Agricultural prices in Bulgaria: Did transition create structural breaks?

Karadeloglou P.

in

Mergos G. (ed.).
Agricultural price reform under transition in Bulgaria, Romania, and Slovenia

Chania : CIHEAM
Options Méditerranéennes : Série B. Etudes et Recherches; n. 22

1998
pages 167-184

AGRICULTURAL PRICES IN BULGARIA: DID TRANSITION CREATE STRUCTURAL BREAKS?

Pavlos KARADELOGLOU

ABSTRACT

The objective of this paper is to examine the divergence of actual prices from clearing demand-supply prices. The results indicate a shift of the operation of the agricultural price system towards a market determination of prices. The econometric estimation results for Bulgaria show that for many products the impact of total cost (cost-plus pricing) on price formation is declining during the transition period; on the other hand the impact of excess demand (market pricing) is increasing for all the products that were considered in the study. The results of the model indicate the existence of an important structural break at the beginning of the transition in the determination of agricultural prices in Bulgaria. This structural break, which is observed in the early years of transition, confirms that a transformation of the price mechanism is actually taking place in Bulgaria, leading the agricultural sector towards a liberalised mechanism of price determination.

Keywords:

BULGARIA, AGRICULTURAL PRICE POLICY, TRANSITION ECONOMIES

1. Introduction

Fixed prices, set below market-clearing levels by central authorities, are the cornerstone of socialism, while decentralised price formation is the fundamental trait of a market economy. In a traditional, centrally- planned economy the prices of most products and factors were fixed by the government for a relatively long period of time. Such fixed prices fail to reflect either the correct value of goods or the equilibrium of supply and demand. They are distorted and lead to distorted incentives and the misallocation of scarce resources.

The main characteristic of the goods and services market in the former CPEs was the implementation of price controls due to shortages. Price control creates "black markets", and in addition to ordinary "speculative" buying and selling activities, people engage in barter and travel to find a better supply. Moreover shortages create queues and consumer search spontaneously emerges to perform the allocation function. The solution to this problem is total price decontrol, i.e. the bringing of consumer prices to their market-clearing levels; this will make queues disappear and thus benefit the average consumer.

Although this method of total price decontrol was not adopted, adjustments of administered prices and/or partial price liberalisation have been applied in the reforming socialist economies. Price reforms have been undertaken for several purposes, e.g. to alleviate shortages associated with queues, to correct relative price imbalances that lead to a less efficient allocation of resources, and to eliminate or reduce commodity subsidies. Price adjustment has been implemented in different ways. In some cases prices have simply been liberalised and allowed to adjust to market clearing levels. In other cases the authorities have adjusted administered prices while maintaining some degree of control or restriction over them.

The choice of pricing policies is quite important for the pace of reform in the former planned economies during the transition period. Price decontrol is the key step in the transition to market. It is widely recognised that reform of the price system is the key to the success or failure of reform of the entire economic system. By the reform of the price system we mean precisely the lifting, in a planned and deliberate way, of price controls, with a view to the gradual formation of a price system that would, with flexibility, reflect the balance in the supply-demand relationship in the market, so that in the end the price mechanism can play its full role.

In fact, the lifting of price controls has been advocated as a means to eliminate distortions and provide a re-adjustment of relative prices, create production incentives and encourage domestic output, eliminate rationing, and absorb "excess" real money balances. Price liberalisation may have the following effects: (i) market-clearing prices can give the right incentives to those firms that were profit maximizers before the reform, (ii) the performance of a firm is generally thought to be more efficient under flexible prices than under fixed prices, unless the firm enjoys substantial monopolistic power and (iii) equilibrium prices, even if they deviate from marginal costs, will still reflect consumer values and so will provide better indication than fixed prices of subsequent fundamental prices in the economy.

Since 1989, the agro-food sector in all Central and East European countries has moved towards a more market-orientated organization of production, consumption and trade. The initial liberalisation of price and trade regimes and abolition of subsidies had dramatic impact on consumer purchasing power and agricultural incomes, inducing increased government intervention. Moreover, the reduction of agricultural trade with the Soviet Union created surpluses and depressed domestic food and agricultural prices following the loss of export markets. More precisely, we can distinguish three phases of developments in agricultural policy in the CEECs since 1989 (see also Kybczynski, 1991). Firstly, consumer prices increased significantly due to the abolition of subsidies and the liberalization of price and trade regimes; there has been a significant shift in the relative prices of agricultural products in comparison to the general price level. During the transition all subsidies from food products depressed demand for agricultural raw materials. As a result, real income has dropped sharply and there has been a fall in the household demand for food. Secondly, the uncertainty induced by general economic reform pushed some governments to introduce new policy measures to protect production and/or consumption. Thirdly, some CEECs are gradually introducing policy packages that are similar to the Common Agricultural Policy (CAP) of the EU, having as a final objective their accession to the EU.

Significant increases in input prices have occurred during recent years. The rise in the prices of agricultural inputs was the result of efforts to adjust to both world prices and increased import prices, which were brought about by exchange rate adjustments. Moreover the continuing monopolization and inefficiency in the supply of inputs have also pushed the prices paid by producers to a higher level than that which they would have reached given more competitive conditions.

Price liberalisation in Bulgaria began along with the change in regime. All prices, including those for agricultural inputs, farm-gate prices of agricultural products, and wholesale and retail prices of foodstuffs were entirely liberalised[1]. A sharp increase in prices, even those of staple foodstuffs, forced the Government to make some exceptions to this general strategy of price liberalisation. The Government tried to control the prices of some basic food products by a "projected-price" system. Projected prices were based on minimum purchasing prices, calculated within normative cost and profit margins (mark-up on cost). The profit margins were different for producers, processors and traders and could not be exceeded. These projected prices continued to exist until 1993 when they were replaced by ceiling prices calculated on the basis of actual costs and fixed profit margins.

[1] This section is largely based on information given in Mishev et al. (1996). See also OECD (1995). The only exception concerns the price of energy products.

Moreover, the Government also introduced a minimum guaranteed price for some basic agricultural commodities which was set below the market price level. This minimum guaranteed price system was introduced and subsequently abolished several times.

In actual fact, the question in the case of the former CPEs is not whether price decontrol, which is by definition the key step in the transition to the market, should be introduced. It centres rather on how prices should be decontrolled - slowly or in a "big bang"? It is well-known that in those economies industries were in most cases extremely concentrated, and vertically integrated. Rapid price decontrol would imply that these firms could enjoy a considerable degree of monopolistic power. This raises the difficult question of whether, in the short run, monopoly prices are worse than fixed prices and poses further questions concerning the speed of liberalisation and other related matters, such as:

i) At what stage of the reform process should price liberalisation be introduced?

ii) Should decontrol of some particular prices be postponed substantially?

iii) How will agricultural price deregulation affect the general level of prices?

iv) How will price reform affect resource allocation and social welfare?

What should the final prices be? In other words, how can price reform be carried out correctly and what is the appropriate method for evaluating price distortion?[2]

Much research work has already been carried out concerning price reform in the CEECs, e.g. by Agenor (1993), Braverman and Guasch (1990), Dinopoulos and Lane (1992), and Kybczynski (1991). However, little empirical data on the transition process has been evidenced. The purpose of this paper is to investigate the effects of structural change on the process of price determination of agricultural products in Bulgaria. Specifications for the determination of the prices of final agricultural products and those used for intermediate consumption will constitute the main subject of the research. The modelling work undertaken in this paper is aimed at a description of how the transformation is being effected during the transition process, and how the general level of prices is affected. It is necessary to have a model in order to simulate the mixed planned/market system, and to discuss the effects of price policy as the planned part of the economy is reduced. After having established a formalised model for the determination of prices as they were in the past, we will seek the most appropriate way to determine actual prices. In addition, the suitability of a model describing the equilibrium approach to price determination will be evaluated.

