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MEASURING NONTARIFF TRADE POLICIES

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ABSTRACT

This paper surveys and critiques various methods of measuring nontariff trade measures (NTMs) for the purpose of determining which seem most promising for facilitating the process of reducing the trade-distorting effects of such policies through multilateral negotiations. Four measurement methods are analyzed: price-impact measures, quantity-impact measures, frequency-type measures, and welfare measures. The general conclusion is that, despite a host of difficulties, theoretical and empirical analysis has progressed sufficiently far to enable reasonable measures of nontariff policies to be made that are useful for assessing relative sectoral protection across countries and monitoring changes in protection and subsidization levels over time. Tariff and subsidy equivalents, preferably determined by directly comparing distorted and non-distorted prices, are the most useful forms of measurement, since they focus on the price-distorting effects of NTMs and are also concepts with which public and private officials are already familiar. However, the various other types of measures can be valuable in supplementing the information obtained from tariff and subsidy equivalents.

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I. Introduction

International trade is presently distorted by a wide variety of government measures other than tariffs. A study for the World Bank (Olechowski, 1987) estimates that in 1984 about 15 percent of the import product categories of the major developed countries, accounting for 18 percent of the value of their imports, were subject of non-tariff measures (NTMs). Compared to 1981, this represented an increase in import coverage of 2.4 percent.

A concern that these measures may undermine the international benefits achieved from the significant tariff liberalization in the post-World War II period has stimulated interest in measuring non-tariff trade policies by means other than simply determining their product and value coverage.[1] This paper surveys various measurement methods that have been proposed with the aim of determining which seem most promising for facilitating the process of reducing the trade-distorting effects of NTMs.[2] Part I briefly contrasts the problem of measuring tariffs versus non-tariff policies, while Part II presents a background analysis of the price and quantity effects of NTMs. The merits and drawbacks of various types of measures are then discussed in Parts III through VII. Conclusions are set forth in Part VIII.

II. Measuring Tariffs Versus Non-Tariff Policies

When tariffs were the major trade-policy instrument, there was general agreement that the most appropriate way of measuring the extent to which governments regulated international trade

was by calculating the rate at which imports were taxed. But both researchers studying patterns of protection and negotiators engaged in tariff-reducing multilateral negotiations realized the imperfect nature of this measure. The tariff rate is also only one part of the information needed to assess the impact of reducing an import duty on such key economic variables as the domestic price of the imported good, the price of the domestic substitute for the imported good, the volume of imports, the volume of output of the domestic substitute, the change in value-added in the domestic industry, and domestic employment. To determine these effects, it is necessary to know such relationships (and their behavior over time) as the direct and cross-price elasticities of demand for imports and the domestic substitute, the elasticities of supply for imports and the domestic good, the share of intermediate inputs used in producing the domestic good, and the number of person-years used per unit of output. Furthermore, if the duty cut is part of a general process of tariff reductions in which interactive effects are significant, a general equilibrium model is needed to trace out the various indirect price, output, and employment effects.

Despite the limitations of measuring tariff protection as the rate at which imports are taxed, governments have been (and still are) prepared to negotiate reciprocal tariff reductions using changes in this measure as an index of the duty cuts they received and granted. For example, in the Kennedy Round of multilateral trade negotiations (1962-1967), when a 50% tariff-

cutting formula was agreed upon by the participants, equal cuts in tariff rates among countries were regarded as achieving an approximate balance of concessions. In effect, trade negotiators were willing to assume that the differences among commodities and countries in such response indicators as demand and supply elasticities tended to even out when tariffs were cut on a wide range of goods.[3]

Non-tariff trade policies are expressed in many forms. In one major category, quantitative restrictions, the volume or value of imports or exports is limited, either on a global or a country-selective basis. In another important group, subsidies, the government provides direct financial assistance to producers or factors of production or supplies intermediate goods and services to firms at below their economic cost. In still another category, the government establishes standards and regulations relating to health, safety, packaging, labeling, and so forth that may inadvertently or deliberately discriminate against foreign suppliers. Illustrations of other trade-distorting measures are government purchasing policies that treat domestic suppliers preferentially, variable import levies, arbitrary customs procedures that restrict imports, and tied aid programs. Because of these many different ways in which NTMs are expressed, there is, unlike in the case of tariffs, no one obvious means of comparing non-tariff policies.

III. Price and Quantity Effects of Non-Tariff Trade Policies

One approach to comparing non-tariff measures is to focus on the various wedges that they introduce between the world price of an imported or exported good or service, the prices domestic consumers pay for the imported product and its domestically produced substitute, and the price received by the domestic producers of this latter good. A quota, for example, like a tariff, introduces a wedge (beyond that associated with any tariff on the product, transportation costs, and other markups) between the price received by foreign producers for the imports they supply and the price charged domestic consumers for these imports. This similarity between tariffs and quotas is illustrated in Figure 1, which depicts a country's demand curve for imports (D_M) and the supply curve of imports from foreign countries (S_F) that it faces under perfectly competitive conditions. In the absence of any protection, imports are oq_o and the domestic and the world prices are both op_o. If an ad valorem tariff is levied on imports, the import-supply curve, which indicates the price importers charge consumers after paying their own government the import duty, shifts upward to S_{F+t}, thereby yielding a new equilibrium import quantity and price of oq_1 and op_1, respectively. The tariff creates a wedge between the price consumers pay for imports, op_1, and the foreign price of the import good, op_3. The domestic government collects the difference, p_1LMp_3 as tariff revenue.

