Quality Restrictions as Barriers to Trade: The Case of European Community Regulations on the Use of Hormones

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Sanitary regulations, product definitions, grades, production or processing regulations, and other qualitative standards are generally applied to both domestic production and imported goods. These quality restrictions can be seen as trade barriers, although it is often difficult to determine whether a given restriction is based on legitimate health or safety concerns or is simply an alternative device for protecting producers. The purpose of this paper is to evaluate the welfare effects of a recent quality regulation, the European Community ban on the use of hormones in livestock production. A conceptual framework is developed to analyze the effects of the ban on the market for edible offals. The results indicate that Community prices for edible offals will increase 34% to 45%, while the world price will fall by at least 35%.

Key words: edible offals, European Community, quality restrictions, trade, welfare.

Traditional barriers to trade implemented by importing countries include tariffs, import quotas, and voluntary export restraints. The different consequences and welfare effects of these forms of protection have been documented in the literature (see, for example, Allen, Dodge, and Schmitz; Kreinin; Blyth; Caves and Jones). All three have the effect of raising prices in the importing country but differ in the way in which the revenue from the market intervention is distributed. Typically, the revenue from a tariff is collected by the government of the importing country, while the rents generated by an import quota accrue to those who receive licenses to import. In the case of an import quota, the government can capture the rents if the licenses are sold or auctioned. Voluntary export restraints also generate quota rents, but these rents are retained in the exporting country through the sale, auction, or grant of the right to export.

Another type of trade barrier is the use of qualitative standards to prevent the entry of certain kinds of goods. Examples of this type of trade barrier include sanitary regulations preventing imports of livestock from regions where certain diseases (hoof and mouth disease, African swine fever) have not been eradicated, product definitions specifying a narrow range of ingredients allowed in processed food (German beer, French and Italian pasta), grades, production or processing standards, and many more. Qualitative trade restrictions differ from the more conventional trade barriers in several respects. First, they do not necessarily affect the exports of all suppliers. Producers in countries with similar standards or those capable of modifying their products to comply with the regulations do not perceive a barrier to their exports. Producers unable to comply with the standard, on the other hand, can no longer sell anything to the country implementing a new quality requirement. For these producers, the effect is complete exclusion from the market in question.

Regulations are implemented to change a particular pattern of behavior. The need for a government regulation implies that there is some economic advantage to the practices the regulation is designed to alter. As a consequence, it is likely that compliance with the regulation will raise the costs of production for domestic producers. Thus, the importing

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country is likely to experience higher internal prices. The effect of the regulation on imports depends on the response of domestic producers and consumers and whether any exporting countries can meet the standard. In the extreme, imports will fall to zero if no foreign producers are in compliance with the regulation. In this case there are no quota rents generated by the quality restriction, although producers protected by the regulation may experience an increase in producer surplus. If no foreign producers are initially in compliance with the regulation, the cost of changing production practices to meet the new standard will probably offset any potential quota rents that might be gained from selling in the protected market. There will be quota rents for foreign producers who are already in compliance with the regulation or who can comply with it costlessly.

It should also be noted that quality restrictions differ from conventional barriers to trade in that they are often motivated by legitimate concerns for public health and safety. If this is the case, consumers may be willing to pay the higher price in order to obtain products that meet the higher standards. However, there are many cases where the market is able to take account of quality variation without a government regulation. Discounts for high moisture content in grain are an example of price adjustments based on quality criteria. If quality differences are taken into account through normal market processes, regulations may serve mainly to protect domestic producers and have the effect of limiting the choices available to consumers.

