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Measuring the Domestic Distributional Impact of Trade Liberalization

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MEASURING THE DOMESTIC DISTRIBUTIONAL IMPACT OF TRADE LIBERALIZATION

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by

Ellen Hornig*

I. INTRODUCTION

Since the early 1960s, several developments have stimulated economists' interest in the domestic impact of international trade. Trade has gained importance in the U.S. economy, comprising a growing share of the gross national product, absorbing an increasing portion of agricultural output and, potentially or in actuality, supporting or threatening several domestic industries. Though not yet a dominant factor in U.S. economic development, trade has become a more prominent issue during a period of general economic instability: chronically high inflation and unemployment rates are frequently attributed to such trade-related factors as import competition, the energy 'crises', and rising commodity prices. Trade negotiations, under way during most of the past twenty years, have brought to the arena of public discussion topics such as slow growth and excess capacity in some sectors of industrialized nations, increasing export capacity in developing countries, and trade adjustment assistance. As the manipulation of trade policy continues under public scrutiny, distribution of the burdens and benefits of trade naturally attracts attention.

Just as interest in international trade has grown, so has the body of theoretical and empirical literature dealing with trade[1]. One topic which has attracted many writers is the impact of liberalization on the domestic economy. Foci vary: some analysts stress the welfare gains from trade, some the changes in demand for factors, some the regional impact; but a common thread exists in that most authors use a simple partial-equilibrium

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[1] A comprehensive summary of fairly recent work in trade analysis, stressing empirical applications of trade theory and relating different areas of analysis one to the other, is Robert Stern's survey article.

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model as a starting point for evaluating the costs and benefits of liberalization[2]. This model may then be extended in various ways to improve estimates of distributional effects and to take into account the presence of market 'distortions' which affect measurement of the gains from trade.

As applications of the model proliferate, the need to re-examine both the model and the uses to which it is put becomes increasingly apparent. There are potentials in the model that remain unexploited; at the same time, the model is often ascribed more significance than it possesses, and policy conclusions are drawn from it with insufficient recognition of its inherently conservative nature.

This paper has three main goals. The first is to review and criticize methods and applications of partial-equilibrium analysis actually used to study the impact of trade liberalization on various groups' incomes, on regions, and on changes in demand for labor and capital. The second is to suggest how improvements, both theoretical and methodological, may be made within the conventionally used framework. The third is to question whether this model, with its strong orientation towards the measurement of the efficiency gains from trade, is in fact a useful tool with which to evaluate distributional gains.

With respect to the second goal, two things are done. First, an improvement on the treatment of income distribution under liberalization in the partial-equilibrium model is outlined: by assuming that liberalization is gradual rather than instantaneous, it is shown that the conventional model, assuming instantaneous liberalization, overlooks a large flow of revenue or quota-rent income which may accrue over the course of staged liberalization. The political importance of this flow, and of other flows of income under staged liberalization, is also noted. Second, as part of criticizing extant measurements of adjustment costs, ways of improving the accuracy of these measurements are emphasized.

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[2]An alternative to the static partial-equilibrium model used in trade impact analysis is the simulation model, which has recently been used in several trade impact studies (Rausser and Freebairn, Novakovic and Thompson, Jondrow et. al.). When properly designed and implemented, such a model can yield paths over time for all the transfers identifiable in the static model; moreover, it can trace the path between short-run shifts and final long-run import-induced changes, capturing both initial shocks and final 'equilibrium' values. In this it has a great advantage over static models, particularly in facilitating estimation of the path of factor displacement and associated adjustment costs. Jondrow et. al. use this capacity in their study of the domestic impact of liberalized steel imports.

Because they are highly sector-specific and very complex, however, simulation models cannot be described and criticized in general terms as can static welfare models. For this reason they are not discussed here as models, although Jondrow et. al.'s study is used frequently to provide examples of sophisticated analysis of displacement and adjustment costs.

The final goal is undertaken in the summary where, on the basis of what has been reviewed and contributed before, the potentialities and limitations of the partial-equilibrium analysis of trade impact are assessed. Limitations are seen to arise from two sources. First, because of the model's simple and highly aggregated nature, little information about actual changes in group incomes, or about other distributional effects, can be derived from the model. When distributional data are derived from the model, they are obtained by allocating aggregate changes to recipient groups on the basis of assumed patterns of distribution. Second, the role of weights applied, implicitly or explicitly, to costs and benefits estimated by the model is examined. The question is raised whether by abandoning the conventional use of equal welfare weights this model can be made to contribute more to policy evaluation; it is then suggested that there may be more direct ways to approach this goal.

II. MEASURING THE IMPACT OF TRADE LIBERALIZATION: CHANGES IN OUTPUT, INCOMES, AND 'WELFARE'

Static Partial-Equilibrium Analysis of Liberalization; the General Problem

Partial-equilibrium analysis of liberalization begins with the specification of domestic and foreign supply and demand conditions. Solutions under autarky and free trade are described, and the impact of liberalization is depicted as a movement towards the free-trade solution. After changes in domestic output are determined, concomitant changes in income levels and distribution, factor demand, and adjustment costs, may be studied. The type and degree of detail of distributional calculations will depend on the focus of the study and the availability of data.

In partial-equilibrium analysis it is conventional to assume that changes in the industry under study cause no significant repercussions elsewhere in the economy. Dardis and Learn detail the (presumably non-existent) secondary effects of trade liberalization as "...changes in total employment, changes in the terms of trade and balance of payments, and changes in the prices of commodities in other parts of the economy" (Dardis and Learn, p. 23). Since many studies of liberalization do, in fact, include estimations of interindustry effects and factor displacements, it is worth examining more closely the reasons for departing from the conventional assumptions.

The primary reason for this departure is that, in various ways, the producers, factors, and markets involved do not conform closely to the perfectly competitive model. When firms are large, labor is organized, production is concentrated in a few communities or a single region, factors are not homogeneous, or the affected industry is linked heavily with other sectors, secondary effects gain importance. The way in which they are expressed depends on the nature of rigidities in the system.

To say that no price changes occur elsewhere in the economy as a consequence of changes in output in a single industry is to say, in the neoclassical framework, that no interindustry effects occur: no supply

or demand pressures on product or factor markets are created outside of the affected industry. This situation might obtain if the industry were small. In practice, however, the absence of price effects in factor or product markets may be due to price rigidities, in which case all adjustments must take place through quantity shifts. Changes in output and employment are then greater than they would be in the presence of flexible prices, and the assumption that total employment (or total factor demand) is unchanged may be invalid.

Given that institutional factors suggest that secondary effects will be significant, the research must establish the form that these effects will take. Partial-equilibrium studies of liberalized trade in manufactured goods generally assume wage and price rigidity and measure all effects as displacements (see, e.g., Baldwin and Lewis; Baldwin, Mutti, and Richardson; Frank and Freeman; Isard; Magee; Mutti; Salant and Vaccara; and Szenberg, Lombardi, and Lee). Wage rigidities arise when wages are fixed over a period of time by negotiated contracts; price rigidities arise as delivery contracts, costs of reprinting catalogues, etc. decrease the frequency of price adjustments. The problem must be dealt with differently when agricultural trade is involved: output prices here are generally assumed to be flexible (because product markets behave competitively), and factor adjustments, when they are considered, may be manifested in either form. When the major inputs are the proprietor's labor, his privately owned land, and other fixed capital assets, adjustment takes place as a decrease in the implicit returns to these factors in fixed supply (see, e.g., Jackson). When factor services are purchased (e.g. when hired labor is heavily used), adjustment is likely to be reflected at least in part in the form of layoffs or firings (see Harbert and Blandford, and Johnson, on the issue of liberalizing US sugar imports). These differing assumptions about the mechanisms by which secondary effects occur are reflected in the choice of the partial-equilibrium model used.

The assumption that no changes in the terms of trade (i.e. in the world price of the traded good) follow liberalization extends to the international sphere the assumption that demand changes exert insignificant pressures on supplying markets. This is the 'small country' assumption favored by trade analysts because it implies that foreign supply is perfectly elastic at the world price. Under this circumstance, welfare gains and income changes are more easily estimated, and the task of estimating a foreign supply function is avoided[3]. Although this 'small country' assumption is almost always employed in partial-equilibrium analyses of liberalization, even for the US, there is evidence that foreign supply

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[3]It is not difficult to employ a less-than-perfectly elastic foreign supply curve, particularly in a linear model: Dardis and Learn show how this is done in discussing calculation of the costs of protection (gains from trade) (pp. 35-37).

is generally price-elastic[4], as one might expect it to be beyond the short run.

Finally, the assumption that the balance of payments is unaffected by liberalization is reasonable for most individual commodities but probably unreasonable for a few (e.g. oil). Balance-of-payments considerations would be more important in a general-equilibrium study.

The important assumptions, then, are those that deal with domestic repercussions in product and factor markets, for it is the violation of these assumptions that gives impetus to the estimation of factor displacement, regional impact, and adjustment costs. These estimations depend, however, on prior estimation of output displacement in the liberalized industry, which may be achieved with the static partial-equilibrium model. The same model yields changes in incomes accruing to various groups, and the welfare gains from liberalization accruing to society as a whole; the derivation and interpretation of these measures is covered below.

Static Partial-Equilibrium Analysis of Liberalization: Two Common Cases

Two cases appear frequently in empirical analyses of trade liberalization. In the first, domestic supply is less than infinitely elastic, foreign supply is perfectly elastic at the world price, and imports are perfect substitutes for domestic goods. In the second, both domestic and foreign supply are perfectly elastic (but at different prices), and imports are imperfect substitutes for domestic goods. Baldwin and Lewis suggest (p. 243) that

> ...(t)he most appropriate approach would seem to be to employ a perfect substitution model for agricultural and mineral products that introduces less-than-completely elastic supply curves and an imperfect substitution model with infinitely elastic supply curves for manufactured products,

but in practice completely elastic foreign supply is commonly assumed for agricultural imports as well. This can usually be justified when the tariff or quota change under examination is absolutely small (note that a 30 percent tariff reduction is still absolutely small if the tariff is originally set at 6 percent ad valorem). The two models described above are depicted in figures 1 and 2.

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[4]Baldwin and Lewis cite as evidence Clark's finding that "...a 1 percent change in U.S. demand for finished manufactures caused foreign producers to change their price by 0.32 percent" (Baldwin and Lewis, p. 243, fn. 5). Clark's work is reported in Peter Clark, "The Effects of Recent Exchange Rate Changes on U.S. Trade Balance," in P. Clark, D. Logue and R. Sweeney, eds., The Effects of Exchange Rate Adjustments (Washington, D.C.: Government Printing Office, 1977).

Formal equivalency between tariffs and quotas is assumed to obtain, so that a quota may be translated into a tariff-equivalent[5], and liberalization is represented as a move to complete free trade.

These models, particularly the perfect-substitution one (figure 1), are well known, but it may be useful to review the interpretation of the areas under the curves and recall once more the problems inherent in comparing them.

In figure 1, the instantaneous move from protection to free trade causes the domestic price to fall from P_0 to the world level, P_1. Domestic consumption of the traded good rises from Q_0^d to Q_1^d ; domestic production falls from Q_0^s to Q_1^s . Imports increase from $(Q_0^d - Q_0^s)$ to $(Q_1^d - Q_1^s)$. These shifts cause an increase in consumer surplus of (A + B + C + D) , a fall in producer surplus of A[6], and a fall in government tariff revenues, or quota-holders' rents, of C (to zero). The areas B and D represent welfare gains to society. B, the welfare gain in production (or domestic resource cost of protection), measures the amount by which the costs of producing the protected good exceed the opportunity costs of employing the factors thus used elsewhere, given world prices. D measures that increase in consumer surplus not offset by losses elsewhere in the economy.

Figure 2a depicts the import-consuming sector in the importing country. Liberalization causes the domestic price of the imported good to fall from P_0 to the world level, P_1, and domestic consumption to rise from Q_0^d to Q_1^d . Consumer surplus increases by (M + N), while tariff revenues or quota rents are decreased by M. Increased consumption of the imported

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[5]That is, an ad valorem tariff of $(P_0-P_1)/P_1 \cdot 100$ percent will have the same effect on prices and quantities as will a quota measured by $(Q_1^d-Q_0^d)$ (figures 1, 2a) (see Bhagwati). This equivalence breaks down when one or more actors behave as monopolists or monopsonists (see Bhagwati; Shibata; McCulloch).

[6]The concepts of consumer surplus and producer surplus are discussed at length in Currie, Murphy and Schmitz (especially in pp. 742-758). Consumer surplus, as measured here, corresponds to Hicksian compensating variation if it can plausibly be assumed that the ordinary demand curve coincides with the compensated demand curve: i.e., that the income effect of a price change is zero. This assumption is tolerable for most single commodities, but questionable in the case of trade in large bundles of goods.