A similar wedge is created if a policy is introduced limiting the quantity of imports to oq_1. The foreign-supply

curve, S_{fQ}, becomes vertical at oq_1 and above op_3, with the price paid by domestic consumers again rising to op_1. If the quota rights are allocated to domestic importers, they will reap the windfall gain of p_1LMp_3 by being able to buy abroad at a price of op_3 and sell at home at a price of op_1. In contrast, if the quota rights are allocated to foreign exporters, as is the case with most voluntary export restraint agreements, these exporters gain this rent.

The price effects of restricting imports by such non-tariff means as using variable levies or foreign exchange controls can be analyzed in much the same way as tariffs and quotas. Suppose, for example, that op_1 is the target price below which the government does not want the domestic price to fall. Given the initial domestic-demand and foreign import-supply curves, an import levy of p_1p_3 per unit accomplishes this goal. If the foreign import-supply curve declines, the government will raise the levy, while it will lower the per-unit levy if the domestic-demand curve increases. Unlike quotas, with variable levies the quantity of imports varies, while the price remains fixed when domestic demand shifts.

Even the price effects of a discriminatory technical barrier can be analyzed with the aid of Figure 1. Suppose, for example, that the product supplied by foreigners satisfies in some objective sense the health or safety standards imposed on the product by the importing country, but that this country requires certain costly modifications in the foreign product because

technically it is not exactly the same as the domestic substitute. By raising foreign costs, this requirement shifts the foreign import-supply curve up to S_{f+t} and produces the same price-raising and import-reducing effects as a tariff.

Officials in the importing country are concerned not only with a trade-restricting policy's price and quantity effects on imports but also with its price and output effects on the domestic product with which imports compete. If imports and domestic products are perfect substitutes, the effects are straightforward. The price of that proportion of output produced domestically rises to the same level as the domestic price of imports, thereby reducing total consumption of the goods but increasing the amount supplied domestically. In manufacturing, however, many products within a tariff line are similar but not identical. They are differentiated in some way from each other by the firms producing them, making the assumption of perfect substitutability between imports and domestic production inappropriate. In this case, the increase in the price of imports due to the introduction of a trade-restricting policy can be viewed as increasing the demand curve for the domestic variety as domestic consumers substitute the domestic version for higher-priced imports. Given an upward-sloping (but not vertical) domestic-supply curve, this shift will, in turn, result in an increase in the price and output level of the domestic substitute.[4]

In contrast to quantitative restrictions and other non-

tariff policies impinging directly on the domestic price of imports and indirectly on domestic producer prices, trade-distorting government subsidies directly affect the prices domestic producers receive for their products. The impact of a domestic production subsidy, when the good is being imported, is shown in Figure 2. The curve S_0 is the domestic-supply curve prior to the production subsidy, S_F is the foreign-supply curve, and S_T is the horizontal sum of these two curves. The curve D_0 is the domestic demand for the home and foreign product, assumed to be identical. The equilibrium price and consumption level are op_0 and oq_0, respectively, with oq_1 supplied by domestic producers and q_1q_0 imported.

A fixed per-unit subsidy shifts the domestic-supply curve to $S_{0\text{-}S}$ and the sum of this curve and the foreign-supply curve to $S_{T\text{-}S}$. The increased total supply reduces the domestic price to op_1, increases domestic supply to oq_3, and increases consumption to oq_2. Domestic producers now receive op_3 per unit of output they produce; op_1 of this is covered by the price consumers pay for the product and p_1p_3 comes from the government as a subsidy.

A subsidy that is not tied to output-producing activities, for example, a subsidy to existing capital services (in contrast to a subsidy that is used in acquiring new plant and equipment), has no effect on output, prices, and trade and is just an income-redistributing policy.

IV. Frequency-Type Measures

As the preceding analysis indicates, non-tariff trade policies can be measured either by their price or quantity effects. As mentioned in the introduction, another obvious method, which will be discussed in this section, is simply to measure these policies in terms of their numbers and trade coverage.[5]

Frequency-type measures record the number, form, and trade coverage of non-tariff trade policies as determined from special surveys, frequency of complaints by trading partners, and government reports. The best-know effort involving this approach is a joint World Bank-UNCTAD study (Nogues, Olechowski, and Winters, 1986 and Olechowski, 1987) of governmental commodity-specific border measures affecting the imports of sixteen industrial countries in the period 1981-1984. The data are derived from various official national publications and information supplied by governments to the GATT. Three indices of the prevalence of selected non-tariff trade policies (mainly ones with obvious quantity or price effects) are constructed in this study. The first uses a country's own import weights to determine the proportion of imports from its trading partners affected by these policies, and the second employs world import weights. For the last index, the extent of non-tariff trade policies is measured simply by the number of commodity trade flows between a country and its trading partners that are affected by these policies.