The purpose of this paper is to analyze the effects of a recently enacted quality restriction, the ban on the use of hormones in livestock production adopted by the European Community (EC). Meat producers in the United States and Australia have expressed their opposition to the EC regulation, arguing that there is little scientific evidence of adverse effects from consuming meat from animals treated with growth promotants (*Agra Europe,* 17 Jan. 1986, 5 Dec. 1986; *Feedstuffs,* 17 Aug. 1987). From this perspective the EC ban is a barrier to trade rather than a measure to protect public health. European consumer groups disagree and have insisted on the implementation of the hormone ban as scheduled (*Agra Europe,* 5 Dec. 1986). To analyze the economic effects of this regulation, a conceptual model is developed and applied to the market for edible offals. The first part of the paper contains background information on the hormone ban, livestock policy, and the edible offal market in the EC. In the second part, a model of the edible offal market is estimated and used to assess the welfare implication of the hormone ban. The implications of these results and limitations of the analysis are discussed in the concluding section.

The EC Hormone Ban and the Market for Edible Offals

Hormones are widely used to promote growth in livestock. The major benefits of these agents are improved feed conversion and faster, more uniform, growth rates. In addition, certain breeds will produce leaner meat when treated with hormones (Byers). Thus, reduced costs because of more efficient feed use and less time spent in the fattening stage may be accompanied by higher quality meat. These factors have led to the widespread adoption of this practice in livestock production throughout the world. It is estimated that hormones are used for beef cattle production in all regions of the world, although the proportion of animals treated ranges from a low of about 15% in parts of Latin America to a high of around 95% in North America (McEvoy). Within the EC, natural hormones were used prior to 1985, although some member states had banned their use (U.S. Department of Agriculture 1987). Some observers in the EC fear that hormones will continue to be used illicitly once the ban is fully implemented (*Agra Europe,* 26 June 1987).

Hormonal agents are usually administered to livestock through implants or injections. Under some circumstances, hormonal residues may remain in the meat at the time of slaughter. In 1981, the EC adopted a directive prohibiting the use of substances "having a thyrostatic action" following the discovery of traces of the hormone DES (a known carcinogen) in baby food in Italy (European Community). Concern for consumer safety was the basis for this initial regulation.

On 31 December 1985 the EC adopted a second directive prohibiting the use of substances having "a thyrostatic, estrogenic, androgenic or gestagenic action" (European Community). This directive, which will be-

come effective on 1 January 1988, also includes provisions to prevent the importation of meat from animals to which any of these hormonal substances has been administered. The ban does not affect nonsexual hormones, although there is consumer pressure to regulate the use of nonsexual substances as well (*Agra Europe,* 5 Dec. 1986).

Since 1981, contradictory evidence has been published concerning the effects of hormone use on human health (Galbraith). A joint FAO/WHO committee on food additives found that three growth promotants (estradiol-17B, progesterone, and testosterone) can be used safely in livestock production with no danger to human health (*Feedstuffs,* 17 Aug. 1987). Within the EC, support for the hormone ban is not unanimous. The United Kingdom, supported by Denmark, is hoping to block implementation of the ban, agreeing that there is little scientific evidence to support it (*Agra Europe,* 8 May 1987). European and some U.S. consumer groups, however, remain convinced that the practice should be stopped (*Agra Europe,* 5 Dec. 1986). Consumer groups in the EC have been the main source of pressure for restrictions on the use of both natural and artificial hormones in livestock production. The EC Commission, however, has found it convenient to acquiesce to this pressure. The hormone ban is seen as a measure that may slow the growth in surplus beef production in the EC, thus reducing subsidy expenditures (*Agra Europe,* 28 Aug. 1987).

The Common Agricultural Policy (CAP) includes a wide range of provisions to protect livestock markets in the EC. These include tariffs, variable levies, export subsidies and various subsidies paid directly to producers (Harris, Swinbank, and Wilkinson). Livestock production in the EC generally exceeds internal consumption, and the EC is a major exporter of milk products, beef, and veal. The only livestock product for which the EC is a significant importer is sheepmeat, although specialty products such as high-quality beef and edible offals are also imported. Support prices for major livestock products are generally higher than world prices so that EC exports must be subsidized.