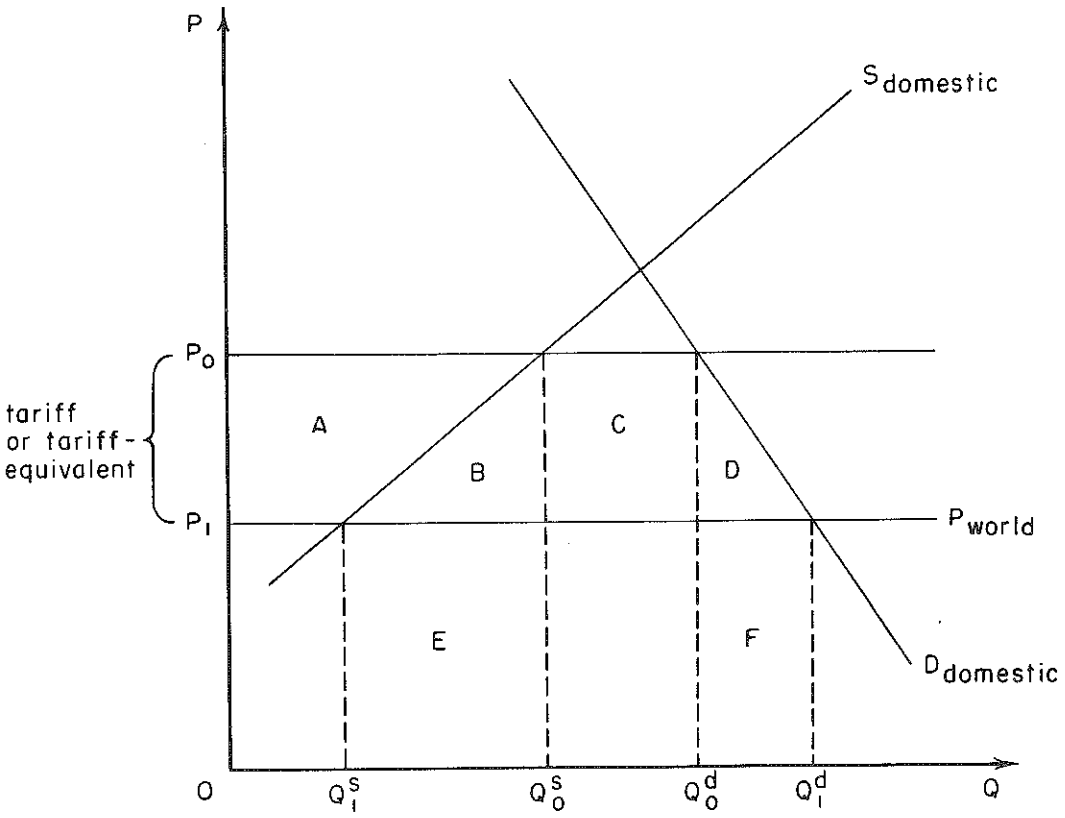

FIGURE 1. PERFECT-SUBSTITUTION MODEL

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[6]The interpretation of producer surplus in the context of trade policy analysis is often clouded by uncertainty over the nature of the supply curve. The meaning of the surplus area varies according to whether the supply curve is a short-run curve, with factor prices fixed but factor supplies perfectly elastic; a long-run curve with some factor (e.g. land) still in fixed supply; a long-run curve with all factors in perfectly or imperfectly elastic supply; or something in between (see Currie, Murphy and Schmitz, pp. 753-758). Furthermore, if over the course of gradual liberalization industry supply curves change because, for instance, factor supplies are altered as expected factor returns decrease, measurement and interpretation will be complicated.

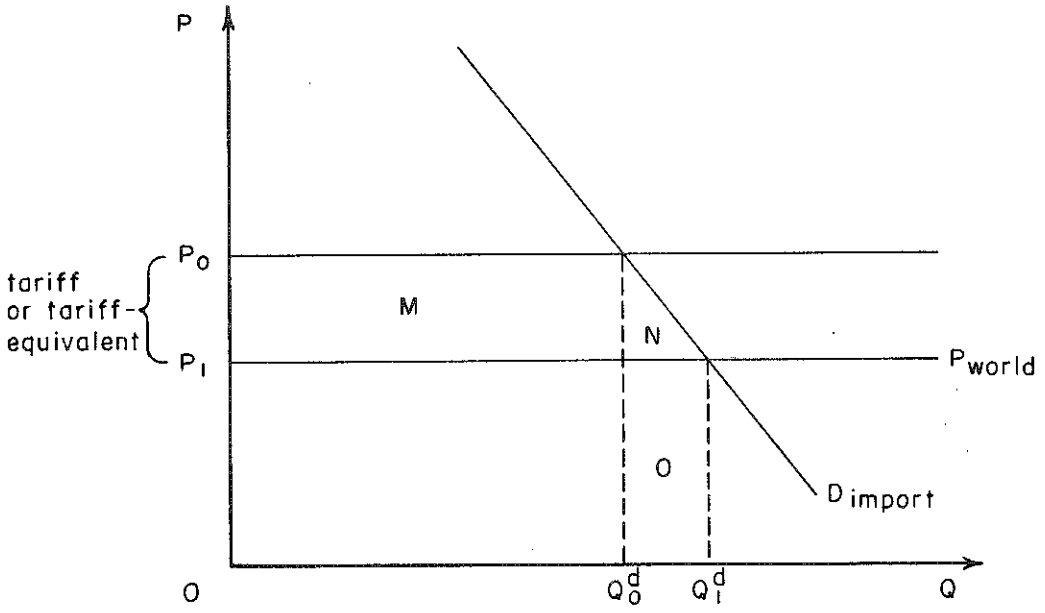

FIGURE 2a. IMPERFECT-SUBSTITUTION MODEL: IMPORT SECTOR

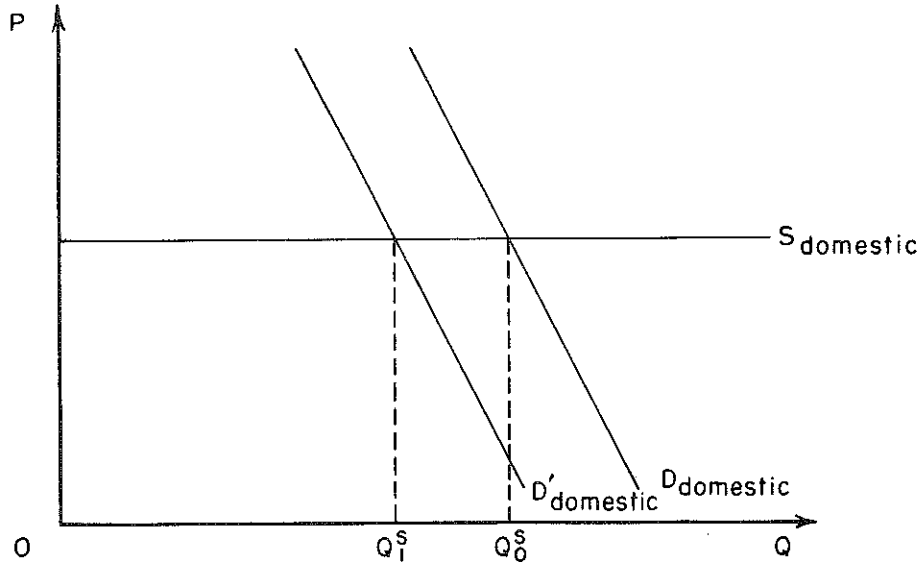

FIGURE 2b. IMPERFECT-SUBSTITUTION MODEL: DOMESTIC IMPORT-COMPETING SECTOR

good causes demand for the domestic good to fall, as represented by the leftward shift of the demand curve, in figure 2b, from DD to D'D'. Domestic output falls from Q_0^s to Q_1^s . With perfectly elastic domestic supply, there is no change in producer surplus.

In evaluating the effect of liberalization with one of these models, it is conventionally assumed that the marginal utility of income is the same for each group involved, and that intergroup comparisons of utility can be made. This convenient assumption permits most of the income changes measured in the model to be 'netted out': the gain in consumer surplus is partly balanced by losses in revenue or rent, and producer surplus, leaving a net gain of (B + D) in figure 1, or N in figure 2a. For this reason areas A and C in figure 1, and M in figure 2a are often referred to as 'transfer' areas: one group's loss becomes another's gain. Implicit in this approach is the assumption that redistributional considerations are extraneous to the evaluation of the desirability of a given policy: if gainers could compensate losers and still be better off, the policy change is preferred to the current state.

The empirical literature on trade liberalization frequently stresses welfare gains and overlooks implicit transfers (e.g. Magee; Bale and Greenshields; Szenberg et. al.) Yet, empirically, estimated transfer areas tend to be far larger than the welfare gain triangles. In Magee's study, under varying assumptions[7], net welfare gains from liberalization equal between 2.3 and 7.2 percent of the 'pure' transfer area (A + C) in the perfect substitution model, and up to 13 percent of the comparable area (M) in the imperfect-substitution model. Comparable magnitudes are reported in other studies. Bale reports that calculated transfer costs involved in the protection of Japanese agricultural trade and production are "...often more than ten times the size of the net social losses..." (p. 349). Mintz finds that the welfare loss incurred by maintaining US sugar quotas equals between 18 and 24 percent of the pure transfer area[8], and this appears to be the highest estimate in the literature.

Taken together, the relatively large sizes of the transfer areas, and the not-altogether defensible practice of effecting comparisons between changes in different groups' welfares by equating utility with income and assuming that the marginal unit of income is of equal value to all groups, suggest that closer attention should be paid to distributional changes measured by the model and less to efficiency gains.

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[7]Magee estimates these areas separately for the short and long run, using more elastic demand curves in the short run (hence the greater size of the long-run gain). Percentages are calculated from Magee's data on pp. 663 and 667.

[8]Calculated from Mintz's data, p. 40. Mintz uses a perfect-substitution model, but makes two assumptions about the differential between world and domestic prices under free trade - hence the two estimates of welfare costs.

However, obstacles arise to measuring the real distributional effects of liberalization which are not always easily overcome. First, the groups or individuals who bear the benefits and costs of the fall in the price of the traded good are not necessarily easy to identify. Second, estimated domestic output displacement, upon which all subsequent estimates of factor displacement and adjustment costs depend, can be very sensitive to the model chosen and the output displacement mechanism assumed.

Distribution of surplus

As is shown above, liberalization causes a decrease in producer surplus and tariff revenues or quota rents, and an increase in consumer surplus. From the point of view of the economist who focuses on net welfare gains, the distribution of the surplus is uninteresting; but from the point of view of the recipients, and of the politicians they elect, the distribution of losses and gains is of paramount importance.

The consumer surplus, or 'user surplus', as Mintz more accurately terms it, accrues in theory to the consumer of the imported good. However, there are two ways in which this assertion is frequently misunderstood. First, when the imported good is an intermediate good, the first user is a producer. To the extent that decreased costs are passed on, through lower prices, some portion of the surplus will accrue to the politically defined 'consumer'--but this portion will be determined by market power and pricing practices within industries, and may not be identifiable.[9] Some authors tend to equate gains or losses of surplus, as measured by the model, with welfare gains or losses for real social groups (e.g. Bale). This practice could be particularly misleading in a multi-industry study, such as Magee's, where a large portion of the consumer surplus may accrue to producers.

Second, when the imported good is actually a final demand good, the question arises of how benefits from liberalization are distributed among different income classes of consumers. Bale and Mintz both discuss, in a general way, the regressive impact on low-income consumers of restrictions applied to trade in necessities (food and apparel). Bale (p. 348) states that

> ...the costs to consumers are unevenly borne. Consumers in the lower income brackets bear a disproportionate burden in that a larger portion of their income is spent on food than is the case with wealthier consumers. Thus, the effect of price intervention is not only to transfer income from consumers to producers, but also to skew income distribution categories.

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[9] I have not found any studies which try empirically to trace the distribution of surplus in this manner.

Mintz notes that textile quotas not only share the general regressivity of consumption taxes, but by virtue of their particular structure[10] disproportionately restrict cheaper types of imports, doubly penalizing lower income groups (p. 65).

Studies of the welfare or distributional impact of liberalization do not seem to attach much importance to this question, since nowhere among these studies does one find estimates of the distribution of surplus among consumers.[11] The question is approached from a different angle by Fieleke, who attempts to measure the distributional impact on consumers of the US tariff structure. He does this by estimating the percentage of total consumption expenditures paid to tariffs by consumers in each of three income classes. Since he omits both indirectly borne tariff costs, and costs imposed by other forms of trade restriction, his estimates may be too low. He finds the overall impact of the tariffs to be mildly regressive: tariff expenditures in 1967 absorbed 2.1 percent of the lower budget group's expenditures, 1.8 percent of the moderate budget group's, and 1.7 percent of the higher budget group's (p. 646). Presumably, abandoning the tariffs would then cause benefits to be distributed in a mildly progressive manner.

