How to consider governance in economic policy modeling?

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Abstract:

The purpose of this paper is to compare the role of "bad" governance and price distortions on economic growth. We therefore present a general equilibrium growth model where some producers finance a rent-seeking system by setting the price for their intermediates in an olgopsonistic manner. This model is applied to the Bulgarian economy, in particular to the agri-food chain. From this application we find that as long as processors allocate real resources towards rent-seeking activities, there will be no significant welfare gains from free trade. Thus, we find "bad" governance to be a strong impediment to economic growth and development.

1 Introduction

Which policy fosters economic growth? This question has always been one of the main challenges for development and trade economists. Typically, the possibility to achieve higher income levels through trade and specialization has been widely recognized and ordinary cross country regressions overwhelmingly find a moderate positive relationship between income and growth (see Edwards (1995) and Rodrik (1995) for a survey on this literature). However, these studies do not really provide an answer to the initial

question since first, a simple regression over trade and income suffers from endogeneity—countries with high income levels for reasons other than trade may trade more (Helpman 1998, or Frankel and Romer 1999)—and second, they do not identify an exact mechanism through which export expansion affects growth. Challenged by these shortcomings, Dollar (1992), Sachs and Warner (1995) or Edwards (1998)—among others—use measures of countries' trade policies as an instrument for its trade share and find a significantly inverse relationship between the extend of policy-caused barriers to trade in a certain country and its level of economic growth. The policy implication drawn from this results is fundamental: key to higher growth rates is a liberal foreign trade policy! During the past decade, this finding has been widely recognized by (Stiglitz 1998) as well as by policy advisors.[1] However, there remains scepticism. Rodriguez and Rodrik (1999) for instance criticize that this inverse relationship does not immediately stand out in the data, at least not if one simply compares country growth rates with standard measures of policy induced trade barriers.[2] Therefore, they argue that indicators for "openness" as used in these studies are "...problematic as measures of trade barriers or are highly correlated with other sources of poor economic performance" (p.3). Furthermore, Frankel and Romer (1999, 379) argue that "...countries that adopt free-market trade policies may also adopt free-market domestic policies and stable fiscal and monetary policies. Since these policies are also likely to affect income, countries' trade policies are likely to be correlated with factors that are omitted from the income equation. Thus they cannot be used to identify the impact of trade." In order to account for this sort of endogeneity, Frankel and Romer suggest a measure of the geographic component of countries' trade which accounts for endogeneity but still shows the significant positive relation between trade flows and growth levels. However, while this proceeding more convincingly accounts for the endogeneity between income and trade, it does not allow for any conclusion as to which extent an increase in trade flows is caused by more liberal policies rather than by other factors such as changes in transportation costs, external shocks etc.

More recently, increasing attention has been given to the impact of governance quality and institutional environment on economic performance.

[1] Based on these insights, the IMF (1997, 84-85) for instance mentions the opening toward foreign trade as one of the main "Policies to Boost Growth and Promote Convergence."

[2] Rodriguez and Rodrik (1999) use average tariff rates from the World Bank's World Development Indicators and an index for non-tariff bariers to trade taken from Barro and Lee (1994).

Based on well-known arguments by Olson (1982) or North (1990), Hall and Jones (1999) for instance find empirically that the differences in capital accumulation, productivity and, thus, output per worker among countries is significantly driven by differences in the institutional environment.[3] Similarly, Kaufmann et al. (1999) find an significant impact of governance quality[4] on economic performance for both developing and developed countries. Accordingly, the World Bank (2000, 136) suggests that "...a capable state with good and transparent government institutions is associated with higher income growth, national wealth, and social achievements." Again, this issue contains a fundamental policy implication. Although changes in governance are by far more difficult to initiate than simple changes in tax or tariff rates, the evolution of a certain governance builds up on decisions made by people and thus, can also be changed if just the commitment to achieve this is strong enough.

So is it the quality of governance the relevant margin on which policies should act to boost growth and to improve economic performance? Or does governance quality simply change over time once growth stimulating policies such as trade liberalization set a country on the right track? In this paper we will address this question. To compare the relative impact of both types of distortions we will focus our discussion towards a country where there is broad evidence for the harmful existence of both types of distortions. We will exemplarily choose the case of Bulgaria. Therefore, we will start with a brief review of recent economic developments in Bulgaria. Afterwards, we will develop a general equilibrium model that considers distortions caused by taxes and tariffs as well as market imperfections due to excessive redistributive activities just as they prevail once governance quality[5] is low. Imbedding these imperfections into a Ramsey-type model of economic growth will allow us to study the implications of "bad" governance on welfare and growth. In the fourth section, we will use our model to study three experiments, the partial elimination of tariff and tax distortions, the partial elimination of the imperfections caused by redistributive activities and the complete abolition of all prevailing imperfections and distortions. Our results will show

[3] An endogenous factor in their estimations to which they refer to as "social infrastructure."

[4] Kaufmann et al. (1999a, p.1) define governance as *"the traditions and institutions by which authority in a country is exercised. This includes (1) the process by which governments are selected, monitored and replaced, (2) the capacity of the government to effectively formulate and implement sound policies, and (3) the respect of citizens and the state for the institutions that govern economic and social interactions among them."*

[5] We will refer to the same definition as in Kaufmann et al. (1999a).

a significant impact of both types of policies with also a higher impact of governance improvements. However, the highest welfare level as well as the highest growth rates can only be achieved once policies act at both margins.

2 Bulgarian Facts

Bulgaria's transition process started in the early nineties with the liberalization of nearly all prices. This action was followed by a sharp decline in GDP by roughly 25 per cent between 1989 and 1992. The next three years were characterized by moderate growth, mainly from large export-oriented firms and a small but growing private sector. In 1995, a sharp decline in agricultural output again led to a contraction of GDP. With the partial reintroduction of price setting policies by the government and two major waves of inflation in 1994 and 1996, the economy has stagnated at a level far below its initial level of performance. The introduction of the currency board in 1997, which has pegged the exchange rate to the Deutsche Mark, has led to a significant stabilization. However, it remains to be seen whether recent attempts to improve privatization and restructuring will be able to support this artificial stabilization.

To keep food prices at a low level the government established price ceilings for most agricultural products. This policy, combined with restrictions on exports, allowable price margins and cost-plus pricing practices of food processors, have lowered farm gate prices, but they have not provided incentives for food processing enterprises to decrease costs and to increase efficiency (Davidova 1994). Instead, they have strongly distorted production incentives in agriculture and thus, have even contributed to a major shortage of bread and grain in 1996 (OECD-CEET).

In 1991, the government started a large privatization process, however large monopolies continued to exist in particular wholesale and foreign trade and food processing (World Bank, 1993). On the other hand a land law effective March 1, 1991 restored the right of formers owners up to 20 hectares in areas of intensive cultivation and 30 hectares in other areas (World Bank 1993). However, the plots of farmers were expected to be small when the redistribution and ownership of land started. The expected land distribution, reported by the National Statistics Institute survey of Bulgaria, indicates that 28.9 percent of the owners would have a plot up to 1.5 hectares, while 22.3 percent between 1.6 and 3 hectares (Keliyan in Coenen Ed., 1996). The poor land property rights and no established land lease agreements in Bulgaria prevents farmers from been engaged in large scale production, as they

confine themselves to the area of land that belong (or presumable belongs) to them. Since the transportation of agricultural goods requires sophisticated and expensive transportation means, this together with the inability of farmers to produce a large scale, makes impossible or not cost effective for agricultural producers to bring their output to large communities, and, thus, they most sell their output to traders and food processors.

