The Determinants of Tariff and Nontariff Trade Restrictions in the United States

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This paper develops and tests a simple model for the determination of tariff and nontariff barriers to trade across industries within the United States, using 1970 trade data. We find that nontariff trade restrictions have supplemented tariff protection in the United States. Both tariff and nontariff trade restrictions are biased toward industries in which the United States has an apparent comparative disadvantage in world trade and away from industries in which consumer welfare losses from protection would be great. We also find substantial evidence that tariff and nontariff trade restrictions predominate in industries with very different market characteristics.

The purpose of this study is to synthesize a number of ideas expressed in earlier work into a simple analytical framework to explain the structure of tariff and nontariff barriers to trade across industries in the United States. Our central premise is that, subject to political constraints, trade restrictions are consistent with profit maximization across industries. Using International Trade Commission data for tariff and nontariff trade restrictions and industry characteristics for 225 U.S. manufacturing industries in 1970, we find that such an approach has significant explanatory power.

The resulting empirical analysis is unique in a number of important respects. First, we provide separate reduced form estimates of tariff

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and nontariff trade restrictions in the United States. Second, by extending our analysis to include the estimation of a simultaneous model for the determination of tariff and nontariff trade restrictions, we provide empirical support for our hypothesis that nontariff trade restrictions have been utilized in part to compensate for internationally agreed-upon tariff reductions in the post–World War II period.

The third important finding is that, while tariff and nontariff trade restrictions co-exist in industries with some common characteristics, there are some distinct differences in industry characteristics that are more strongly associated with one rather than the other alternative form of protection. Specifically, we find that both tariff and nontariff trade restrictions are biased toward industries in which the United States is at a comparative disadvantage in world trade, and away from industries in which losses in consumer welfare from protection would be particularly large. But there are some real differences too. Tariffs are biased toward industries which are low-skill intensive, away from industries that are capital intensive, and unrelated to product heterogeneity, the concentration of production, and the geographical dispersion of domestic production facilities. In contrast, nontariff trade restrictions are concentrated in industries producing fairly homogeneous products using relatively capital-intensive techniques of production that, at the same time, are not intensive users of low-skilled labor. In addition, nontariff trade restrictions are found predominantly in industries in which production is less concentrated and in which production facilities are distributed across regions of the United States in a fashion consistent with the distribution of population and, therefore, voting power in Congress.

I. The Political Economy of Trade Restrictions

The general approach of this paper is that the structure of tariff and/or nontariff trade restrictions across industries is consistent with the simple joint maximization of industry profits subject to political constraints. In effect, we assume that individual industry characteristics influence the profitability of trade restrictions and that political factors similar to those discussed by Cheh (1974, 1976), Pincus (1975), Baldwin (1976*a*), Caves (1976), Caves and Jones (1977), Helleiner (1977), Stone (1978), and others are critical in determining which industries are most successful in obtaining restrictions on imports of competitive products.

The primary information to emerge from a simple analysis of the relationship between industry rents and protection is that the profitability of trade restrictions should normally be negatively related to the absolute value of the own price elasticity of demand for the product and positively related to the foreign elasticity of supply of the product.[1] In effect, the more responsive consumers are to price increases induced by trade restrictions and the less responsive foreign suppliers are to changes in the international price of the good, the less profitable any given level of protection will be.

Furthermore, a discussion of the profitability of protection assumes that imports represent a reasonable threat to sales in the United States by domestic producers. If concern for industry profits is important in explaining the structure of trade restrictions, we would expect trade barriers to be biased away from industries in which the United States has a comparative advantage in international trade because imports in such industries would be expected to be inconsequential and restricting them would provide little benefit.[2] We included a number of variables that previous studies have indicated are associated with U.S. comparative advantage or disadvantage in trade with the simple expectation that trade restrictions should be found predominantly in product lines in which the United States is at a comparative disadvantage vis-à-vis the rest of the world.

Obviously, if there are positive terms of trade effects associated with protection sufficient to offset the deadweight consumption and production costs created by trade barriers, the government can generally increase aggregate social welfare and support for itself by restricting trade. But substantial terms of trade effects are not likely to exist for more than a handful of industries at present levels of protection. In general, increased protection would be expected to promote industry profits at the expense of the general public. In a broad sense, profits should be thought of as the sum of rents to entrepreneurs and to workers with firm- or industry-specific human capital and/or a strong union. The costs to the general public include artificially high product

[1] Assuming that protection is less than prohibitive, that foreign supply depends only on the foreign price, and that the domestic market clearing price, P_D, is positively related to the degree of trade protection given, we can generate the following relationship between industry profits, Π, and trade restrictions:

$$\frac{\partial \Pi}{\partial \tau} = \left\{S_D + \left(\frac{MC_D}{P_D} - 1\right)\left[D\eta + S_F\epsilon_F\left(1 - P_F\frac{\partial \tau}{\partial P_D}\right)\right]\right\}\frac{\partial P_D}{\partial \tau}$$

where S_D represents domestic supply, MC_D is the domestic marginal cost of production, D is aggregate domestic demand, η = the absolute value of the own price elasticity of demand for the product, S_F, ϵ_F, and P_F represent the foreign supply, foreign supply elasticity, and foreign price of the product, respectively, and τ represents the tariff or tariff equivalent rate. Details for this derivation are available upon request from the author.

