Staff Papers Series

Staff Paper P91-14

April 1991

The Political Economy of Agricultural and Trade Policies in Open Economies: Implications for International Cooperation in the GATT

by

Harald von Witzke and Ulrich Hausner

Department of Agricultural and Applied Economics

University of Minnesota
Institute of Agriculture, Forestry and Home Economics
St. Paul, Minnesota 55108

The Political Economy of Agricultural and Trade Policies in Open Economies: Implications for International Cooperation in the GATT

by

Harald von Witzke and Ulrich Hausner*

*Center for International Food and Agricultural Policy; 332 Classroom-Office Building; 1994 Buford Avenue; St. Paul, Minnesota 55108; phone: (612) 625-1712; FAX: (612) 625-6245. This is a revised version of a paper presented at the 1991 Hendricks Symposium, University of Nebraska, Lincoln, Nebraska, April 4-7, 1991. Research has been supported in part by a grant from the Agricultural Experiment Station, University of Minnesota and by North Central Experiment Station Regional Project NC-194. This paper is based in part on von Witzke and Hausner (1990), and Hausner (1991).

1. Introduction

The economic environment of agriculture has changed significantly in the last few decades. Two of these changes have immediate implications for the topic of this paper. In the past, agriculture in many countries produced predominantly for the domestic market and had relatively few links with the rest of the economy. Beginning in the 1960's, however, agriculture had become more open and more integrated into the national economies. These two developments have made agriculture increasingly sensitive to the general economic environment outside of agriculture both at home and abroad, and to agricultural and trade policies in foreign countries.

Around the globe, agriculture appears to have two characteristics in common: It is subject to various kinds of government (market) intervention, and there is a characteristic pattern of government involvement in the course of economic development. In less developed countries where agriculture is large both in terms of employment and its share in GNP, agriculture tends to be taxed, while in developed countries, where agriculture is only a relatively small industry, it tends to be subsidized.

Following, we will analyze the determinants of agricultural price policy intervention and discuss their implications for the reform of the international agricultural trade regime. First, we will analyze agricultural price policy formation in the course of economic development. Then, we will focus on the determinants of the level of agricultural price support in developed countries. We will conclude with some thoughts on endogenous interactions of national agricultural policy decisions in the

context of multilateral trade negotiations under the General Agreement on Tariffs and Trade (GATT) in which agricultural protectionism and agricultural policy reform has played a central role in recent years.

2. Political Economy of Agricultural Price Policy in Economic Development

The typical pattern of government market intervention in agriculture is depicted in Figure 1. In this graphical illustration the vertical axis denotes the price and the horizontal axis denotes the GNP as an indicator of the level of economic development. The function P_p P_p' depicts the producer price relative to the world price P_w which is identical to the horizontal axis.

Figure 1 suggests a rather surprising pattern of government market intervention in the course of economic development. At low levels of economic development agriculture is taxed, i.e. the producer price is below the world price. With increasing economic wealth governments switch from taxing agriculture to subsidizing it, and the producer price exceeds the international level.

Public choice theory offers a straightforward explanation for this phenomenon.[1] In analogy to typical goods or input markets one can think of political economic markets. Here we focus on the market for a regulated agricultural commodity price. On this market the supply curve represents the marginal costs and the demand curve the marginal benefits to the political decision maker of alternative levels of the regulated price. In Figure 2, the vertical axis denotes the marginal political economic costs and benefits of alternative levels of a government regulated agricultural

---

[1]The following discussion is based on Honma and Hayami (1986). See also Olson (1986).

producer price and the horizontal axis denotes the producer price relative to the world price.

At low levels of economic development the marginal political economic benefits of supporting the farm price above international levels are low (MB_0). The marginal political economic costs of doing so are high despite the fact that the majority of the labor force is engaged in agriculture (MC_0).

The marginal benefits of agricultural price support are low because the non-agricultural population is a relatively small group which lives concentrated in urban areas, in close proximity to decision makers, and with relatively good infrastructure. All of this results in comparatively low costs of organizing an interest group (see Olson, 1965). Moreover, the urban population tends to be relatively better educated than their rural counterpart; hence, they better understand the effects of agricultural policy. The prime interest of the non-agricultural population tends to be low food prices. This is because in early stages of economic development incomes are low and the share of income spent for food is high. Hence, low food prices have a significant impact on real wages and incomes. The agricultural population, on the other hand, represents the majority of the total population. They live dispersed in rural areas, with poor infrastructure and far away from decision-making centers. Hence, organizing a lobby is relatively costly. Moreover, the agricultural population tends to be not very well informed. Frequently, they do not know what macroeconomic and agricultural policies are pursued by the government and what their economic implications are.

The low marginal benefits of supporting agriculture and the high

marginal cost of doing so result in a political economic equilibrium in which the agricultural producer price is below the world price. In figure 2, this is the intersection of MC_o and MB_o which results in $P_o < P_w$.