Despite the privatization processes continues, privatization does not necessarily mean the increase of competition. Buckwell (1997) argues that if farmers have not choice about whom they sell their products, then there is little scope to achieve the benefits of a market system, and if state monopolies are turned into private monopolies, the more fragmented farming sector is still in large disadvantage. To measure the effects of income redistribution in the agri-food chain, Ivanova et al. (1995) and Gorton et al. (1999) estimate the protection levels of farmers, food processors, traders and consumers and compare them with their reference world market levels. Their finding is that between 1990 and 1996, consumers did not receive the benefits from low farm gate prices as these benefits were accrued by processors and traders at the expense of agricultural producers. Gorton et al. mainly explain their observations by the generally high costs of transactions in Bulgaria. However, given the persistence of the observed redistribution, it appears questionable that there has been no explicit winner from this development since 1990. Accordingly, Swinnen (1997) stresses the importance of collusive rent-seeking behavior of food processors and traders who for instance have been able to control big parts of relevant distribution channels such as storage facilities or who have redistributed financial assets through "transfer pricing" between state-owned and private firms. Furthermore, to explain the weak bargaining position of farmers, Hanisch and Pavel (1999) stress the concentration of machines in barely restructured cooperatives, the weak sanction mechanisms for contract enforcement, the weak protection and the delayed reform of property rights, and the fact that most talented people have left the agricultural sector and have often turned into retailers. Based on these findings, we believe, that the best representation of the market structure between agricultural producers and food processor is one in which food processors have market power over agricultural producers.

3 The model: environment and equilibria

We describe a closed economy. There are two final products —processed food and manufactures— and one intermediate good —agricultural raw products.

While processed food is a pure consumption good, manufactures are a consumption good and a unit of manufactured goods can be transformed— at no cost —into a unit of capital, which can then be used to increase the capital stock of the economy (K_t). There are two economy wide factors of production, labor and capital, and a sector specific factor v, used only by agricultural producers, i.e. land.

3.1 Firms

3.1.1 Competitive Industries

The production of agricultural raw products Y_A uses intermediate agricultural raw products I_A and employs labor L_A, capital K_A, the sector specific factor v services and a nested constant elasticity of substitution CES/Leontief technology;

$$Y_A = \min\left\{\theta_A K_A^{\alpha_k} L_A^{\alpha_l} v^{\alpha_v},\ BI_A\right\},\ 0 < \alpha_i < 1,\ \sum_i \alpha_i = 1 \tag{1}$$

with

$$0 < \alpha_{i\in\{k,\,l,\,v\}} < 1,\ \sum_{i\in\{k,\,l,\,v\}} \alpha_i = 1 \text{and } \theta_A,\ B > 0$$

The agricultural sector sells raw agricultural goods to food processors and rents capital, labor and the sector specific factor v services. The agricultural sector chooses non-negative values of Y_A, K_A, L_A, and I_A to solve the agricultural sector's GDP_A, defined as

$$GDP_A = \max\left(p_a Y_A - rp_k K_A - wL_A - p_a I_A\right) \tag{2}$$

subject to (1) where p_a denotes the agricultural commodity price, rp_k is the rental rate of capital and w is the wage rate.

The production of manufactures Y_M uses labor L_M and capital K_M services and a technology represented by a Cobb-Douglas function

$$Y_M = \theta_M K_M^{\alpha_M} L_M^{1-\alpha_M},\ 0 < \alpha_M < 1 \text{ and } \theta_M > 0 \tag{3}$$

The manufacturing sector chooses K_M and L_M to solve the problem of maximizing profits, that is

$$\max_{K_M,\,L_M}\ [p_m Y_M - rp_k K_M - wL_M] \tag{4}$$

subject to (3) , where p_m is the price of manufactures

3.1.2 Noncompetitive Industry

In contrast to the agricultural and manufacturing sectors, food processors are noncompetitive. There is a finite number n of food processing firms indexed by j $(j = 1, \cdots, n)$. Food processors have increasing returns to scale in production, modeled by assuming that to produce a nonnegative amount of output Y_{Fj}, food processing firm j uses a fixed minimum input requirement of capital K_{Fj}^{Fix} and labor L_{Fj}^{Fix}, in addition to variable capital K_{Fj}^{V} and labor L_{Fj}^{V} and agricultural raw products I_{Fj} and a technology of the form

$$Y_{Fj} = \min\left\{\theta_{Fj}\left(K_{Fj} - K_{Fj}^{Fix}\right)^{\alpha_{Fj}}\left(L_{Fj} - L_{Fj}^{Fix}\right)^{1-\alpha_{Fj}},\ A_j I_{Fj}\right\} \qquad (5)$$

with

$$0 < \alpha_{Fj} < 1,\ \theta_{Fj} > 0,\ \text{and } A_j > 0$$

where $K_{Fj} = K_{Fj}^{V} + K_{Fj}^{Fix}$ and $L_{Fj} = L_{Fj}^{V} + L_{Fj}^{Fix}$.

We assume that the socio-economic environment in which food processors operate makes it necessary for them to finance a rent-seeking and corruption system through an additional, fixed expense (FC). We think of this rent-seeking and corruption system as a mix of several redistributive activities such as bribes that food processors have to pay in order to operate, activities of new firms who need to secure their property rights, or attempts of food processors to roll over their arrears to farmers.[6] We further assume that firms in this sector enter and exit the market until profits equal zero.

We assume that firms act as in Cournot competition (see Kehoe and Kehoe 1994) Mercenier (1995) for market power in the output side) by choosing the amount of intermediate inputs that maximizes their profits. Each producer j is endowed with full knowledge of the agricultural sector's technology and knows the amount of sector specific factor v available in the economy. Firm j computes the solution of the sectoral agricultural problem, and obtains the net supply of agricultural goods $Y_A^{net}(p_a,\ rp_k,\ w,\ v)$[7]. Firm j, then, solves for the inverse agricultural supply function

$$p_a\left(Y_A^{net},\ rp_k,\ w,\ v\right)$$

[6] See for instance Kaufmann et al. (1999a, b and c), or Hellman et al. (2000a and b) for a discussion of various forms of rent seeking in transition economies.

[7] The net supply of agricultural goods equals the total production of agricultural goods minus the amount of agricultural goods used as input in the production of agricultural goods i.e. seeds and feed grain.

