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Implications of Qualitative Restrictions in International Agricultural Trade

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Executive Summary

The purpose of this report is to examine the effect of qualitative restrictions on internationally traded goods. The case of the European Community ban on the use of hormones in livestock production illustrates the consequences of these types of restrictions.

Quality restrictions include such measures as sanitary regulations, product definitions, grades, and production or processing standards. Normally, they are applied to both domestic and imported products. Although they are often motivated by legitimate health or safety concerns, many of these measures can be seen as a kind of trade barrier used to protect domestic producers from foreign competition.

The economic effects of quality restrictions differ from those of the conventional trade barriers: Import tariffs, import quotas, and voluntary export restraints (VERs).

Tariffs lead to higher prices in the importing country, increased production, lower consumption, and a reduction in imports. If a country is a major importer, the tariff will lead to depressed world prices. Tariffs generate government revenue. Ordinary tariffs contribute less to world price instability than other forms of protection. The variable levy is a type of tariff that has the same destabilizing effects as quotas and VERs.

Import quotas restrict the quantity imported, causing the price to rise in the country imposing the quota. The static effects are the same as those for import tariffs except for the disposition of the revenue, known as the quota rent, generated by the quota. Tariff revenues belong to the government, while quota rents generally accrue to private traders. VERs are the same as import quotas but are administered by the exporting country. The quota rents generated by a VER are retained in the exporting country. Because both quotas and VERs prevent world price variation from influencing producer and consumer decisions, they are more destabilizing than ordinary tariffs.

The economic effects of quality restriction are more complicated. In extreme cases, no producers in other countries can comply with the regulation and the country implementing the quality restriction ceases to trade. If this occurs, internal prices may increase greatly and the world price may be depressed. In general, quality restrictions likely will lead to higher domestic prices although the benefit to producers may be offset by higher production costs. Consumers will pay higher prices and have fewer choices, although regulations may be needed if the market fails to eliminate harmful products. The volume of trade may be reduced, depending on how many producers in other countries can comply with the regulation. Quality restrictions do not generate quota rents. If the primary motivation for a quality restriction is to protect producers from foreign competition, the economic effects are likely to be worse than those generated by more conventional trade barriers.

The economic effects of a specific quality regulation are analyzed. The example studied is the European Community (EC) ban on the use of hormones in livestock production. This regulation will also be applied to imported livestock products and may have a significant impact on the world market for edible offals, a product extensively imported by the EC.

Econometric estimates of the economic relationships indicate that the hormone ban could cause EC edible offal prices to increase by as much as 45 percent. Consumption is predicted to fall by 12 percent and the reduction in world demand due to the EC withdrawal from the market could cause the world price of edible offals to fall almost 35 percent. These estimates represent upper limits and the actual effects of the hormone ban are likely to be more moderate. Nevertheless, it appears that the EC policy will have a significant impact on the world market for edible offals.

A critical issue in evaluating the impact of quality restrictions is the problem of distinguishing between regulations reflecting legitimate health and safety concerns and those that are simply another way to eliminate foreign competition. This is an important problem in political economy and requires further research.

I. Introduction

The purpose of this report is to present an analysis of the effect of qualitative restrictions on internationally traded goods and to illustrate the consequences of these measures with a specific example: The case of the European Community (EC) hormone ban and its implications for trade in edible offals. Qualitative restrictions include measures such as sanitary regulations, product definitions, grades, and production or processing standards. When a country establishes regulations of this nature, it must also apply the regulations to imported goods. If it does not, goods not meeting the standards would enter the market and undermine the regulation. The necessity of extending domestic quality regulations to imported goods opens up the possibility of using these regulations to protect domestic producers from foreign competition. Although quality restrictions are often motivated by legitimate health or safety concerns, many of these measures can be seen as barriers to trade.

A recent case from Germany illustrates the nature of the problem. A law dating back to 1516 specifies the ingredients legally permitted in beer. This law, the Reinheitsgebot, stipulates that only yeast, malted barley, hops, and water can be used to brew beer (Agra Europe, March 13, 1987). Recent German legislation extended the beer regulation to imported beer. In effect, the old Reinheitsgebot was used to prevent beer imports from other European countries where additives or other ingredients such as rice or corn are used to brew beer. The European Court of Justice ruled that this ban on imports of foreign beers was a barrier to trade aimed at other members of the EC. Because trade barriers between EC members are generally not allowed, Germany has been instructed to lift its ban on beer imports. The German government had argued that a legitimate health concern existed because Germans drink more beer than others and could be harmed by heavy consumption of the additives used in beers from other countries. The Court did not accept this argument, ruling that the law was actually a trade barrier designed to protect German beer producers from foreign competition (Agra Europe, March 13, 1987).

Determining whether a quality regulation is a trade barrier or a legitimate measure to protect public health and safety is a complicated problem. Scientific evidence that certain substances are harmful is not always conclusive. Moreover, quality differences will be taken into account, in many cases, through the normal functioning of the market. On the other hand, some quality problems are particularly difficult to detect and could be dangerous to human health if left unregulated. For example, salmonella bacteria, a common health hazard arising from unsanitary livestock slaughter and processing procedures, are not visible to the naked eye. However, in many instances, it is unclear that quality regulations are necessary to protect human health or safety. To the extent that quality regulations applied to imported goods are trade barriers, they will serve to protect domestic producers and limit the choices available to consumers.

The use of quality restrictions as barriers to trade is a particularly important issue as the world enters a new round of trade negotiations. Agricultural subsidies will be included in the new round of multilateral trade negotiations (MTN) being conducted through the General Agreement on Tariffs and Trade (GATT). Previous rounds have made progress in establishing rules for international trade and limiting conventional trade barriers such as import tariffs and quotas. However, movements toward freer trade often result in efforts to circumvent the new rules. For example, elimination or reduction of industrial tariffs was followed by a proliferation of "non-tariff" barriers such as import quotas. As nations move to limit import quotas, one can expect greater use of voluntary export restraints or other means to protect domestic producers. In this setting, quality regulations may become particularly attractive as a barrier to trade that is justifiable as a measure to ensure the quality and safety of the goods allowed in internal markets.

The working hypothesis underlying this study is that nations will take whatever action they can to protect their domestic markets at the same time they are negotiating reductions in protection. In industrial nations, the producer generally is protected, while less developed countries tend to intervene on behalf of the consumer. Thus, we predict that as progress is made in reducing agricultural barriers in the GATT negotiations, governments in industrial countries will begin to seek out new methods to protect agricultural producers. One method they are likely to discover fairly rapidly is the use of quality regulations.

The experience of the EC supports these predictions. One of the basic principles of a common market such as the EC is that no trade barriers should exist between the members of the community. This principle led to the gradual elimination of tariffs and import quotas between the countries in the EC and the establishment of a common external tariff applied to non-EC countries. Eliminating agricultural trade barriers within the EC, however, may result in shifts in the location of agricultural production. These shifts occur as less efficient producers in one region go out of business and more efficient producers in other areas expand their operations. These changes can be socially disruptive; therefore, it is not surprising that a variety of unconventional protective measures has surfaced within the EC. Rejuvenation of the German beer law is one example. Others include definitions of the ingredients allowed in French and Italian pasta; prevention of pork imports from Spain where African swine fever has not been eradicated; Danish rules on reusable packaging for beer, mineral water, and soft drinks; and the entire agri-monetary system (Peterson, 1985; Harris, Swinbank, and Wilkerson; Agra Europe, February 6, 1987). Some of the quality regulations in individual EC countries effectively protect their producers from competition from producers in other EC countries even though protection violates a basic principle of a common market.

If the EC experience is an indication of a likely response to agricultural trade liberalization, the use of quality regulations to restrict trade may increase. In this context, it is important to understand the effects of this type of trade barrier. In the first section of the report, the effects of quality restrictions on prices, supply, demand, trade, and producer and consumer welfare are analyzed and contrasted with import tariffs, import quotas, and voluntary export restraints. The second section of the report is devoted to analyzing a specific case: The EC ban on the use of hormones (growth promotants) in livestock production and its probable effect on the world edible offal market. Conclusions and suggestions for further research are presented in the final section of the report.

II. The Economic Impact of Quality Restrictions And Other Trade Barriers

A detailed discussion of the economic impact of tariffs, import quotas, voluntary export restraints, and quality restrictions is presented in the *Appendix*. The implications of these trade barriers are outlined in this section of the report. Readers interested in the technical background and economic logic behind the propositions presented here may wish to refer to the *Appendix*.

The four trade barriers noted above must be studied in terms of both the static and the dynamic effects. The static effects of a trade barrier include the impacts on domestic and world prices; the quantities produced, consumed, and traded; and producer, consumer, and government situations. The dynamic effects concern the way in which trade barriers influence price stability through time. Frequently, a trade barrier has the static effect of increasing producer prices at the same time that it has the dynamic effect of contributing to greater price instability in the world market. Static and dynamic effects are outlined for each of the trade barriers discussed.

