The EC LIVESTOCK SECTOR: POLICY, TRADE, AND RESEARCH

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ABSTRACT

Livestock policies in the European Community (EC) are explained and analyzed. Then we provide a review of the literature on models that attempt to explain livestock production and meat demand in the EC.

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Introduction

This paper summarizes the first phase of a two-phase study to model the European Community's (EC's) livestock sector. This first phase has three objectives, the first of which is to describe the operation of Common Agricultural Policy (CAP) as it applies to livestock production and trade. This material is written to provide the detail needed so that the final model is realistic and accurate. We concentrate on the details of the policies that are relevant for modeling this sector. Also, we discuss the actual implementation of these policies and how they are viewed by producers and traders. Special attention is given to the changes in the way price supports operate.

The second objective is to provide detail on trade flows both within the EC and between the EC and the rest of the world. We also discuss production and consumption patterns of EC member countries. This information will allow us to customize our models at the individual country level, analyze where policy changes will have the greatest consequences, and predict where opposition to policy changes will be greatest.

The third objective is to review recent work that has been done on the topic. Surprisingly, no one has estimated an EC livestock model using country data. We document those models that do exist and discuss their methodology, data, and results.

The combined livestock sectors of the 12 EC member countries are larger in terms of production, consumption, and trade than that of either the United States or the former Soviet Union (FSU). The EC countries dominate world trade in value-added agricultural products and their trade sectors are among the most highly protected in the world. Any liberalization of these protectionist policies would dramatically alter the world's trade in livestock products. Although econometric models are limited in terms of forecast accuracy, they are well suited for the analysis of alternative policies. For example, it is not immediately obvious how European livestock producers would react if both cereal

and livestock prices were reduced to world levels. The profit increase attributable to lower feed grain costs might well compensate for the reduced output prices.

These alternative policy responses will differ greatly from country to country. Production methods and consumer tastes differ dramatically among the 12 EC member countries. For example, the ban on beef hormones has had a dramatic effect in Ireland and the United States where steers are castrated, but has had little effect in Germany where bull meat is consumed. Given the importance of these countries in world beef trade and the differences between them, the absence of similar research is truly surprising. One hopes that it is not because previous researchers have found it impossible to get reasonable results. By reviewing previous work and discussing the current policy environment, we hope to summarize for an American audience much of the knowledge accrued about their European counterparts.

The EC Beef and Veal Regime

Development of the Beef and Veal Regime

The process leading to a common organization of the EC beef and veal market began in 1964. In November of that year, agreement was reached by the six original member states on a set of common regulations and on the steps required to bring the disparate national policies into line. After a transitional period of just over three and a half years, the new system was fully in place by July 1968.

The system established over the 1964 to 1968 period remains the cornerstone of the present-day system. Basically the system was developed to establish a customs union for beef and veal. To achieve this, the EC-6 set out to (1) establish a single internal market, and (2) to maintain the internal market price as closely as possible to an agreed common guide price through a system of measures to protect it from external market forces. Under the first objective, it was necessary to establish free

trade between the six member states by removing all border taxes and subsidies. This task was effectively accomplished over the transitional period. Simultaneously, under objective two, a common system of import taxes and export subsidies was introduced to protect the EC market price. Later, within this customs-union framework, internal support measures such as public support buying (intervention buying), aid for private storage, and various production subsidies were introduced.

Import Taxes

In 1964, the EC-6 was a substantial net importer of beef and veal. Because there was political demand to establish an internal market price significantly higher than the price at which imports were commonly available, the main plank of the evolving EC beef policy was its protection measures against imports. These measures involved the application of customs duties and variable import levies. The customs duties were set at 16 percent for live cattle and calves with the exception of purebred animals for breeding, which were exempt. For imports of carcass beef and veal, the duty was set at 20 percent. The import levies were designed to bridge the gap between the import price plus customs duty and the internal EC guide price. Thus, the levy would vary depending on the gap prevailing at any point in time and is commonly referred to as the variable levy. The duty-levy system arbitrarily takes the import price as 100 and the EC guide price as 150.

The system, if operated strictly as described above, would have set import levies which are completely independent of the internal EC market supply/demand situation. In reality, however, the system from the beginning had built into it certain variations in recognition of the internal EC market price level. For this and other purposes, market prices throughout the EC for a range of cattle types (i.e., steers, heifers, and cows of various qualities) are monitored each week. An average market price is computed for each country, which in EC jargon is known as a reference price. The EC reference price is a weighted average of these national prices and is used as a trigger for a number of

EC support mechanisms, including a provision for adjusting the import levy to take account of the internal supply-demand balance.

The adjustment factor depends on the level of the reference price in relation to the guide price. Table 1 shows the details of the adjustment system. Thus, in effect, the import levy is arrived at by calculating a basic levy, which is the full gap between the guide price and the import price inclusive of the 20 percent import duty, and then adjusting that basic levy according to the EC reference/guide

Table 1. Adjustment of levy applied to imports of cattle into the internal EC reference/guide price relationship

Reference price as percent of guide price	Percent of levy charged
> 106	0
104 - 106	25
102 - 104	50
100 - 102	75
98 - 100	100
96 - 98	105
90 - 96	110
< 90	114

price relationship. These calculations are made on a live cattle basis. The levies for carcasses and primal beef cuts and veal are derived from this by means of a set of technical coefficients.

The import levies are calculated in terms of European Currency Units (ECUs) and in an overall EC context. The levies to be applied by each member state are obtained by converting to national currencies using "green" or representative rates of exchange coupled with a monetary coefficient, and by adding or subtracting the monetary compensatory amounts (MCAs) applying to each member state at the time. The green rates of exchange are institutional rates at which, effectively, intra-EC trade in certain CAP-supported products (including live cattle, beef, and veal) takes place. MCAs are border

taxes or subsidies applied so as to sustain the gap between green and market exchange rates wherever such a gap exists. A description of this system is given in Appendix A.

This outlines the core system adopted by the EC in relation to beef imports. Of course, like virtually all institutionalized systems, there are a host of accompanying refinements, variations, and concessionary agreements. Some of these have applied almost throughout the lifetime of the beef regime while others are of more recent vintage. For example, a special trading arrangement has applied between the EC and Austria, Sweden, and Switzerland. Under the agreement, imports of cattle and fresh or chilled beef and veal are subject to a levy that is based on the gap between the market price for cattle in those three countries and the EC guide price. Also, in the case of imports of frozen beef and veal from all sources, a special adjustment factor is applied to allow for the reduction in quality sustained during freezing and storing. In addition, there is a facility by which levies may be prefixed for up to 60 days for imports from certain countries such as Argentina, Uruguay, Australia, and New Zealand. This arrangement compares with the general application whereby the levies are computed monthly and no prefixing is allowed.

Perhaps the most significant deviations from the norm are those arising out of concessionary agreements. The EC has been above self-sufficiency in the beef sector since 1979, although it is likely to have returned to a deficit position in 1989 and to remain in deficit in the early 1990s. Furthermore, the internal EC market price has been generally well below the guide price, so that the rate of import levy applied has been at or above 100 percent of its basic level (see Table 1). This situation has left beef imports noncompetitive in general and the majority of the imports that have taken place have been under concessionary schemes whereby the EC has agreed to either totally or partially waive the taxes on certain quantities of imports. In 1988, approximately 574,000 metric tons, carcass equivalent, were imported under such agreements. This amounted to 8 percent of EC

consumption that year and 98.5 percent of total beef imports. The following are among the more important concessions currently being applied:

General Agreement on Tariff and Trade (GATT) agreements. Imports of 53,000 metric tons annually of frozen beef subject only to the 20 percent customs duty. Imports of almost 48,000 bulls, heifers, and cows of alpine and specified mountain breeds other than for slaughter subject only to a 4 percent customs duty. Some 34,000 metric tons of high-quality beef cuts to be imported from the United States, Argentina, Australia, and Uruguay, free of import levy but subject to the full customs duty.

