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# Cutting the Agricultural Price Pie: Power or Justice?

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**Abstract:** Agricultural protection varies considerably among different commodities. To understand inter-industry protection within agriculture, the price-setting procedure needs to be analysed. The price-setting procedure in Sweden is organized as a two-stage negotiation procedure involving producers and consumers. This type of price setting gives farmers an excellent opportunity to affect relative prices. The question is whether the stronger groups have used this situation to affect relative prices to their advantage. Four different price-setting principles are discussed in this paper: inertia, fairness, monopolistic price discrimination, and power. The model is tested by pooling cross-section (13 commodities) and time-series data (1973–83). Fairness and inertia together are the major explanation of the trend in relative prices at the negotiation level. In spite of their strong influence on the price-setting procedure, powerful groups are not misusing the situation to their advantage. It is not possible for a farm organization to build its image on the notion of solidarity and at the same time exploit weaker groups. Neither is it possible for farmers to exploit consumers by behaving as price discriminating monopolists and keep the credibility of their organization intact.

## Introduction

Producers of agricultural products in Sweden have been beneficiaries of support since the 1930s. However, levels of support measured as PSEs vary considerably between products. Subsidies account for 16 percent of the income of sheepmeat producers and for more than 75 percent in the case of milk producers. Variation within the EC is even larger. It is therefore legitimate to ask for an explanation of such a big difference. High levels of protection in agriculture as a whole as compared with other sectors of the economy have been analysed recently in terms of political market-place theory (Anderson and Hayami, 1986; Gardner, 1989; and Paarlberg, 1989). Models of the political market have also been applied in the field of trade theory to analyse level of tariffs in different industries, changes of level of tariffs, etc. (Lavergn, 1983; Baldwin, 1985; Finger *et al.*, 1982; and Goldstein, 1986). Inter-industrial protection within agriculture has not attracted so much analysis; Gardner (1987) is a notable exception.

Variables used in models attempting to explain differences in inter-industry protection usually include the relative international competitiveness of each industry, pressure-group influence, efforts to minimize displacement costs, international negotiations, historical factors, and miscellaneous aspects of the public interest (Lavergne, 1983). Agriculture has one unique feature, however, as compared with other industries, particularly in the European context, namely that prices are set annually (or sometimes even semiannually) by an administrative procedure (this is the case for the EC and for all Nordic countries). In order to understand inter-industry protection within agriculture, the price-setting procedure needs to be analysed. The issue is not very well researched. Fearne (1989) analysed the price-setting procedure of the EC, but only for the agricultural sector. A related line of research is the issue of endogenization of policy in agricultural sector models, in particular trade models. This modelling is, however, often done in a very simplistic way, either by price wedges or by price transmission functions, without any explicit behavioural analysis (Whaley and Wigle, 1990). This paper attempts to analyse price setting in Swedish agriculture in order to explain inter-industry protection in the sector. The purpose of the paper is further elaborated in the next section, following a description of the Swedish price-setting procedure.

## Setting of Agricultural Prices in Sweden

During the period analysed (1973–85), price setting was organized as a two-stage semi-negotiation procedure<sup>2</sup> involving producers and consumers and supervised by the National Agricultural Marketing Board. Producers are represented by the leaders of the farmers' union. The Consumer Delegation, appointed by the government and consisting of, *inter alia*,

representatives of labour unions and the agricultural processing industries, acts on behalf of the consumers. Consumer interests are not easily organized. The Consumer Delegation is, accordingly, an artificial, bureaucratic structure, having at least partial vested interests in the preservation of the system rather than being a true “fighter” for consumer interests.

In the negotiations, prices (so-called “middle prices”) of semi-processed products at the wholesale level are set. Border protection (variable levies) is adjusted accordingly.<sup>3</sup> In the first stage of the negotiations, a total compensation amount (TCA) to the whole farm sector is decided. The TCA consists of three parts: compensation for increased cost at the farm and processing levels and an income parity component. This stage of the negotiations was strongly governed by formal rules that gave more or less automatic compensation according to official indexes and statistics. There is thus not much to be analysed here as far as the level of compensation is concerned. One can, of course, ask the fundamental question of why this type of approach was chosen. This, however, takes us back to where we started, namely, to the question of why agriculture is supported, as distinct from other sectors.