and incorporates it into its profit maximization problem, takes the demand of agricultural goods of other food processors I_{Fg} (for $g \neq j$) and FC as given, sets the net supply of agricultural goods equal to the sum of food processors demand of agricultural goods, to maximize profits π_{Fj}, subject to (5), that is

$$\pi_{Fj} = \begin{cases} \max\limits_{K_j, L_j, I_{Fj}} p_f Y_{F,j} - r p_k K_{Fj} - w L_j - p_a I_{Fj} - FC, \text{ if } \geqq 0 \\ \quad \text{s.t. } \{Y_{F,j}, K_{Fj}, L_j, I_{Fj}, p_a\} \in \Theta \\ 0, \quad \text{otherwise} \end{cases} \tag{6}$$

where

$$\begin{aligned} \Theta \;=\; & \{\ (Y_{Fj}, K_{Fj}, L_j, I_{Fj}, p_a) : \\ & Y_{Fj} = \min\left\{\theta_{Fj}\left(K_{Fj} - K_{Fj}^{Fix}\right)^{\alpha_{Fj}} L_{Fj}^{1-\alpha_{Fj}},\ A_j I_{Fj}\right\}, \\ & K_{Fj} = K_{Fj}^{V} + K_{Fj}^{Fix}, \\ & p_a = p_a\left(Y_A^{net},\ r p_k,\ w,\ v\right), \\ & Y_A^{net} = I_{Fj} + \sum_{g \neq j} \bar{I}_{Fg}\ \} \end{aligned}$$

a firm operating the market will solve the problem

$$\max_{K_j, L_j, I_{Fj}} p_f Y_{F,j} - r p_k K_{Fj} - w L_j - p_a I_{Fj} - FC$$

$$\text{s.t. } \{Y_{F,j}, K_{Fj}, L_j, I_{Fj}, p_a\} \in \Theta$$

3.2 Households

There is an infinitely lived representative consumer and an infinite number of discrete time periods $t = 0, 1, 2, ..., \infty$. The consumer derives satisfaction from the consumption of the two final products. The utility from the consumption of C_t in period t is defined as

$$\sum_{t=0}^{\infty} \left(\frac{1}{1+\rho}\right)^t \frac{C_t^{1-\theta} - 1}{1-\theta} \tag{7}$$

where $0 < \rho$ is the rate of consumer time preference, $\theta > 0$ is the inverse elasticity of intertemporal substitution, and $C_t = C_{f,t}^{\beta_c} C_{m,t}^{1-\beta_c}$ (with $0 < \beta_c < 1$)

is an aggregate composite from the consumption of food $C_{f,t}$ and manufactured commodities $C_{m,t}$. The representative consumer has an initial capital endowment $\bar{K}_0$ and at each period she is endowed with labor $\bar{L}$ and the sector specific factor $\bar{v}$.

At each period of time consumers purchase final goods and sell capital, labor and the sector specific factor services. Consumers solve the problem of maximizing (7)subject to an intertemporal budget constraint

$$p_t C_t + p_{k,t} K_{t+1} + B_{t+1} = w_t \bar{L} + (1 + r_t - \delta)\, p_{k,t} K_t + (1 + r_{b,t})\, B_t + p_{v,t} \bar{v} + T_t \tag{8}$$

B_{t+1} denotes the holdings of bonds from period t to $t+1$, also subject to constraint

$$B_t \geqq = -\bar{B} \text{ for sufficiently large } \bar{B} > 0$$

to eliminate the possibilities of Ponzi games, given initial assets position

$$K_0 = \bar{K}_0 \text{ and } B_0 = 0$$

p_t denotes the price of the aggregate consumption composite C_t, $p_{k,t}$ and $r_t p_{k,t}$ are the price and rental rate of capital respectively, w_t is the labor wage rate, $p_{v,t}$ is the rental rate of the sector specific factor v, the price of bonds is fixed to unity and $r_{b,t}$ is the interest rate of bonds at period t, and T_t is a lump-sum transfer.

Finally, there is a fiscal authority or an agent which imposes a tax or an extra cost denoted FC on each firm producing processed food. The tax receipts obtained from these firms are then passed on to each consumer as lump-sum transfers. This transfer to consumers is denoted by T_t.

The economy must satisfy the following feasibility conditions. First, the labor demand from the different production units must equal the total labor endowment

$$L_{A,t} + \sum_{j=1}^{n} L_{Fj,t} + L_{M,t} = \bar{L} \tag{9}$$

similarly for capital

$$K_{A,t} + \sum_{j=1}^{n} K_{Fj,t} + K_{M,t} = K_t \tag{10}$$

the total sector specific factor v used in production, must equal its total endowment

$$v_t = \bar{v} \tag{11}$$

Second, the total production of agricultural raw products must equals its intermediate demand

$$Y_{A,t} = I_{A,t} + \sum_{j=1}^{n} I_{Fj,t}, \tag{12}$$

Third, the production of processed food equals its demand

$$\sum_{j=1}^{n} Y_{Fj,t} = C_{f,t} \tag{13}$$

Finally, the capital stock at $t+1$ equals forgone consumption plus capital stock t out of depreciation

$$K_{t+1} = Y_{M,t} + (1-\delta) K_t - C_{m,t} \tag{14}$$

where δ denotes the constant depreciation rate of capital.

3.3 Sequential Markets and Steady State Equilibria

We are now ready to specify the Sequential Markets Equilibria as well as the Steady State Equilibrium for our model:

Definition 1 *Let* $X_t = (C_t, C_{f,t}, C_{m,t}, K_{t+1}, B_{t+1}, \{Y_{A,t}, Y_{M,t}, \{Y_{Fj,t}\}_{j=1}^{n_t}\}, \{K_{A,t}, K_{M,t}, \{K_{Fj,t}\}_{j=1}^{n_t}\}, \{L_{A,t}, L_{M,t}, \{L_{Fj,t}\}_{j=1}^{n_t}\}, \{I_{A,t}, \{I_{Fj,t}\}_{j=1}^{n_t}\}, v\ )$ *denote a vector of quantities and* $P_t = (\hat{p}_t, \hat{p}_{a,t}, \hat{p}_{f,t}, \hat{p}_{m,t}, \hat{p}_{k,t}, \hat{p}_{v,t}, \hat{r}_t, \hat{r}_{b,t}, \hat{w}_t)$ *be a vector of prices. A sequential markets equilibrium is an allocation sequence* $\left\{\hat{X}_t\right\}_{t=0}^{\infty}$, *a price sequence* $\{P_t\}_{t=0}^{\infty}$ *the number of firms* $\{\hat{n}_t\}_{t=0}^{\infty}$ *and transfer* $\{\hat{T}_t\}_{t=0}^{\infty}$, *such that:*

1. *Given prices, and lump sum transfer* $\hat{T}_t$, *the sequence of quantities* $\{\hat{C}_t, \hat{C}_{f,t}, \hat{C}_{m,t}, \hat{K}_{t+1}, \hat{B}_{t+1}\}_{t=0}^{\infty}$ *solves the representative consumer's utility maximization problem*;

2. *At time t given prices, quantities* $\hat{Y}_{A,t}$, $\hat{K}_{A,t}$, $\hat{L}_{A,t}$, $\hat{I}_{A,t}$ *solve the agricultural sector GDP maximization problem* ;

3. *At time t given prices, quantities* $\hat{K}_{M,t}$, $\hat{L}_{M,t}$, *solve the manufacturing sector profit maximization problem;*

4. *At time t given prices, quantities* $\hat{K}^V_{Fj,t}$, $\hat{L}_{j,t}$, $\hat{I}_{j,t}$ *solve the profit maximization problem of firm j for* $j = 1, ..., \hat{n}_t$*;*

5. *The number of firms* $\hat{n}_t$ *producing processed food is such that the profits of each firm equals zero;*

6. *The sequence* $\left\{\hat{X}_t\right\}$ *and* $\{\hat{n}_t\}_{t=0}^{\infty}$ *satisfy the feasibility conditions* (9) − (14)*.*

7. *The number of firms times FC* ($\hat{n}_t FC$) *equals transfer* $\hat{T}_t$ *and*

8. *Bonds satisfy*

$$\hat{B}_{t+1} = 0$$

Definition 2 *A steady state equilibrium is a vector of quantities* X^{ss}*, a vector of prices* P^{ss}*, the number of firms* n^{ss} *and transfer* T^{ss}*, such that, for some initial* K_0*, the vectors of quantities* X_t *and prices* P_t*, the number of firms* n_t*, and transfer* T_t *for all t satisfy the definition of sequential markets equilibrium above and are constant for all t.*

4 Empirical application

We apply and calibrate the model to the Bulgarian economy using a *Social Accounting Matrix* (SAM). The structure of this data requires some extensions. First the agricultural output reported in the SAM for Bulgaria includes agricultural raw products as well as food for own consumption or for their sale in local markets. To capture this simultaneous production we specify total output in agriculture Y_A^{tot} as a CES composite of raw products Y_A and food Y_S:

$$Y_A^{tot} = \left(\mu_A Y_A^{\rho_a} + (1 - \mu_A) Y_S^{\rho_a}\right)^{\frac{1}{\rho_a}} \tag{15}$$

$$0 < \mu_A < 1 \text{ and } \rho_a < 1$$

The SAM also reports consumption of agricultural goods by consumers. However, for the case of Bulgaria, the raw commodities sold to consumers are in the most part sold by retailers rather than by agricultural producers.