Fieleke's low figures may explain why estimation of distribution impact on consumers generally attracts little interest. The distributional impact on consumers of a price change in any one commodity, or even a group of traded commodities, will be miniscule unless the item plays a major role, directly and indirectly, in consumption (e.g. textiles, apparel, oil), and the price change is absolutely large. In most cases it is probably more fruitful to study the division of surplus between intermediate and final users than to concentrate on inter-consumer distribution.

Analogous problems arise in determining the real distribution of the loss of producer surplus associated with liberalization. As with consumer surplus, there is a dual problem of discovering first who the affected producers are, and then of identifying (by studying the structures of ownership, market power, and such) the intra-firm allocation of the loss. The first question is addressed in the literature; the second appears not to be. Mintz attempts to divide the increase in producer surplus caused

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[10] Since quotas limit quantities, not values, of imports, exporters are induced to concentrate on more expensive lines of goods. Fewer of the lower priced goods, which would be bought by the poorer consumer, are supplied (Mintz, p. 65).

[11] Outside of the literature on liberalization, there are studies of the impact of government policies on various groups of consumers. See, e.g. Josling's estimates of the costs per household (grouped by income class and family composition) of a shift in farm price-support policy in Great Britain.

by raw sugar quotas into extra profits accruing to domestic low-cost producers (those who would be in business even without protection) and profits to producers of quota-induced additional output (p. 43). This much is easily done[12], but one cannot tell from the model whether the protection-induced profits accrue to the same producers as do extra profits (as income on increased output) or whether they go to older, higher-cost plants which remain in use because of protection. The distinction is important, particularly where patterns of geographic dispersion of production correspond to an identifiable cost structure. This appears to be the case, for instance, in the U.S. steel industry (Jondrow et. al., ch. 7) and in U.S. sugar beet and cane production (Harbert and Blandford; Johnson).

Intra-firm or intra-sectoral distribution of the producer surplus lost to liberalization is generally ignored. An interesting alternative, though, is offered by Harbert and Blandford, who study the potential costs and benefits of liberalizing U.S. sugar imports. In addition to measuring, by conventional means, the loss of producer surplus associated with elimination of the tariff on sugar imports in 1977, they estimate directly various costs accruing at the farm level. These are changes in returns per acre to sugar growers (with and without replacement of sugar with the best alternative crop) and changes in returns to farm labor (also with and without alternative crops). Machinery costs are included in per acre losses, under the assumption that displaced specialized equipment has no alternative use and a "negligible resale value" (pp. 10-15). These costs are not identical to the change in producer surplus; they are estimated with short-run supply assumptions, whereas the supply curves used to calculate surplus are closer to long-run ones. Furthermore, the overlap between these costs and the costs included in producer surplus is in many ways imperfect. The problem of breaking down producer surplus into its separate components is thus not directly addressed. In general, to allocate producer surplus between various factors and profits one needs a lot of accounting information, something which is probably more easily secured for agricultural producers than for manufacturers.

The problem of identifying the impact on producers of liberalization is complicated in the simple imperfect-substitution model where, with perfectly elastic domestic supply, producer surplus does not even exist (figure 2b). If costs are truly constant, one could estimate the change in producer profits by assuming some average markup over costs and multiplying this by the output foregone. If the industry is oligopolistic, identifying producer losses will be extremely difficult. Changes in producer surplus can more easily be measured if domestic supply is less than perfectly elastic (figure 3):

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[12] Actually, it can only be done if the domestic supply curve is upward-sloping. Referring to figure 1, the portion of the producer surplus to the left of Q_1^s accrues, under protection, to efficient producers; the remainder accrues to inefficient producers who need protection to stay in business.

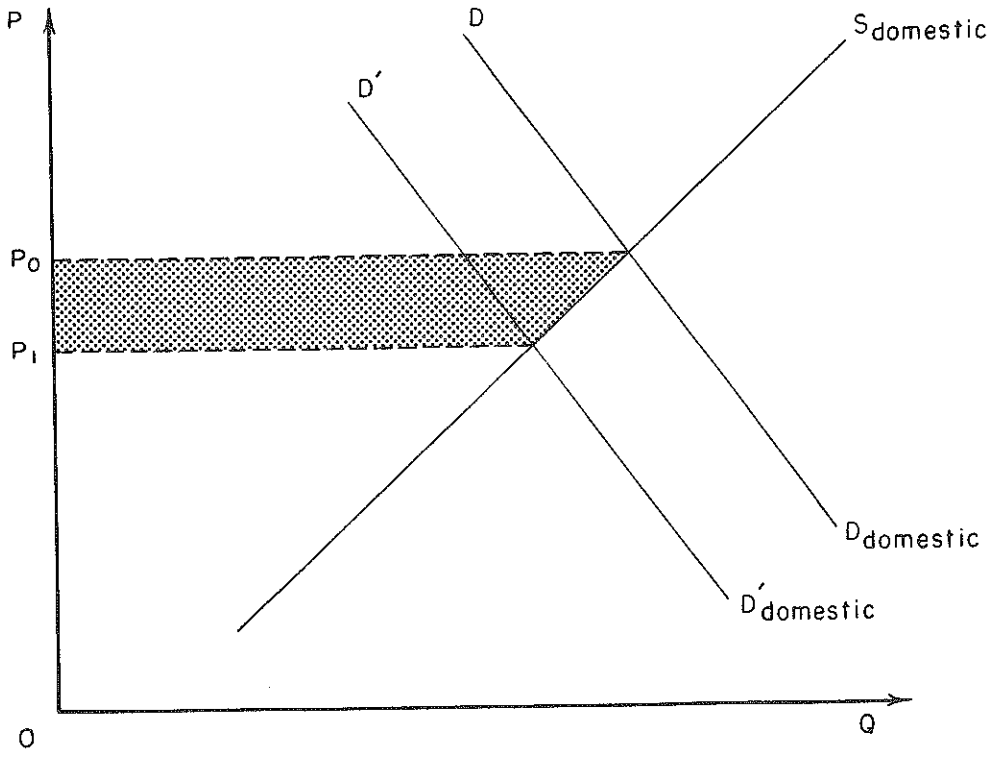

FIGURE 3. PRODUCER AND CONSUMER SURPLUS IN THE DOMESTIC SECTOR; IMPERFECT-SUBSTITUTION MODEL WITH LESS-THAN PERFECTLY ELASTIC DOMESTIC SUPPLY

in this case, the liberalization-induced demand shift causes the price of the domestic good to fall. The loss of producer surplus, shown as a shaded area, is equivalent to the increase in consumer surplus; no net welfare gains accrue (Jondrow et. al. p. 6-7).

The absence of attention paid to the real distribution of producer surplus is unfortunate. Such information would not only be interesting in itself; it would also indicate the stakes that different groups involved in production might have in opposing liberalization. The income losses thus entailed create powerful incentives for producers and organized labor to lobby against liberalization, which frequently they do, and at times with great success. Thus it is important to identify as accurately as possible the losses to different groups implied by liberalization, in order to anticipate source and strengths of opposition, and to facilitate adjustment (e.g. through adjustment assistance).

The third 'transfer' area in the partial-equilibrium model of liberalization measures either tariff revenues or quota rents. When protection has been effected through tariffs, a movement to free trade causes the

government to lose these revenues. Perhaps because the government is not thought to have interests independent of its clients', the loss of these revenues is generally ignored in the literature. This is probably justifiable in single-commodity studies; in multi-commodity cases, though, revenue losses become quite large, and the question of whether they are offset by revenues gained through increased trade arises. Baldwin, Mutti and Richardson address this question and find that a 50 percent multilateral tariff reduction yields net revenue gains (pp. 8-10, 21). If revenues lost through liberalization of trade in one good were not offset by increased revenue from concomitant increases in other imports, they would have to be offset, explicitly or implicitly, through the domestic economy.

Accrual of quota rents is a more complicated topic, as the structure of the quota system determines who captures the rents. Mintz writes (p. 30) that

> ..(w)hether this extra income, the quota profit, goes to the exporter or to the importer, or is shared by both, depends on the method of distributing the quota. If the government sells licenses entitling the holder to import the good, the price differential becomes government revenue. If the government merely imposes a global quota or if it licenses domestic importers so that they have an interest in shopping around the world for the lowest priced good, the entire differential, or quota profit, may go to the importers. Under such circumstances the import cost is a transfer cost and not part of the national cost of the quota. But if the importing country allocates the quota by country of origin and leaves the allocation by business firms to the exporting industries, then these industries will act as cartels and the entire quota profit will be theirs.

In practice, quota and quota- like systems are generally structured so as to channel some portion of rents to supplier countries. Both the former U.S. sugar import quota system, and the U.S. dairy import quota system, allot individual quotas to exporting countries. The system of 'voluntary' export restraints, or VERs, used to limit imports into the U.S. of apparel and textiles, is similarly structured. When quota rents are thus transferred abroad, sizable benefits accrue to exporting countries[13]; when benefits are potentially large, their distribution may play a role

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[13]An illustration: a recent article on Japanese imports of oranges estimated that quota-holders' profits amounted to around $43.9 million, with this sum being divided among 91 firms and individuals having exclusive rights to import (the profits thus accrued to the Japanese). It was also reported that 22 of the quota-holders collectively controlled over 60 percent of orange imports. Profits for this group would thus average approximately $1.2 million per quota holder (Wall Street Journal, Nov. 1, 1978).

in an importing country's foreign policy. The U.S. sugar quota program is generally acknowledged to have been used in this manner (Johnson). Stern notes that, as a rule, "..quota arrangements are subject to much abuse," and terms them "..a pernicious form of trade control.." (pp. 868-869). They are nevertheless an increasingly popular one, despite the fact that the GATT attempts to place strict limitations on their use.[14]

In summary, then, the actual distribution of income changes under liberalization is not adequately represented by the transfer areas in the partial-equilibrium model. If one were to analyze the real distribution of surplus between interested groups, a more accurate picture of the distributional impact of liberalization would emerge.

Output displacement

Although real changes in income are one of the significant effects of trade liberalization, empirical analyses of distributional impact focus strongly on the issue of factor (primarily labor) displacement and the costs thereof. Identification of these depends on prior estimation of output displacement (changes in domestic output), which is achieved through the partial-equilibrium model. The process is straightforward in the perfect-substitution model, but more complicated in the imperfect-substitution model.

The perfect-substitution model (figure 1) is conventionally assumed to be an excess-demand model, demand for imports being determined as

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[14] Article XI of the GATT states that

> ...(n)o prohibitions or restrictions other than duties, taxes or other charges, whether made effective through quotas, import or export licenses or other measures, shall be instituted or maintained by any contracting party on the importation of any product of the territory of any other contracting party or on the exportation or sale for export of any product destined for the territory of any other contracting party.

The same article lists numerous exceptions to the preceding, including one which permits restriction of agricultural or fisheries products when necessary to enforce domestic governmental measures which restrict domestic production of competing goods or remove temporary surpluses of the same from the market (art. XI (2) (c)). The well-known "escape clause" is detailed in article XIX. The U.S. dairy import quota does not conform to the GATT requirements for restriction of agricultural imports (domestic production is not restrained, as it was in the domestic sugar program); in 1954 the U.S. sought and obtained a waiver of its GATT commitments to permit continuation of Section 22 quotas. The information summarized here appears in the U.S. Tariff Commission, TC Publication 243.

a residual after domestic supply has been absorbed[15]. The price is determined exogenously by the world price under free trade, or by the world price plus a tariff or tariff-equivalent under protection. When the price falls, the decrease in domestic import-competing production is measured directly by $(Q_0^s - Q_1^s)$. If the supply curve is a long-run one, as it is conventionally assumed to be when displacements are measured (Magee), the change in output is implicitly 'assigned' to higher-cost producers[16]. Knowledge of the cost structure of the industry (either in terms of geographic distribution of different-cost plants, or of factor/output ratios associated with different cost levels) can then be employed to improve estimates of distributional impact[17].

By contrast, the imperfect-substitution model does not yield a direct estimate of output displacement, nor does it allocate changes in output among different-cost producers when the domestic supply elasticity is infinite. Displacement in the domestic sector is determined in theory by the elasticity of demand for domestic goods with respect to the import price. The distribution of the change in output among domestic producers can be determined when domestic supply is less than perfectly elastic, but is difficult to identify when the elasticity is infinite.

Output displacement follows liberalization in an indirect manner. As the price of the import good falls, the relative price of the domestic good rises. When demand for the domestic good is portrayed as a function solely of the domestic price (figure 2b), the demand curve is shifted leftward by this price change, and domestic output falls by $(Q_0^s - Q_1^s)$.