[2] There is, of course, the interesting possibility that the United States has a comparative advantage in some product and that trade restrictions are used to price discriminate between the domestic and foreign market to maximize monopoly rents. That such a phenomenon could be systematic and significant across the 225 manufacturing industries we have data for is doubtful.

prices, misallocation of productive resources, and waste in terms of administrative costs of implementing and maintaining protectionist programs.

In order to rationalize the existence of trade restrictions for numerous commodities in the United States, we assume that, up to some limiting degree of trade restraint, industry interest groups are more responsive to trade policy than consumers are.[3] One simple explanation of such an asymmetry in response to trade policy by industry interests and by consumers stems from the fact that information about market conditions is costly and imperfect and must be updated as market conditions change. To the extent that producers are less numerous than consumers and their well being (wealth) is more directly affected than the wealth of individual consumers by trade policy, they will invest more resources in keeping informed about and be more sensitive to trade policy changes affecting their industry. Clearly, the reverse could be true for industries in which buyers are more concentrated than sellers and the wealth effects are greater per consumer than they are per producer. But such cases are exceptional. This asymmetry in responsiveness does not imply that seller concentration need be positively related to protection. In fact, in his study of the structure of tariffs in Canada, Caves (1976) suggested that concentration could be negatively related to protection. Presumably, the argument would be that the spoils of protection will buy more votes the more widely they are dispersed. In each industry there may exist some critical value of seller concentration relative to buyer concentration, determined by the cost of market information which is required for the industry to obtain protection. And among protected industries there may be a negative association between protection and concentration, CONR. In short, the impact of seller concentration on the existence and extent of trade restrictions is ambiguous.

So far we have argued that producers and workers in an industry have a greater economic incentive on average than consumers in general do to acquire costly information about the impact of trade restrictions on their prices, profits, and wages and in continuing to invest in such information gathering as market conditions change and old information decays or becomes less relevant. However, constant changes in trade restrictions could easily attract media attention and thereby provide consumers with relatively cheap and current infor-

[3] Apart from the observation that nonzero trade restrictions exist for industries that enjoy no obvious terms of trade effects, we provide no direct test of our assumption that industry interests are more responsive than consumer interests to changes in trade policy. However, the notion that industry interests are weighted more heavily than consumer interests in determining the structure of protection is consistent with earlier empirical work by Ray (1974), Baldwin (1976*b*), and Caves (1976).

mation regarding the impact that proposed changes in trade limitations would have on their welfare. Therefore, pressure to alter trade restrictions may follow a fairly discrete time path in order to permit industry interest groups to capitalize on the high cost and low quality of information available to consumers.[4] Maintaining a given quota in the presence of expanding demand or foreign supply would be comparable to imposing higher and higher explicit tariffs over time. Conversely, if demand for a product is declining and/or foreign supply is shrinking, a quota is comparable to a declining explicit tariff. Therefore, assuming some stickiness in policy changes, quotas or other nontariff trade restrictions would have some relative advantage in expanding markets while tariffs would be somewhat advantageous for protecting declining product markets.[5] In our empirical analysis we will attempt to test the relative explanatory power of dynamic demand, ΔD, and supply, ΔS, conditions in tariff and nontariff trade restriction regressions.

Finally, simple demand and supply analysis can be used to demonstrate that the deadweight loss associated with a given trade restriction will be positively related to the absolute value of the own price elasticity of demand for the product, η, and positively related to the domestic elasticity of supply, ϵ_D. To the extent that the government is strongly concerned with the overall welfare effects of trade restrictions, tariff and nontariff trade barriers would be negatively related to the absolute value of the own price elasticity of demand for the product and negatively related to the domestic elasticity of supply for the product.