Import Tariffs

An import tariff is a tax applied to imported products at the point of entry. Tariffs can be set as a fixed amount (e.g., $10 per ton), a percentage of the pre-tariff price (known as an ad valorem tariff), or as an amount that varies with world market conditions. An example of the latter is the variable levy used by the EC. The variable levy is a tax or tariff set as the difference between the world price and a predetermined internal price known as the threshold price. Unlike per unit and ad valorem tariffs, the variable levy can change from day to day. All three types of tariffs have the same static effects, but the dynamic impacts of the variable levy differ from those of the other two.

The purpose of a tariff is to protect domestic producers from the competition of cheaper imported goods. Tariffs raise the price of a product in the domestic market. As a result, producers receive and consumers pay a higher price than they would if no tariff was imposed. Because producers receive a higher price, they will normally produce more goods. Likewise, consumers generally purchase fewer goods at the higher price. The result is that the amount of goods the country imports is reduced. If the country imposing a tariff is a major importer, the reduction in its imports may represent a significant decrease in world demand. If this occurs, it is likely that the world price will also be depressed.

In summary, the static effects of import tariffs are as follows:

- The price in the country levying a tariff increases.
- At the higher price, producers in that country increase their output while consumers reduce consumption.
- The amount of goods the country imports declines.
- The fall in world demand leads to a reduction in world trade and lower world prices.

These changes are to the advantage of producers in the country imposing the tariff. They may also benefit consumers in the rest of the world who are able to purchase at a lower world price. Conversely, producers in the rest of the world and consumers in the country levying a tariff are hurt by the changes. As shown in the *Appendix*, a tariff also leads to an efficiency loss for the world as a whole. This efficiency loss may be partially offset by government revenue generated by the tariff. In some cases, it may be possible for a government to levy an "optimum" tariff which leads to an increase in social welfare for that country as compared to its situation under free trade. Of course, this increase in social welfare is at the expense of the country's trading partners. For the world as a whole, an import tariff, or any other kind of trade barrier, necessarily reduces global welfare below the level attained with free trade.

Per unit and ad valorem tariffs have a minimal impact on price stability. Variations in world prices are transmitted to markets protected by these measures. Consider a $10 per unit tariff on a good with a world price of $100. A shock to the world market leading to an increase of the world price to $120, for example, is reflected in the protected market in which prices rise from $110 to $130. In addition, shocks within the protected market are transmitted to the world market. For example, an unusually good harvest leads to lower prices in the protected market. This, in turn, leads to increased consumption, although the net result is likely to be some decrease in imports. The decrease in imports results in a slight reduction in world price. The main dynamic effect of an

ordinary tariff is that it leads to a lower volume of world trade than in the free trade case. Markets in which the volume of trade is low are sensitive to relatively small changes. Thus, in the smaller world market, a fairly small shock may cause significant price instability. Within the protected market, the greater degree of self-supply reduces the vulnerability of the market to shocks transmitted from the world market.

The variable levy, on the other hand, often contributes to much greater price instability. Because the variable levy is adjusted to reflect world price changes, no variation in world prices is transmitted to the protected market. If the EC threshold price is $140 per unit and the world price is $100 per unit, the variable levy is $40. If a shock on the world market causes the world price to rise to $120, the variable levy is reduced to $20 per unit and the internal price in the EC remains at the predetermined level. In addition, a shock within the EC is entirely transmitted to the world market. Because the internal price in the EC is fixed, an unusually good harvest does not lead to a price decline within the EC, and consumption, therefore, does not change. With the same level of demand and a larger supply, the effects of the good harvest are entirely absorbed by a reduction in imports. Thus, the variable levy insulates the EC from any instability that may originate in the world market and shifts any internally generated instability onto the world market.

Import Quotas and Voluntary Export Restraints

An import quota is a restriction on the quantity a country imports. Import quotas can be designed to have the same effect on prices as tariffs. Limiting imports brings about a kind of shortage, causing the price in the protected market to rise. At the higher price, production increases while consumption falls and equilibrium is re-established between the increased domestic supply, reduced domestic demand, and lower quantity of imports. A tariff raises the price, leading to a decrease in the quantity imported, while a quota limits the quantity imported, leading to a rise in the price.

The static effects of an import quota are the same as those of a tariff. The price in the protected market increases, domestic production increases, and domestic consumption decreases. Imports, of course, decline, and if the country imposing the quota is a large country, the world price will be depressed by the decrease in world demand. There is one way, however, in which an import quota differs from an import tariff. Recall that an import tariff leads to government revenues equal to the per unit value of the tariff multiplied by the number of units that are still imported. In the case of a quota, an equivalent revenue, referred to as a quota rent, is generated (*Appendix*). The quota rent is equal to the difference between the price in the protected market and the depressed world price multiplied by the quantity of imports permitted under the quota.

Import quotas are normally implemented by providing private import firms with licenses to import a certain quantity. The government first must decide the total amount of imports that will be allowed. This total quantity is then divided among the import firms, each of which is licensed to import a specific amount. These importers are able to buy the product at the depressed world price and sell it at the higher price in the protected market. The profits from the transactions of all the importers are the quota rents. If the quota is set to raise prices by the same amount as a given tariff, the quota rent will be equal in value to the government revenue generated by the tariff. The difference is that in the case described above, the quota rent belongs to the private traders granted the right to import, while in the case of a tariff, the revenue accrues to the government.

Of course, an import quota can be implemented in other ways. For example, the government could capture the quota rents by selling or auctioning the licenses to import. The government could also tax the quota rents, allowing the importers to keep some portion of this revenue. Many possible arrangements can be imagined. The important point is that import quotas generate quota rents, which may very well be captured in whole or in part by private traders. This is in contrast to the tariff which generates revenues that belong unequivocally to the government, the only authority with the power to levy taxes.

Voluntary export restraints (VERs) are agreements between an importing country and one or more exporting countries. The exporting country "voluntarily" agrees to limit the amount shipped to the importing country. The agreement to limit exports is usually obtained through the implicit or explicit threat of more severe measures such as tariffs or quotas. A VER has the same static effects as an import quota, including the generation of quota rents. The reason for this is that VERs effectively limit the amount that an importing country is able to purchase. VERs differ from import quotas with respect to the disposition of the quota rents. In the case of an import quota, the rents are retained in the importing country by private traders, the government, or some mixture of private and government interests. In the case of a VER, however, the quota rents belong to government or private interests in the *exporting* country. This is because the exporting country is the one regulating the flow of the product. If the government of the exporting country grants export licenses to private traders, these individuals will be able to buy the product at the depressed world price and sell it to importers at the higher price in the protected market. Thus, the only differences between a VER and an import quota are how the trade barrier is administered and who receives the quota rents.

The dynamic effects of import quotas and VERs are the same as those occasioned by the variable levy. Quotas and VERs regulate the quantities imported. The variable levy also determines the quantity imported because internal prices are not allowed to vary. In all three cases,

a sudden decrease in world price will not lead to greater imports because the quantities are fixed or world price changes are not transmitted to the protected market. Likewise, any instability within the protected market is fully transferred to the world market. Thus, in comparison with ordinary import tariffs—variable levies, import quotas, and VERs tend to reduce price variations within the protected market and increase price instability in the world market.

Quality Restrictions

The effects of quality restrictions are somewhat more complex than those of the trade barriers described above. Much depends on whether exporting countries can comply with the regulation. If producers in some or all exporting countries can comply easily with the regulation, it may have very little impact on trade. On the other hand, producers unable to comply with a quality restriction will find themselves completely excluded from the protected market. If some producers can comply while others cannot, quality restrictions may be discriminatory. Trade may be entirely eliminated between certain regions at the same time that it continues unabated between other regions. In the extreme, the country introducing a quality restriction may cease to import altogether if no producers in other countries are able to comply with the restriction.

Quality restrictions usually lead to higher internal prices. In the extreme case in which a country ceases to import, internal prices may increase dramatically because they are determined entirely by domestic supply and demand (*Appendix*). Countries that do not engage in foreign trade are in a situation referred to as autarky. If all countries were to impose unique and exclusive quality requirements, all trade would cease. In this state of general autarky, global welfare would decline dramatically.

In more realistic cases, quality restrictions are likely to lead to somewhat higher internal prices, a reduction in the choices available to consumers, and a reduction in imports. These effects are similar to those of import quotas, and the extent to which the quality restriction reduces the volume of trade determines the degree to which these consequences are realized. One difference between quality restrictions and other types of trade barriers is that they do not generate revenue or quota rent. It is not possible to buy a lower priced product that does not meet the quality standard and sell it for the higher price in the market in which the standard is applied.

Another way quality regulations differ from the conventional trade barriers is that they are often motivated by honest health, safety, or quality concerns. If this is the case, consumers may be willing to pay the higher price in order to obtain products that meet the higher standards. Of course, there are many cases in which the market is able to account for quality variation without a government regulation. Discounts for high moisture content in grain is an example of price adjustments based on quality criteria. However, if the market fails to take quality differences into consideration, consumers may be better off with a government regulation that causes prices to increase and limits the range of products available. This would be the case if the regulation protects consumers from unsafe or harmful products.

The dynamic effects of quality restrictions depend on the specific situation. If a quality restriction adopted in one country causes that country to stop importing altogether, there may be increased instability within the country. Although world market instability cannot be transmitted to the internal market of the autarkic country, any shocks within that country must be absorbed by this internal market. In other words, an autarkic country cannot shift any of its internal instability to the world market. If quality restrictions reduce the number of countries participating in world trade, the world market will be smaller and more vulnerable to destabilizing shocks. Thus, quality restrictions may lead to increased instability in both the internal and world markets. These effects will be mitigated if the regulation interferes only slightly with international trade flows.