The second stage of the negotiations, where the TCA is distributed among different commodities in the form of price increases is, on the other hand, not based on formal rules or official statistics. In other words, discretion rather than rules is used. According to several members of the Consumer Delegation (whom the author interviewed), farmers exert strong influence on the distribution. This is hardly surprising, taking into account the strength of the incentives to both negotiating parties involved, as pointed out above.

This type of price-setting procedure gives farmers an excellent opportunity to affect relative prices. The question to be asked here is whether the stronger farm groups have used this situation to affect the distribution and hence the relative prices to their advantage or whether other criteria were used. The purpose of this paper is to establish what factors determined the development of relative middle prices during 1973–85; i.e., to analyse the second stage of the negotiation process.

### Analytical Models of the Distribution Process

From a mathematical point of view, the second stage of the negotiations can be viewed as a problem with one equation (all the money has to be distributed) and several unknowns (changes in individual prices have to be determined). The process can be described by the following equation:

$$(1) \quad TCA = \sum \Delta P_i D_i$$

where the  $D_i$ s are the past levels of consumption, taken as fixed. Basing the distribution on the fixed levels of demand (i.e., disregarding the impact of price increases on demand) may seem strange at first sight but is not always unreasonable. If the level of agricultural prices, by and large, follows inflation, and if relative prices of different food commodities are not changing drastically, the impact on consumption can be expected to be limited, particularly if household incomes are rising as well. At the same time, the process of negotiation is facilitated by avoiding discussions of unknown and uncertain demand elasticities.

Many different sets of  $\Delta P_i$  satisfy the above equation.<sup>4</sup> In order to make the system soluble, a “closure” of some kind has to be introduced. Different closures or distribution principles are discussed below.

A very simple way of arriving at a unique price solution would be to postulate that all prices should be increased by the same proportion. This distribution would leave the relative prices of different products unchanged, preserving the *status quo*. Bias towards the *status quo* is a very strong tendency in many social processes. On the other hand, this simple proportionality rule would make the second stage of negotiation redundant. It is conceivable that both farmer and consumer representatives might have an interest in making the negotiation process more complicated and thereby more “important.”

Compensating farmers for increased cost (including an income parity component) on the sector level is based on the notion of justice or fairness. A natural way of prolonging this procedure would be to distribute the TCA in proportion to the development of costs of individual commodities. One could argue that a distribution based on relative cost development is the only one that preserves the logical consistency of the whole negotiation process from the point of view of society. If farmers are to be compensated for cost increases, the logical thing to do is to increase the prices of the products whose costs have increased. Otherwise, the outcome can be that, for instance, the price of milk is increased because production costs of pigmeat have increased (thereby contributing to the cost increase at the sector level). On the other hand, this type of distribution would totally disconnect the domestic price from market conditions on domestic and foreign markets.

Distribution of the TCA in relation to cost might be claimed to be fair from the point of view of different groups of producers. If different groups of producers are not distinguished and all farmers are treated and act as one group, the collective interest of the group would be to reach maximum revenue the following year. The distribution problem can then be formulated as the budget restriction:

$$(2) \sum_{i=1}^n \Delta P_i D_i = TCA$$

and the objective function:

$$(3) \text{Max: } \sum (\Delta P_i + P_i)(\Delta D_i + D_i)$$

Assuming that own-price elasticities are known and constant and cross-price elasticities are zero, the optimal solution of the problem is given by:

$$(4) \Delta P_i = \frac{\lambda - e_i - 1}{2} \frac{P_i}{e_i}, \quad i = 1 \dots n \quad \lambda = \frac{TB + \sum \frac{D_i P_i}{2} + \sum \frac{D_i P_i}{2e_i}}{\sum D_i \frac{P_i}{2e_i}}$$

The intuition behind the above solution is very simple. The price of least-price sensitive products should be increased and all other prices decreased. There are, however, obvious limitations to this type of behaviour insofar as the external and internal legitimacy of the process is concerned. Huge price increases on inelastic necessities could induce consumers (and politicians) to reconsider the whole idea of supporting farmers. Over-exploiting the system is dangerous for farmers since they are dependent on public sympathy. In other words, external legitimacy puts upper limits on price changes. The lower limits are set by internal considerations. If all farmers produced the same commodities in the same proportions, it would be rational for them to act as revenue-maximizing monopolists and to discriminate among commodities in relation to demand elasticities. If farmers are highly specialized, as is increasingly the case, there are obvious limitations on such behaviour. Producers of price-sensitive commodities benefit relatively less by price increases since demand is discouraged more, but they are still better off if prices are raised (since demand elasticities are, in absolute values, less than one). The level of revenue at the sector level can be of no interest to them. The winners could theoretically compensate the losers (since revenue is maximized), but it is difficult to find a compensation scheme that is workable in practice.

