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# AGRICULTURE AND GOVERNMENTS IN AN INTERDEPENDENT WORLD

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Edited by  
Allen Maunder, Agricultural Economics Unit, Queen Elizabeth House  
University of Oxford, England  
and  
Alberto Valdés, International Food Policy Research Institute  
Washington DC, USA

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QUEEN ELIZABETH HOUSE  
UNIVERSITY OF OXFORD

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## HARALD VON WITZKE

### *Determinants of the US Wheat Producer Support Price*

#### INTRODUCTION

Throughout the world, agriculture is subject to more or less intense government intervention. There is a characteristic pattern of government involvement in the course of economic development. In less developed countries, where agriculture represents the majority or at least a large fraction of population, agriculture is more or less heavily taxed. In developed countries, such as the United States, agriculture is only a small sector of the economy but tends to be subsidized.

Typically, government market intervention is characterized by various adverse allocative and distributive effects. Not surprisingly, US agricultural and trade policy has drawn much criticism over the years. Although a number of proposals for a more or less drastic policy reform have been put forward, the more than 50-year-old US price and income policy is still being continued in principle. Of course, there have been quite remarkable policy changes such as the introduction of deficiency payments or measures of domestic supply management. However, the principle of US agricultural policy, namely to provide income support to farmers via a government regulated minimum price has remained the same. While the system of government intervention in grains has fluctuated only gradually over time, the level of real producer price support has changed quite remarkably since the early 1960s.

Applications of public choice theory to the analysis of agricultural policy formation have led to valuable general insights into the determinants of agricultural policy decision making in various parts of the world (for example Bates, 1981; Anderson and Hayami, 1986; Olson, 1986; Hayami, 1988). However, the knowledge of the determinants of US agricultural policy decisions is still limited (Schuh, 1981; Spitze, 1986).

Agriculture in the United States has become increasingly open and operates in an increasingly international economic environment. The core of public choice theory, however, is still largely domestic in character. 'International aspects are rarely dealt with in public choice as evidenced by their complete neglect in surveys and textbooks. On the other hand there is a "demand" for a public choice analysis in this area by international trade theorists . . .' (Frey, 1984).

Analyses of the determinants of US agricultural policies have followed several lines of research. First, there are studies that incorporate endogenous government behaviour into traditional market models (for example Dixit and Martin, 1986). Typically, the public choice part of these models is heuristic in

character and focuses on domestic policy determinants. Second, there are formal models that are in the main stream of public choice literature. The main focus of this type of analysis is on domestic aspects of policy formation. The empirical results tend to support the relevance of central hypotheses of public choice theory for US agricultural policy (Gardner, 1986). Third, there are studies that explain international trade on selected markets with endogenous government decisions in major trading countries including the United States (for example, Abbott, 1979; Sarris and Freebairn, 1983). Although these studies explicitly capture important international aspects of national agricultural policy formation, the results are naturally too general to yield more specific and detailed insights into the determinants of US agricultural price policy decisions.

Here we will develop a formal model that specifically focuses on US wheat policy decisions. It will be based on public choice theory and will incorporate some international aspects of endogenous national policy decisions. The model is of the reduced form type and aims at explaining US producer price support in wheat over time. It represents a supply-side approach to agricultural policy modeling in that it is based on the political economic calculus of the regulator, that is the agricultural policy decision maker as the supplier of a minimum producer price. We will first develop the conceptual framework and then test the model empirically. The study concludes with some implications for international interactions of endogenous national agricultural policy decisions in the context of the present round of multilateral trade negotiations in the General Agreement on Tariffs and Trade (GATT).

## CONCEPTUAL FRAMEWORK

Hayami (forthcoming) describes the central elements of political economic markets in agriculture, based on classical public choice theoretical analyses. According to this framework, an equilibrium on any given political economic market prevails when the policy maker's marginal political economic costs (loss of political support or votes) equal the marginal benefits (gain in political support or votes) resulting from a change in a government regulated price. Our theoretical considerations follow this framework (see also Riethmuller and Roe, 1986).