We can summarize the discussion to this point by indicating the tariff and nontariff trade barrier regressions to be estimated, with the expected sign of the coefficient specified below each variable:

$$\begin{array}{l} \tau = F(\eta, \epsilon_F, \epsilon_D, X_1, \ldots, X_n, \text{CONR}, \Delta\text{D}, \Delta\text{S}) \\ \qquad\quad -, \ ?, \ -, \ -, \ldots, \ -, \quad ?, \quad +, \ + \end{array} \tag{1}$$

and

$$\begin{array}{l} N = G(\eta, \epsilon_F, \epsilon_D, X_1, \ldots, X_n, \text{CONR}, \Delta\text{D}, \Delta\text{S}, \tau) \\ \qquad\quad -, \ ?, \ -, \ -, \ldots, \ -, \quad ?, \quad +, \ +, \ + \end{array} \tag{2}$$

where N represents a measure of nontariff trade restrictions, the ambiguous sign on the elasticity of foreign supply, ϵ_F, reflects the fact that the sign on the foreign supply elasticity would only be positive in

[4] Similar views regarding the relative merits of tariffs and quotas in the context of dynamic market changes have been expressed by Kreinin (1970), Fishelson and Flatters (1975), Caves and Jones (1977), and others.

[5] Cheh (1974) found some evidence that tariff cuts during the Kennedy Round were less vigorously applied to declining industries in the United States.

the noncompetitive case, ϵ_D represents the domestic supply elasticity, $X_1, \ldots, X_n$ are alternative measures of U.S. comparative advantage, CONR is a measure of seller concentration, and ΔD and ΔS represent the expected percentage growth in demand and supply at the time that trade restrictions are set (both are expected to be more positively significant in explaining nontariff than tariff protection).

In the empirical section we treat the implementation of tariff and nontariff trade barriers as a sequential process. Tariffs predate nontariff barriers in virtually every case, and nontariff trade restrictions are estimated as functions of both tariffs and of the political and economic factors we identify as important explanatory variables. Later we test for this sequential effect and find evidence that it does exist.

II. Empirical Results

The empirical results discussed in this section were generated from data made available by the U.S. International Trade Commission in 1975. More precise definitions of the variables used in the regressions are given in the Appendix. The observations consisted of 225 four-digit manufacturing industries in the United States in 1970 and are specified in a separate appendix available upon request.

Alternative forms for tariff regressions were estimated and are presented in table 1, while estimates of alternative specifications for nontariff trade barrier regressions are presented in tables 2 and 3. For regressions (1.1)–(1.3) in table 1, the dependent variable used was a weighted-average nominal tariff measure for each industry in 1970. In effect, the four-digit tariff rates were calculated by weighting the tariffs of less aggregated components by their import shares within the classification for the given four-digit industry. Regressions (1.4)–(1.6) differ from the earlier ones only in terms of the specification of the dependent variable. In regressions (1.4)–(1.6) the dependent variable is the four-digit industry nominal tariff rate calculated as the simple average of component nominal tariff rates.

The dependent variable in table 2 is an Index of the Incidence of Nontariff Barriers in the U.S., 1970, constructed by the U.S. Tariff Commission.[6] In effect, the index measures the comprehensiveness of

[6] The index was constructed by the U.S. Tariff Commission and is explained in *Trade Barriers*, Report to the Committee on Finance of the U.S. Senate, Part 2, pp. 160–72, Washington, D.C., April 1974. The quantitative restrictions included and the weighting scheme used were as follows: Bilateral Quota (0.91); Global Quota (1.96); Quota (unspecified) (1.36); Prohibited Imports (embargoes) (1.36); State Trading (0.91); Automatic Licensing (0.45); Liberal Licensing (0.45); Discretionary Licensing (0.91); Licensing (unspecified) (0.91); Minimum Price System (1.36); Seasonal Restriction (0.91); Restriction (unspecified) (0.91); Export Restraint (VERs) (1.36); Suspended

TABLE 1*

U.S. Tariff Regressions, 1970 (OLSQ)†

Independent Variables	Dependent Variables: U.S. Weighted-Average Tariffs: 1970			U.S. Simple Average Tariffs: 1970		
	(1.1)	(1.2)	(1.3)	(1.4)	(1.5)	(1.6)
Constant	17.96	16.22	9.94	18.62	17.09	14.95
	(14.15)	(9.74)	(4.32)	(14.14)	(9.76)	(6.05)
FTDNMOS	...	$-.6 \times 10^{-3}$	$.4 \times 10^{-3}$	...	$.3 \times 10^{-3}$	$.9 \times 10^{-3}$
		(.27)	(.21)		(.15)	(.39)
CONR4L	.01	.01	.02	.02	.02	.02
	(.74)	(.59)	(1.06)	(1.46)	(1.31)	(1.23)
SKILLD	−31.85	−30.96	−33.35	−31.46	−30.78	−32.37
	(9.26)	(8.84)	(10.00)	(8.82)	(8.36)	(9.04)
SEINRD	...	7.95	10.29	...	5.90	7.32
		(2.13)	(2.86)		(1.51)	(1.90)
ESCAL(67)	−6.69	−6.57	−4.57	−4.11	−4.06	−3.30
	(2.80)	(2.79)	(1.94)	(1.66)	(1.64)	(1.31)
LABINT	...	...	10.73	...	...	3.36
			(3.63)			(1.06)
KLRA	...	$-.3 \times 10^{-4}$	...	...	$-.2 \times 10^{-4}$	...
		(2.23)			(1.59)	
WDAVPD	.25	−.01	−.18	.14	−.05	−.07
	(.64)	(.04)	(.46)	(.34)	(.11)	(.17)
ΔIMP	.04	.02	$-.45 \times 10^{-2}$	.05	.03	.03
	(.47)	(.25)	(.06)	(.53)	(.39)	(.37)
ΔCON	−.70	−1.11	−.08	−.83	−1.10	−.74
	(.60)	(.96)	(.07)	(.69)	(.90)	(.59)
R^2	.33	.37	.39	.30	.32	.31
F-statistic‡	18.11	13.88	15.29	15.46	11.11	10.88