In the course of economic development the relative political economic success of agriculture tends to grow. The marginal political economic costs of supporting agriculture decline (MC_0 to MC_1) and the marginal political economic benefits increase (MB_0 to MB_1).

With economic growth, agriculture loses its comparative advantage. The agricultural population declines relative to the urban population. The marginal benefits of supporting agriculture increase as there are less people in agriculture, and the infrastructure in rural areas improves. Both developments reduce the costs of organizing a lobby. Moreover, the education of the agricultural population improves, which enables them to better understand the effects of economic policy and to express their political economic interests.

At the same time, the marginal costs of supporting agriculture decline. The non-agricultural population grows, making the organization of an interest group relatively more expensive. Incomes increase and the share of income spent for food declines; hence, the price of food becomes a less important determinant of real wages and incomes.

The decreasing marginal costs and increasing marginal benefits of agricultural support shift the equilibrium on the political economic market in agriculture to the right. Countries switch from taxing agriculture to subsidizing it. In Figure 2, the new equilibrium is given by the intersection of MC_1 and MB_1; the resulting price is $P_1 > P_w$.

In the course of economic development, more and more countries change

their agricultural policy towards subsidies. While the United States and most West European Countries have a long tradition of subsidizing agriculture[2] many other countries have joined this group of countries only recently such as South Korea or Taiwan (Honma and Hayami, 1986). As more and more countries switch from taxing agriculture to subsidizing it, the budgetary costs of supporting agricultural incomes via distorted agricultural commodity prices tend to increase because the world price declines and domestic production increases.

3. Determinants of Agricultural Policy Intervention in Developed Countries

The level of economic development is only one in a number of determinants of agricultural policy formation. Economic development, although fluctuating over time, occurs continuously in rolling waves rather than abrupt changes and thus affects agricultural policy only over longer time periods. Agricultural price support levels in developed countries, however, are characterized by quite remarkable changes over shorter periods of time.

Following, we will discuss the determinants of agricultural price support policy decisions in developed countries over time and present some empirical evidence for the United States; that is, we will focus on the right hand side of Figures 1 and 2 where the producer price is above the world price. The approach used is a reduced form model of wheat and corn policy formation in the United States. Although we specifically focus on the United States here, analogous models can be, and have been, tested empirically for other developed countries such as Japan or the European

---

[2]Dating as far back as the 18th century in Great Britain.

Community with results comparable to those reported here (Riethmuller and Roe, 1986; von Witzke, 1986). The theoretical framework used represents a supply side approach to policy modeling in that it is based on the political economic calculus of the agricultural policymaker as the supplier of a minimum producer price.

3.1 System of Agricultural Price Support

One central element of U.S. grain policies in the last few decades has been the loan rate which provides a price floor to producers. In the early 60's producer prices were "decoupled" from the loan rate. Beginning in 1963/64 the loan rate was supplemented by direct payments proportional to production. In 1974/75 a target price was introduced where the difference between target price, and loan rate or market price (whichever is higher) is a deficiency payment.

Other measures of market intervention have been employed as well such as "payment in kind" subsidies or acreage reduction programs.[3] Although it may be desirable to incorporate some of these instruments into an analysis of U.S. wheat and corn price policy decisions we have elected to focus only on the level of producer price support in the form of a target price.

The target price does not affect consumers in the form of a higher price. Consumers pay the loan rate or the world market price whichever is higher. In fact, during the time period analyzed here loan rate and world market price were usually very close. Taxpayers however, are affected by

---

[3]While it may be defensible to neglect most of the other instruments employed in grains and to focus on the producer price only it may be less so with regard to the base acreage for deficiency payments. However, producer price support and base acreage are not unrelated which can be seen to be reflected in eq. 2 (see below).

this type of agricultural producer price support, as there are budgetary expenditures involved. Total deficiency payments are the difference between the target price, and the loan rate or the world price, multiplied by the quantity produced at the target price. If the loan rate is above the world price there are additional budgetary expenditures; their extent depends on storage costs, on the extent of surplus production, on the form of surplus disposal, and on the difference between loan rate and world price.