In summary, quality restrictions are likely to have the following effects:

- They will lead to higher prices in the country implementing the regulation and may depress the world price.

- Domestic producers will receive a higher price but their costs of production are likely to increase as well since they must comply with the regulation.

- Domestic consumers must pay higher prices and the choices available to them are reduced.

- Producers who exported to the country implementing a quality restriction will find themselves excluded entirely from that country's market if they cannot comply. Quality restrictions may, therefore, be selective and discriminatory.

- In some cases, quality restrictions can lead to greater instability in both the domestic and world markets.

If the objective is to protect domestic producers from foreign competition, quality regulations are the least desirable way to achieve this goal. For the country imposing quality restrictions, no quota rents are generated, the choices available to consumers are reduced, the higher prices received by producers may be offset by higher costs of production, and the regulation may exacerbate domestic instability. For other countries, these regulations may be discriminatory and have the potential for dramatically reducing the volume of trade. The result will be increased instability in the world market and larger efficiency losses (*Appendix*). The adverse economic effects of quality restrictions may be acceptable if the true motivation is to correct a market failure that would threaten the health and safety of individuals or livestock, or harm the environment. On the other hand, better methods of protecting domestic producers from foreign competition can be implemented.

III. The EC Hormone Ban and the Market for Edible Offals

On December 31, 1985, the EC adopted a directive prohibiting the use of hormonal growth promotants in livestock production (European Community, Dec. 31, 1985). This directive includes provision to block imports of livestock products from animals to which the banned hormonal substances have been administered. The U.S. has challenged the EC ban before GATT officials arguing that the EC legislation is, in reality, a trade barrier (Inside U.S. Trade, May 29, 1987). Meat producers in the U.S. and Australia claim that there is little scientific evidence of adverse effects from consuming meat from hormone-treated animals (Agra Europe, January 17, 1986; December 5, 1986). Within the EC itself, the United Kingdom and Denmark are opposed to the hormone ban and have taken steps to block its implementation (Agra Europe, May 8, 1987). European consumer groups, however, are pressing for implementation of the ban as scheduled (Agra Europe, December 5, 1986). The ban was to have gone into effect on January 1, 1988, but its implementation was delayed for one year in response to foreign opposition (Agra Europe, November 20, 1987).

The purpose of this section of the report is to analyze the economic consequences of the EC hormone ban. No attempt will be made to judge the legitimacy of the competing claims concerning the harmful health effects of livestock growth promotants. The analysis will focus on the economic consequences of the ban for a particular market. The specific case chosen for study is the market for edible offals. This example was chosen because edible offals are an important U.S. export to the EC.

EC Policy and the Market for Edible Offals

Hormones are used extensively as growth promotants in livestock production. They lead to improved feed conversion and faster, more uniform growth rates, thus reducing the costs of production. Growth promotants are usually administered through implants or injections. The EC has offered some concessions in the conflict over the hormone ban, including limited hormone use administered though injections. U.S. livestock producers have rejected this offer because the most common treatment method in the United States is to use ear implants (Inside U.S. Trade, May 29, 1987). This issue concerns residues that may remain in the meat depending on the method of administering the hormones and the timing of the treatment. In 1981, the EC adopted legislation prohibiting the use of certain kinds of hormones following discovery of the hormone DES (a known carcinogen) in Italian baby food (European Community, November 6, 1981). This was followed by the 1985 ban on all sexual hormones.

Agricultural policy in the EC includes a great many measures to protect internal markets. Tariffs, variable levies, export subsidies, and various input subsidies and production aids are used to protect livestock product producers. In recent years, EC livestock production has generally been greater than consumption, and the EC has become an important exporter of milk products,

beef, and veal. Prior to 1968 and the implementation of the Common Agricultural Policy (CAP), Western Europe was the largest beef deficit area in the world (Simpson and Farris). Currently, the EC is self-sufficient in pork and poultry but imports substantial quantities of sheep-meat, high-quality beef, and edible offals. Because the support prices for most livestock products are above the world price, any exports must be subsidized. The hormone ban may lead to higher production costs and, ultimately, higher internal prices in the EC. The effect of such a change would be to increase the size of the export subsidies needed to continue exporting the surplus. Thus, a potential consequence of the ban may be to worsen the already tight agricultural budget. This effect would be lessened if the EC is able to promote its meat exports as hormone-free and charge a premium on foreign markets.

Edible offals include livers, brains, kidneys, sweetbreads, tripe, and tongues from cattle and hogs. They are by-products of less value than the meat for which the animals are primarily produced. Because edible offals are by-products, supply is largely determined by the number of animals slaughtered for meat. Thus, the supply of edible offals can generally be calculated as a fixed proportion of total meat supplies. Consumption of edible offals in the EC is relatively high. This is particularly true in France and Ireland where per capita consumption is about twice the average for countries belonging to the Organization for Economic Cooperation and Development (OECD, 1984). Because of the high consumption rate and the fact that the amount of edible offals per animal slaughtered is fixed, the EC must import significant quantities. More than half the edible offals consumed in France are imported, and they constitute 15 percent of the meat consumed annually in France (Ross).

The EC imports about 200,000 metric tons of edible offals each year and the U.S. is a major source of these imports. In 1986, U.S. exports to the EC amounted to 90,000 metric tons of edible offals worth some $107 million (U.S. Meat Export Federation, April 14, 1987). Other suppliers to the EC include Argentina, Brazil, Australia, and New Zealand. For most livestock products, the EC applies extensive trade barriers. For edible offals, however, the only measure used is a tariff of 7 percent for livers and 4 percent for other edible offals (Agra Europe, Ltd., 1986). The hormone ban is an additional trade barrier that may have a significant impact on the edible offal market.

Implications of the Hormone Ban for Edible Offals

A model of the world market for edible offals is illustrated in *Figure 1*. The world is divided into three regions: exporting countries, the EC, and non-EC importing countries. Because offals are by-products of meat production, marketed supplies depend more on conditions in meat markets than on edible offal prices. The supply schedules for all regions are therefore shown as perfectly inelastic.
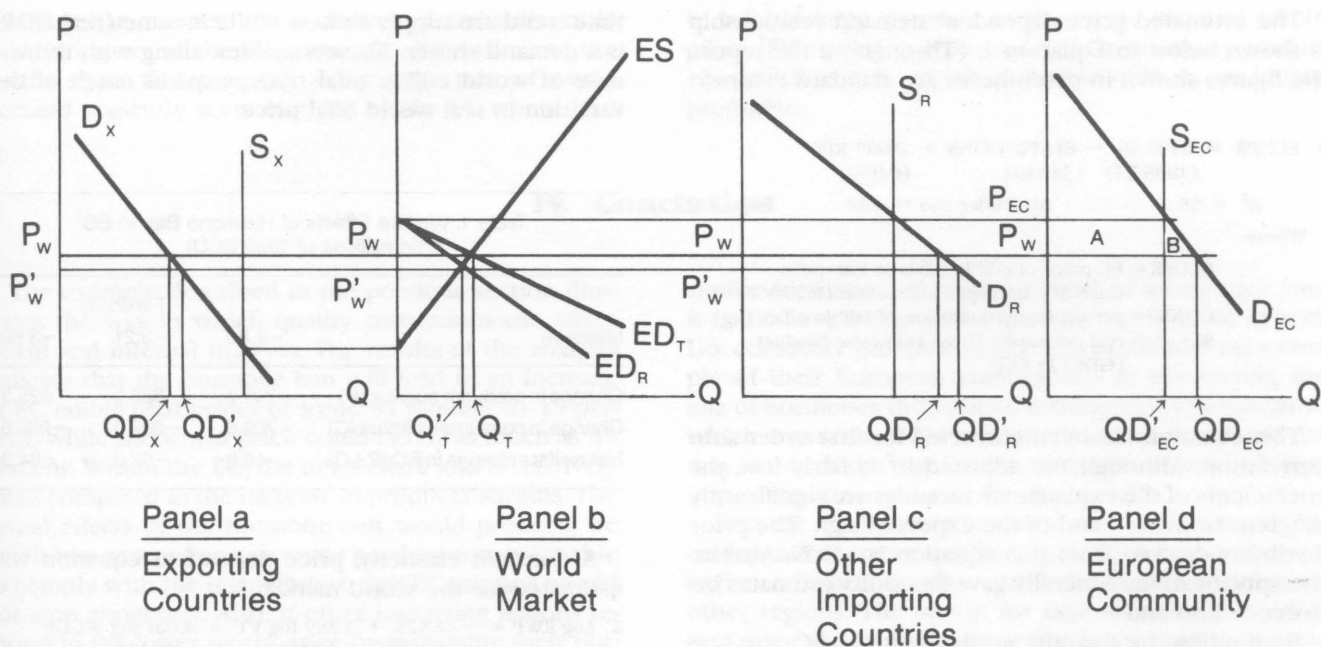
Figure 1. World Market for Edible Offals.