It seems that, during transition, the effort of the authorities has been to introduce some structural change, and shift from an administered method of price determination based on information concerning cost to a liberalised one with market clearing prices. If this fundamental structural change has occurred, the traditional tools of economic analysis and econometric model-building rest to a large extent on the precept that the structure of the economy is stable, and thus on the notion that the future will be similar to the past. This assumption is almost certainly inappropriate in the case of the Eastern European economies, both at the present time and for some time to come. Therefore the solution is to use a certain methodology which can take into account structural modifications and breaks and be able to quantify them. We opted for a model where the old and new method of price determination is represented, and decided on the use of Kalman filter methodology in the estimation of the model.

The paper is divided into five sections. In section two the price corresponding to different market organisation structures is formalised; section three contains a brief description of the actual situation in the agricultural sector in Bulgaria with an illustration of the model to be estimated, while in section four the results of the estimation are discussed..

---

[2] See also Boycko (1991)

2. Market Organisation and Prices

Agricultural and food pricing policy in the CPEs was characterised by centralised price determination. Producer and consumer prices were set without reference to international prices. Producer prices of individual commodities were generally established without reference to each other, since producers responded to centrally-determined production targets and not to market signals. Furthermore, consumer prices did not necessarily cover producer prices plus processing and marketing costs. The result was that the maintenance of the price structure involved a costly system of implicit and explicit subsidies.

The issue of price relationships in the agricultural sector of economies in transition is one of considerable interest. Price developments in these countries have been characterized by the evolution of the price/cost ratio. In fact, price increases did not follow the evolution of cost, the components of which were highly subsidized. On the other hand the abolition of consumer subsidies, lower disposable income and the disruption of export markets put severe downward pressure on food and product prices, which in general did not increase as fast as the general level of prices. Moreover, in the early stages of transition, governments tended to liberalize input prices but continue control of basic food prices.

The establishment of market-orientated agriculture will require the completion of the process of price reform. There should be an allowance for the adjustment of the prices received by producers through: (i) the elimination of price controls, (ii) the removal of the remaining delivery obligations and restrictions on domestic trade, (iii) the elimination of cost-based pricing mechanisms, including the system of fixed profit margins for processing and trade, together with (iv) the creation of competition both in input supply and fixed profit margins for marketing.

Economic theory does not yet offer a complete theoretical framework with which to describe the transition dynamics. The only basis for the study of the impact of price reform is the Arrow-Debreu paradigm which allows analysis of small changes in a market economy. However, this paradigm assumes the existence of well-defined property rights, financial and market institutions, and analysis is limited by their absence.

Microeconomic theory teaches that in the absence of externalities and policy distortions, a competitive equilibrium is efficient. Although "equilibrium" is only a conceptual phenomenon, it can help to understand how economic variables tend to behave under certain conditions. The equilibrium price is used as the reference to evaluate the degree of price distortion. In the transition process major attention has been paid to the liberalisation of the economy from excessive government regulation.

In both transition and developed market economies the prices of individual commodities can be divided into three broad groups: (i) those fixed impersonally on an auction-market basis, (ii) those fixed as a result of some administrative decision and (iii) those which are not administered but fixed by firms according to their average cost and with no apparent relation to market conditions.

The prices which fall into the first group are those which emerge, typically, through a process of offer and counter-offer. By contrast the prices in the second group are simply announced; in the case of the third group firms fix their prices with reference to a profit rate applied on average cost.

The competitive market theory of pricing is the basis for the hypothesis advanced concerning the relationships between price change and excess demand. Excess demand, which is defined as the difference between the demand and supply of a product, has an expected positive effect on price. It is a proxy for the elasticities that exist in both demand and supply markets. Competitive market theory bases price behaviour on the difference between demand and supply. Only in cases of infinitely fast price adjustment will equilibrium always be attained between supply and demand. In most cases a gap between demand and supply exists as given in the following price adjustment

equation, which, in combination with a demand and supply function, forms a model of competitive theory. The price hypothesis based on excess demand is as follows:

$\Delta P = \lambda\ (D-S) = \lambda\ (ED)$

where λ= adjustment coefficient and Δ=change in a variable. This function was originally developed in the *tβtonnement* hypothesis of Walras. Most studies utilise measures of excess demand which indicate the relative movements in the supply-demand situation, instead of measuring *D* and *S*..

In the second group, prices fixed by firms in accordance with the average cost are included. Such prices are frequently described as "mark-up" prices because the process by which the seller fixes the price of a unit of output is to "mark-up" the cost of a unit of output (unit cost), i.e. he adds some fraction of the figure to the unit cost; the sum added is designated as the profit margin. In a mark-up model, the price is determined in the following manner:

$$Price = unit\ cost + (x * unit\ cost) = (1 + x) * unit\ cost$$

The term *(x * unit cost)* is the profit margin: clearly it is equal to price *minus* the unit cost. The fraction *x* is referred to as the *relative* profit margin, because it represents the profit margin expressed as a proportion of unit cost.

Each method of price determination corresponds to a certain market organisation. The sets of equations in Table 1 illustrate the alternative mechanisms for representing market types. If *D, S*, and *p* denote demand, supply and prices respectively, it is clear that the first column corresponds to a price-adjusted competitive market, since the market clearing price is determined from the demand supply equality. The second column indicates an imperfectly competitive market where market supply is rationed by demand, and this affects prices through the rate of utilisation U. In this latter case excess supply is assumed. In fact, this market organisation corresponds to a situation for which a downward stickiness of prices results in excess capacity in terms of installed capital. This situation is modelled through a mark-up pricing rule and production levels which adapt exactly to demand. Finally the central way of price and production determination is represented in the third column. In this last case, equilibrium is obtained at the minimum of supply and demand.

Table 1 - Market organisation and the corresponding price

	Price Adjustment	*Quantity Adjustment*	*Administered Prices*
Demand	*D = f(p)*	*D = f(p)*	*D = f(p)*
Supply	*S = g(p)*	*S' = g(p)*	*S=S*
Equilibrium	*D = S*	*D = S*	*min (D,S)*
Price	*D = S*	*p = h(unit cost, U)* *U = S'/S*	*p=p*

3. The Situation in Bulgaria and the Proposed Model

3.1. The situation of agricultural prices in Bulgaria

The share of agriculture in total GDP was about 9.0% in 1994, a slight drop from 9.2% in 1993. It is clear that the contribution of agriculture to GDP has decreased substantially since reform began.

The liberalisation which began in 1990 was accomplished in February 1991. The measures implemented by the government to decentralise the economy led to price formation under market equilibrium based on supply and demand. In order to reduce the negative consequences of the transition period for the economy and for consumers, the government continued its intervention in the price formation for certain goods, namely fuel, electricity, coal, transport and communication services. Moreover the government kept the retail prices of some major goods under control. During the 1990-1995 period the list of the commodities subject to monitoring and the rules for control were

changed. While in 1992 and 1993 the retail price control covered 11 commodities including bread, meat, milk, and milk products, in 1995 the list of monitored commodities was expanded to 33 items, including food and some non-food products.

Up to March 1993 the control on consumer prices was carried out through a system of so-called projected prices. They were based on the normative determined expenditures plus normative margins. Processors and traders were obliged to pay minimum prices which were consistent with the estimated production cost. These minimum prices, added to their normative costs and profitability margins, gave the projected retail prices.

The system changed in March 1993. The Council of the Ministers approved new rules for controlling the prices of basic foodstuffs through ceiling prices. The Government only determined the profit margins through the food chain and made an attempt to control them. Profit margins for producers and processors were fixed at 12% of the costs and at 10% for traders. The ceiling prices were calculated as actual cost plus the normative determined profit margin. Price changes due to cost modifications were to be announced to the consumers three days before they came into force.

During the transition period minimum prices to farmers were introduced. They were valid for certain periods and repeatedly abolished. In 1992, for example, the minimum prices covered wheat, milk and all kinds of meat and meat products and were valid only from April to the end of the same year.

During the transition period, the above increases in retail prices together with the decrease in real income reduced demand for agricultural products. In addition to the liberalisation process which took place during the transition period, another factor that had a bearing on the important price increase is the monopolistic power of the agricultural processing industries. In fact, the market structure affords the latter the possibility to exercise market power in both directions, by buying agricultural products and selling processed products.

