Trade Substitution Elasticities for Analysis of a North American Free Trade Area

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Abstract. Elasticities of substitution between U.S. imports from Mexico, Canada, the rest of the world, and competing domestic production are estimated for 128 mining and manufacturing sectors, based on quarterly data for 1980-88. Results will be useful for subsequent computable general equilibrium (CGE) model simulations of North American trade, including the proposed free trade area between Mexico and the United States.

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1. INTRODUCTION

The prospect of a free trade area (FTA) between the United States and Mexico has generated a considerable amount of interest in the United States. Some are concerned that the employment and earnings of unskilled U.S. workers would be adversely affected. Presumably, there would be offsetting gains to other groups in the United States. Policy makers have expressed the need to make an overall assessment of the net effect of a U.S.-Mexico FTA on U.S. welfare.

Computable general equilibrium (CGE) models of international trade are well suited to assess the welfare effects of an FTA. However, most existing CGEs do not distinguish between U.S. imports from Mexico and from other sources. Conceptually, it is fairly straightforward to break Mexico out as a separate trading partner, much as Canada was included as a separate country in studies of the U.S.-Canada FTA. This allows tariffs and nontariff barriers to be reduced between the FTA partners but not with the rest of the world.

While extension of CGE model equations to break Mexico out as a separate trading partner with the U.S. is possible, the additional data and parameter requirements are considerable. Regarding the data, a social accounting matrix (SAM) for Mexico will be needed. Further, estimates of parameters will be required that distinguish U.S. trade with Mexico from trade with the rest of the world. These include substitution elasticities between imports from different sources and domestic production, as well as elasticities of transformation between domestic production and exports to different destinations. The purpose of this paper is to provide estimates of substitution elasticities between U.S. imports from Mexico, Canada, and from the rest of the world. These parameter estimates are a necessary input into virtually any multi-sector modeling of a U.S.-Mexico or a North American FTA, CGE or otherwise. Such estimates do not currently exist.

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2. THEORETICAL MODEL

The modeling approach is a variant on Armington (1969), Shiells *et al.* (1986), and Reinert and Roland-Holst (1990). U.S. consumers are assumed to maximize utility subject to the budget constraint. Their utility function is assumed to be weakly separable between goods in different industry groups so that allocation of expenditure to goods within an industry group is made conditional upon the level of spending on this group.

We shall follow Armington and Reinert and Roland-Holst by assuming that the representative U.S. consumer's subutility function for an industry group takes the constant elasticity of substitution (CES) form and is linearly homogeneous. The CES and linear homogeneity assumptions are made so that estimates are consistent with the theoretical structure of many CGEs, even though these assumptions may be at variance with the data. Two alternative specifications of the CES model will be considered. The first assumes that U.S. imports from Mexico, Canada, and the rest of the world, as well as competing domestic production all enter into the subutility function for an industry group:

$$u(x_1, x_2, x_3, x_4) = (\alpha_1 x_1^\rho + \alpha_2 x_2^\rho + \alpha_3 x_3^\rho + \alpha_4 x_4^\rho)^{1/\rho}$$

where $\sigma = 1/(1-\rho) \geq 0$ is the elasticity of substitution, α_i are positive constants, and

x_1 = quantity of Mexican imports
x_2 = quantity of Canadian imports
x_3 = quantity of imports from rest of world
x_4 = quantity of U.S. output for domestic consumption.

For reasons that will become clear, this will be referred to as the *nonnested specification*. Demand functions corresponding to this subutility function are as follows:

$$x_i(p_1, p_2, p_3, p_4, y) = \alpha_i^\sigma (p_i/P)^{-\sigma}(y/P)$$

where $i = 1, \ldots, 4$,

$$P = (\alpha_1^\sigma p_1^{1-\sigma} + \alpha_2^\sigma p_2^{1-\sigma} + \alpha_3^\sigma p_3^{1-\sigma} + \alpha_4^\sigma p_4^{1-\sigma})^{\sigma/(1-\sigma)}$$
$$y = p_1 x_1 + p_2 x_2 + p_3 x_3 + p_4 x_4.$$

Computable general equilibrium modelers may work with a specialization of the approach just described. In many existing trade CGEs, it is assumed that domestic production substitutes with an aggregate of imports from all sources. Elasticities of substitution based on this approach were estimated by Reinert and Roland-Holst. One could simply add a nest to the utility function by assuming that imports from different sources are separable from domestic production. If this approach is employed, estimated elasticities of substitution between the different import varieties will be needed.

Formally, the *nested specification* is based on the assumption that imports from all sources are separable from competing domestic production. Together with the CES and linear homogeneity assumptions, this implies that the subutility function for an industry group is as follows: [1]

$$u(x_1, x_2, x_3, x_4) = (\beta_1 X^\delta + \beta_2 x_4^\delta)^{1/\delta}$$

and

$$X(x_1, x_2, x_3) = (\alpha_1 x_1^\rho + \alpha_2 x_2^\rho + \alpha_3 x_3^\rho)^{1/\rho}$$

where $\omega = 1/(1-\delta) \geq 0$ is the elasticity of substitution between composite import good X and domestic production x_4; $\sigma = 1/(1-\rho) \geq 0$ is the elasticity of substitution between imports from different sources; and β_1, β_2, α_1, α_2, and α_3 are positive constants. Demand functions for import varieties are as follows:

$$x_i(p_1, p_2, p_3, y) = \alpha_i^\sigma (p_i/P)^{-\sigma}(y/P)$$

where $i = 1, 2, 3$ and

$$P = (\alpha_1^\sigma p_1^{1-\sigma} + \alpha_2^\sigma p_2^{1-\sigma} + \alpha_3^\sigma p_3^{1-\sigma})^{\sigma/(1-\sigma)}$$
$$y = p_1 x_1 + p_2 x_2 + p_3 x_3.$$

There are arguments to be made in favor of each specification. Winters (1984) rejects the hypothesis that demand is separable over foreign and domestic sources based on Lagrange multiplier tests and the almost ideal demand system. This implies the nested specification is invalid and so the nonnested specification should be used. On the other hand, Brown (1987) demonstrates that use of the nested approach can eliminate adverse terms-of-trade effects inherent in use of the nonnested approach in multicountry CGEs, if the elasticity of substitution between different import varieties, σ, is large compared to the elasticity of substitution between composite imports and domestic production, ω. In view of this, we shall compare estimates of σ from the nested specification, presented below, with the estimates of ω reported by Reinert and Roland-Holst. As a purely practical matter, the measured price of U.S. products is available for a considerably shorter period than the other measures of prices and quantities for many industry groups so that the number of degrees of freedom is often greater using the nested specification. In view of these considerations, we report estimates using both the nonnested and nested specifications.