Excess supply and demand schedules are derived as the difference between supply and demand in the three regions. The excess demand schedules for the two importing regions are added horizontally in the world trade quadrant to give ED_T. The intersection of ES and ED_T determines the initial world price, P_w.

For the purpose of this analysis, it is assumed that all exporting countries use hormones and that it would be very costly to change this practice. Thus, when the EC hormone ban goes into effect, the EC will cease importing edible offals. Trade will continue among the other importing countries and exporting countries. The situation is assumed to be similar to the first quality restriction case described in the *Appendix*. In fact, this is an extreme case and the estimated effects should be seen as upper limits. With these assumptions, the EC will be in autarky after implementing the hormone ban. The price in the EC will rise from P_w to P_{EC}. Producer surplus increases by area "A" while consumer surplus falls by area "A + B." (See *Appendix* for definitions of producer and consumer surplus.) Area "B" represents the net loss to the EC of the hormone ban. In the world market, removal of the EC excess demand leaves the excess demand schedule labeled ED_R. This is the excess demand from non-EC countries. A new equilibrium is established at a lower world price, P_w', and a smaller quantity traded, Q_T'. The fall in world price is dampened somewhat because other importing nations may increase purchases at the lower price. For the exporting countries, a smaller quantity is exported at a lower price.

The relationships described above were estimated econometrically using annual data from 1972 to 1984. The data include the quantities produced, consumed, and imported in nine EC countries (Greece, Spain, and Portugal are excluded). In addition, data on the supply of edible offals to the world market and an estimate of world price obtained by dividing the dollar value of world trade by the quantities traded are used (U.S. Meat Export Federation, April 18, 1986). The EC price was obtained by using real exchange rates to translate the world price into an EC price and adjusting this price to reflect the tariff. Other variables used include world and EC income (OECD, 1986). The quantity variables were obtained from Foreign Agriculture Service (USDA) or Food and Agriculture Organization (FAO) publications.

To measure the effects of the hormone ban in the EC, it is necessary to estimate a demand equation. The assumption of perfectly inelastic supply was tested and not rejected (Peterson, Paggi, and Henry). The system is assumed to be recursive with predetermined supplies. These assumptions mean that the logical specification of the demand relationship is with price as the dependent variable. This specification allows direct estimation of the price flexibility of demand. A price flexibility measures the percentage change in a price for a given percentage change in quantity. For this analysis, knowledge of the price flexibility allows estimation of the change in EC prices when imports are eliminated and the quantity supplied and consumed is determined entirely by EC production.

The estimated price-dependent demand relationship is shown below in Equation 1. (Throughout the report, the figures shown in parentheses are standard errors.)

1. ECUPR = 5595.46 − 814.72 CONS + 0.067 RLY
   (1805.23)   (348.10)   (0.039)

   R^2 = .55   first order rho = .539

Where:

   ECUPR = EC price of edible offals in European
           Currency Units per metric ton (ECU/MT)
   CONS = per capita consumption of edible offals (kg)
   RLY   = real per capita Gross Domestic Product
           (GDP) in ECU

This equation has been corrected for first order auto correlation. Although the adjusted R^2 is fairly low, the coefficients of the explanatory variables are significantly different from zero and of the expected sign. The price flexibility derived from this equation is −3.21. Alternative specifications generally gave flexibility estimates between −2.80 and −3.60.

By limiting the quantity available in the EC, the hormone ban will lead to an increase in price (to P_{EC} in *Figure 1*) and changes in producer and consumer surplus. To measure these effects, it is necessary to know the price flexibility, EC production of edible offals, EC imports of edible offals, and the initial price. Subtracting imports from total consumption gives the change in quantity in the EC. The percentage change in quantity multiplied by the flexibility gives the percentage change in EC price. This allows an estimate of P_{EC} to be made and also makes it possible to estimate areas "A" and "B" in *Figure 1* with some simple geometry. To provide a range in the estimates, flexibilities of −2.80, −3.21, −3.60 were used. The average values of the other variables for the period 1980-1984 were used in the computations. The results are shown in *Table 1*.

Elimination of imports in the EC would lead to a decline in consumption of about 12 percent and an increase in market prices of some 34 percent to 45 percent. At the higher price, producer surplus increases by between 720 million ECU and 925 million ECU. The ECU (European Currency Unit) is a basket of EC currencies that is usually fairly close to the U.S. dollar in value. The analysis has been conducted in real terms, that is, after monetary values are corrected for inflation. The maximum gain for EC edible offal producers is, thus, less than one billion real (1980) ECU. The fall in consumer surplus is larger than the increase in producer surplus, leading to a net loss for the EC. However, this efficiency loss is fairly small compared to the magnitude of producer gains.

Real world price depends on both excess supply and excess demand. A two-equation excess supply and excess demand model was estimated but the results could not be used for this analysis (Peterson, Paggi, and Henry). The two-equation model did, however, provide useful information in choosing the variables included in Equation 2. World per capita poultry consumption and the time trend are supply shifters while income (real GDP) is a demand shifter. These variables, along with the volume of world edible offal trade, explain much of the variation in real world offal price.

Table 1. 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

A constant elasticity, price dependent equation was estimated for the world market.

2. Log RWP = −42.525 + 1.289 log VT + 4.061 log WGDP
             (19.36)   (0.755)   (2.525)

   −2.227 log T + 1.870 log PCP
   (0.616)   (1.177)

R^2 = .81   first order rho = 0.588

Where:

   RWP   = real world price ($/MT)
   T   = time trend
   VT   = world edible offal trade (MT)
   PCP   = world per capita poultry consumption (kg)
   WGDP = real GDP of OECD countries ($)
   log   = natural logarithms

Equation 2 can be used to obtain an estimate of the decrease in real world price resulting from EC withdrawal from the world market. The average volume of world trade during 1980-1984 was about 700,000 metric tons, of which 200,000 were imported by the EC. Setting the quantity variable (VT) at 500,000 using 1980-1984 average values for the other variables, and solving Equation 2, provides an estimate of the decrease in world price. The results indicate that the real world price would decrease almost 35 percent after the hormone ban holding all else constant. In combination with the lower quantity traded, the total value of world edible offal trade could shrink from a 1980-1984 average, in nominal dollars, of more than $1 billion to $504 million.

It should be emphasized that these results are upper-limit estimates. Changes in imports by non-EC importing countries have not been taken into account. These imports can be expected to increase, dampening the impact of the EC ban. In addition, these results are based on the assumption that the EC ceases all imports. If some countries are able to comply with the EC regulation with no cost involved, or if some exporting countries do not use hormones, the decrease in EC imports may be less pronounced and the impact on world prices less severe. Also, negotiations on the implementation method of the

hormone ban may result in its dilution, thereby diminishing the impact of the EC regulation. Nevertheless, the results show that removal of the large part of world demand presently accounted for by the EC would lead to a fairly large decrease in the world price of edible offals. If the price is depressed sufficiently, many producers may find that exporting edible offals is no longer profitable.

IV. Conclusion

The example described in the previous section illustrates the way in which quality restrictions can affect world and internal markets. The results of the analysis indicate that the hormone ban will lead to an increase in EC edible offal prices of some 34 percent to 45 percent, while the world price could fall by as much as 35 percent. Within the EC, the net welfare loss is relatively small compared to the increase in producer surplus. The actual effects of the hormone ban would probably be much less severe because some producers may be able to comply with the regulation so that EC imports would not stop altogether. Also, if other importing nations respond to the lower world price by increasing their purchases of edible offals, the impact of the ban would be mitigated.

Despite these qualifications, it appears that the EC hormone ban may substantially disrupt the world market for edible offals. In this situation, an interesting question concerns the response of producers in exporting countires. The U.S. beef industry estimates that compliance with the ban would result in the loss of about $314 million of domestic production, almost three times the value of U.S. beef and veal exports to the EC (U.S. Meat Export Federation, April 14, 1987). On the other hand, some producers may find that they can increase their returns by producing hormone-free beef and edible offals to take advantage of the higher prices in the EC. Whether this kind of response is possible depends in part on the certification and inspection procedures that the EC requires. It is not inconceivable for the EC to set up certification requirements that are so cumbersome that any potential for specializaion to take advantage of the EC price would be eliminated.

For the EC, an essential question concerns the implications of the ban for beef exports. Higher prices in the EC may increase budget problems because export subsidies may have to be increased. On the other hand, it is possible that a premium for hormone-free beef could be charged, offsetting, at least partially, the need for increased subsidies. It also should be noted that no completely effective method has been developed for detecting hormones in meat. In fact, a thriving black market trade exists for hormones that have been illegal for many years in countries such as Germany and The Netherlands. These circumstances may preclude charging a premium for hormone-free beef and raise interesting questions concerning how the EC will enforce the ban, both internally and with respect to imported meat. Another issue concerns the likelihood that other countries will adopt similar legislation. If Japan established a hormone ban, it could have a dramatic impact on world trade in beef. U.S. consumer groups may also elect to follow the example of their European counterparts in eliminating the use of hormones in livestock production. The extent to which countries adopt regulations of this nature and the way in which the regulations are implemented will have important consequences for world trade.