Since many national governments and other international

organizations besides the World Bank and UNCTAD (for example, the International Monetary Fund [IMF] and the GATT) maintain lists of non-tariff policies affecting current trade flows, the trade-coverage approach has the advantage of being relatively easy to implement. Figures cited in the World Bank-UNCTAD study indicating that in 1984 18 percent of the imports of the major industrial countries were affected by non-tariff border policies have also alerted public officials about the pervasiveness of these policies. But there are obvious disadvantages to measuring non-tariff policies in this manner; the most serious is the failure to distinguish among different types of non-tariff policies or forms of a particular policy in the degree to which they affect import prices and quantities and other variables of interest. Another drawback is the sensitivity of frequency-type measures to the degree of country and product-line disaggregation used by the investigator. For these and other reasons, most governments do not accept frequency-type indices as meaningful measures of non-tariff policies.

V. Price-Impact Measures

Given public and private officials' familiarity with measuring tariffs in percentage terms, a strong case can be made for favoring price over quantity measures of non-tariff trade-distorting policies. The existence of a wedge between the domestic and foreign price of imported products, as in the case of a tariff, would also seem to simplify the measurement problem

compared to quantitative estimates. Most empirical measurement efforts have, in fact, focused mainly on this approach. Three types of price-impact measures are considered in this section: tariff equivalents, subsidy measures, and the effective rate of protection or assistance.

A. Tariff Equivalents and Their Estimation

The tariff equivalent (t_n) of import-restricting non-tariff policies (also called the implicit rate of protection) measures the rate by which the domestic border price (p_m) of the imported good exceeds the price (p_1) paid by domestic importers to foreign exporters, inclusive of transport costs to the importing country and any tariffs levied by this country. Specifically, $t_n = (p_m - p_1) / p_1$.[6] This measure is termed a "tariff equivalent" because under perfectly competitive conditions, an ad valorem tariff at this rate would yield the same wedge between the domestic and import prices.

As Moroz (1985) points out, there are two basic methods of estimating tariff equivalents. One is directly to observe the world price of the imported product and the domestic price at which it is sold, taking account of wholesale and retail margins as well as tariffs and transport costs; the other is to use information on the quantity changes resulting from a non-tariff measure and data on relevant demand and supply elasticities to estimate the price wedge.

i) Comparative Price Analyses

The price-comparison method is clearly the most straight-

forward way of estimating the tariff equivalents of non-tariff measures. This is one of the methods used by the Commission of the European Communities in estimating the effects of removing existing barriers among members of the European Communities by 1992 (Commission of the European Communities, 1988). The price data utilized were collected by the Statistical Office of the European Communities (Eurostat), in cooperation with the statistical services of the Member States, as part of its program of calculating purchasing power parities and comparing gross domestic product in real terms between Community countries. For 1985 Eurostat obtained price information from Member countries on household consumption items and equipment goods for 215 basic headings comprising nearly 3,000 products (Eurostat, 1988).[7] Other studies relying on the price-comparison approach include Dardis (1967), Roningen and Yeats (1976), Baldwin (1975), and Bhagwati and Srinivasan (1975).

There are numerous data and interpretation problems with the price comparison method, however. First there generally is no direct information on the prices that importers pay foreign suppliers.[8] It is usually necessary to try to obtain price data from third-country markets for the identical product whose quality and price are unaffected by the NTMs.[9] If this effort is successful, the costs of delivering this good to the domestic market, including the payments of any import duty, must be estimated. Finally, if this imported good is resold on an open domestic market and the margins involved in shipping the good

from its port of entry to this market can be identified, the price wedge due to non-tariff trade-distorting policies can be determined.

The import good usually varies in quality from the domestic substitute with which it competes.[10] Domestic price data usually do not distinguish between domestically produced and imported goods, however. Using the available price series, which typically are an average of the prices of these goods, tends to underestimate the price wedge caused by the trade barrier, especially if imports are a small part of total consumption. As experience with quantitative restrictions on automobiles, footwear, and textiles has demonstrated, quality upgrading also tends to occur when imports are limited by physical quotas in contrast to ad valorem tariffs. To separate the domestic price-increasing effects due to improved quality from those due to a smaller import volume of a given quality requires the use of hedonic regression techniques (Feenstra, 1984) or estimations of the price elasticities of various qualities of the product (Levinsohn, 1988).

It is not easy, furthermore, to separate the different possible causes of the wedge between domestic and foreign prices, once it has been estimated as accurately as possible. The price difference is often due to a number of different non-tariff policies, some of which may not be observable. In imperfectly competitive markets, part of the price wedge may also represent producer-profit margins that are above those in perfectly

competitive markets.

One situation in which price differentials due to a specific non-tariff policy can be estimated quite accurately is when export-quota rights are sold in an open market with registered prices. Such is the case for quota rights on clothing products in Hong Kong and India and was the case for a short period in Taiwan. Using this information, Hamilton (1986, 1988) has calculated tariff equivalents for the non-tariff barriers imposed by various industrial countries against clothing exported by both Hong Kong and Taiwan. Australia and New Zealand also have instituted systems for auctioning quotas for several commodities (see Bergsten, Elliot, Schott, and Takacs [1987]).

