Domestic trade and transportation costs as barriers to international trade

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Abstract. Available evidence indicates that costs of non-traded services in domestic transportation, wholesaling, and retailing (domestic margins) are higher if a good is shipped in international trade than if it is shipped from domestic producers to domestic consumers. Consequently, domestic margins appear to act as natural barriers to trade in the same manner as international transport costs do. This paper presents estimates of the barriers that the domestic margins impose against U.S. imports and shows that they exceed the barriers imposed by tariffs and international transport costs combined.

Commerce interne et coûts de transport en tant qu'entraves au commerce international. Les renseignements disponibles indiquent que les coûts des services non-transigés internationalement (transport interne, commerce de gros et de détail) sont plus grands si le bien est expédié outre-frontières que s'il est expédié de producteurs nationaux à consommateurs nationaux. En conséquence, les marges bénéficiaires dans le commerce intérieur semblent agir comme entraves naturelles au commerce international de la même manière que les coûts de transport internationaux. Ce mémoire tente d'évaluer la hauteur des barrières que ces marges bénéficiaires imposent aux importations en provenance des Etats-Unis, et suggère qu'elle est plus grande que celle engendrée par l'effet combiné des tarifs douaniers et des coûts de transport au plan international.

I. INTRODUCTION

It is well known that the cost of transporting goods between countries acts as a natural barrier to international trade. A number of authors have examined the size of this barrier and have compared it with the barriers imposed by tariffs or quotas

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(see, e.g., Waters 1970; Finger and Yeats 1976; Clark 1980, 1981a, b). Their goals were to evaluate the potential for unfettered trade to eliminate differences among countries in prices of traded goods and to show the degree to which existing differences could be attributed to natural as opposed to artificial trade barriers.

In this paper we identify another, previously unrecognized source of natural trade barriers. Specifically, we show that trade and transport services within the borders of the trading countries – largely non-traded services in domestic transportation, wholesaling, and retailing – impose trade barriers, because more of them are needed when the producer and consumer are not in the same country. We estimate the size of these barriers and compare them with tariffs and international transport costs.[1] The structures of protection (by stage of fabrication) afforded by the various barriers are also compared. The results indicate that natural trade barriers play a much greater role in insulating domestic producers from import competition than was previously recognized.

We focus on the gaps that the within-country (domestic) margins create between producers' prices at home and abroad, because these are the gaps that determine the protection afforded to various domestic industries and factors of production. We examine only barriers to U.S. imports, but the level and industry pattern of the barriers imposed by the domestic margins should be similar across countries.

II. THE ROLE OF DOMESTIC MARGINS AS A NATURAL TRADE BARRIER

Domestic margins include all of the costs of domestic transportation, wholesaling, and retailing services that are incurred in marketing a good, from the time the good leaves the producer's plant to its final purchase. For a good that is produced and consumed in the same country, the domestic margins are the difference between the per-unit value at the producer's plant (the producer's price) and the retail price paid by the consumer (the purchaser's price).

A good that is shipped in international trade incurs domestic margins in both the exporting and importing countries. The margins in the exporting country are the difference between the producer's price and the per-unit value at the port of embarkation, inclusive of all costs needed to bring the exports to the side of the carrier that will transport them abroad. The margins in the importing country are the difference between the per-unit value at the port of entry (gross of import tariffs) and the retail price paid by consumers. Thus, the total domestic margins on a good shipped in international trade consist of the difference between the producer's price in the exporting country and the purchaser's price in the importing country, less customs duties and less the costs of international freight and insurance.

Unfortunately, data needed to measure the domestic margins on goods shipped in international trade are incomplete. Surveys conducted by the U.S. Department of Commerce (1979, 1984) provide data on the costs of domestic transportation,

1 We do not provide a comprehensive measure of total trade barriers, because we lack a consistent set of quantitative estimates for the current artificial non-tariff trade barriers. Estimates of the non-tariff barriers for earlier years can be found in Baldwin (1970).

wholesaling, and retailing for U.S. domestic shipments and U.S. exports, but other countries do not report margins on exports. Furthermore, no country measures domestic margins on imports. Instead, margins are measured for all domestic sales of a good, with no distinction made as to whether the good originated at home or abroad. The margins for imports are assumed to be the same as those on the competing domestic output. Researchers also used this assumption to measure the factor content of imports and exports.[2]