Because food and agricultural markets are highly interdependent today, quality restrictions adopted in one region are likely to affect producers and consumers in other regions. The reason for this widespread effect is that domestic measures must also be applied to imports if the good is traded. In many, perhaps most, cases the motivation for establishing quality regulations is the belief that the market will fail to account for health or safety hazards, or other quality components believed to be important. However, many situations occur in which the quality regulation is perceived by at least some of the market participants as a trade barrier. If elimination of conventional agricultural trade barriers leads to great reliance on quality restrictions to protect domestic producers, there may be a proliferation of regulations that have little to do with legitimate health and safety concerns.

This type of outcome may be worse than the current situation. The conventional trade barriers presently in use may be less disruptive than quality restrictions designed as an alternative protectionist device. For the importing country, a tariff or import quota has the advantage of generating government revenue or quota rents that may offset the efficiency losses to some extent. This is not the case with quality restrictions. For the world as a whole, the efficiency losses may be greater with quality restrictions because they eliminate trade between countries with different regulatory regimes altogether. In general, using quality regulations to protect domestic producers from foreign competition is the least desirable way to accomplish protectionist objectives.

This points back to the problem of distinguishing between quality restrictions that are based on legitimate concerns from those that are simply methods to eliminate foreign competition. To make such a determination requires more than scientific evidence. The economic, political, legal, social, and cultural aspects of the issue may be as important as any laboratory evidence presented. The political economy of quality restrictions in international trade is an important area for further research.

References

Agra Europe. various issues. Newsletter on the European Community. London.

Agra Europe Ltd. 1986. CAP Monitor, Agra Europe Ltd. Turnbridge Wells, Kent, U.K.

Allen, Roy, Claudia Dodge, and Andrew Schmitz. 1983. Voluntary Export Restraints as Protection Policy: The U.S. Beef Case. Amer. J. Agr. Econ. 65(2): 291-296.

Blyth, Nicola. 1984. The EEC Sheepmeat Market and Voluntary Export Restraint Agreements. Australian J. of Agr. Econ. 28(1):33-43.

Byers, Floyd M. 1986. Department of Animal Science, Texas A&M University. Personal Communication. College Station, Tx.

Caves, R. E. and R. W. Jones. 1977. World Trade and Payments. Little, Brown and Co., Boston.

European Community. Official Journal of the European Community, various issues, 1972-1986. Office of Official Publications of the EC, Luxembourg.

FAO, FAO Trade Yearbook. various issues. FAO Statistics Series, Food and Agricultural Organization. Rome.

Galbraith, H. 1981. Hormone Levels in Humans, Animals and Plants. The Scottish Farmer. 19(9) Edinburgh.

Harris, Simon, Alan Swinbank, and Guy Wilkinson. 1983. The Food and Farm Policies of the European Community. John Wiley and Sons, New York.

Inside Washington Publishers. May 29, 1987. Inside U.S. Trade. Newsletter on International Trade. Washington, D.C.

Kreinin, Mordechai. 1979. International Economics, A Policy Approach. Harcourt Brace Jovanovich, Inc., New York.

OECD. 1984. Meat Balances in OECD Countries. Organization for Economic Cooperation and Development. Paris.

OECD. 1986. National Accounts, Main Aggregate, 1960-1984. Organization for Economic Cooperation and Development. Paris.

Peterson, E. Wesley F. 1985. Agricultural Policy in the European Community. MP-1578, TAES, Texas A&M University, College Station, Tx.

Peterson, E. Wesley F., Mechel Paggi, and Guy Henry. 1987. Quality Restrictions as Barriers to Trade: The Case of European Community Regulations on the Use of Hormones. Unpublished manuscript, Texas A&M University, College Station, Tx.

Ross, Leslie. April 1986. U.S. Variety Meats — Tops on French Tables, Foreign Agriculture. Foreign Agriculture Service, USDA, Washington, D.C.

Simpson, James R. and Donald E. Farris. 1982. The World's Beef Business. Iowa State University Press, Ames, Iowa.

Tomek, William G. and Kenneth L. Robinson. 1981. Agricultural Product Prices. Cornell University Press, Ithaca.

U.S. Department of Agriculture, Foreign Agriculture Service. various issues, 1975-1985. Foreign Agricultural Circular: Livestock and Meat. Washington, D.C.

U.S. Meat Export Federation. April 18, 1986. Personal Communication.

U.S. Meat Export Federation. April 14, 1987. Personal Communication.

Wonnacott, Paul and Ronald Wonnacott. 1982. Economics. second edition, McGraw Hill Book Co., New York.

APPENDIX

The Impacts of Alternative Trade Barriers

Trade barriers affect prices; quantities supplied, demanded, and traded; government budgets; and the well-being of producers and consumers. The way in which these variables are affected depends on the nature of the trade barrier. The purpose of this appendix is to detail the impacts of four common types of trade barriers: Import tariffs, import quotas, voluntary export restraints, and quality restrictions. Each type of barrier is analyzed using graphs and the concepts of consumer and producer surplus. Producer surplus is defined as the area above the supply curve and below the prevailing price. Consumer surplus is defined as the area below the demand curve and above the prevailing price. These concepts are illustrated in *Figure A1*.

In Panel a. of *Figure A1*, consumers are able to purchase the product at the world price (P_w). Consumer surplus is represented by the hashed area labeled "A." If price was at P_2, there would be some consumers still willing to buy the product. These consumers benefit from being able to purchase the good at the lower P_w. Consumer surplus measures the total benefits to consumers of being able to purchase at P_w rather than at higher prices. The small hashed area "B" is producer surplus. It measures the benefit to producers of being able to sell at P_w rather than at lower prices. In Panel b. of *Figure A1*, the world price has changed from P_w to P_w'. This increase in the world price leads to a reduction in consumer surplus. Because consumers now must purchase at P_w' instead of P_w, total consumer surplus has declined by the area "A+B+C+D." Producers, on the other hand, benefit from the higher price. In terms of producer surplus, they have

gained area "A." Producer and consumer surplus are useful concepts for evaluating the impact of trade policies on the well-being of producers and consumers, and are used in the following discussion.

Import Tariffs

The first type of trade barrier to be examined is the import tariff. In *Figure A2*, a three-quadrant graph of a world market is used to show the equilibrium prices and quantities in the absence of trade barriers. The difference in supply and demand in the importing region is used to derive an excess demand schedule (ED). This excess demand schedule, shown in the world trade quadrant, indicates the quantities imported at different world prices. The excess supply schedule (ES) for exporting countries is derived in the same manner. The equilibrium world price is established at P_w where excess supply equals excess demand. Note that $Q_T = QD_M - QS_M = QS_X - QD_X$.

If an import tariff is applied to the product being traded in *Figure A2*, it will raise the price in the market of the importing countries. This is shown in *Figure A3*. A tariff is a tax on imported goods. Tariffs can be levied on an ad valorem, per unit, or variable basis. The effect of the tariff is to raise the price in the importing countries from P_w to P_T. At the higher price, consumers in the importing countries purchase less, and producers in the importing countries increase supplies to the market. Consequently, the importing countries import less of the product. In effect, the excess demand schedule shifts from ED_0 to ED_1, causing world price to fall to P_w'. The fall in world
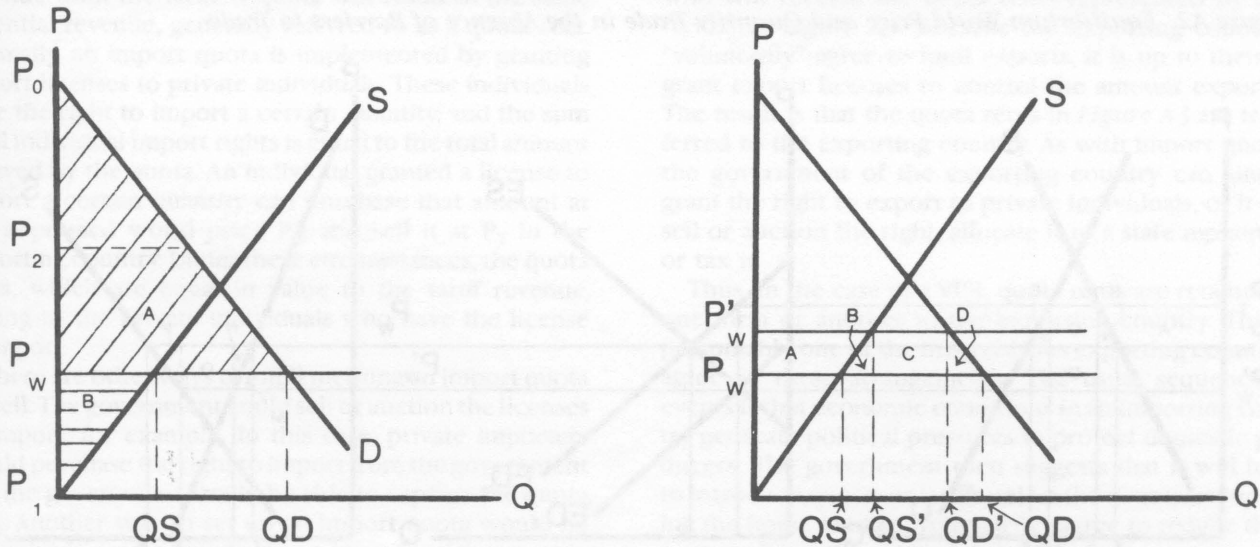
a. Total Producer and Consumer Surplus

b. Changes in Producer and Consumer Surplus

Figure A1. Producer and Consumer Surplus.

price occurs because the situation represented in *Figure A3* is that of a major importing country. A tariff applied in a small importing country may have an imperceptible effect on world price if the country purchases very small amounts in relation to the volume of world trade.