The Lome convention. This agreement between the EC and a group of African, Caribbean, and Pacific (ACP) countries provides for the importation of 30,000 metric tons annually. This beef is allowed into the EC duty free. In addition, only 10 percent of the EC import levy is applied, provided that the remaining 90 percent is charged by the exporting country as an export tax. The countries participating in this agreement are Botswana, Zimbabwe, Madagascar, Swaziland, and Kenya.

Balance sheet scheme. Under this scheme, the EC makes an annual estimate of its requirements of certain types of cattle and beef from third-world countries where it expects a shortfall to arise from domestic sources. The EC may then decide to grant import concessions to make up the deficit. This practice has facilitated imports of manufacturing-grade beef and young male cattle for fattening. These have been admitted at either zero or a reduced levy rate but with full customs duty applying. In some cases, the required import licenses for manufacturing beef have carried a condition that the importer purchase an equivalent quantity of beef from EC intervention stocks. This practice is known as the "jumelage" system. In 1989, imports of 20,000 metric tons of frozen beef and 175,000 young cattle were allowed under the balance sheet scheme.

Autonomous high-quality cuts. This is a scheme separate from the high-quality cuts allowance under the GATT, which has operated for the past four years. It provides for the importation of 6,000 metric tons of high-quality beef free of import levies but subject to the full 20 percent customs duty.

EC-Yugoslavia agreement. Under this agreement, imports of 4,200 metric tons of baby beef are allowed at a reduced levy. The reduction depends on the strength of the EC market. The full customs duty is paid. Finally, in relation to imports, two other provisions in the EC beef regime have been brought into force in exceptional circumstances. For example, in the period from 1974 to 1977, because of a severe slump in cattle prices, import licenses for most categories of cattle, beef, and veal were totally suspended under a special safeguard clause. At the other end of the scale, in 1972 and 1973 when EC prices were exceptionally high, special and exceptional measures were introduced to ease the situation. Under these measures, the customs duties applicable to cattle, beef, and veal imports were either totally or partially suspended. This measure was taken in addition to the normal provision for reducing and eliminating import levies in such circumstances.

Export Refunds

From its inception, the EC beef support regime has incorporated a system of export subsidies designed to bridge the gap between the internal EC price and the prices obtained on export markets. These subsidies are sometimes referred to as "export refunds" or "restitution payments." As the EC moved from net importer to net exporter status, this component of its support regime naturally came to be the dominant one. The process by which the refunds are set is less clearly defined than in the case of import levies, and the refund can deviate significantly from the gap between the guide price and the export price for various reasons. The EC commission has tended to set the refunds on a three-month rather than a monthly basis, although they have at times adjusted the refunds more frequently depending on market conditions. This practice has often meant that the refund level became outdated during its period of application. Furthermore, the actual refund level is often

influenced by factors other than the EC/world price gap. Among these are: (1) the quality of beef in public storage within the EC, (2) the EC budgetary situation, (3) the outlook for both the EC and world market situations, and (4) political considerations, such as possible countervailing moves by competitors in the export markets.

The refunds apply to most categories of live cattle and fresh, chilled, or frozen beef carcasses or cuts. They are initially set in ECUs per 100 kg for the EC as a whole. For an individual member state, the ECUs are then converted to a national level by applying the "green" exchange rate and a monetary coefficient and then adding or subtracting the MCA applicable at that time for that country. Thus, if a positive MCA (subsidy on intra-EC exports) were in operation for a particular country, the refund on exports to non-EC countries would also be increased by that amount; while if a negative MCA were in operation, the refund would be reduced (see Appendix A for more details).

The refund level is differentiated according to the destination of the exports. For this purpose, there are five export zones:

Zone I: North Africa, Near and Middle East, except Lebanon.
Zone II: West, Central, East, and South Africa, except Botswana, Kenya, Madagascar, Swaziland, and Zimbabwe. For refunds on fresh or frozen boneless cuts, this zone also includes French Polynesia and New Caledonia.
Zone III: China, Hong Kong, Thailand, Burma, Pakistan, Sri Lanka, Vietnam, Indonesia, the Philippines, and North Korea.
Zone IV: Non-EC European countries (except Austria, Sweden, and Switzerland), the Canary Islands, Cuctas, Metilla, and Greenland; ships' stores, oil rigs, and military bases.
Zone V: Austria, Sweden, and Switzerland.

The highest level of refund generally applies to Zone I.

In addition to being differentiated by destination, the refunds are also differentiated by beef type. Thus, fresh or chilled steer beef in forequarter or hindquarter form carries a higher refund than does similar beef from female cattle.

Traders can opt to have the rate of export refund fixed in advance. The refund granted is the one operative at the time of prefixing and can remain valid for up to five months. Because the refunds are adjusted by the MCA applying to the country in question, there is also a provision for prefixing the MCA level. This option can only be used if the refund is being prefixed. To facilitate traders further, there is also a provision for the payment of export refunds in advance of proof of shipment or arrival at destination.

The Intervention System

This is the term commonly used for the public support buying system for beef within the EC which was first introduced in 1973. The original plan was that a specific quantity of beef would be removed from the market by an intervention agency when market prices are low, the beef would be stored, and then it would be released back onto the market when prices improved. Thus, it was intended that the intervention agency would be a buyer of last resort and that buying would only take place in exceptional circumstances. In practice, however, intervention buying has come to be a more significant and permanent component of the EC price support system. It has also become a very expensive component, so in recent times steps had to be taken to reduce its role to that originally intended. The most decisive moves in this regard were agreed upon in 1987. It is useful to outline the system as it had evolved up to 1987 before examining the steps taken to reduce its role.

In any support buying scheme, two elements are of particular significance. The first is the market price at which buying is triggered, and the second is the price that the buying agency is prepared to pay. In the EC beef regime, both of these elements hinge on what is known as the intervention price. At the outset in 1973, this price was set at 93 percent of the guide price. If the market (reference) price dropped below that level, support buying could be authorized and the intervention price could be paid for whatever supplies were offered by the intervention agency. The intention was to put a market floor at that level as far as possible.

Although, intervention buying of live cattle is theoretically possible, such buying has never happened in practice. All produce placed in intervention over the years has been in the form of carcasses, half carcasses, or quarters of steer, heifer, and bull beef. Only for a short period during the drought of 1976 was cow beef purchased. To facilitate the purchase of such categories, a set of killing-out percentages and technical coefficients are used to derive intervention prices for them.[1] These prices are converted to a national level by means of the "green" exchange rates applicable to the individual countries.

The modifications to the system over the years were mainly directed toward reducing the buying-in price, and making the introduction of support buying more dependent on market conditions. Thus, in 1976, the intervention price was reduced to 90 percent of the guide price. For some countries, this price was reduced further in 1978 through a revision of a set of coefficients by which the intervention price had to be multiplied prior to obtaining the buying-in price. These coefficients were intended to make allowance for differences in the quality of cattle. For all cattle types in the United Kingdom, Denmark, Belgium, and Ireland, the coefficients were less than 1.0. For Germany, France, the Netherlands, and Luxembourg, they were mostly greater than 1.0. The effect was that the buying-in price in any particular country could now differ significantly from the intervention price.

