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Long-Run Industry-Level Estimates of U.S. Armington Elasticities

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Abstract: A key relationship for trade policy analysis is the degree of substitution between imported and domestic goods due to changes in the relative price of those two goods, commonly known as the Armington elasticity. We estimate Armington elasticities for 311 industries at the 4-digit SIC level over the period 1989 to 1995. Our estimation results offer the most comprehensive, disaggregated, and up-to-date set of Armington elasticities. We report long-run estimates when possible, and find that long-run estimates are on average twice as large as the short-run estimates. This is important since long-run estimates are more appropriate for most trade policy analysis than short-run estimates. Further, it is shown that statistically significant differences exist within most 3-digit SIC industries, which highlights the importance of estimation at a disaggregated level since policy changes are typically focused on narrow product definitions.

JEL Classifications: F1 (Trade), C1 (Econometric and Statistical Methods)

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I. Introduction

Using economic models to evaluate changes in trade policy generally requires the conversion of policy changes into price effects. Model analyses use these price shifts to determine how policy is expected to affect output, employment, trade flows, economic welfare, and other variables of interest. The direction and magnitude of a trade policy change on individual variables depends on the size of the shock as well as the behavioral relationships present in the economy. When evaluating policy shifts within an economic model, these behavioral relationships largely take the form of elasticities reflecting the responsiveness of one set of variables to a change in a second set. For example, trade policy often takes the form of a change in the relative price of traded goods and domestic sales. As a result, a key relationship for model analysis is the degree of substitution between imported and domestic goods due to changes in the relative price of those two goods, commonly known as the Armington elasticity.[1]

In general, knowledge of elasticities is important for aggregate issues, such as changes in tariffs and taxes. Such policy changes will affect a country's trade balance, level of income, and employment, depending on the elasticity magnitudes. The Armington elasticity is an essential component of modeling the effects of international trade policy. Indeed, trade substitution elasticities can drive key results from applied general equilibrium modeling. Since results of trade policy analysis using static computable models are generally interpreted as the long-run effect of a policy change being considered, we attempt to extract the long-run estimates from the data. In doing so, this paper provides the most comprehensive and disaggregated set of Armington elasticity estimates to date.

[1]The constant elasticity of substitution (CES) specification for the trade substitution elasticity is derived from Armington (1969).

The paper is organized as follows. The next section provides an overview of previous work in this area, section III presents the empirical model, and section IV describes the data used in the estimations. The econometric methodology is discussed in section V, and the elasticity estimates and cross-industry comparisons are available in the final section.

II. Literature

Comprehensive industry-level estimates of Armington elasticities have appeared intermittently over the last few decades. Four well-known studies available for U.S. imports include Stern, Francis, and Schumacher (1976), Shiells, Stern, and Deardorff (1986), Reinert and Roland-Holst (1992), and Shiells and Reinert (1993). These papers focus on industry-level detail at the two- or three-digit SIC level.

One of the first systematic studies to provide import-demand elasticities for the U. S. was carried out by Stern, et al. (1976). This study offers "best estimates" of U.S. import-demand elasticities for 28 industries at the 3-digit ISIC level. Interestingly, rubber products, wearing apparel, metal products excluding machinery and transport equipment were among the sectors found to be "extremely import sensitive," while food, beverages, textiles, tobacco, machinery including electrical machinery, and iron and steel were classified as "moderately import sensitive." The wood and paper products industries were considered "import inelastic."

Shiells, et al. (1986) estimated trade substitution elasticities using a simple stock-adjustment model with annual data from 1962-1978 for 163 disaggregated industries. The authors obtained statistically significant Armington elasticities for 122 of 163 sectors estimated. Their estimates compared adequately with previous estimates from Stern et al. (1976).

Reinert and Shiells (1993) disaggregated U.S. imports into those from the NAFTA members and those from the rest of the world (ROW). Using quarterly data over 1980-1988, they obtained estimates for 128 mining and manufacturing sectors. Elasticities were estimated using three specifications: (i) generalized least squares estimation technique, based on a Cobb-Douglas price aggregator; (ii) maximum likelihood estimation using a CES price aggregator; and, (iii) a simultaneous equation estimator that uses a Cobb Douglas price aggregator and employs a distributed lag model. Reinert and Shiells found the estimates to be relatively insensitive across the three alternative estimation procedures.

Reinert and Roland-Holst (1992) estimated Armington elasticities for 163 U.S. mining and manufacturing sectors. They obtained significant estimates for approximately two-thirds of the 3-digit SIC industries estimated using quarterly data from 1980-1988. Reinert and Roland-Holst's elasticity estimates are the most widely cited estimates in the literature; however, these estimates are now over a decade old.