In the case of a large importing country, the reduction in demand for imports will depress the world price. Importers in these countries now purchase the product on the world market at P'_w, pay a tax equal to the difference between P_T and P'_w, and sell the product on the market of the importing countries at P_T. This change means that consumer surplus in the importing countries is reduced by area "A+B+C+E." Producers gain area "A"

which is transferred from consumers. The small triangles "B" and "E" represent efficiency losses due to the distortion introduced by the tariff. Area "C+D" is the government revenue from the tariff. The overall effect for the importing countries can be determined by adding the gains and losses. The loss in consumer surplus (A+B+C+E) can be subtracted from the producer gains (A) and government revenue (C+D). The net effect is area "D−B−E." If area "D" is bigger than areas "B+E," there is a net gain for the importing countries.

In the exporting countries, consumers benefit from the depressed world price, but there is a loss in producer surplus. In *Figure A3*, consumers in the exporting coun-
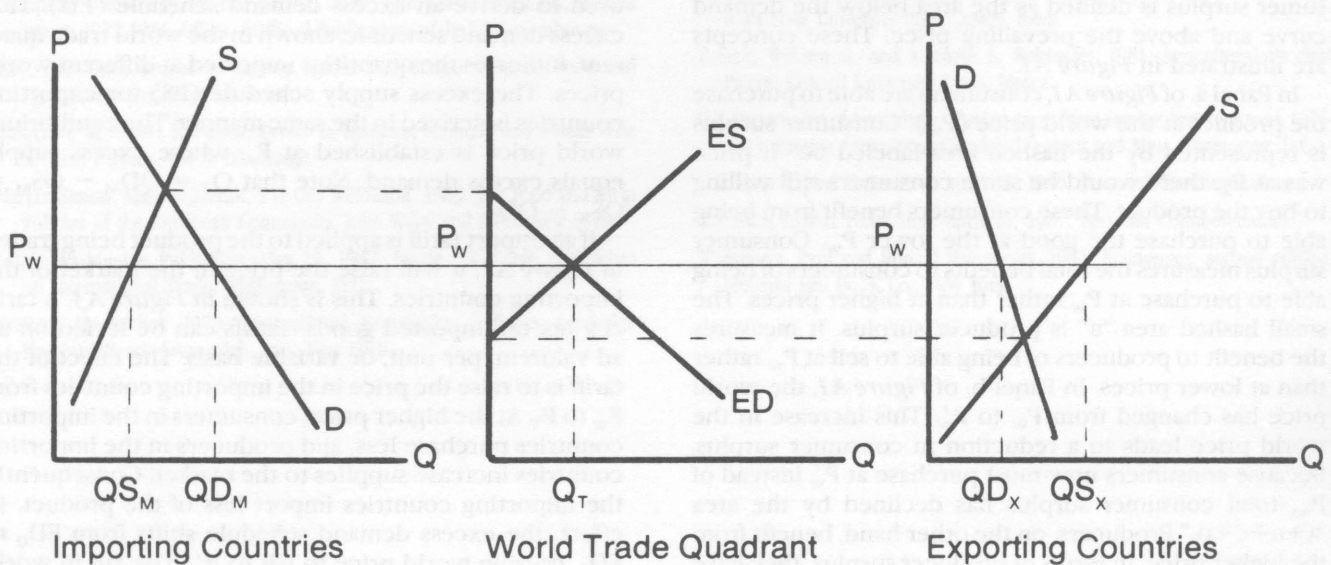

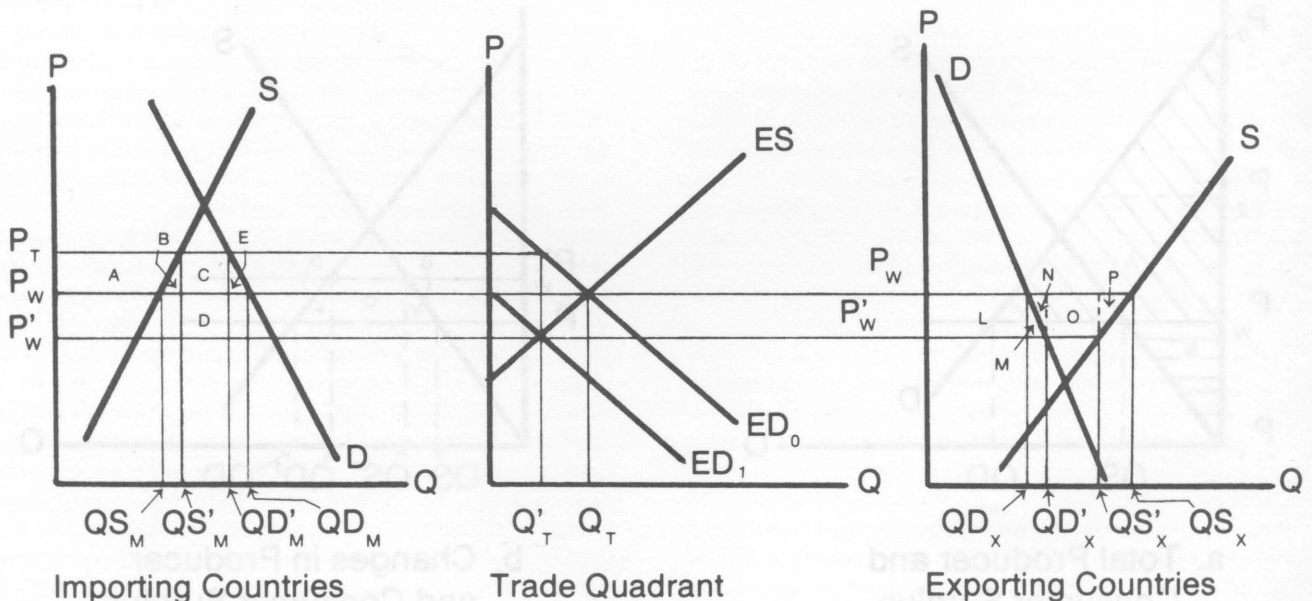Figure A2. *Equilibrium World Price and Quantity Trade in the Absence of Barriers to Trade.*

Figure A3. *The Effects of Trade Barriers.*

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tries gain area "L+M" while producers lose area "L+M+N+O+P." Thus, there is a net loss to the exporting countries equal to area "N+O+P." Area "O" is transferred from the exporting countries to the importing countries where it appears as area "D." For the world as a whole, there are four small triangles—B, E, N, and P—which represent the efficiency loss due to the imposition of the tariff.

In summary, the introduction of an import tariff raises prices in the importing countries and depresses the world price received by exporters. The tariff benefits producers in importing countries and consumers in exporting countries. Producers in exporting countries and consumers in importing countries are hurt by the tariff and there is an efficiency loss for the world as a whole. Finally, the government in the importing country obtains revenue from the tariff.

Import Quotas

An import quota limits the quantity allowed on the market. The effect of a quota is also a price increase, but the direction of causality is reversed compared to import tariffs. The tariff raises price, leading to a decrease in the quantity imported. A quota limits the quantity imported, leading to an increase in price. A quota can be designed to have the same effect on prices as a tariff. In *Figure A3*, an import quota set equal to the difference between QD'_M and QS'_M will cause the market price to rise to P_T. A quota of this nature would effect producer and consumer surpluses, quantities traded, and prices the same as the tariff described above.

An import quota differs from a tariff in one way. Recall that area "C+D" in *Figure A3* represents government revenue from the tariff. A quota will result in the same potential revenue, generally referred to as a quota rent. Normally, an import quota is implemented by granting import licenses to private individuals. These individuals have the right to import a certain quantity, and the sum of all individual import rights is equal to the total amount allowed by the quota. An individual granted a license to import a certain quantity can purchase that amount at the depressed world price P'_w and sell it at P_T in the importing country. Under these circumstances, the quota rents, which are equal in value to the tariff revenue, belong to the private individuals who have the license to import.

There are other ways of implementing an import quota as well. The government could sell or auction the licenses to import, for example. In this case, private importers would purchase the right to import from the government and the government would be able to capture the quota rent. Another way to set up an import quota would be to establish a state monopoly on imports of the good in question. A state agency established as the only legal importer could buy the entire quota on the world market at P'_w, sell it in the country at P_T, and retain the quota rent as government revenue. It would also be possible for the quota rent to be shared in some fashion between the government and private traders. For example, import licenses could be sold at a price that would only recover some portion of the quota rent, rather than the entire amount.

In summary, an import quota leads to the following changes:

- Prices in the importing country increase.
- World prices and prices in exporting countries decrease.
- Producer surplus in the importing country and consumer surplus in the exporting country increase.
- Consumer surplus in the importing country and producer surplus in the exporting country decrease.
- There is a net efficiency loss for the world as a whole.

These effects are the same as those occasioned by an import tariff. The main difference between import quotas and import tariffs concerns the disposition of area "C+D" in *Figure A3*. In the case of a tariff, this area is government revenue. In the case of a quota, it is a quota rent which may be shared in any one of a number of ways between the government and private traders.