3. ECONOMETRIC METHOD

The approach in Reinert and Roland-Holst was to estimate the elasticity of substitution between imports (aggregated across all sources) and domestic production based on a two-good CES utility function and ordinary least-squares (OLS). They regressed the logarithm of the ratio of quantities on the logarithm of the ratio of prices. The slope from this regression provides an estimate of the elasticity of substitution.

[1] Some parameter and variable names used above in defining the nonnested subutility and demand functions are used again in the nested case but are given different definitions. This simplifies subsequent exposition.

With more than two goods, one could regress the logarithm of the ratio of quantities on the logarithm of the ratio of prices for each pair of goods. [2] Unfortunately, several different estimates of the elasticity of substitution, σ, would be obtained by applying OLS separately to each equation. It is clearly better to impose equality of the different slope parameters as a cross-equation constraint on the estimation. However, there are additional nonlinear, cross-equation constraints on the intercepts that would be difficult to incorporate into the estimation procedure.

In this paper, a different technique is employed.[3] Instead of regressing logarithms of ratios of quantities demanded on logarithms of ratios of prices, we regress logarithms of quantities demanded, x_i, on logarithms of relative price, (p_i/P), and real income, (y/P). Equality of all relative price coefficients is imposed using constrained least-squares. By estimating the original demand functions rather than demands in ratio form, it is not necessary to impose nonlinear, cross-equation parameter restrictions.

The system of demands must be estimated jointly to impose the constraint that slopes in all demand equations are equal. Given this, it is desirable to allow for the possibility that regression disturbances in one demand equation are correlated with disturbances in other demand equations. This seemingly unrelated regressions (SUR) approach incorporates additional information into the estimation and accordingly yields more efficient parameter estimates than are obtained by estimating each demand equation separately.

It is also important to allow for the possibility that regression disturbances are serially correlated. Rather than test for serial correlation and then correct if the null hypothesis of serial independence is rejected, we decided to correct all equations for serial correlation without testing and thereby avoid pre-test bias. This was accomplished using a Cochrane-Orcutt transformation. It was necessary to generalize this transformation in cases where there were missing values to reflect gaps between observations.

4. DATA

Two types of data are needed to estimate the model presented in Section 2. The first consists of quantities and prices of U.S. imports from Mexico, Canada, and the rest of the world. The second consists of quantities and prices of domestic production for domestic consumption. Aggregation yielded data for 163 mining and manufacturing sectors. [4]

For imports, quarterly data for 1980-88 were extracted from U.S. Department of Commerce data tapes by 7-digit TSUSA item separately for the three suppliers: Mexico, Canada, and the rest of the world. Laspeyres price indices were computed for each of the 163 estimation sectors (subscript suppressed for simplicity) and supplier (subscripted by i) as follows:

$$p_i(t) = \sum_j \phi_{ij} \cdot [p_{ij}(t)/p_{ij}(0)] \qquad (i = 1,2,3)$$

[2] There are six pairs of goods in the nonnested case and three pairs in the nested case.

[3] The Appendix presents the econometric method in more detail.

[4] A table detailing the concordance between the 163 sectors and the corresponding BEA and SIC sectors is available from the authors.

where ϕ_{ij} is the base-period supplier i import share of TSUSA item j, $p_{ij}(t)$ is the unit value of supplier i imports of TSUSA item j in quarter t, and $p_{ij}(0)$ is the unit value of supplier i imports of TSUSA item j in the base period. The base period is the second quarter of 1987 for mining and the second quarter of 1986 for manufacturing sectors. A measure of import quantity for each supplier and estimation sector was obtained by dividing import value by the import price index.

Producer price indices (PPI) were used to measure the price of domestic production. These were obtained from U.S. Department of Labor data tapes on a four-digit SIC basis and aggregates were formed for each of the 163 estimating sectors. In cases where there was more than one producer price series included in an estimating sector, the series were aggregated using domestic output weights (1986 for manufacturing, 1987 for mining). Domestic output data for base periods was obtained from U.S. Department of Commerce data tapes for manufacturing sectors and the Census of Mining for mining sectors. Since the PPI is available on a monthly basis, a three-month average was used.

Domestic output measures were based on the Federal Reserve Bank's Indices of Industrial Production (IIP). The IIP series were aggregated for each of the 163 estimating sectors. When there was more than one IIP series included in an estimating sector, the series were aggregated using IIP series weights. Since the IIP series are monthly, a three-month average was taken.

The IIP data provide series for quantity of domestic production but we require data on domestic sales of domestic goods, *i.e.*, domestic production less exports. To construct this series, we first rescaled the IIP series to express domestic production as a proportion of the base-year quarterly production. [5] Next, we applied base year output to these series to generate series of real output. Finally, we subtracted real exports to obtain real domestic sales [6] and used this to measure the quantity of U.S. output for domestic consumption.

5. RESULTS

The role of imports in meeting U.S. domestic demand as well as the Canadian and Mexican shares of total U.S. imports are shown in Table 1. The first column of figures gives the estimated share of imports in total domestic demand during 1988, the most recent year of our data set. Imports constitute more than 50 percent of domestic demand in the following sectors: rubber and plastics footwear (78), shoes, except rubber (82), china and earthenware products (91), primary lead, zinc, and nonferrous metals, n.e.c. (98), and radio, TV, phonograph records, and tapes (138).

The second column of figures in the table gives the estimated share of imports from Canada in total imports. Sectors with the greatest Canadian shares include: cheese, natural and processed (12), condensed and evaporated milk (13), fluid milk (15), shortening and cooking oils (32), logging camps and logging contractors (45), sawmills (46), pulp mills (55), newspapers (63), and aircraft (146). Note, however, that many of these high Canadian

[5] Again, the base years are 1987 for mining and 1986 for manufacturing.

[6] To generate the real export series, quarterly export data for the years 1980-88 were extraced from U.S. Department of Commerce data tapes by 7-digit Schedule B item. Aggregates of exports were then formed for each of the 163 estimating sectors. Laspeyres price indices were computed to deflate the exports.

import shares are in sectors with very low total import shares. For example, imports of cheese, fluid milk, and shortening and cooking oils have a share in total U.S. domestic demand of less than 0.001.

The third and last column of figures gives the estimated share of imports from Mexico in total imports. Sectors with the greatest Mexican shares include: chemical and fertilizer mineral mining (8), cigars (35), paper bags, board, and stationery products (58), sanitary paper products (59), glass containers (85), cement, hydraulic (86), structural clay products, n.e.c. (89), ceramic plumbing and electrical supplies (90), transformers, switchgear and switchboard apparatus (129), and electrical equipment and supplies (144).