Therefore we introduce a retailer activity to the food processors problem. We modify the consumers preference so that they also include agricultural goods (assumed to be bought from food processors/retailers) and food produced by farmers. Thus, the per period utility function is then given by

$$U = \frac{\left(\theta_C C_{a,t}^{\beta_a} C_{F,t}^{\beta_f} C_{m,t}^{1-\beta_a-\beta_f}\right)^{1-\theta} - 1}{1-\theta}$$

$$0 < \beta_a < 1,\ 0 < \beta_f < 1 \text{ and } \beta_a + \beta_f < 1 \tag{16}$$

where $C_{a,t}$ denotes the consumption of agricultural goods and $C_F^{\beta_f}$ is a composite good from the consumption of food produced by farmers C_{fs} and the consumption of food produced by food processors C_{fm}

$$C_F = \left(\mu C_{fm}^{\rho_f} + (1-\mu)\, C_{fs}^{\rho_f}\right)^{\frac{1}{\rho_f}} \tag{17}$$

with

$$0 < \mu < 1 \text{ and } \rho_f < 1$$

The SAM reports intermediate demand for agricultural, food and manufactured commodities by each sector. We consider this by assuming that output of food processor j and sector M is a fixed proportion of intermediate inputs and value added, which in turn is a Cobb-Douglas aggregate of labor and installed capital:

$$Y_Z = \min\left\{\theta_Z K_Z^{\alpha_z} L_Z^{1-\alpha_z},\ A_{ZA} I_{ZA},\ A_{ZF} I_{ZF},\ A_{ZM} I_{ZM}\right\}$$

$$\text{with } 0 < \alpha_Z < 1 \text{ and } A_{Zi} > 0 \text{ for } i = A, F, M$$

where I_{Zi} is intermediate demand for commodity $i \in \{A, F, M\}$ by sector or firm $Z = M, Fj$. For the agricultural sector similarly its production technology is given by

$$Y_A^{tot} = \min\left\{\theta_A K_A^{\alpha_k} L_A^{\alpha_l} v^{\alpha_v},\ B_A I_{AA},\ B_F I_{AF},\ B_F I_{AM}\right\}$$

We open the economy to foreign trade and use the Armington specification, which introduces imperfect substitution between goods, produced domestically, and foreign goods.

Next is the consideration of the public budget. We introduce a government agent who receives income from taxes and tariffs, provides public goods and services at a given level $\overline{G}$ and pays transfers (T^G) to the representative consumer. The SAM reports revenue from taxation on labor and capital income, consumption tax and tariffs on imports. Therefore, the public budget constraint, in a sequential market setting, is given by

$$\begin{aligned}(1+\tau_{c_m})\, p_{m,t}\overline{G}_t + T_t^G = & \sum_{i\in\{a,fm,m\}} \tau_{c_i} p_{i,t} C_{i,t} + \tau_{c_m} p_{m,t}\overline{G}_t \\ & + \sum_{i\in\{a,fm,m\}} t_i^{IM} p_{i,t}^{IM} IM_{i,t} + \tau_L \bar{L} + \tau_K r_t K_t \text{ for all } t\end{aligned} \tag{18}$$

where τ_{c_i} is the consumption tax rate for commodity i, τ_L and τ_K are labor and profit tax rate, respectively, $p_{i,t}^{IM}$ and IM_i denote the import price and imports of commodity i and t_i^{IM} is the import tariff rate for commodity i. Since we do not consider explicitly the impact of public goods provision on consumers' welfare, we endogenize the rate of consumption tax (τ_{c_i}) subject to an equal yield constraint ($\overline{G}_t = \overline{G}$). Thus, any change in tariff or tax policy affects the consumption taxes rate such that the real value of government expenditures remains constant.

Additionally, we re-write the budget constraint of the representative consumer to include taxes (**??**):

$$\begin{aligned}& \sum_{i\in\{a,fm,m\}} p_{i,t}\left(1+\tau_{c_i}\right) C_{i,t} + p_{fs} C_{fs,t} + K_{t+1} + p_{b,t} B_{t+1} \\ = \;& w_t\left(1-\tau_L\right)\bar{L} + \left(1 + r_t\left(1-\tau_K\right) - \delta\right) K_t \\ & + \left(1 + r_{b,t}\left(1-\tau_K\right)\right) p_{b,t} B_t + p_{v,t}\bar{v} + T_t + T_t^G \text{for all } t\end{aligned} \tag{19}$$

where p_{fm} and p_{fs} denote the price of food produced by food processors and farmers respectively.

We rewrite market clearing equations as to include foreign trade. Also the production of food by farmers equals its demand

$$Y_s = C_{fs}$$

Finally, we assume free capital markets, where domestic consumers can invest abroad and foreigners can invest domestically[8]. Thus we impose a

[8] We introduce free capital markets, since with the implementation of a currency borad in 1997, the Bulgarian economy does not impose important investment restrictions (with the only exemption of non-private enterprises).

balance of payments constraint, such that exports minus imports equals savings minus investment plus service on foreign debt; [9]

$$S_t - K_{t+1} + (1-\delta) K_t + r_{b,t} FD_t = \sum_i p_{i,t+1} EX_{i,t+1} - \sum_i p^{IM}_{i,t+1} \left(1 + t^{IM}_i\right) IM_{i,t+1}$$

where savings equal;

$$S_t = K_{t+1} - (1-\delta) K_t + p_{b,t} \left(B_{t+1} - B_t\right)$$

EX_i denotes the exports of commodity i, and FD denotes foreign debt. A negative B_t indicates a positive net claims of foreigners on the domestic economy, while a positive B_t indicates net claims of nationals in foreign countries (this relaxes the equilibrium condition for a closed economy where $B_{t+1} = 0$)[10].

4.1 Calibration and data

We calibrate the model to a steady state equilibrium solution using the SAM for Bulgaria. The calibration of a competitive general equilibrium model is a standard procedure (see for instance Srinivasan and Whalley 1986). Therefore, we instead focus the discussion on the calibration of the fix cost paid by food processors.

To estimate the fixed cost paid by food processors, we follow the study by Gorton et al. (1999), which estimates producer and consumer subsidy equivalents (PSE/CSE) as an indicator of the level of protection in the Bulgarian agro food chain (see Ivanova et al. 1995 for an introduction in the methodology).