Voluntary Export Restraints

Voluntary export restraints (VERs) are similar to import quotas in that they regulate the quantity placed on the market. VERs are agreements negotiated between an importing country and one or more exporting countries. The exporting countries agree to limit their exports to some predetermined quantity. This type of restriction has the same effects in the importing and exporting countries as an import quota. The difference, again, concerns who will receive the quota rents represented by area "C+D" in *Figure A3*. Because the exporting countries "voluntarily" agree to limit exports, it is up to them to grant export licenses to control the amount exported. The result is that the quota rents in *Figure A3* are transferred to the exporting country. As with import quotas, the government of the exporting country can simply grant the right to export to private individuals, or it can sell or auction the right, allocate it to a state monopoly, or tax it.

Thus, in the case of a VER, quota rents are retained in one form or another in the exporting country. This is presumably one of the main reasons exporting countries agree to these arrangements. The usual sequence of events is that economic conditions in an importing country generate political pressures to protect domestic producers. The government then suggests that it will have to introduce quotas or tariffs unless the countries supplying the home market "voluntarily" agree to reduce their exports. From the point of view of the exporting country, a voluntary agreement is preferable to quotas or tariffs because the quota rent generated by a VER is retained in the exporting country.

An illustration of the value of these quota rents is provided by Wonnacott and Wonnacott. In Hong Kong,

private exporters have been granted the right to sell certain quantities of textiles in the United States. The quota rent associated with this right is substantial and a market has developed in which these export quotas are traded. An individual who owns an export quota can sell or lease it to someone who actually produces and exports the good. "Some Hong Kong exporters with large quotas found that it was more profitable to sell the quota rights than to produce the goods. So they closed down their factories and lived off the proceeds from the sale of their quotas" (Wonnacott and Wonnacott, p. 656).

Quality Regulations

Quality regulations differ from the trade barriers described above in several respects. First, they do not necessarily have the same effect on imports from all sources. Producers in some countries may be able to continue exporting to a country implementing a qualitative restriction if there are similar regulations in their country, or if they can easily comply with the regulation of the importing country. On the other hand, producers who are unable to comply with a regulation will effectively be excluded from the market—their exports will fall to zero. Thus, quality regulations on internationally traded goods may be discriminatory, eliminating all trade between certain regions, while allowing trade to continue as if no barrier between other regions existed.

Quality regulations generally lead to higher internal prices because domestic producers must also comply with the regulation. Although producers will receive higher prices, they are also likely to experience higher costs of production as a result of complying with the regulation. Imports by the country implementing a quality regulation may decline if few suppliers are able to comply. In the extreme, imports will be entirely eliminated if no producers in the exporting countries are able

to comply with the regulation. This extreme situation is depicted in *Figure A4*. Assume that no producers in the exporting countries are in compliance with a regulation implemented in the importing countries and that they are unable to alter their practices to comply with the rule, at least in the short-term. Under these circumstances, all trade of the product will cease and the two markets will be in the situation referred to as autarky. Prices will be determined entirely by domestic supply and demand. For the importing countries, this is shown as an increase from P_W to P_A in *Figure A4*. Producer surplus increases by area "A," consumer surplus decreases by area "A+B," and society experiences a net loss of area "B."

In the exporting countries, price falls from P_W to P_N. Consumer surplus increases by area "C," producer surplus decreases by area "C+D," and society experiences a net loss of area "D." For the world as a whole, areas "B" and "D" represent the efficiency losses due to the elimination of trade. The global efficiency loss represents the maximum loss to the world economy. If some producers can comply with the regulation, or if only some of the importing countries adopt the restriction, some trade would continue and the impact on prices and quantities would be less severe.

Consider a world made up of four regions or countries, two of which are net exporters of the product, while the other two are net importers. Excess supply (ES) schedules can be derived for the two exporting countries and excess demand (ED) can be derived for the importing countries. These schedules can be added horizontally to determine the aggregate ES and ED schedules. The procedure is illustrated in *Figure A5*. The individual excess supply and excess demand curves are aggregated to form the kinked schedules ES_{1+2} and ED_{3+4}. The intersection of these schedules determines a world price
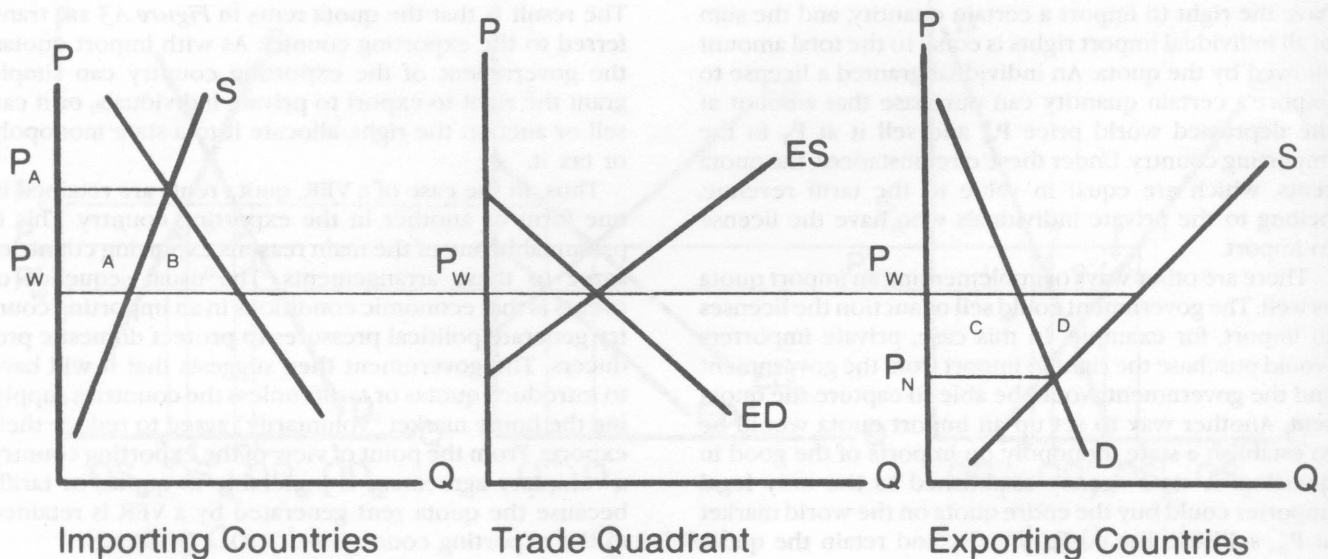

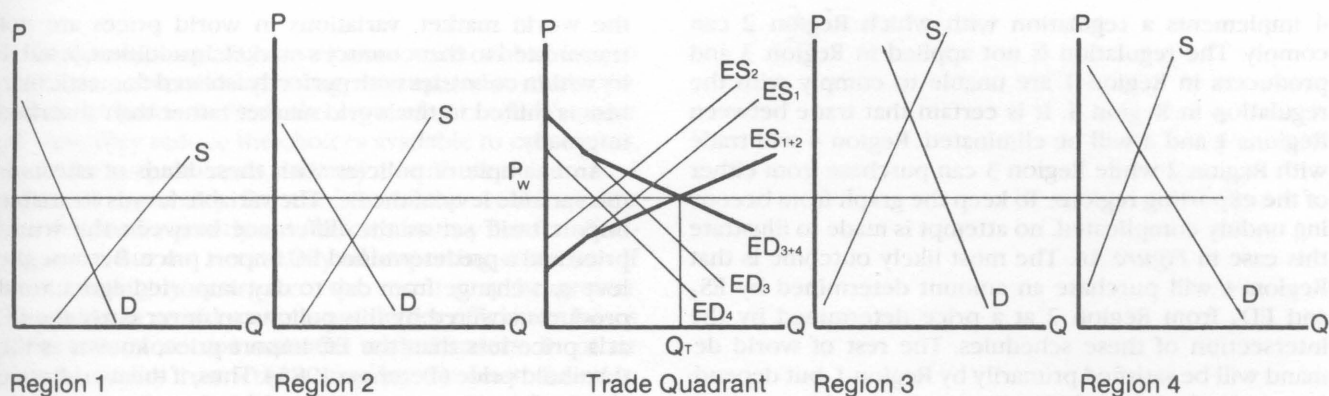*Figure A4. The Effects of Eliminating Trade.*

Figure A5. Equilibrium in a Four-Region Trade Model.

and the quantities traded by each region, assuming no trade barriers are in effect.

As in *Figure A4*, quality restrictions that lead to a cessation of all trade would result in autarky, in which supply and demand in each region would determine prices and quantities. In the more complex situation shown in *Figure A5*, there would be four prices corresponding to the four intersections of supply and demand schedules in the four regions.

In *Figure A6*, the world trade quadrant from *Figure A5* is reproduced in order to further analyze the implications of quality restrictions. In the absence of trade barriers, world price is P_w and quantity Q_T is exchanged. Consider the three following situations:

1. Region 4 implements a quality restriction with which it is impossible for anyone in Regions 1 or 2 to comply. Region 3 does not have any quality restrictions.