There is evidence that the wholesale expenses for imports incurred within the United States are at least as great as those for competing sales by domestic producers. Industry analysts at the U.S. International Trade Commission identified only two industries (autos and apparel) in which distribution channels for imports and domestic output are substantially different. In both industries, imports tend to go to wholesale, whereas domestic manufacturers tend to perform the wholesale services themselves and sell directly to retailers, but wholesale services were believed to be equally expensive for both types of shipments. In no industry were costs of wholesaling for imports believed to be less than those for the competing domestic output. The Interindustry Economics Division of the Bureau of Economic Analysis in the Commerce Department also agrees with this view. When constructing the margins for domestic sales, they assume that all imports go to wholesale; the amount of domestic output sold in the home market through wholesale is measured as the residual from total domestic wholesale sales. They also assume that the margins are the same for both imports and domestic shipments.

In many cases the wholesale margins on imports are likely to exceed those on competing domestic shipments. One reason is that freight and insurance costs do not capture the full cost of international transportation. Specifically, the time needed for the international transportation of imports can impose substantial additional inventory storage costs when the timing of wholesale or retail sales is uncertain and the mode of international transportation is slow. Some of the extra costs might be included in the wholesale margins in the exporting country, but they are more likely to become part of the wholesale margins in the importing country. For example, Jondrow, Chase and Gamble (1982) found that longer delivery lags for imports imposed additional inventory storage costs in the United States that caused wholesalers to pay a premium of from 9 to 11 per cent for domestic steel over physically identical imports during the 1970s, even though they sold the steel from both sources at the sale price.[3] Wholesale margins on imports can also reflect other cost disadvantages, such as those arising from differences in language and

2 See, for example, Leontief (1954), Baldwin (1971), and the studies cited therein. Some countries report margins for imports that differ from those on domestic shipments for some product categories (see U.N. Industrial Development Organization 1985). On further inspection, however, it was found that the differences arose only because the reported margins were weighted averages calculated from more detailed data, where it was assumed that the margins for imports and domestic shipments were the same.

3 Their study helps explain why there are differences in price between landed imports (valued gross of customs duties and quota rents) and competing domestic goods, even for homogeneous product categories, and it provides a cogent argument for the need to allow for imperfect substitutes in trade models. Of course, there are also other explanations for such price differences. For

laws, the need for currency exchanges, and the need for imports to be processed through customs.[4]

Even if we grant the assumption that domestic margins incurred within the importing country are the same for imports and competing domestic shipments, however, the imported good will require more domestic trade and transport services than the competing home production, by the amount of the domestic margins in the exporting country. The implied trade barrier is substantial: for example, the domestic margins on U.S. exports average about 15 per cent of the producers' values (see U.S. Department of Commerce 1984). Yet, surprisingly, none of the studies that assumed equal margins within the importing country mentions the implied barriers.

Wholesaling costs account for the bulk of export margins, and it is the duplication of these services in the exporting and importing countries that appears to be the main source of trade barriers imposed by domestic margins.[5] This duplication cannot be confirmed absolutely from available data, but there is strong reason to believe that it occurs. Using Census Bureau data on the disposition of U.S. total final sales and of sales by U.S. wholesalers (to personal consumption, business inventories, government, or export), the Interindustry Economics Division determined that, in each industry, exports are as likely to go to wholesale within the United States as are final domestic sales. Furthermore, the division assumes that the margins for the two types of shipments are the same.

The total within-country transport costs for imports (incurred in both the exporting and importing countries) can exceed or fall short of those for the competing domestic shipments. Hence, these costs can act to impede or encourage international trade.[6] On average, however, their role is much less important than that of the domestic margins.

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example, the International Ladies Garment Worker's Union et al. (1988) found that in 1987 the plant value of U.S.-made apparel was about three times as great as the customs value of imports of equal quality. Customs duties and differences in inventory storage costs within the United States account for some of the difference, but two other factors appear to be more important. First, the import values often do not include substantial value added (such as fashion design) undertaken domestically by the importer, whereas such costs are included in the plant values of the competing domestic goods. Secondly, U.S. importers sometimes buy quota rights separately and do not include them in the customs value.

