 and -1.52 for scenario 3 and 4, respectively.

Thus, overall it is fair to conclude that taking legislative bargaining explicit into account not only allows a quantitative prediction of how policy outcome change under different political institutions, but also deliver fundamentally different policy predictions for given political institutions.

Therefore, CGPE's provide important contributions not only at theoretical level, but also for applied political economy analysis.

Nevertheless, we have to admit that our applied CGPE approach is only a first step towards a comprehensive applied political economy modeling. In particular, in future research the cooperative legislative bargaining model can be further elaborated to even better reflect bargaining procedures applied in political practice. Moreover, the reduced form modeling of the general equilibrium model could be improved, e.g. estimating a generalized quadratic form instead of a simple linear form. Analogously, the equilibrium of the modified Baron-Ferejohn game could be better approximated in future applications. On the one hand for given policy proposals the corresponding QRE could be calculated and on the other hand individual policy proposals could be derived as true Nash strategies. Furthermore, it would be interesting to test prediction power of CGPE approach empirically, that is to compare CGPE predictions with real empirical policy decisions, e.g. comparing base run predictions with real CAP reforms decided in 2013.

Finally, future research could also focus on the interesting question to what extent real world politicians are able to understand the complex interplay of economic and political framework conditions. Thus, it might be conceivable that politicians reduce real world complexity via applying much more simplified heuristics and rules of thumb. Technically, this implies that support maximization is based on much less complex economic and political models than assumed in our CGPE approach. For example, in this regard political ideology can be understood as political belief regarding a much more simplified transformation of specific policy instruments into political support. We consider incorporation of 'political beliefs' or 'political ideology' into formal political economy modeling also as a very interesting topic for future research.

References

- Anderson, Kym**, “Lobbying Incentives and the Pattern of Protection in Rich and Poor Countries,” *Economic Development and Cultural Change*, January 1995, 43 (2), 401–23.
- Banks, J.S. and J. Duggan**, “Stationary Equilibria in a Bargaining Model of Social Choice,” 1998. mimeo, California Institute of Technology.
- Baron, D. and J. Ferejohn**, “Bargaining in Legislatures,” *American Political Science Review*, 1989, 85, 1181–1206.
- Baron, D. P.**, “A Sequential Choice Theory Perspective on Legislative Organization,” *Legislative Studies Quarterly*, 1994, XIX (2), 267–296.
- Becker, G. S.**, “A Theory of Competition Among Pressure Groups for Political Influence,” *Quarterly Journal of Economics*, 1983, 98, 371–398.
- Beghin, J.C. and M. Kherallah**, “Political institutions and international patterns of agricultural protection,” *The Review of Economics and Statistics*, 1994, 76 (3), 482–489.
- , **W.E. Foster, and M. Kherallah**, “Institutions and market distortions: international evidence for tobacco,” *Journal of Agricultural Economics*, 1996, 47 (3), 355–365.
- Binswanger, H. and K. Deininger**, “Explaining Agricultural and Agrarian Policies in Developing Countries,” *Journal of Economic Literature*, 1997, 35, 1958–2005.
- Blin, Jean-Marie and Mark A Satterthwaite**, “On Preferences, Beliefs, and Manipulation within Voting Situations,” *Econometrica*, 1977, 45 (4), 881–888.
- Brockmeier, Martina**, *Ökonomische Auswirkungen der EU-Osterweiterung auf den Agrar- und Ernährungssektor: Simulationen auf der Basis eines Allgemeinen Gleichgewichtsmodells* number 22. In ‘Agrarökonomische Studien.’, Kiel: Vauk, 2003.
- Buchanan, James and Gordon Tullock**, *The Calculus of Consent*, Cambridge University Press, 1967.
- Commons, J. R.**, “Institutional Economics,” *American Economic Review*, 1931, 21, 648–657.