In 1978, steps were taken to make the introduction and suspension of intervention buying more responsive to market conditions. In particular, clear procedures were set down by which buying would be suspended in a particular country when its market price rose above 100 percent of the buying-in price, and reintroduced if it fell back below 100 percent. Over the years, quantity restrictions have also been imposed from time to time, such as setting a maximum percentage of

[1] This practice is necessary because the intervention price set at Brussels each year is for live cattle (because the guide price relates to live cattle.)

factory kill that could be sold into intervention and restricting purchases to either forequarters or hindquarters, depending on market conditions for those particular beef types.

In spite of the various modifications and restrictions, the level of support buying under the intervention system tended to remain unacceptably high. In 1987, an agreement was reached on measures designed to confine the system to its original role as a last resort to be applied only in exceptional circumstances. First, intervention buying is now confined to young bull beef and steers. Second, the intervention price is now set on a deadweight basis and differentiated by carcass type (bull or steer) and quality. Third, two new conditions must be met simultaneously before intervention buying is triggered. These conditions are: (a) the overall average EC market price for a particular grade must fall below 91 percent of the relevant intervention price; and (b) the market price for that grade in a particular EC member country must fall below 87 percent of that country's intervention price.

Also under the new rules, when intervention was allowed, the buying-in price was set at or close to the market price, which basically meant that the market price could not be higher than 87 percent of the intervention price. Intervention buying would operate only in the country and for the grade showing the depressed price.

In 1989, further restrictions were introduced. The EC and national trigger points were reduced to 88 percent and 84 percent, respectively, of the relevant intervention price, compared with the 91 percent and 87 percent levels that operated since 1987. Furthermore, intervention buying is now to be limited to 220,000 metric tons per year for the EC as a whole. This ceiling may only be exceeded in extenuating circumstances, defined as a market situation in which the EC price for a particular grade of beef falls below 84 percent of the intervention price and a particular country's price falls below 80 percent.

The buying-in price regulation also changed because a completely new buying-in system has been introduced. Under this system, the 220,000 metric ton intervention quota is to be filled by means of a tendering system. Meat companies will submit tenders to sell male beef into intervention, provided that the necessary trigger conditions are met for the country in question. If the tender is accepted, the price paid by the intervention agency will be the price indicated in the tender. Furthermore, the products must be delivered within 16 days of the final date for submission of tenders and payment will not be made until between 120 and 140 days after delivery.

Beef from intervention may be sold either to the home market or to export markets. The latter sales are eligible for the normal export refunds applicable to that beef type. Sales from intervention are made through either fixed price sales or tender sales.

In summary, the new provisions described have served to drastically reduce the dependency of the EC market on intervention buying. The 220,000 metric ton ceiling, if fully met, would amount to 38 percent of the peak intake of 582,893 metric tons, which occurred in 1986. It would amount to less than 3 percent of the forecasted EC production in 1990. Furthermore, the buying-in price for that limited amount is greatly reduced from previous levels.

Aids to Private Storage

Alongside the public intervention buying system, the EC has also operated an aids to private storage (APS) scheme. Again, the principle is to remove beef from the market at times of heavy supply and release it back onto the market at more favorable times. This scheme has increased in importance since the mid-1980s, and is likely to continue to do so in the coming years because of the curtailment of the intervention system.

Under the APS scheme, meat traders contract to store certain categories of beef for a specified period of time, and in return the EC Commission pays a subsidy toward the storage cost. The scheme is normally operated in the latter half of the year and usually for a two to three month period.

The trader can contract to store for a period of between four and eight months. However, there is provision for withdrawal after two months, provided that the withdrawal is for the purpose of exporting to a non-EC market. In that case, storage must have been for a minimum of two months.

The subsidy is comprised of a fixed amount of aid for four months plus a daily allowance for each day stored over the four months. If the beef is withdrawn for export before the end of four months, the fixed amount is reduced by using the same daily allowance. An attractive aspect of the scheme is that if a trader intends to store beef for later export to a non-EC country, it is possible to bond the beef and thus obtain the current export refund rate for fresh beef, which would be higher than that for frozen beef.

Each year when the scheme is introduced, the EC Commission fixes the subsidy rates and the categories of beef eligible for the program. In the past, both male and female beef have been eligible, but the 1988 and 1989 schemes have been confined to beef from male adult cattle. Different rates are specified for categories such as carcasses, sides, quarters, and pistola hinds and fores.

In the early 1980s, the APS scheme covered about 25,000 metric tons of beef. This amount increased to 275,000 metric tons in 1984 and is now operating at around 150,000 metric tons.

Other Subsidies

Most of the CAP expenditure in the beef sector is directed toward maintaining a satisfactory market price through the mechanisms described in the previous sections. Beef producers, however, have benefitted over the years from a number of direct subsidies or premiums, which take the form of headage payments. The main schemes in operation in recent years are described here.

Suckler cow premium. This scheme, introduced in 1980, applies to cows in herds kept solely for the purpose of producing and rearing calves. Dairy cows, which may in this context be defined as cows kept for commercial milk production, are excluded. An annual subsidy (premium) is paid to the

herd owner for each cow in his herd. In 1989, the premium was 40 ECUs ($43) per cow.[2] This level was a 60 percent increase on the rate paid the previous year. There is also a provision that allows national governments to add a further 25 ECUs ($27). The scheme is open to all member states, and there are no limitations with regard to number of cows eligible or the part-time or full-time status of the farmer.

Calf premium. This scheme, which was begun in 1975, provides for the payment of a premium for any calf that reaches the age of six months. The scheme was first applied in Italy only, and later it was applied in Italy, Greece, and Ireland only. The premium in 1988 was 9 ECUs per calf, which could be increased by up to 23 ECUs per calf by the national governments. The premium was abolished in 1989.

Special male premium. This premium was introduced in 1987 as a temporary compensation to beef producers for the curtailment of the intervention buying system. It currently amounts to 40 ECUs per animal, which can be increased by up to 25 ECUs by the national governments. Payment is limited to 90 male animals per farm, and it can only be paid once during the lifetime of the animal. The program is open to all member states and all herd owners.

Less-favored areas scheme. This scheme, introduced in 1975, provides for annual headage subsidies to be paid on certain livestock categories in selected areas of the EC. These areas are judged to be disadvantaged by criteria such as low agricultural output, low population density, and poor infrastructure. Introduced in 1975, the scheme is limited in its scope by a number of built-in restrictions. Among these are the off-farm income of the farm family, which must be below a certain level per farm; upper limits in the number of eligible amounts and the total payment per acre; dairy cows in excess of the first ten, and farms below a certain size, which are ineligible. The subsidy rate

[2] This figure is based on an exchange rate of about $1.08 per ECU, which was the approximate rate for July to September 1989.

varies by animal category and member state. The current annual subsidy for cattle can be as high as 101 ECUs per livestock unit.[3] This level, however, could be severely reduced on many farms because of the restrictions mentioned and particularly because of the upper limit on payment per acre.

Milk Sector Supports

In the EC, a high proportion of the calves entering the beef production chain come from dairy herds and are the surplus calves remaining after retention for normal cow replacements. In addition, the beef market has on occasion been significantly affected by dairy farmers' decisions to alter herd sizes. In times of herd expansion, cow cullings are reduced and additional heifers are retained for breeding. The result is a temporary reduction in the supply of cow and heifer beef. Conversely, in times of dairy herd contraction, the supply of beef in these categories is temporarily increased. Overall, therefore, a permanent reduction in dairy herd sizes will at first add to beef supplies but eventually will lead to reduced supplies. The converse is true for a permanent increase in dairy cow numbers. It is clear, therefore, that beef supplies are intrinsically dependent on the market support operating in the milk sector. This section presents a brief outline of the system.[4]

Import and export measures. These measures are similar in principle to those applied in the beef sector, although there are operational differences. For imports, the EC sets threshold prices each year for the main dairy products. A levy is then charged on imports, which is equal to the difference between a product's threshold price and its world (lowest offer) price. Thus, the threshold price is a minimum import price and as such represents one of the elements of support that keeps internal prices well above the corresponding world prices.