3.2. Specification of the proposed model

In the centrally planned economies under transition to market an attempt is being made to move gradually from accounting prices to equilibrium prices. This is the main aspect of the transition process. However during the transition period the price formation mechanism is partly liberalised and thus different price systems may occur. The most likely situation is that in which a group of prices are set either according to the situation prevailing in the market or fixed by the firms, while some others are still fixed by the government (or State-owned enterprises). As a result two or three prices can co-exist for the same product and any of them can be quite different from the market clearing equilibrium price. The difference of each price from its equilibrium level can be used to measure the distortions that prevail in the economy (see also Xu, 1988, 1993). In the former centrally-planned economies the price reform may take quite a period of time; the liberalisation of prices can be slow and it may begin with certain sectors and/or products and finally affect the whole economy. As a result different pricing methods can co-exist for different products. Prices of certain products may follow a "cost orientated" pricing approach, whereas others may be administered prices. If a model of the transition in which there are possible structural breaks is required, all these methods of price formation must be introduced.

The Planned Price

The planned price corresponds to the price fixed by the State or State-owned enterprises. It is fixed exogenously and corresponds to that in the pre-liberalisation period.

$$Pa = \overline{Pa}$$

The Cost-Based Price

For the evaluation of the price resulting from the quantity adjustment process, one has to take into account the cost of labour, the cost of input and the profit rate. This method of price determination follows the model based on the mark-up hypothesis and was formalised by Eckstein (1964). According to the mark-up hypothesis the unit cost is increased by one rate in order to cover the indirect costs and another rate is added which represents profit. Eckstein was the first to propose a formalised equation to represent the mark-up hypothesis as follows:

$$p = \pi K/Q + wL/Q + mM/X$$

where π= profit rate, K= capital stock, w= wage rate, L = standard employment, m= raw material price, M= the quantity of raw materials and Q= production. A variant of this approach can be represented by the following equation:

$$p = (1+\delta)\frac{wL/Q + mM}{Q}$$

where δ is the mark-up coefficient. This model casts doubt upon the usefulness of profit maximisation based on the marginal cost, and marginal revenue equality. Price fluctuations are linked to normalise unit cost changes based on market structures and the firms' economic situation with no reference to the profit maximisation process. While this reasoning would implicitly imply a total absence of the influence of demand on price, it is generally admitted that when excess demand is very high a faster price increase is expected. It is thus normal to add a demand proxy in a mark-up model, implying that firms are obliged to vary their profit rate according to demand fluctuations. This is very important because theoretically, when prices are said to be independent of demand, what is meant is that firms are not affected by certain macroeconomic aggregates.

The Market Clearing Price

The market clearing price structure is based on supply and demand equilibrium and requires that: i) all parties participating in the market exhibit an economically rational behaviour (utility and profit maximisation), and ii) there should be no monopolistic element in the market.

The specification is based on the following assumption:

$$P_e = f(D - S)$$

where D,S are respectively the demand and supply of the product.

Synthesis of the three models.

When the different types of price are defined the overall aggregate price of the product or group of products could be specified as follows:

$$P = Pa^{A} Pm^{B} Pe^{C}$$

$$A,B,C \geq 0$$

$$A + B + C = 1$$

where Pa, Pm, Pe are the administered, market, and equilibrium prices respectively. A, B and C are the weight of each type of price in the final, total aggregate price. The values of A, B and C also indicate the degree of the transition of the economy from a centrally-planned to a market orientated one. A, B and C are coefficients measuring the speed of economic transformation. This way of representing the transition from a centrally-planned to a market economy makes it possible to evaluate the impact on P of the application of economic reforms as well as the importance of the

impact of the speed of adjustment. The situation in the past can be represented if we set A=1, B=0 and C=0. The transition is represented by the gradual convergence of A to 0 and C to 1. The next step is to estimate the coefficients A, B, C and trace the path of the transition.

4. Estimation Results

The timing and nature of reform varies from country to country, moreover the post-reform period has been characterised by structural instability as the reform process continues with the transition to private ownership of land. There are insufficient points in time series data to obtain meaningful price variations. Economic modelling should include the pre- and post-reform period, leading to a specification of a time varying parameter model[3]. The estimation method used is based on Kalman filter methodology which is useful in estimating variable parameter models, unobservable components, standard ARMA and least squares problems[4]. The advantage of this method is that it allows for the variation of the estimated coefficients through time and produces an estimation of the entire set of k coefficients for each of the last T-k periods covered by the sample. By applying such a methodology the structural breaks which have occurred in the behavioural relationship can be estimated, observed, and calculated. This characteristic of the methodology allows the distinction of the differences in the responsiveness of price formation to cost evolution and excess demand. In the case of agricultural prices in Bulgaria, the question of the structural change to be examined concerns the change in the method of price determination from a cost-based approach to a market equilibrium one[5].

The functional form for each product is either a linear function of the price on the total cost and the demand-supply equilibrium, or a Cobb-Douglas function which, by using logarithms for the linearisation of the equations, helps to reduce variability in the data and yields a straight interpretation of the coefficient estimates as elasticities. The estimation is made for 9 products, namely barley, cattle meat, goat meat, cow milk, pig meat, poultry meat, sunflower seeds, oriental tobacco and wheat. All data used for the estimation were supplied by the Bulgarian Authorities (Ministry of Agriculture). For the large majority of the series, the period covered runs from 1971 to 1995, except for barley, cow milk and goat milk for which the available data end in 1993. For each product, three different demand pressure indicators were used in the equations: (i) the excess demand resulting from demand-supply difference, (ii) the demand-supply ratio and (iii) the excess demand as measured by the difference between observed demand and its trend over time.

Detailed estimation results for each product are provided in the Appendix, while the results of the retained variables are presented in Table 2. For all products, total cost and demand pressure seem to play an important role in the determination of production price. All cost and excess demand parameters are significantly different from zero in the retained equations. For the logarithmic equations the total cost parameters lie between 0.71 and 1.22, the lowest being for goat meat and the highest for wheat. For the equations estimated in levels the parameters cover a wider range since the lowest, corresponding to oriental tobacco, is 0.43 and the highest equals 2.12 and concerns the estimated coefficient for cow milk. Excess demand is also significantly different from zero for the determination of all prices considered in the paper. However, excess demand is represented differently in the equations, as all three types of proxies tested in the specifications are retained in the final equations. In fact for oriental tobacco, cattle meat and goat meat the proxy

[3] See also Hall (1993) and Hallam (1995).

[4] For a description of the methodology, see Harvey (1987), Cuthbertson (1992).

[5] It should however be noted that, according to Charemza (1993), estimation of a time varying parameter model via an updating procedure such as the Kalman filter is appropriate only under the assumption that the variables are co-integrated. In the period of transition there may be no co-integrating relationship and the error term will be non-stationary for this period. In this model the long-run mechanism is of limited memory and with the absorption of new information, the old may be forgotten as belonging to the old regime.

retained is the demand-supply difference in absolute terms; the higher impact of the excess demand is observed for goat meat (0.14) while for oriental tobacco and cattle meat the estimated coefficient is around 0.09. For barley, cows' milk and wheat the ratio of demand to supply was considered; of these products cows' milk appears to be more influenced by excess demand. Finally for pig meat, poultry meat and sunflower seeds the excess demand over the trend seems to fit the data better[6]. The results of the equations estimated are presented in Table 2.