While the aforementioned papers provide valuable estimates of trade substitution elasticities, they do not consider explicitly the long-run aspect that is applicable to applied partial and general equilibrium modeling. In this paper, we estimate Armington elasticities for 312 industries at the 4-digit SIC level over the period 1989 to 1995. Where appropriate, we employ techniques that extract the long-run estimates from the data in order to make the estimates particularly relevant to applied modeling of trade policy.

III. Empirical Model

A standard assumption in trade policy models is that consumers differentiate between domestic and imported goods.[2] It follows that similar domestic and imported goods are substitutes in consumption. The Armington elasticity that we estimate below describes the ease of substitution between domestic goods and the composite import, by sector. The Armington assumption considerably simplifies the task of parameterizing a multi-region trade model.[3]

The elasticity of substitution between home sales and imports can be derived from a familiar two-stage budgeting process.[4] From an economy-wide perspective, a representative consumer has a well-behaved utility function defined over composite good **C**, which contains imported goods (M) and domestic goods (D). In the first stage, a representative consumer allocates total expenditures to different product categories. In the second stage, a representative consumer allocates expenditures within each group between D and M, taking the relative prices as given. The Armington specification yields the following CES functional form for the composite good:

$$\mathbf{C} = \alpha \left[\beta \cdot M^{((\sigma-1)/\sigma)} + (1-\beta) \cdot D^{((\sigma-1)/\sigma)}\right]^{\sigma/(\sigma-1)} \qquad (1)$$

where σ represents the constant elasticity of substitution between domestic and import goods, and α and β are calibrated parameters in the demand function. We follow the standard assumptions of a well-behaved utility function and continuous substitution between M and D. Also, the assumption of weak separability of product categories in the utility function means that

[2]See Shiells, Stern and Deardorff (1986).

[3]However, inferences about policy and welfare drawn from models that incorporate the Armington structure can be misrepresented. See Francois and Shiells (1994) for an overview of the controversy over the Armington assumption.

[4]See Helpman and Krugman (1985), and Shiells, et al. (1986).

the allocation of expenditures to goods within an industry group is conditional on the level of spending on this group. Then, an optimization of the second-stage sub-utility function yields a ratio of imports to domestic goods that is a function of relative prices:[5]

$$M/D = [(\beta/(1-\beta))\cdot(p_d/p_m)]^{\sigma} \qquad (2)$$

where prices are multiplicative. This first-order condition equates the rates of substitution and relative prices, and the Armington elasticities can be estimated for disaggregated commodity categories.[6] This first-order condition can be conveniently rewritten as the base equation used in the estimations:

$$y = a_o + a_1 \cdot x \qquad (3)$$

where $y = \ln(M/D)$, $a_o = \sigma \ln[\beta/(1-\beta)]$, a_1 is the Armington elasticity of substitution between imports and domestic sales, and x represents $\ln(p_d/p_m)$.[7]

IV. Data

Four data series are required to operationalize equation (3): real imports, domestic sales of domestically produced goods, and the prices of those two groups of goods. With the exception of domestic prices, each of these series is constructed from data that are compiled at a more detailed level. The quantity and price data were constructed on a monthly frequency

[5] de Melo and Robinson (1989) provide a detailed discussion of CES import behavior in a general equilibrium model.

[6] Winters (1984) discusses the separability assumptions. The parameter σ is also seen as the compensated price elasticity of import demand.

[7] The log linear equation is a standard specification used in the literature to estimate Armington elasticities. See, for instance, Shiells, et al. (1986); Shiells and Reinert (1993); Ho and Jorgenson (1997); Reinert and Roland-Holst (1992)).

covering the period January 1989 to December 1995. The data and industry analysis is generally defined at the 4-digit level of the U.S. Standardized Industrial Classification (SIC).[8]

Real Import Quantities and Prices

Real import quantities and prices are constructed from U.S. Department of Commerce (DOC) trade data that have been disaggregated to the ten-digit level of the U.S. Harmonized Tariff Schedule (HTS). One of the main difficulties associated with data featuring this level of detail is to aggregate these data to the four-digit SIC level. A concordance compiled by the U.S. DOC and maintained by the U. S. International Trade Commission was used to match the detailed ten-digit HTS lines to four-digit SIC categories. Both customs value (CV) data and units of quantity were collected to construct real import series. When the detailed trade series are grouped by four-digit SIC category, the quantity units across trade categories are often not identical. For those industries, we constructed real import series using a Laspeyres index with a 1992 base year.[9] Aggregate import values were deflated by these indices to construct the industry level import price indices.