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[3] A livestock unit is the equivalent of one beef cow in feed requirements.

[4] The measures described here apply to manufacturing milk. Milk prices (i.e., milk for direct human consumption) are not set at the EC level or directly supported by the CAP.

There are export refunds on exports to enable EC dairy products to be competitive on the world market. These refunds are designed to bridge the gap between the EC market price and world prices. Because the EC is a substantial net exporter, this mechanism coupled with a support-buying (intervention) system plays an important role in maintaining the high internal milk price.

Intervention system. Intervention buying is operated in the internal butter and skim milk markets where prices are set for those products annually.[5] These prices are derived from a target price for milk, which is the price the support policy aims to guarantee to producers. The skim milk and butter intervention prices are usually set at a level sufficient to yield about 80 percent of the target milk price. The intervention agency is available to purchase these products from processors at those prices, thereby placing a floor in the internal market. This support mechanism is further bolstered by the fact that sales out of intervention to non-EC countries also qualify for export refunds.

Production quotas. Under the price support system, growth in EC milk production continuously outstripped growth in EC milk demand. Dependence on the intervention system mounted, and the cost of the support system became excessive. By 1984, surplus production had reached over 20 percent and was projected to continue to increase. It was against that year's background that the EC decided to introduce milk quotas in 1984. Each member state was allocated a quota based on historical production levels. Milk within the quota qualifies for the normal (supported) price. Milk in excess of the quota receives that price but is then subject to a superlevy. Currently, the superlevy is larger than the price, and this system has been absolutely effective in halting the growth in milk supply. In fact, with continued improvement in milk yields, it led to a 16 percent reduction in dairy cow numbers in the EC between December 1983 and December 1988, which in turn caused considerable disruption in the beef market.

[5] In Italy, the intervention system is operated on cheese instead of butter and skim milk powder.

Other measures. Since 1977, the EC has also charged a co-responsibility levy on milk sold to creameries.[6] This is a percentage levy, usually set at about 2 percent, and the proceeds are used to expand the market for milk and milk products. Although this approach was intended to curtail supply, the levy was never large enough to be effective in that role.

In the late 1970s, the EC introduced a nonmarketing of milk scheme and a dairy herd conversion scheme. In the former, farmers were given substantial compensation payments if they agreed to cease milk production and dispose of their cows. In the latter, farmers were offered compensation for ceasing to sell milk but were allowed to retain their cows for use as sucklers in beef production. These schemes had only a limited impact on overall milk supply. In 1986, a similar scheme was introduced to encourage discontinuation of milk production. Again, the uptake was relatively small.

The EC Pork Regime

Introduction

The 12 countries of the EC produced about 13.3 million metric tons of pork in 1988. This amount was just over 50 percent of total meat production and about 11 percent of total agricultural production. The EC is more than self-sufficient in pork and exported over 500,000 metric tons in 1988, mainly to the United States and Japan. At the same time, EC imports amounted to about 130,000 metric tons.

The common EC support regime for the pork market began in July 1967. Its introduction paralleled that of the cereal regime and the two are closely interlinked. This situation is not surprising, given that compound feed, usually consisting of a high cereal component, can account for over 70 percent of pig production costs. The system, which has evolved over the years, is designed

[6] This levy is not applied to liquid milk sales and sales to creameries in disadvantaged areas of the EC.

to support the internal EC price for pigs at a relatively high level in comparison to world prices. It does this primarily through two measures:

(1) An import levy/export refund system to prevent dilution of the internal price through trade.

(2) An APS scheme, which may be introduced to help alleviate the problem of temporary surpluses in supply.

Although public intervention buying similar to that operated for beef is provided for, it has only been applied in the pig sector on one occasion (Belgium in 1985) because private storage has always been considered a less expensive and generally more efficient means of dealing with temporary surpluses.

The pork regime covers live pigs (except for purebred breeding stock), pork and offals, pig fat and lard, sausages, and other preserved meat or meat offal. Each year, a basic price is set that applies to carcasses or half carcasses of a standard quality. This price is decided by taking into account the price needed to give pig producers an adequate return, and the necessity to avoid creating a structural surplus in the pork market. Because of the way in which the support measures are put into operation, however, the basic price has no practical role in determining the amount of market support. This situation contrasts the beef and mutton regimes, where the basic prices play an important role. Market support for pork is linked primarily to differences in costs facing EC producers and non-EC producers.

Protection Against Imports

The internal EC price is protected against cheaper imports through a system of import levies. In the beef and mutton regimes, import levies are designed to bridge the gap between an internal EC target price and the price of imports, inclusive of any customs duties that apply. In the pork regime, the import levy, called the basic import levy, is calculated not as the difference between external and internal prices but rather as the estimated difference between external and internal production and marketing costs.

A central concept in the levy derivation is the sluice-gate price. This price is calculated quarterly and is, in effect, an estimate of the cost of pork production and marketing in non-EC countries. As such, the sluice-gate price is composed mainly of a cost factor derived from cereal prices on the world market. The cereals used are barley (40 percent), maize (35 percent), and oats (25 percent), and the c.i.f. prices for these commodities at Rotterdam are used. The method of calculation assumes a feed conversion factor of 5.46. In addition to cereal costs, allowance is also made for (1) other production costs such as transport, insurance, and labor, (2) costs of feed components other than barley, maize, and oats (e.g., protein balancer, mineral salts, and vitamins), and (3) overhead costs in production and marketing. The sum of all these cost elements gives a sluice-gate price, which is calculated in ECUs on a per 100 kg carcass meat basis. This price is used as a proxy for an import price in the levy calculations.

The difference between EC and non-EC costs is brought into play in calculating the basic import levy, which has two components: a variable element and a fixed element. The variable element is set equal to the difference in production costs arising from the difference in cereal prices in EC and non-EC countries. Here, the non-EC cost is based on c.i.f. prices at Rotterdam for barley (40 percent), maize (20 percent), oats (10 percent), rye (20 percent), and sorghum (10 percent). The EC cost is based on the Rotterdam threshold prices set by the EC for these grains each year. These threshold prices are the Duisburg target prices for such cereals, adjusted downward by the cost of transport between Duisburg and Rotterdam, a discharge cost, and a commercial margin.[7] Thus, these prices are in effect the EC target prices for Rotterdam rather than the actual market prices. The difference between these prices and the non-EC grain prices is then transformed to a carcass pork basis by assuming a feed conversion factor of 4.2.

[7] The EC target prices for the main cereals are set for Duisburg, Germany, which represents the region of maximum grain deficit. Rotterdam is the main port of entry for grain imports.

The fixed element is calculated as 7 percent of the average sluice-gate price for the previous twelve months and is added primarily to protect the domestic EC processing industry. The sum of the sluice-gate price and the two levy elements effectively gives a minimum import price for pig carcasses. As such, the prices are key components in the underpinning of the internal market price.

In the July to September quarter of 1989, the sluice-gate price was calculated as 118.81 ECUs ($128.11) per 100 kg of pork carcass. The variable element of the levy was set at 44.181 ECUs ($47.64) per 100 kg, and the fixed element at 7.206 ECUs ($7.77) per 100 kg. In the same quarter, the actual average EC market price was 166 ECUs ($178.00) per 100 kg.