When non-tariff trade restrictions are applied on a country-specific basis, as in the case of textiles and apparel, the estimated price wedge applies only to imports from a particular country or small group of countries. If an average tariff equivalent for total imports of the product is desired, the tariff equivalent estimated for the restricted exporters must be reduced to take into account the increase in imports from non-controlled suppliers resulting from the imposition of the country-selective import barrier.[11]

Another problem with measuring the effect of non-tariff policies by comparing foreign and domestic prices is the variability of this measure due to fluctuations in nominal exchange rates. An appreciation of a country's currency, for example, will increase the <u>ad valorem</u> equivalent of a

quantitative import restriction as the domestic currency price of the foreign product to importers decreases[12]. The rate of assistance provided by a specific production subsidy (or specific import duty) will also increase as a consequence of the appreciation of a country's currency, whereas the rate of assistance or protection associated with an ad valorem tariff or production subsidy is unaffected by exchange rate changes. Because of the volatility of exchange rates in recent years, some have suggested in OECD discussions of measuring agricultural assistance that averages of rates of assistance based on more than a single year should be calculated for trade-distorting measures that are sensitive to exchange rate changes.

In summary, the price-comparison method of measuring the ad valorem equivalent of non-tariff trade policies is straightforward and logically appealing, but difficult measurement problems are often encountered in estimating and interpreting differences in foreign and domestic prices. Careful and often costly studies are required to deal with these problems in a satisfactory manner. Nevertheless, as was the case with the Community's study of the effects of removing barriers among Member States or the OECD work on quantifying agricultural assistance, the price-comparison method should be an important component of any effort to measure the effects of non-tariff trade-distorting policies.

ii) Inferring Price Changes from Quantity Changes

Probably the most widely used non-tariff trade-distorting

policy is quantitative restrictions. A government decides that imports from all or a subgroup of suppliers will be reduced by a specified amount or market share. The price wedge that would produce this quantitative decline in imports can be calculated, given estimates of import-demand and import-supply elasticities and, if imports are imperfect substitutes for domestic production, of domestic-demand and domestic-supply elasticities together with the relevant cross-price elasticities. Since the tariff equivalents of quantitative restrictions vary as the demand for imports increases over time, an estimate of the rate at which the demand for imports grows is also needed to keep the tariff equivalents up-to-date. Among the investigators using this approach to estimate tariff and subsidy equivalents are Morici and Megna (1983) and Moroz (1985).

When direct observations on changes in imports are not available, information on the market share of imports prior to the imposition of the non-tariff barrier can sometimes be used to estimate quantity reductions. Relevant elasticities can be applied to these quantity changes to infer the price wedge associated with the restriction. Other more elaborate approaches for estimating quantity effects of non-tariff policies are also available, such as using sector-specific or applied general equilibrium models. These will be discussed in Part V, which is devoted entirely to quantity-impact measures.

While considerable effort is required to obtain good estimates of the parameters needed to measure the tariff

equivalents of quantitive trade restrictions, this approach should be used to supplement the information obtained from the price-comparison method.

iii) Surveys

Another estimating method that can compliment those already discussed is to survey those who have been affected by NTMs. In the Community study cited above, the technique of asking firms to estimate the price and quantity impact on them of various technical regulations was used as an additional method of estimating the cost effects of removing these trade barriers. Surveying governments and private firms in countries whose exports have been adversely affected by foreign trade restrictions can also yield useful information about the price effects of these measures. In interpreting the results of such surveys, we must, of course, recognize that it may be in the economic interests of some respondents to either exaggerate or minimize the importance of particular non-tariff policies.

B. Subsidy Measures and Their Estimation

i) Subsidy Equivalents

As noted in Part II, unlike import controls, trade-distorting government subsidies directly increase the per-unit receipts of domestic producers (p_r) for their output. The most common way of measuring these subsidies is to express them as a percentage of the per-unit sales value (p_c) of the product. Specifically, the ad valorem subsidy equivalent (s) can be expressed as follows:

$s = (p_r - p_c) / p_c$.

Under this definition, tariff equivalents of non-tariff policies (t_n) and subsidy equivalents (s) are not directly comparable; one measure relates to imports and the other to production of the domestic substitute. But if imports and domestic production are perfect substitutes, there is a simple relationship between the two measures on the production side. With perfect substitutes, the domestic price of imports (p_m) will be the same as the consumer price of the domestically produced good (p_c). Ignoring transport costs,

$$p_m = p_i (1 + t_n) = p_w (1+ t) (1 + t_n),$$

where p_i is the tariff-inclusive price paid by the domestic importer and p_w is the world price, and t is the ad valorem tariff, therefore, it follows from the relationship, $p_r = p_c (1 + s)$, that $p_r = p_w (1 + t) (1 + t_n) (1 + s)$. Using estimates of elasticities of domestic supply, foreign supply, and domestic demand, it is also possible to determine the tariff equivalent that directly reduces imports by the same quantity that a domestic subsidy does indirectly.

Estimating subsidy equivalents generally is an easier task than estimating tariff equivalents, since data on public subsidies usually are published in government budgets. The main problem is identifying the amounts that various industries receive when the subsidy is not industry-specific or the disbursing agency does not have records on the industries receiving the subsidy.

ii) Producer Subsidy Equivalents

The OECD (1987) and various national governments have undertaken significant work in recent years in measuring the extent of agricultural support. The measurement concept that has been developed, the producer subsidy equivalent (PSE), is defined as the payment or subsidy required to compensate producers for the removal of government agricultural assistance programs and is usually expressed as a percentage of the total value of output. A related concept, consumer subsidy equivalents (CSEs), measures the implicit tax on consumption from agricultural policy measures (the market support element of PSE) and any subsidies to consumption. Direct price comparisons play an important role in estimating both PSEs and CSEs.