[9] For a steady state solution we also impose the conditions:

$$S_t = \delta K_t$$

and

$$r_{b,t} FD_t + \sum_i p^{IM}_{i,t+1} \left(1 + t^{IM}_i\right) IM_{i,t+1} - \sum_i p_{i,t+1} EX_{i,t+1} = 0$$

[10] Despite the free capital markets assumption, our model can still exhibit transitional dynamics rather than immediate convergence to the steady state after imposing a shock. This is because strictly speaking, assuming home and foreign goods to be imperfect substitutes gives some market power even to the smallest country. Thus, the marginal value of capital—which equals the unit costs of investments—is not determined by world market prices only but also becomes a function of domestic commodity prices (see Diao et all. 1997 for a further study of transition dynamics under the Armington specification).

Assuming, that a the negative PSE of agricultural producers is in part due to the market power of food processors and traders over the price for agricultural raw products and that processors and traders use this low agricultural price for covering fixed cost expenditures, we use these results to estimate FC. However, some adjustments should be mentioned: first, we use a different aggregation scheme than Gorton et al., in particular, our model does not differentiate between processors and retailers. Second, Gorton et al.'s calculations for processors and traders depend on critical assumptions concerning exchange rate and reference world market prices (Swinnen 1997).

Protection levels for each stage of the food chain (expressed as $\%PSE$, the rent from protection as percentage of the value of output at domestic prices) for the five main commodities (see Table 1) suggest the magnitude of income transfers to food processors. In addition to the benchmark year of our model, 1994, we also present information for 1996 to emphasize, that the observed redistribution of income between farmers and processors/traders is consistent over time.

Table 1. %PSEs for five key commodities for Bulgarian food supply chains

	1994	**1996**
Farm	-26	-7
Processing	8	20
Retail	41	19
Consumer (CSE)	-33	1

Source Gorton et al. (1999)

Food processors and especially traders received positive gains of about 8 to 41 percent of their domestic sales value. Since for both years, a border tariff was placed on food imports, part of the rents is due to protection by trade policy rather than the result of imperfect competition. However, for both years, there was also a tariff on imports of agricultural products. This reduces protection of food processors and in particular, it protects primary producers. But, since the reported %PSE figures for farmers show negative levels, we conclude, that part of the positive gains for food processors and traders and the negative rents for farmers are due to processor's market power over farm gate prices. Therefore, we use the results reported in Table 1 as a rough indicator for the level of income redistribution due to oligopsonistic competition. By choosing a relatively low value we ensure that we

underestimate rather than overestimate the influence of oligopsonistic competition. Given the estimations by Gorton et al. (table 1) this appears to be below the real level of distortions. As we also know from previous experiments, that assuming a value for additional expenditures not related to the production process (FC) equal to 15 percent of the domestic sales value corresponds to a %PSE of -10 for farmers, therefore, we assume that the fixed cost paid equals;

$$FC = 0.15 \cdot Y_F$$

The model is based on 1994 National Accounts data including adjustments for hidden economy activities and production of subsistence food accounting for 26 percent of private food consumption (see OECD 1996 or NSI 1997 for a detailed description of data and methodology).

The SAM does not provide information about payments to a sector specific factor, in the agricultural sector. However, the SAM provides an account denoted "mixed income". This is a residual, of revenue minus the payment to factors of production paid by farmers. In the case of Bulgaria where farmers do not rent land, since property rights are not well established, then we believe that a large proportion of this fixed income includes land plus the non-paid wages to family workers. We use this as the sector specific factor, in the absence of any other measure.

4.2 Policy simulations

In the previous chapter, we developed a model that explicitly considers price distortions due to commodity specific tariff and tax rates, oligopsonistic competition of food processors due to the prevalence of a rent-seeking and corruption system as well as subsistence production of agricultural farmers. The purpose of this section is to study and compare the impact of trade liberalization and the reduction of transaction costs under an economy where one sector has market power in the input side.

Liberalization of tariffs and taxes has been widely recommended for developing countries as well as for economies in transition. The underlying common wisdom is that trade liberalization increases welfare and favors economic growth. The reduction of tariffs lowers domestic consumption prices and induces an income and a substitution effect. The former arises from the lower price level itself, the latter from the substitution of domestic goods by cheaper imports. Furthermore, this effect also reduces the domestic costs of capital goods, what may lead to an increase in investment and thus, higher future growth rates. Finally, models with imperfect competition such

as Harris (1984) suggest that after liberalization, a fewer number of firms produce the same amount of output. Hence, formerly fixed resources become available to the rest of the economy (Mercenier and Schmitt 1996). This reduces the corresponding deadweight losses and therefore, generates additional welfare gains.

However, trade liberalization also bears some shortcomings. First, tariff revenue has become a major source of public income for many developing countries. Therefore, liberalization either requires the reduction of public expenditures, or a sufficient revenue replacement policy, or both. Since in many cases, a reduction of public spending, for example through firing of civil servants or lowering social contribution payments, is not politically feasible, the most commonly used replacement policy is to rise domestic taxes. This, however, implies important trade-offs with the efficiency goals of liberalization, for instance, when the positive income effect is offset by a rise of domestic consumption taxes.

What are the expected welfare effects from institutional reform policies? Recent contributions to the impact of rent seeking and growth such as Romer (1994), Mauro (1995), Shleifer and Vishny (1998) or Sonin (2000) discuss various channels through which the presence of rent-seeking activities may affect economic growth. They all conclude that these activities are fairly harmful to growth as they distort incentives and the allocation of factors and assets. In our model, this negative effect of rent-seeking activities on welfare and growth is brought about by the fixed costs which cause deadweight losses and reduce output and the number of firms. Consequently, we expect that ruling out rent-seeking activities comes along with a significant improvement of economic performance.

To summarize, trade liberalization increases efficiency and welfare but also comes along with several policy trade-offs, the importance of which depend on their relative magnitude. On the other hand, we expect a significant improvement in welfare and efficiency from institutional reform policies. What our model will provide is a quantitative assessment of the relative importance of institutional reforms and price liberalization under consideration of various trade-off mechanisms of these policies. In other words, given "bad" governance and in particular, weak protection of property rights in the food chain of Bulgaria, what should be more important? "Getting the Prices Right" or "Getting Institutions and Competition Right"?

4.3 Experiments

In the benchmark equilibrium, several policy measures distort domestic prices, but also rent-seeking activities and oligopsonistic behavior of food processing firms distort the economy. To study the partial impact of both kinds of distortions on production and welfare we start with excluding policy distortions under the present level of imperfect competition. Then, we simulate a "good" governance, strong property rights and a switch to perfect competition under the initial level of policy distortions by eliminating the fixed expenditure in the food sector (FC). Finally, in order to capture the full potential of replacing all kinds of distortions, we run a third simulation with an undistorted economy. These experiments are defined as follows:

1. *policy*: we liberalize foreign trade by setting tariffs equal to zero and replace consumption tax rates by commodity with a uniform rate.

2. *market*: we eliminate oligopsonistic competition in the food chain under pre-existing tax and tariff rates by setting the fixed costs equal to zero ($FC = 0$).

3. *total reform*: we combine scenarios 1 and 2.

In all three scenarios we shock the model in the first period and do not consider any exogenous shocks in latter periods. Thus, the endogenous variables jump to a new level and then, move along the transition path towards their new steady state. The intention for the choice of this strategy is to highlight the effects on growth and allocation following an unanticipated reform. We believe that this strategy reflects the specific situation of the Bulgarian case, where various changes of policies and governments in the 1990s have caused a high degree of uncertainty.