The common ECU sluice-gate price and levies are converted to the national level by means of the green exchange rates. The levy is adjusted for MCAs wherever these apply (see Appendix A.) The sluice-gate price, import levies, and MCAs for meat categories other than carcasses are derived by applying appropriate technical coefficients to the carcass figures. For processed products, an additional amount is added to the basic import levy to reflect the extra value added, which can be up to 10 percent of the c.i.f. prices for such products.

If the world price (the offer price) drops below the sluice-gate price and this threatens the EC market-price, there is provision to impose a supplementary levy to raise the effective offer price to the sluice-gate price level.

In practice, no customs duties are paid on pork imports except for very select products such as heads, feet, tails, livers, tongues, and liver sausages. The duty on these items ranges between 4 percent and 25 percent. On joining the EC in 1986, Spain and Portugal agreed to adapt to the common policy on a phased basis. As a result, both have been allowed to operate restrictions on imports by means of quotas. These restrictions are to be phased out by 1995. In December 1989, the EC agreed to reduce by 50 percent the import levies on 18,300 metric tons of pork from these countries as a measure of economic aid to Poland and Hungary.

Refunds on Exports

Exports of selected pork products from the EC qualify for an export refund to enable them to compete in world markets. These refunds are set for three month periods. The method of setting them is rather vague compared to that applied to the import levy. In theory, they are designed to offset the difference between the internal EC price and the world price. In practice, other factors such as the prospective supply/demand situation of these markets and undertakings given to trading partners play a significant role. Usually two rates are fixed: a rate for North America and a higher rate for all other non-EC countries.

There is a provision that allows for prefixing of the refund. An export license is granted that is valid for up to two months beyond the month of issue. The refund is fixed for that period. To obtain such a license, however, a security payment must be advanced to ensure that the exports actually take place. If the exporting country is subject to an MCA on its pork exports, the allowable export refund is adjusted for this. Thus, a negative MCA would cause the refund to be reduced, whereas a positive MCA would cause it to be increased. The MCA can also be prefixed at the same time as the export refund.

Aids to Private Storage (APS)

Public intervention buying is provided for in the EC pork regime. This, in theory, can be triggered if the average market price falls below 103 percent of the basic price. The buying-in price would be between 78 percent and 92 percent of the basic price. In practice, intervention buying has occurred on only one occasion even though the market price has often been below the trigger point for long periods. Instead, the preferred internal support measure has always been APS.

Like intervention buying, APS may be introduced when the market price drops below 103 percent of the basic price and is likely to stay below that level. However, this rule has not been applied in practice. Over the past decade, the EC market price for pork has been almost continuously

well below 103 percent of the basic price, but the decision on whether and when to introduce APS has been made on the basis of a more general consideration of the market situation rather than strictly on the actual prevailing price.

The APS scheme involves a payment or subsidy to traders who store pork for a certain period of time, usually between four and seven months. The traders are required to sign a contract to that effect and lodge a security as a sign of their intention to fulfill the contract. Only in the case of meat for export to non-EC countries are premature withdrawals from storage allowed, and then there is a deduction from the subsidy for each day missed. The general intention of the scheme is to remove supplies from the market at times of oversupply with a view to putting them back on market later when the situation improves or, alternately, of disposing of them on the export market. In the latter case, these exports qualify for whatever MCA-adjusted export refunds are being paid at the time. The scheme has become more popular over the years, and in 1988 approximately 200,000 metric tons of pork were covered by APS contracts compared to less than 90,000 metric tons in 1980. The 1988 figure, however, still represents less than 2 percent of total EC production.

In summary, there are several support measures either in actual operation or provided for in the EC pork regime. Although a basic price is set that normally would be interpreted as a target price, the support mechanisms are not directly linked to that basic price. Thus, in 1988 the basic price was set at 203 ECUs ($240.50) per 100 kg. The market price, however, averaged only 121 ECUs ($143.00) per 100 kg.

The EC Mutton Regime

Development of the Mutton Regime

Compared to the beef and pork regimes, the EC's mutton regime is of relatively recent origin (1980). However, it could be argued that the forces that generated the pressure for a common policy

in this sector had their origins in the first enlargement of the EC in 1973 when the United Kingdom, Denmark, and Ireland became members. Prior to that, France was the EC's only major mutton producer and consumer. Perhaps it was primarily for that reason that France was permitted to unilaterally manage and protect its sheep market. After 1973, the balance shifted somewhat because two of the new member states, the United Kingdom and Ireland, had significant sheep industries with substantial exports. It was only a matter of time until objections were raised that the French policy contravened the Treaty of Rome.

In 1978, under threat of legal action, France granted Ireland free access to its market in a bilateral agreement. The United Kingdom, on the other hand, took its case to the European Court of Justice and won. It was then agreed by all EC member states that if France were to remove all tariffs against imports of mutton, the most logical next step would be to establish a common, Community-wide policy. In May 1980, a policy covering both mutton and goat meat was approved by the member governments to begin that October.

The Basic Price

Each year, a basic price is set for fresh and chilled sheep carcasses, which is a target price set primarily with a view to ensuring a reasonable return to producers. However, in fixing the price, consideration is also given to (1) the budgetary cost of the associated support measures, (2) the current position and future expectations regarding EC production and consumption of mutton, and (3) the market situation for other livestock products, particularly beef and veal.

The basic price is initially set in ECUs, and this price is common to all member states. It is then converted to national prices by applying the relevant green exchange rates for each country. The basic price is a key element in the calculation of the ewe premium, which is the chief measure used to support producer returns.

The Ewe Premium

The principle behind the ewe premium is that, if the market price that producers receive for lambs should fall below the basic price, the shortfall is made up by means of a subsidy (premium) paid on a per ewe basis. Thus, it is a form of deficiency payment. For the purpose of administration, the EC is divided into a number of regions. Originally there were seven:

1. Italy and Greece
2. France
3. Belgium, Denmark, West Germany, Luxembourg, and the Netherlands
4. Republic of Ireland
5. Great Britain
6. Northern Ireland
7. Spain and Portugal (since 1986)

The market price, officially referred to as the representative price, is monitored for each region throughout the year. In the event that the annual average is below the basic price, the income loss in each region is calculated as the difference between the basic and the representative price per 100 kg carcass weight multiplied by indigenous production (100 kg of mutton.) This number is then divided by the number of ewes in the region that are eligible for the premium. Only in-lamb ewes in flocks of ten or more such ewes are eligible. Where additional support payments are in operation (e.g., the variable premium in Britain, see Appendix B), these are deducted from the income loss.

Other Support Measures

The ewe premium measure is applied in all regions. In addition, there is provision in the regulation for (1) intervention buying, (2) APS, (3) export refunds, (4) protection against imports, and (5) a variable premium (in Great Britain only).

Intervention buying is normally allowed only during the period from July 15 to December 15. An intervention price is set at 85 percent of the basic price and is seasonally adjusted. If the average EC market price drops below that level and at the same time a similar price relationship exists in at

least one region, intervention buying is permitted. In practice, however, this form of support has been used only to a negligible degree and the provision for it was abolished January 1, 1990.

APS is also provided for in the regulations and is designed to come into operation if the EC market price falls below 90 percent of the basic price or if this condition merely applies in one or more regions. From 1990 onward, the APS scheme is to be revamped along the lines of the beef APS scheme. It is intended to act only as a "safety net" and will operate on a tendering basis in times of depressed market prices. To date, the APS provision has been used very little in the mutton regime.