Four types of measures are included in calculations of PSEs: market price supports, direct income supports, indirect income supports, and other supports. Domestic price support programs, tariffs, and quotes are examples of the first set of measures, while deficiency and disaster payments illustrate those in the second group. Indirect income supports include capital grants, concessional credit, and input subsidies. In the group of "other supports" are research, advisory, training, and inspection services supplied by the government, as well as taxation and transportation concessions. PSEs and CSEs have been estimated for all twenty-four members of the OECD. They have been valuable in monitoring trends in agricultural support across countries and also have been used as an input into the GATT negotiations on

agriculture in the Uruguay Round.

iii) Trade Distortion Equivalents

An alternative measure to the PSE proposed by the Canadian government for use in the agricultural sector is the trade distortion equivalent (TDE). Like subsidy equivalents, it differs from the PSE by focussing on the trade distorting effects of policies rather than their income supporting effects. There are some agricultural programs such as government research, training and the provision of market information that are assumed to have an insignificant impact on current production and prices received by producers and thus are omitted from TDE calculations.

Production subsidies in agriculture are also sometimes tied to a reduction in productive capacity. As Whalley and Wigle (1988) find from analyzing the pre-1985 U.S. wheat program in a general equilibrium framework, eliminating such subsidies and the related capacity-reduction requirement can actually increase output in contrast to what would be expected if the production subsidy alone is considered. Josling and Tangermann (1987) point out that the appropriate calculation for explaining the production effect of such programs is to estimate the production subsidy (or production tax) that would have called forth the actual production in the absence of supply controls. TDE estimates attempt to do this by including a corrective factor that reduces PSE and subsidy equivalent calculations when subsidies that increase producer prices are tied to supply controls.

C. The Effective Rate of Assistance or Protection

The effective rate of assistance or protection, a concept refined by Corden (1966) and Balassa (1965), measures the percentage by which the value added in an industry changes due to government protection and subsidization policies compared to its value under conditions of free trade and the absence of government production-related subsidization programs. Specifically, the effective rate of assistance (ERA) is:

$$ERA = (VA^1-VA)/VA$$

where VA^1 and VA are value added with and without, respectively, trade-distorting government policies. Value added is the difference between the total value of an industry's (or firm's) output and the costs of the intermediate inputs used in producing the final product, for example, raw materials, energy, and transportation. It measures the change in the return to the capital and labor employed directly in an industry or firm.

If it is assumed that all inputs and outputs are traded under perfectly competitive conditions, all foreign supply and demand curves are infinitely elastic, imports and domestic production in an industry are perfect substitutes, and intermediate inputs are used in fixed proportions, calculation of the change in value added is quite straightforward. Under these conditions, tariffs and non-tariff policies affecting imports raise the domestic price of imports and the domestic substitute by the ad valorem equivalents of these policies, while production subsidies raise the price received by producers above the

domestic price by their subsidy equivalents. Subsidies or import restrictions on intermediate inputs lower or raise input prices to producers by their subsidy or tariff equivalents. More specifically, VA^1, the value added resulting from various government policies, is measured by the existing value added in an industry, while this industry's value added under free trade is estimated by deducting from VA^1 the revenue equivalents of the tariff and non-tariff barriers affecting the industry's output, the revenue equivalents of production subsidies, the revenue equivalents of input subsidies, and adding the revenue equivalents of tariff and non-tariff barriers affecting intermediate inputs used in production. The difference between VA^1 ans VA expressed as a percentage of VA is the effective rate of assistance. Among the many studies of effective rates of assistance or protection are those by Balassa (1965), Baldwin (1970), Wilkinson and Norrie (1975), and Pitt (1981).

The effective rate of assistance brings out the significance of a product's value-added share under free trade in determining the effects of protection. Making the simplified assumptions cited above, contrast the degree of protection on a simply processed good that sells for $1 per unit under free-trade conditions, in which the cost breakdown consists of $.90 of traded intermediate inputs and $.10 of value added by primary factors, with that on a more elaborately processed good also selling for $1 but whose cost components consist of $.50 of traded intermediates and $.50 of value added by primary factors.

A five per cent duty on the imports of each good will raise the price of each to $1.05. Since free-trade conditions still prevail for the intermediate inputs used in producing both goods, the costs of these inputs remain unchanged. Consequently, the $.05 increase in the domestic value of the final goods will go to the primary factors. This raises the return to the primary factors used in producing the first good by $.05/$.10 or 50 percent but to the primary factors used in making the second good by only $.05/$.50 or 10 percent. Thus, a low nominal tariff on a simply processed good with a low value-added component can yield a high effective rate of assistance or protection.

Modifying the assumptions of the simple model by introducing, for example, less than perfectly elastic supply curves and imperfect substitution between imports and domestic production makes the calculation of effective rates of assistance considerably more difficult, just as dropping these assumptions makes the calculation of tariff and subsidy equivalents more difficult. It is a comparatively easy step, however, to calculate effective rates of assistance once tariff and subsidy equivalents have been estimated, especially if a standardized input-output table (or one for developed and another for developing countries) is used to determine the shares of various intermediate inputs used in production.