4.4 Results

Table 1 allows for a first assessment of our experiments. We start with discussing the effects on welfare, GDP and output. Under *policy*, welfare increases by one percent, whereas the new steady state level of GDP shows a slight decline. Output in the agricultural sector also increases, however just to a small extent, whereas we observe a drop in output for nonfood production. Somehow surprisingly, the output of food processors increases significantly, although initial tariffs on food imports are the highest in our model and thus, food production is the most protected activity (table A-1). However, this is due to a drop in demand for (and thus, production of) subsistence food following the reduction of prices due to liberalization.

In the *market* scenario we observe much stronger effects. When policy

	policy	market	total reform
	(deviation in percent)		
welfare[1]	0.10	6.30	6.70
GDP	-0.86	5.56	4.68
output of...			
...agriculture[2]	1.25	12.19	13.81
...subsistence	-12.49	-25.75	-34.17
...food[2]	16.87	53.19	69.49
...nonfood	-3.14	-3.36	-6.85

[1] equivalent variation in income

[2] output of food processing firms (domestic sales + exports)

Table 1: welfare, GDP and output (steady state effects)

rules out rent-seeking activities, formerly fixed factors become available to the most efficient industries. This induces dramatic positive output effects for food (by more than 50 percent) and agriculture as well as a significant reduction of subsistence production which exceeds the one in the previous experiment. Furthermore, output in nonfood industries decreases only by about three percent such that we finally observe an economy-wide increase in GDP by almost six percent (table A-1). The combination of the two previous scenarios in *total reform*, that is the simulation of a undistorted, full competitive economy, combines the results of the two previous experiments. Welfare, GDP and agricultural output change slightly compared with the market scenario, and output in the nonfood sector declines by about twice the level of the previous runs. The apparently most significant effect however is the dramatic rise in output of marketed food where two effects matter. First, zero tariffs reduce domestic food prices which causes a drop in the demand of subsistence food up to a level which is entirely based on consumers preferences. Second, also the shift towards a competitive equilibrium has a significant impact on production in the food industry.

To understand these results, we look at the transitional dynamics for the first 25 periods as well as on the steady state effects of consumption (figure A-1) and aggregate investments (figure A-2). High consumption and increasing investment levels are consistent with large effects on welfare and GDP (*market*), whereas low consumption and declining investment levels explain the small effects on welfare and the negative implication for GDP in the *policy* experiment. However, looking at the patterns of prices that

determine these variables, the results appear to be contradictory. According to figure A-3, the Consumption Price Index (CPI) decreases for all scenarios and this decline is even stronger in the *policy* than in the *market* experiment. Furthermore, it appears to be striking that the price for investment goods increases when tariffs are abolished (*policy*) and thus, imports become cheaper (figure A-4). Moreover, why do aggregate investments fall in the *policy* but rise in the *market* scenario (figure A-2) although for both experiments, the price for investment goods exceeds its benchmark? To understand this puzzle, we need to recall that the model is based on an intertemporal utility function and the hypothesis of perfect foresight. Consequently, these results are driven by income-type of behavior. Accordingly, real income of representative households depends not only on consumption prices, but also on prices of factor endowments, on the domestic capital stock as well as on the holdings of foreign capital assets. Consequently, the answer to the puzzle lies in the performance of these variables.

Aggregate investments depend on the price for the investment composite and the rental rate of capital . Under *policy*, the price of investment goods increases despite zero tariffs because the government's budget constraint causes consumption tax rates to increase in order to replace the losses from tariff revenue. This increases the price of the nonfood composite gross of consumption tax, and since aggregate investment goods mainly consists of nonfood commodities, it also explains the increase in their price. Furthermore, the transitional pattern of this price determines the rental rate of capital since non-arbitrage conditions for investments imply that as the price of investment goods declines along the transition path, than—at a constant world interest rate—the rental rate of capital in period t has to be above this price. As figures 5 and 6 confirm, this condition holds for all three scenarios. The incentive or disincentive to invest arises from the difference of both prices: as long as the price of investment composites is higher (lower) than the rental rate of capital, there is no (a strong) incentive to further invest and thus, the capital stock decreases (increases) as it is the case for the *policy* (*market*) experiment (figure A-7). As a result, income from capital declines under *policy* and increases with *market*. Furthermore, low incentives for new installation of capital (*policy*) also reduce import demand such that the trade deficit falls below its initial level (figure A-8). This in turn allows households to expand their holdings of foreign capital assets (figure A-9) since they have no incentive to expand the domestic capital stock. However, along the transition path, the higher returns from these capital assets increases import demand such that the trade deficit in the new steady state even exceeds its benchmark level. In turn, the opposite

effect reduces the steady state levels of foreign capital assets and the trade deficit when investment incentives are stronger (*market*).

While this provides a sufficient explanation for the development of aggregate investments, capital and GDP, income effects from endowments of domestic and foreign capital are ambiguous and thus, do still not provide a straightforward explanation for the low welfare effects of *policy* when compared with the *market* experiment. However, looking at the output effects in an undistorted economy (*total reform*), we find a comparative advantage in labor intensive (agriculture) rather than in capital intensive production (nonfood). Moreover, the liberalization of the foreign trade regime also lowers the price for agricultural raw products, whereas when food processors offer a competitive price in the market and the total reform experiment, the price increases (figure A-10). Therefore, we can explain the drop of the wage rate below the benchmark in the *policy* scenario and the rise in the *market* and the *total reform* scenario (figure A-11) by the Stolper-Samuelson theorem. Since the labor endowment is by far the biggest source of private income, this eventually determines real income such that it almost offsets the positive income effect resulting from lower domestic prices in policy, whereas it supports low prices for the market and the total reform experiment.

4.5 Sensitivity Analysis

In how far do these results rely on critical assumptions? Table 3 in the appendix shows the steady state effects of selected variables under different levels of Armington and subsistence elasticities. The figures suggest that although the levels of variables in the model change depending on the choice of various elasticities, the ranking of the three scenarios depending on welfare and output effects remains constant. In other words, although the assumed elasticities have a significant impact on the steady state levels of the variables in our model, we do not observe changes in the relative impact of one policy for different combinations of elasticities. It is in particular remarkable that not only for welfare, but also for almost all other variables, steady state effects are stable relative to the other scenarios.

On the other hand we have shown that our results are mainly driven by Stolper-Samuelson like effects on wages that arise from the switch to perfect competition. Since the specification of the initial redistribution of income in the agri-food chain is rather stylized, it is important to analyze the stability of our results with regard to changes of these rents. Initially, we have assumed that food processors and traders receive a rent of fifteen percent of their domestic sales value. Consequently, we now re-compute our