In relation to imports, the EC mutton regime provides for protection through customs duties and import levies backed up by a system of import licenses and security payments. The largest product category covered is fresh, chilled, or frozen sheep or goat meat. In principle, this category is subject to a variable import levy calculated as the difference between the basic price and the "free at frontier" offer price. In practice, under GATT rules, the levy is subject to a maximum limit which is set at 20 percent of the customs value. Other less significant categories are subject to customs duties only, which range from zero for purebred breeding stock to 24 percent for edible offals that are salted, in brine, dried, or smoked. There are, in addition, provisions for (1) a special levy on mutton imports and (2) an outright suspension of imports, both in the event of a serious drop in market prices. The regulations also require that most imports take place under license and that these licenses be granted only after lodging of a security payment to guarantee that the imports will actually take place and within a given time period.

Although these are the basic regulations governing imports in the mutton regime, in practice almost all imports occur under concessionary schemes that grant more favorable entry conditions to limited qualities. Voluntary restraint agreements (VRAs) have been drawn up between the EC and a number of countries that traditionally import mutton into the EC. Under these VRAs, the exporting

country agrees to limit its exports to the EC. In return, the EC applies no import levy and a customs duty of 10 percent instead of the normal 20 percent. These agreements usually contain further undertakings regarding limits on exports into "sensitive areas," i.e., France and the Republic of Ireland.

By far, the most significant VRA has been one setting an upper limit of 245,500 metric tons on imports of lamb into Britain from New Zealand. In latter years, production in New Zealand has fallen and thus the quota, once considered quite restrictive, is no longer reached. A new limit of 205,000 metric tons was agreed upon for 1990. Other sizeable VRA quotas have been 23,000 metric tons from Argentina, 17,500 metric tons from Australia, 5,800 metric tons from Uruguay, and 4,800 metric tons from Yugoslavia, as well as 10,000 head of live sheep from Hungary and 5,800 head from Poland. The Argentinean limit was reduced to 19,000 metric tons for 1990. The Australian limit remained at 17,500 metric tons.

In the case of countries with which VRAs have not been drawn up, the EC unilaterally allocates import quotas. Again, these imports are free of import levies and are subject to a reduced customs duty of 10 percent. Unlike the VRA quotas, the granting of import licenses for these quotas is made subject to payment of a security.

On the export side, the refund system is similar to that operated for beef. This system has never been applied and, in any case, EC exports of live sheep and mutton are minimal. In fact, the EC is only about 80 percent self-sufficient in mutton, although this situation is changing because of a rapid rise in sheep numbers in Ireland and the United Kingdom.

Recent Policy Changes

Two recent EC developments are likely to impact significantly the level and system of price support in the EC sheep sector. The first is a general EC budgetary reform package designed to halt the rising cost of the CAP. This reform has meant the application of a stabilizer system when setting

guide and basic prices. The principle behind this system as applied to the sheep sector is that maximum production targets are set for each region. For every 1 percent by which regional production exceeds the target, the regional basic price for the following year is reduced by 1 percent. This policy is of particular significance in the sheep regime because the support system is such that producers effectively receive the basic price. The ewe premium bridges whatever gap might exist between the market price and the basic price, which contrasts the beef and pork regimes under which actual producer returns usually fall well below the target price. With rising ewe numbers in the EC, the expectations are that the stabilizer clause will, in the near future at least, force a downward adjustment in the basic price set in the annual price-fixing process and that there will be a resulting reduction in ewe premiums below the levels that would otherwise apply.

The second significant development is a recent agreement to harmonize and rationalize regulations in the sheep regime itself. The main changes are that:

(1) the number of regions is to be reduced from seven to one so that a single ewe premium will apply throughout the EC,

(2) the British variable premium system is to be phased out, and

(3) ewe premium payments per farm are to be limited to 500 ewes in lowland areas and 1,000 ewes in less favored and mountain areas. Ewes in excess of these limits will qualify for only 50 percent of the full premium.

These changes were to be phased in over the 1990-93 period and will result in a common support system, with Britain coming into line with the rest of the EC. Spain and Portugal, on becoming members in 1986, fully adopted the EC arrangements

The mutton regime has, in terms of budgetary expenditure per ton of meat, been the most expensive of the EC livestock support systems. Although the new measures may halt its escalating costs, it is likely to remain an expensive system.

Literature Review

This section reviews the literature on sources of meat supply and demand elasticities available for EC member states. In reporting elasticities, emphasis is placed on the degree of disaggregation and on primary sources and quality of estimates.

The sources of elasticities are considered under five headings. The first is the Ministered Trade Mandate (MTM) model developed by the Organization for Economics Cooperation and Development (OECD) to address the implication of globally reduced agricultural sector protection (OECD 1987). The second is the Newcastle CAP model developed by Thomson (1985), with an emphasis on estimating the financial implications of CAP alterations for different economic agents. This also was the goal of the models developed, both individually and in collaboration, by Munk (1986) and Munk and Mahé (1987).

The International Institute for Applied Systems Analysis (IIASA), based in Austria, has also done much work on modeling EC food markets (Färber 1984). This model is evaluated as well.

Finally, some less comprehensive elasticity sources are considered. Caspari, Macharen, and Hobhouse (1980) conducted an exhaustive literature review of EC supply and demand elasticities for farm products; their work is summarized. Subsequent publications are also considered in this section.

The MTM Model

Methodology. The global MTM model covers all major industrialized economies, many other economies, and all economic sectors. The EC is treated as one economic zone. Elasticities are borrowed mainly with estimations or assumptions only for elasticities not available from other sources. Neither consumer preferences nor the underlying production technology are specified. The model has only a simulation component.

The supply and demand elasticities are the parameters of linear supply and demand functions, respectively. There are two equations, one supply and one demand, for each commodity. Commodities are classified under three broad groupings: livestock, dairy, and crops.

The model is medium term (five years); that is, adjustment to new price levels is assumed complete after five years. The model is partial because many variables relevant to the agricultural sector are not considered. For example, agricultural input prices and disposable income are not incorporated. The model is comparative static because estimates of the dynamic adjustment over the intervening five years cannot be recovered. Each economic zone is connected to the world market through the effect of exchange rates on domestic output prices.

Country and commodity coverage. The ten oldest member states of the EC are included. In the future it is intended to cover all member states. Countries are not considered individually; i.e., price differences, national currencies, and intra-EC trade flows are not modeled. Elasticities are weighted averages of estimates for individual countries.

Own-price supply elasticities are available for beef, pork, mutton, and poultry meat, but not for fish, which is not considered by the model. Cross-price supply elasticities are not available; however, beef, pork, and poultry meat supply elasticities with respect to unit feed cost are provided. Own- and cross-price demand elasticities are available for all combinations of the four meats except for pork with respect to poultry. No time change parameters are available.

Data. Elasticities are mostly borrowed. Where more than one elasticity is available, averages are used. Meat supply elasticities are from the IIASA EC model estimates. Because poultry and pork were combined as one product by IIASA, their own price supply elasticities are identical. IIASA imposed the same supply and demand model specifications for each country. The models are estimated for each individual country. EC supply elasticities are arrived at by arithmetic weighted

averaging. Weighting is according to state share of total EC production of that commodity. The data appears to be from Eurostat.

A wider choice of elasticities is available on the demand side. Again, IIASA elasticities are available, but they were not used. IIASA demand elasticities may not have been available when the MTM model was being constructed. Alternately, the sources that were used may have been considered more accurate. The demand elasticity sources that were used were mainly national studies conducted by individual researchers. Some studies were EC funded. Mutton demand elasticities are not reported for some countries. The data source from which these elasticities were estimated is not made clear.

Evaluation. Commodity coverage, while not complete, is not a critical deficiency of the model. The model is not disaggregated to a national level, which is a critical deficiency. Cross-price supply elasticities are not present. However, commodity elasticities with respect to feed costs are present. In conclusion, the model would be a satisfactory starting point were it disaggregated to a country level.