- DeGorter, H. and G. C. Rausser**, “Endogenizing U.S. Milk Price Supports,” Working Paper No 504. Department of Agricultural and Resource Economics (CUDARE), University of California at Berkeley 1989.
- DeGorter, Harry and Johan Swinnen**, *Handbook of agricultural economics* Handbooks in Economics, North-Holland,
- Downs, Anthony**, *An Economic Theory of Democracy*, New York: Harper and Row, 1957.
- Fafchamps, Marcel, Alain De Janvry, and Elisabeth Sadoulet**, “Tariff seeking in a general equilibrium framework,” *The journal of international trade & economic development*, 1993, 2 (2), 167–189.
- Francois, J., D. Nelson, and A. Pelkmans-Balaoing**, “Endogenous Protection in General Equilibrium: Estimating Political Weights in the EU,” February 2008.
- Gardner, B.**, “Causes of U.S. Farm Commodity Programs,” *Journal of Political Economy*, 1987, 95 (2), 290–310.
- Goeree, Jacob K and Charles A. Holt**, “An Explanation of Anomalous Behavior of Political Participation,” *American Political Science Review*, 2005, 99, 201–213.
- Grossman, Jean Baldwin**, “Evaluating Social Policies: Principles and U.S. Experience,” *The World Bank research observer*, 1994, 9 (2), 159–180.
- Henning, C. H. C. A., M. Herrmann, and S. Shikano**, “Legislative Organization and Its Consequence for Outcome-Oriented Voting,” August 2008.
- Henning, Christian H. C. A.**, *Macht und Tausch in der europäischen Agrarpolitik: Eine positive politische Entscheidungstheorie*, Frankfurt/Main: Campus, 2000.
- , “The Role of Institutions in Agricultural Protectionism,” in G. Van Huylenbroeck, W. Verbeke, and L. Lauwers, eds., *Role of Institutions in Rural Policies and Agricultural Markets*, Amsterdam: Elsevier, 2004, pp. 137–151.
- , “Legislative Bargaining in the EU Agricultural Policy: Derivation and application of a modified Baron-Ferejohn Model,” 2007. Mimeo, University of Kiel.
- , *The Perfect Storm The Political Economy of the Fischler Reforms of the Common Agricultural Policy*. Centre for European Policy Studies, Centre For European Policy Studies,

- , **C. Struve, B. Brümmer, and L. Seidel**, “Macht und Ideologie in der erweiterten EU: Anwendung eines generalisierten Banzhaf-Index,” in “Beitrag auf der 45. Tagung der Gesellschaft für Wirtschafts- und Sozialwissenschaften des Landbaues” 2005.
- Henning, Christian H.C.A.**, “Determinants of Agricultural Protection from an International Perspective The Role of Political Institutions,” International Food Policy Research Institute October 2008.
- , **Melvin Hinich, and Susumu Shikano**, “Postelection Bargaining and Voter Behavior: Towards a General Spatial Theory of Voting,” 2005. Weekly Political Economy Discussion Group.
- Hinich, Melvin J.**, “Equilibrium in Spatial Voting: The Median Voter Result is an Artifact,” *Journal of Economic Theory*, 1977, 16, 208–19.
- Hix, Simon**, *The Political System of the European Union* The European Union Series, Hampshire, New York: Palgrave, 1999.
- Krause, Kim Carolin**, *Lobbying in der der Gemeinsamen Europäischen Agrarpolitik in einer erweiterten EU-25*, Göttingen: Cuvillier Verlag, 2005.
- Ledyard, John**, “The Pure Theory of Large Two Candidate Elections,” *Public Choice*, 1984, 44, 7–41.
- Magee, Stephen P., William Allen Brock, and Leslie Young**, *Black hole tariffs and endogenous policy theory: political economy in general equilibrium*, Cambridge: Cambridge Univ. Press, 1989.
- McKelvey, R. and T. Palfrey**, “Quantal response equilibria for normal form games,” *Games and Economic Behavior*, 1995, 10, 6–38.
- and – , “Quantal response equilibria for extensive form games,” *Experimental Economics*, 1998, 1, 9–41.
- Milesi-Ferretti, Gian Maria, Roberto Perotti, and Massimo Rostagno**, “Electoral systems and public spending,” *The quarterly journal of economics*, 2002, 117 (2), 609–657.
- Miller, G.**, “The Impact of Economics on Contemporary Political Science,” *Journal of Economic Literature*, 1997, 35, 1173–1204.