One central element of US wheat policies in the last few decades has been the loan rate which provides a price floor to producers. In the early 1960s producer prices were 'decoupled' from the loan rate. Beginning in 1963/64 the loan rate was supplemented by direct payments of some sort. In 1974/75 a target price was introduced where the difference between target price and loan rate or market price is a deficiency payment.

Other measures of market intervention have been employed as well such as 'payment in kind' subsidies or acreage reduction programmes.<sup>2</sup> Although it may be desirable to incorporate some of these instruments into an analysis of US wheat price policy decisions we have elected to focus only on the level of producer price support.<sup>3</sup>

For the purpose of this study, it should be emphasized that the producer price during the period analysed here has been 'decoupled' from consumer price. That is, consumers are not directly affected by producer price support in the form of

a target price. However, taxpayers are affected as price support tends to result in budgetary expenditures.

Consider the following strictly concave criterion function (W) that a single agricultural policy maker maximizes in every period t, by setting a producer price.

$$W_t = W(Y_t, B_t) \tag{1}$$

s.t.

$$Y_t = Y(P_t) \tag{2}$$

$$B_t = B(P_t) \tag{3}$$

where

Y = producer income

B = budgetary expenditures

P = producer price

t = time index

In equation (1), income of producers can be interpreted as a determinant of the decision makers' political support from this group. Budgetary expenditures (revenues) caused by a government regulated price represent the loss (gain) of political support from the rest of the electorate. If the producer price (the target price) would be equal to the consumer price it would be necessary to add  $P_t$  as an argument to equation (1). In this case, consumer welfare would be directly affected by the supported producer price.

Maximizing (1) subject to the constraints in (2) and (3) yields the optimum condition for the government controlled price in (4). Its political economic interpretation is obvious. The agricultural policy decision maker sets the price such that marginal political benefit equals the marginal cost.

$$(\partial W_t / \partial Y_t) \cdot (\partial Y_t / \partial P_t) + (\partial W_t / \partial B_t) \cdot (\partial B_t / \partial P_t) = 0 \tag{4}$$

where  $\partial W_t / \partial Y_t > 0, \partial Y_t / \partial P_t > 0, \partial W_t / \partial B_t < 0, \partial B_t / \partial P_t > 0.$

According to the implicit function theorem, this problem can be solved for the optimum price as the criterion function is assumed to be strictly concave, that is,  $P_t$  can be expressed as a function of  $Y_t$  and  $B_t$ . The structural parameters, however, cannot be identified. Denote the optimal price in period t by  $\tilde{P}_t$ , and let the solution to this problem be:<sup>4</sup>

$$\tilde{P}_t = \alpha_0 + \alpha_2 Y_t + \alpha_3 B_t \tag{5}$$

Usually policy makers are not perfectly free to adjust a regulated price over time as there are various contractual policy constraints. The time cost of decision making tends to increase with increasing extent of price adjustments. Major price adjustments may even require special legislation. Moreover, policy makers may be constrained by bills that cover several periods and that may restrict policy

adjustments. US farm bills represent examples of this type of constraint as farm bills contain at least some guidelines for annual price adjustments.

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

$$P_t - P_{t-1} = c(\tilde{P}_t - P_{t-1}) + u_t \quad 0 < c < 1 \quad (6)$$

In equation (6),  $u_t$  represents an error term. Combining (5) and (6) yields a testable hypothesis about the formation of the US target price in wheat over time.

$$P_t = \beta_0 + \beta_1 P_{t-1} + \beta_2 Y_t + \beta_3 B_t + u_t \quad (7)$$

where

$$\beta_0 = c\alpha_0, \beta_1 = 1-c, \beta_2 = c\alpha_2, \text{ and } \beta_3 = c\alpha_3$$

As mentioned above, this analysis attempts to capture national as well as some international aspects of policy formation. The right-hand side of equation (7) contains variables which, at first glance, may be perceived as domestic in nature. However, the wheat sector has been very export orientated during the time period analysed here. Generally, exports and incomes are closely related on such markets. Exports in turn are influenced not only by domestic variables but also by such variables as world market prices or exchange rates. Similarly, budgetary expenditures caused by deficiency payments are influenced by the world market price as well. A relatively high (low) world market price of wheat (if it exceeds the loan rate) reduces (increases) the deficiency payment per bushel of wheat produced and thus the budgetary expenditures caused by the supported wheat producer price.