It is not clear how the hormone ban will affect production costs within the EC. The use of both natural and artificial hormones has been illegal for several years in some EC countries. Producers in countries where growth promotants are not banned should experience an increase in production costs when the new legislation goes into effect. Producers in countries where these products are already banned will not see a change in their costs. On the other hand, observers have noted a thriving black market in hormones, suggesting that this production practice is common throughout the EC (U.S. Department of Agriculture 1987). If this is true and the new hormone ban can be implemented in a way that will prevent hormone use, production costs may actually increase. Whether production costs increase or are simply prevented from falling, the main impact is likely to be on the EC budget. If production costs and, consequently, internal prices are higher than would otherwise be the case, export subsidies may have to be larger to maintain current export levels. On the other hand, EC exporters may be able to take advantage of the fact that their meat is hormone-free in promoting it on foreign markets. If they are able to charge a premium for hormone-free meat, the budgetary impact may be reduced.

Most of the edible offals consumed in Europe are from cattle and hogs and include livers, brains, kidneys, sweetbreads, tripe, and tongues. Consumption of edible offals is particularly high in France and Ireland, where per capita consumption is about twice the average for OECD countries (*Meat Balances in OECD Countries*). Edible offals are a by-product of somewhat less value than the meat for which the animals are primarily produced. The supply of edible offals from EC livestock is largely determined as a fixed proportion of total meat supplies. Because of the relatively high levels of per capita consumption, EC production of edible offals accounts for only 80% to 90% of total consumption. In France, over half of the edible offals consumed are imported, and edible offals make up about 15% of the meat consumed annually (Ross).

On the average, the EC imports about 200,000 metric tons of edible offals each year. The United States is a major source of these imports. In 1986, about 90,000 metric tons of edible offals worth $107 million were exported to the EC by the United States (U.S. Meat Export Federation 1987). Argentina, Brazil, Australia, and New Zealand also export edible offals to the EC and other countries (see table 1). As noted earlier, EC livestock markets are protected by a variety of trade barriers and subsidies. In the case of edible offals, however,

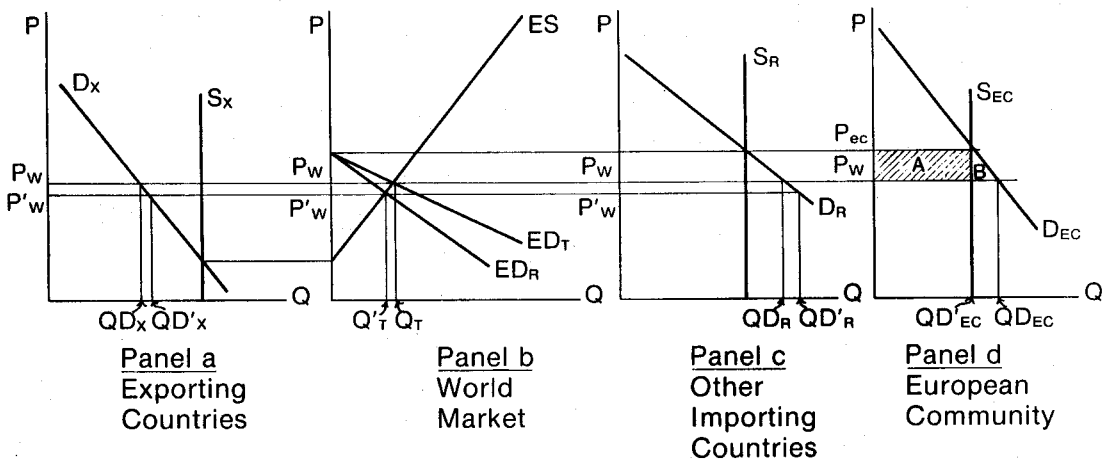

Figure 1. World market for edible offals

the only trade barrier is a customs duty (U.S. Department of Agriculture 1981). Unlike other agricultural products in the EC, therefore, variations in the world price of edible offals are transmitted to the EC market. The recent EC legislation on hormone use constitutes an additional barrier to entry. This measure may have a significant impact on the edible offal market.