4 From this last consideration, it is clear that the trade barrier imposed by the domestic margins can arise from artificial as well as natural sources. Some quota rents might also show up as part of the domestic margins if they are captured by wholesale or retail operations.

5 For the United States, wholesaling costs account for about three-fourths of the domestic margins on exports (see U.S. Department of Commerce 1984). It should be noted that wholesaling costs might act to encourage trade in some cases, just as might the within-country transport costs. For example, if scale economies in wholesaling are important and the home market is small, then total wholesaling costs might be smaller for foreign than for domestic sales, even if they are duplicated on the foreign sales.

6 Finger and Yeats (1976, 170f) note that the difference between transportation costs within the home country for imports and the competing domestic output can serve to either reduce or exacerbate the trade barrier imposed by international transport costs, but they ignore the role of transport costs within the exporting country. Melvin (1985) shows that differences in domestic transport costs can offset completely the trade barriers imposed by international transport costs and even encourage international trade.

III. DATA AND METHODOLOGY

We used data from computer tapes provided by the Census Bureau to compute the freight factors (the ad valorem rate of international transportation costs, including both freight and insurance costs) and the ad valorem tariff equivalents for U.S. imports in 1987. The freight factor is measured as the difference between the c.i.f. value and the customs value as a proportion of the customs value. The tariff rate is measured as the ratio of duties collected to customs value. Tariffs and freight factors are computed for sixty traded-goods sectors of the small input-output table for the United States.[7] The rates for each input-output sector are import-weighted averages of the rates for the four-digit SIC categories within the sector.[8]

Data for domestic margins in the United States are from the U.S. Department of Commerce (1984) and are for 1977. The domestic margins are measured as a proportion of the producer's price. Because there are no data on domestic margins for foreign exports to the United States, we assume their ad valorem rates are the same as those for U.S. exports. This procedure is not as arbitrary as it may first appear. Wholesale costs, which account for the bulk of the domestic margins, are determined largely by the characteristics of the good and, owing to factors such as inventory storage costs, they tend to vary with the good's price. Also, variations in freight factors caused by differences in value per unit of weight tend to be much more important than those caused by differences in routes or distances.[9] Therefore, the ad valorem rates of the domestic margins on foreign exports to the United States should be similar in size to those for U.S. exports and follow the same pattern among industries.

We use the standard assumption that the domestic margins on U.S. imports are the same as those on the competing domestic shipments. Thus, the barriers against U.S. imports that are imposed by domestic margins are assumed to be equal to the domestic margins on U.S. exports. This assumption understates the true barriers in cases where the domestic margins on imports exceed those on the competing domestic output.

Corden's (1966) formula is used to calculate the effective rates of protection. The formula is well known, so for brevity we present only the version for the total effective rate of protection for tariffs, international transport costs and domestic margins combined.[10] The combined effective rate of protection for good j (ERP_j) is

7 Of the eighty-one sectors in this input-output table, only sixty-one contain traded goods. Sector 50 (miscellaneous machinery and equipment, except electrical) contains exports but no imports.

8 This weighting procedure tends to understate the nominal protection afforded by the various barriers, because high barriers discourage imports and so receive smaller weights. There is no clearly superior method, however, that can be applied to obtain comparable averages for all of the barriers.

9 Waters (1970) points this out. See also the evidence in Karreman (1961) and Moneta (1959).

10 Shortcomings of effective rate of protection calculations are also well known. Ramaswami and Srinivasan (1971), Bhagwati and Srinivasan (1973), and Jones and Neary (1984) (to name a few) provide good theoretical critiques of the concept.

$$\text{ERP}_j = \frac{(m_j + f_j + t_j) - \sum_{i=1}^{n} a_{ij}(m_i + f_i + t_i)}{1 - \sum_{i=1}^{n} a_{ij}},$$

where the subscript j refers to a final good, the subscript i refers to an intermediate input to production, m denotes the domestic margins, f denotes the international freight factor, t denotes the ad valorem tariff rate, and a_{ij} is the dollar amount of i that would be required to produce one dollar of j if all three trade barriers were absent. The effective rate of protection for a single barrier is obtained by deleting the terms for the other two barriers from the formula.