Cross-price elasticities are apparently not always obtainable, either because attempts to estimate them fail (e.g. Szenberg et. al., pp. 62-82) or because too many industries are involved for individual estimations to be feasible (Baldwin and Lewis, p. 243). Mutti does succeed in estimating these for the five industries in his study (p. 106). Given the empirical difficulties involved, many authors simply estimate (or borrow) elasticities of import demand, calculate the increased value of imports following liberalization, and assume dollar-for-dollar displacement

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[15] If foreign and domestic goods are truly perfect substitutes, this is hard to defend. However, it is reasonable to suppose that domestic purchasers will prefer to buy from domestic producers; information about products is more easily obtained, business transactions may be made more quickly, language barriers do not exist, and so forth.

[16] Each point on the supply curve corresponds, in theory, to the minimum average cost of producing the corresponding amount of the good.

[17] Vintage-capital models, discussed further on in this paper, relate factor displacement directly to cost structure (Isard; Jondrow et. al.) In chapter 7 of Jondrow et. al., cost structure is related to geographic distribution via age of plant.

of domestic output, suitable adjustment being made to bring import values into line with producer prices[18] (e.g. Baldwin and Lewis; Baldwin, Mutti and Richardson; Szenberg, Lombardi and Lee). Mutti uses his estimated cross-price elasticities to calculate displacement (p. 106); it would be interesting as well to compare his results with those obtained using dollar-for-dollar displacement.

Whichever displacement mechanism is used, the problem of relating the distribution of displacement to industry cost structure remains. If the perfectly elastic supply function really describes the long-run response of the firms involved[19], changes in output must be allocated proportionally among producers, for lack of information suggesting any other pattern. Even if the infinitely elastic supply curve arises as a consequence of oligopolistic behavior (with a few price leaders setting prices high enough to shelter some other less efficient firms), the absence of a domestic price shift makes it impossible to demonstrate that displacement should be other than proportional. A priori assumption of perfectly elastic domestic supply forces all subsequent displacements to be distributed proportionally over firms; if the assumption is not carefully justified, the distributional impacts consequent upon it may be suspect.

This concludes discussion of the implicit income-distributional effects and the impact on domestic production measured by static partial-equilibrium analysis. This model is widely used in the analysis of the impact of liberalization, yet it is deficient in one major respect: it relies on instantaneous liberalization, whereas in practice trade liberalizations of significant magnitudes are usually taken in stages[20].

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[18] Baldwin, Mutti and Richardson describe the price adjustment in a two-way model of liberalization as follows: "...the appropriate international margins (are first subtracted) from exports to obtain exports on an f.o.b. basis, and then...domestic trade and transportation margins (are deducted) from both f.o.b. exports and c.i.f. imports to obtain final demand changes in each sector on a producer-value basis" (p. 17, fn. 15).

[19] Baldwin, Mutti and Richardson, as well as Mutti, rely on a paper by Walters (A. Walters, "Production and Cost Functions: An Econometric Survey," Econometrica 31 (January 1963): 1-66) for justification of the infinitely elastic domestic supply function in manufacturing. Mutti estimates domestic supply functions for five manufacturing industries and reports that "..estimates yield confidence intervals that include large positive and negative numbers, and consequently they are assumed to be infinite.." (p. 105).

[20] Tariff cuts agreed upon in the recently completed Tokyo Round of MTNs will be staged over 8 years.

Because staged liberalization creates a flow of costs and benefits to affected groups, and stretches out the period of adjustment to changed output, its distributional impact can differ appreciably from that of instantaneous liberalization. Before turning to methods of estimating factor displacement and adjustment costs, topics central to the evaluation of the distributional impact of liberalization, staged liberalization is discussed in the context of the partial-equilibrium model.

Staged Liberalization: Analysis with a Partial-Equilibrium Model

There are two ways in which dynamic elements may be introduced into the static partial-equilibrium model. The first, which is done in conjunction with extending the measurement of welfare gains over time, is to permit demand and/or supply curves to shift exogenously over time, in order to reflect population or industrial growth[21]. The second is to let liberalization occur in stages and to study the time paths of changes in surplus, revenue or rent, and output. Mutti considers the paths of welfare gains and adjustment costs under staged liberalization, but apparently no-one else has studied the other aspects of liberalization in quite this fashion. I therefore take this opportunity to outline a simple model of the behavior of implicit transfers when liberalization is staged over a period of several years.

Staged liberalization causes both relative and absolute 'transfers' to differ from those measured in the instantaneous-liberalization model, due to the combined effects of discounting and the different directions of change taken by consumer surplus, producer surplus, and rents or revenues over time. Consumer gains and producer losses (as formally defined in the model) are both reduced by staged liberalization; rents or revenues, which fall to zero under instantaneous free trade, behave quite peculiarly with more gradual change. If the initial level of protection is sufficiently high, rents may first increase, reach a maximum, and then gradually fall as liberalization progresses. Assuming that the three transfer areas identified in the model correspond to benefits or losses accruing to identifiable groups, gradual liberalization may be shown to have significant

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[21] For example, Magee assumes that domestic supply and demand grow at the same rate, which is constant over time (p. 684). Szenberg, et. al. assume only that import demand grows at a constant rate, proportionate to the increase in domestic disposable incomes, despite the fact that the growth rate in recent years has been very much higher; they assume that as the market share of imports increases their growth rate will come down to the assumed 4 percent level (pp. 85-86). Mutti also assumes that imports will 'settle down' from their observed high growth rates and "converge to the current growth rate of the combined market for import and domestic competing goods" (p. 105). Note that when only welfare gains (not transfers) are considered, domestic supply shifts are irrelevant in the imperfect-substitution model; all welfare gains arise in the import-demand sector (see figure 2).

political advantages, which reinforce the social value some feel to be inherent in gradual, as opposed to abrupt, change.

The importance of the rate of liberalization in determining the behavior of income changes is illustrated below with a simple, linear perfect-substitution model (figure 4). Let all supply and demand curves be fixed over the period of liberalization (though this is not necessary). The initial tariff or quota fixes the price at $P = P_0$; liberalization is staged so that the price falls in equal decrements from P_0 to the world price, P_W .

It is apparent that producer and consumer surpluses, discounted to their present values, will be less than when liberalization is instantaneous. As the price falls, producers take the largest losses in the first period and smaller losses in subsequent ones. Consumers gain less in the earlier stages than in later ones, so that under gradual liberalization the present value of consumer surplus shrinks, relative to its value under instantaneous liberalization, more than do producer losses.

The strength of this effect depends, in the linear model, on the slopes of the supply and demand curves. For the producer, the steeper the supply curve, the more valuable is delayed liberalization: proportionately more of the total loss is deferred to the future. Conversely, the less steep the supply function, the larger the portion of the total loss taken at the outset. Producers must therefore always favor staged liberalization, but should be particularly supportive of it (given its inevitability) when supply is not price-responsive. This suggests that agricultural producers will, as a rule, be more interested in gradual liberalization than will producers of manufactured goods.

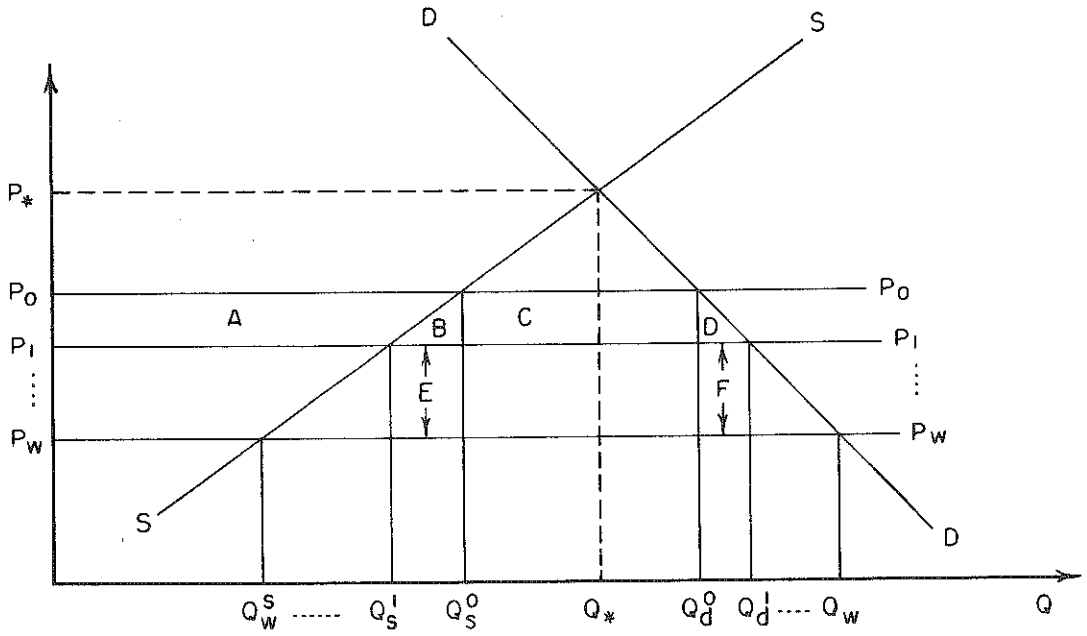

FIGURE 4. STAGED LIBERALIZATION IN THE PERFECT-SUBSTITUTION MODEL

Just as producers lose less with staged liberalization, consumers gain less. When the demand curve is steep, a smaller portion of the surplus is deferred to the future than is the case when the curve is shallow; thus, ceteris paribus, the consumer should be less opposed to staged liberalization of imports of basic necessities than to the same treatment afforded luxury goods (if one is speaking generally of final demand goods). But is this reasonable? The problem here is that consumer response must be considered with reference to the whole bundle of import goods consumed. The foregoing statement holds only if expenditures on the two sorts of goods are roughly equal.

Consumer and producer interests may be compared in the case of liberalization of a single good. When both supply and demand curves are steep, the case for gradual liberalization, based solely on the behavior of producer and consumer surpluses, is strongest: producer losses are minimized, as is the proportion of consumer surplus forfeited through deferral. Conversely, if neither curve is steep, neither consumers nor producers have a strong reason to favor phased liberalization, though producers must always prefer it to instantaneous liberalization, and consumers must always prefer the latter.

In any case, the picture of group preferences is incomplete without consideration of the behavior of rents or revenues under phased liberalization. Under the assumption that the government is not interested in the behavior of revenues once it is committed to liberalization, the following discussion is confined to quota rents.

The behavior of rents in this model is particularly interesting because, depending on the initial price level (P_0), rents may either increase, decrease, or stay the same in the first stages of liberalization, in marked contrast to their fate under free trade. A corollary of this is that partial liberalization, which will have unambiguous impacts on both consumer and producer surpluses, may have any of three effects on quota rents.

The reason for this may be seen casually by inspecting figure 4, and formally by setting up a quota rent function and maximizing it with respect to the domestic price of the import good. Referring to figure 4, let the price fall by (P_0-P_1). When this happens, quota-holders lose rents equivalent to C. At the same time they gain new rents, equivalent to (E + F), as their imports expand from $(Q_0^d - Q_0^s)$ to $(Q_1^d - Q_1^s)$. As long as the marginal rent increase exceeds the rents lost, quota holders' incomes will rise as the price falls.

By maximizing the quota rent function with respect to any price P_t, it may be shown that rents are greatest when the domestic price is halfway between the price at autarky and the world price. Let quota rents at any price P_t be defined as

(1) $R = (P_t - P_w)\ [(Q_*^s - Q_t^s) + (Q_t^d - Q_*^d)]$ where $Q_*^s = Q_*^d$ = domestic autarkic equilibrium.

Using simple linear supply and demand functions of the form

(2) $Q_t^d = \frac{1}{b}(a - P_t)$ (e.g. $P_t^d = a - bQ_t$) ; $b > 0$

(3) $Q_t^s = \frac{1}{e}(P_t - c)$ (e.g. $P_t^s = c + eQ_t$) ; $e > 0$

and substituting into (1):

(4) $R = (P_t - P_w)(P_* - P_t)(\frac{1}{b} + \frac{1}{e})$.

Taking the derivative with respect to P_t and rearranging terms yields

(5) $dR/dP_t = (P_* + P_w - 2P_t)(\frac{1}{b} + \frac{1}{e})$,

so that revenue is maximized when

(6) $P_t = \frac{1}{2}(P_* + P_w)$.

Rents decrease on either side of this price line, the rate of decrease depending on the slopes of the lines.

Two aspects of the behavior of quota rents merit attention. First, the position of the initial price relative to the rent-maximizing price will determine whether quota-holders' incomes can or cannot be increased by liberalization. If extant prices exceed the maximizing level, quota-holders should support partial liberalization which will bring the domestic price down to the rent-maximizing level. If complete liberalization is inevitable, quota-holders should seek a pattern of price adjustment that will move them rapidly to the optimal level and delay as long as possible movement beyond that point. If prices are already below the optimal level before liberalization begins, the present value of rent receipts is maximized by slowing the change as much as possible. This behavior of rents suggests that quota-holders' approaches to lobbying will be varied: if initial quotas are very small relative to total demand, quota-holders will probably side with consumers and lobby for partial (certainly not complete) liberalization; but if the quota is relatively large, quota-holders, like producers, will oppose liberalization, and advocate gradual change if change is unavoidable.

