MEASURING CROSS-SUBSIDISATION OF THE SINGLE PAYMENT SCHEME IN ENGLAND

Alan Renwick and Cesar Revoredo-Giha

Land Economy and Environment Research Group, Scottish Agricultural College (SAC)

Contact: Alan Renwick
Land Economy and Environment Research Group, SAC
King's Buildings, West Mains Road, Edinburgh EH9 3JG, UK.
E-mail: alan.renwick@sac.ac.uk

European Association of Agricultural Economists

Università degli Studi della Tuscia

Istituto nazionale di Economia Agraria

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Abstract

The specific purpose of this paper is to estimate the extent to which decoupled payments under the Single Payments Scheme (SPS) are being used (either explicitly or implicitly) in England to support the continuation of activities that were previously supported by area and headage payments. In the absence of a farm survey, the methodology consists of using information on farm accounts collected through England's Farm Business Survey (FBS), to estimate a multi-output cost function differentiated by farm size and farm type. This cost function, calibrated to match regional prices in England, is used to estimate the level of cross-subsidisation in the first full year after implementation of the SPS (2005/06). Results indicate that cross-subsidisation was occurring, which might infer that many farmers across England are coupling their payments. Whilst, these results are for the first year, and in that sense may reflect a transitional situation, they are nevertheless important because they provide empirical evidence to inform the discussion concerning the impact and future development of the SPS.

Key Words: English agriculture, single farm payment, micro-econometric models.

JEL code: Q12, Q18.

Introduction

This paper derives from the a project for the UK Department of Environment, Food and Rural Affairs (Defra) “Estimating the Environmental Impacts of Pillar I Reform and the Potential Implications for Axis II funding”. The purpose of the paper is to estimate the extent that farmers are cross-subsidising the Single Payment Scheme (SPS) payments by applying them to productive activities as if they were coupled payments, and not selecting the most profitable ones at the new prices.

The motivation behind the paper is to increase our understanding of the impact of the SPS by providing information on how farmers are utilising the proceeds of the SPS. There is a need for detailed analysis using real farm data as most of the available information about the use of the SPS is either anecdotal or simulated based on assumptions about the degree of coupling and without any empirical basis. Furthermore, understanding the behaviour of farmers in respect to the SPS is important because of the possible implications for future scenarios. For example, if farmers are using the SPS to cross-subsidise activities that are the not the most profitable then: (1) the SPS, despite what economic theory and policy makers may say, is having an impact on production.[1] (2) removal of the SPS (say by 2013) may have important implications for the level of production if farmers continue to cross-subsidise.

Section II briefly outlines the background to the implementation of the SPS. Section III outlines the empirical approach adopted for the study, whilst Section IV presents the results and discussion. The paper concludes with a brief consideration of the need for further analysis.

Background

On 26 June 2003, EU farm ministers adopted a fundamental reform of the Common Agricultural Policy (CAP) and introduced a new Single Payment Scheme (SPS) for direct subsidy payments to landowners. Although the SPS applies throughout the European Union according to rules agreed between the member states, the implementation details vary from country to country.

The intention of the SPS was to change the way the EU supports its farm sector by removing the link between subsidies and production of specific crops (e.g., area and headage payments). In this sense, the scheme replaced eleven previous subsidy schemes which were based on the production of crops and/or livestock e.g. suckler cow premium and arable area payments scheme. It should be noted that Member States have the choice to maintain a limited link between subsidy and production to avoid abandonment of particular production.

[1] For instance, OECD (2006) considers how alternative indirect channels towards decoupled payments can affect production.

Member States had options in the way they calculated and made payments. The main difference lies in whether they calculated SPS on the basis of individual farmers' direct payments during a past reference period, thus producing a patchwork of different payments, or whether all payments are averaged out and paid uniformly over a region or state. Within the latter approach, payment levels may be varied between specific areas (e.g. disadvantaged and non-disadvantaged areas). An in-between system is also available which allows Member States either to operate a mixed historic/flat rate approach that stays the same over time ('static'); or they may choose a mix that alters over time ('dynamic'), usually so that the proportion of SPS based on historic references reduces as the flat rate element increases, offering a means to transit from the basic to the flat rate approach. For England, Defra decided to implement a dynamic flat rate approach.