Olson's analysis (1965) of the relative political power of interest groups on political economic markets has stimulated a large number of studies, suggesting that relatively small interest groups, such as agricultural commodity groups in developed countries, tend to be more successful, at least until some threshold is reached (for example Anderson and Hayami, 1986; Gardner, 1986; Hamayi, forthcoming.) While there is plenty of evidence supporting this view, the change in interest groups' success over the election cycle has not received much attention. It may immediately appear to be counterintuitive that small interest groups have a relatively more powerful political economic bargaining position in election than in non-election years as only a relatively small number of votes may be gained by allocating political favours to such groups. In fact, policy makers may be better off concentrating their efforts on relatively large groups where more votes can be potentially gained.

However, if a small interest group succeeds in positioning itself such that it contains the median (or the decisive) voter, small interest groups may well be even more successful in extracting rents in election years than in non-election years. As Frey (1984) has noted, public choice models that are based on the policy makers' maximization of political support or votes may, in fact, be misspecified if they neglect election cycles, '... because between elections a

democratically chosen government may well yield to the pressures of the organized groups, in particular because it needs their support to carry out its economic policies successfully, and also because it is interested in their financial support in view of future elections'.

If the above considerations are correct, then the question of the changing relative political power of smaller interest groups, such as agricultural producer groups, represents, in fact, an empirical problem. In many cases relative political economic power of small interest groups may be lower in election years. The government may still enjoy the support of these groups as they have learned from past experience that they will be compensated by more political favours in non-election years. Only if an interest group consistently succeeds in positioning itself on the political economic market such that it contains the median (or the decisive) voter will it consistently extract relatively more political economic rents in election years than in non-election years. Some interest groups may succeed in being decisive in some elections and may fail to do so in others. In this case an empirical analysis would be very difficult unless one is able to find an explanation for this phenomenon.

Notice that the above considerations of the changing relative political power of small interest groups do not contradict one of Olson's basic hypotheses, namely that such groups tend to be relatively more successful on political economic markets. Our considerations imply, however, that the success of relatively small interest groups may change systematically over the election cycle. In the following empirical analysis we will also test whether this is the case with regard to US wheat producers.

## EMPIRICAL ANALYSIS

### *The empirical model*

In equation (7), the producer price for  $t$  is determined by the agricultural policy maker at some prior time. Let this be at  $t-1$ . At this time the policy makers know neither  $Y_t$  nor  $B_t$ . Hence,  $Y_t$  and  $B_t$  have to be substituted by their respective expected values  $Y_t^*$  and  $B_t^*$ . Recent developments in economic theory suggest that economic agents form expectations based on the available information at the time of the decision which is commonly denoted as:

$$Y_t^* = E(Y_t | I_{t-1}) \quad (8)$$

$$B_t^* = E(B_t | I_{t-1}) \quad (9)$$

Moreover,

$$Y_t = Y_t^* + v_t \quad (10)$$

$$B_t = B_t^* + w_t \quad (11)$$

Substituting equations (10) and (11) into equation (7) and including  $E$  yields:

$$P_t = \beta_0 + \beta_1 P_{t-1} + \beta_2 Y_t^* + \beta_3 B_t^* + \beta_4 E_t + \varepsilon_t \quad (12)$$

We are now in a position to discuss the expected signs of the parameters. According to the theoretical analysis the sign of  $\beta_0$  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  $\beta_2$  and  $\beta_3$  to be negative. That is, a relatively low (high) agricultural income or relatively low (high) budgetary expenditures lead to a relatively high (low) producer support price. As  $0 < c < 1$ ,  $\beta_1$  can be expected to be positive. A presidential election year will be accounted for by a dummy variable (E). It is 1 in an election year and 0 in all other years. Hence, if the relative political power (that is, the producer support price) of wheat producers is systematically lower (higher) in election than in non-election years, the sign of the dummy variable will be negative (positive).