A second interesting property of quota-rent behavior is that pairs of quotas exist which, by yielding appropriate pairs of prices on either side of the rent-maximizing level, will yield identical rents with different levels of imports. These will correspond to identical profits if importing is a constant-cost industry[22]. Thus if the initial import level

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[22] If costs increase with volume, profits will fall even though rents are identical; if they decrease, as would be the case if initial import levels were very low and economies of scale remained to be exploited, profits will be greater after liberalization even though rents are unchanged. The role of cost structure in determining importers' profits is suggested by Corden's work (Corden, 1971, p. 202).

is low and the price above the importer's optimal level, liberalization can, in theory, be achieved without disturbing rent receipts at all. In practice, calculating the relevant price levels may be difficult - and even if it is possible, price adjustments may not be instantaneous, so that rents will not really be unchanged (they may increase temporarily).

In summary, it is interesting to examine the behavior of 'transfers' under staged liberalization because in doing so different rationales for what is, politically, an accepted practice become clear. First, gradual rather than instantaneous liberalization tends to favor both producers and quota-holders over consumers, a result consistent with the widely held conviction that policy makers weight the welfare of producers more heavily than that of consumers[23]. Second, gradual liberalization avoids the creation of sudden income losses, and is thus consistent with optimizing behavior under Corden's 'conservative social welfare function'. Corden maintains that "...any significant absolute reductions in real incomes of any significant section of the community should be avoided" (Corden, 1974, p. 107), citing the unfairness of deliberately lowering anyone's income, the benefits conferred on risk averters by ruling out large losses, and the advantage to the government of maintaining social peace by avoiding large transfers. Corden stresses the fact that his welfare function is designed to apply to the method of change rather than to preserve the status quo, and himself uses it to advocate gradual over sudden liberalization (pp. 107-109). In this framework one does not need a theory of clientele groups to justify slow or partial liberalization. Third, gradual liberalization probably minimizes factor displacements and the adjustment costs arising therefrom; a strong point in its favor and one that is dealt with insufficiently in the literature on the distributional impact of trade.

This concludes discussion of the measurement of changes in output, income, and welfare in partial-equilibrium models of liberalization. These changes, while of major importance, reflect only part of the total impact of liberalization. The factor displacements and consequent adjustment costs which follow losses of output when market 'distortions' exist constitute another class of potential effects of liberalization. Measurement of these effects is discussed in the following section.

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[23]For evidence, see Rausser and Freebairn on beef import quotas. The authors state (p. 446) that "...over the period 1959-1969 policy makers weighted a two-dollar increase in beef producer returns...as approximately equivalent in social value to a one-dollar decrease in consumer meat costs..." Consumers here are 'consumers' in the popular sense - it is hard to say whether the assumption about favored clientele groups holds when consumers are industries for which the import is an intermediate good.

III. MEASURING THE IMPACT OF TRADE LIBERALIZATION: FACTOR DISPLACEMENT AND ADJUSTMENT COSTS

An Overview of the Problem

Were the real world accurately depicted by the perfectly competitive model of economic behavior, and characterized by complete factor mobility, factor displacement would never persist. Factors released from production in one industry would immediately be absorbed into another, and no social adjustment costs would arise (private costs could still exist).

In fact, displacement can be a significant problem in the wake of trade-induced losses of production. Changes in output cause the derived demand for factors of production to change; rigid prices, and other institutional rigidities, impede the reabsorption of these factors; and costs, both private and social, are thereby incurred. Demand-induced displacements may be reduced somewhat by taking advantage of voluntary changes in factor supply (attrition), but empirical evidence repeatedly confirms that factor displacements attain significant levels when domestic output is sharply reduced.

Several steps are required to estimate the adjustment costs likely to accompany liberalization. First, the connection between decreased production and decreased factor demand must be established. Second, changes in factor supply should be studied. Third, the probable duration of factor unemployment must be estimated. Lastly, values must be attached to these services foregone. Measurement may be further complicated by efforts to establish the geographic or demographic distribution of losses.

In the pages which follow, considerable attention is paid to exactly how estimates of displacement and costs are obtained, as well as to the theoretical considerations underlying the methods used. The intent is to provide, to some extent, a practical handbook as well as a discussion.

Factor Displacement: Changes in Demand

The demand for factors of production is a derived demand determined by the demand for output. When liberalization causes domestic production to fall, there are associated declines in demand for labor and capital. In a perfectly competitive system, at equilibrium, factor displacements could not persist, as relative prices would adjust instantaneously to permit the reabsorption of these factors into production - but in the 'real world' displacements can and do persist, resulting in significant private and social costs and creating political problems.

The central question in the determination of the reduction in factor demand is: how are changes in the level and composition of factor demand related to changes in output? The crucial determinants of this relationship are industrial cost structures, the nature of factor and output pricing, and the degree of substitutability between factors. Also of interest in the study of displacement are such distributional questions as the occupational characteristics of displaced workers and the geographic distribution of changes in factor demand.

The simplest displacement mechanisms are those used when an industry is assumed to be characterized by constant costs in both the short and long runs, rigid wages and prices, and no substitutability between capital and labor. When these conditions hold, factor displacements are proportionate to output displacement: that is, demand for labor declines by the same percentage as does demand for output. Empirically, estimation of displacement of any factor is achieved by multiplying the value of the change in output by the average factor/output ratio. This is done in the studies by Salant and Vaccara, Szenberg et. al., Mutti, Magee, Baldwin and Lewis, and Baldwin, Mutti and Richardson, all of which, excepting Magee, deal solely with liberalized trade in manufacturing industries.

Of these studies, only Mutti's and Baldwin, Mutti and Richardson's incorporate measures of capital as well as labor displacement. Conceptually, capital displacement is no different from labor displacement: when production declines, workers are laid off or dismissed, and a certain portion of the capital with which labor works also ceases to be used. In practice, there are difficulties associated with measuring capital displacement. When changes in output are fairly small, adjustments may be effected by altering the rate of use of capital: running a plant for ten hours instead of twelve, and so forth; rather than by shutting down machines or plants. Similarly, in agriculture, changes may be made by using land, machinery, and such less intensively, rather than by ceasing to use them altogether. True physical displacement of capital, analogous to firing a worker, comes only when changes in output are large - and to estimate the value of the capital displaced one must know the physical identity of the capital involved, which is virtually impossible for an economist studying several manufacturing industries simultaneously[24]. Most authors find it convenient to ignore capital displacement; even where it is acknowledged, the problem of identifying physically displaced capital is evaded by moving directly to calculating the value of capital's share of output foregone. Thus Mutti, and Baldwin, Mutti and Richardson both use measures of capital's share of value added in the displaced output. Mutti uses a straightforward estimate of this quantity (Mutti, p. 104); Baldwin et. al. take depreciation into account, to correct for the fact that adjustment in their model is not instantaneous (pp. 15-16).

Since most authors focus solely on labor displacement it is important to examine possible extensions of the simple proportional-displacement model. Three sorts are encountered in the literature: calculation of interindustry effects, including labor displacement in supplying industries; calculation of the geographic distribution of displaced labor, including interindustry effects; and calculation of the occupational distribution of displaced labor, also including interindustry effects. All three

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[24]Szenberg et. al. include a detailed description of the shoemaking process and the machinery involved, but unfortunately do not use their knowledge to estimate capital displacement.

extensions are carried out via proportional distribution, so that some highly restrictive assumptions underlie the analysis.

Interindustry effects are included in various studies: Salant and Vaccara, Mutti, Baldwin and Lewis, and Baldwin, Mutti and Richardson. When total labor displacements are calculated in this manner, assumptions of constant costs, rigid wages, and no factor substitutability are implicitly extended to all supplying industries.

Labor displacements in directly and indirectly impacted industries may then be allocated among either or both regions (states) or occupational groups by utilizing matrices of proportional distributional data once displacement at the national level has been established. Regional or state-level changes in employment, by industry, are calculated by first allocating displaced output to regions according to each region's share in total production (in that industry) in the base year, and then multiplying this change by the national average labor-output coefficient for that industry. It is thus assumed that there are no regional differences in either the composition of the industry[25] or the productivity of the workforce. This method is used by Baldwin and Lewis, who add to it calculations of the occupational distribution of displaced workers.

Occupational distributions are measured by multiplying labor displacement by industry (or by industry, by state) by a matrix of occupational skill distributions by industry, known as the National Industry Occupational Employment Matrix[26]. Use of this matrix implies the assumption that the skills of workers in any industry in a given area are distributed exactly as are the skills of workers in the whole industry: e.g. if 10 percent of the steel industry's workforce is comprised of clerical workers, then when a steel plant in Pennsylvania cuts output (and therefore employment) by 25 percent, 10 percent of the displaced workers will be clerical workers. There is an obvious danger here of attaining a false impression of accuracy, as the mass of information generated obscures the shaky foundations upon which the results lie. Only one study of liberalization uses a combined regional/occupational breakdown: this is Baldwin and Lewis's; but it has been influential in determining public attitudes towards liberalization[27].

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[25] At the level at which most of these studies are made (never using a finer industrial classification than the SIC 4-digit level, so that national interindustry tables may be used), there may be considerable differences between the output of one state and the output of another.

[26] Published periodically by the U.S. Bureau of Labor Statistics.

[27] The Congressional Budget Office study of the distributional impact of liberalization under the Tokyo Round of MTNs draw heavily from Baldwin and Lewis, who find that while changes in employment associated with liberalization will be small, they will be unevenly distributed: the Northeast will have the greatest losses relative to total employment, while the Midwest will enjoy the greatest relative gains (pp. 252-253). Baldwin and Lewis's overall picture of the impact of liberalization is reassuring, a conclusion transmitted clearly in the CBO report. This report was widely quoted in the popular press at the time of its publication. See Congress of the United States, Congressional Budget Office.

Both regional and occupational breakdowns are used in other studies of the distributional impact of government policy[28].

When an industry affected by liberalization is not characterized by constant costs, estimation of displacement becomes more complicated. If the assumption of rigid wages is retained, displacement should be related directly to technological characteristics of the industry. Alternatively, it is possible to assume that factor returns are flexible, in which case displacements may not occur.

An approach which relates displacement to technology is the use of the vintage-capital model(Isard; Katz, in chapter 4 of Jondrow et. al.). In this model[29], capital purchased in a given year is assumed to embody a fixed capital-labor ratio: that is, it takes a certain number of workers to run the machine, and this number cannot subsequently be changed. The overall capital-labor ratio of an industry changes over time because newer capital embodies a higher capital-labor ratio. Once a machine is purchased and in place, the variable costs of using it are determined by the wage rate (which appears to be exogenously determined, at least in single-industry studies). Capital can either be assumed to 'expire' after a fixed number of years, or it can be retired when the variable costs of operating it are too high.

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[28]Schluter and Heady estimate labor demand shifts by agricultural commodity by region resulting from projected final demands for food and fiber in 1980 (pp. 70-79). Frank and Freeman break down net employment shifts associated with US direct foreign investment into occupational skill groups (pp. 156-158). Haveman and Krutilla use a Leontief balanced regional interindustry model to examine regional changes in employment, by industry and detailed occupation, arising from the hypothetical construction of each of twelve possible water resource projects in each of ten regions (pp. 38-64).

[29]Isard gives as sources for the theory of vintage capital models the following: L. Johansen, "Substitution Versus Fixed Production Coefficients in the Theory of Economic Growth: A Synthesis," Econometrica 27 (April 1959), 157-176; R. M. Solow, "Substitution and Fixed Proportions in the Theory of Capital," Review of Economic Studies 29 (June 1962), 207-218; and R. M. Solow, J. Tobin, C. C. von Weizsäcker, and M. E. Yaari, "Neoclassical Growth with Fixed Factor Proportions," Review of Economic Studies 33 (April 1966), 79-115.

This model enables the researcher, having once estimated the parameters for the industry under study[30], to relate output and factor displacement to the industry's stock of capital of different vintages. In theory, changes in output come about as a response to price changes: liberalization drives down the price of domestic goods[31], so that the costs of producing with the older machines will exceed returns, and the machines will cease to be used. In practice, both authors cited here take the change in output as given[32], and simply 'assign' it to the oldest vintage capital. By this means they demonstrate that labor displacement may be as much as twice as high in this model as it is in the constant-cost model (Isard, pp. 408-409; Jondrow et. al., pp. 4-45, 4-46).