The UK Government introduced the SPS in 2005. For the purposes of the SPS, the UK is divided into four regions: England, Northern Ireland, Scotland and Wales. England is further divided into three areas: (1) England outside the upland Severely Disadvantaged Area (SDA); (2) English upland SDA (other than moorland); and (3) English moorland within the upland SDA (Defra, 2006).

The SPS is linked to meeting environmental, public, animal and plant health and animal welfare standards and the need to keep land in good agricultural and environmental condition. To gain funds from the SPS, the farmer has to cross comply - that is, to farm in an environmentally friendly way, with careful use of pesticides and fertilisers. Farmers also had to set aside 8 per cent of their productive land annually (although this has since been set to zero); in addition two metres on the perimeter of each field must be left uncropped to become overgrown. .

Empirical Approach

Data

The information used in the paper was extracted from Defra's Farm Accounts in England (Defra, 2008), which is prepared from the results of the Farm Business Survey (FBS) in England. Nearly all farms in the FBS have accounting years ending between 31st December and 30th April, although on average, the accounts end in February (Defra, 2007).

The data used covered the eight year period from 1998/99 to 2005/6 (the first year after implementation of the SPS). The information available was by Defra's robust farm type (i.e., cereals, dairy, general cropping, horticulture, LFA grazing livestock, lowland grazing livestock, mixed, pigs and poultry) and farm size (i.e., small, medium and large). This resulted in a balanced panel dataset of 192 observations. Table 1 provides information on the number of farms in England and by region and type that the data represents.

Variable costs were allocated to one of 6 groups: feed, livestock services, seed, fertilisers, crop protection and other goods and services. The outputs considered in the estimation were 19 (i.e., wheat, barley, other cereals, oilseed rape, potatoes, sugar beet, other crops, vegetables and fruits, by-prods, forage and cultivations, set aside, dairy cows and heifers in milk, beef cows, other cattle, ewes, other sheep, breeding sows, other pigs, hens and pullets in lay, other poultry).

The estimation of cost functions requires input prices. Defra's input price data for the United Kingdom were used for all the input categories. Output prices by Government Office Region were from Defra's Farm Accounts in England (Defra, 2008).

Methodology

The approach adopted was to estimate farm level marginal cost functions by region, farm size and farm type and use them to predict the optimal output allocation, after the first year of the single payment scheme[2] given the prevailing input and output prices (i.e., it is an ex-post analysis). Comparison between the observed and predicted output is used to estimate whether cross-subsidisation is occurring. We concentrate the analysis on cereals, cattle and sheep for two main reasons. First, these enterprises were subject to coupled payments before the SPS (i.e., arable area payments and headage payments). Second, the fact that production was maintained at similar levels in the first year after decoupling was implemented, despite the prevailing low commodity prices implies that some degree of cross-subsidisation was occurring.

The starting point of the methodology was the estimation of a variable cost function considering terms by farm size and type. A multi-product cost function was chosen due to the fact that most of farms produce more than one output and also because itemised cost data by individual enterprise (which is now collected by Defra) was only available for the last two years of our eight year period.

From the aforementioned variable cost function, marginal cost functions were derived and calibrated for each Government Office Regions (i.e., East Midlands, East of England, North East, South East and London, South West, West Midlands and Yorkshire and Humber) using available output prices. It was assumed that each region was a separate market and therefore all producers in the region faced the same prices. It should be noted that Government Office Regions classification, although chosen because of data availability, does approximate quite well differences in natural resources (e.g. land quality) and production specialisation (e.g. the Eastern region for cereal production) across England.

[2] Data availability limited our analysis to the first year after implementation

The exercise of computing marginal cost functions by region effectively meant that for each region (denoted by the sub-index r), we constructed farm models (i.e., 'representative farms') which were disaggregated by farm type (denoted by the sub index t) and farm size (denoted by the sub index s). Therefore, a maximum of 24 supply relationships (i.e., 3 farm sizes multiplied by 8 farm types) were possible in a region. An alternative way to view this is to consider a regional market comprising 24 different possible producers (large cereal farm or small LFA livestock) for each commodity.

Instead of using quantities produced (e.g. tonnes) in the estimation of the cost function, we used areas or average animal numbers. Whilst, perhaps unorthodox, this approach has two advantages for this study: first, the resultant profit maximisation situation subject to this cost function yields directly the area allocated to a crop and the average number of animals and; second, it avoids the problem of estimating a cost function where the regressors (i.e., crop outputs) are stochastic (since quantities produced are the multiplication of areas and yields and the latter are normally considered random terms).