Table 1 shows that both Canadian and Mexican production contributed to 1988 U.S. imports in almost every mining and manufacturing category considered. Thus, even prior to FTA agreements, these three economies were linked in a broad range of industrial sectors.

The results of the nonnested estimation are presented in Table 2. Out of the 127 cases where the data were able to support estimation of the nonnested model, all but 6 sectors provided estimates of the correct sign. The positive elasticities ranged from less than 0.10 to 1.31. Goodness of fit in Table 2 is indicated by the Buse (1979) R^2 measure (see Appendix). These values are low for many sectors, and significant estimates of the elasticity of substitution are, in many cases, obtained with a low R^2. Given that some evidence exists for the nonseparability of manufactures demand over foreign and domestic sources [Winters (1984)], these estimates may be relevant to CGE modeling of North American trade. [7]

Table 3 presents the results of the lower-tier, nested specification. Out of 128 cases where the data were able to support estimation of the nested model, all but 3 sectors provided estimates of the correct sign. One of these 3 sectors, distilled liquor except brandy (27), was not negative in the nonnested model estimation. Four sectors (3, 26, 53, 82) which have negative estimated elasticities of substitution in the nonnested estimation have positive estimated elasticities of substitution in the nested estimation. Positive elasticities range from 0.14 to 1.98. Again, goodness of fit is measured in Table 3 using the Buse R^2 measure.

It is unclear whether the degree of substitutability between import sources alone exceeds that between import sources and domestic output, or, equivalently, whether the nested elasticities of substitution exceed the nonnested elasticities of substitution. The difference in the ranges of estimated elasticities of substitution (0.14 to 1.98 vs. 0.10 to 1.31) indicates that the lower-tier nested estimates tend to be slightly larger. In the case of hand tools (113), for example, the lower-tier nested estimate of the elasticity of substitution is 1.00, whereas the nonnested estimate from Table 2 is 0.65. A number of sectors show the opposite result, however. For example, in the case of electrical housewares and fans (134), the elasticity of substitution for the lower-tier nest is 0.79, whereas the nonnested estimate is 1.31.

Another important comparison is that between the lower-tier, nested elasticity of sub-

[7] Note, however, that the nonnested CES utility function is additively separable. We plan to use a flexible functional form to compare the nonnested and nested specifications in future work. By definition, a flexible functional form is not additively separable.

stitution, σ, and the elasticity of substitution between domestic production and imports as a whole, ω. This is the comparison between our Table 3 estimates and those presented in Reinert and Roland-Holst. Examination of these two sets of results does not indicate that there is any tendency for one to be larger than the other. We will have more to say concerning this outcome in the concluding section.

6. CONCLUDING COMMENTS

In multicountry CGE modeling, such as models of a U.S.-Mexico or North American FTA, the practitioner faces a choice between specifying the model using national product differentiation or firm-level product differentiation. In the present paper, we have restricted the inquiry to the national product differentiation approach. [8] Within this approach, the practitioner faces yet another set of choices. One possibility is to model the choice between different import sources and competing domestic goods within the same CES aggregation function. In this case, the estimates in Table 2 are relevant. The second possibility is to model import demand in a two-tier framework, with an upper-tier CES aggregation function for imports as a whole and competing domestic goods and a lower-tier CES aggregation function for the various import sources. Reinert and Roland-Holst (1990) provide estimates of the upper-tier elasticities of substitution, while Table 3 of this paper provides estimates of the lower-tier elasticities of substitution.

Brown (1987) presented an analytical model of the two-tier approach, demonstrating that national product differentiation may imply large terms of trade effects regardless of the size of the country. Additionally, she showed that these terms of trade effects would increase in magnitude: (1) the larger is the upper-tier elasticity of substitution and (2) the smaller is the lower-tier elasticity of substitution. Avoiding large terms-of-trade effects would then require that the lower-tier elasticities of substitution be large relative to the upper-tier elasticities of substitution or that the Table 3 elasticities be large relative to the Reinert and Roland-Holst elasticities. While this is the case for many sectors, it is not an overall pattern. Based on the assumption of national product differentiation and CES functional forms, then, the econometric evidence presented here indicates that changes in U.S. commercial policy vis-a-vis Canada and Mexico may involve large terms-of-trade effects.

An important future extension will be to relax the CES assumption and use a flexible functional form such as the almost ideal demand system (AIDS) or the transcendental logarithmic (Translog) utility function. This approach may yield different conclusions regarding the size of terms-of-trade effects. It also will allow for imports from different sources to be complements with one another or with domestic production. Policy analysts have raised the possibility that Mexican and Canadian goods might be complements in U.S. consumption, so that the excluded partner might actually gain from an FTA in certain sectors. These issues, however, are beyond the scope of the present paper.

[8] The firm-level product differentiation approach is reviewed in Brown and Stern (1989). Norman (1990) compares the two approaches.

APPENDIX

In the present paper, demands are estimated using a seemingly unrelated regressions (SUR) technique, imposing cross-equation constraints, correcting for serial correlation, and adjusting for missing observations. For the nested case and suppressing time subscripts for simplicity,[9] the demands for U.S. imports from Mexico, Canada, and the rest of the world are:

$$\begin{aligned} ln(x_1P/y) &= \sigma ln(\alpha_1) - \sigma ln(p_1/P) + \epsilon_1 \\ ln(x_2P/y) &= \sigma ln(\alpha_2) - \sigma ln(p_2/P) + \epsilon_2 \\ ln(x_3P/y) &= \sigma ln(\alpha_3) - \sigma ln(p_3/P) + \epsilon_3 \end{aligned} \qquad (A-1)$$

where ϵ_1, ϵ_2, and ϵ_3 are random variables with zero mean and constant variance. [10] The demand equation for good 3, U.S. imports from the rest of the world, is dropped since it is implied by the demands for goods 1 and 2 together with the budget constraint, $p_1x_1 + p_2x_2 + p_3x_3 = y$.[11]

The first two demands in Equations $(A-1)$ can also be expressed as follows:

$$\begin{aligned} y_1(t) &= \beta_{10} + X_{11}(t)\beta_{11} + \epsilon_1(t) = X_1(t)\beta_1 + \epsilon_1(t) \\ y_2(t) &= \beta_{20} + X_{21}(t)\beta_{21} + \epsilon_2(t) = X_2(t)\beta_2 + \epsilon_2(t) \end{aligned} \qquad (A-2)$$

where $t = 1, \dots, T$. First-order autoregression is assumed:

$$\begin{aligned} \epsilon_1 &= \rho_1\epsilon_1(t-1) + u_1(t) \\ \epsilon_2 &= \rho_2\epsilon_2(t-1) + u_2(t) \end{aligned} \qquad (A-3)$$

where ρ_1 and ρ_2 are autoregressive parameters $(-1 < \rho_i < 1)$. It is assumed that $u_1(t)$ and $u_2(t)$ are contemporaneously correlated but serially uncorrelated:

$$E(uu') = \Omega \otimes I$$

where $u = (u_1(1), \dots, u_1(T), u_2(1), \dots, u_2(T))'$, Ω is a 2×2 symmetric, positive definite matrix and I is a $T \times T$ identity matrix.