To apply the formula, the barriers m, f, and t each must be expressed as a proportion of the import price that would occur if all three barriers were absent. In our model this import price is the foreign producer's price, which is assumed to be less than the customs price by the proportion of the domestic margins on U.S. exports of the good. Hence, t and f exceed the tariff rate and freight factor expressed as proportions of the customs price.[11] As noted above, the ad valorem rates of the domestic margins on the foreign exports are assumed to be the same as those on U.S. exports.

Corden's formula does not allow substitution between inputs and primary factors of production, and it tends to overstate the protective effects of the barriers if substitution occurs (see Corden 1966; Anderson and Naya 1969). The overstatement applies to all of the barriers, however, and it does not necessarily distort the pattern of protection or the size of one barrier relative to another. Nevertheless, to investigate the importance of the bias, a second set of calculations was performed in which the substitution elasticities were assumed to be unitary.

For the case of fixed physical input coefficients, the value coefficients observed in the presence of the barriers must be altered to account for the price changes caused by the barriers. Specifically, the value coefficients that would occur absent the barriers are calculated as $a_{ij} = a'_{ij}(1 + m_j + f_j + t_j)/(1 + m_i + f_i + t_i)$, where a'_{ij} denotes the observed value coefficient in the presence of the barriers.[12] For the case of unitary substitution elasticities, the value coefficients are fixed, so $a_{ij} = a'_{ij}$ and the formula is applied using the observed coefficients.

11 The proportions t and f are calculated as follows. Let PC denote the customs price and PF denote the barrier-free price for a product. Also, let T and F denote the tariff rate and international freight factor expressed as proportions of the customs price. Then, according to the assumptions of our model, PC = (1 + m)PF. By definition, tPF = TPC and fPF = FPC. Hence, $t = T(1 + m)$ and $f = F(1 + m)$.

12 Waters (1970), Finger and Yeats (1976), and Clark (1980, 1981a, b) performed similar calculations for models that included tariffs and international transport costs. The same adjustment to the coefficients is made when the effective rate of protection for a single type of barrier is calculated, because the effect of each barrier is measured assuming the other barriers are absent. The observed value coefficients are taken from the U.S. input-output table constructed by the Commerce Department for 1985.

Four commodity groups, formed according to the scheme used by Balassa (1965), are used to measure protection by stage of fabrication. The commodity groups are consumer goods, investment goods, and two types of intermediate products: semi-manufactures whose main inputs are natural raw materials (denoted intermediate products I) and all other intermediate goods at higher levels of fabrication (denoted intermediate products II).

IV. RESULTS

Table 1 presents the nominal rates of protection afforded by the various barriers and the effective rates of protection when physical input coefficients are assumed to be fixed. Nominal and effective rates of protection are given for each of the individual trade barriers and for the total for all the barriers combined. We find that the protection afforded by domestic margins (whether measured as the nominal or effective rate) exceeds that afforded by tariffs and transportation costs combined for half of the sixty input-output sectors and for the overall average of all sectors. The barriers imposed by tariffs and international transportation costs combined averaged 7.2 per cent both for the nominal rates and for the effective rates. In contrast, the domestic margins averaged 12.7 per cent for the nominal rates and 14.2 per cent for the effective rates. The total barriers averaged 21.8 per cent for the nominal rates and 23.4 per cent for the effective rates.

As explained in section III, the nominal rates for tariffs and international freight factors shown in table 1 are expressed as percentages of base import prices that are lower than the customs prices. Hence, these nominal rates are not directly comparable with those in the earlier studies (Waters 1970; Finger and Yeats 1976; Clark 1981a). Nevertheless, the results indicate that the total barriers are much greater than previously recognized, and they should greatly reduce expectations for the ability of trade to equalize prices of goods and rewards to factors of production among countries.

As was the case in the earlier studies, we find that the average rates of protection from international transportation costs still exceed those for tariffs. Unlike the results of the earlier studies, however, we find that in most of the individual sectors the effective rate of protection from tariffs or international transport costs has become less than the nominal rate. We also find that the average effective rate has moved closer to the average nominal rate for both barriers.

Table 2 shows how the various trade barriers are correlated across sectors. In general, the nominal rates of protection are good predictors of the effective rates. The lowest correlation coefficient between the nominal rate and the corresponding effective rate is 0.968 (for domestic wholesale margins). Because domestic margins make up such a large part of the total protection afforded by all three barriers, it is surprising that they are not as highly correlated with total protection as are the domestic transport costs for exports that make up only a small part of the total. Tariffs are negatively correlated with the total.