However, it is possible that farmers, at least to some extent, act on the illusion of a collective interest, in spite of the conflicting objectives in reality. There is some evidence of this being the case. Improving the prices of grains is often portrayed in farmer newspapers as a success story, in spite of the fact that this by no means benefits all farmers.

Since farmers strongly influence the distribution of the TCA, it is possible that more powerful groups use this situation to their advantage rather than in order to maximize the collective revenue. In such a case, price changes would be biased against products of weaker groups. However, distributing the TCA cannot evolve to a pure game of power. The weaker groups could revolt and the unity of the farm movement could be lost. If stronger groups can achieve more by preserving unity, as is probably the case, they will limit their claims or short-sighted interests so as not to endanger the future of the farm movement.

## Statistical Models to be Tested

Four different distribution principles, *status quo*, fairness, revenue maximization, and power, have been presented as mutually exclusive hypotheses. In reality, several criteria may be used at the same time, together with some additional variables. It has been argued that in the case of both revenue maximization and power-oriented distribution, behaviour is limited by social acceptability. It is reasonable to argue that limits on price changes are related to trends in relative costs of production. World market prices and domestic market conditions probably affect distribution as well, since it may be easier for the producers of relatively undersupplied commodities facing favourable world market prices to argue for price increases for their products. Furthermore, since a price change in product  $i$  is dependent on all the other price changes, as products are competing with each other, a price index is introduced as an explanatory variable ( $Pind_i$ ). As may be seen from Equation (1), the outcome of the price-setting procedure is a vector of price change in *absolute* and not percentage terms (as, for instance, is the case in the EC). However, this creates some problems as far as the pooling of data is concerned.  $\Delta P_i$  are of very different orders of magnitude, so that the intercept and some of the slope coefficients cannot be expected to be the same for all variables. This is particularly the case for power indicators and elasticities. Pooling of data is necessary since there are only 13 observations (commodities) each year. The simplest way to avoid this problem is to reformulate the equations in terms of percentage changes. This reformulation is, however, made at the expense of the explanatory power of the model. Simple analysis of the correlation between price and cost changes shows a stronger relation between absolute than between percentage changes. This is due to the nature of the cost variable (see the next section for discussion).

$$(5) \quad PMP_{it} = \alpha + b PATC_{it} + c PPW_{it} + d SSR_{it} + e Pind_{it} + f El_i + g Pow_{ind}_i + e_{it}$$

$PMP$ ,  $PATC$ , and  $PPW$  are percentage changes in prices, average total cost, and world market prices, respectively.  $SSR$  is the self-sufficiency ratio.

## Definition and Measurements of Variables

The prices analysed in the paper are the outcomes of price-setting decisions and not actual market prices. Implementation of price decisions has occasionally been postponed by the government's anti-inflationary measures. In the mid-1970s, price increases were partly replaced by food subsidies, which were later removed. Due to these factors, there is a discrepancy between the two price series. However, the discrepancies are due to factors outside the negotiation system and can be disregarded, as we are studying the process of price setting and not the development of market prices. Prices were changed twice a year, on 1 January and 1 July. Due to the lack of semi-annual data on cost variables, we analyse annual changes. The lag structure is accounted for by aggregating a price change in July of year  $t$  with a price change in January of year  $t + 1$ . These two changes are related to changes in the explanatory variables in year  $t$ .

Production costs are composed of two parts: average total costs at farm level ( $ATC_F$ ) and average processing costs ( $ATC_P$ ).  $ATC_F$  was calculated using the standard method of gross margin calculations commonly used in Swedish agriculture, in both the research and extension services. Existing estimates were revised to ensure consistency over time and across commodities. Calculations are based on the "Central Plains" region, which is considered to be representative of average conditions in Sweden. Gross margin calculations are to a great extent based on assumptions about input/yield levels, thereby becoming normative cost indicators rather than positive figures. The fact that the cost figures are partly normative does not necessarily pose a problem. The hypothesis of fairness does not say that the TCA is distributed in relation to the trend in real cost but only in relation to that trend as it is perceived by the negotiators. If farmers base the distribution proposal on cost figures, they use the same type of gross margin calculations, since information on the trend in true cost at the commodity level is not available. Gross margin figures are, however, probably treated as indicators and not as precise figures, which makes calculation of percentage changes questionable.