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9 Estimation in the nonnested case is a straightforward generalization of the method described below.

10 Price aggregator P was computed using the Cobb-Douglas functional form,

$$P = (p_1/\alpha_1)^{\alpha_1}(p_2/\alpha_2)^{\alpha_2}(p_3/\alpha_3)^{\alpha_3},$$

and mean budget shares. This is similar to the simplification often employed to estimate the almost ideal demand system. Demand parameter estimates are not greatly affected by this simplification if the price series are highly collinear.

11 Estimators obtained by dropping the last demand equation are asymptotically inefficient compared to maximum likelihood estimation (but consistent) since in this case $\epsilon_1 + \epsilon_2 + \epsilon_3 \not\equiv 0$ [see Theil(1971, pp. 274-75)].

The system of T observations in Equations $(A-2)$ can be expressed in matrix notation as follows:

$$\begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = \begin{pmatrix} X_1 & 0 \\ 0 & X_2 \end{pmatrix} \begin{pmatrix} \beta_1 \\ \beta_2 \end{pmatrix} + \begin{pmatrix} \epsilon_1 \\ \epsilon_2 \end{pmatrix}$$

where $y_1 = (y_1(1), \ldots, y_1(T))'$, $\beta_1 = (\beta_{10}, \beta_{11})'$, etc.; or

$$y = X\beta + \epsilon \qquad (A-4)$$

where $y = (y_1', y_2')'$, etc. Let $V \equiv E(\epsilon\epsilon')$. Then the joint generalized least-squares (GLS) estimator of β is:

$$\hat{\beta} = (X'V^{-1}X)^{-1}(X'V^{-1}y)$$

Let P be a $2T \times 2T$ matrix such that $PVP' = \Omega \otimes I$.[12] This implies

$$V^{-1} = P'(\Omega^{-1} \otimes I)P$$

so that $\hat{\beta}$ can be written:

$$\hat{\beta} = (X^{*\prime}(\Omega^{-1} \otimes I)X^*)^{-1}(X^{*\prime}(\Omega^{-1} \otimes I)y^*)$$

where $X^* = PX$ and $y^* = Py$. Since Ω, ρ_1, and ρ_2 are unknown, they are replaced with consistent estimates as described in Judge *et al.* (1985, pp. 488-90); estimation is based on only $(T-1)$ observations for simplicity. We did, however, modify the autoregressive joint GLS estimator to account for missing observations by generalizing the transformation matrix given in Savin and White (1978, p. 60).

It is apparent that slope parameters in the two demand equations should in theory be equal. That is, $\beta_{11} = \beta_{21}$. This constraint can be expressed $R\beta = r$, where $R = (0, 1, 0, -1)$, $\beta = (\beta_{10}, \beta_{11}, \beta_{20}, \beta_{21})'$, and $r = 0$. The constrained joint GLS estimator used in this paper (correcting for serial correlation and missing observations) is given by [Theil (1971, p. 316)]:

$$\hat{\beta}^* = \hat{\beta} + CR'(RCR')^{-1}(r - R\hat{\beta}) \qquad (A-5)$$

where

$$C = (X^{*\prime}(\Omega^{-1} \otimes I)X^*)^{-1}$$

and Ω as well as ρ_1 and ρ_2 are replaced with consistent estimates. The variance-covariance matrix of the estimator given in Equation $(A-5)$ is:

$$V(\hat{\beta}^*) = C - CR'(RCR')^{-1}RC \qquad (A-6)$$

A measure of goodness-of-fit for the autoregressive joint GLS estimator was computed based on Buse (1979):

$$R^2 = 1 - \frac{\hat{\epsilon}'V^{-1}\hat{\epsilon}}{(y - Dy)'V^{-1}(y - Dy)} \qquad (A-7)$$

[12] Transformation matrix P is given in Judge *et al.* (1985, pp. 486-87).

where

$$\hat{\epsilon} = y - X\hat{\beta}^*$$
$$D = W(W'V^{-1}W)^{-1}W'V^{-1}$$
$$W = \begin{pmatrix} \iota & 0 \\ 0 & \iota \end{pmatrix}$$

and ι is a $T \times 1$ vector of ones. R^2 lies between zero and one and can be used to test the null hypothesis that all slope coefficients in the system are zero.

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Table 1: U.S. Import Shares, 1988