Conceptual Model

A simple model of the world market for edible offals is illustrated in figure 1. Domestic supply and demand in exporting nations are shown in panel a. The importing countries are divided into the EC (panel d) and other importing nations (panel c). Domestic supplies in all three regions are assumed to be perfectly inelastic. The rationale for this assumption is that edible offals are a by-product of meat production. It is thus likely that supplies marketed depend more on conditions in meat markets than on edible offal prices. On the other hand, increases in offal prices may lead to greater supplies if livestock processors find it profitable to market offals that currently are simply thrown away or used in pet foods. However, for purposes of illustration, assuming perfectly inelastic domestic supplies is reasonable.

Panel b of figure 1 represents the world market. Excess supply is derived in the conventional manner by measuring the horizontal distance between the supply and demand schedules in the exporting nations. Excess demand in the world market is the sum of the excess demand schedules for the EC and other importing countries. To keep the graph fairly simple, the intercepts for the two excess demand schedules are assumed to coincide.

The introduction of the hormone ban by the EC means that imports of hormone treated offals will cease. It is assumed that all produc-

Table 1. World Trade in Edible Offals in Metric Tons

Country	1981	1983	1985
	Imports		
EC total	205,000	202,000	181,000
From: U.S.	96,968	101,013	86,675
Canada	12,165	10,651	
Oceania	20,058	20,068	
Other	75,809	70,268	
Japan	64,431	65,035	82,090
Mexico	68,510	39,238	104,530
Other	287,179	335,239	359,356
Total	625,120	641,512	726,976
	Exports		
U.S. total	210,117	219,195	247,696
To: EC	96,968	101,013	86,675
Japan	35,260	35,855	40,070
Egypt	9,170	19,009	29,378
Mexico	20,108	21,354	60,805
Other	48,611	41,964	30,768
Canada	73,567	69,355	76,488
Oceania	94,544	101,502	84,400
Latin America	80,216	60,449	66,475
Other	245,851	255,059	279,654
Total	704,295	705,560	754,673

Source: FAO, Eurostat, USDA/ERS.

ers in exporting countries use hormones and that they will not immediately cease this practice. In this situation, EC imports will fall to zero and the internal price will rise to P_{ec}. Prior to the hormone ban the price in the EC was equal to the world price plus the customs duty. The duty is not shown in figure 1, but adding it to the EC panel would not affect the analysis presented here. The increase in the EC price following the hormone ban raises producer surplus by the area labeled *A*. Consumer surplus falls by areas *A* plus *B*, so there is a net welfare loss in the EC equal to area *B*.

In the world market, the excess demand schedule shifts from ED_t to ED_r where ED_r is excess demand in importing countries other than the EC. ED_t, of course, is the sum of excess demand in the EC and ED_r. This fall in excess demand results in a lowering of the world price for edible offals. Consumers in the exporting countries as well as those in non-EC importing nations benefit from the lower prices, while producers in both regions are hurt. Note that the fall in total world trade is less than the amount of EC imports that are lost because the lower world price will lead to some increase in imports by non-EC importing countries.

Empirical Results

The relationships described above were estimated econometrically using annual data for the period 1972 to 1984. The data include the quantities produced, consumed and imported in nine EC countries including the six original members and three countries, Denmark, Ireland and the United Kingdom, that joined in 1972. Because these last three countries did not officially enter the EC until January 1973, observations for 1972 for the three countries were added to those of the six original members. Greece is not included in the analysis. In addition to the EC data, world excess supply and demand data and prices are used. An estimate of the world price was obtained by dividing the dollar value of world trade by the quantities traded (U.S. Meat Export Federation 1986). It would have been preferable to use actual prices, but no such price series is available. The EC price was obtained using a dollar/European Currency Unit (ECU) exchange rate adjusted for inflation according to the procedure described by Longmire and Morey. The real ECU price was adjusted to reflect the customs duty. The customs duty applied to most edible offals was 9% until 1980 when it was cut to 4% (U.S. Department of Agriculture 1981). Thus, the ECU price was multiplied by 1.09 for the period 1972 to 1979 and by 1.04 for the period 1980 to 1984. The income variable used was compiled from OECD national accounts series for real consumer expenditures (*National Accounts, Main Aggregate, 1960–1984*). All series on quantities produced, consumed and traded were drawn from Foreign Agriculture Service (U.S. Department of Agriculture, various issues) or FAO publications.