Table 1: England - Number of businesses according to farm type, size (SLR) and region according to Census 2006

Type			Government Office Region								**Total**
			East Midlands	East of England	North East	North West	South East and London	South West	West Midlands	Yorkshire Humber	
Cereals	Size	Small	4,256	5,188	1,161	538	2,798	1,999	1,560	661	18,161
		Medium	2,558	5,955	869	816	3,118	1,654	1,505	1,644	18,120
		Large	6,697	19,557	5,132	395	12,643	2,147	1,833	2,092	50,495
	Total		13,511	30,701	7,161	1,750	18,559	5,800	4,899	4,397	86,776
Dairy	Size	Small	406	258	190	745	265	784	335	376	3,358
		Medium	1,194	486	277	1,746	623	1,652	930	787	7,695
		Large	1,487	2,222	0	4,205	2,680	7,368	2,089	1,397	21,449
	Total		3,087	2,967	467	6,696	3,568	9,803	3,354	2,560	32,501
General Cropping	Size	Small	1,477	2,347	0	683	291	207	558	715	6,278
		Medium	878	1,724	157	0	120	233	448	1,459	5,018
		Large	7,105	16,188	1,688	758	2,144	2,073	2,361	1,774	34,090
	Total		9,460	20,259	1,845	1,441	2,555	2,513	3,366	3,947	45,386
Horticulture	Size	Small	0	82	0	56	155	28	15	1	336
		Medium	0	114	0	0	18	10	31	0	173
		Large	747	2,324	8	185	2,838	345	633	62	7,142
	Total		747	2,519	8	241	3,011	383	679	63	7,652
LFA Grazing Livestock	Size	Small	1,075	0	1,467	1,960	0	1,005	755	1,171	7,434
		Medium	641	0	2,943	3,372	0	1,188	397	2,870	11,411
		Large	1,671	0	5,400	13,422	0	3,177	580	6,059	30,308
	Total		3,387	0	9,810	18,754	0	5,369	1,732	10,099	49,153

Continues

Table 1: England - Number of businesses according to farm type, size (SLR) and region according to Census 2006 (cont.)

Lowland Grazing Livestock	Size	Small	293	318	228	324	1,353	1,350	855	453	5,173
		Medium	325	1,148	517	268	929	1,295	339	111	4,932
		Large	1,249	2,594	987	1,140	1,692	2,135	694	83	10,574
	Total		1,867	4,060	1,731	1,732	3,974	4,781	1,888	646	20,680
Mixed	Size	Small	836	514	359	577	746	724	318	777	4,850
		Medium	287	689	254	336	539	831	562	439	3,939
		Large	3,016	2,360	3,056	1,447	4,950	4,976	3,656	525	23,986
	Total		4,139	3,563	3,669	2,361	6,235	6,531	4,536	1,742	32,775
Pigs and Poultry	Size	Small	44	91	0	0	136	29	58	114	471
		Medium	92	99	1	26	0	56	26	73	373
		Large	92	99	1	26	0	56	26	73	373
	Total		227	289	2	52	136	142	109	260	1,217
Totals by row											
Cereals			13,511	30,701	7,161	1,750	18,559	5,800	4,899	4,397	86,776
Dairy			3,087	2,967	467	6,696	3,568	9,803	3,354	2,560	32,501
General Cropping			9,460	20,259	1,845	1,441	2,555	2,513	3,366	3,947	45,386
Horticulture			747	2,519	8	241	3,011	383	679	63	7,652
LFA Grazing Livestock			3,387	0	9,810	18,754	0	5,369	1,732	10,099	49,153
Lowland Grazing Livestock			1,867	4,060	1,731	1,732	3,974	4,781	1,888	646	20,680
Mixed			4,139	3,563	3,669	2,361	6,235	6,531	4,536	1,742	32,775
Pigs and Poultry			227	289	2	52	136	142	109	260	1,217
Small			8,386	8,797	3,404	4,884	5,743	6,126	4,455	4,267	46,061
Medium			5,975	10,215	5,019	6,565	5,348	6,919	4,238	7,384	51,662
Large			22,064	45,344	16,272	21,578	26,947	22,276	11,871	12,064	178,417
Total			36,424	64,357	24,694	33,027	38,037	35,321	20,565	23,715	276,140