The nature of the error term in equation (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  $\epsilon_t$ , reveals that this is the case here. As  $\epsilon_t = u_t - \beta_2 v_t - \beta_3 w_t$ , the use of OLS would yield inconsistent estimates. In essence, this problem requires suitable instrument variables for the anticipations (for example Wallis, 1980; McCallum, 1976). Possible first order serial correlation of the residuals have been accounted for by the Hildreth-Lu procedure.

The empirical analysis is over the time period 1963/64 to 1983/84. The data used are from USDA publications. All monetary variables have been deflated by the CPI. Suitable information on the specific income situation of US wheat farmers is not available. As policy makers do not have such information either, a proxy can be used without a major risk of biased estimates. The US wheat sector has been very export oriented during the time period analysed here. The US share in world exports is commonly perceived as a good indicator of the income situation of wheat farmers and has been used as a proxy for Y.

### *Empirical results*

The instruments for the anticipations  $Y_t^*$  and  $B_t^*$  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 empirical test of equation (12) in which  $E_t$  was alternatively used to account for presidential election years gave the following results:<sup>5</sup>

$$P_t = 4.207 + .6362P_{t-1} - .0808Y_t^* - .6049B_t^* \quad (13)$$

(2.90)    (5.21)    (-2.73)    (-2.59)

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

$$P_t = 5.376 + .5798P_{t-1} - .1028Y_t^* - .8542B_t^* - .2755E_t \quad (14)$$

(5.449)    (6.798)    (-5.15)    (-5.25)    (-3.25)

$$\bar{R}_2 = .891 \quad \rho = -.728 (-4.40)$$

Based on the results of the regression analyses, the central hypotheses developed in this paper cannot be rejected. The coefficients for  $Y_t^*$  and  $B_t^*$  have the



expected negative signs and are highly significant in both equations (13) and (14). This is, a relatively low (high) expected share in world wheat exports (proxy for wheat 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 (for example Riethmuller and Roe, 1986; von Witzke, 1986), suggesting that in developed countries fluctuations in agricultural price support over time are predominantly driven by producer incomes and budgetary expenditures caused by price support.

Overall, the results of equation (14), which also contains  $E_t$ , are statistically somewhat stronger than those of (13). The sign of  $E_t$  is negative and highly significant. All other things being equal, producer price support in wheat is about 27 cents per bushel lower in presidential election years than in other years. This suggests that, during the period analysed here, US wheat producers have not been able to position themselves on the political economic market such that they contain the median or the decisive voter.

As mentioned above, not much is known about the relative political economic success of interest groups over the election cycle. Hence, this study's empirical results can not be generalized. It may turn out that the pattern found in this study is typical of many relatively small pressure groups in democracies, but it is equally possible that the fluctuation of small interest groups' relative success over the election cycle depends crucially on various other group characteristics and/or on specific institutional arrangements that may vary from one country to the other, or even within a country from one industry to the other. At any rate, the phenomenon of changing relative success of interest groups over the election cycle certainly deserves some further attention and could lead to deeper insights into the dynamics of political decisions.

The fact that the US wheat producer support is relatively lower in presidential election years than in other years appears to be not implausible, however. First, wheat producers represent only a very small fraction of the electorate and probably play only a marginal role in the political economic calculus in presidential election campaigns. Second, wheat producers are predominantly located in states that do not have a large number of electoral votes such as Kansas and some other Great Plains states. Political favours are more likely to be allocated (or promised to be allocated) to larger states where more electoral votes are at stake such as California, Florida or New York.<sup>6</sup>

## SUMMARY AND CONCLUSIONS

As has been shown, the US producer price support in wheat is endogenous rather than exogenous. The results of the empirical analysis suggest that the structure underlying wheat price support was relatively constant during the period analysed. Producer price support in wheat could be explained largely by policy makers' expectations of the US share in world exports, by budgetary expenditures caused by price support, and by presidential election years. The hypothesis that interest groups' relative power changes characteristically over the election

cycle could not be rejected by the empirical analysis. All other things being equal, price support in wheat is lower in presidential election than in non-election years. This suggests that US wheat producers have not been able to position themselves on the political economic market such that they contain the decisive voter.