VI. Quantity-Impact Measures

Quantity impact measures focus on changes in the volume of imports and domestic production caused by various non-tariff policies. As Jager and Lanjouw (1977) point out, a case can be made that trying to measure quantitative changes in imports and domestic output is more relevant for negotiators and domestic producers than trying to estimate price wedges. Quantitative measures can be aggregated across commodities and compared across countries by expressing the decrease or increase in trade attributable to trade policies as percentages of estimated trade or domestic production in the absence of those policies.

Besides inferring quantity changes from the simple methods discussed in Part IV, as Hufbauer, Berliner, and Elliot (1986) have done, investigators have analyzed the effects of policy changes on particular industries by using both sector-specific and general equilibrium models.

A. Sector-Specific Models

Instead of attempting to capture all the interrelationships that determine the effects on an industry of changes in non-tariff policies, those using sector-specific models examine only the most significant of these relationships. Though they require considerable effort to implement, such models are much less time-consuming to build than general equilibrium models and have the benefit of not having to rely, as is often the case under simple methods or applied general equilibrium models, on parameter values for elasticities that are based on out-of-date studies.

Among those who have used this approach to analyze trade

policy issues are Grossman (1986), who models the U.S. steel industry, Moroz and Salembier (1985), who study the effects of Canada's footwear import quotas, and Pelzman (1986), who develops a model of the U.S. textile and apparel market. By estimating the reduced-form equation for employment using monthly observations over a ten-year period, Grossman obtains elasticity parameters that can be used to estimate the effects on employment, output, domestic prices of such policy changes as reducing the level of duties on steel imports. For certain key sectors that are highly protected or subsidized and for which the accuracy of existing elasticity values is doubtful, sector-specific studies are highly desirable. The results from such studies are, however, very sensitive to the particular way the model is formulated by the investigator.

B. General Equilibrium Approaches

i) Multi-Good, Multi-Country Trade Models

As Deardorff and Stern (1985) note, one general approach to measuring the quantitative effects of non-tariff trade policies is to develop a multi-good, multi-country regression model to explain actual trading patterns on the basis of factor endowments and various trade-resistance factors such as distance. The general relationships obtained are then used to estimate a particular country's trade with other countries from its unique set of factor endowments and resistance factors. The deviations between the country's actual and estimated trade patterns are taken to measure quantitatively the extent to which its trade

policies are more or less restrictive than the collection of countries used to obtain the general relationships.

Notable applications of this technique by Saxonhouse (1983, 1988), Balassa (1986), and Lawrence (1987) have attempted to ascertain if Japan's trade structure is consistent with its resource endowment. The results are inconclusive. Leamer (1988) uses this approach in trying to determine whether trade in individual products is distorted by unusually restrictive or export-promoting government policies. He concludes that the technique is too imperfect in explaining actual trading patterns on the basis of real variables such as factor endowments to isolate the effects of various trade measures.

ii) Applied General Equilibrium (AGE) Models

When major changes in protection and subsidy levels occur across industries and countries, the impact-effect measures obtained from sector-specific or other partial-equilibrium approaches may be misleading. An applied general equilibrium model is needed to take account fully of all the feedback effects from such changes. Among the AGE models that have been specially developed to examine trade policy issues are those constructed by Deardorff and Stern (1986), Dixon, Parmenter, Sutton, and Vincent (1982), Harris and Cox (1983), Whalley (1985), and Tarr (1988). In the more elaborate of these models, the effects of changes in non-tariff policies across industries and countries on such variables as imports, exports, domestic production, employment, relative prices, and value added can be determined under a wide

variety of assumptions about exchange rates, the flexibility of wages, and the mobility of labor and capital.

The usefulness of AGE models for policy analyses seems highly promising as they become more disaggregated, are extended to more countries, and are based on more reliable parameter estimates of key relationships. But until there is greater agreement among the builders of these systems on the appropriate way to model the key price and quantity-determining relationships and greater comparability in industry detail, they are likely to serve more as useful checks on non-tariff policy measures obtained by the other methods than as the basic measurement approach.

VIII. Welfare Measures

In measuring the impact of tariff or non-tariff policies, economists naturally think in terms of the comparative welfare effects of such policies. An economy-wide viewpoint is usually adopted, but the effects on world welfare can also be estimated. The methodologies previously described that utilize various direct and cross-price elasticities to arrive at price or quantity measures of non-tariff policies already provide all the information needed for calculating consumer-surplus and producer-surplus measures of economic welfare. In the recent EC study of the effects of removing the remaining non-tariff barriers among Member States, the purpose of obtaining price and quantity measures of these barriers was so that they could be used for

calculating the welfare gains from completing the Common Market. Other studies of the welfare effects of non-tariff trade policies using a partial equilibrium approach are those by Tarr and Morkre (1984), Hickok (1985), and Hufbauer, Berliner, and Elliot (1986). With AGE models, welfare changes are usually measured by using the Hicksian concept of equivalent variation, that is, the income that it would be necessary to provide members of the economy in the pre-policy-change situation to make them as well-off as they are after the policy change.