Table 2 - Results of the equations estimated

	Barley	Cattle Meat	Goat Meat	Cow Milk	Pig Meat	Poultry Meat	Sunflower Seed	Oriental Tobacco	Wheat
Constant	-2122.7 (-4.171)	1.070 (2.143)	0.879 (1.755)	- 4516.14 (-1.924)	268.5 (0.486)	0.405 (2.286)	1.618 (14.96)	8408.94 (5.109)	-0.509 (-1.785)
Cost	1.802 (38.53)			2.127 (27.61)	1.198 (24.13)			0.434 (31.15)	
Demand - Supply								0.089 (3.454)	
Demand / Supply	2117.5 (4.155)			4448.32 (1.750)					
Demand - Trend					0.012 (1.060)				
Log (Cost)		0.739 (21.72)	0.713 (24.72)			0.962 (42.42)	0.806 (43.99)		1.221 (24.64)
Log (Demand - Supply)		0.095 (2.302)	0.141 (3.854)						
Log (Demand / Supply)									1.012 (1.330)
Log (Demand - Trend)						0.406 (3.369)	0.140 (1.224)		
SSR	67717.5	0.928	0.226	815781	0.10+09	0.271	0.345	0.43+08	0.950
Variance of residuals	3385.87	0.044	0.012	40789.1	0.49+07	0.013	0.016	0.19+07	0.043
Mean of dependent variable	582.08	8.08	8.09	1727.45	7924.6	7.85	6.25	12081.53	5.47

The purpose of estimating the equations with the Kalman filter methodology is to investigate if any structural changes in the behaviour of price formation have occurred during the transition period. In fact in the table and the graphs shown in the Appendix, the evolution of time varying parameters of total cost as well as of excess demand is presented. The time trend of the evolution of the parameter is also included in the graphs.

Looking at the table with the values of the parameters for cost Table 3) we can observe a mixed behaviour of the parameter through time, depending on the agricultural product. The overall trend for sunflower seeds and wheat is positive, indicating that since 1971 the impact of total cost in the determination of the production price of these agricultural products is increasing. For oriental tobacco, cow' milk, cattle meat and goat meat the trend has a negative slope. The impact of total cost in the determination of price is decreasing constantly through time. For barley, pig meat and poultry meat the time evolution of the estimated coefficients is clear. The time path exhibits upward or downward fluctuations; if however only the transition period is considered, the impact is slowing.

Whereas the time trend for total cost coefficients is not always clear, this is not the case when the excess demand coefficients are considered (Table 4). For all the agricultural products considered one can observe that the impact of estimated coefficient of demand is increasing over time. For six products the estimated coefficients were negative at the beginning of the estimation period and become positive at the end of the sample period. It is remarkable that for barley, wheat, sunflower

[6] The choice of the final form of the proxy used is not based on any theoretical consideration but the criteria used are rather practical

seeds, oriental tobacco and cow milk the most important modification takes place after 1990, i.e. after the major change occurred in Bulgaria with the beginning of the transition period (see Appendix 1)..

Table 3 - Time path of the estimated parameters for cost

Year	Barley	Cow Milk	Pig Meat	Oriental Tobacco	Cattle Meat	Goat Meat	Poultry Meat	Sunflower Seed	Wheat
			levels				logs		
1971	-5.765	2.008	-	0.867	-	-	-	-0.317	-0.029
1972	-5.765	2.008	1.200	0.867	1.113	1.027	0.953	-0.317	-0.029
1973	-5.765	2.008	1.200	0.867	1.113	1.027	0.953	-0.317	-0.029
1974	-1.520	1.506	1.200	0.972	1.113	1.027	0.953	-0.249	-0.028
1975	-0.539	2.218	1.441	1.076	1.121	1.210	0.857	-0.297	-0.019
1976	0.056	1.962	1.427	0.769	1.106	1.212	0.880	0.051	-0.131
1977	0.075	1.675	1.437	0.588	1.130	1.213	0.892	0.021	-0.029
1978	0.450	1.386	-6.107	0.9358	-0.028	0.807	0.567	0.049	-0.052
1979	0.687	1.563	-4.785	0.961	0.009	0.778	0.560	0.059	-0.066
1980	1.726	1.436	-1.670	0.663	0.307	0.330	0.475	0.480	0.191
1981	2.261	1.534	-0.822	0.919	0.654	0.679	0.499	0.497	0.282
1982	2.124	1.588	-0.346	0.982	0.695	0.707	0.663	0.476	0.175
1983	1.889	1.633	-0.034	1.001	0.697	0.722	0.881	0.473	0.153
1984	1.687	1.663	0.242	1.005	0.681	0.727	1.054	0.455	0.223
1985	1.530	1.695	0.538	1.003	0.653	0.741	1.206	0.451	0.177
1986	1.531	1.664	0.588	0.994	0.649	0.770	1.229	0.449	0.193
1987	1.504	1.608	0.687	0.957	0.624	0.800	1.159	0.438	0.219
1988	1.527	1.483	0.953	0.944	0.480	0.813	1.047	0.436	0.281
1989	1.550	1.340	1.121	0.945	0.450	0.776	0.964	0.553	0.323
1990	1.806	0.670	1.213	0.746	0.338	0.579	0.754	0.681	0.822
1991	2.271	2.034	1.145	0.519	0.465	0.654	0.930	0.859	1.261
1992	2.015	1.866	1.129	0.583	0.536	0.661	0.955	0.821	1.273
1993	1.802	2.127	1.154	0.577	0.597	0.713	0.964	0.822	1.306
1994	-	-	1.005	0.430	0.667	-	0.960	0.810	1.234
1995	-	-	1.19772	0.434	0.739	-	0.962	0.806	1.221

Table 4 - Time path of the estimated parameters for excess demand

Year	Oriental Tobacco	Barley	Cow Milk	Cattle Meat	Goat Meat	Wheat	Pig Meat	Poultry Meat	Sunfl. Seed
	Demand-Supply	Demand/Supply		Log(Demand-Supply)		Log(Dem./ Sup)	Demand-Trend	Log(Demand - Trend)	
1971	-0.053	451.37	-432.86	-	-	-0.3094	-	-	-0.1338
1972	-0.053	451.37	-432.86	-0.0007	0.0045	-0.3094	-0.0026	0.0271	-0.1338
1973	-0.053	451.37	-432.86	-0.0007	0.0045	-0.3094	-0.0026	0.0271	-0.1338
1974	-0.047	83.60	-12.25	-0.0007	0.0045	-0.3596	-0.0026	0.0271	-0.1502
1975	-0.027	61.74	-429.24	-0.0007	0.0112	-0.4229	0.0002	0.0210	-0.2337
1976	-0.046	-29.43	-316.72	-0.0019	0.0121	-0.2962	0.0001	0.0191	0.1129
1977	-0.060	-24.41	-71.93	-0.00085	0.0119	-0.3888	0.00019	0.0119	0.0890
1978	-0.024	73.94	266.69	-0.0343	0.1504	-0.3353	-0.0002	-0.0372	0.0735
1979	-0.019	125.09	1.05	-0.0318	0.1408	-0.2980	-0.0016	-0.0230	0.0829
1980	-0.020	-78.58	182.27	-0.0009	0.2166	-0.8696	0.0004	-0.1359	0.0843
1981	-0.002	77.03	106.45	-0.0111	0.1281	-0.7768	0.0011	-0.0969	0.0952
1982	0.004	44.87	67.19	-0.0125	0.1276	-0.5336	0.0013	0.1320	0.0795
1983	0.006	2.53	-25.22	-0.0125	0.1268	-0.5288	0.0017	0.4209	0.0803
1984	0.007	-21.51	-155.83	-0.0117	0.1268	-0.4302	0.0021	0.6403	0.0753
1985	0.006	-30.94	-188.98	-0.0084	0.1240	-0.3056	0.0022	0.8117	0.0824
1986	0.005	-30.47	-252.68	-0.0089	0.1161	-0.2738	0.0034	0.8332	0.0799
1987	-0.004	-37.22	-368.20	-0.0069	0.1055	-0.2219	0.0043	0.7740	0.0973
1988	-0.008	-34.09	-401.45	0.0246	0.1014	-0.1071	0.0044	0.7013	0.0969
1989	-0.009	-23.24	-715.95	0.0296	0.1139	-0.0420	0.0042	0.6525	0.1654
1990	-0.017	-166.57	2623.04	0.0590	0.2109	0.4606	0.0040	0.5849	0.1288
1991	0.005	-338.91	2312.54	0.0184	0.1545	1.0830	0.0043	0.4371	0.1962
1992	-0.010	3201.57	2137.20	0.0358	0.1554	1.0693	0.0044	0.4069	0.1707
1993	-0.009	2117.49	4448.32	0.0296	0.1414	1.1728	0.0042	0.4016	0.1701
1994	0.091	-		0.0632	-	1.0361	0.0046	0.4008	0.1539
1995	0.089	-	-	0.0953	-	1.0122	0.0118	0.4058	0.1405

5. Conclusions

The agricultural sector in Bulgaria is under transition from a planned to a market economy. Price formation is moving away from accounting prices, based on the evolution of total cost, to market clearing prices. The aim of this paper was to investigate the latter and quantify the effort made in that direction in the agricultural sector in Bulgaria. To this end, an estimation of a model for price determination including the two methods of price determination was proposed. The model, in which the new and old regime can co-exist, was estimated using the Kalman filter for nine agricultural products. This method actually affords the possibility to quantify the importance of each regime, by estimating parameters that vary over time and by identifying any structural break that has occurred.