The simplest approach to estimating the consequences of the hormone ban is to assume that supplies are predetermined so that the system can be treated recursively. If the quantities supplied are perfectly inelastic, depending on the number of animals slaughtered for meat, it is reasonable to assume that supplies of edible offals are predetermined. In this recursive system, price-dependent demand equations can be estimated by ordinary least squares (Tomek and Robinson). Imports are treated as a residual computed as the difference between the quantities demanded and supplied. This approach allows direct estimation of price flexibilities, which can be used to determine the change in EC prices following the implementation of the hormone ban.[1]

The estimated demand relationship is reported below. Throughout the paper, the figures in parentheses below the equations are standard errors. Real EC prices are modeled as a function of per capita consumption and real income (as measured by per capita GDP in the EC). The demand equation was also estimated with several variables to represent substitutes in demand. These additional variables added little to the explanatory power of the equation and were dropped.

$$(1)\quad ECUPR = \underset{(1{,}805.23)}{5{,}595.46} - \underset{(348.1)}{814.72}CONS + \underset{(.039)}{.067}RLY$$

where $\bar{R}^2 = .55$, first-order rho = .539, *CONS* is per capita consumption of edible offals, and

[1] A supply equation was estimated in an attempt to test the hypothesis that supply is perfectly inelastic. The estimated equation showed a negative price response, suggesting that price depends on the quantity supplied rather than the reverse. The elasticity estimated from this equation was significantly different from zero statistically but quite small (−.06). These results suggest that the assumption that supply is predetermined is not unreasonable.

RLY is real per capita GDP. The original estimation showed evidence of serial correlation so the equation was reestimated using the Cochrane-Orcutt procedure. Although the adjusted R^2 is fairly low, the coefficients for both explanatory variables are significant and of the expected sign. The price flexibility derived from equation (1) is −3.21. Alternative specifications generally yielded flexibilities between −2.80 and −3.60.

These results can be used to compute the welfare implications of the hormone ban within the EC. The first step in these computations is to use the price flexibility to determine the EC price when imports are eliminated (P_{ec} in fig. 1). The change in producer surplus (area A) is simply the product of EC offal production and the change in price. To determine the change in consumer surplus, the area of the small triangle (area B) must be added to area A. Area B, which is also the net welfare loss, is computed by multiplying the change in quantity (that is, what the EC previously imported) by the change in price and dividing this amount by two. In addition to the price flexibility, it is necessary to know EC production of edible offals (*ECOFF*), EC imports (the difference between *CONS* and *ECOFF*), and the initial price (*ECUPR*). To provide a range in the estimates, flexibilities of −2.80 and −3.60 were used in addition to the flexibility derived from equation (1)(−3.21). The quantity and price variables are the average levels for the period 1980–84. The EC price is in real ECUs with the customs duty removed. The welfare effects in the EC are summarized in table 2.

Table 2. Welfare Effects of Hormone Ban in EC in Millions of 1980 ECU

Measure	Flexibility		
	−2.80	−3.21	−3.60
Change in producer surplus (*P*)	719.7	825.0	925.3
Change in consumer surplus (*C*)	−769.6	−882.3	−989.6
Net welfare change in EC (*P* + *C*)	−49.9	−57.3	−64.3

The elimination of imports of edible offals following the hormone ban would lead to a decline in consumption of about 12%. Market prices in the EC are estimated to increase between 34% and 45%. The changes lead to relatively large gains in producer surplus and losses in consumer surplus. As would be expected, the net welfare loss is fairly small compared to the gains realized by producers. The predicted changes are quite large relative to historical price variation. The largest change in real EC prices observed during the period upon which this analysis is based was 25%. Although cross-price effects were not found to be significant, it is quite possible that changes of the magnitude indicated above would lead to some substitution that would mitigate the impact on prices. In addition, if producers in some countries are in compliance with the regulation on hormones, imports by the EC need not fall to zero. This would also reduce the size of the welfare changes. The estimates shown in table 1 thus should be seen as upper limits. The actual changes resulting from the hormone ban may be less pronounced. On the other hand, Ginzel and Krissoff obtained similar results (an increase of 49% in the EC offal price) in a separate analysis.