VII. Conclusions

There are a number of techniques for measuring non-tariff trade policies, none of which, unfortunately, is as simple to implement as measuring tariffs. As numerous studies indicate, however, taken together they provide a practical and feasible means of obtaining measures of non-tariff policies that can be used for assessing relative sectoral protection across countries and monitoring changes in protection and subsidization levels over time.

Tariff and subsidy equivalents of non-tariff policies are the measures with which public and private officials concerned with trade issues are most familiar and, therefore, are the most useful forms of measurement. Comparing foreign and domestic prices is the most direct means of obtaining tariff equivalents, but estimates based on known quantity changes, coupled with relevant price-elasticity estimates, and on sector-specific

studies are also useful as a check on the results from comparative price analysis. When good estimates of tariff and subsidy equivalents are available, they can also be used to calculate the effective rate of assistance, since this measure indicates the impact of trade distortions on the returns to domestic capital and labor more sharply than tariffs and subsidy equivalents alone.

Estimates of the quantitative effects of non-tariff policies are a valuable supplemental measure. In some instances, the technique used to estimate tariff and subsidy equivalents involves obtaining prior estimates of quantity changes so this information is readily available. Such is the case when demand and supply elasticities for traded and domestic goods are used along with the data on quantitative changes to infer tariff equivalents, as well as when sector-specific and AGE models are used. These latter models provide useful checks on other non-tariff measures and will become even more useful as greater uniformity in modeling specification and broader country and more detailed industry coverage is achieved.

Lists of non-tariff policies and the magnitude of the trade affected by these policies have proved to be helpful in alerting government officials and others to the pervasiveness of non-tariff trade-distorting policies. Frequency-type measures by themselves, however, are only a very crude measure for comparing the extent of protection or assistance across industries and countries.

Welfare measures, though regarded by economists as the best summary measure of policies that reduce economic efficiency, are unlikely to serve as a generally accepted basis for ascertaining whether a balance of concessions has been achieved in a negotiation. The wide divergence in views among negotiators about the proper welfare weights to be given to different groups within a country and to be assigned to different countries makes it difficult to use welfare estimates for this purpose. But they can be very useful to individual countries in assessing alternative liberalization proposals, especially if the gains and losses to different consumer and producer groups across industries are separately identified so that public officials can combine these welfare changes according to their own sets of welfare weights.

In addition to determining the form in which to measure trade-distorting non-tariff policies, investigators must decide on the types of policies they wish to measure and the industry and country detail to include. Financial constraints will probably force researchers in this area initially to focus on a limited number of sectors and countries and on those nontariff measures where price and quantity effects are significant. Concentrating on a small number of industries, such as textiles and apparel, steel, electronics, automobiles, and shipbuilding, and on major consuming and producing markets, not only makes the measurement task feasible but covers many of the non-tariff trade policies of most concern to governments. There is also a danger

that measurement exercises will get bogged down in disputes over what is and is not a trade-distorting policy. Concentrating initial efforts to measure non-tariff policies across countries on policies that quantitatively limit imports and exports, enforce particular prices, or clearly represent trade-distorting government subsidization may avoid this problem.