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[30]Estimations are done in Isard, pp. 406-409. and in Jondrow et. al., pp. 4-27 ff. Neither author is actually very successful in demonstrating that the model can fit the industries studied (the U.S. textile industry in Isard, the U.S. steel industry in Jondrow et. al.). Isard's results suggest that most of the change in labor-output ratios over time is due to disembodied changes in efficiency, not to technical change embodied in new capital (p. 407). As these results do not conform to his expectations, and since they imply "...little difference between unit labor requirements on new and old capital vintages," (p. 408) the author decides to proceed on the assumption that technical change is between two-thirds and completely embodied. Katz, in Jondrow et. al., indicates that cross-sectional relationships between average labor productivity and age-of-plant, while moving in the expected directions, "..are seldom statistically significant," (p. 4-24) yet clearly wants to believe that they are: "This finding, if correct, is highly important for our purposes, since one of the consequences of liberalizing imports will undoubtedly be to reduce the share of output produced by aging and obsolescent processes" (pp. 4-24, 4-26). He therefore calculates the "cumulative distribution of output and employment by equipment vintages" in the steel industry, 1930 to 1971 (table 4-5, p. 4-28), and uses the labor/output ratios implied therein as upper bounds for estimating displacement, the lower bound being the average labor/output ratios (proportional displacement).

[31]Since this is not a constant-cost industry, a backward shift in the demand for the domestic good as a function of its own price yields both a change in output and a change in price. See figure 3.

[32]Katz uses changes in output estimated via a dynamic simulation model of the US steel industry (chapter 3 of Jondrow et. al.). Isard does not actually estimate displacement; his study is designed primarily to ascertain whether the burden of adjustment to liberalized textile imports in the US could be lightened by discouraging new investment in the domestic textile industry. His point is that by allowing imports to substitute for output 'foregone' by not investing in new plant, labor displacements would be considerably below the level attained by closing old plants (pp. 408-409). Unfortunately, he ignores the possibility of the domestic price falling and old plants becoming too costly to operate.

The vintage-capital model relies on a very explicit capital-displacement mechanism (output is decreased by retiring machines of a certain vintage), but neither study mentioned above deals with capital displacement per se. It would appear that by estimating the expected useful life of each vintage in the absence of liberalization, and comparing it with the life realized after liberalization, one could derive some estimate of the value of displaced capital.

The vintage-capital model, by relating output displacement to identifiable industrial characteristics (age of capital), may lend itself to estimation of the regional impact of liberalization in a more accurate manner than is permitted by the simple, proportional-displacement inter-industry model. In chapter 7 of Jondrow's study, Devine and O'Neill examine the regional distribution of older steel-making technology (open-hearth furnaces) and attempt to relate it to historical regional patterns of labor displacement (pp. 7-24 to 7-30). Being moderately successful[33], they proceed on the assumption that the expected relationship does exist to study the probable geographic pattern of labor displacement under steel import liberalization (pp. 7-33 to 7-39).

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[33]The author's methods are worth reporting here because they illustrate the difficulty of justifying empirically the assumption that regional impact should correspond to regional distribution of different technologies. Having studied technology in the steel industry and related it to costs of production (pp. 7-4 to 7-24), the authors hypothesize that a systemmatic relationship should show up between observed changes in local steel employment in a cyclical downturn (1970-71) and the type of furnace used in local operations. To test this they construct a sample of 11 states and 4 SMSAs in which furnace types of specific plants can be identified and for which BLS employment data are available at a sufficiently detailed industry level. They then run a simple regression of the form $Y = a + bX$, with Y being the absolute value of the percentage decline in employment and X being the percent of capacity in open hearth furnaces. The results are poor ($\bar{R}^2 = .03$), and the authors posit two explanations for this: either geographic dispersion of unemployment rates reflects variable costs, but furnace type is not a sufficient indicator of variable cost structure; or alternatively, unemployment patterns are determined by factors other than variable costs, notably either geographic concentrations of cyclically sensitive steel-using industries, or else plant modernizations in which labor is displaced by new capital-intensive processes. Having no way to test all these possibilities, the authors choose instead to study their three outlying observations; doing this reveals that other-than-variable-cost factors determine labor displacement in each case. When these three observations are discarded, the $\bar{R}^2$ rises precipitously, from .03 to .52, leading the authors to conclude that "(t)he fairly large R^2 suggests that furnace type may in fact be the dominant determinant of geographic dispersion in variable cost" (pp. 7-24 to 7-30).

As techniques for measuring changes in factor demand have been developed almost completely in response to interest in improved evaluation of liberalized trade in manufactured goods, tools for evaluation of liberalized agricultural trade are poorly developed. Whereas labor displacement is the central issue in manufacturing sectors, most displacement in agricultural production will be reflected in decreased, or less efficient, utilization of land and capital. An important area for further study is thus the proper measurement of displacement in agricultural production.

Factor Displacement: Changes in Supply

As part of the normal workings of the labor market, a certain percentage of jobs are regularly vacated by workers leaving voluntarily to seek or enter employment elsewhere. One method of effecting displacement in an impacted industry is simply not to fill posts that are emptied in this manner.

It is customary, in studies of trade liberalization, to treat attrition as a costless form of adjustment (Jondrow et. al.; Brechling). Whether or not this is justifiable depends on whether workers in the process of searching for jobs, and potential workers preparing themselves for the labor market, suffer any loss on account of the decreased opportunity. It could be argued that investments in human capital (industry-specific training) are forfeited when voluntarily emptied jobs are withdrawn from the market; the issue has long been of concern to unions (see Frank, Jr. chapter 3). However, since these job losses do not require compensation and are relatively inconspicuous, they are generally ignored.

Whether or not attrition is properly considered to be costless, it is undoubtedly a less costly form of displacement than are firing and laying off. If the determinants of attrition can be understood, it is theoretically possible to estimate paths of adjustment which will minimize adjustment costs (by relying as much as possible on attrition), perhaps subject to constraints on the length of time in which liberalization must be completed.

Empirically, estimation of attrition may be handled in one of two ways. Either the rate of attrition is assumed to be independent of conditions in the industry, or it is assumed to be endogenously determined by these conditions.

Exogenous quit rates are implicitly assumed in Jacobson's study of losses incurred by displaced workers in the U.S. steel industry (chapter 5 in Jondrow et. al.). In order to ascertain by how much initial estimates of labor displacement (demand-induced) should be reduced, the author studies the historical experience of workers in steel firms where employment has either risen or fallen. Workers leaving 'rising' firms are assumed to do so voluntarily, and serve as a measure of the normal rate of attrition. This same rate of attrition is ascribed to workers leaving 'falling' firms, so that actual displacements are measured as a residual after voluntary quits are subtracted from the calculated change in demand

for labor (Jondrow, et. al., ch. 5). By this means the author determines that attrition will absorb between 24.2 and 39.0 percent of the separations needed to adjust to a lower level of output following liberalization[34].

Jacobson's results here may be compared with Brechling's simulation analysis of labor turnover in U.S. durable-goods and nondurable-goods industries, in which both exogenous and endogenous quit rates are employed. Brechling finds that when attritions are assumed to respond to economic conditions they drop sharply: from 79 percent with exogenous quits to a high of 43 percent[35] with endogenous quits (p. 68). The author summarizes the implications of his research for the analysis of trade impact as follows (p. 68):

> ...The failure of unreplaced attritions to bring about much of the net reduction in employment occurs in spite of the large reductions in new hires and is due to the sharp decline in voluntary quits. In other words, a decline in the demand for an industry's output and, hence, for labor discourages attritions so strongly that, despite large reductions in replacements, the level of unreplaced attritions cannot rise much...
>
> ...(R)esults suggest that the extent to which costless unreplaced attritions can bring about net reductions in employment may be quite limited and this conclusion may well be at variance with the views held commonly by labor economists.

Despite Brechling's pessimism, his results do suggest that a significant portion of projected displacement may in fact be absorbed by voluntary quits, and a large portion of potential adjustment costs avoided. Studies which fail to account for possible attrition may thus overestimate the magnitude of actual labor displacement caused by trade liberalization and consequently overstate associated adjustment costs.

Adjustment Costs

Adjustment costs are, roughly, the costs that accrue either explicitly or implicitly to factors displaced by liberalization-induced shifts in

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[34] Rates are estimated separately by age-tenure group - hence a range of values.

[35] Attrition accounted for 42.9 percent of the change in employment in durable-goods industries, and 27.8 percent in nondurables (p. 85).

output[36]. The measure is rough because all possible costs are not accounted for: coverage in the empirical literature is restricted to costs arising from price rigidities, with numerous private costs being ignored.

Two major motivations prompt the calculations of adjustment costs. The first is to provide a figure that can be compared with the welfare gains from trade to ascertain whether liberalization leads to a potential Pareto improvement: that is, whether total social gains exceed total social losses. This is primarily an economist's exercise, as what is at stake is a test of the classical 'optimality of free trade' doctrine (e.g., Magee). The second: to measure the impact of liberalization in terms of quantitative and qualitative changes in employment, and in associated losses of income, is more liberal, or even explicitly political. This may be done out of sympathy for labor, out of a need to estimate what actual compensable losses (under trade adjustment assistance legislation) might be, or simply out of a desire thoroughly to examine the distributional impact of liberalization.

In theory, one must distinguish between the private and social, or welfare, costs of adjusting to liberalization. The costs commonly measured in empirical studies approximate social costs, but since private costs overlap with social ones the former are in practice partly measured as well.

In the neoclassical framework, with perfectly flexible wages and prices, full factor employment, and instantaneous adjustment (perfect factor mobility), social adjustment costs do not exist (Baldwin, Mutti and Richardson, pp. 12-14). The latter arise through 'distortions', being most commonly attributed to rigid wages (as in the following example), though numerous other factors impede adjustment as well[37]. Private costs, however, can exist with or without price rigidities. The Stolper-Samuelson theorem demonstrates that under liberalization the real wages of the scarce factor of production fall, even though

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[36]There is no conceptual distinction between trade-induced displacement, with its associated adjustment costs, and displacement resulting from the 'normal' workings of a market economy. As conservatives like to point out, if one supports trade adjustment assistance it is inconsistent not to support general industrial adjustment assistance as well (which is anathema to conservatives). Trade adjustment assistance is generally acknowledged to be politically motivated; as one writer sympathetic to labor points out, "...(a)djustment assistance has been primarily a device to pass trade bills, a function it helped to perform on two occasions" (Mitchell, p. 73).

[37]Some of these are factor immobility, institutional impediments to workers voluntarily retraining themselves for available jobs (e.g., unavailability of credit for this purpose), and monopolistic and monopsonistic producer behavior.

the usual neoclassical assumptions hold[38]; hence even if labor is never unemployed, a real wage change follows liberalization and must be counted a private loss.

Since the U.S. economy is generally believed to be characterized by rigid wages (in manufacturing) in the short run, or over the period during which adjustments are made[39], social as well as private costs are created by liberalization. Baldwin, Mutti and Richardson demonstrate graphically the origins of social, or welfare, costs under rigid pricing in the imperfect-substitution model, incidentally illustrating the degree to which social and private costs may overlap, with the following figure[40].

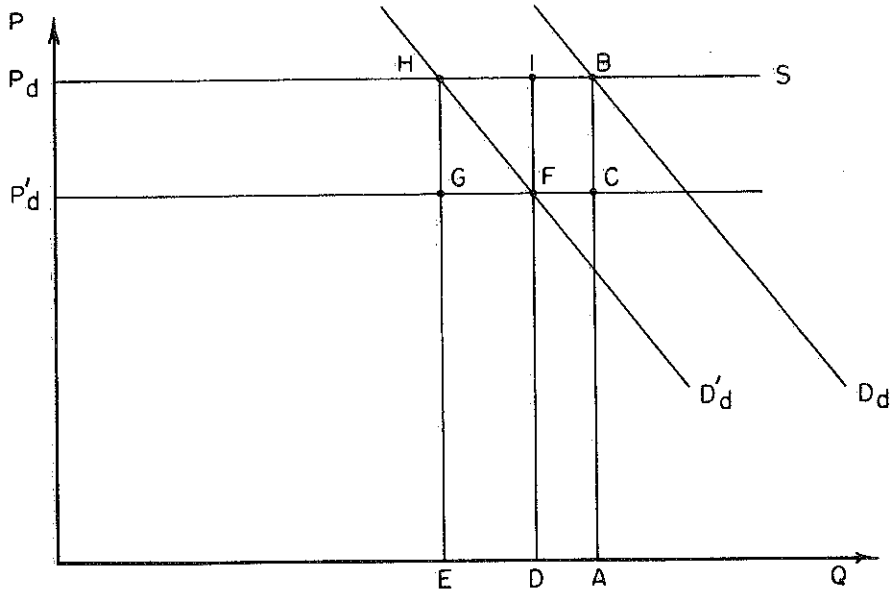

FIGURE 5. MEASURING THE SOCIAL COSTS OF ADJUSTMENT IN THE DOMESTIC GOODS MARKET OF A CONSTANT-COST INDUSTRY WHEN WAGES ARE RIGID

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[38]W. F. Stolper and P. A. Samuelson, "Protection and Real Wages," Review of Economic Studies 9 (November 1941): 58-73.