Sector	Description	Imports[a]	Canada[b]	Mexico[c]
1	Iron and ferroalloy ores mining	0.195	0.867	0.003
3	Nonfer. metal ores mining, exc. copper	0.009	0.471	0.174
4	Coal mining	0.001	0.480	0.023
5	Crude petroleum and natural gas	0.232	0.112	0.107
6	Stone, sand, and gravel	0.007	0.424	0.012
7	Clay, ceramic, and nonmetallic minerals	0.130	0.489	0.165
8	Chemical and fertilizer mineral mining	0.067	0.212	0.245
9	Meat packing plants and prepared meats	0.009	0.763	0.014
12	Cheese, natural and processed	0.000	0.995	0.000
13	Condensed and evaporated milk	0.001	1.000	0.000
15	Fluid milk	0.000	1.000	0.000
16	Canned, dehydrated, pickled, and frozen foods	0.040	0.051	0.141
17	Flour and other grain mill products	0.011	0.724	0.012
18	Cereals and flour	0.001	0.412	0.083
19	Dog, cat, and other pet food	0.005	0.441	0.000
20	Prepared feeds, n.e.c.	0.005	0.785	0.004
21	Wet corn milling	0.009	0.344	0.035
22	Bread, cake, cookies, and crackers	0.013	0.368	0.037
23	Sugar	0.092	0.011	0.083
24	Chocolate and other confectionery products	0.052	0.065	0.053
25	Malt and malt beverages	0.074	0.169	0.172
26	Wine, brandy, and brandy spirits	0.192	0.000	0.008
27	Distilled liquor, except brandy	0.186	0.395	0.063
28	Soft drinks, flavorings, and syrups	0.009	0.056	0.059
29	Vegetable oil mills	0.015	0.713	0.058
30	Animal and marine fats and oils	0.030	0.305	0.006
31	Roasted coffee	0.029	0.146	0.060
32	Shortening and cooking oils	0.000	1.000	0.000
33	Sea foods, ice, and pasta	0.066	0.197	0.079
34	Cigarettes	0.001	0.600	0.000
35	Cigars	0.023	0.000	1.000
36	Tobacco	0.093	0.031	0.059
37	Yarn, thread, and broadwoven fabric mills	0.028	0.064	0.033
38	Narrow fabric mills	0.051	0.096	0.039
39	Floor coverings	0.052	0.103	0.027
40	Felt, lace and other textile goods	0.043	0.348	0.029
41	Hosiery	0.018	0.032	0.005
42	Knitting mills	0.008	0.054	0.014
43	Apparel made from purchased materials	0.306	0.013	0.024
44	Housefurnishings, textile bags, canvas	0.067	0.061	0.047
45	Logging camps and logging contractors	0.005	0.956	0.000
46	Sawmills	0.166	0.957	0.007
47	Hardwood dimension and flooring mills	0.090	0.157	0.051
48	Millwork, wood kitchens and cabinets	0.009	0.283	0.068
49	Veneer and plywood	0.042	0.382	0.013
50	Wood pallets, skids, and containers	0.009	0.236	0.123
52	Wood preserving and particleboard	0.110	0.248	0.095
53	Household furniture	0.123	0.127	0.038
54	Office furniture	0.102	0.334	0.145
55	Pulp mills	0.460	0.983	0.000
56	Paper mills, except building papers	0.170	0.844	0.012
57	Paperboard mills	0.010	0.733	0.075
58	Paper bags, board, and stationery products	0.036	0.214	0.276
59	Sanitary paper products	0.003	0.124	0.721
60	Building paper and board mills	0.134	0.717	0.070

Table 1, Cont'd.: U.S. Import Shares, 1988

Sector	Description	Imports[a]	Canada[b]	Mexico[c]
61	Paper coating and glazing	0.028	0.393	0.059
62	Paperboard containers and boxes	0.004	0.397	0.036
63	Newspapers	0.003	0.984	0.000
64	Periodicals, books, and greeting cards	0.024	0.127	0.020
65	Printing	0.006	0.276	0.009
66	Industrial inorganic and organic chemicals	0.082	0.335	0.052
67	Agricultural chemicals	0.050	0.432	0.054
68	Chemical preparations	0.043	0.250	0.035
69	Plastics materials and resins	0.028	0.506	0.061
70	Synthetic rubber	0.148	0.464	0.081
71	Organic fibers	0.026	0.268	0.096
72	Drugs	0.040	0.030	0.015
73	Soap, detergents, and sanitation goods	0.022	0.127	0.035
74	Paints and allied products	0.010	0.157	0.001
75	Petroleum refining and products	0.096	0.153	0.028
76	Paving mixtures and blocks, asphalt felts	0.009	0.833	0.104
77	Tires and inner tubes	0.167	0.205	0.027
78	Rubber and plastics footwear	0.699	0.003	0.028
79	Other rubber products	0.090	0.125	0.031
80	Miscellaneous plastics products	0.057	0.202	0.034
81	Leather tanning and finishing	0.260	0.051	0.044
82	Shoes, except rubber	0.644	0.004	0.011
83	Other leather goods	0.444	0.015	0.044
84	Glass and glass products, exc. containers	0.120	0.147	0.114
85	Glass containers	0.035	0.216	0.226
86	Cement, hydraulic	0.132	0.233	0.243
87	Brick and structural clay tile	0.005	0.254	0.173
88	Ceramic wall and floor tile	0.265	0.012	0.064
89	Structural clay products, n.e.c.	0.065	0.078	0.230
90	Ceramic plumbing and electrical supplies	0.136	0.030	0.202
91	China and earthenware products	0.646	0.001	0.013
92	Concrete, lime, and gypsum products	0.007	0.846	0.034
93	Stone and nonmetalic mineral products	0.102	0.162	0.040
94	Primary steel	0.119	0.186	0.033
95	Iron and steel foundries	0.014	0.271	0.036
96	Metal heat treating and primary metal	0.034	0.855	0.000
97	Primary copper	0.178	0.538	0.005
98	Primary lead, zinc, nonfer. metals, n.e.c.	0.632	0.508	0.119
99	Primary aluminum	0.276	0.770	0.014
101	Copper rolling and drawing	0.069	0.147	0.132
102	Aluminum rolling and drawing	0.057	0.280	0.016
103	Other nonfer. rolling, drawing, insulating	0.031	0.318	0.187
106	Metal barrels, drums and pails	0.189	0.217	0.096
107	Metal plumbing fixtures, heating equipment	0.049	0.143	0.036
108	Fabricated metal work	0.009	0.417	0.031
109	Fabricated plate work (boiler shops)	0.021	0.408	0.135
110	Screw machine products and bolts, etc.	0.130	0.130	0.007
111	Forgings and stampings	0.025	0.105	0.050
112	Cutlery	0.188	0.011	0.013
113	Hand tools	0.118	0.190	0.058
115	Other fabricated metal products	0.167	0.186	0.062
116	Pipe, valves, and pipe fittings	0.045	0.173	0.053
117	Turbines and turbine generator sets	0.087	0.230	0.000
118	Internal combustion engines, n.e.c.	0.246	0.103	0.038