* Absolute values of *t*-statistics appear in parentheses. For samples of this size *t*-statistics greater than 1.65 are significant at the 5% level and *t*-statistics greater than 2.33 are significant at the 1% level. (For a two-tailed test the values of the *t*-statistic for significance at the 5% and 1% levels, respectively, are 1.96 and 2.576.)

† OLSQ = Ordinary Least Squares. The weighted-average tariff and simple average tariff regression results were not estimated using Tobit since only 5 of the 225 observations were at the limit value of zero for the weighted tariffs and only 1 observation was at the limit value for the simple tariffs.

‡ For $F(6,218)$ an *F*-statistic greater than 2.80 is in the upper 1% of the distribution. For $F(9,215)$ an *F*-statistic greater than 2.41 is in the upper 1% of the distribution.

TABLE 2

U.S. NONTARIFF TRADE RESTRICTIONS (Tobit)

Independent Variables	Dependent Variable: Index of the Incidence of Nontariff Barriers in the U.S.: 1970 (2.1)	(2.2)	(2.3)	(2.4)	(2.5)	(2.6)
Constant	1.91	.26	6.68	2.12	.38	6.16
	(1.02)	(.11)	(2.43)	(1.11)	(.16)	(2.13)
FTDNMOS	...	$.14 \times 10^{-2}$	$.1 \times 10^{-4}$	...	$.12 \times 10^{-2}$	$-.1 \times 10^{-4}$
		(.54)	(.38)		(.46)	(.03)
CONR4L	−.04	−.05	−.06	−.04	−.05	−.06
	(1.92)	(2.36)	(2.86)	(1.98)	(2.44)	(2.74)
SKILLD	−5.05	−6.78	−2.42	−6.26	−8.16	−6.04
	(1.13)	(1.49)	(.53)	(1.42)	(1.82)	(1.37)
SEINRD	...	4.99	2.14	...	5.95	4.06
		(1.08)	(.47)		(1.29)	(.89)
ESCAL(67)	2.44	2.78	.34	1.61	2.01	−.31
	(.88)	(1.00)	(.12)	(.59)	(.73)	(.11)
LABINT	...	...	−12.69	...	...	−10.05
			(3.76)			(3.07)
KLRA	...	$.1 \times 10^{-5}$	...	...	$.1 \times 10^{-5}$	...
		(2.14)			(2.02)	
WDAVPD	−3.93	−4.004	−3.75	−3.76	−3.87	−3.59
	(3.62)	(3.63)	(3.36)	(3.49)	(3.53)	(3.26)
ΔIMP	−.07	−.05	−.03	−.08	−.06	−.05
	(.75)	(.56)	(.34)	(.83)	(.64)	(.50)
ΔCON	1.40	1.34	.09	1.45	1.33	.24
	(1.01)	(.95)	(.07)	(1.04)	(.93)	(.17)
USWTTF	.20	.20	.26	...	...	...
	(2.97)	(2.99)	(3.72)			
USSMPTAR	...	...	...	.18	.18	.19
				(2.70)	(2.70)	(2.84)

NOTE.—158 of the 225 observations had the limit value of zero.

nontariff protection in an industry. Fifteen types of nontariff trade restrictions were considered and assigned weights reflecting their relative effectiveness in limiting imports. Then the extent of nontariff protection given to each industry was calculated as the percentage of actual to potential protection to be derived from all 15 nontariff

Import Restriction (0.91); Mixing Regulations (0.91). The weights on the right were determined by assigning each restriction a number from 1 to 3, high or low, depending on its degree of restrictiveness. The average of those numbers was divided into the assigned number for each restriction, resulting in the weights shown. Index values for industry categories were then obtained as follows: For any given commodity, the sum of its specific weights divided by the sum of weights for the 15 categories (11.35) expressed in percentage terms yielded the percentage of maximum nontariff restraint of trade given to that industry. Total imports of major trading countries were used as weights to aggregate the basic product category data. Such a weighting means that restrictions in a heavily traded category were counted more than restrictions in lightly (world) traded categories. In cases in which the listed restrictions were known to apply to only part of a given product category they were arbitrarily counted only half as much as restrictions known to be applicable to an entire category.