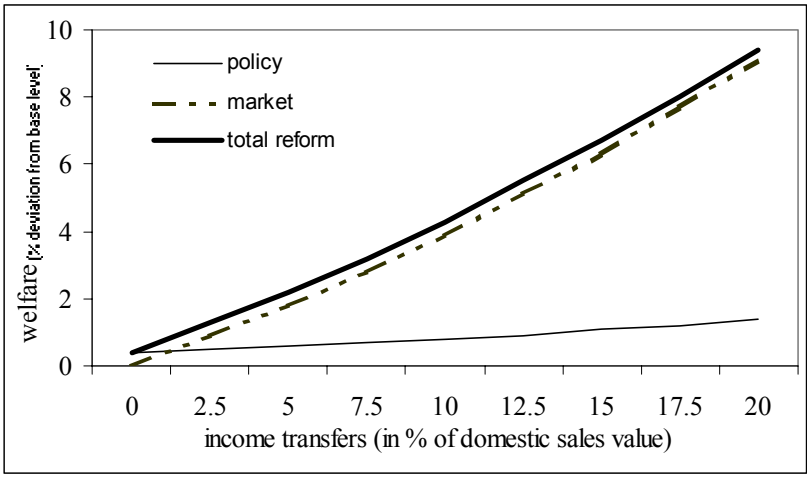

Figure 1: welfare changes by different levels of initial income transfers

simulations for alternative initial levels of income transfers for an interval between zero and twenty percent. As the main intention of this study is to obtain a stable ranking of the three policies depending on their relevant welfare effects, we focus the following discussion on the different welfare implications which we calculate for different level of initial income transfers. Figure 1 summarizes the results. Our first finding is that welfare effects for all three scenarios increase with the assumed level of initial income transfers. For *policy*, this is because of rationalization gains similar to the ones predicted by other studies of trade liberalization and imperfect competition in a general equilibrium setting. The general intention is that when tariffs are eliminated, fewer firms are necessary to produce a given amount of output and the higher the initial level of imperfect competition, the higher the gains from liberalization . For the *market* scenario, the positive impact on welfare is driven by the Stolper-Samuelson effect on wages as discussed above. The higher the initial income transfer, the higher the initial price discrimination against agricultural raw products but also, the higher the rise of this price when rent seeking is eliminated and thus, the larger the Stolper-Samuelson effect on the wage rate. This in turn rises consumers' income. Finally, the (always) higher welfare gains in the *total reform* experiment are caused by a combination of the two previous effects. As figure 1 clearly shows, both, the market as well as the total reform scenario already lead to higher welfare gains than the policy experiment when the initial level of income transfers

accounts for only 2.5 percent. Thus, with regard to the assumption which we test in this section (fifteen percent) we conclude, that our welfare based policy ranking is stable for a fairly wide range around our initial assumption.

5 Conclusions

Based on a neo-classical growth model, the paper shows how an economy can be locked in a non-competitive equilibrium under "bad" governance. We assume that food processors set the price for their intermediate input in an oligopsonistic manner and use the corresponding rents to finance a rent seeking system. Although this specification does not explicitly simulate the rent-seeking behavior, the model incorporates the allocational effects that go along with this behavior. Therefore, it allows for a quantitative assessment of the impact of various policies such as trade liberalization or institutional reforms under consideration of several feedback effects. The results demonstrate that the initial distortions caused by redistributive activities are very big and that they push resources out of activities where the economy has a comparative advantage. Furthermore, we find that given the low quality of governance, there will be no significantly positive impact from liberalization on welfare and growth. Moreover, since these policies lower incentives to invest in the country, they cause an outflow of capital as well as a decline of GDP and the domestic capital stock. Finally, we find that among the analyzed policies only the betterment of governance and the institutional framework can potentially lead to a significant improvement in the allocation of resources and thus, to a positive effect on welfare. We explain these results by the dramatic impact of oligopsonistic behavior of food processors that distorts the equilibrium wage rate of labor, the biggest endowment in the economy, through a *Stolper-Samuelson* effect. Consequently, as long as rent-seeking activities and oligopsonistic competition prevail, there will be no significant improvement in welfare and growth. Finally, based on a sensitivity analysis we find our results to be stable with regard to changes in critical assumptions of the calibration procedure.

The paper provides an idea about the priority of different aspects of reform policies based on a formal framework. However, the most important drawback is that we assume the rules of the rent-seeking game as exogenously given by a fixed expenditure which firms have to cover. Instead, a more carefully specification of the behavior of the beneficiaries of rent seeking and corruption should allow for an endogenization of the rules of the game. Some examples how this can be achieved are Grossman and Helpman (1994),

who model the optimal level of protection, Grossman and Kim (1995) who endogenize attempts to secure own property, or Angeletos and Kollintzas (2000) who solve for the optimal level of corruption in the spirit of Grossman and Helpman.

From policy makers' view, our results suggest that a to attain economic growth the Bulgarian economy would requires a much deeper reform than just canceling tax and tariff distortions. Instead, policy should focus on the improvement of governance through the elimination of noncompetitive behavior and market imperfections. For instance, a sufficient legal framework and an independent jurisdiction with strong courts are necessary to strengthen property rights or to enforce contracts. Furthermore, an efficient anti-corruption agency but also several NGOs could help to reduce the extend of unproductive and redistributive activities. However, breaking up a well established rent-seeking system will certainly cause the resistance of its beneficiaries and thus, will be a fairly difficult task to achieve. Therefore, it can not just be seen as the task of some policy makers or the government but will instead require the general commitment of the society as a whole. Therefore, Hellman et al. (2000a) suggest to make the social costs at which such a system operates transparent to the population, pro-reform groups and NGOs. In this context, our results could play an important role for the case of Bulgaria as they show that the social costs of rent-seeking activities financed by the food chain are about six times higher than the welfare losses due to economy-wide policy distortions.

6 APPENDIX

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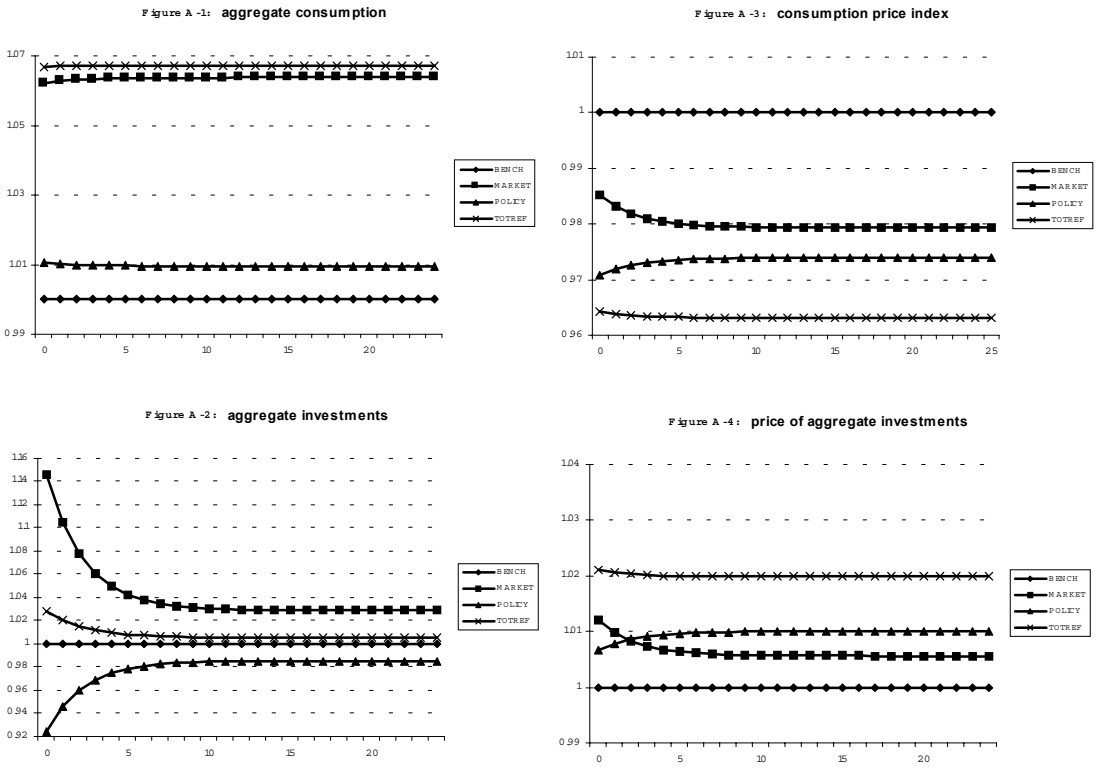
Figure A-1: aggregate consumption
1.07
1.05
1.03
1.01
0.99
0
5
10
15
20
BENCH
MARKET
POLEY
TOTREF
Figure A-3: consumption price index
1.01
1
0.99
0.98
0.97
0.96
0
5
10
15
20
25
BENCH
MARKET
POLEY
TOTREF
Figure A-2: aggregate investments
1.16
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
0.94
0.92
0
5
10
15
20
BENCH
MARKET
POLEY
TOTREF
Figure A-4: price of aggregate investments
1.04
1.03
1.02
1.01
1
0.99
0
5
10
15
20
BENCH
MARKET
POLEY
TOTREF