The results show that for many products the impact of total cost on price formation is declining during the transition period; on the other hand the impact of excess demand is increasing where all the products that were considered in the study are concerned.

According to the results obtained from the model, it seems that an important structural break has actually occurred in Bulgaria in the determination of agricultural prices. This structural break, observed in the years following the transition, confirms that a transformation of the price formation mechanism is actually taking place in Bulgaria, leading the agricultural sector towards a liberalised method of price determination.

References

Agent P.R. (1993). Price reform and durable goods in the transition to a market economy, *IMF Working Power*, WP/93/47.

Boycko M. (1991). Price decontrol: The macroeconomic case for the Big Bang approach, *Oxford Review of Economic Policy*, Vol. 7. No 4, pp. 35-45.

Braverman A. and Guasch, L. (1990). Agricultural reform in developing countries: Reflection for Eastern Europe, *American Journal of Agricultural Economics*, Dec. 1990, pp. 1243-1251.

Brooks K. , Guasch, L., Braverman A.,and Csaki C. (1991). Agriculture and the transition to the market, *Journal of Economic Perspectives*, Vol. 5, N.4 pp.149-161.

Charemza, W.W. (1993). *Economic transformation and long-run relationships: The case of Poland.* Discussion Paper DP 16-93, Centre for Economic Forecasting, London Business School.

Cuthbertson, K., Hall, S., and Taylor, M. (1992). *Applied econometric techniques*, Philip Allan.

Dinopoulos E. and Lane, T.P. (1992). Market liberalisation policies in a reforming Socialist economy, *IMF Staff Papers*, Vol. 39, No 3, pp. 465-494.

Eckstein O. (1964). A theory of the wage-price process in modern industry, *A Review of Economic Studies,* October 1964, pp. 267-286.

Hall, S.G. (1993). Modelling structural change using the Kalman filter, *Economics of Planning*, 26, 1-13.

Hallam, D. (1995). *Agricultural Supply Response Analysis Under Structural Change*. (This volume).

Harvey, A. (1987). Applications of the Kalman Filter in econometrics, in T. Bewley (ed.): *Advances in Econometrics*, 1, 285-313, Cambridge University Press.

Hwa E.-C. (1985). A model of price and quantity adjustments in primary commodity markets, *Journal of Policy Modeling*, 7(2):305-338.

Kybczynski T.M. (1991. The sequencing of reform, *Oxford Review of Economic Policy*, Vol. 7, No 4, pp. 26-35.

Mishev Pl., Tzoneva, M., and Ivanova, N. (1996). *Agricultural Reform, markets and prices in Bulgaria.* (This volume)

OECD (1995). *Agricultural policies, markets and trade in the Central and Eastern European countries, selected New Independent States, Mongolia and China, monitoring and outlook*, OECD, Paris 1995.

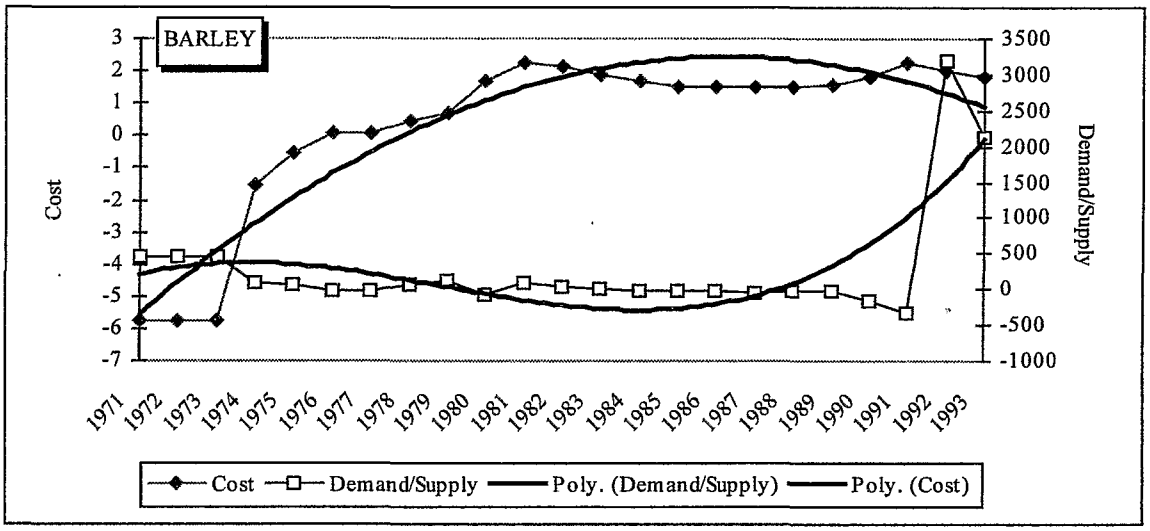
Swinnen J. (1996). Endogenous prices and trade policy developments in Central European agriculture, *European Review of Agricultural Economics*, 23 (1996), 133-160.

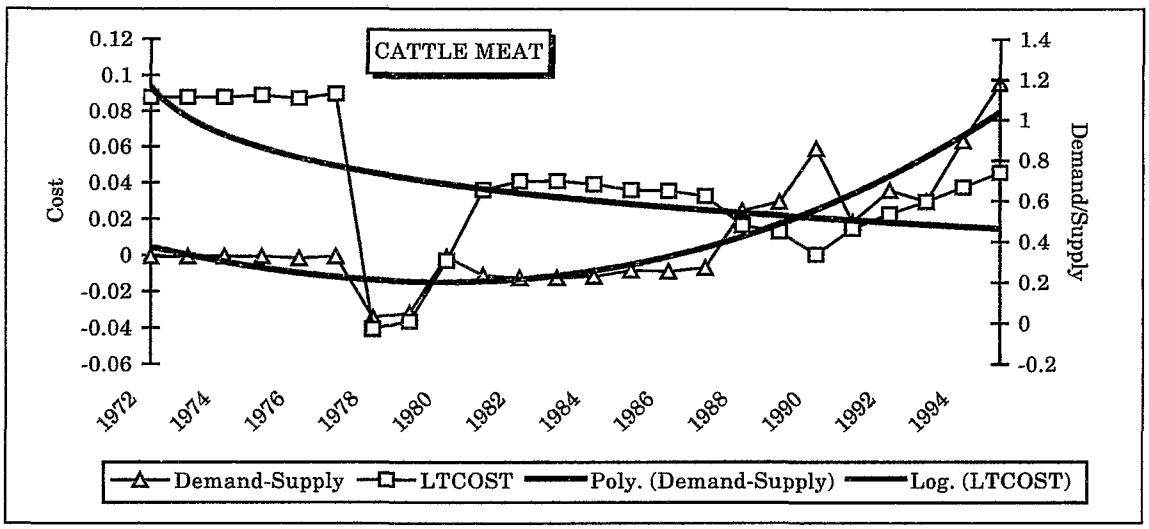
Xu D. (1988). Background to a mathematical model of price reform in China, *Chinese Economic Studies*, Spring 1988, pp. 78-90.