3.2 Theoretical Framework

A single agricultural policymaker is assumed to have preferences over consumers and producers. They can be represented by a utility function which is assumed to be strictly concave (eq. 1). The policymaker's constrained maximization problem is:

$$\max \quad u(x_1, x_2) \tag{1}$$

$$\text{s.t.} \quad c_1(x_3) \geq x_1 \tag{2}$$

$$c_2(x_3) \geq x_2 \tag{3}$$

where x_1 = producer income

x_2 = budgetary expenditures

x_3 = target price (minimum producer price)

In equation (1) agricultural producer income (x_1) can be interpreted to represent the policymaker's political support from farmers, while budgetary expenditures (x_2) caused by the deficiency payment system represent the loss in political support from the rest of the electorate. The two constraints in equations (2) and (3) are assumed to be linear and

continuous. Both agricultural producer income in equation (2) and budgetary expenditures in equation (3) are functions of the target price (x_3). The policymaker chooses x_3 in order to maximize utility. The optimum condition of this maximization problem is given in equation (4).[4]

$$\frac{\partial u}{\partial x_1} \cdot \frac{\partial c_1}{\partial x_3} + \frac{\partial u}{\partial x_2} \cdot \frac{\partial c_2}{\partial x_3} = 0 \tag{4}$$

Equation (4) has an obvious political economic interpretation. The policymaker sets the target price such that the marginal political economic benefits via growing political support from agricultural producers equals the marginal political economic costs via reduced support from consumers resulting from an increase in the target price.

As the policymaker's utility function is assumed to be strictly concave there is a solution for this problem for x_3. Let the solution be approximated by the following statistical model:

$$x_{3t}^0 = \alpha_0 + \alpha_1 x_{1t} + \alpha_2 x_{2t} + \phi_t \tag{5}$$

where x_{3t}^0 denotes the optimum price in period t. The derivation of equation (5) is contained in the appendix.

In the real world policymakers face various contractual constraints in adjusting a government regulated price over time. Usually, decisions on the price level involve time cost which tend to increase with increasing extent of price adjustments. Major price changes may even require special legislation. Often, policy decision makers are also constrained by bills which contain guidelines for price adjustments over time. U.S. farm bills

---

[4]For the derivation of the optimum condition see the appendix.

represent examples of this kind of constraint.[5]

A very common and convenient way to account for such constraints is the Nerlovian partial adjustment approach (Nerlove, 1958). Here it implies that the actual difference in the target price between two periods is a constant fraction of the difference between the optimal price and the past price.

$$x_{3t} - x_{3t-1} = \gamma(x^0_{3t} - x_{3t-1}) + \theta_t \qquad (6)$$

where $0 < \gamma \leq 1$

θ_t = error term; normally and independently distributed.

Combining equations (5) and (6) yields:

$$x_{3t} = \beta_0 + \beta_3 x_{3t-1} + \beta_1 x_{1t} + \beta_2 x_{2t} + \mu_t \qquad (7)$$

where $\beta_0 = \gamma\alpha_0$, $\beta_3 = 1-\gamma$, $\beta_1 = \gamma\alpha_1$, and $\beta_2 = \gamma\alpha_2$

3.3 Empirical Analysis

In equation (7), the producer price for t is determined by the agricultural policymaker at some prior time. Let this be at t-1. At this time the policymaker knows neither x_{1t} nor x_{2t}. Hence, x_{1t} and x_{2t} have to be substituted by their respective expected values x_{1t}^* and x_{2t}^*. Economic theory suggests that economic agents form expectations based on the available information at the time of the decision which is commonly denoted as:

---

[5]The 1985 Farm Bill, for example, permitted to set the loan rate based on past market prices, but limited to a five percent annual drop (USDA, 1990). Since the target price is connected to the loan rate via the deficiency payment rate and resulting budgetary expenditures, the target price, set annually by the U.S. Congress, can be expected to develop in a similar pattern.

$$x_{1t}^* = E\,(x_{1t} \mid I_{t-1}) \tag{8}$$

$$x_{2t}^* = E\,(x_{2t} \mid I_{t-1}) \tag{9}$$

Moreover,

$$x_{1t} = x_{1t}^* + v_t \tag{10}$$

$$x_{2t} = x_{2t}^* + w_t \tag{11}$$

Substituting eqs. (10) and (11) into eq. (7) yields:

$$x_{3t} = \beta_0 + \beta_3\, x_{3t-1} + \beta_1\, x_{1t}^* + \beta_2\, x_{2t}^* + \epsilon_t \tag{12}$$

We are now in a position to discuss the expected signs of the parameters. According to the theoretical analysis the sign of β_0 is not determined a priori. In developed countries where agriculture tends to be subsidized, such as in the United States, one would expect the signs of both β_1 and β_2 to be negative. That is, a relatively low (high) expected agricultural income or relatively low (high) expected budgetary expenditures lead to a relatively high (low) producer support price. As $o < \gamma \leq 1$ and $\beta_3 = 1-\gamma$, β_3 can be expected to be greater than or equal to zero.

The nature of the error term in eq. (12) deserves some further discussion. As Nelson (1975) has noted, the error term typically results in some complications when exogenous variables have to be substituted by their anticipations. A closer look at ϵ_t reveals that this is the case here. As $\epsilon_t = u_t + \beta_1 v_t + \beta_2 w_t$, the use of OLS would yield inconsistent estimates. In essence, this problem requires the use of suitable instrument variables for the anticipations (e.g. Wallis, 1980; McCallum, 1976).