Domestic Sales and Price Data

The most challenging series to construct was domestic sales of domestically produced goods. Domestic sales of traded goods represent the net of total domestic production less exports

[8]The 1987 SIC descriptions are provided in the *Standard Industrial Classification Manual* (1987).

[9]Monthly average 1992 unit values of each quantity type were used as the base weights. Ten-digit tariff lines that were sparsely populated were dropped during the aggregation process.

and each of those variables had to be individually constructed. Total domestic production was constructed from the following approach.[10]

First, for each four-digit SIC category, 1992 average monthly shipment values were calculated from annual total shipments data obtained from the *Survey of Manufacturing* published by the U.S. Census Bureau. Second, monthly industrial production indices at the 4-digit SIC level were collected from the Federal Reserve Board of Governors (BOG) and normalized to the 1992 monthly average.[11] Third, real monthly domestic output series were calculated as a product of the 1992 monthly average domestic shipments and the normalized industrial production series. Next, the 1992 monthly average export values for each SIC category were calculated. Fifth, real monthly exports were constructed using the same procedure as imports, a Laspayre index of usable ten-digit export categories. An export index was calculated by normalizing these data to their 1992 monthly averages. Sixth, monthly exports were constructed as a product of the real monthly export index and the 1992 monthly average value of exports for each 4-digit SIC category.[12] Finally, real domestic sales of the domestically produced goods are calculated as the difference between the constructed monthly domestic production and monthly exports.

Prices of domestically produced goods were proxied using the producer price indices (PPIs) available from the Bureau of Labor Statistics (BLS). Prices used in construction of the PPI are generally ex-factory which apply to the first significant commercial transaction in the

[10]The technique we used to construct U.S. domestic sales is outlined in Reinert and Roland-Holst (1992).

[11]We utilized both published and unpublished series. Unpublished series was kindly provided by Charlie Gilbert of the BOG; public data were downloaded from www.bog.frb.fed.us/releases/download.htm.

[12]The average monthly export values were calculated using all 10-digit HTS lines, whether or not they were included to construct the index of real exports.

United States. The classification system corresponds to commodity lines, and products were grouped by similarity of end-use or material composition and were seasonally adjusted. Price series were generally identifiable for 4-digit SIC industry levels from January 1989 to December 1995. Among the sectors chosen for this analysis, 379 out of the 415 4-digit SIC category pricing series were available. The method used to select a replacement was to use the closest available product category, which was found either at the 5- or 3-digit level. A two-way concordance between SIC codes, industrial production series, and pricing proxies was constructed from the most disaggregated series available. In the event that data series were not available at the 4-digit level, data were constructed from concorded data to the 3- or 4-digit level.[13]

V. Econometric Results

Specification

An assumption in comparative static modeling is that prices and quantities adjust instantaneously to some given exogenous change. However, adjustment actually may take some time, perhaps due to factors such as consumption patterns, trade in intermediate goods, and existing inventory levels. Therefore, we attempt to allow for time of adjustment in the estimation procedure. Accordingly, the estimation technique of equation (3) was determined by the time-series properties of the quantity and pricing series. We use the weighted symmetric test to determine the order of integration of the two series used in estimating equation (3), the ratio of

[13]Out of the 415 industrial production index series used for the estimations, 208 and 183 series were originally provided at the 3- and 4-digit level, respectively.

domestic sales to imported goods, and the corresponding relative prices.[14] When series were found to be intergrated of order one, or I(1), tests for second-order integration were easily rejected. Therefore, each series was either stationary [I(0)] in log-levels or in first-differenced form.

A group of non-stationary time series is cointegrated if a linear combination of them is stationary; that is, the combination does not have a stochastic trend. We tested for a long-run, stationary relationship between the ratio of domestic goods and imports, and the relative price ratio for each SIC series using the Engle-Granger technique. The Engle-Granger test is only valid if all the cointegrating variables are I(1). Accordingly, this test was performed only when both the ratio of domestic goods and imports, and the relative price ratio, were I(1). The cointegration results allowed us to determine whether a single-equation error correction model would be an appropriate specification for each series.[15]

Domestic and import price and quantity data were available for 312 of the 391 four-digit SIC categories examined. A three-step procedure was used to select the model that would generate, when possible, long-run elasticity estimates.

First, for industries having stationary log-level data, a parsimonious geometric lag model was estimated because it can be used to easily extract both short- and long-run elasticity estimates.[16] In these cases, equation (3) was operationalized as:

$$y_t = a_o + a_1 x_t + a_2 y_{t-1} + u_t \qquad (4)$$

[14]The Weighted Symmetric test is recommended over the Dickey-Fuller test because it has (sometimes only slightly) higher power (see Pantula, Gonzales-Farias, and Fuller, 1994).