The results of this study have some interesting implications for international interactions of national agricultural policy decisions in various countries. At present the signatories of the GATT treaty are under way to another round of multilateral negotiations on the reduction of international trade barriers. One of the central issues of this round of negotiations are distortions of agricultural trade. While previous GATT rounds have been rather successful in reducing barriers to trade in general, this has not been the case with regard to agricultural trade policy measures and other instruments that distort international agricultural trade.

Two main actors in the Uruguay round of GATT negotiations are the United States and the European Community (EC). Both political entities support their farmers via agricultural price policy. Some authors have argued that the potential benefits of a unilateral reduction in producer price support by the United States (and many other countries) are large and, therefore, the United States would be well advised to pursue this strategy irrespective of the outcome of the GATT negotiations. This assessment is certainly valid. Others have argued that only a co-ordinated strategy of major trading countries can be feasible, as a unilateral support price reduction would be counteracted by other trading countries' policy adjustments. An application of the results in this paper to wheat price support by the United States and the European Community, may help to shed some more light on this controversial discussion.

Assume the United States were to unilaterally phase out producer price support. As the United States is a large country in terms of exports in wheat and other important agricultural commodities, the resulting decline in production and exports would increase world market prices, *ceteris paribus*. This in turn would reduce the export subsidies per unit in the Community and thus budgetary expenditures there. As has been shown, declining budgetary expenditures result in relatively higher agricultural support prices in the EC which in turn would reduce market prices (von Witzke, 1986). Therefore, in the absence of an agreement on agricultural policy adjustment toward lower support prices, US agriculture would have to carry the main burden of adjustment. The Common Agricultural Policy of the European Community would benefit, as the reduced US price support acts to alleviate budgetary pressure on the CAP.

This in turn would lead to a relatively higher support price level there. As the EC is a large wheat producer (and exporter) as well, the growing exports would reduce the world market price and result in relatively higher adjustment costs in the US wheat industry. The argument with regard to a unilateral price reduction by the Community is analogous, *mutatis mutandis*. As the 1988 declaration by an international group of agricultural and trade economists states: 'It is correctly perceived that concerted action on a comprehensive basis to reduce the distortions produced by national farm support policies and illiberal food trade arrangements will substantially reduce the adjustments required for each country's agriculture' (Mutual Disarmament in World Agriculture, 1988).

## NOTES

<sup>1</sup>For a comprehensive survey see Rausser, Lichtenberg and Lattimore (1982).

<sup>2</sup>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 regards 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 equation (2) (see below).

<sup>3</sup>As the knowledge of the determinants of agricultural policies is still rather limited, it appears reasonable to restrict the analysis to a less comprehensive problem.

<sup>4</sup>Or a linear approximation.

<sup>5</sup>t-values in parentheses. The wheat support price P is in \$/bushel, the US share in world wheat exports is in per cent; and budgetary expenditures are in US \$1000.

<sup>6</sup>I owe this argument to Daniel W. Bromley.

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## APPENDIX

### *Estimates of the Instrument Variables*

$$Y_t = 23.09 + .4385 Y_{t-1} \quad (1a)$$

(2 .79) (2 .21)

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

$$B_t = 204,233 + 448.93 B_{t-1} \quad (2a)$$

(1.88) (1.98)

$$R^2 = .123$$

## DISCUSSION OPENING – ALEX F. McCALLA

The Von Witzke paper adds to a growing literature that tries to endogenize government behaviour in agricultural policy making. The particular innovation of the paper is to test whether or not wheat farmers do better or worse in election years. The other variables in his empirical analysis – last year's price, a proxy for farmers incomes and, I assume, last year's budgetary costs – have been widely used in past empirical analysis. Overall it is a clear, well written paper which lays out his argument and presents his empirical results effectively.