The empirical analysis is over the time period 1963/64 to 1983/84. The data used are from USDA (1984) publications. All monetary variables have

been deflated by the CPI. Detailed information on the specific income situation of U.S. wheat and corn farmers is not available. As policymakers do not have such information either, a proxy can be used without a major risk of biased estimates. A number of different proxies for Y could be used in principle such as overall farm income or farm income in major grain producing states. We have elected to use the U.S. share in world wheat and corn exports. The U.S. grain sector has been very export oriented during the time period analyzed here. Hence, the U.S. share in world exports is commonly perceived as a good indicator of the income situation of farmers producing wheat and/or corn.

The instruments for the anticipations x_{1t}^* and x_{2t}^* were estimated via autoregressions. A one-period lag was chosen for each time series based on the significance of the coefficients. The results are summarized in the appendix. The superscripts w and c denote wheat and corn respectively.

The empirical test of eq. (12) gave the following results:[6]

$$\underset{\quad}{x_{3t}^w} = \underset{(2.90)}{4.207} + \underset{(5.21)}{.6362}\,x_{3t-1}^w - \underset{(-2.73)}{.0808}\,x_{1t}^{w*} - \underset{(-2.59)}{.6049}\,x_{2t}^{w*} \qquad (13)$$

$$\bar{R}^2 = .853$$
$$\rho = -.291\ (-1.16)$$

$$\underset{\quad}{x_{3t}^c} = \underset{(3.09)}{1.023} + \underset{(7.62)}{.9313}\,x_{3t-1}^c - \underset{(-3.04)}{.0090}\,x_{1t}^{c*} - \underset{(-2.74)}{.2898}\,x_{2t}^{c*} \qquad (14)$$

$$\bar{R}_2 = .801$$
$$\rho = -.175\ (-.696)$$

---

[6] t-values in parentheses. The support price is in $/bushel, the U.S. share in world exports is in percent and budgetary expenditures are in $1000. For alternative specifications see von Witzke (1990), Hausner (1991).

Based on the results of the regression analyses, the central hypotheses developed in this paper cannot be rejected. All coefficients have the expected signs and are highly significant. The coefficients for x_{3t-1} have positive and those for x_{1t}^* and x_{2t}^* have negative signs in both equations. This is, a relatively low (high) expected share in world exports (proxy for producer income) or relatively low (high) budgetary expenditures result in a comparatively high (low) wheat producer support price, ceteris paribus. These results are similar to those obtained in time series analyses of the determinants of agricultural price support in other developed countries such as Japan or the European Community (e.g. Riethmuller and Roe, 1986; von Witzke, 1986), suggesting that in developed countries fluctuations in agricultural price support over time are largely determined by producer incomes and budgetary expenditures caused by price support.

4. Endogenous Agricultural Policy Interdependence: Some Implications for International Agricultural and Trade Policy Reform

Multilateral trade negotiations under the General Agreement on Tariffs and Trade (GATT) have been quite successful in removing barriers to trade and distortions of international competition in many industries. One of the most notable exceptions has been agriculture. Until the Uruguay Round agricultural trade and policy issues have rarely been dealt with in GATT negotiations. The endogenous nature of agricultural policy together with increasing global trade in food and agricultural commodities have created incentives for many countries, especially food exporting developed countries that subsidize agriculture, to pursue internationally

coordinated strategies aimed at leading to a more liberal world agricultural trade regime.

As discussed in Section 2 of this paper, with economic growth government reduce the taxation of agriculture, or they increase its subsidization. Some countries switch from taxing agriculture to subsidizing it. Due to this endogenous change in agricultural policy world prices of agricultural commodities have become more and more depressed relative to what they would be under free trade.[7]

This also suggests that the effects of agricultural and trade policies of those countries that attempt to support their agricultural sectors are to a large extent offsetting each other (Resources for the Future, 1988). A country in an attempt to support agriculture reduces the world price. This, in turn, triggers additional upward adjustments in support price levels in other countries with an analogous effect on world prices. Nowhere is agriculture likely to be much better-off than before the price support escalation. Tax-payers and/or consumers[8] have to bear the budgetary consequences of this process. In the 1980s budgetary expenditures in the United States and in the European Community, the two most important food and agricultural commodity trading countries, more than doubled. As the persistent agricultural income problem in developed countries cannot be alleviated in the long-run by price support, and as all agricultural price support appears to result in, are growing budgetary

---

[7]Estimates of the impact of agricultural producer price support in grains indicate that world wheat prices would be significantly higher in the absence of agricultural price support (e.g., Sarris and Freebrairn, 1983; Koester, 1982; Anderson and Tyers, 1988).

[8]Depending on the specific form of price support.

expenditures, there certainly is a growing incentive for each developed country to initiate an agricultural and trade policy reform.