The next step is to analyze the impact of the EC legislation on the world market. Excess demand equations for the EC and the rest of the world and an excess supply equation for exporting nations were specified and estimated with two- and three-stage least squares. The price coefficients in the demand equations were not significantly different from zero. A system including a single excess demand equation was also estimated with similar results. The initial specifications included world meat production, real-world price, and a time trend as explanatory variables for world excess supply. Real-world price, real-world GDP, and per capita poultry consumption (a substitute) were included as explanatory variables for world excess demand. In the initial system, the coefficient of world meat production was not significantly different from zero in the excess supply equation, and only real-world income (*GDP*) was significant in the excess demand equation. In addition, the linear system originally specified was inappropriate for analyzing the impact of the EC ban. About 30% of the total quantity of edible offals traded go to the EC. Removal of such a large quantity from a linear system would give unreliable predictions. Nevertheless, the results of these initial estimates did provide some insights. For example, the price coefficient in the world excess supply equation was quite robust, changing only slightly under different specifications and estimation techniques. The excess supply elas-

ticity from the linear equations was estimated to be .17.

To overcome the problem of linearity, the system was estimated in logarithms. The logarithmic system showed evidence of serial correlation so it was reestimated using two-stage least squares corrected for first-order serial correlation (Cochrane-Orcutt technique). World meat production was dropped from the system, and the real-world price is not included in the demand equation. The results are shown in equations (2) and (3).

$$(2)\quad \log WSOFF = \underset{(.734)}{10.381} + \underset{(.077)}{.221} \log RWP + \underset{(.054)}{.46} \log T$$

$$R^2 = .97 \qquad \text{rho} = .463,$$

$$(3)\quad \log WDOFF = \underset{(4.506)}{-1.627} + \underset{(.579)}{1.583} \log WGDP + \underset{(.472)}{.557} \log PCP$$

$$R^2 = .95 \qquad \text{rho} = .246,$$

where *WSOFF* is world excess supply of edible offals, *WDOFF* is total excess demand for edible offals, *RWP* is real-world price (deflated by U.S. GNP deflator), *T* is time trend, *WGDP* is real GDP of OECD countries, and *PCP* is world per capita poultry consumption.

These results indicate that the excess supply elasticity is about .2, only slightly different from the estimate derived from the linear system. The income elasticity of demand appears to be relatively large.[2] The signs for all of the parameters except that of poultry consumption are as expected. However, the coefficient for the poultry consumption variable is not significantly different from zero. The estimated supply elasticity and income elasticity of demand were quite robust, varying only slightly in alternative specifications. On the basis of these results, an estimate of the impact of the EC hormone ban can be obtained by subtracting the 1980 to 1984 average volume of EC imports from the quantity traded on the world market. To represent the movement along the excess supply curve, the left-hand side of the excess supply equation is reduced by the amount of EC imports and solved for the real-world price, holding the other variables constant. Because of the large proportion of world trade accounted for by EC imports, the estimated fall in price is quite large. Based on equation (2), it is estimated that the real-world price would fall about 78% following the withdrawal of the EC from the market.

The fall in world price predicted above appears somewhat extreme. Because no response by importers to changes in world price was found, the system described by equations (2) and (3) does not allow the adjustments by the importers that would be expected following such a large change. Historically, world edible offal trade ranged from about 400,000 metric tons to over 700,000 metric tons after 1980. In recent years the EC has purchased about 200,000 metric tons or 29% of the quantity traded. A fall in the volume traded to about 500,000 metric tons is a very large change, although that quantity is still within the historical range. The largest change in the volume of trade from one year to the next observed in the historical data was 16%, although the average volume of trade in the early 1980s was 63% greater than the average volume from 1972 to 1975.