TABLE 3

U.S. NONTARIFF TRADE RESTRICTIONS (Probit)

INDEPENDENT VARIABLES	DEPENDENT VARIABLE: Dummy Variable for Nontariff Barriers in the U.S.: 1970 (3.1)	(3.2)	(3.3)	(3.4)	(3.5)	(3.6)
Constant	.20	−.26	2.35	.36	−.09	2.36
	(.41)	(.41)	(2.75)	(.72)	(.15)	(2.77)
FTDNMOS	...	$.3 \times 10^{-3}$	$.1 \times 10^{-2}$	...	$-.3 \times 10^{-3}$	$.1 \times 10^{-2}$
		(.34)	(1.20)		(.45)	(1.28)
CONR4L	−.01	−.01	−.02	$-.7 \times 10^{-2}$	−.01	−.02
	(1.38)	(2.36)	(3.10)	(1.46)	(2.41)	(2.96)
SKILLD	−1.79	−2.77	−1.47	−2.13	−3.14	−2.51
	(1.52)	(2.21)	(1.13)	(1.84)	(2.55)	(2.01)
SEINRD	...	2.68	1.86	...	2.84	2.22
		(2.21)	(1.46)		(2.37)	(1.80)
ESCAL(67)	−.82	−.59	−1.73	−.99	−.79	−1.82
	(1.09)	(.74)	(1.96)	(1.34)	(1.00)	(2.14)
LABINT	...	...	−4.79	...	...	−4.01
			(4.75)			(4.22)
KLRA	...	$.1 \times 10^{-4}$	...	...	$.1 \times 10^{-4}$	...
		(2.95)			(2.78)	
WDAVPD	−.41	−.47	−.40	−.39	−.46	−.38
	(2.53)	(2.78)	(2.22)	(2.39)	(2.68)	(2.16)
ΔIMP	−.27	−2.29	−.02	−.03	−.02	−.02
	(1.05)	(0.87)	(.60)	(1.07)	(.92)	(.69)
ΔCON	.52	.48	.04	.50	.44	.02
	(1.46)	(1.29)	(.11)	(1.41)	(1.19)	(.05)
USWTTF	.06	.06	.08	...	...	...
	(2.77)	(2.80)	(3.53)			
USSMPTAR	...	...	...	.05	.05	.05
				(2.49)	(2.51)	(2.77)
Pseudo R^2	.25	.31	.39	.24	.30	.35
Likelihood Ratio Test*	44.29	56.42	73.03	42.29	54.25	65.85

* For eqq. (3.1) and (3.4), a value above 18.50 for the likelihood ratio test is in the upper 1% of the distribution. For the remaining equations, a value above 23.2 for the likelihood ratio test is in the upper 1% of the distribution.

restrictions. Industries with high percentage index values are then viewed as having received more comprehensive nontariff protection than industries with low percentage index values. The dependent variable in table 3 is simply a dummy variable which equals 1 if the index for nontariff barriers is positive and zero otherwise. In every other respect the equations estimated in tables 2 and 3 are the same.

There are three different specifications for each of the tariff relationships and six different specifications for each of the nontariff relationships because we have taken an eclectic approach to the empirical explanation of U.S. comparative advantage. Within each subset of equations the alternative regressions differ only in their specification of the $X_1, \ldots, X_n$ variables alluded to in Section I and in the specification of the tariff variable in the nontariff trade restriction regressions. The various specifications of variables explaining U.S. comparative advantage are derivative from previous empirical works, including Stern (1964), Hufbauer (1970), Baldwin (1971), Caves (1976), Cheh (1976), and Stone (1978). The tariff regressions were estimated using ordinary least squares. Since only 67 of the 225 industries had nonzero, nontariff trade restrictions, the nontariff trade barrier index equations and the nontariff trade barrier dummy equations were estimated using Tobit and Probit estimating techniques, respectively.

International trade agreements and the decline in the importance of tariffs as a source of federal revenues have tended to induce the substitution of nontariff trade restrictions for tariffs in protected industries. The positive significant coefficient on the tariff variable in each of the nontariff trade restriction dummy equations indicates that nontariff trade restrictions are concentrated in industries with high nominal tariffs. Whether those nontariff trade restrictions were induced by tariff ceilings in highly protected industries, or not, is not clear. What is clear is that industries with the economic need and political clout to obtain high rates of tariff protection are also successful in obtaining nontariff trade restrictions. The use of nontariff barriers to trade in the United States apparently results in a greater variation in trade restraint across industries than one would suspect from looking at nominal tariff rates alone.