Unilateral liberalization of agricultural and trade policy, however, is not very likely to be a feasible strategy in open economies when policy decisions are endogenous. Under these conditions one country's agricultural and trade policy reform would be counteracted by other countries' endogenous policy adjustments.

To illustrate the political economic problems of unilateral agricultural and trade policy "disarmament" assume a world of only two large countries, here referred to as the European Community and the United States.[9] Assume further the United States would discontinue agricultural price support. The resulting decline in U.S. production and exports would increase world market prices. The main driving forces of agricultural price support over time in the European Community are essentially the same as in the United States, namely agricultural incomes and budgetary expenditures (von Witzke, 1986). Under the system of price support in the Community and the present surplus production, increasing world prices of agricultural commodities would reduce EC budgetary expenditures. This, in turn, would lead to higher support prices there and thus increased EC exports and declining world prices. Compared to an unchanged EC agricultural policy U.S. agriculture would have to bear higher cost of adjustment to the unilateral policy change. These higher cost of adjustment in U.S. agriculture are simply due to the fact that

---

[9]These two political entities are the two most important food and agricultural commodity trading countries.

agricultural policymakers in the European Community would be free-riding on U.S. agricultural and trade policy liberalization.

In fact, such a policy reaction could be observed in the past under comparable circumstances. In the early to mid eighties the European Community was expected by many to face financial collapse or to significantly reduce the level of price support. For a number of reasons this did not happen, however, until the second half of the 1980s. Two of them are linked to macro-economic and agricultural policy decisions in the United States. In the first half of the 1980s the value of the U.S. dollar steadily increased against the currencies that form the ECU. This acted to reduce the difference between EC support prices and world market prices in terms of the ECU; it also reduced the export subsidies per unit and, thus, total budgetary expenditures which, in turn, lead to higher support prices in the Community. In the same time period, budgetary expenditures of agricultural price support in the United States had reached levels that were politically no longer tolerable. As reductions in real support prices to an extent that would significantly reduce budgetary expenditures appeared infeasible, acreage reduction programs were introduced. These programs together with unfavorable weather conditions in the United States reduced agricultural production and thus exports, again increasing world prices and thus contributing to relatively higher price support in the European Community.

5. Conclusion

The theory of endogenous institutional choice stipulates that changes in the economic environment act to induce institutional change (Hayami and Ruttan, 1985). Several changes in the economic environment of world

agriculture have rendered the existing international agricultural trade regime inadequate. Food has become increasingly abundant (e.g. Ruttan and von Witzke, 1990). More and more countries have switched from taxing agriculture to subsidizing it; and the international interdependence of national farm economies has grown.

Policymakers can no longer provide political economic rents to farmers via distortionary agricultural and trade policies without excessive budgetary expenditures. Most developed countries have an incentive to reform their agricultural and trade policies. Unilateral agricultural trade liberalization, however, is not possible as it would be counteracted by other countries' free-riding on one country's policy reform.

A liberal agricultural trade regime, now favored by many countries, represents an international public good. No country, acting on her own, can supply herself with such institutional change of the international agricultural trade regime except through cooperation with other countries (Runge, von Witzke and Thompson, 1989). A better understanding of the forces that have shaped the national agricultural and trade policies as well as the present international agricultural trade regime will certainly facilitate the development of institutional arrangements that can lead to free(r) trade in agriculture. The outcome of the Uruguay Round of multilateral trade negotiations under the GATT suggests that the design of a political feasible reform of the international agriculture trade regime remains an important challenge for agricultural economic research.

References

Anderson, K. and R. Tyers, "Liberalizing OECD Agricultural Policies in the Uruguay Round: Effects on Trade and Welfare," Journal of Agricultural Economics 39 (1988): 197-216.

Hausner, U. "Determinants of U.S. Corn and Wheat Price Policy." Department of Agricultural and Applied Economics, University of Minnesota, St. Paul, 1991.

Hayami, Y. and V. W. Ruttan, Agricultural Development: An International Perspective. 2nd ed. Baltimore, MD: Johns Hopkins University Press, 1985.

Honma, M. and Y. Hayami, "Structure of Agricultural Protection in Industrial Countries." Journal of International Economics 20 (1986): 115-129.

Koester, U., "Policy Options for the Grain Economy of the European Community: Implications for Developing Countries." Research Report 35, Washington, D. C., 1982.

McCallum, B. T., "Rational Expectations and the Estimation of Econometric Models: An Alternative Procedure." International Economic Review 17 (1976): 484-490.

Nelson, C. R., "Rational Expectations and the Estimation of Econometric Models." International Economic Review 16 (1975): 555-561.

Nerlove, M., The Dynamics of Supply: Estimation of Farmers' Response to Price. Baltimore, MD: Johns Hopkins University Press, 1958.

Olson, M., The Logic of Collective Action. Cambridge, MA: Harvard University Press, 1965.