As far as the specific paper goes, I have only one specific comment. A student of mine at Davis, Linda Young, analysed wheat policy formation in the US, Canada and Japan over the post World War II period. She used several empirical formulations to explore what appeared to be the major determinants of wheat prices. In the US she explored what determined the loan rate and the target price. Her results show that last year's price is the most significant variable followed by the level of last year's stocks. The result at variance with von Witzke is that budgetary costs turned out to be non-significant (and often the wrong sign) in all formulations. This of course was contrary to our *a priori* expectations. I hope Harald will comment on this and also on why he chose the three variables he did.

I would hope however that our discussion today addresses broader conceptual issues involved in determining what causes policy makers to do what they do. While Professor von Witzke presents a conceptual model of policy makers maximizing a simple criterion function, it is not clear that the estimated equation relies on that model. Rather the approach taken by Professor von Witzke could just as easily be characterized as inductive empiricism as was the approach taken by Young (1987) and many others. That is, candidate exogenous variables are hypothesized, based perhaps on theory, but more likely on intuition and our

understanding of the policy process, and then statistical analysis is done to determine which are significant. The approach called the behavioural approach by Rausser, Lichtenburg and Lattimore (1982), hypothesizes what exogenous variables appear to influence policy makers' behaviour but does not derive the equations from a model of the decision making process of the policy maker.

Are we satisfied with attempts to develop conceptual models of policy makers behaviour following the same general line as von Witzke? These generally involve assuming (or generating) a policy maker utility function which one attempts to maximize by equating the marginal cost of supplying another unit of political benefit (a higher support price) to the marginal benefit of additional votes and/or campaign contributions. Using such a structural model it should be conceptually possible to determine which arguments are to be decision makers utility function and what weights are attached to them. This approach becomes increasingly complicated mathematically with more complex (realistic?) utility functions and has presented great difficulty for estimation, primarily because of data limitations.

These difficulties I suspect explain why most empirical work is of the sort Professor von Witzke has done. However it still leaves a certain uneasiness as to why those particular variables, but not others, were chosen and why only one policy variable was addressed.

None of my comments should be interpreted as criticism of the paper. Quite the contrary. I applaud people who are willing to investigate why policy makers do what they do. It is clearly superior to treating policy variables as exogenous as is done in most policy analysis. But surely we need to get further 'into the policy-maker's head' if we are going to be able to use policy equations in *ex ante* policy option analysis.

Several possibilities might be discussed. The behavioural approach seeks to imply policy maker behaviour from past performance. Utility function structural (public choice) models assume that policy makers are rational maximizers of simple or complex utility functions. Perhaps we should ask policy makers what they take into account in reaching decisions and then attempt to verify those variables by analysing past voting records. Do they have multi-level objective functions, that is, some concerns of national interest-employment, fiscal responsibility, and so on, some of regional issues, some of sectoral concern, for example, agriculture versus automobiles and some of constituency and local voter concern? How are these levels ordered? How influential is the marginal voter? How effective are campaign contributions? I realize these kinds of questions sound more like political science than economics, but do we really believe decision makers are altruistic souls maximizing social welfare?

This whole area is very challenging and, I must say, difficult to model. It becomes more complex when we start to take international considerations into account. Do policy makers in Canada make their policy choices conditional on how they think US policy makers will react to their choices or do they take existing policy as given? Or do they ignore their international competitors? If we are to model a world of large countries who intervene in their agricultures, surely policy interdependence is a reality. How do we approach that subject in a meaningful way?

I perceive my role as 'discussion opener' to be one of encouraging us to use Professor von Witzke's very good paper as a beginning point of a broader discussion in the area of the political economy of agriculture policies. Hopefully as we go to a more general discussion some of these issues can be addressed.

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