Source: Defra, 2008

The functional form for the cost function was chosen due to its simplicity and adequacy for the task of estimating theoretically consistent marginal costs (i.e., supply relationships). The cost function omitting the sub-indices f,s,r for simplicity and also the specific dummies, is given by (where the sub-index t represents the time period, m is the number of outputs and n is the number of inputs):

$$(1)\quad C_t(W,A)=\left[\alpha_0+\sum_{h=1}^{m}\alpha_h A_{ht}+\frac{1}{2}\sum_{h=1}^{m}\alpha_{hh}A_{ht}{}^2\right]\cdot\exp\left[\beta_0+\sum_{j=1}^{n}\beta_j \ln W_{jt}+\frac{1}{2}\sum_{j=1}^{n}\sum_{k=1}^{n}\beta_{jk}\ln W_{jt}\ln W_{kt}\right]+\varepsilon_t$$

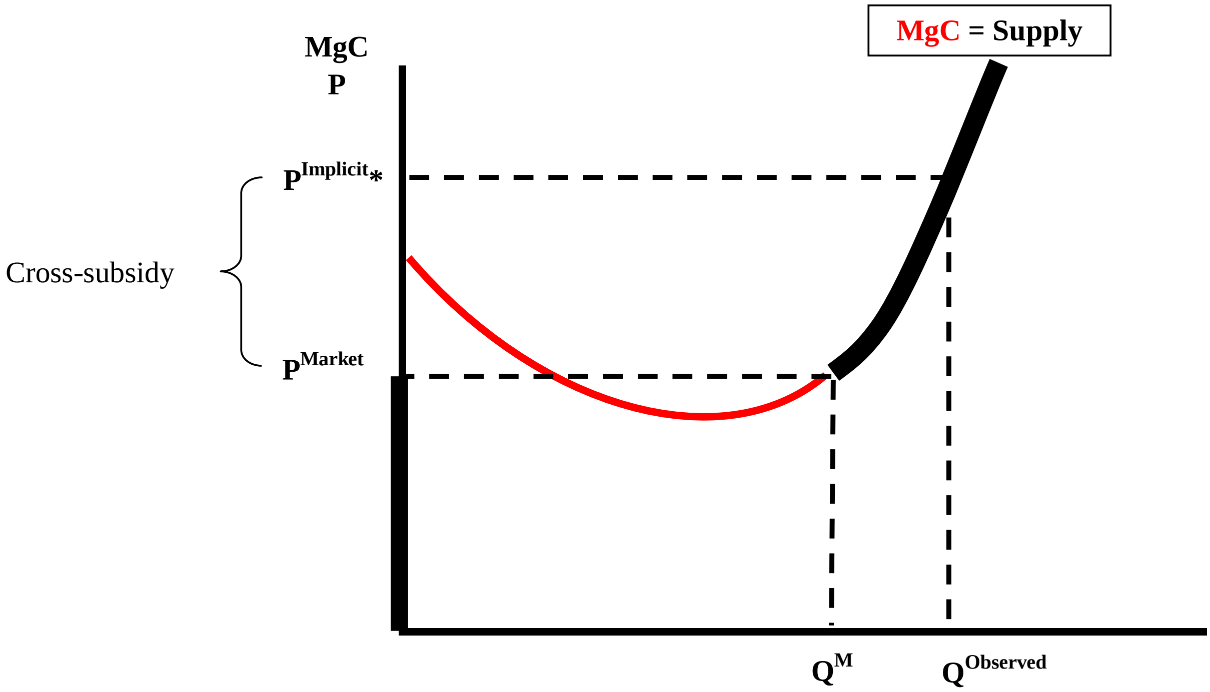
It should be noted that the first part in brackets corresponds (excluding the parameter α_0) to the quadratic cost function frequently used in positive mathematical programming models, where separability amongst outputs (where the As in the formula represent the crop areas or average livestock numbers) is assumed. The second term in brackets corresponds to the input prices (Ws). This functional form can be deduced from the more general cost function presented in Pulley and Braunstein (1992).