[39]Baldwin, Mutti and Richardson, p. 15. The authors point out further that returns to capital may also be inflexible, contrary to the usual assumptions, since "...(w)idespread and well-known product pricing practices, such as marking up on variable costs...can make returns to ownership of "capital" residually rigid in the short run, too, in industries with limited ability to substitute physical capital for labor" (p. 15).

[40]This figure is taken directly from Baldwin, Mutti and Richardson, p. 13.

In this figure, the authors attempt to measure in the domestic goods market the social costs (as reflected by factor costs) of liberalization under rigid factor pricing (but with long-run constant costs as well). They apparently assume that all revenue goes to factor payments (there are no pure profits, and material costs are omitted).

The situation depicted in figure 5 is described as follows. Freer trade in the import good causes demand for the domestic good to fall from D_d to D'_d. If affected factors of production will accept lower wages, the cost of production (and the supply curve) falls from P_d to P'_d.[41] The change in output is measured by AD; factors displaced by this change lose income measured by IFCB, while retained factors lose $P_dP'_dFI$. Both these losses are private losses: the whole rectangle $P_dP'_dCB$ is equivalent to consumer surplus realized as the price falls, so that (in a conventional welfare-economics framework) no net social costs arise. Displaced factors are assumed to be instantly reemployed elsewhere at the new, lower wage also received by retained factors and equivalent to the new value of their marginal product. The wage differential persists for all factors but continues to be a private loss.

Under rigid pricing, however, welfare costs do arise. When demand falls, there is no accommodating shift in factor prices, so that not only is the change in output greater than under flexible factor prices (by the amount ED), but output prices do not decline. The loss in wages, which now accrues only to displaced factors (retained factors earn a monopoly rent of $P_dP'_dHG$, an amount which under flexible prices goes to consumers), is equivalent in each time period to HGCB. Since this amount is not matched by a comparable consumer gain, it constitutes a welfare loss.

HGCB is actually the minimum possible welfare loss under a regime of rigid factor pricing. It is assumed that displaced factors will be reemployed to produce other goods valued at GEAC[42]. The authors point out that "...(i)f no alternative goods at all can be produced by the released resources (there is no similar employment available, or the costs of readapting are greater than the returns from any new employment) unemployment will be maximal, and the welfare costs of adjustment to the society will approach HEAB" (p. 14).

There are thus two sorts of welfare costs which arise from rigid pricing in this model. The first, measured by HGCB, corresponds to

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[41] In a partial-equilibrium framework it is impossible to say how far wages and output prices will actually fall.

[42] This implies that elsewhere in the economy wages are competitively set, and that 'aberrant' behavior in one industry is not influential enough to alter the behavior of wages elsewhere. This contradicts the authors' stated assumption that the U.S. economy is characterized by rigid wages. The 'competitive' wage level must be regarded as one which would obtain in the absence of all rigidities.

unemployment costs. The second, measured by some portion of GEAC, corresponds to what is usually termed the permanent wage loss or wage differential. The magnitudes of these costs are determined by both the initial levels of displacement and by the persistence of displacement over time.

In practice, what costs are identified and measured, and how do they correspond with the areas described above? Measured costs included wages actually lost during unemployment, the differential between observed pre- and post-liberalization wages, and the loss in returns to capital. All these costs are measured directly from observed wages, not from the domestic product market in the manner depicted in figure 5; it is unclear to what extent estimated social costs correspond to theorized costs[43]. What is clear is that, empirically, the only costs which anyone attempts to measure are those that approximate social costs. A whole set of private costs: relocation and retraining expenses, losses in value of workers' capital assets (e.g., land and houses) when heavily localized changes depress property values, consequent property tax losses to the community, community multiplier effects following from lost income and outmigration, and the psychological costs borne by displaced workers and their families; is ignored. These are costs which would be difficult to estimate, but the lack of interest shown in them is indicative of the fact that trade economists have yet to transcend the limited framework provided by the welfare model.

The simplest approach to calculating adjustment costs is that which treats only wages lost to unemployed labor, ignoring both capital losses and permanent wage differentials. At the most basic level, no information about labor force characteristics or differences in wages paid to different workers is used. Magee uses such an approach. Having calculated long-run labor displacement in each of the aggregate sectors defined in his study, he assigns one-fifth of the total to each of the five years following hypothetical liberalization[44]. He then assumes average durations

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[43] If rigid product prices arise from oligopolistic behavior rather than from cost structures, the area HGCB may not be completely or even mostly comprised of factor wage losses: it may contain a large element of rent. The area will still correspond to a loss of consumer surplus, but empirical estimates equating observed wage losses with social costs may be too low. In addition, the use of the observed post-liberalization wage as a proxy for the value of displaced labor's marginal product may seriously bias estimation if most of the economy is characterized by noncompetitive pricing practices.

[44] Magee assumes a time path for changes in output rather than forcing them to occur instantaneously. He does not do the same for welfare gains; the prices of imports are assumed to fall instantaneously after liberalization, permitting welfare gains to accrue immediately and in full. He simply assumes that domestic industries will need five years to adjust to "a new long-run equilibrium" (Magee, p. 680).

of unemployment in each sector, calculates the average annual wage in each sector, multiplies the wages by the appropriate durations, and takes the present value of the total. He does not attempt to capture the permanent wage differential.

Both Mutti, and Baldwin, Mutti and Richardson attempt to relate the duration of unemployment to the socioeconomic characteristics of displaced workers, assuming, however, that the displaced workforce possesses the same socioeconomic characteristics as the retained workforce. Their procedure begins by assigning to displaced workers the socioeconomic characteristics of the whole labor force of the industry in question[45]. The average duration of unemployment for all displaced workers is then calculated via a regression equation relating the duration of unemployment to socioeconomic characteristics[46]. The average duration of unemployment is then multiplied by the average full-time daily wage (Baldwin, Mutti and Richardson, p. 19) or the current wage plus fringe benefits (Mutti, p. 104) to obtain unemployment costs per worker. Neither author estimates the permanent wage differential.

Since layoffs are likely disproportionately to affect young workers, females, and those with low seniority, and since these groups are generally paid lower wages than are retained workers, assuming both average socioeconomic composition and average wages for displaced workers may "...overstate income losses due to adjustment and dislocation" (Baldwin, Mutti and Richardson, p. 18). Szenberg, Lombardi and Lee attempt to take into account differences in the compositions of the displaced and retained workforces, and in the wages earned by each, to measure both wages lost during enemployment and the permanent wage differential suffered by displaced workers in the U.S. footwear industry.

Using data from McCarthy's study of adjustment assistance in the Massachusetts shoe industry (McCarthy), the authors partition displaced

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[45]These characteristics can be obtained from the Census of Population.

[46]Baldwin, Mutti and Richardson use an equation from the Department of Labor (source not further specified) which relates "...the number of days unemployed before obtaining (the) first post-layoff job.." to age in years, sex, race (white or nonwhite), and years of education (p. 18). Mutti uses results from Bale's dissertation (Malcolm Bale, "Adjustment to Freer Trade: An Economic Analysis of the Adjustment Assistance Provisions of the Trade Expansion Act of 1962," unpublished Ph.D. thesis, University of Wisconsin, 1973) to relate duration of unemployment to sex, age, status as household head, past wage, education, and the local unemployment rate (p. 105). Baldwin et. al. do not report estimated durations; Mutti's range from 12.1 to 15.0 weeks for the five industries directly affected (p. 106).

workers into permanently and temporarily unemployed workers, and estimate separately the adjustment costs borne by each group[47]. Losses borne by the permanently unemployed (those who never find another job) are calculated by taking the product of the average number of years remaining to each worker until retirement is reached, and the average wage of this group before displacement. Since the average wage of this group, which is fairly close to retirement, is below the average wage for other workers, this portion of unemployment is less 'costly' than the others.

The temporarily unemployed bear costs through both their initial unemployment and their subsequent reemployment at a lower average wage. The unemployment cost is calculated as the product of the average duration of unemployment and the average wage for this group; the permanent wage loss is calculated as the present value of the average difference between pre- and post-liberalization wages for this group, extended over the average number of years remaining until retirement (pp. 88-89)[48].

Szenberg, Lombardi and Lee's estimated costs suggest that the permanent wage differential comprises a large share of total adjustment costs. From their results one may calculate that costs are divided as follows:

(a) wage loss of the permanently unemployed	43.2%
(b) wage loss of the temporarily unemployed	15.9
(c) permanent wage differential	40.9
	100.0%

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[47] McCarthy studied the actual experiences of displaced workers in the Massachusetts shoe industry, so that his work shows the age and sex composition of displaced workers, their wage levels before and after displacement, and a variety of other data. All of Szenberg, Lombardi and Lee's distributional data come from McCarthy.

[48] Szenberg et. al. do not use most of the information about displaced workers available in McCarthy's study; it is interesting to see what McCarthy's own results suggest about the distribution of adjustment costs among workers. McCarthy finds that the group of workers which failed to regain employment was on the average older and more heavily female than the rest of the labor force, had slightly lower education and skill levels, and lower pre-impact wages (McCarthy, p. 88). McCarthy characterizes them as "near-retirees or secondary wage earners," and adds that their failure to seek reemployment was based on discouragement rather than on disinterest.

Of those who became reemployed, reemployment experiences varied markedly with different socioeconomic characteristics. Most startling is McCarthy's finding that men, on average, actually increased their real wages upon reemployment, though for 'all workers' post-impact wages were lowered; the burden of adjustment clearly fell on the female workers in the shoe industry (pp. 114-118). His results are far too extensive to summarize here, but they are well worth reviewing if one is interested in the finer points of the impact of liberalization and adjustment assistance on an industrial workforce.

The permanent wage differential is thus large, suggesting that studies which neglect to include it may significantly underestimate social adjustment costs.

The permanent wage differential is considerably larger in Jacobson's study of adjustment costs in the steel industry (chapter 5 in Jondrow et. al.). Jacobson's approach is certainly the most sophisticated in the trade-impact literature. Using historical observations of employment patterns in the steel industry, the author establishes both the age-tenure characteristics of displaced workers over time (as employment reductions continue, different groups are displaced sequentially) and earnings profiles, by age-tenure group, of displaced workers throughout their unemployment and subsequent reemployment (see pp. 5-2 to 5-3 for a succinct description of his methods). Both unemployment costs and permanent wage losses are therefore measured separately for each age-tenure group; and displacements, rather than falling in equal proportions on all groups of workers, are allocated selectively to mirror observed layoff patterns in the industry.

The relative magnitudes of the costs attributable to unemployment and to lifetime earnings losses obtained by Jacobson are startling. For all displaced workers taken together, earnings losses in the first year (when most unemployment occurs) comprise only 10.8 percent of the total lifetime loss. Losses over the next four years comprise 40.6 percent of the total, with losses thereafter comprising the remaining 48.6 percent (pp. 5-119, 5-120)[49]. Permanent wage losses in the steel industry apparently comprise almost 90 percent of total adjustment costs, a startlingly high figure in view of the fact that so many authors are content to use wages lost during unemployment as a measure of the total labor costs of adjustment (e.g., Mutti; Magee; Baldwin, Mutti and Richardson).

Inspection of differences in the compositions of the labor forces in the U.S. steel and footwear industries suggest that the relative size of the permanent wage differential may be found to vary in response to two important factors: the proportion of older workers in the displaced workforce, and the proportion of women and minorities displaced. The greater the numbers of older, nonwhite, or female workers displaced, the lower should be the relative size of the permanent income differential.

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[49] Jacobson's figures show that the burdens borne by different categories of displaced workers vary significantly. In the first five years following displacement, young workers with low tenure tend to lose the least, both in the first and subsequent years. Young workers with higher tenure (more than one year) tend to lose more than does any older group, although losses incurred by workers ages 29-40 with high tenure (over 3 years) may be fairly similar. Lastly, prime-age workers (ages 29-40) with less than 3 years' tenure actually gain income by being displaced, at least after the first year (Jacobson, p. 5-43). This is consistent with McCarthy's finding that displaced males in the Massachusetts shoe industry, on average, were reemployed at a higher wage than they had received prior to displacement (see fn. 48).

The role of displaced older workers here is fairly obvious. Older workers are more likely than others to remain unemployed after displacement; even if reemployed, the duration of employment following displacement will be short compared to that of younger workers, while the spell of unemployment is likely to be comparatively long. The costs associated with displacing older workers will be primarily unemployment costs.