- Napel, Stefan**, “The Inter-Institutional Distribution of Power in EU Codecision,” *Social Choice and Welfare*, 2006, 26 (1), 1–26.
- North, D. C.**, *Institutions, Institutional Change and Economic Performance*, Cambridge: Cambridge University Press, 1990.
- Olper, A.**, “Determinants of Agricultural Protection: The Role of Democracy and Institutional Setting,” *Journal of Agricultural Economics*, 2001, 52 (2), 75–91.
- **and V. Raimondi**, “Constitutional Rules and Agricultural Policy Outcomes,” University of Milano, Department of Agricultural Economics September 2008.
- Peltzman, S.**, “Toward a More General Theory of Regulation,” *Journal of Law and Economic*, 1976, 199, 211–240.
- Persson, Torsten and Guido Tabellini**, *Political Economics. Explaining Economic Policy*, The MIT Press, 2002.
- R Development Core Team**, *R: A Language and Environment for Statistical Computing* R Foundation for Statistical Computing 2005. ISBN 3-900051-07-0.
- Rausser, G. and J. Freebairn**, “Estimation of Policy Preference Functions: An Application to U.S. Beef Import Quotas,” *Review of Economic & Statistics*, 1974, 56, 437–449.
- Romer, T. and H. Rosenthal**, “Political resource allocation, controlled agendas, and the status quo,” *Public Choice*, 1978, 33 (4), 27–43.
- Schneider, F., W.W. Pommerehne, and B.S. Frey**, “Politico-Economic Interdependence in a Direct Democracy: The Case of Switzerland,” in D.A. Hibbs and H. Fassbender, eds., *Contemporary Political Economy: Studies on the Interdependence of Politics and Economics*, Amsterdam: North Holland, 1981.
- Shepsle, K.A.**, “Institutional Arrangements and Equilibrium in multi-dimensional voting models,” *American Journal of Political Science*, 1979, 23, 27–59.
- Shepsle, Kenneth A.**, “Studying Institutions: Some Lessons from the Rational Choice Approach,” *Journal of Theoretical Politics*, 1989, 1 (2), 131–147.
- Stigler, George J.**, “The theory of economic regulation,” *The Bell journal of economics and management science*, 1971, 2, 3–21.

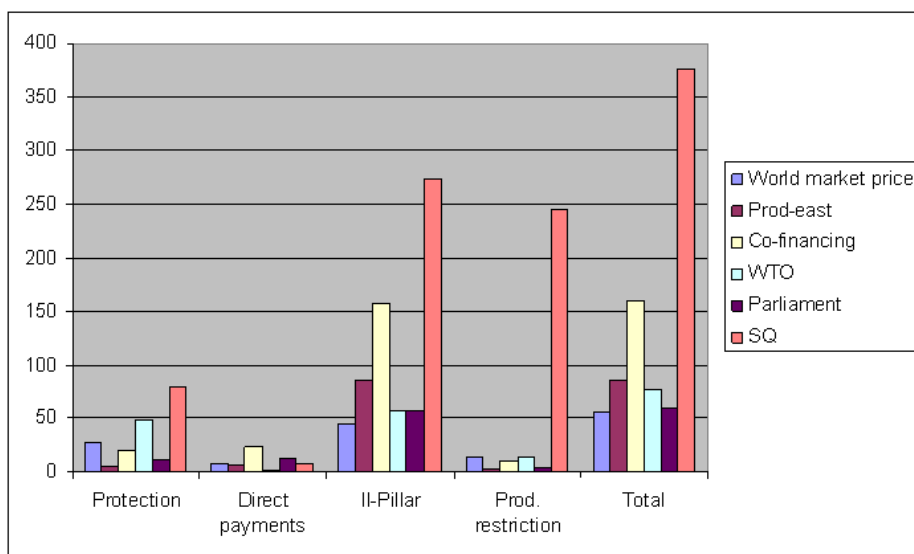
- Struve, Carsten**, “Quantitative polti-ökonomische Analyse der Europäischen Agrarpolitik.” PhD dissertation, CAU Kiel 2006.
- Swinnen, Johan F. M., Anurag Narayan Banerjee, and Harry De Gorter**, “Economic development, institutional change, and the political economy of agricultural protection : an econometric study of Belgium since the 19th century,” *Agricultural economics*, 2001, *26* (1), 25–43.
- Tinbergen, J.**, *Economic Policy: Principles abd Design*, Amsterdam: North-Holland Publishing Company, 1956.
- Tyers, R. and K. Anderson**, *Disarray in World Food Markets*, Cambridge, New York, Melbourne: Cambridge University Press, 1992.
- Weber, M.**, *Wirtschaft und Gesellschaft*, TÄ¼bingen: J.C.B. Mohr, 1921.
- Weingast, B. and W. Marshall**, “The Indutrial Organization of Congress; or why Legislators, like Firms, are not Organized as Markets,” *Journal of Political Economy*, 1988, *96*, 379–389.
- Weingast, Barry**, “A Rational Choice Perspective on Congressional Norms,” *American Journal of Political Science*, 1979, *23*, 245–263.
- Wilson, R.**, “The Role of Uncertainty and the Value of Logrolling in Collective Choice Processes,” Working Paper 124, Stanford University 1967.
- Zusman, P.**, “The Incorporation and Measurement of Social Power in Economic models,” *International Economic Review*, 1976, *17*(2), 432–447.