2. Regions 3 and 4 both implement a quality restriction with which Region 1 is unable to comply but with which Region 2 can comply.

3. Region 4 implements a quality restriction with which Region 2 can comply. Region 1 is unable to comply with the regulation, which is not enforced in Region 3.

Other combinations could be imagined, but these are the most useful cases for tracing the implications of quality restrictions. Each will be examined respectively.

In the first case, the regulation exists only in Region 4. Region 3 does not apply the regulation and the two exporting regions cannot comply with it. The result is that Region 4 will drop out of the market and move to a state of autarky, while trade among the three remaining regions will continue. The equilibrium will occur where $ES_{1+2} = ED_3$ in *Figure A6*. World price declines from P_w to P_A, while the quantity traded falls from Q_T to Q_A. Consumers (producers) in Region 3 stand to gain (lose) from this change while producers (consumers) in Regions 1 and 2 stand to lose (gain) from it. In Region 4, the changes in producer and consumer surpluses are the same as those illustrated in *Figure A4* since the region essentially enters a state of autarky.

In the second case, Region 2 is able to comply with

a regulation implemented in both importing regions but Region 1 cannot. In this scenario, trade can continue among regions 2, 3, and 4, but Region 1 is excluded from the world market. Equilibrium is now established where the Region 2 excess supply schedule (ES_2) intersects the total excess demand (ED_{3+4}). Because total demand has not changed and one of the suppliers to the world market is excluded, world price rises to P_B. The quantity traded is less than the case in which no regulations are in place (Q_T). In this situation, producers in regions 2, 3, and 4 benefit while consumers in those regions must pay a higher price. The changes in consumer and producer surplus in Region 1 are the same as those shown in *Figure A4* for an exporting country forced into autarky.

The third case is somewhat more complicated. Region 3 is discussed in part B of the report.

Because quality restrictions essentially "purify" certain exchanges, they do not generate quota rent. It is not possible to purchase lower cost production in compliance with a regulation on the world market and sell them for a higher price in a regulated market. This is an important difference from the more traditional barriers. It is possible, however, to question the relevance of the standard measures of producer and consumer welfare. After all, the loss in consumer surplus resulting from higher prices in a regulated market may be offset by the worth consumers ascribe to being assured by the quality restriction that the product is not hazardous. The cost of achieving a given level of safety need to increase, but the quality restriction is simply a way to make these products safer through compliance.

Further Considerations on Trade Barriers

Up to this point, the discussion of the different barriers to trade has been confined to the terms of the static effects. Comparative statics was used to compare the situation under a given barrier to that before it was introduced. It is important to note that these static effects compared in turn, while it may also be considered. The dynamic trade restrictions may also impinge upon the evolution of prices through time, thereby increasing
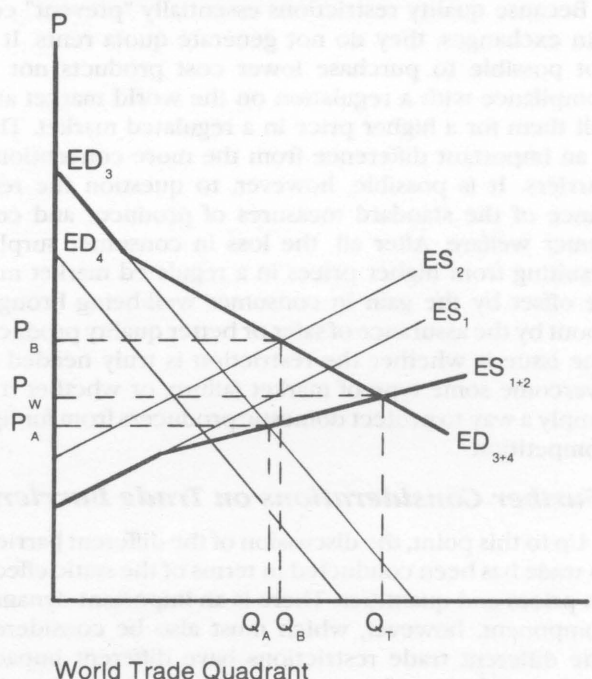

World Trade Quadrant

Figure A6. The Effects of Quality Regulations.

4 implements a regulation with which Region 2 can comply. The regulation is not applied in Region 3 and producers in Region 1 are unable to comply with the regulation in Region 4. It is certain that trade between Regions 1 and 4 will be eliminated. Region 4 will trade with Region 2 while Region 3 can purchase from either of the exporting regions. To keep the graph from becoming unduly complicated, no attempt is made to illustrate this case in *Figure A6*. The most likely outcome is that Region 4 will purchase an amount determined by ES_2 and ED_4 from Region 2 at a price determined by the intersection of these schedules. The rest of world demand will be satisfied primarily by Region 1, but depending on the location of ED_3, Region 3 may also purchase from Region 2. The implications of this situation for the change in prices and quantities are somewhat ambiguous.

In general, the impacts of quality regulations are more complicated than those of more conventional trade barriers. Frequently, this type of barrier is applied selectively. Countries already complying with the regulation or able to comply without cost can continue trading with the regulating country. Countries unable to comply are completely excluded from the market in question. The quantity of imports by an importing country implementing a quality restriction may not change significantly if many countries already have a similar regulation. In this situation, however, it is likely that the source of these imports will be altered. On the other hand, some regulations may move an importing country to an autarkic position, and if this country is large, the impact on world prices and trade could be substantial. An example of this situation is discussed in Part III of the report.

Because quality restrictions essentially "prevent" certain exchanges, they do not generate quota rents. It is not possible to purchase lower cost products not in compliance with a regulation on the world market and sell them for a higher price in a regulated market. This is an important difference from the more conventional barriers. It is possible, however, to question the relevance of the standard measures of producer and consumer welfare. After all, the loss in consumer surplus resulting from higher prices in a regulated market may be offset by the gain in consumer well-being brought about by the assurance of safer or better quality products. The issue is whether the restriction is truly needed to overcome some type of market failure, or whether it is simply a way to protect domestic producers from foreign competition.

Further Considerations on Trade Barriers

Up to this point, the discussion of the different barriers to trade has been conducted in terms of the static effects on prices and quantities. There is an important dynamic component, however, which must also be considered. The different trade restrictions have different impacts on the evolution of prices through time. If the internal market of an importing country is perfectly isolated from the world market, variations in world prices are not transmitted to that country's market. In addition, instability within countries with perfectly isolated domestic markets is shifted to the world market rather than absorbed internally.

An example of policies with these kinds of effects is the variable levy of the EC. The variable levy is a variable import tariff set as the difference between the world price and a predetermined EC import price. Because the levy can change from day to day, imported agricultural products covered by this policy can never enter the EC at a price less than the EC import price, known as the threshold price (Peterson 1985). Thus, if the world price increases or decreases, the variable levy is adjusted so that the price within the EC is not affected by the world price change. On the other hand, a shock within the EC can be shifted to the world market, thereby increasing world price instability. Suppose the weather in the EC has been particularly good and the corn harvest is much larger than normal. Because internal prices cannot fall below the threshold price, EC corn consumption will not change. The only effect of the supply shock will be to reduce EC imports which will tend to depress the world price. Thus, a policy such as the EC variable levy reduces instability internally by shifting the burden of adjustment to the world market.

In terms of price stability, the least disruptive trade barrier is an ordinary tariff (Blyth). An ad valorem tariff, for example, allows fluctuations in world price to be transmitted to the internal market. Also, variation in domestic output is not prevented from causing a decline in internal prices. The impact of an internal supply shock is at least partially absorbed by the market in the importing country where the shock occurred. Import quotas and VERs lead to greater world price instability because, as with the variable levy, quantities imported are limited to a predetermined amount (Blyth). In general, trade barriers tend to increase instability on world markets by shifting the burden of adjustment out of the internal market. On the other hand, variability originating in the world market is more likely to disrupt domestic markets if free trade exists than if countries employ trade barriers.

The way in which quality restrictions affect the dynamics of prices and markets depends on the specific situation. If the restrictions eliminate trade in a given commodity, any shocks must be absorbed entirely by the internal markets. Although an autarkic country is unaffected by world market variation, it is unable to shift a portion of the adjustment burden due to internally generated shocks to the world market. The result may be increased internal instability. To the extent that quality restrictions lead some countries to cease participating in world trade, the world market will be thinner and more vulnerable to destabilizing shocks. Often, trade barriers stabilize internal markets and destabilize world markets. Quality restrictions may have the disadvantage of contributing to greater instability in both domestic and world markets.

In summary, quality restrictions used as barriers to trade have several disadvantages compared to more conventional barriers. From the regulating country's point of view, they reduce the choices available to consumers, generate no quota rents, and may contribute to increased domestic instability. For the rest of the world, quality restrictions frequently are a discriminatory barrier affecting some, but not necessarily all, exporting countries. If they are highly restrictive, the result may be greater instability in world markets and larger efficiency losses than with more conventional trade barriers. In other words, quality restrictions may be the least desirable way to protect producers. If the motivation for implementing a quality restriction is to protect consumers, the environment, or livestock from harmful substances, these disadvantages are likely to be of little concern. However, if the primary motivation for implementing a quality restriction is to protect producers from foreign competition, better methods are available to accomplish that objective, at least from the economic perspective.