Table 1, Cont'd.: U.S. Import Shares, 1988

Sector	Description	Imports[a]	Canada[b]	Mexico[c]
119	Farm and garden machinery and equipment	0.131	0.294	0.030
120	Construction, mining, oil field machinery	0.096	0.119	0.075
121	Elevators, conveyors, cranes	0.132	0.133	0.023
122	Machine tools and power driven hand tools	0.197	0.106	0.012
123	Special industry machinery	0.171	0.096	0.006
124	Pumps, compressors, blowers, fans, furnaces	0.195	0.143	0.018
125	Ball and roller bearings, transmission equip.	0.152	0.073	0.009
126	Carburetors, pistons, rings, valves	0.000	0.517	0.036
127	Electrical computing equipment	0.207	0.049	0.024
128	Service industry machines	0.041	0.085	0.134
129	Transformers, switchgear and switchboard app.	0.085	0.096	0.204
130	Electrical industrial apparatus	0.089	0.112	0.100
131	Household cooking equipment	0.033	0.175	0.012
132	Household refrigerator and freezers	0.028	0.354	0.026
133	Household laundry equipment	0.013	0.313	0.000
134	Electric housewares and fans	0.157	0.038	0.137
135	Household vacuum cleaners	0.061	0.062	0.000
136	Sewing machines, other household appliances	0.273	0.055	0.043
137	Electric lamps, lighting, wiring devices	0.194	0.095	0.170
138	Radio, TV, phonograph records and tapes	0.501	0.011	0.118
139	Telephone and telegraph apparatus	0.138	0.123	0.030
140	Radio and TV communication equipment	0.043	0.082	0.037
141	Electron tubes	0.072	0.106	0.001
142	Semiconductors, other electronic components	0.278	0.062	0.055
143	Storage batteries	0.140	0.045	0.166
144	Electrical equipment and supplies	0.234	0.051	0.247
145	Motor vehicles, parts and accessories	0.250	0.316	0.042
146	Aircraft	0.009	1.000	0.000
147	Aircraft and missile equipment, n.e.c.	0.064	0.307	0.002
149	Boat building and repairing	0.069	0.216	0.091
150	Railroad equipment	0.091	0.489	0.000
151	Motorcycles, bicycles, and parts	0.432	0.013	0.005
153	Transportation equipment, n.e.c.	0.185	0.303	0.000
155	Ordnance and accessories	0.022	0.320	0.007
157	Engineering, scientific, and optical equipment	0.074	0.101	0.018
158	Measuring devices and environmental controls	0.141	0.113	0.068
159	Surgical, medical and dental equipment	0.043	0.045	0.153
160	Watches, clocks, and ophthalmic goods	0.271	0.009	0.034
161	Photographic equipment and supplies	0.091	0.146	0.021
162	Jewelry, musical instruments, toys	0.433	0.028	0.025
163	Pens, pencils, brooms, burial caskets, signs	0.164	0.034	0.029

Notes: [a]The share of imports in total domestic demand. [b]The share of imports from Canada in total imports. [c]The share of imports from Mexico in total imports.

Source: Authors' estimates.

Table 2: Estimates of the Elasticity of Substitution between U.S. Imports from Mexico, Canada, the Rest of the World, and Domestic Production

Sector	Description	Elast.	T-Stat.	R-Sqr.	Obs.
1	Iron and ferroalloy ores mining	1.20	3.25	0.19	16
3	Nonfer. metal ores mining, exc. copper	-0.29	-6.40	0.43	19
5	Crude petroleum and natural gas	0.67	5.98	0.27	30[a]
6	Stone, sand, and gravel	1.12	23.84	0.92	16
7	Clay, ceramic, and nonmetallic minerals	-0.02	-1.14	0.03	16
8	Chemical and fertilizer mineral mining	0.86	4.86	0.40	16
9	Meat packing plants and prepared meats	0.57	3.59	0.11	36
16	Canned, dehydrated, pickled, and frozen foods	0.79	4.57	0.18	36
17	Flour and other grain mill products	1.09	5.43	0.22	36
18	Cereals and flour	0.22	2.99	0.07	32[a]
20	Prepared feeds, n.e.c.	1.31	15.29	0.75	29[a]
21	Wet corn milling	1.16	9.40	0.70	14
22	Bread, cake, cookies, and crackers	0.66	5.43	0.21	34
23	Sugar	0.21	1.19	0.00	36
24	Chocolate and other confectionery products	0.19	5.68	0.23	36
25	Malt and malt beverages	0.01	1.00	0.01	36
26	Wine, brandy, and brandy spirits	-0.03	-0.10	0.00	20
27	Distilled liquor, except brandy	0.32	1.55	0.02	35
28	Soft drinks, flavorings, and syrups	0.88	4.52	0.19	30
29	Vegetable oil mills	0.79	6.66	0.29	36
30	Animal and marine fats and oils	0.86	4.45	0.24	22[a]
31	Roasted coffee	0.50	7.19	0.29	36
33	Sea foods, ice, and pasta	0.37	6.85	0.33	36
36	Tobacco	0.79	4.96	0.19	36
37	Yarn, thread, and broadwoven fabric mills	0.73	14.73	0.67	36
38	Narrow fabric mills	0.77	5.12	0.32	18
39	Floor coverings	0.79	4.25	0.32	14
40	Felt, lace and other textile goods	0.53	2.09	0.10	12
41	Hosiery	0.98	5.33	0.25	28[a]
42	Knitting mills	1.18	5.82	0.51	14[a]
43	Apparel made from purchased materials	0.48	5.44	0.23	36
44	Housefurnishings, textile bags, canvas	0.46	7.27	0.42	12
46	Sawmills	0.43	2.51	0.07	32
47	Hardwood dimension and flooring mills	1.02	28.04	0.94	18
48	Millwork, wood kitchens and cabinets	0.14	3.45	0.10	36
49	Veneer and plywood	0.04	0.43	0.00	36
50	Wood pallets, skids, and containers	1.29	20.93	0.81	36
52	Wood preserving and particleboard	0.87	23.65	0.81	36
53	Household furniture	-0.14	-4.76	0.17	36
54	Office furniture	0.51	5.35	0.21	16[a]
56	Paper mills, except building papers	0.12	0.95	0.01	27[a]
58	Paper bags, board, and stationery products	0.17	2.50	0.09	20
59	Sanitary paper products	1.06	21.68	0.85	29[a]
60	Building paper and board mills	1.28	3.35	0.30	12
61	Paper coating and glazing	0.76	8.12	0.49	24
62	Paperboard containers and boxes	0.72	6.84	0.46	16
64	Periodicals, books, and greeting cards	0.89	24.69	0.86	36
65	Printing	1.01	22.04	0.86	26
66	Industrial inorganic and organic chemicals	0.90	18.34	0.82	24
67	Agricultural chemicals	0.22	4.10	0.15	36
68	Chemical preparations	0.68	3.00	0.19	14
69	Plastics materials and resins	1.07	14.65	0.67	36
70	Synthetic rubber	0.81	6.87	0.34	33[a]

Table 2, Cont'd.: Estimates of the Elasticity of Substitution between U.S. Imports from Mexico, Canada, the Rest of the World, and Domestic Production