Figure 2:

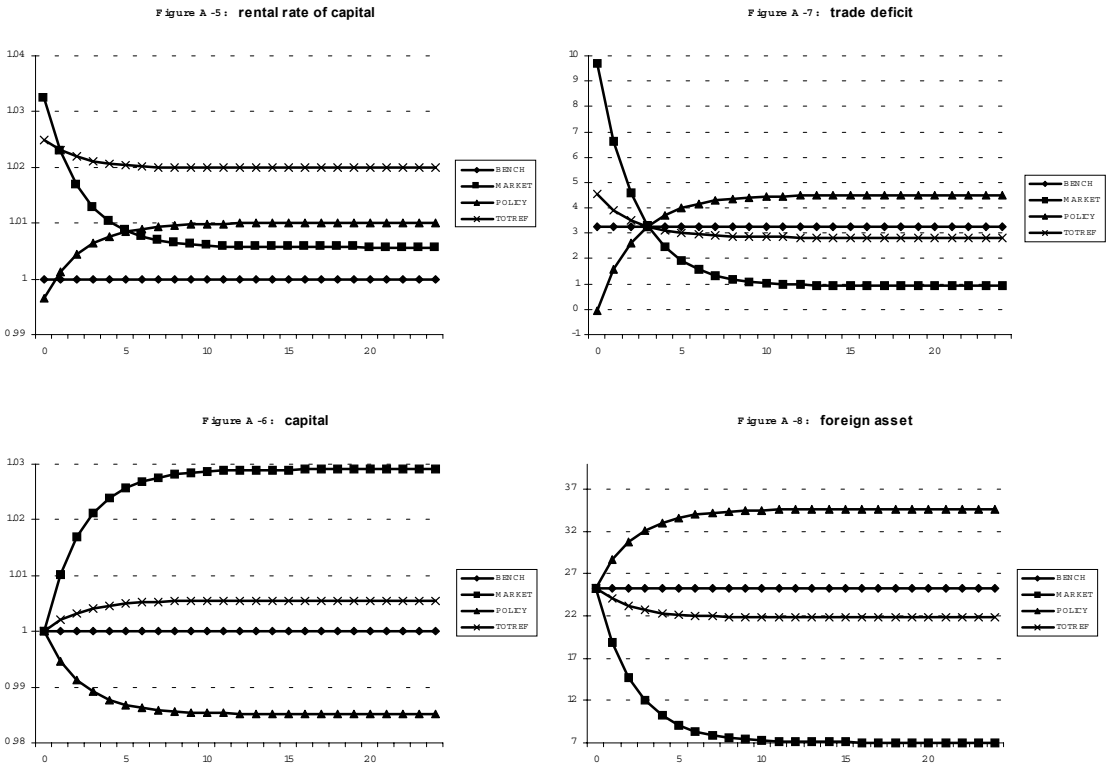
Figure A-5: rental rate of capital
1.04
1.03
1.02
1.01
1
0.99
0
5
10
15
20
BENCH
MARKET
POLICY
TOTREF
Figure A-7: trade deficit
10
9
8
7
6
5
4
3
2
1
0
-1
0
5
10
15
20
BENCH
MARKET
POLICY
TOTREF
Figure A-6: capital
1.03
1.02
1.01
1
0.99
0.98
0
5
10
15
20
BENCH
MARKET
POLICY
TOTREF
Figure A-8: foreign asset
37
32
27
22
17
12
7
0
5
10
15
20
BENCH
MARKET
POLICY
TOTREF

Figure 3:

Figure A-9: price of agricultural raw products

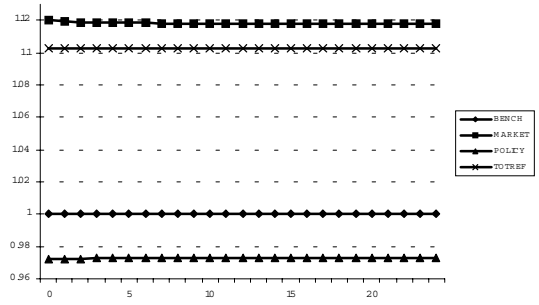

Figure A-10: wage rate

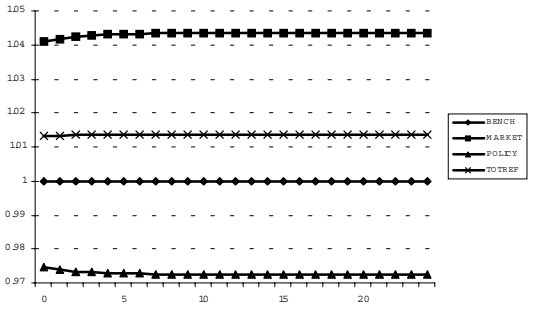

Figure 4:

	Armington elasticities (s^A) / subsistence elasticities (s_S)								
	$s^A = 1$ / $s_S = 2$			$s^A = 2$ / $s_S = 4$			$s^A = 4$ / $s_S = 6$		
	policy	market	total reform	policy	market	total reform	policy	market	total reform
	deviation in percent								
welfare	0.70	5.50	5.80	1.10	6.30	6.70	1.70	7.40	8.00
GDP	-0.59	5.01	4.36	-0.86	5.56	4.68	-0.63	6.66	5.74
households' income	0.34	5.31	5.19	0.69	5.97	6.02	1.33	6.91	7.04
consumption	0.59	5.65	5.78	0.96	6.37	6.71	1.67	7.47	7.98
households' savings	-1.57	2.64	0.58	-1.45	2.84	0.54	-1.36	2.47	-0.32
capital stock	-1.62	2.71	1.01	-1.48	2.90	0.55	-1.38	2.51	-0.32
output of...	deviation in percent								
...agriculture	0.38	7.52	8.17	1.25	12.19	13.81	3.78	20.49	23.72
...subsistence	-3.97	-8.80	-12.09	-12.49	-25.75	-34.17	-23.80	-43.54	-54.66
...food	12.13	31.76	43.75	16.87	53.19	69.49	28.33	89.01	111.38
...nonfood	-2.56	-0.21	-2.96	-3.14	-3.36	-6.85	-4.89	-9.48	-14.33
imports of...	in billion of levs			in billion of levs			in billion of levs		
...food products	24.96	22.55	27.10	27.47	21.94	29.12	31.80	20.29	32.53
...nonfood goods	215.58	223.52	222.94	218.46	226.27	228.71	225.05	232.58	241.03

Table 2: sensitivity analysis: changes in Armington and subsistenceelasticities

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