FIGURE 1

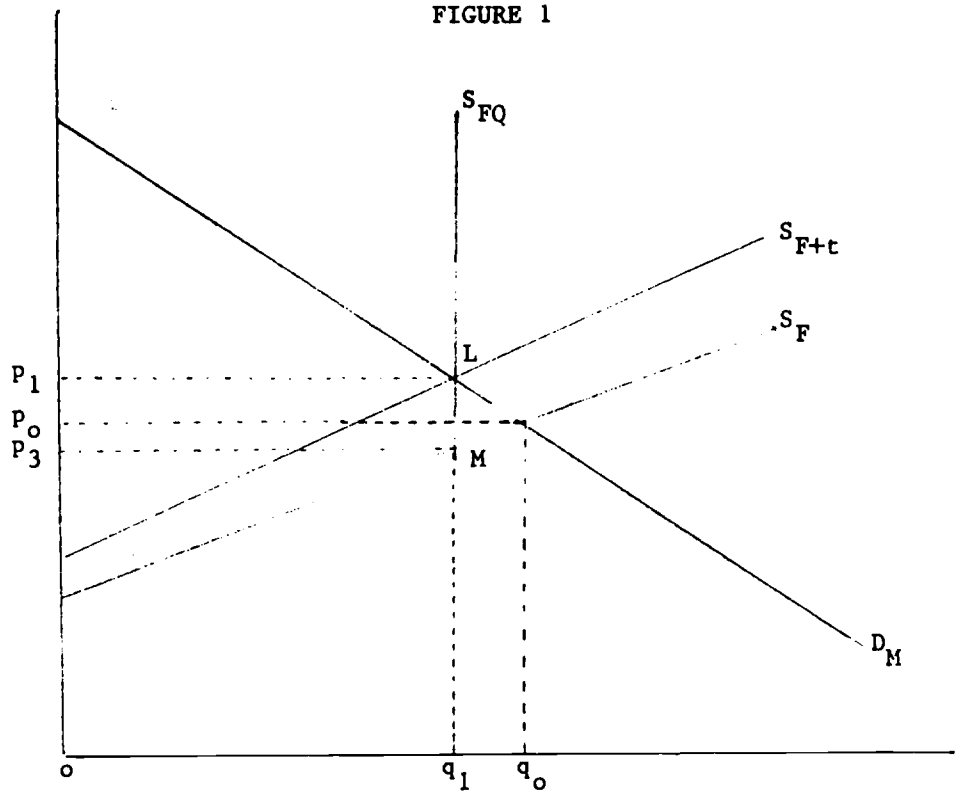
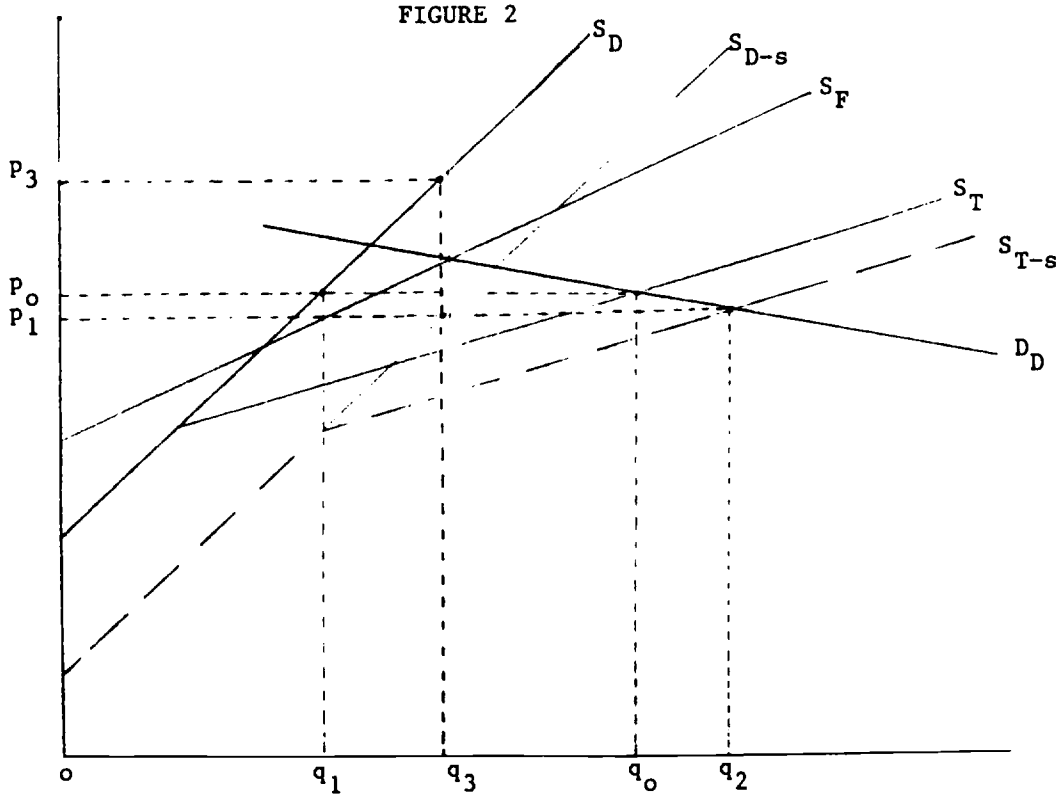


FIGURE 2



ENDNOTES

1. Average tariffs in the industrial countries have been reduced from about 40 percent in the mid-1930s to a current level of about 5 percent.

2. The focus of the paper is on goods and services that are traded across national borders. Goods and services supplied by foreign firms within a country are also subject to trade-distorting and discriminatory government measures, but these are not considered here.

3. The European Community argued, however, that to achieve reciprocity there should be greater cuts in high-duty items than low-duty ones. The tariff-cutting formula adopted in the Tokyo Round by which high-duty rates were cut by a greater percentage than low rates reflected this viewpoint.

4. The successive cross-price effects between imports and the domestically produced substitute will settle at levels where the price and output level of the domestic variety are greater than initially and the price of imports is higher but the quantity lower than initially.

5. This threefold classification is used in the excellent survey of measurements methods by Deardorff and Stern (1985).

6. Under such arrangements as voluntary export restraints (VERs) where export licenses are usually allocated directly to foreign producers, p_1 is the price these producers would receive if export licenses were auctioned off by the foreign government. If the producers export to markets that are not subject to VERs, this is also the price that importers in these markets pay the producers.

7. This is part of a joint EUROSTAT-OECD exercise in calculating purchasing power parities in which EUROSTAT collects data for EC members and OECD is responsible for obtaining data from non-EC members of OECD.

8. Unit values estimated from customs data are usually poor indicators of these prices.

9. In the case of VERs, for example, the export price in the tariff equivalent formula can be estimated from the price in markets supplied by foreign producers where VERs do not apply.

10. As the OECD (1987) study of U.S. agricultural policies and their subsidy-equivalent effects documents, even finding identical agricultural products is not an easy task.

11. Levinsohn (1988) finds, for example, that to reduce total U.S. auto imports by the same quantity as a one percent rise in the price of Japanese autos alone requires only a 6/10 of one percent rise in auto imports from all sources.

12. For a discussion of changes in the rate of protection or assistance and changes in exchange rates, see Industries Assistance Commission, 1981.

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