The positive and significant coefficient on the tariff variable in each of the nontariff trade restriction equations in table 2 indicates that high tariffs and high rates of nontariff trade restrictions go hand in hand. In effect, nominal tariffs alone both understate the extent of variation in protection across industries and systematically understate the extent to which high tariff industries are being protected.

To the extent that tariffs have been limited by domestic and international political considerations as well as industry preferences for nontariff trade restrictions, we would expect the economic and political factors described in Section I to maintain significant explanatory power in the nontariff trade barrier regressions. The empirical results discussed below are consistent with that expectation.

Hufbauer (1970), Baldwin (1971), and others have found that significant correlations exist between the ability of the United States to export products and the skill intensity, research and development intensity, and labor intensity of production. Our objective is not to replicate previous work but, rather, to introduce variables that have been employed as proxies for U.S. comparative advantage in previous work as control variables that should enter the tariff and nontariff trade restriction equations with negative and significant coefficients. Confirmation of that expectation would be consistent with our hypothesis that protection is provided partly in response to industry pressure to reduce competition from foreign suppliers in the domestic market.

The measures used as controls for comparative advantage include the first trading date, FTDNMOS; the percentage of scientists and engineers in research and development, SEINRD; and the percentage of skilled workers in the workforce, SKILLD.[7]

Focusing on the results in tables 1 and 3,[8] only the skill intensity measure has the expected negative and significant coefficient in the tariff and nontariff regressions. Numerous studies of trade flows have found that the United States imports relatively capital-intensive goods and goods which use low-skilled labor suggesting that protection would be biased toward industries with both characteristics. However, we find that tariffs are negatively related to the capital/labor ratio, KLRA, and positively related to labor intensity, LABINT, holding the skill coefficient constant, while nontariff trade restrictions are positively related to the capital/labor ratio and negatively related to the labor intensity of production.

One could speculate that, since recent additions to trade restrictions have been primarily in the form of nontariff barriers to trade, the negative coefficient on LABINT reflects an inability of nonunionized, low-skilled labor to obtain protection from imports while middle-skilled, unionized workers and producers in industries with heavy capital components have succeeded in obtaining nontariff trade restrictions. Then the reverse signs on those variables in the tariff regressions would have to be attributed to the upper bounds on tariff changes that have been imposed in the Post–World War II period. At best, that explanation is strained. In any event, our results indicate that there is additional important work to be done in this area.

As suggested in Section I, the impact of sellers' concentration on trade restrictions is ambiguous. In his study of the structure of tariffs in Canada, Caves (1976) found a negative and significant relationship between Canadian tariff rates and the four-firm concentration ratio. While the concentration ratio enters the tariff regressions with insignificant and positively signed coefficients, concentration enters the

[7] Two other variables not reported on here: The number of scientists and engineers in research and development relative to total employment (SKLPC) and the wage rate for production workers (WGPRMH) were both insignificant and often positively signed in all of the trade restriction equations.

[8] The index of nontariff barriers to trade is sufficiently subjective in nature and the results obtained in tables 2 and 3 are sufficiently similar that extended discussion of the results in table 2 would not be productive.

nontariff trade barriers regressions with a negative significant coefficient.

Caves speculated that a negative relationship between trade restrictions and seller concentration might reflect a bias by politicians to provide protection to industries with many producers in which the benefits would be widely dispersed. In order to test that hypothesis along with the hypothesis that protection has been sequential with nontariff trade restrictions supplementing predetermined tariffs, we ran the simple simultaneous model summarized in table 4. The results presented in table 4 are obtained from two-stage least-squares regression models. The two models differ only in terms of the designated measure for tariff rates. In the first model, we used the weighted-average tariff measure. In the second model, we used the simple average tariff measure. In both models we used the simple 0-1 dummy measure of nontariff barriers to trade. The results obtained in table 4 are qualitatively invariant with the choice of the subset of comparative advantage variables included. Therefore, for the sake of brevity, the estimators presented in table 4 are offered as representative. The principal findings are that tariffs do positively and significantly affect nontariff trade restrictions, while nontariff trade restrictions have no significant impact on tariff determination, supporting our sequential model, and that nontariff trade restrictions are negatively and significantly related to both seller concentration and the geographical concentration of production, GEOG.[9] The negative sign on GEOG means that nontariff trade restrictions are biased toward industries in which production is distributed across regions of the United States in a manner similar to the distribution of population and therefore toward industries with substantial representation in Congress.