Sector	Description	Elast.	T-Stat.	R-Sqr.	Obs.
71	Organic fibers	0.87	10.68	0.52	36
72	Drugs	0.98	23.87	0.93	16
73	Soap, detergents, and sanitation goods	0.80	3.36	0.20	16
74	Paints and allied products	0.66	3.35	0.17	18[a]
75	Petroleum refining and products	0.53	3.54	0.13	36
76	Paving mixtures and blocks, asphalt felts	0.85	2.54	0.08	16[a]
77	Tires and inner tubes	0.44	13.91	0.52	32[a]
78	Rubber and plastics footwear	0.68	2.87	0.09	30[a]
79	Other rubber products	0.15	2.10	0.04	28
80	Miscellaneous plastics products	1.10	16.21	0.70	36
81	Leather tanning and finishing	0.86	9.00	0.43	36
82	Shoes, except rubber	-0.09	-0.49	0.00	16
83	Other leather goods	1.08	9.38	0.66	16
84	Glass and glass products, exc. containers	0.66	18.79	0.65	36
85	Glass containers	0.12	4.96	0.20	31[a]
86	Cement, hydraulic	1.01	26.28	0.87	36
87	Brick and structural clay tile	0.90	5.27	0.20	36
88	Ceramic wall and floor tile	0.95	37.51	0.93	36
89	Structural clay products, n.e.c.	0.92	43.31	0.99	11[a]
90	Ceramic plumbing and electrical supplies	0.94	25.47	0.90	36
91	China and earthenware products	1.16	17.55	0.75	36
92	Concrete, lime, and gypsum products	0.18	1.28	0.07	36
93	Stone and nonmetallic mineral products	0.91	24.29	0.89	36
94	Primary steel	0.94	26.50	0.94	16
95	Iron and steel foundries	1.19	13.93	0.79	16
97	Primary copper	0.79	11.66	0.58	34
98	Primary lead, zinc, and nonfer. metals, n.e.c.	0.04	0.15	0.00	32
99	Primary aluminum	0.73	3.62	0.10	36
101	Copper rolling and drawing	-0.69	-4.52	0.14	34[a]
102	Aluminum rolling and drawing	0.69	11.69	0.64	34[a]
103	Other nonfer. rolling, drawing, and insulating	0.75	11.30	0.70	26
106	Metal barrels, drums and pails	1.00	13.90	0.75	22
107	Metal plumbing fixtures and heating equipment	1.02	29.07	0.95	16
108	Fabricated metal work	0.64	10.83	0.52	36
109	Fabricated plate work (boiler shops)	0.97	10.21	0.60	33[a]
110	Screw machine products and bolts, etc.	0.68	11.18	0.70	16
111	Forgings and stampings	1.10	19.76	0.89	16
112	Cutlery	0.93	9.84	0.63	19[a]
113	Hand tools	0.65	20.10	0.79	36
115	Other fabricated metal products	0.68	13.96	0.64	36
116	Pipe, valves, and pipe fittings	1.03	46.48	0.95	36
118	Internal combustion engines, n.e.c.	0.95	78.64	0.98	35[a]
119	Farm and garden machinery and equipment	1.07	26.45	0.94	16
120	Construction, mining and oil field machinery	1.00	82.14	0.99	35[a]
121	Elevators, conveyors, cranes	1.01	20.18	0.81	33
122	Machine tools and power driven hand tools	0.96	27.28	0.96	14[a]
123	Special industry machinery	0.85	20.39	0.79	36
124	Pumps, compressors, blowers, fans, furnaces	0.91	24.73	0.87	30
125	Ball and roller bearings, transmission equip.	0.92	20.21	0.79	36
127	Electrical computing equipment	1.15	19.99	0.80	36
128	Service industry machines	0.88	14.78	0.85	16
129	Transformers, switchgear and switchboard app.	0.65	12.67	0.64	36
130	Electrical industrial apparatus	1.06	51.92	0.99	14

Table 3: Estimates of the Elasticity of Substitution between U.S. Imports from Mexico, Canada, and the Rest of the World

Sector	Description	Elast.	T-Stat.	R-Sqr.	Obs.
1	Iron and ferroalloy ores mining	0.99	6.56	0.39	36
3	Nonfer. metal ores mining, exc. copper	1.10	7.45	0.44	36
5	Crude petroleum and natural gas	0.94	1.79	0.04	36
6	Stone, sand, and gravel	1.11	15.23	0.77	36
7	Clay, ceramic, and nonmetallic minerals	-0.05	-0.77	0.01	36
8	Chemical and fertilizer mineral mining	1.10	13.22	0.71	36
9	Meat packing plants and prepared meats	0.65	3.09	0.13	36
16	Canned, dehydrated, pickled, and frozen foods	0.69	2.97	0.11	36
17	Flour and other grain mill products	1.40	3.48	0.15	36
18	Cereals and flour	1.98	8.90	0.55	32[a]
20	Prepared feeds, n.e.c.	1.23	14.58	0.80	29[a]
21	Wet corn milling	1.12	5.55	0.28	36
22	Bread, cake, cookies, and crackers	0.22	1.29	0.02	36
23	Sugar	0.14	0.58	0.00	36
24	Chocolate and other confectionery products	1.03	14.18	0.73	36
25	Malt and malt beverages	0.60	1.34	0.02	36
26	Wine, brandy, and brandy spirits	0.06	0.33	0.00	34[a]
27	Distilled liquor, except brandy	-0.02	-0.07	0.00	35
28	Soft drinks, flavorings, and syrups	1.21	5.45	0.29	36
29	Vegetable oil mills	0.85	5.53	0.31	36
30	Animal and marine fats and oils	0.59	3.04	0.18	22[a]
31	Roasted coffee	0.74	6.21	0.36	36
33	Sea foods, ice, and pasta	1.31	9.24	0.53	36
36	Tobacco	0.35	1.78	0.04	36
37	Yarn, thread, and broadwoven fabric mills	1.04	15.05	0.77	36
38	Narrow fabric mills	1.18	7.43	0.44	36
39	Floor coverings	0.99	11.84	0.67	36
40	Felt, lace and other textile goods	0.95	9.86	0.59	36
41	Hosiery	0.82	3.64	0.19	28[a]
42	Knitting mills	1.23	8.34	0.73	14[a]
43	Apparel made from purchased materials	0.83	5.51	0.26	36
44	Housefurnishings, textile bags, canvas	0.70	5.74	0.32	36
46	Sawmills	0.45	2.23	0.06	36
47	Hardwood dimension and flooring mills	1.01	65.76	0.98	36
48	Millwork, wood kitchens and cabinets	0.79	3.76	0.17	36
49	Veneer and plywood	0.47	2.83	0.12	36
50	Wood pallets, skids, and containers	1.35	18.39	0.83	36
52	Wood preserving and particleboard	1.18	36.75	0.95	36
53	Household furniture	0.30	3.04	0.19	36
54	Office furniture	0.84	6.03	0.50	20[a]
56	Paper mills, except building papers	0.17	1.24	0.04	27[a]
58	Paper bags, board, and stationery products	1.14	6.11	0.36	36
59	Sanitary paper products	1.26	10.79	0.67	29[a]
60	Building paper and board mills	0.51	2.92	0.11	32[a]
61	Paper coating and glazing	0.40	5.39	0.26	35[a]
62	Paperboard containers and boxes	0.95	9.14	0.56	36
64	Periodicals, books, and greeting cards	0.94	38.46	0.95	36
65	Printing	1.24	23.41	0.84	36
66	Industrial inorganic and organic chemicals	0.93	17.14	0.80	36
67	Agricultural chemicals	1.13	9.35	0.54	36
68	Chemical preparations	0.93	27.01	0.91	36
69	Plastics materials and resins	0.98	11.97	0.66	36
70	Synthetic rubber	0.50	2.53	0.10	33[a]