Olson, M., "The Exploitation and Subsidization of Agriculture in Developing and Developed Countries." Agriculture in a Turbulent World Economy. A. Maunder and U. Renborg (eds.), Brookfield, VT: Gower, 1986.

Resources for the Future, Mutual Disarmament in World Agriculture. Washington, D. C.: Resources for the Future, 1988.

Riethmuller, P. and Roe, T. L. "Government Intervention in Commodity Markets: The Case of Japanese Rice and Wheat Policy." Journal of Policy Modelling 8 (1986): 327-349.

Runge, C. F., H. von Witzke, and S. J. Thompson, "International Agricultural and Trade Policy: A Political Economic Coordination Game." Policy Coordination in World Agriculture. H. von Witzke et al. (eds.), Kiel: Vauk, 1989.

Ruttan, V. W. and H. von Witzke, "Toward a Global Agricultural System." Interdisciplinary Science Review 15 (1990): 57-63.

Sarris, A. H. and J. Freebairn, "Endogenous Price Policies and International Wheat Prices." American Journal of Agricultural Economics 65 (1983): 214-224.

USDA, "Background for 1985 Farm Legislation." Various volumes, Washington, D. C., 1984.

USDA, "The Basic Mechanisms of U.S. Farm Policy: How They Work, with Examples and Illustrations." Economic Research Service Miscellaneous Publication No. 1479, Washington, D.C., 1990.

von Witzke, H., "Endogenous Supranational Policy Decisions: The Common Agricultural Policy of the European Community." Public Choice 48 (1986): 157-174.

von Witzke, H., "Determinants of the U.S. Wheat Producer Support Price: Do Presidential Elections Matter?" Public Choice 64 (1990): 155-165.

von Witzke, H. and U. Hausner, "International Agriculture and Trade Policy Interdependence: The Case of U.S. and EC Price Support." Jahrbuch für Neue Politische Ökonomie 9 (1990): 93-107.

Wallis, K., "Econometric Implications of the Rational Expectation Hypothesis." Econometrica 48 (1980): 49-73.

Figure 1: The agricultural producer price in the course of economic development

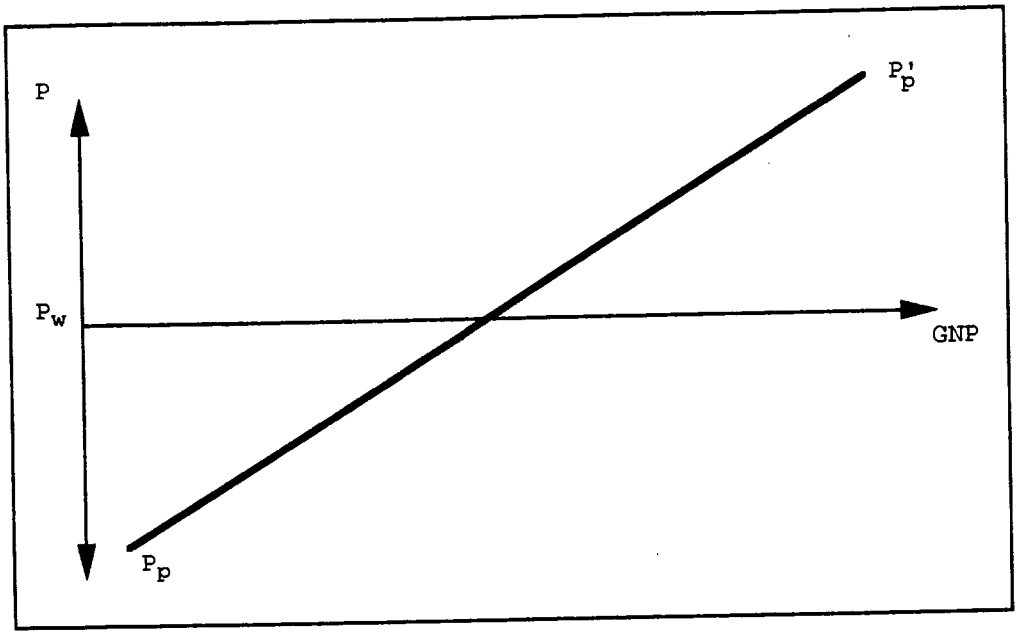
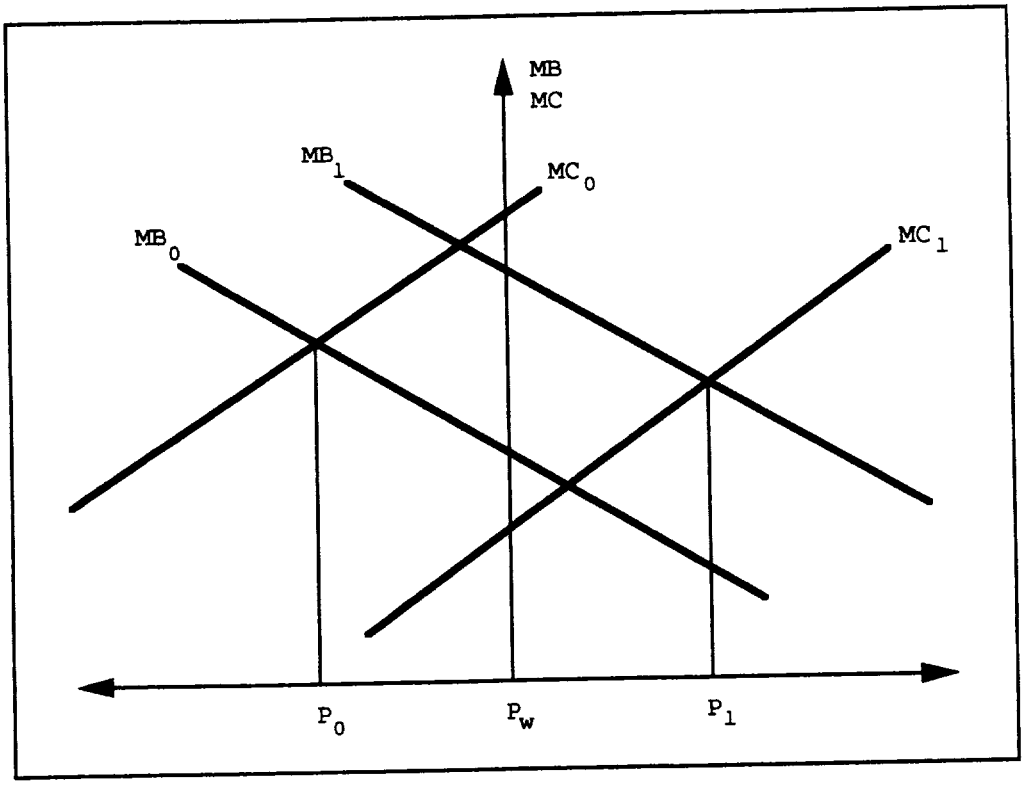