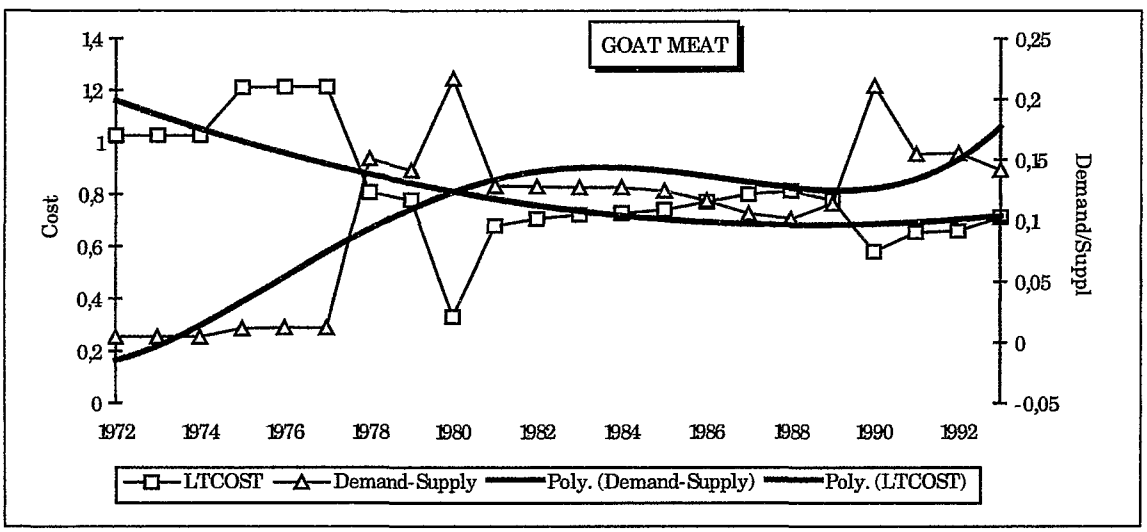
Xu D. (1993).Price distortion in the transition process: A CGE analysis of China's case, *Economics of Planning*, 26:161-182, 1993.

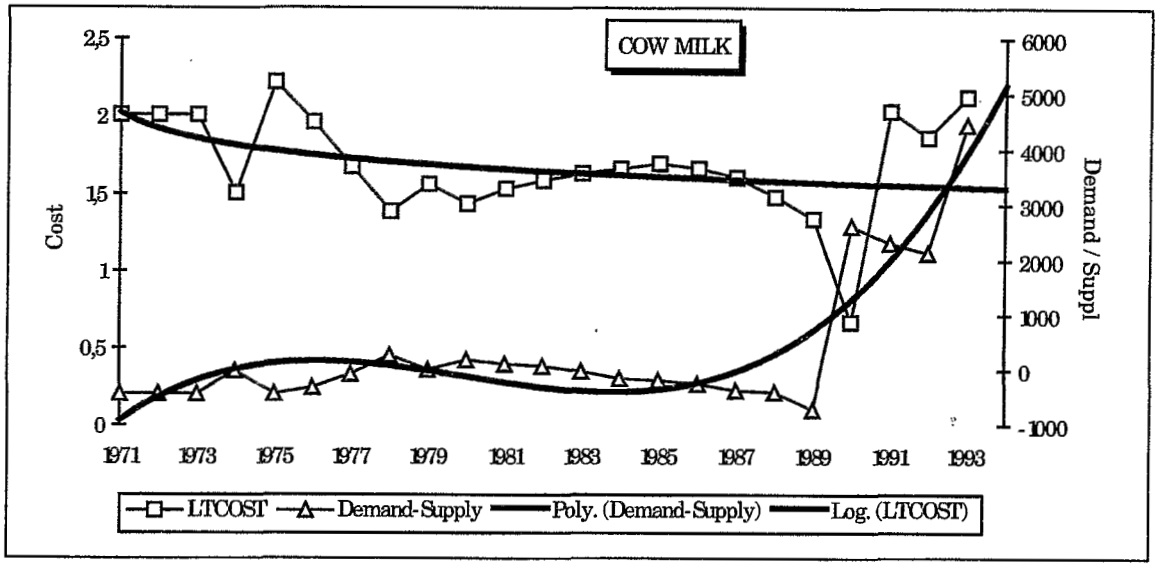
Appendix I

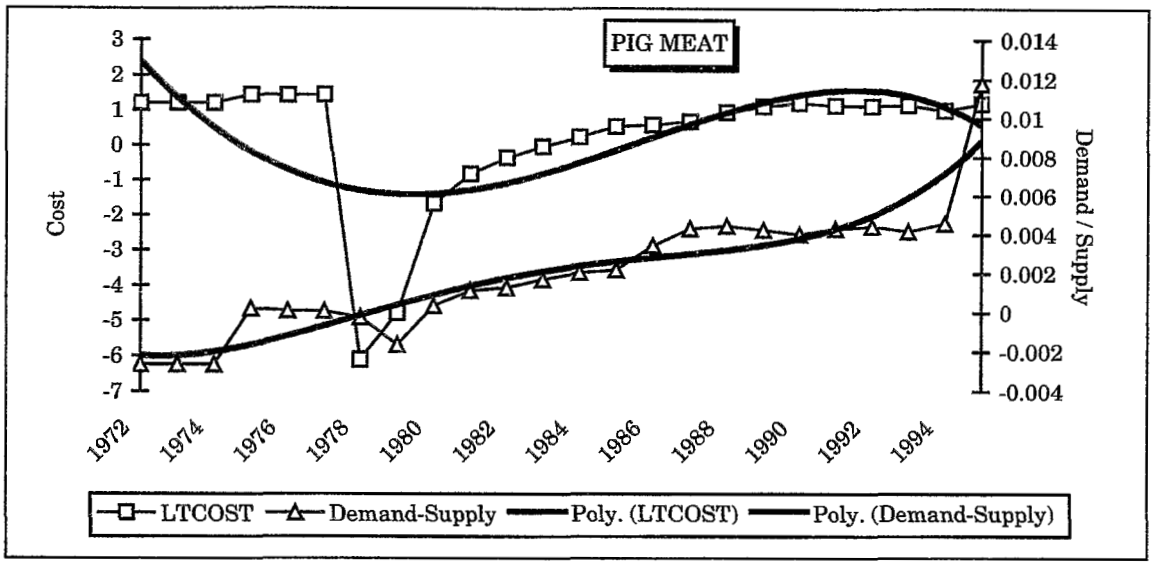
Evolution of estimated coefficients and their time trend