We used a measure of scale economies in U.S. manufacturing in 1967, ESCAL(67), as a proxy for the domestic, ϵ_D, elasticity of supply.

[9] GEOG is measured as follows: index value =

$$\sum_{i=1}^{4}\left|\frac{VS_i}{\sum_{i=1}^{4} VS_i} - \frac{P_{OP_i}}{\sum_{i=1}^{4} P_{OP_i}}\right|,$$

where VS_i = value of shipments in region i, $i = 1, \ldots, 4$, and P_{OP_i} = population of region i, $i = 1, \ldots, 4$. To the extent that production in industry i is distributed across the north, south, central, and western United States in a fashion similar to the general population, the index value will approach zero. The basic data for the index are from the *Census of Manufactures* for 1967. The lack of concordance between TCSIC and SIC data means that 27 observations were lost and that table 4 was estimated using 198 rather than 225 observations. Apart from the fact that the inclusion of GEOG in the regression runs for tables 1–3 would have similarly reduced the sample size from 225 to 198, the negative significance of GEOG in the nontariff dummy equations in table 4 indicates that it should have been included in the earlier estimates as well.

TABLE 4*

SIMULTANEOUS ESTIMATES OF TARIFF AND NONTARIFF TRADE RESTRICTIONS IN THE U.S., 1970

	WEIGHTED-AVERAGE TARIFFS		SIMPLE AVERAGE TARIFFS	
	Dependent Variables			
	U.S. Weighted-Average Tariffs (4.1)	Dummy Variable for Nontariff Barriers (4.2)	U.S. Simple Average Tariffs (4.3)	Dummy Variable for Nontariff Barriers (4.4)
INDEPENDENT VARIABLES	OLSQ	Probit	OLSQ	Probit
Constant	9.69	−2.65	16.02	−7.22
	(2.76)	(1.34)	(4.08)	(2.08)
FTDNMOS	...	$-.18 \times 10^{-2}$	...	$-.23 \times 10^{-3}$
		(1.61)		(1.96)
CONR4L	.03	−.02	.03	−.02
	(1.97)	(2.81)	(1.41)	(2.91)
SKILLD	−23.52	10.80	−27.02	14.55
	(4.49)	(1.97)	(4.61)	(2.15)
SEINRD	...	−0.60	...	0.21
		(0.34)		(0.13)
ESCAL(67)	−4.24	...	−4.83	...
	(1.04)		(1.06)	
LABINT	10.19	−7.42	.79	−.35
	(2.14)	(4.02)	(.15)	(3.41)
KLRA	$-.2 \times 10^{-4}$	$.1 \times 10^{-4}$	$-.2 \times 10^{-4}$	$.13 \times 10^{-4}$
	(1.77)	(1.88)	(1.56)	(2.21)
WDAVPD	...	−.44	...	−.46
		(2.29)		(2.38)
ΔIMP	...	$-.9 \times 10^{-2}$	...	−.29
		(.33)		(1.01)
ΔCON	...	.55	...	.81
		(1.17)		(1.56)
PUSWTTF	...	.52	...	...
		(2.87)		
PUSSMPTAR†	...	...	...	.64
				(2.87)
PDUM2†	.82	...	.27	...
	(.94)		(.28)	
GEOG	1.10	−.92	1.73	−1.53
	(.94)	(2.00)	(1.32)	(2.55)
R^2	.33	...	.27	...
F-statistic	13.51	...	10.25	...
Pseudo-R^2	...	.31	...	.31
Likelihood ratio test	...	49.10	...	49.10

* In converting the geographical dispersion index from SIC to TCSIC codes, 27 of the 225 observations had to be deleted for missing data. Consequently, the models estimated in table 4 are based on 198 observations.

† PUSWTTF, PUSSMPTAR, and PDUM2 are the predicted values of USWTTF, USSMPTAR, and DUM2 on the instrumental variables from the first stage of the two-stage least-squares estimation procedures.

The discussion of Section I suggested that ESCAL(67) should be negatively and significantly related to tariff and nontariff trade restrictions if the government is strongly concerned about the overall welfare costs of protection. ESCAL(67) appears in all of the weighted tariff and nontariff trade barrier dummy regressions with the expected negative sign and generally significant coefficient. While the sign of ESCAL(67) is negative, it is less significant in the simple tariff regressions.