$ATC_P$  was estimated using the same background data as used in the negotiations. The cost of processing crop products was disregarded due to the lack of complete time series.

Strength or power of a group cannot be measured directly. Indicators of power used in the literature are strongly influenced by Olson (1965), who claims that it is difficult to organize a group for the purpose of achieving a common benefit. Any effort by a potential organizer has to be weighed against potential gains that will accrue to all, even to nonparticipants. Accordingly, many indicators relate to, on the one hand, the cost of a collective action (i.e., number of producers, geographical dispersion, rate of growth of production, etc.) and, on the other hand, to the benefits from it (i.e., average size of production, etc.). It follows from the theory that it is easy to organize small homogeneous groups facing a large potential benefit. A possible criticism is that Olson's theory describes a process of forming an organization or rather explains why certain groups (like consumers or taxpayers) never managed to organize themselves, while the issue is often one of measuring the strength of an existing organization with established channels of communication. Furthermore, it can be easily shown that the relationship between size and strength is not that simple. Small milk producers in northern Sweden (Norrland) appear to be a very powerful group, while the few large producers of eggs (80 percent of eggs are produced by less than 200 producers) are not. Regional support to milk producers has been considerably increased recently, while newly introduced environmental restrictions on egg production ("hens' liberation") resulted in income loss for producers without any compensation being paid. The explanation is purely ideological. While small farmers in Norrland are extremely popular with politicians of all persuasions, large-scale egg producers are not considered to be "true farmers."

Several different indicators of power were used: number of producers, average size of production, share of the commodity in total farm income at the price-negotiation level, number of full-time producers, and share of the commodity produced by large farmers. As a measure of domestic market conditions, the self-sufficiency ratio was used:

$$(6) \frac{S_{it} - D_{it}}{S_{it}} - 1$$

World market conditions were described by border prices. To test the hypothesis that farmers behave as one group in putting price increases on inelastic products, a set of demand elasticities is needed. Unfortunately, existing estimates do not cover all commodities included. For the missing elasticities, some assumptions were made. Power indicators and elasticities vary between commodities but are constant over time, thereby resembling dummy variables. Price changes in remaining products were represented by a price index:

$$(7) \frac{\sum \Delta P_j D_j}{\sum P_j D_j}, i \neq j$$

## Estimation Results

The model was estimated by pooling time-series and cross-section data. The intercept and slope coefficients for production costs, prices of other commodities, domestic market conditions, power index, and elasticities were assumed to be the same for all products. For world market prices, this assumption is not valid due to policy differences. A 1977 agricultural policy decision decreed that all arable land should be preserved and emerging surpluses should be exported in the form of grains. For remaining products, self-sufficiency was the stated objective. A dummy variable was used to account for this difference. The results are given below, with  $t$  values in parentheses.

$$(8) \quad PMP_t = -0.023 + 0.081 PATC_t + 0.157 PMP_{t-1} + 0.096 PPW_t - 0.018 SSR_t +$$

(-2.21)	(2.19)	(2.99)	(4.90)	(-1.75)
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$$0.90 Pind_t + Pow ind (3)_t$$

(8.66)	(2.76)
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$$R^2 = 0.59 \quad F(7, 122) = 25.3 \quad DW = 2.12$$

The above equation covers grains (wheat, rye, barley, and oats). All coefficients have the expected signs. All are significant at the 5-percent level, with the exception of the coefficient for  $SSR$ , which is significant at the 10-percent level. The vector of demand elasticities was omitted as the coefficient proved insignificant (the sign of the coefficient was, however, correct). The power indicator used above is average size of production. Similar results were produced by using the logarithm of the share of the commodity in total farm income. Other indicators performed less well; in particular, the share of the commodity produced by the largest farmers. In the latter case, the sign is negative but not significant, indicating that a high degree of concentration in production has, if any, a negative impact on price changes. In the case of non-grains (oilseeds, potatoes, milk, beef, veal, sheepmeat, pigmeat, poultry, and eggs), the coefficient for  $PPW$  is significantly negative. Since this can hardly be the causal explanation for the phenomenon in question, one may draw the conclusion that world market prices are not taken into consideration for these commodities. Lagged price change was introduced to avoid the problem of serial correlation of residuals.