Figure 2: The political economic equilibrium producer price in the course of economic development



APPENDIX I

THE THEORETICAL DERIVATION OF THE REDUCED FORM MODEL

The policymaker's constrained maximization problem is given by

$$\max \quad u(x_1, x_2) \tag{A1}$$

$$\text{s.t.} \quad c_1(x_3) \geq x_1 \tag{A2}$$

$$c_2(x_3) \geq x_2 \tag{A3}$$

where x_1 = producer income

x_2 = budgetary expenditure

x_3 = target price (minimum producer price)

It is assumed that $u: R^2 \rightarrow R$ is twice differentiable and strictly concave, and that the underlying preferences are locally nonsatiated. Both constraints are assumed to be continuously differentiable and linear. Given the strict concavity of the objective function and the linear constraints we know that if there exists an x^0 that locally maximizes $u(x)$ s.t. $c_j(x) \geq 0$ ($j = 1, 2$, and $x \in R^3$) then x^0 also globally maximizes $u(x)$ s.t. $c_j(x) \geq 0$. Furthermore, since preferences are locally nonsatiated, equations A2 and A3 hold with equality, that is, we have an equality constrained maximization problem. Since the rank condition is satisfied, i.e., rank [D c(x)] = 2, we can apply Lagrange's Theorem. Define the Lagrangian $L: R^3 \times R^2 \rightarrow R$ by

$$L(x, \lambda) = u(x_1, x_2) - \lambda_1(c_1[x_3] - x_1) - \lambda_2(c_2[x_3] - x_2) \tag{A4}$$

The first order derivative of the Lagrangian with respect to x and λ provides the FONC's for x^0 being a local (and global) maximizer of u(x) s.t. c(x)=0:

$$D\,L(x^0,\,\lambda^0) = 0 \tag{A5}$$

$$x_1: \quad \partial u/\partial x_1\ (x^0) + \lambda_1^0 = 0 \tag{A5.1}$$

$$x_2: \quad \partial u/\partial x_2\ (x^0) + \lambda_1^0 = 0 \tag{A5.2}$$

$$x_3: \quad -\lambda_1^0\ (\partial c_1/\partial x_3)\ (x^0) - \lambda_2^0\ (\partial c_2/\partial x_3)\ (x^0) = 0 \tag{A5.3}$$

$$\lambda_1: \quad -c_1(x_3^0) + x_1^0 = 0 \tag{A5.4}$$

$$\lambda_2: \quad -c_2(x_3^0) + x_2^0 = 0 \tag{A5.5}$$

Combining equations A5.1 and A5.2 yields the equilibrium condition for a government controlled producer support price:

$$\frac{\partial u/\partial x_1}{\partial u/\partial x_2}\ (x^0) = -\frac{\partial c_2/\partial x_3}{\partial c_1/\partial x_3}\ (x^0) \tag{A6}$$

That is, the agricultural policymaker sets the minimum producer price x_3, such that the ratio of marginal political benefits equals minus the reverse ratio of marginal costs.