In Section I we indicated that we expected to find a negative and significant coefficient for the absolute value of the own price elasticity of demand for the product in the trade restriction equations. On the assumption that the own price elasticity of demand is reduced by product heterogeneity, we used a measure of product differentiation, WDAVPD, as an inverse measure of the absolute value of the own price elasticity of demand. Consequently, we expected to find a positive and significant coefficient on the product differentiation variable in the tariff and nontariff trade barrier regressions. The relative negative significance of WDAVPD in the nontariff trade barrier regressions compared with the tariff regressions may be partially related to another factor that we have not discussed. Clearly, nonprice, quantitative restrictions are more easily applied and enforced if products are fairly standardized. Consequently, the negative coefficient on product heterogeneity may partially reflect an administrative preference by the government for nonprice restrictions for homogeneous products.

Earlier we argued that while market conditions change continuously, it may still make sense for industry interest groups to push for changes in trade restrictions in discrete fashion. If so, we would expect tariffs to be relatively more productive in industries that are expected to contract and nontariff trade barriers to be relatively more productive in expanding industries. We used the percentage growth in apparent domestic consumption between 1965 and 1970, measured by the percentage growth in domestic shipments plus imports minus exports, as a proxy for demand shifts, ΔD, and the percentage growth in imports between 1965 and 1970 as a proxy for supply shifts, ΔS. Clearly, both the apparent domestic consumption variable and the import expansion variable reflect both demand and supply phenomena and in that sense are poor proxies for the effects of pure demand and supply shifts that we are trying to measure. With that caveat in mind, we simply report that neither of the variables included to measure dynamic influences has any significant explanatory power in the tariff or nontariff trade barrier regressions.

Unfortunately, we have no good measures of the industry-specific revenue effects associated with tariff and nontariff trade restrictions, or of the administrative costs of implementing alternative forms of trade restrictions across industries. Consequently, all of our estimates suffer from the potential biases associated with important left-out variables.

III. Conclusions

We presented evidence that both tariff and nontariff trade restrictions are found predominantly in industries in which the United States has no comparative advantage vis-à-vis the rest of the world and away from industries in which the deadweight losses to consumers from protection would be high. In addition, we presented direct evidence that nontariff trade restrictions have been used to supplement tariffs and, thereby, offset the trade-liberalizing effects of post–World War II tariff agreements.

We also presented evidence that there are significant differences in the industrial characteristics of industries with tariff protection compared with those with nontariff trade protection. Specifically, tariffs are positively and significantly related to labor intensity and negatively and significantly related to the capital/labor ratio while just the opposite is true for nontariff trade restrictions. In addition, nontariff trade restrictions are negatively and significantly related to both seller concentration and geographical concentration in an industry while both characteristics are positively and insignificantly related to tariffs.

Appendix

Definitions of Variables

Independent Variables

FTDNMOS—Product cycle proxy: unweighted average of Schedule B first trade dates corresponding to TCSIC as of January 1974.

CONR4L —Concentration Ratio, 1970: percentage of shipments accounted for by the four largest firms in the industry.

SKILLD —Skills measure, 1970: professional and kindred workers, plus managers and administrators (except farm), plus craftsmen and kindred workers, as a percentage of total employment. Based on three-digit SIC data with values repeated at four-digit levels.

SEINRD —Percentage of scientists and engineers in R & D in 1970. Based on two-digit SIC data with values repeated at the four-digit level.

ESCAL(67)—Economies of Scale measure, 1970: value of the exponent in the regression equation $V = KN^a$, where V is the ratio of value added in plants employing N persons to average values added for the industry, and K is a constant.

LABINT —Labor Intensity Ratio, 1970 (payroll divided by value added).
KLRA —Capital/Labor Ratio, 1970: Total capital stock divided by employment (thousands of dollars).
WDAVPD —Weighted Average of Product Differentiation measure, 1970: The measure is the coefficient of variation in the unit values of exports destined to different countries weighted by U.S. export shares, i.e., the standard deviation of U.S. export unit values weighted by export shares divided by means of unit values.
ΔIMP —Percentage change in imports between 1965 and 1970.
ΔCON —Percentage change in apparent U.S. consumption between 1965 and 1970, where apparent U.S. consumption is measured by the value of U.S. shipments plus imports minus exports.
GEOG —See n. 9.

Dependent Variables

Tariffs—USWTTF—U.S. weighted-average tariffs for 1970 and USSMPTAR—U.S. simple average tariffs for 1970 are taken from the GATT *Tariff Study*, Geneva, 1970.

Index of Nontariff Barriers—Index of the Incidence of Nontariff Barriers in the U.S., 1970: The index was constructed by the U.S. Tariff Commission and is explained in *Trade Barriers*, Report to the Committee on Finance of the U.S. Senate, Part 2, pp. 160–72, Washington, D.C., April 1974. See n. 6.

Dummy Variable for Nontariff Barriers in the U.S., 1970—DUM2—The value of the dummy variable was set equal to 1 if the index of nontariff barriers was nonzero for a particular product and zero otherwise.

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