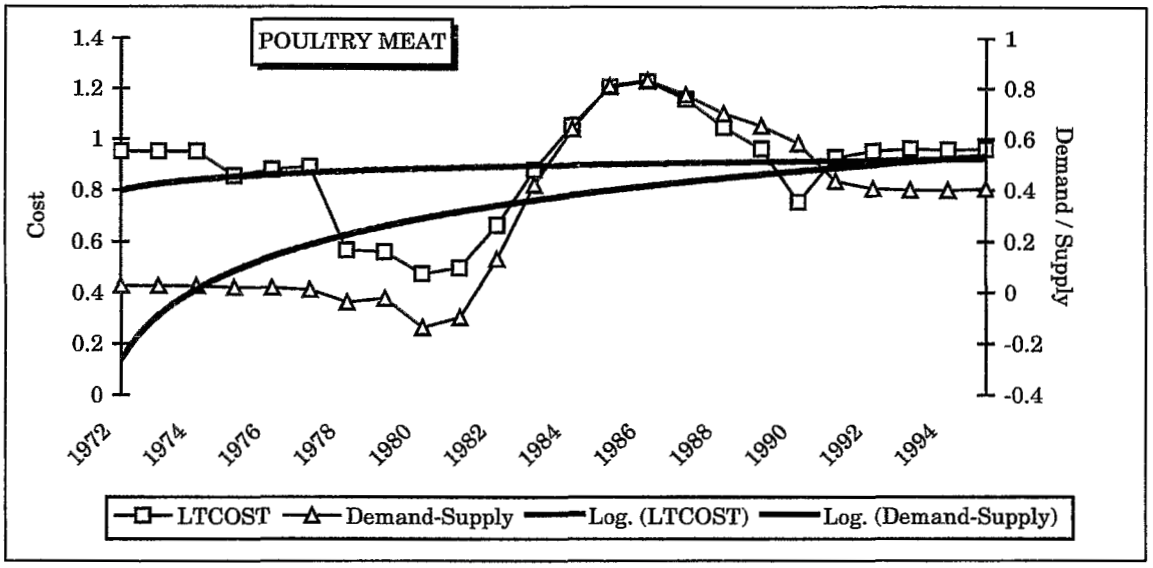


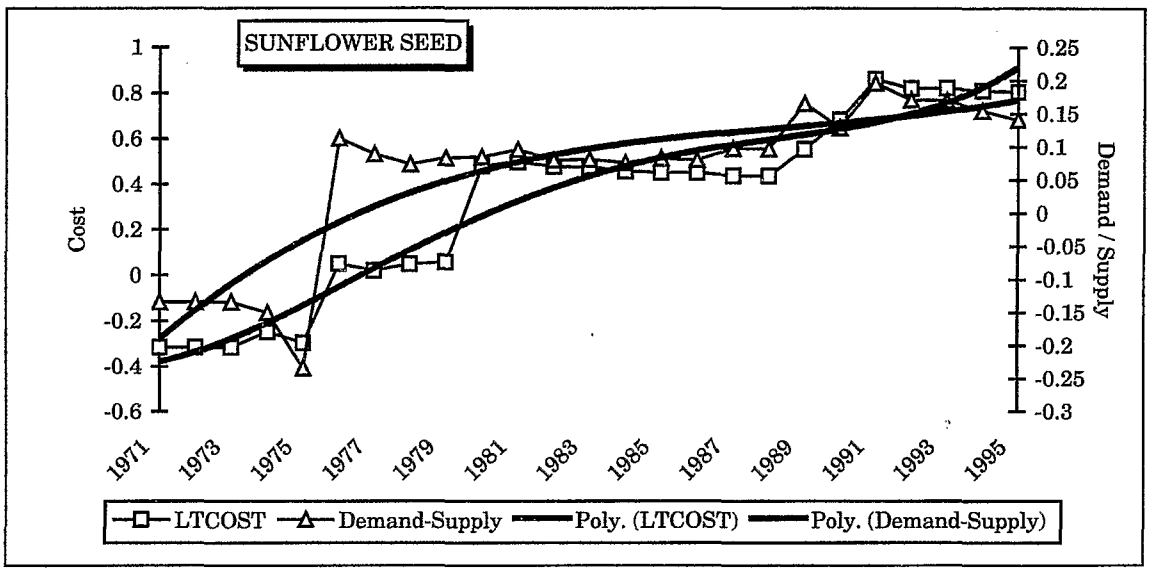


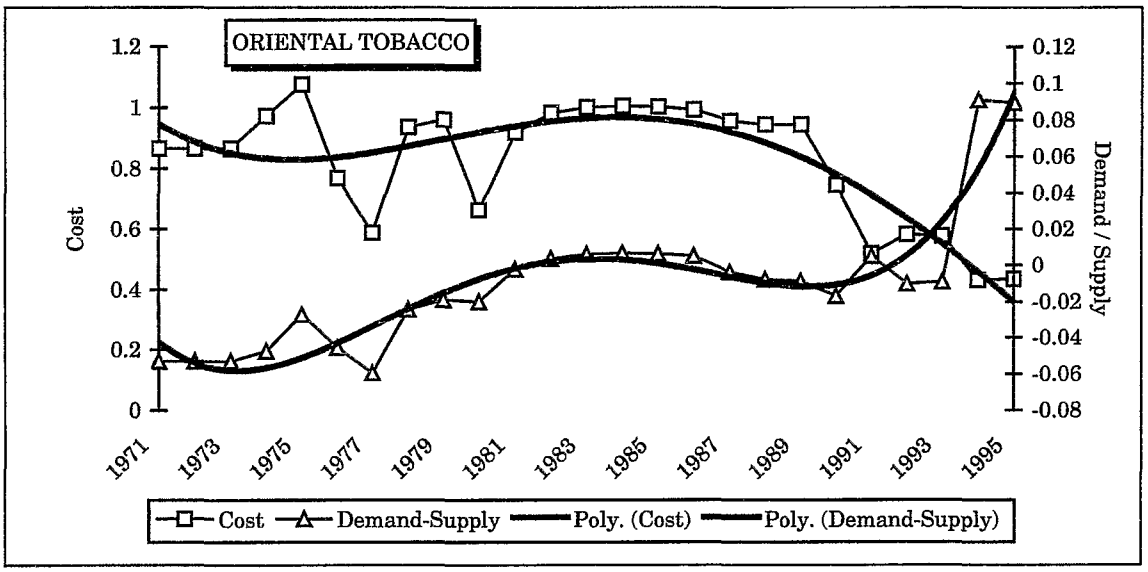


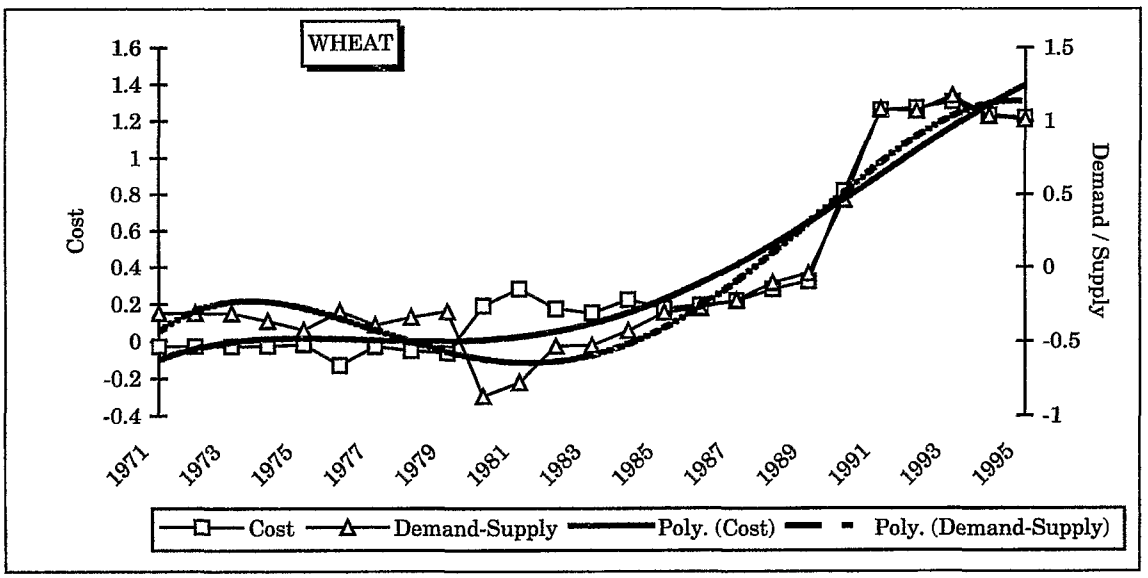

COW MILK
Cost
Demand / Suppl
2,5
2
1,5
1
0,5
0
6000
5000
4000
3000
2000
1000
0
-1000
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
LTCOST
Demand-Supply
Poly. (Demand-Supply)
Log. (LTCOST)


PIG MEAT
Cost
Demand / Supply
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
-0.002
-0.004
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
LTCOST
Demand-Supply
Poly. (LTCOST)
Poly. (Demand-Supply)


POULTRY MEAT
Cost
Demand / Supply
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
LTCOST
Demand-Supply
Log. (LTCOST)
Log. (Demand-Supply)


SUNFLOWER SEED
Cost
Demand / Supply
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0.25
0.2
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
-0.3
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
LTCOST
Demand-Supply
Poly. (LTCOST)
Poly. (Demand-Supply)


ORIENTAL TOBACCO
Cost
Demand / Supply
1.2
1
0.8
0.6
0.4
0.2
0
0.12
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
Cost
Demand-Supply
Poly. (Cost)
Poly. (Demand-Supply)


WHEAT
Cost
Demand / Supply
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
1.5
1
0.5
0
-0.5
-1
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
Cost
Demand-Supply
Poly. (Cost)
Poly. (Demand-Supply)