Table 3, Cont'd.: Estimates of the Elasticity of Substitution between U.S. Imports from Mexico, Canada, and the Rest of the World

Sector	Description	Elast.	T-Stat.	R-Sqr.	Obs.
71	Organic fibers	0.90	9.15	0.55	36
72	Drugs	0.98	69.31	0.99	36
73	Soap, detergents, and sanitation goods	0.95	20.25	0.85	36
74	Paints and allied products	1.04	5.93	0.43	26[a]
75	Petroleum refining and products	0.96	5.81	0.32	36
76	Paving mixtures and blocks, asphalt felts	1.00	10.90	0.62	36
77	Tires and inner tubes	0.87	5.63	0.34	32[a]
78	Rubber and plastics footwear	0.81	3.10	0.13	30[a]
79	Other rubber products	1.05	18.65	0.83	36
80	Miscellaneous plastics products	0.99	12.86	0.70	36
81	Leather tanning and finishing	0.80	6.08	0.34	36
82	Shoes, except rubber	0.65	2.33	0.07	36
83	Other leather goods	1.03	9.93	0.57	36
84	Glass and glass products, exc. containers	1.04	28.94	0.92	36
85	Glass containers	0.85	10.36	0.66	31[a]
86	Cement, hydraulic	0.58	2.72	0.10	36
87	Brick and structural clay tile	0.98	6.77	0.40	36
88	Ceramic wall and floor tile	1.00	33.11	0.94	36
89	Structural clay products, n.e.c.	1.04	13.31	0.73	33[a]
90	Ceramic plumbing and electrical supplies	1.00	26.02	0.91	36
91	China and earthenware products	1.14	15.82	0.78	36
92	Concrete, lime, and gypsum products	1.00	13.05	0.72	36
93	Stone and nonmetallic mineral products	1.13	37.93	0.95	36
94	Primary steel	0.76	11.54	0.62	36
95	Iron and steel foundries	0.78	10.91	0.64	36
97	Primary copper	0.79	13.04	0.71	36
98	Primary lead, zinc, and nonfer. metals, n.e.c.	0.95	2.79	0.10	36
99	Primary aluminum	0.58	2.57	0.08	36
101	Copper rolling and drawing	-0.43	-1.48	0.03	34[a]
102	Aluminum rolling and drawing	0.90	13.42	0.73	34[a]
103	Other nonfer. rolling, drawing, and insulating	1.00	14.57	0.76	36
106	Metal barrels, drums and pails	0.98	35.98	0.95	36
107	Metal plumbing fixtures and heating equipment	1.02	27.27	0.92	35[a]
108	Fabricated metal work	0.93	16.20	0.79	36
109	Fabricated plate work (boiler shops)	0.38	2.14	0.06	34[a]
110	Screw machine products and bolts, etc.	1.08	9.81	0.57	36
111	Forgings and stampings	1.03	15.03	0.77	36
112	Cutlery	1.15	14.25	0.78	29[a]
113	Hand tools	1.00	46.76	0.97	36
115	Other fabricated metal products	0.97	20.30	0.86	36
116	Pipe, valves, and pipe fittings	1.02	42.28	0.96	36
118	Internal combustion engines, n.e.c.	1.01	58.18	0.98	35[a]
119	Farm and garden machinery and equipment	0.88	17.02	0.78	36
120	Construction, mining and oil field machinery	1.00	60.37	0.98	35[a]
121	Elevators, conveyors, cranes	1.02	19.20	0.84	33
122	Machine tools and power driven hand tools	0.99	26.08	0.90	36
123	Special industry machinery	1.00	26.26	0.91	36
124	Pumps, compressors, blowers, fans, furnaces	1.11	32.37	0.94	36
125	Ball and roller bearings, transmission equip.	0.99	15.30	0.77	36
127	Electrical computing equipment	1.02	16.58	0.82	36
128	Service industry machines	1.05	35.09	0.95	34[a]
129	Transformers, switchgear and switchboard app.	0.79	14.62	0.75	36
130	Electrical industrial apparatus	1.01	37.54	0.95	36

Table 3, Cont'd.: Estimates of the Elasticity of Substitution between U.S. Imports from Mexico, Canada, and the Rest of the World

Sector	Description	Elast.	T-Stat.	R-Sqr.	Obs.
132	Household refrigerator and freezers	1.10	12.93	0.71	35[a]
134	Electric housewares and fans	0.79	7.25	0.42	36
136	Sewing machines and other household appliances	0.94	23.71	0.89	36
137	Electric lamps, lighting, and wiring devices	1.01	33.99	0.94	36
138	Radio, TV, phonograph records and tapes	1.08	25.59	0.90	36
139	Telephone and telegraph apparatus	1.18	26.61	0.97	12[a]
140	Radio and TV communication equipment	0.95	30.03	0.93	36
141	Electron tubes	0.67	4.47	0.26	26[a]
142	Semiconductors and other electronic components	0.86	15.68	0.78	36
143	Storage batteries	0.96	23.78	0.95	16
144	Electrical equipment and supplies	1.05	54.84	0.98	36
145	Motor vehicles, parts and accessories	0.98	41.50	0.96	36
149	Boat building and repairing	0.97	18.69	0.84	33[a]
151	Motorcycles, bicycles, and parts	0.93	5.30	0.31	34[a]
155	Ordnance and accessories	0.92	9.67	0.68	23[a]
157	Engineering, scientific, and optical equipment	1.05	26.77	0.94	23[a]
158	Measuring devices and environmental controls	1.00	28.38	0.92	36
159	Surgical, medical and dental equipment	0.97	24.51	0.90	36
160	Watches, clocks, and ophthalmic goods	0.99	11.19	0.64	36
161	Photographic equipment and supplies	0.89	10.12	0.61	34[a]
162	Jewelry, musical instruments, toys	0.91	11.45	0.65	36
163	Pens, pencils, brooms, burial caskets, signs	0.92	26.53	0.91	36

Note: [a]One or more gaps were present in the time series so Savin and White's (1978) procedure was used to correct for serial correlation with missing observations.

Source: Authors' estimates.