$Pind$  is highly significant, explaining most of the variance. This is partly due to the fact that the cost variable, because of its normative character, may not really reflect cost changes at the sector level. It can be argued, however, that the high degree of correlation also reflects inertia of the system; i.e., a tendency for different prices to develop in a similar fashion.

## Summary and Conclusions

Returning to our previously formulated hypotheses, it seems that inertia and fairness are together the major explanation of trends in relative prices at the negotiation level. In spite of their strong influence on the price-setting procedure, powerful groups are not misusing the situation. Some of the power variables are significant but contribute only marginally to the explanation of total variance. It is obviously not possible for a farm organization to build its image on the notion of solidarity and to exploit weaker groups at the same time. Neither is it possible for it to exploit consumers by behaving as a price-discriminating monopolist and still keep the credibility of the organization intact.

Domestic market conditions have some influence on negotiated prices. World market prices affect domestic grain prices. A great deal of variance in the sample still remains unexplained. This may be due to the fact that some important variables may still be missing or to an error of measurement in variables used. The most likely reason is that we are dealing with a unique social process. By pooling the data, we are searching for consistent rules of

behaviour over time and across commodities. Lack of continuity and consistency in behaviour may, however, be present as different persons have been participating at different times.<sup>5</sup> During the 1980s, prices of beef, veal, and sheepmeat increased by exactly the same amount on several occasions, suggesting the use of some rules of thumb. It is also conceivable that different rules were used for different commodities. It is more important to find the right price for beef than for veal and sheepmeat, which are minor commodities.

## Notes

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<sup>2</sup>Since the final decision is taken by Parliament and not by the negotiating parties themselves, the negotiations should rather be seen as deliberations.

<sup>3</sup>Any surpluses of livestock products are exported with the aid of producer-financed subsidies, thereby lowering producer prices. Surpluses of crop products are financed by government.

<sup>4</sup>The number of solutions is not endless, since very small price changes (less than Skr0.01) are not practicable.

<sup>5</sup>Three different leaders of farm organizations, with a very different style of leadership, were participating on behalf of farmers during the period analysed in this paper.

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## Discussion Opening—*David Kelch* (US Department of Agriculture)

Farm groups in most developed temperate zone countries have become more politically astute over the past 10–12 years in dealing with the political consequences of surplus production. Consequently, it is not surprising that the author dismisses two of the hypotheses to explain the distribution of revenues to farmers across commodities in the annual price-setting negotiations in Sweden. These two hypotheses are based on the social unacceptability, or should we say political unacceptability, of (1) monopolistic price discrimination, which damages the farmer's image in the public's eye, or (2) the use of power through numbers of growers or percentage of production against a minority of farmers, which destroys farmer unity. Having already answered the question politically, given the political constraints in Sweden on farmer actions within the price-setting process, the author goes on to develop a model that results in the same conclusion; i.e., the price-setting process among farmers is based on fairness and inertia and not on monopolistic price discrimination or power.

The model developed to examine the relationships seems adequately specified with the appropriate variables and caveats about data limitations, although the author ignores the possible presence of heteroscedasticity in the pooled data variance and does not incorporate a technology variable. Notwithstanding the theoretical and statistical considerations incorporated into the model by the author, one word stands out in the paper that is more likely than any econometric model to explain total farm revenue, the origin of that revenue, and its distribution among farmers. The word is perception. The author points out that the distribution to farmers of the total compensation amount through prices is not determined by real cost trends in the various commodities, but rather by the cost trends as perceived by the negotiators. The author also points out that small dairy farmers receive greater support compared to factory egg producers who are not "considered" (i.e., perceived) to be "true farmers."

The words perception and justice seem crucial to understanding the price-setting process, yet the conclusions do not address them. Are we to conclude that the restraint of power in slicing the agricultural pie among farmers is "just" when it is based on perceptions among farmers? Are we to conclude that democratic societies determine farm support by the perception that one is a "true farmer"?

This reviewer is led to believe that Swedish farm groups could use some agricultural economists to provide measures of costs of production to farmers and the budgetary consequences to consumers and taxpayers of supporting inefficient producers while penalizing efficient producers. Both the size of the pie and how it is sliced might then change.

*[Other discussion of this paper and the author's reply appear on page 69.]*