Table 3 summarizes the results for measuring protection from the various barriers by stage of fabrication. As in the study by Waters (1970), the protection from tariffs

TABLE 1
United States nominal and effective rates of protection from tariffs, international transport costs, domestic transport costs, and wholesaling costs (all figures in per cents)

BEA sector and description	Nominal protection					Effective protection				
	Tariff	International freight	Domestic freight	Wholesale	Total	Tariff	International freight	Domestic freight	Wholesale	Total
01 Livestock and livestock products	1.4	2.3	1.5	7.5	12.8	−0.1	−3.9	−1.6	4.5	−1.2
02 Other agricultural products	2.9	13.1	8.1	14.2	38.4	2.8	15.0	9.1	15.8	42.7
03 Forestry and fishery products	0.4	7.1	0.0	27.6	35.0	−0.7	7.2	−0.9	33.7	39.3
05 Iron and ferroalloy ores mining	0.2	17.0	4.0	2.5	23.7	−0.6	19.5	3.7	0.3	23.0
06 Nonferrous metal ores mining	0.0	12.6	3.4	2.5	18.5	−1.3	14.4	3.3	−0.3	16.1
07 Coal mining	0.0	25.6	24.0	5.7	55.3	−1.1	31.5	30.5	3.7	64.6
08 Crude petroleum and natural gas	0.5	5.1	3.5	0.0	9.0	0.4	5.0	3.5	−0.3	8.7
09 Stone and clay mining and quarrying	0.2	23.2	97.8	3.3	124.5	−0.9	29.7	133.6	0.1	162.5
10 Chemical and fertilizer mineral mining	0.6	21.8	71.1	4.4	97.8	−0.1	25.5	87.3	3.0	115.8
13 Ordnance and accessories	2.3	2.3	1.3	2.7	8.6	2.2	2.0	1.4	0.7	6.3
14 Food and kindred products	4.8	9.9	3.5	8.7	26.9	7.7	14.8	4.1	8.7	35.4
15 Tobacco manufactures	7.2	3.6	0.5	3.4	14.7	8.2	1.9	−1.0	1.2	10.3
16 Broad and narrow fabrics, yarn and thread mills	11.9	6.2	0.9	6.4	25.3	16.2	5.8	−1.6	6.9	27.3
17 Miscellaneous textile goods and floor coverings	7.9	9.4	1.8	9.6	28.7	8.1	14.1	−0.1	15.8	37.8
18 Apparel	20.0	7.6	0.5	5.6	33.8	27.2	8.6	−0.1	4.3	39.9
19 Miscellaneous fabricated textile products	8.6	8.4	0.6	7.2	24.8	7.1	10.0	−0.1	7.4	24.4
20 Lumber and wood products, except containers	1.9	7.3	5.9	10.6	25.7	1.6	7.3	7.4	7.6	23.9
21 Wood containers	2.3	7.4	0.0	0.0	9.7	2.3	7.4	−3.2	−6.1	0.4
22 Household furniture	3.6	8.0	2.0	5.9	19.5	2.5	8.6	1.1	3.1	15.4
23 Other furniture and fixtures	3.1	10.0	1.1	13.2	27.4	2.5	11.3	0.0	15.0	28.9
24 Paper and allied products, except containers	0.6	3.8	6.4	8.8	19.6	−0.7	2.3	6.9	8.9	17.4
25 Paperboard containers and boxes	2.8	7.9	1.7	6.2	18.6	4.1	11.1	−2.0	4.0	17.2
26 Printing and publishing	0.5	5.8	1.4	8.8	16.6	0.2	6.2	0.3	8.7	15.5
27 Chemicals and selected chemical products	5.6	6.5	5.5	8.1	25.8	6.8	6.1	4.3	8.8	26.0
28 Plastics and synthetic materials	6.2	5.9	4.5	2.9	19.5	7.7	5.1	3.9	−2.2	14.4
29 Drugs, cleaning and toilet preparations	5.2	3.0	1.4	16.7	26.3	5.4	1.8	0.6	19.4	27.2
30 Paints and allied products	5.9	6.9	4.9	16.0	33.9	7.5	7.2	5.1	25.9	45.6