The Newcastle Model

Methodology. The Newcastle model considers only the EC agriculture sector and its interactions with world markets. Each country is treated separately. Elasticities are borrowed and are sometimes adjusted; again, neither consumer preferences nor production technology are specified. Emphasis is placed on calculating the welfare and financial consequences of policy changes for different groupings of economic agents. The model seems to have only a simulation component consisting of supply and demand equations linear in exogenous prices where the elasticities are price coefficients.

The model gives only long-run output. The adjustment path cannot be traced. The model attempts to account for trade flows both within the EC and between the EC and the rest of the world.

However, the model seems more suited to modeling intra-EC trade rather than trade with the rest of the world.

Country and commodity coverage. All EC countries are modeled (the model may not have been updated to include Spain and Portugal). Sixteen commodities are covered and include pork, poultry meat, beef and veal, and mutton. Elasticity sets used at the country level are not readily available. Whereas own-price supply elasticities exist for the EC as a whole, cross-price supply elasticities are sparse. Further, own-price supply elasticities seem to be set at 1.0. This suggests heavy reliance upon assumption rather than on estimation. On the demand side, all own- and a few cross-price elasticities are present. Own-price elasticities do not seem to be set as do supply elasticities. No time change parameters are present.

Data. Elasticities are either borrowed or assumed. Averages may have been used where more than one estimate was available. Consequently, the ultimate data upon which estimation was made is not known.

Evaluation. The purpose of the Newcastle project was to model the CAP; that is, food supply and demand and CAP finance requirements. That task is larger than ours, and the focus differs. Their treatment of country meat sectors is insufficiently detailed for the purpose of our model.

The Newcastle model papers do, however, give valuable insights to the problems of CAP modeling. The link between the cereal and livestock sectors is emphasized. The opinion is offered that quotas on internal production and on imports from outside the EC may increase in importance. The Newcastle model has difficulties in accommodating quotas, as do most of the models. It is pointed out that data on intracommunity trade flows is often imprecise and difficult to model. The papers also state that results are particularly sensitive to elasticities, but they are sensitive to trend rates in production and consumption and to world market movements.

Munk's Model and Mahé's Models

These two models are considered together because Munk and Mahé have done much work together and have linked their models to address specific problems.

Methodology. As is done in the Newcastle model, the EC agrisector alone is considered, together with its interactions with world markets. Countries, however, are not treated separately. Therefore intra-EC trade cannot be analyzed. The response time associated with the elasticities is not stated, which may be problematic. The model is not dynamic and does not include an output demand component.

The Johansen modeling approach was used. Both outputs and inputs are functions of exogenous variables.

$$Y_i = F_i (P_i, W_j, Z_k) \quad (1)$$

$$-X_j = G_j (P_i, W_j, Z_k) \quad (2)$$

where Y_i and $-X_j$ represent output and input volume vectors, respectively; P_i and W_j represent output price and input price vectors, respectively; and Z_k represents a vector of short-run fixed factor levels. One may then arrive at elasticity sets, which are used to solve output and input demands, given prices and fixed factor levels. A functional form is often used in obtaining elasticity estimates. Munk does not use a direct functional form. He regresses to find constant elasticity of substitution values for outputs and inputs. He then used assumptions about separability, homogeneity, and symmetry to arrive at own- and cross-output price elasticities evaluated, presumably, at data means. Prior information is incorporated in the procedure. Using these elasticities, simulations may be run.

Country and commodity coverage and data. The EC is treated as the basic geographic unit. Own- and cross-price elasticities are available for beef, pork, poultry, and sheep or goat meat with

respect to the price of each and to the price of feed. The model has a detailed animal feed module, which is also a component of the MTM model.

The data used are from Eurostat Agricultural Accounts and from Eurostat crop balance sheets.

Evaluation. The model is not disaggregated by country and is therefore not suited to our purpose. Further, much information remains unstated in the literature. For example, how and to what extent prior information has been incorporated is unclear. A point to note is Munk's opinion that the imposition of a functional form seldom leads to a satisfactory outcome for models of the EC agrisector.

The IIASA Model

Methodology. The EC model is one in a system that covers most of the important food supplying and demanding economies in the world. All the EC countries are considered as one economic zone because EC agricultural price and trade policies are assumed to be commonly controlled. Further, it is expected that a greater degree of integration will exist. However, it appears that, in establishing parameters for the EC model, national elasticity sets for each EC country were estimated for both supply and demand sides. The model is dynamic on both supply and demand sides. It is mainly deterministic, but does permit stochasticity attributable to weather.

The model contains an exchange component, a supply component, and a demand component; supply is recursive. The interaction is of a cobweb model nature. Supply elasticities are arrived at by simple linear ordinary least squares (OLS) estimation. Demand has four components: consumption, investment, inventories, and international trade. Consumption is modeled as a dynamic, nonlinear expenditure system.

Country and commodity coverage. The model has expanded with EC expansion, covers the EC-10, and may now cover the EC-12. Beef and mutton are aggregated. Pork, poultry meat, and eggs are aggregated. Fish is represented separately, but its elasticities may be difficult to obtain because it

may be aggregated with pork, poultry, and eggs to render it compatible with other IIASA/CAP model commodity lists. Elasticities of supply with respect to other annual feed prices are present. At the EC level, elasticities of supply with respect to world prices have been estimated for each product, as have elasticities of domestic own-prices with respect to world prices.

Data. Supply data must come from Eurostat or their national sources. Much information is obtained from Income Accounts. The source of demand side data is not clear.

Evaluation. This is the only set of consistent supply and demand elasticities available at the EC level. The underlying estimation procedure seems to be well tried and tested. Supply is of Leontief Input-Output model form and so suffers from the deficiencies of linear programming. Linkages of EC commodities to the rest of the world seem to be well quantified. If, as may be the case, elasticities exist at the national level, the only reservation about this model is the quality of the elasticity estimates.

Other Studies

Demand. Fulponi (1988), using an Almost Ideal Demand System (AIDS) model on French data, has estimated own- and cross-price uncompensated demand elasticities and income elasticities for beef, veal, mutton, poultry, and pork. The data used are from a national household budget survey (INSEE 1974, 1980, 1987). The elasticity estimates are shown in Table 2.

The study's results suggest that own-price and income elasticities have been constant over time for the meat aggregate and for four of the five individual meats. Veal own-price elasticity seems to have risen over time and was positive in 1985. Its income elasticity seems to have fallen over time and was negative in 1985.

Table 2. Uncompensated price elasticities, Fulponi (1985)

	Beef	Veal	Mutton	Poultry	Pork	Income Elasticity 1985 Income
Beef	-0.76	0.278	-0.308	-0.226	-0.315	0.8926
Veal	-0.131	0.442	-0.335	-0.195	-0.24	-0.8545
Mutton	0.049	0.292	-0.786	-0.111	-0.348	1.4702
Poultry	-0.025	-0.156	0.117	-0.877	-0.08	1.6461
Pork	-0.028	0.173	-0.156	-0.228	-0.479	1.4495
			Own-price (1985)		Income (1985)	
Meat in Aggregate			-0.7332		1.107	

Two AIDS model studies have been reported for the United Kingdom. Chester and Rees (1987) estimated income elasticities for beef, pork, lamb, and fish. The Meat and Livestock Commission (1989) estimated an AIDS model of the form:

$$W = a + B_1 \text{Log}(TX) + b_2 MP + b_3 PP + b_4 FP + b_5 (\Delta FP) \quad (3)$$

where

W = the red meat and bacon share of total consumer expenditures
TX = total consumer expenditure at constant prices
FP = price index of all food items
PP = price index for poultry
MP = price index for red meat, bacon, and meat products
ΔFP = percentage change in the food price index

The estimated equation was

$$W = \underset{(7.78)}{37.459} - \underset{(3.88)}{2.723}\log(TX) + \underset{(7.83)}{0.031}MP + \underset{(10.25)}{0.047}PP - \underset{(1.67)}{0.082}FP - 0.005(\Delta FP) \quad (4)$$

$R^2 = 0.9945$

The expenditure elasticity of red meat and bacon is positive and has declined over time.