Another problem with the linear and logarithmic systems estimated stems from the probable measurement errors in the price variable. As Orcutt has shown, observation errors and shifts in the demand surface bias the estimated price elasticities in international trade toward zero. As an alternative approach, a price-dependent equation for the world market was estimated. Price-dependent equations including the volume of world edible offal trade, per capita GDP for OECD countries, a time trend, and per capita world poultry consumption as explanatory variables were estimated according to three specifications. The first specification was a simple linear equation. The estimated equation was statistically sound, with all coefficients significantly different from zero at a level of confidence of 95%. The linear equation led to predictions similar to those obtained from equation (2), indicating that the EC ban would lead to a 66% fall in world price.

The other two specifications were nonlinear. A time-varying parameter model was estimated. The coefficients in this model were statistically significant, but the predictions of actual prices based on the model parameters and

[2] It should be noted that the estimated income elasticity is related to excess demand. If all countries have the same underlying income elasticity of demand, an estimate of domestic elasticities is given by multiplying the estimated elasticity by the share of trade in total consumption. For the EC, for example, imports of edible offals make up about 12% of total consumption and the implied income elasticity is about .19.

actual data for the independent variables were highly inaccurate. The final specification was a constant elasticity model shown as equation (4).

$$\begin{aligned}(4)\quad \log RWP = {} & -42.525 + 1.289 \log VT \\ & \quad (19.36) \quad (.755) \\ & + 4.061 \log WGDP \\ & \quad (2.525) \\ & - 2.227 \log T \\ & \quad (.616) \\ & + 1.870 \log PCP \\ & \quad (1.177) \\ & R^2 = .81 \qquad \text{rho} = .588,\end{aligned}$$

where VT is volume traded ($=WSOFF = WDOFF$). The results shown in equation (4) have been corrected for first-order serial correlation. All of the coefficients are significantly different from zero at a level of confidence of 92% or better. As in the previous estimates, the sign of the coefficient for per capita poultry consumption is positive. The coefficient for the volume-traded variable suggests that a 1% change in the quantity traded will lead to about a 1.3% change in the real-world price. This flexibility implies a larger excess supply elasticity than was found in the direct estimates of the excess supply and excess demand schedules. A larger supply response is consistent with Orcutt's results, indicating that direct estimates of price elasticities in international trade may be biased toward zero (Orcutt). On the basis of equation (4), a reduction in world trade equivalent to the volume of EC imports will lead to a fall in real-world price of about 35%.

Of the three specifications for the price-dependent equation, the constant elasticity form appears to be the most reasonable. A linear equation is likely to overestimate the impact of changes in world trade, while the time-varying parameter model could not be validated using historical data. The estimate of a 35% fall in world price is still high relative to the results presented by Ginzel and Krissoff, who found that withdrawal of the EC from the world market for edible offals would cause a 14% decline in the world price. On the basis of equation (4), the value of world edible offal trade would fall from a 1980 to 1984 average of over one billion dollars to about $504 million. This represents a decline of 54%. Using the figure reported by Ginzel and Krissoff still leads to a predicted fall in the value of world trade in edible offals of almost 39%. According to these results, the elimination of EC imports would have a substantial impact on the world market for edible offals.

It should be emphasized that the estimates presented in this paper represent an upper bound. The procedure used to obtain them does not allow the effects of demand changes in other importing countries to be taken into account. As shown in figure 1, the fall in world price should be mitigated by an increase in imports by countries outside the EC. On the other hand, the evidence from the econometric analysis suggests that excess demand may be quite unresponsive to price changes. If this is the case, there would be little to soften the impact of the EC policy change on world prices. The results also depend critically on the assumption that the EC ceases all imports. If some countries are able to meet the new EC requirements the fall in EC imports may be less severe and the impact on world price less pronounced.