TABLE 1 (*continued*)

BEA sector and description	Nominal protection					Effective protection				
	Tariff	International freight	Domestic freight	Wholesale	Total	Tariff	International freight	Domestic freight	Wholesale	Total
31 Petroleum refining and related industries	1.1	8.4	5.3	6.3	21.1	2.0	17.5	9.9	22.6	52.1
32 Rubber and miscellaneous plastics products	6.4	7.8	2.0	8.9	25.0	6.9	8.8	0.4	11.3	27.3
33 Leather tanning and finishing	3.3	3.8	0.6	1.8	9.5	2.5	1.2	−1.1	−1.8	0.8
34 Footwear and other leather products	10.4	6.8	2.1	10.4	29.8	15.3	8.0	2.6	14.7	40.5
35 Glass and glass products	7.7	7.5	2.8	8.2	26.2	8.7	7.3	1.1	8.2	25.3
36 Stone and clay products	6.4	12.9	5.0	11.6	35.8	7.2	13.6	1.2	12.4	34.4
37 Primary iron and steel manufacturing	4.8	8.7	3.4	6.5	23.4	5.5	7.8	2.2	6.3	21.7
38 Primary nonferrous metals manufacturing	1.1	2.1	1.3	5.4	9.8	0.5	0.7	0.7	5.0	6.9
39 Metal containers	0.8	5.3	1.3	2.5	9.9	−1.0	4.7	0.3	−0.6	3.4
40 Heating, plumbing, and fabricated metal products	4.3	6.0	0.9	8.4	19.7	4.7	5.8	−0.2	8.9	19.3
41 Screw machine products and stampings	3.4	7.6	0.7	2.5	14.2	3.0	7.8	−0.4	0.0	10.4
42 Other fabricated metal products	4.3	6.7	2.8	21.1	34.8	4.4	6.7	2.8	28.0	41.9
43 Engines and turbines	1.8	2.6	0.8	7.9	13.1	1.1	1.2	0.3	7.5	10.1
44 Farm and garden machinery	0.4	5.3	1.5	35.2	42.3	−1.9	5.2	1.2	53.9	58.4
45 Construction and mining machinery	2.7	6.0	2.1	26.1	36.9	2.0	5.9	2.1	35.4	45.3
46 Materials handling machinery and equipment	1.0	6.5	1.6	23.7	32.8	−1.0	6.7	1.4	33.5	40.7
47 Metalworking machinery and equipment	4.5	4.1	0.6	13.6	22.8	4.6	3.4	0.2	14.8	23.0
48 Special industry machinery and equipment	3.4	4.1	1.1	16.1	24.7	3.1	3.5	0.7	18.6	25.9
49 General industrial machinery equipment	4.1	4.4	0.7	11.5	20.7	4.2	3.6	0.1	12.7	20.6
51 Office, computing, and accounting machines	2.2	3.3	0.5	8.1	14.1	1.6	2.7	0.2	7.0	11.5
52 Service industry machines	2.7	4.3	0.7	21.1	28.8	2.1	3.4	−0.2	30.0	35.3
53 Electric industrial equipment and apparatus	3.3	3.9	0.6	9.9	17.8	3.4	3.5	0.2	10.3	17.3
54 Household appliances	3.3	5.4	2.3	14.3	25.2	2.5	4.8	2.5	17.8	27.5
55 Electric lighting and wiring equipment	4.2	5.5	0.7	17.6	27.9	4.2	5.2	−0.1	22.0	31.4
56 Radio, TV, and communication equipment	4.6	2.4	0.3	5.6	12.9	5.6	1.4	−0.1	2.3	9.2
57 Electronic components and accessories	2.5	2.5	0.5	11.8	17.2	1.5	0.5	−0.5	13.3	14.8
58 Miscellaneous electrical machinery and supplies	4.6	3.1	1.2	24.3	33.2	5.3	2.1	0.7	32.6	40.8
59 Motor vehicles and equipment	2.0	2.9	4.0	8.3	17.2	0.3	0.4	5.5	7.8	14.0

TABLE 1 (*concluded*)