Appendix II

Table of detailed estimation results, by product

BARLEY	(1)	(2)	(3)	(4)	(5)	(6)
constant	0.899 (-0.057)	-2122.7 (-4.171)	-11.61 (-0.603)	0.164 (1.380)	0.017 (0.147)	0.149 (1.277)
tcost	1.779 (37.09)	1.802 (38.53)	1.706 (32.45)			
d_s	0.002 (3.557)					
ds		2117.5 (4.155)				
rd			.475E-04 (1.140)			
ltcost				1.059 (40.57)	1.093 (43.06)	1.060 (43.79)
ld_s				-0.001 (-0.257)		
lds					1.747 (2.568)	
lrd						0.063 (0.903)
SSR	77259.4	67717.5	118465	0.183	0.138	0.176
Variance of residuals	3862.97	3385.87	5923.27	0.009	0.007	0.009
Mean of dependent variable	582.08	582.08	582.08	5.44	5.44	5.44

CATTLE MEAT	(1)	(2)	(3)	(4)	(5)	(6)
constant	-965.1 (-0.644)	20462.5 (1.119)	511.794 (0.574)	1.070 (2.143)	1.757 (5.753)	2.279 (7.709)
tcost	0.477 (17.15)	0.476 (17.20)	0.460 (13.64)			
d_s	-0.159 (-1.021)					
ds		-21555.8 (-1.104)				
rd			-0.060 (-0.828)			
ltcost				0.739 (21.72)	0.736 (21.75)	0.693 (19.82)
ld_s				0.095 (2.302)		
lds					-2.413 (-2.286)	
lrd						-1.015 (-2.534)
SSR	0.28+09	0.28+09	0.29+09	0.928	0.931	0.896
Variance of residuals	0.13+08	0.13+08	0.14+08	0.044	0.044	0.042
Mean of dependent variable	6855.22	6855.22	6855.22	8.08	8.08	8.08

GOAT MEAT	(1)	(2)	(3)	(4)	(5)	(6)
constant	52.12 (0.104)	4828.7 (2.858)	1242.4 (5.866)	0.879 (1.755)	2.244 (8.355)	2.635 (10.28)
tcost	0.432 (19.84)	0.427 (19.13)	0.403 (19.24)			
d_s	-0.073 (-2.572)					
ds		-4625.9 (-2.134)				
rd			-0.017 (-0.783)			
ltcost				0.713 (24.72)	0.687 (22.78)	0.658 (20.55)
ld_s				0.141 (3.854)		
lds					-0.726 (-2.755)	
lrd						-0.238 (-1.194)
SSR	0.10+08	0.11+08	0.13+08	0.226	0.288	0.374
Variance of residuals	540666	587984	706168	0.012	0.015	0.020
Mean of dependent variable	6227.67	6227.67	6227.67	8.09	8.09	8.09

COW MILK	(1)	(2)	(3)	(4)	(5)	(6)
constant	-128.0 (-0.712)	-4516.14 (-1.924)	-382.03 (-4.985)	0.032 (0.012)	-1.497 (-2.038)	-2.062 (-2.486)
tcost	2.110 (26.26)	2.127 (27.61)	2.101 (19.07)			
d_s	0.002 (1.670)					
ds		4448.32 (1.750)				
rd			0.000 (-0.675)			
ltcost				1.311 (11.54)	1.312 (12.19)	1.353 (9.989)
ld_s				-0.154 (-0.738)		
lds					4.431 (1.315)	
lrd						0.144 (0.294)
SSR	825484	815781	919683	1.813	1.715	1.855
Variance of residuals	41274.2	40789.1	45984.1	0.090	0.086	0.093
Mean of dependent variable	1727.45	1727.45	1727.45	6.45	6.45	6.45

PIG MEAT	(1)	(2)	(3)	(4)	(5)	(6)
constant	410.19 (0.472)	3002.95 (0.134)	268.5 (0.486)	1.683 (3.016)	1.456 (4.538)	1.104 (3.376)
tcost	1.162 (29.98)	1.162 (29.92)	1.198 (24.13)			
d_s	-0.010 (-0.138)					
ds		-2574.26 (-0.111)				
rd			0.012 (1.060)			
ltcost				0.870 (21.37)	0.873 (22.96)	0.912 (21.50)
ld_s				-0.031 (-0.796)		
lds					1.903 (0.915)	
lrd						0.258 (1.002)
SSR	0.11+09	0.11+09	0.10+09	0.914	0.905	0.898
Variance of residuals	0.51+07	0.51+07	0.49+07	0.043	0.043	0.043
Mean of dependent variable	7924.60	7924.60	7924.60	8.08	8.08	8.08

POULTRY MEAT	(1)	(2)	(3)	(4)	(5)	(6)
constant	-700.76 (-0.755)	2999.3 (0.677)	265.11 (1.295)	-1.474 (-0.988)	1.095 (2.491)	0.405 (2.286)
tcost	0.922 (40.56)	0.912 (40.34)	0.912 (59.82)			
d_s	-0.036 (-1.151)					
ds		-3302.2 (-0.600)				
rd			0.011 (1.442)			
ltcost				0.997 (17.54)	0.890 (22.35)	0.962 (42.42)
ld_s				0.161 (1.496)		
lds					0.678 (0.874)	
lrd						0.406 (3.369)
SSR	0.16+08	0.17+08	0.15+08	0.377	0.403	0.271
Variance of residuals	762515	796933	737623	0.018	0.019	0.013
Mean of dependent variable	6580.92	6580.92	6580.92	7.85	7.85	7.85

SUNFLOWER SEED	(1)	(2)	(3)	(4)	(5)	(6)
constant	177.25 (2.728)	1437.2 (1.845)	228.58 (4.271)	1.411 (5.919)	1.643 (14.48)	1.618 (14.96)
tcost	0.820 (37.85)	0.825 (42.19)	0.843 (44.72)			
d_s	-0.002 (-1.442)					
ds		-1271.44 (-1.548)				
rd			0.000 (-0.916)			
ltcost				0.795 (33.85)	0.796 (37.26)	0.806 (43.99)
ld_s				0.027 (0.924)		
lds					-0.455 (-1.098)	
lrd						0.140 (1.224)
SSR	0.12+07	0.12+07	0.13+07	0.355	0.350	0.345
Variance of residuals	55351.6	54632.5	58357.8	0.016	0.016	0.016
Mean of dependent variable	1257.51	1257.51	1257.51	6.25	6.25	6.25

ORIENTAL TOBACCO	(1)	(2)	(3)	(4)	(5)	(6)
constant	8408.94 (5.109)	-2159.17 (-1.066)	2771.37 (6.960)	2.512 (5.648)	2.273 (16.77)	2.114 (19.22)
tcost	0.434 (31.15)	0.462 (48.13)	0.477 (46.17)			
d_s	0.089 (3.454)					
ds		8812.41 (2.500)				
rd			0.011 (0.645)			
ltcost				0.740 (37.15)	0.747 (62.29)	0.758 (61.34)
ld_s				-0.022 (-0.840)		
lds					0.120 (1.313)	
lrd						0.028 (0.692)
SSR	0.43+08	0.51+08	0.65+08	0.098	0.094	0.099
Variance of residuals	0.19+07	0.23+07	0.29+07	0.004	0.004	0.004
Mean of dependent variable	12081.53	12081.5	12081.53	8.81	8.81	8.81

WHEAT	(1)	(2)	(3)	(4)	(5)	(6)
constant	-11.53 (-0.123)	-883.92 (-1.210)	-96.06 (-1.998)	-0.251 (-0.240)	-0.509 (-1.785)	-0.776 (-3.207)
tcost	2.690 (24.78)	2.691 (24.96)	2.740 (26.51)			
d_s	0.000 (1.068)					
ds		872.15 (1.077)				
rd			0.000 (-0.229)			
ltcost				1.223 (16.86)	1.221 (24.64)	1.258 (26.209
ld_s				-0.029 (-0.484)		
lds					1.012 (1.330)	
lrd						0.094 (0.426)
SSR	804820	804150	844530	1.015	0.950	1.017
Variance of residuals	36582.7	36552.3	38387.7	0.046	0.043	0.046
Mean of dependent variable	642.37	642.37	642.37	5.47	5.47	5.47