The presence of female and minority workers in the displaced workforce will tend to lower the relative size of the permanent income differential because the time profiles of these groups' earnings differ considerably from that characterizing the experience of white males. The typical white male's earnings, historically, have risen rapidly in the early years of employment and then continued to rise, more gradually, until sometime in middle age (45-54 years), after which they decline. The earnings of females and minorities, however, have tended to remain quite static over the worker's lifetime (Hall, pp. 393-394). These earnings profiles are sketched in figure 6. Wage increases for white males are tied to experience and on-the-job training (which tend to be positively correlated with age); when a white male is displaced and subsequently reemployed

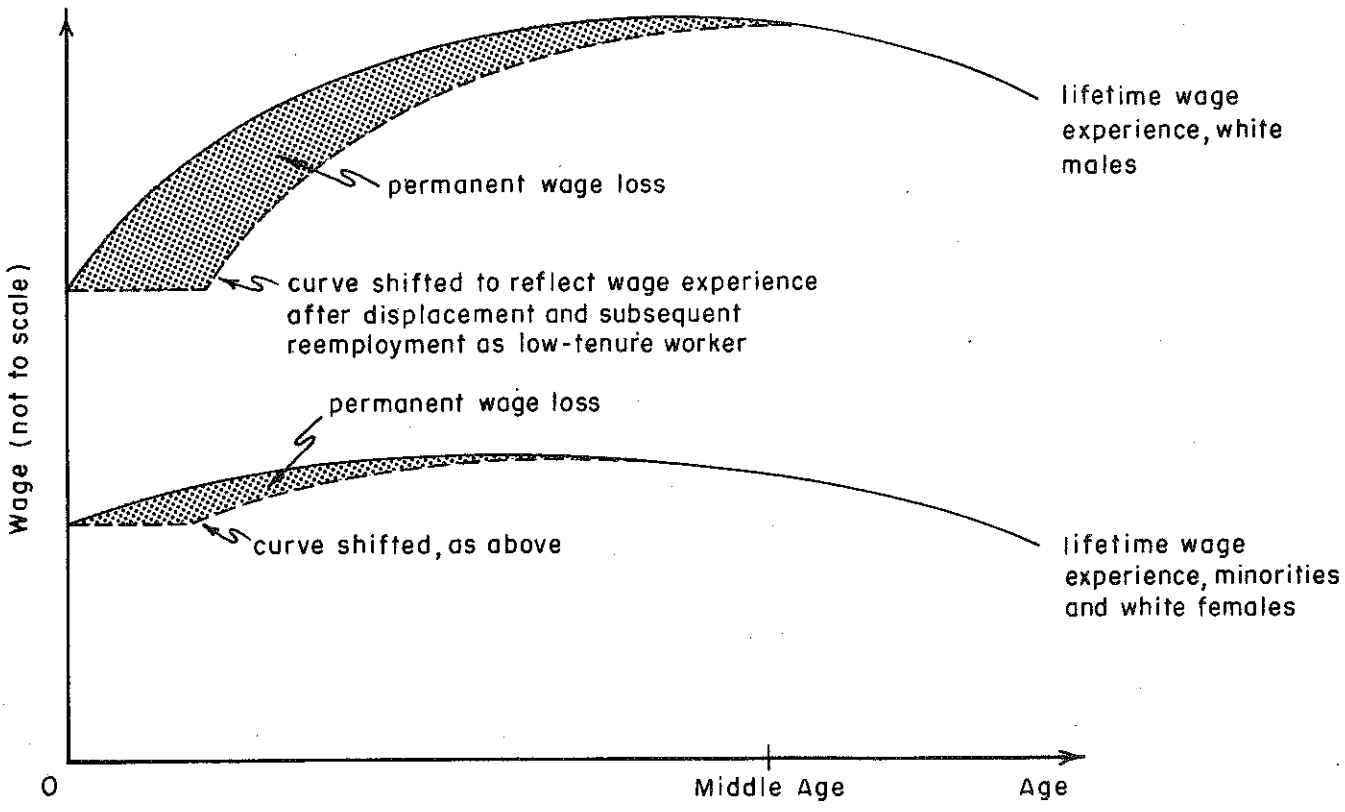

FIGURE 6. MEASUREMENT OF THE PERMANENT WAGE LOSS FOR WHITE MALES, MINORITIES, AND WHITE FEMALES

'as if' he were younger or less experienced, he returns to a lower wage level and, in effect, never quite catches up to his peers. The change will be less pronounced for women and minorities, whose experience and training seem to count for little in the labor market. The magnitude of the losses suffered by members of the two groups are indicated roughly by the shaded areas in figure 6.

As this crudely outlined model suggests, the permanent income differential would tend to be relatively large in an industry with a homogeneously white male workforce, and relatively small in an industry with disproportionate numbers of older, female, or minority workers. The 1970 Census of Population shows that while white males comprised 62.3 percent of the manufacturing labor force in 1970, they comprised 73.6 percent of the labor force in "all metal industries", and just 36.1 percent in the manufacture of other-than-rubber footwear[50]. These data suggest that Szenberg, Lombardi and Lee's estimate of the relative size of the permanent wage differential (40.9 percent of total costs), being based on a disproportionately female and minority workforce, might serve as a lower bound; while Jacobson's estimate of almost 90 percent, based on a disproportionately white-male labor force, might serve as an upper bound. Failure to include the permenent wage differential in cost estimates may introduce a serious bias into the evaluation of the social costs of liberalization.

Because the literature places such a strong emphasis on labor adjustment costs, capital costs have been either ignored or dealt with summarily, as by Mutti and Baldwin, Mutti and Richardson (see the discussion of capital displacement on p. 24 of this paper). Yet the estimation of capital costs should be paid more attention, if only because the owners of capital will constitute a vocal lobby if they perceive liberalization as a threat.

The problem here lies in separating social from private costs. Social costs, as shown above, arise from price rigidities and other 'distortions' of the neoclassical model. In the manufacturing sector, where both factor and output prices are believed to be rigid, spells of unemployment are conventionally attributed to these rigidities, and the permanent wage differential constitutes a social cost, as well as a private one, because it measures consumer surplus foregone through rigid pricing.

When liberalization decreases domestic output, capital displacement can take two forms. Either capital can be retained in its former employment and utilized at a lower rate, or it can be physically 'displaced' and, if possible, used in another activity. When adjustment takes place through less intensive utilization, the change in returns to capital is

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[50] 1970 Census of Population, Vol. 1, Part 1-Sec.2, table 236. "All metal industries" is used here because Census classifications do not permit separation of steel fabricating industries from other metal fabricating industries.

analogous to unemployment costs; Mutti and Baldwin, Mutti and Richardson, by measuring the capital cost as the change in capital's share of value added, thereby measure an unemployment cost. But what happens when capital cannot be reemployed, or can only be reemployed at a lower return? These situations arise not because of distortions in the economy but because of the inflexible nature of capital itself. Land suited to growing grains, for instance, has little value in other activities; a loom is not much use for anything except making textiles. It may be, then, that losses of this sort are not properly social costs, and should not be counted as such.

At the same time, they cannot possibly be ignored, because they clearly affect the welfare of identifiable groups in the economy. Even if capital losses are not social losses, and need not be subtracted from welfare gains, they must be considered. But if they are, then what of the many private costs accruing to labor, and to communities, which are also conventionally ignored?

The narrowness of welfare analysis suggests that any useful approach to measuring the distributional impact of liberalization may have to venture onto shakier ground. Too much is omitted from the various studies discussed above. In the final and summary section criticisms of partial-equilibrium analysis of the impact of liberalization are raised, and alternatives to both methods of measurement and methods of evaluation are considered.

IV. SUMMARY

Many criticisms have been raised in the preceding review of models and empirical methods of partial-equilibrium analysis of liberalization. It has been shown that transfers in the model are poor indicators of the actual redistributive effects of liberalization, and that moving from estimation of aggregate consumer and producer surpluses to measurement of the costs and benefits accruing to real entities may be difficult. The failure of the static instantaneous-liberalization model to capture some important effects of staged liberalization has been demonstrated. The problems of defining and estimating adjustment costs have been covered. But where does this lead? What can now be said about the advantages or limitations of evaluating the impact of liberalization in this manner?

It appears that three generalizations may be made about this model as an empirical tool. The first is that if welfare (or efficiency) effects, in the sense of potential Pareto improvements, are to be measured, estimation of social adjustment costs (which are subtracted from gains in surplus) can be improved. The second is that if distributional effects are of primary interest, the model provides a good starting point but yields little information about real income-distributive effects, and none at all about the private costs associated with change. The third is that formal comparisons between efficiency and equity effects are precluded by the apparent exclusion from the model of major equity effects.

With respect to the first point, it was shown that measurement of social adjustment costs in the literature is often inadequate. Four major sources of bias were found. These are the failure to let attrition offset decreased factor demand, the failure to account for possible greater-than-proportional labor displacement (and less-than-proportional capital displacement), the failure to include in factor costs a permanent income differential, and the failure to count capital costs. Thus even within the welfare framework estimations can be greatly improved.

However, as was also shown, the welfare effects of liberalization are small in comparison with the income-distributional effects. Perhaps as a consequence of the growing realization that distributional effects are what really interest the electorate, and hence their representatives, one observes in the literature a secular trend away from concern with welfare gains and towards an interest in distribution. In the earlier literature (e.g., Dardis and Learn) the focus is entirely on simple welfare gains, adjustment costs being omitted on the assumption that no significant distortions exist. In the next stage, exemplified by Magee, adjustment costs are accorded a cursory treatment, but the focus remains on efficiency. It is in the post-Magee literature that interest in distribution blossoms. Johnson looks specifically at transfers, rather than welfare gains, in his study; Szenberg, Lombardi and Lee use McCarthy's study to refine their estimates of adjustment costs but also, it appears, to increase the informational content of their study; and in the extreme cases, Baldwin and Lewis, and Jondrow et. al., measure the distribution of gains and losses across industries (Baldwin and Lewis), regions (both), and categories of workers (both). These extensions of the model could (with the exception of regional impact studies) be 'justified' as attempts to refine the estimation of adjustment costs in order to improve estimates of welfare gains, but this is not really how they are presented in the studies. There is, quite clearly, a growing interest in the distributional impact of policy changes. Perhaps the best illustration of this is the fact that after Bale and Greenshields published their estimates of the pure efficiency costs of Japanese agricultural production and trade programs (Bale and Greenshields, 1978), Bale had an apparent change of heart and wrote a separate paper pointing out, rather apologetically, that the transfers implicit in the model were "...often more than ten times the size of the net social losses" (Bale, p. 349).

If distributional issues are of concern, improvements can be made both in their measurement and their evaluation. With respect to measurement, perhaps the most pressing issues are identifying ways to estimate the 'true' income-distributive impact of liberalization, both in a static framework and with staged change, and improving the measurement of both social and private adjustment costs. In studying liberalization of agricultural trade, treatment of both of these issues should be facilitated by the wealth of information available about ownership, sources of labor, types of capital, factor returns, and patterns of consumption by income class.

The evaluation of distributional effects may be approached in two ways, either within the framework of the welfare model or in a less constrained manner. Outside the model, there are two routes one may take. The first is simply to present clearly and concisely estimates of the

various changes which occur under liberalization[51], and leave the problem of comparison to policy makers or the electorate. The second is to ascertain (from interviews, records of hearings, extant legislation[52]) which distributional issues are of greatest interest to policy makers, and analyze these in detail. In the wake of a policy change it is possible, as Rausser and Freebairn have demonstrated, to estimate policy-makers' preferences between a limited number of distributional outcomes. Ex ante, it is possible to calculate what a range of distributional outcomes might be if preferences are allowed to vary within reasonable limits.

Within the framework of the welfare model, evaluation of distributional effects is necessarily based on incomplete information. As has been shown, the distributional impact of liberalization is only sketchily measured within the partial-equilibrium model. If one then seeks to arrive at a single summary measure of the impact of liberalization via, for instance, varying the weights attached to incomes received by different groups within the model, many distributional effects will be ignored. Examination of equity-efficiency tradeoffs (see, e.g., Weisbrod; McGuire and Garn; Harberger) will be impeded by the impossibility of including distributional effects lacking in formal economic significance but possessed of ample social and political importance.

In summary, then, the characteristics of partial-equilibrium models of trade liberalization, and the results of empirical work based in part or in toto on these models, are such as to indicate that measurement of the distributional impact of trade calls for both a solid theoretical base and a good dose of judgement and compassion. Partial-equilibrium models serve well as organizational tools and as vehicles for a partial evaluation of trade impact, but are poorly suited to detecting many social and private costs and benefits associated with change.

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[51] This method is praised by Weisbrod (pp. 185-190) as the simplest method of policy analysis.

[52] Rausser and Freebairn describe the process of studying methods and goals of policy-making (pp. 438-441).

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