BEA sector and description	Nominal protection					Effective protection				
	Tariff	International freight	Domestic freight	Wholesale	Total	Tariff	International freight	Domestic freight	Wholesale	Total
60 Aircraft and parts	0.1	0.8	0.6	7.5	9.0	−0.8	−0.1	0.5	7.2	6.9
61 Other transportation equipment	4.6	5.8	1.7	3.0	15.1	5.2	5.6	1.3	−1.1	11.1
62 Scientific and controlling instruments	3.7	3.0	0.3	17.9	24.8	3.5	1.8	−0.4	21.3	26.2
63 Optical, ophthalmic, and photographic equipment	4.9	3.2	0.3	12.3	20.7	5.3	2.1	−0.9	13.8	20.3
64 Miscellaneous manufacturing	4.6	5.7	2.7	23.1	36.1	4.7	5.6	2.5	29.9	42.6
Import weighted average	4.0	5.2	3.0	9.7	21.8	4.2	5.0	3.2	11.0	23.4

NOTES

Each barrier is expressed as a percentage of the price that would occur if all the barriers were absent.

TABLE 2
Correlation between various rates of protection

	Nominal						
	Internat. freight	Tariff and internat. freight	Domestic freight	Wholesale	Total domestic margin	Total	Corresp. effect. rate
Nominal tariff	−0.121 0.356	0.495 *	−0.223 0.087	−0.057 0.665	−0.244 0.060	−0.058 0.659	0.983 *
Nominal international freight		0.802 *	0.706 *	−0.207 0.113	0.589 *	0.742 *	0.972 *
Nominal tariff and freight			0.484 *	−0.215 0.099	0.369 0.004	0.614 *	0.966 *
Nominal domestic freight				0.183 0.162	0.887 *	0.898 *	0.997 *
Nominal wholesale margins					0.293 0.023	0.184 0.160	0.968 *
Nominal domestic freight and wholesale						0.960 *	0.984 *
Nominal total							0.978 *
	Effective						
Effective tariff	−0.064 0.628	0.540 *	−0.207 0.112	−0.078 0.555	−0.236 0.069	−0.032 0.806	
Effective international freight		0.806 *	0.666 *	−0.141 0.284	0.550 *	0.722 *	
Effective tariff and international freight			0.439 0.001	−0.165 0.209	0.324 0.012	0.590 *	
Effective domestic freight				−0.164 0.212	0.851 *	0.864 *	
Effective wholesale margin					0.379 0.003	0.272 0.036	
Effective domestic freight and wholesale						0.955 *	

NOTES
The top number in each element is the correlation coefficient and the bottom number is the probability that the coefficient is not significantly different from zero. A star (*) denotes a probability of less than 0.0005.

and international transport costs combined shows no clear pattern of escalation or de-escalation. Tariffs by themselves tend to increase with the stage of fabrication, but international transportation costs tend to decline. The domestic margins also show no consistent pattern. The nominal rate of protection from all the barriers combined shows no clear pattern, but the effective rate of protection from the combined barriers shows a pattern of de-escalation, as intermediate inputs have higher rates than consumer goods or investment goods.

TABLE 3
United States nominal and effective rates of protection from tariffs, international transport costs, domestic transport costs, and wholesaling costs by stage of fabrication (all figures in per cents)

Commodity group	Tariff	Internat. freight	Dom. freight	Wholesale	Total
	Nominal protection				
Intermediate Goods I	1.8	7.2	6.0	7.0	20.9
Intermediate Goods II	4.4	5.8	2.2	12.6	24.9
Investment Goods	2.8	4.2	0.9	13.2	21.2
Consumption Goods	5.3	4.3	2.3	9.0	20.9
	Effective protection				
Intermediate Goods I	1.9	8.5	6.9	9.5	26.7
Intermediate Goods II	4.8	5.3	1.4	15.2	26.7
Investment Goods	2.4	3.8	0.5	15.4	22.0
Consumption Goods	5.9	3.4	2.7	9.0	21.0

The results for the ERP calculations based on the assumption of unitary elasticity of substitution between inputs and factors of production were little different from those based on the assumption of fixed physical coefficients. The overall levels of the barriers were virtually identical for the two cases. Also, the correlation coefficient between the ERPS calculated for the two cases exceeded 0.996 for every barrier and for the sum of all the barriers.