Assuming that $D^2u(x)$ is negative definite for all $x \in R^2$ (which is sufficient for u to be strictly concave on R^2), that is,

$$\partial^2 u/\partial x_1^2\ (x) < 0 \tag{A7.1}$$

$$\partial^2 u/\partial x_2^2\ (x) < 0 \tag{A7.2}$$

$$\partial^2 u/\partial x_1^2\ (x)\ \partial^2 u/\partial x_2^2(x) - (\partial^2 u/\partial x_1 \partial x_2\,[x])^2 > 0 \tag{A7.3}$$

and assuming that

$$\partial u/\partial x_1 \ (x) > 0 \tag{A7.4}$$

$$\partial u/\partial x_2 \ (x) < 0 \tag{A7.5}$$

$$\partial c_1/\partial x_3 (x) > 0 \tag{A7.6}$$

$$\partial c_2/\partial x_3 \ (x) > 0 \tag{A7.7}$$

$$\partial^2 c_1/\partial x_3^2 (x) - \partial^2 c_2/\partial x_3^2 \ (x) = 0 \tag{A7.8}$$

$$\partial^2 u/\partial x_1 \partial x_2 (x) - \partial^2 u/\partial x_2 \partial x_1 (x) < 0 \tag{A7.9}$$

for all $x \in R^3$

guarantees that the determinant of the second derivative of L with respect to x and λ is strictly less than zero,

$$\det [D^2 L(x^0, \lambda^0)] < 0 \tag{A8}$$

that is, $D^2 L(x^0, \lambda^0)$ is nonsingular.[10]

The assumptions formulated in equations (A7.1-A7.9) are consequences of basic economic considerations about (decreasing) marginal returns, the strict concavity of the objective function, the linear constraints, and Young's Theorem. Albeit somewhat restrictive, they constitute an economically plausible theoretical framework.[11]

---

[10]For a detailed proof, see Hausner (1991).

[11]An increase (decrease) in producer income, at the margin, increases (decreases) the policymaker's utility, that is, political support (Equation A7.4), whereas an increase (decrease) in budgetary expenditures leads to a decrease (increase) in utility (Equation A7.5). Equations A7.6 and A7.7 imply increasing marginal cost of "producing" ("supplying") income and budgetary expenditures via setting the support price. The equalities in Equation A7.8 are a consequence of the linear constraints.

Since for (x^0, λ^0), $D\,L(x^0, \lambda^0) = 0$, and $D^2L(x^0, \lambda^0)$ is nonsingular, by the Implicit Function Theorem (IFT), the FONC's described by eq. (A6) determine x_3^0 (locally) as a function of x_1^0 and x_2^0. That is, there exists a neighborhood V of (x_1^0, x_2^0) in R^2, and a neighborhood U of x_3^0 in R, and a unique continuously differentiable function g: $V \to U$ such that

$$x_3^0 = g(x_1^0, x_2^0) \tag{A9}$$

Given the constrained maximization problem in which the policymaker's control variable is the minimum producer price, x_3, and the assumptions listed above, the IFT guarantees a solution x_3^0 functionally depending on x_1^0 and x_2^0, the producer income and the budgetary expenditure. That is, the solution to the maximization problem can be approximated by the statistical model described in equation 5 (section 2).

The second order cross partial derivatives of the objective function, Equation A7.9, are assumed to be negative: Given that an increase in political support (utility) based on an increase in producer income x_1 occurred, a subsequent increase in budgetary expenditures x_2 (via an increase in support prices set by the policy maker), decreases the policy maker's utility. We get a trade off between increasing support from producers and decreasing support from taxpayers. The equality in Equation A7.9 is guaranteed by Young's Theorem.

APPENDIX II

ESTIMATES OF THE INSTRUMENT VARIABLES

$$(1a)\quad \overset{w}{Y}_t = \underset{(2.79)}{23.09} + \underset{(2.21)}{.4385}\ \overset{w}{Y}_{t-1}$$

$$\bar{R}^2 = .151$$

$$(2a)\quad \overset{w}{B}_t = \underset{(1.88)}{204{,}233} + \underset{(1.98)}{448.93}\ \overset{w}{B}_{t-1}$$

$$\bar{R}^2 = .123$$

$$(3a)\quad \overset{c}{Y}_t = \underset{(2.21)}{23.66} + \underset{(3.68)}{.6398}\ \overset{c}{Y}_{t-2}$$

$$\bar{R}^2 = .374$$

$$(4a)\quad \overset{c}{B}_t = \underset{(2.94)}{949{,}233} + \underset{(1.46)}{318.6}\ \overset{c}{B}_{t-1}$$

$$\bar{R}^2 = .096$$