The cost function was estimated with the inclusion of dummies for farm type and farm size and in addition a quadratic trend was included to try to capture any cost change over time. The results of the cost function estimation are presented in the annex. After the cost function was estimated, the parameters were adjusted to reproduce exactly the results of the season 2005/06, (i.e., the one year after the implementation of SPS).

The approach adopted to compute the degree of cross-subsidisation for a particular enterprise is highlighted diagrammatically in Figure 1. The cross-subsidy for one commodity for the farm is estimated as the difference between the implicit price ($P^{Implicit}$) at the level of observed production ($Q^{observed}$) minus the actual market price (P^{market}). The implicit price is computed using the estimated marginal cost function. Under the assumption that the cost function remains constant, if the market price is below the implicit price, the farmer is using part of his/her proceeds from the SPS to cross-subsidise the production of the commodity.

This approach therefore forms the basis for the results presented in the following section.

Figure 1 – Estimation of the cross-subsidy



Results and discussion

Table 2 presents the results from the cross-subsidy estimation exercise. The results are presented as weighted averages (using production as the weighting variable) over size and farm type for the eight regions in England. As mentioned earlier, the analysis focuses on those crops and livestock that were receiving area or headage payments before decoupling was introduced.

The results highlight substantial levels of cross-subsidisation by commodity but with differences by regions. Although by no means universal, the results do reflect the process of specialisation that has occurred within England. That is, the level of cross subsidisation that is occurring at an enterprise level is less for those areas which tend to have a comparative advantage in production. For example, the East of England and East Midlands appear to have lower levels for cereal production and the South West for beef production. There are exceptions to this, but this may be a result of small levels of production skewing the results (for example cereals in the North West or beef cows in the East of England).

Table 2 - England-Average weighted cross-subsidy by enterprise and region
(£ per hectare or animal)

	East Midlands	East of England	North East	North West	South East and London	South West	West Midlands	Yorkshire and Humber
Wheat	272.4	312.0	453.6	288.2	n/s	393.0	307.4	367.6
Barley	384.7	264.4	296.3	n/s	378.4	273.7	308.4	269.8
Beef cows	155.8	72.5	154.6	109.6	155.8	45.7	173.2	231.5
Other cattle	134.9	174.8	125.9	133.6	133.5	50.6	6.0	117.7
Ewes	49.9	133.5	15.8	32.1	16.6	13.7	19.5	13.0
Other sheep	30.6	36.8	24.8	17.1	16.0	28.8	35.7	17.7

Note: n/s - marginal cost parameters were not statistically significant

The results clearly indicate that, in nearly all circumstances, the level of production found in 2005/6 was higher than that which would have been predicted under the prevailing market conditions. Of course there may be a number of reasons for this which do not necessarily involve a process of systematic cross-subsidisation. These include:

1) the prices achieved in 2005/6 could have been lower than those expected at the time the level of production was decided

2) the time lag associated with changing production levels (particularly for livestock) might infer that that any adjustments made may not be apparent within the first year of the SPS

3) the fact that the policy change was so marked that farmers were just uncertain as to the impact and initially adopted a policy of maintaining the status quo in terms of production.

In terms of the first point above, it should be noted that prices in 2005/6 were in line with prices in the recent past and there was no general expectation that they would necessarily rise. The second and third points relate to the speed of the process of adjusting to the single payment. For example, recent research undertaken in Scotland based on more recent census data, does highlight that sheep numbers have declined markedly in the last couple of years as farmers seem to be adjusting stocking in response to the low market prices.

Another interesting feature of the degree of cross-subsidisation is that in many cases it appears higher than the single payment itself. This raises the question as to the extent that farmers are using other sources of income to support the farm business.

Conclusions and further research

The purpose of the paper has been twofold: first to present a methodology to estimate the level of SPS that is used in the productive activities and; second, to analyse whether decoupled payments are truly decoupled. That is whether farmers are determining the allocation of their production simply according to market prices.

The results for the first year of application of the SPS 2005/06 indicate that for the key commodities that were under area or headage payments, farmers appear to have continued considering the SPS as coupled payments and therefore produced accordingly. Therefore, the SPS, despite what economic theory and policy makers might suggest may be having effects on production though a channel that is more direct than the ones pointed out by OECD (2006).