V. SUMMARY AND CONCLUSIONS

We find that costs of within-country services in transportation, wholesaling, and retailing (domestic margins) impose substantial barriers to international trade. Specifically, we estimate that they impose barriers against U.S. imports that are on average greater than those imposed by tariffs and international transport costs combined. However, the domestic margins do not appear to alter much the pattern of protection by stage of fabrication from that afforded by the other barriers.

As a consequence of shortcomings in the data, the estimates of the individual

industry trade barriers imposed by domestic margins are tenuous. It was necessary to use domestic margins on U.S. exports as proxies for the margins on foreign exports to the United States and to assume that margins on U.S. imports of a good are the same as those on the competing domestic good. Despite the data shortcomings, however, our calculations demonstrate that domestic margins probably impose important trade barriers and that, by ignoring them, the previous studies are likely to understate seriously the size of the natural and total levels of protection that domestic producers enjoy against competition from imports. Better data on domestic margins for traded goods are needed to help economists explain observed differences among countries in prices of traded goods and in rewards to factors of production.

REFERENCES

Anderson, James, and Naya Seiji (1969) 'Substitution and two concepts of effective rate of protection.' *American Economic Review* 59, 607–12

Balassa, Bela (1965) 'Tariff protection in industrial countries: an evaluation.' *Journal of Political Economy* 63, 573–94

Baldwin, Robert E. (1970) *Nontariff Distortions of International Trade* (Washington, DC: Brookings)

— (1971) 'Determinants of the commodity structure of U.S. trade.' *American Economic Review* 61, 126–46

Bhagwati, J.N., and T.N. Srinivasan (1973) 'The general equilibrium theory of effective protection and resource allocation.' *Journal of International Economics* 3, 259–82

Clark, Don P. (1980) 'The Protection of unskilled labor in the United States manufacturing industries: Further evidence,' *Journal of Political Economy* 88, 1249–54

— (1981a) 'Protection by international transport charges: analysis by stage of fabrication.' *Journal of Development Economics* 8, 339–45

— (1981b) 'On the relative importance of international transport charges as a barrier to trade.' *Quarterly Review of Economics and Business* 21, 127–35

Corden, W.M. (1966) 'The structure of a tariff system and the effective protective rate.' *Journal of Political Economy* 74, 221–37

Finger, J.M., and A.J. Yeats (1976) 'Effective protection by transportation costs and tariffs: a comparison of magnitudes.' *Quarterly Journal of Economics* 90, 169–76

International Ladies Garment Workers' Union et al. (1988) 'Import penetration in the apparel industry: a technical study.' Study prepared for the Fiber, Fabric and Apparel Coalition for Trade, September

Jondrow, James M., David E. Chase, and Christopher L. Gamble (1982) 'The differential between domestic and imported steel.' *Journal of Business* 55, 383–99

Jones, R.W., and J.P. Neary (1984) 'The positive theory of international trade.' In *Handbook of International Economics*, vol. 1, ed. R. Jones and P. Kenen (Amsterdam: North-Holland)

Karreman, H.F. (1961) 'Methods for improving world transportation accounts, applied to 1950–1953.' New York National Bureau of Economic Research Technical Paper 13

Leontief, Wassily (1954) 'Domestic production and foreign trade, the American capital position re-examined.' *Economia Internazionale* 7, 3–32

Melvin, James R. (1985) 'The regional economic consequences of tariffs and domestic transportation costs.' This JOURNAL 18, 237–57

Moneta, Carmellah (1959) 'The estimation of transportation costs in international trade.' *Journal of Political Economy* 67, 41–58

Ramaswami, V.K., and T.N. Srinivasan (1971) 'Tariff structure and resource allocation in the presence of substitution.' In *Trade, Balance of Payments and Growth*, ed. J. Bhagwati et al. (Amsterdam: North-Holland)

U.N. Industrial Development Organization (1985) *Input-Output Tables for Developing Countries* (New York: UNIDO)

U.S. Department of Commerce (1979) 'Dollar-value tables for the 1972 input-output study.' *Survey of Current Business* 59, 51–72

— (1984) 'The input-output structure of the U.S. Economy, 1977.' *Survey of Current Business* 64, 42–84

Waters, W.G. (1970) 'Transportation costs, tariffs, and the pattern of industrial protection.' *American Economic Review* 60, 1013–20