Table 3: Institutional power distribution in the EU-27 for different decision-making procedures in %

Legislative procedure			Legislative procedure			Legislative procedure		
country	Consul- tation	Co- decision	country	Consul- tation	Co- decision	Com- mission/ EP-groups	Consul- tation	Co- decision
DE	7,0	6,5	PL	6,7	6,2	kom	9,3	
UK	7,0	6,5	RU	3,9	3,6	EVP		5,2
FR	7,0	6,5	CR	3,4	3,1	PSE		3,5
IT	7,0	6,5	HU	3,4	3,1	ALDE		3,3
ES	6,7	6,2	BU	2,8	2,6	Verts		0,8
NL	3,6	3,4	SR	2,0	1,9	GUENGL		0,8
HE	3,4	3,1	LI	2,0	1,9	INDDEM		0,5
BE	3,4	3,1	LE	1,1	1,1	UEN		0,5
PT	3,4	3,1	SL	1,1	1,1	IN		0,8
SW	2,8	2,6	ET	1,1	1,1			
AU	2,8	2,6	CY	1,1	1,1			
DK	2,0	1,9	MA	0,9	0,8			
FI	2,0	1,9						
IR	2,0	1,9						
LU	1,1	1,1						
Σ	61,1	56,9	Σ	29,5	27,5	Σ	9,3	15,4

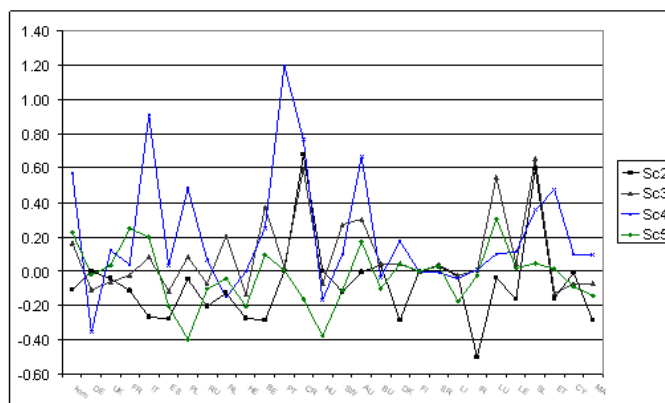
Source: Henning et al. (2005a)

Members of the EU-15 command 60% of the power, the new members around 30% and at the level of the institutions of the EU, supranational agents, i.e. the Commission and the EP, command together 10% of the power for the consultation and 15% for co-decision procedure.



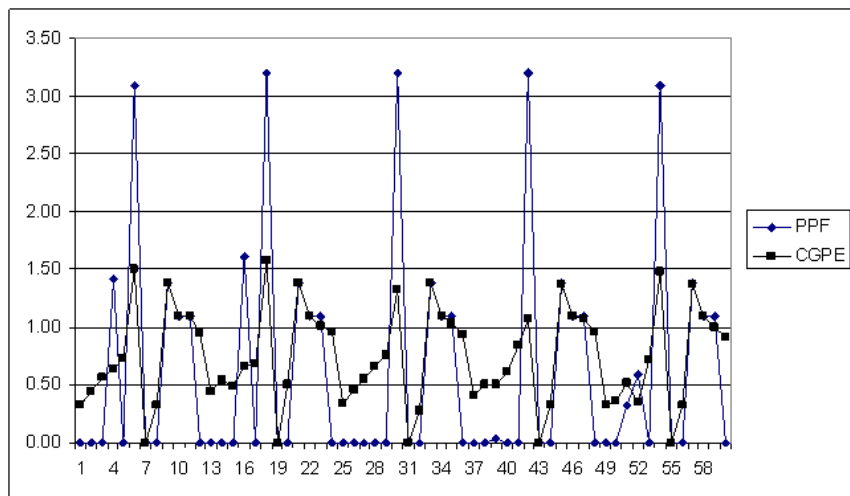
Source: Own Calculation

Figure 2: Impact of political and economic factors on CAP policy outcomes: Euclidian Distance to base-run



Source: Own Calculation

Figure 3: Adoption of policy proposals preferred by the commission and national council members in different scenarios: Decoupled payments measured as difference to base run scenario



Source: Own Calculation

Figure 4: Adoption of policy proposals predicted by a CGPE and a PPF approach for scenario 1-5