However, as mentioned in Section IV, it is important to mention that the obtained results might be due to some inertia in the production, associated for instance to rotation considerations or due to the fact that, as in the case of livestock, it takes time to restructure production. In this sense, it is worthwhile to repeat the exercise as more recent data becomes available, because this will provide a solid base to judge the ways farmers are restructuring their businesses in the presence of the SPS. This information is important if one needs to evaluate the impact of removing the SPS because if farmers do not become more market oriented (i.e., do not take their decisions based on market signals) the elimination of the SPS may have important productive implications in the future than those predicted by models that assume that farmers consider the SPS as a decoupled from production support.

The work of the paper opens several possible paths for future research. The first is to use individual farm data from the FBS in the estimation of the cost functions. This would allow the computation of specific parameters for all regions. As more detailed cost data (at the individual enterprise level) become available a second line of research would be to compare the results obtained from multiproduct cost functions with those by enterprise.

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Annex

Correlation between estimated and observed endogenous variable: 0.99 Log likelihood: -1969.88		Standard error	t ratios
Variables	**Coefficients**		
Intercept-dummies for farm type			
Cereals	8.0381	0.3860	20.8260
Dairy	8.1215	0.3902	20.8160
General cropping	8.1899	0.3831	21.3760
Horticulture	15.3020	0.3860	39.6400
LFA grazing livestock	-19.8520	1.0000	-19.8520
Lowland grazing livestock	-0.2545	1.0000	-0.2545
Mixed	-15.1000	1.0000	-15.1000
Pigs and poultry	-16.2430	1.0233	-15.8730
Intercept-dummies for farm size			
Small	-5.2610	0.3833	-13.7260
Medium	-5.3912	0.3827	-14.0860
Large	-6.1467	0.3821	-16.0880
Intercepts associated to trend			
Trend	-0.0514	0.0271	-1.8969
Squared trend	0.0105	0.0029	3.6827
Input prices variables			
$\ln(W_1)$	0.3878	0.0255	15.2100
$\ln(W_1) \cdot \ln(W_1)$	0.2192	0.5602	0.3913
$\ln(W_1) \cdot \ln(W_2)$	-0.0325	0.0964	-0.3366
$\ln(W_1) \cdot \ln(W_3)$	-0.0912	0.3083	-0.2957
$\ln(W_1) \cdot \ln(W_4)$	0.0569	0.1441	0.3949
$\ln(W_1) \cdot \ln(W_5)$	-0.0080	0.2478	-0.0322
$\ln(W_1) \cdot \ln(W_6)$	-0.1445	0.2682	-0.5388
$\ln(W_2)$	0.0535	0.0054	9.9754
$\ln(W_2) \cdot \ln(W_1)$	-0.0325	0.0964	-0.3366
$\ln(W_2) \cdot \ln(W_2)$	0.0415	0.1131	0.3670
$\ln(W_2) \cdot \ln(W_3)$	-0.0296	0.0710	-0.4171
$\ln(W_2) \cdot \ln(W_4)$	0.0146	0.0380	0.3828
$\ln(W_2) \cdot \ln(W_5)$	0.0272	0.0752	0.3622
$\ln(W_2) \cdot \ln(W_6)$	-0.0212	0.1072	-0.1982
$\ln(W_3)$	0.1114	0.0150	7.4363
$\ln(W_3) \cdot \ln(W_1)$	-0.0912	0.3083	-0.2957
$\ln(W_3) \cdot \ln(W_2)$	-0.0296	0.0710	-0.4171
$\ln(W_3) \cdot \ln(W_3)$	0.0342	0.2269	0.1506
$\ln(W_3) \cdot \ln(W_4)$	-0.0240	0.0914	-0.2630
$\ln(W_3) \cdot \ln(W_5)$	0.0500	0.1710	0.2925
$\ln(W_3) \cdot \ln(W_6)$	0.0606	0.2174	0.2789
$\ln(W_4)$	0.1274	0.0073	17.3760
$\ln(W_4) \cdot \ln(W_1)$	0.0569	0.1441	0.3949
$\ln(W_4) \cdot \ln(W_2)$	0.0146	0.0380	0.3828
$\ln(W_4) \cdot \ln(W_3)$	-0.0240	0.0914	-0.2630