Conclusions

Quality restrictions on traded goods may have significant impacts on both consumers and producers. Because they often have the effect of preventing any imports from entering the country, their effect may be larger than more conventional barriers to trade. In this paper we have examined the implications for edible offal markets of recent EC legislation banning the use of hormones in livestock production. Assuming that this restriction causes the EC to cease importing edible offals (i.e., that no exporting countries are in compliance with the EC regulation), the effect on prices is likely to be substantial. The results of the analysis presented here indicate that EC prices will increase between 34% and 45%, while the world price will fall by at least 35%. As expected, within the EC the net welfare loss resulting from the regulation is relatively small compared to the increase in producer surplus. The estimates presented in this paper constitute upper limits. The impact of the EC legislation would be less severe if EC imports do not fall to zero (i.e., if some exporters can comply with the regulation) or if other importing nations respond to the lower world price by increasing their purchases of edible offals.

Nevertheless, the effect of the hormone ban on both EC and world prices may be substantial. For the EC, higher prices for edible offals

may not have a direct impact on exports because the EC currently does not export these products. If compliance with the hormone ban raises costs of livestock production or prevents them from declining, internal prices may be higher than would otherwise be the case. This could put pressure on the EC budget since export subsidies may increase. On the other hand, it is conceivable that EC exporters would be able to charge a premium for hormone-free beef on the world market offsetting the need for increased subsidies. The problem with this is that a black market for hormones already exists, and it is not clear that the EC will actually be able to enforce the ban internally. If properly administered, artificial and natural growth promotants are difficult to detect.

From the point of view of the United States, the EC ban could have a very significant effect on sales of edible offals and high quality beef. The EC directive would not only reduce the volume of U.S. sales but would also lead to a lower world price. In 1986, the value of U.S. edible offal exports was about $337 million, and 32% of these exports were shipped to the EC. Assuming a 35% fall in world price and no market for the edible offal exports previously sold to the EC, the value of U.S. exports would have fallen 56%, to about $148 million. The U.S. beef industry estimates, however, that compliance with the EC hormone ban would result in the loss of $314 million of domestic production (U.S. Meat Export Federation 1987). It does not appear that it would be worthwhile to attempt to comply with the EC legislation in an effort to save the edible offal market.

However, some individual producers might find it profitable to produce high-quality beef and edible offals without hormones in order to take advantage of the higher EC prices. At the moment it is not clear how the EC will control for the presence of hormones in imported meat. Because of the cost and difficulty of detecting growth promotants, the EC may simply ban imports from countries where these products are still used regardless of whether a particular producer actually administered them. Alternatively, the EC could permit imports certified to be hormone free but establish a system of inspection and certification so cumbersome that it would not be profitable to export low-valued products such as edible offals. If the certification procedure is administratively burdensome, the result could well be that the EC ceases importation of edible offals entirely. If this is the case, the estimates presented in this paper are not at all unrealistic. A final issue for the United States concerns the possibility that other countries might adopt similar legislation. If Japan were to implement a hormone ban, for example, it could have a significant effect on U.S. exports of high quality beef.

There are many existing and potential quality restrictions in international trade. Further analysis of the effects of these restrictions would be useful in defining policies to deal with them. The most difficult problem in the study of these regulations is to discover methods to distinguish restrictions that are based on legitimate health or other concerns from those that are primarily designed as an alternative protectionist device in a world where conventional trade barriers are being eliminated.

Consider the case in the EC. Artificial hormone additives have been banned in several countries for many years. However, the substantial cost-savings due to the use of hormones have provided an incentive for the illegal use of these products. Because farmers frequently are not trained in the administration of hormones, there have been cases where unsafe levels of hormonal residues have been found in meat. In this situation, consumer perceptions are that any use of hormones is a threat to human health, and it is the consumer groups that have pressed for the ban rather than producer groups seeking protectionist rents. In contrast, fewer problems with these substances have been encountered in the United States, where hormones are administered legally (in the form of ear implants rather than injections as in the case in EC) by individuals who are reasonably well-trained in their use. Convincing European consumers that hormones can be administered safely may be difficult. This is an example of regulatory politics where the actions of the various interest groups are based on incomplete information. Because nations come increasingly into contact through international trade, conflicts such as the one over the EC hormone ban may occur more frequently. The political economy of quality regulations in international trade is an area where much further research is needed.

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