Year	Expenditure elasticity of red meat and bacon
1974	0.44
1986	0.07

Donatos and Mergos (1989) also applied an AIDS model to Greek food data. Meat was not disaggregated.

Tyers and Anderson (1988) report price elasticities of demand and income elasticities for the EC-10. Meat is disaggregated only into the categories of ruminant and nonruminant. Individual countries are not considered. They also report these elasticities for Spain and Portugal, which are treated as one economic unit. Rojko et. al. (1979) report own-price and some cross-price demand elasticities for the EC and for Spain and Portugal. Own- and cross-price demand elasticities also exist for the principal meats for Ireland.

Supply. Revell and Thomson (1988) have estimated a beef supply model for the EC-10 as an economic unit. It is assumed that cow numbers change in a partial adjustment manner. Fit, especially of the cow herd equation, was poor. Arregui (1986) estimated a similar model at EC level. Boussard (1982) has estimated some meat supply elasticities for some EC countries. At the EC-10 level, both Rojko and Tyers and Anderson have presented own- and cross-price elasticities for some meats. Both sources have estimated some of the required elasticities for Spain.

Finally, a paper by Colman (1985) may be worth considering. He showed that, for the EC grain sector, changes in institutional EC price levels do not transmit completely and cannot be expected to. The transmission losses for EC wheat and barley were not trivial. This finding may be true also for meat products.

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APPENDIX A

THE EUROPEAN COMMUNITY'S AGRIMONETARY SYSTEM

Each year in the annual European Community (EC) price-fixing process, the Council of Ministers* agrees on a set of target and intervention prices, commonly known as institutional prices, for the main products covered by the Common Agricultural Policy. These prices are set in European Currency Units (ECUs). An ECU is a basket of specific amounts of the national currencies of the EC member states and serves as a common currency for the EC. The amount of each currency in the basket is based primarily on the relative economic importance of each country in the EC economy. At present:

1 ECU = O.6242 DM + 1.332 F.Fr. + 151.8 Lira + 0.2198 Guilder
+ O.08778 U.K. + 0.008552 IR + 0.1976 Kroner
+ 3.431 B.Fr. + 1.440 Drachma + 6.885 Peseta
+ 1.393 Escudo

To convert the institutional prices from ECUs to national currencies, it is necessary to use exchange rates. In the early days of the CAP, these rates were the ordinary market rates** which operated smoothly until 1969. In August 1969, the French franc was devalued by 11.11 percent. If the new exchange rate had been applied to the CAP prices, it would have meant a sharp rise in ECUs France when converted to francs. This rise would have led to higher farm prices and higher food prices, something which, at least for the main food products, was unacceptable to the French government. The solution adopted was to allow France to continue to apply an exchange rate at or close to the old rate when converting most CAP prices and to apply the new market rate for all other

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* This group, comprising members from the individual member states, makes the final decisions on support prices and other CAP matters.

** At that time, a different basket of currencies was used for the common currency unit.

(agricultural and nonagricultural) trade and international transactions. Thus the concept of a "green exchange rate" was born. In official documentation it became known as the representative rate. Shortly afterward, Germany revalued its currency and adopted a separate green exchange rate to avoid a drop in farm prices.

The dual exchange rate system could not stand on its own. The application of green rates different from market rates would mean that the institutional prices of CAP products (e.g., intervention prices) would have been different in the two countries, which would have seriously distorted trade flows. To prevent distortion, a system of border taxes and subsidies was devised for such products. These taxes and subsidies were effectively designed to bridge the gap between the market and the green exchange rates and became known as Monetary Compensatory Amounts (MCAs). Thus, if a country had devalued its currency but did not wish to apply this to its CAP products, a negative MCA would be introduced consisting of a tax on exports and a subsidy on imports. Conversely, a positive MCA would be applied in the case of a revalued currency. This system, which in 1969 was intended only as temporary and transitional measure, has continued in the EC to the present time in spite of numerous statements of intention by the Council of Ministers to phase it out. In fact, all member states have applied MCAs from time to time and they are still being applied in about half the member states. Thus, since January 11, 1990, beef trade in Greece operates an MCA of 21.2 percent at one extreme, whereas Spain operates an MCA of +1.4 percent at the other extreme. To further complicate matters, it is quite usual to fund individual countries operating different MCA rates for different CAP products. The entire system of separate green rates supported by MCAs is commonly referred to as the agri-monetary system.

The use of green rates in the CAP system can give rise to numerous complications, two of which are relevant to the present study. The first could arise if, for example, a U.S. analyst wanted to compare an institutional price such as the target price for cereals in the EC with its counterpart in the

United States. This would not be a simple task of taking the common EC target price expressed in ECUs and converting it to U.S. dollars at the market exchange rate. The reason is that in the EC when the target price is converted to national currencies, the green exchange rates are used. Some of the rates will be higher than the corresponding market rates and some will be lower, but most importantly the divergences do not necessarily sum to zero. In fact, they tend toward the downward side (in terms of national currency per ECU) so that in effect the average of the target prices applied at the individual country level would be lower than that suggested by the simple U.S.$/ECU exchange rate unit.

The second complication of significance arises when looking at support measures directed at imports and exports. Most CAP product markets are protected by a system of import levies and export refunds. Broadly, these levies and refunds are designed to bridge the gap between EC target prices and world prices. However, because of the use of green rates the target prices in national currencies will differ from country to country, and because of the application of MCAs in trade, the market prices will also differ.

Consistency then requires that any common export refunds or import levies set in Brussels for trade with non-EC countries must also, when being applied at the individual country level, be adjusted for the MCAs applied in those countries. This is achieved by a formula of the following type for a country with a negative MCA:

(1) French exp. refund (francs) = Common Exp. Refund (ECUs) x Green Rate (francs/ECU) x Monetary coeff. - MCA (francs) (1)

(2) Monetary Coefficient = $\frac{100 + \text{MCA}\%}{100}$ (2)

Here MCA refers to absolute MCA.

For a country with a positive MCA, the MCA's absolute value is added in (1) and subtracted in (2). The monetary coefficient is necessary because in practice the MCAs which are set do not fully bridge the gap between the green and market exchange rates.

APPENDIX B

THE BRITISH VARIABLE PREMIUM SYSTEM

Prior to joining the Common Market, the United Kingdom had operated a cheap food policy whereby it allowed food imports to enter at world prices. This meant that U.K. market prices were kept low. The incomes of domestic producers were then supported by means of deficiency payments. These payments were subsidies paid directly to producers to bridge the gap between low market prices and a target price which was set to yield producers an adequate return.

The deficiency payments system was in sharp contrast to the EC support system which involved relatively high food prices for the consumer. Consequently, in 1973 when the United Kingdom became a member of the EC, it was allowed to continue some elements of this former system and the deficiency payments which were retained became known as variable premia. The deficiency payments continued to be paid in the beef and sheep sectors. In the former, it was more commonly referred to as the slaughter premium. These premiums, however, are now being phased out. The beef premium ceased to exist in 1989 and the sheep premium was eliminated in 1992.