Correlation between estimated and observed endogenous variable: 0.99 Log likelihood: -1969.88		Standard error	t ratios
Variables	**Coefficients**		
$\ln(W_4) \cdot \ln(W_4)$	0.0424	0.0616	0.6886
$\ln(W_4) \cdot \ln(W_5)$	0.0299	0.1024	0.2921
$\ln(W_4) \cdot \ln(W_6)$	-0.1197	0.1186	-1.0099
$\ln(W_5)$	0.1010	0.0127	7.9546
$\ln(W_5) \cdot \ln(W_1)$	-0.0080	0.2478	-0.0322
$\ln(W_5) \cdot \ln(W_2)$	0.0272	0.0752	0.3622
$\ln(W_5) \cdot \ln(W_3)$	0.0500	0.1710	0.2925
$\ln(W_5) \cdot \ln(W_4)$	0.0299	0.1024	0.2921
$\ln(W_5) \cdot \ln(W_5)$	0.0643	0.2092	0.3076
$\ln(W_5) \cdot \ln(W_6)$	-0.1635	0.2234	-0.7320
$\ln(W_6)$	0.2189	0.0136	16.0354
$\ln(W_6) \cdot \ln(W_1)$	-0.1445	0.2682	-0.5388
$\ln(W_6) \cdot \ln(W_2)$	-0.0212	0.1072	-0.1982
$\ln(W_6) \cdot \ln(W_3)$	0.0606	0.2174	0.2789
$\ln(W_6) \cdot \ln(W_4)$	-0.1197	0.1186	-1.0099
$\ln(W_6) \cdot \ln(W_5)$	-0.1635	0.2234	-0.7320
$\ln(W_6) \cdot \ln(W_6)$	0.3884	0.3213	1.2087
Output related terms (linear and squared)			
Intercept	82.3860	6.8916	11.9540
Wheat	-146.9800	8.3536	-17.5950
Squared wheat	3.3141	0.2061	16.0790
Barley	-63.1990	6.5282	-9.6809
Squared barley	-8.5487	0.6174	-13.8450
Other cereals	-338.0600	4.8795	-69.2810
Squared other cereals	23.6890	1.0280	23.0440
Oilseed rape	136.8800	3.1569	43.3600
Squared oilseed rape	-3.2183	2.0864	-1.5426
Potatoes	-48.0730	1.1903	-40.3860
Squared potatoes	21.7130	1.0177	21.3350
Sugar beet	582.1600	2.6269	221.6200
Squared sugar beet	0.0000	2.5838	0.0000
Other crops	-61.5760	2.1558	-28.5620
Squared other crops	0.0000	3.1766	0.0000
Vegetables and fruits	-2.9495	0.7401	-3.9855
Squared vegetable and fruits	0.0000	0.1130	0.0000
By prods., forage and cultivations	-105.6800	2.1876	-48.3090
Squared by prods., forage and cultivations	-11.2580	0.3751	-30.0140
Set-aside	-48.0890	4.1656	-11.5440
Squared set-aside	-5.6264	0.9948	-5.6556
Dairy cows and heifers in milk	-1656.4000	4.6599	-355.4500
Squared dairy cows and heifers in milk	-4.8653	0.2972	-16.3690
Beef cows	-923.4100	1.0003	-923.1600
Squared beef cows	0.0000	4.9363	0.0000
Other cattle	2518.7000	3.3184	759.0000

Correlation between estimated and observed endogenous variable: 0.99 Log likelihood: -1969.88		Standard error	t ratios
Variables	**Coefficients**		
Squared other cattle	0.0000	1.0441	0.0000
Ewes	-906.1600	1.3706	-661.1200
Squared ewes	0.0000	0.5541	0.0000
Other sheep	-124.7400	1.3843	-90.1110
Squared other sheep	0.0000	0.5935	0.0000
Breeding sows	15767.0000	1.0000	15767.0000
Squared breeding sows	10.8770	2.6830	4.0542
Other pigs	-85.2900	1.9025	-44.8310
Squared other pigs	1.1233	0.3069	3.6600
Hen and pullets in lay	-64.8380	1.3335	-48.6220
Squared hen and pullets in lay	-0.8074	0.1147	-7.0397
Other poultry	-13.1780	29.5680	-0.4457
Squared other poultry	0.0000	0.9414	0.0000
Notes:			
W_1= Feed grown and purchased price			
W_2= Livestock services price			
W_3= Seeds (purchased and grown) price			
W_4= Fertilizers price			
W_5= Crop protection price			
W_6= Other good and services price			