[15]The theory is set forth in Engle and Granger (1987).

[16]See Pindyck and Rubinfeld (1981), pp. 269-70.

where y and x are the goods and price ratios, respectively, and u_t represents an *iid* error term. Long-run elasticity estimates can be estimated as $a_1/(1-a_2)$ if $1< a_2 <0$; otherwise the reported elasticities are a_1.

Second, when the data for an SIC were both I(1) and cointegrated, a single-equation error-correction model of the following form was estimated to extract the long-run elasticity estimates:

$$\Delta y_t = a_o + a_1 \Delta x_t + a_2 y_{t-1} + a_3 x_{t-1} + u_t \qquad (5)$$

where $\Delta y_t = y_t - y_{t-1}$ and u_t represents an *iid* error term. Equation (5) is a form of the unrestricted version of the error-correction mechanism (ECM) model associated with Hendry, Pagan, and Sargan (1984). This model allows the short-run and long-run responses of demand with respect to price to be determined completely by the data.[17] Specifically, short-run elasticity estimates are (a_1) and long-run elasticity estimates are ($-a_3/a_2$).

Finally, when both series were I(1) and not cointegrated or when only one series was stationary, the variables were first-differenced for stationarity and the following model was estimated:

$$\Delta y_t = a_o + a_1 \Delta x_t + u_t \qquad (6)$$

where a_1 is the (short-run) Armington elasticity. Monthly dummies are also added to each regression.

[17] Johnson, et al. (1992) employ this error correction modeling technique to estimate short-run and long-run elasticities for Canadian consumption of alcoholic beverages.

Results

This section discusses the results of the Armington elasticity estimates outlined above. Table 1 reports short-run and long-run estimation results from equation (4).[18] These Armington elasticity estimates are for those sectors in which both price and quantity series were I(0). Of the 72 sectors estimated for this group, 63 had positive short-run and long-run Armington estimates that were each significant at the ten-percent level, only one dropped out at the five-percent level, and 20 had significant serial correlation.

In reviewing the long-run estimation results, the five most import sensitive sectors were plastic materials and resins, photographic equipment, paperboard boxes, malt beverages, and softwood veneer and plywood. A few of the least import sensitive sectors included games and toys, nonrubber footwear, gray iron foundries, rolling mill machinery, and aircraft. Table 2 shows the ratios of long-run to short-run elasticity estimates from equation (4). The long-run estimates in this group were over five times as large as the short-run estimates, although, on average, the long-run elasticities were about twice as large as the short-run elasticities.

Table 3 reports estimation results from equation (5). Of the 28 sectors that had non-stationary and cointegrated price and quantity series, 21 sectors resulted in positive and significant long-run Armington estimates. Table 4 reports estimation results from equation (6), which was used for sectors that had non-stationary but not cointegrated price and quantity series, or both stationary and non-stationary series. Out of the 211 sectors estimated for this group, 184 sectors resulted in positive and significant (short-run) Armington estimates.

Overall, of the 311 sectors estimated, 268 had positive and significant Armington estimates that were significant at the ten-percent level. Rough comparisons between these long-

[18]Note that the price series in equation (2) is inverted, thus, the elasticity estimates are positive.

run estimates and those reported by Reinert and Roland-Holst reveal that the long-run estimates reported here are generally larger.[19]

To test the relevance of estimating Armington elasticities at the 4-sigit SIC level over the 3-digit level, we conduct common means tests within 3-digit SIC levels to determine how comparable elasticities are within the same broadly defined industries. The results suggest that statistically significant differences exist among most of the 4-digit SICs within the respective 3-digit SIC category. Only the statistically significant estimates were tested. The results of the means tests, reported in Table 5, reveal significant differences within most 3-digit sectors. For 367 of the 416 means tests conducted on short-run elasticity estimates, the null hypothesis that the elasticity estimates within the same 3-digit SIC were not statistically significantly different was rejected. Similarly, the null hypothesis was rejected for the 25 of the 27 means tests conducted on the long-run estimates. For example, consider SIC 281. The null hypothesis that the difference between estimated elasticities for SIC 2812 and SIC 2813 is not statistically significant was rejected; hence, the difference between elasticity estimates SIC 2812 and SIC 2813 was found to be statistically significant.

VI. Conclusion

This paper provides the most comprehensive and disaggregated set of Armington elasticities to date. Because most trade policy analysis attempts to estimate the long-run effects of a trade policy shock, we attempt to extract the long-run relationships from the data when possible. On average, the long-run estimates are twice as large as the short-run estimates. Also,

[19]While Reinert and Roland-Holst estimated at the 3-digit SIC level and we estimated at the 4-digit SIC level, a rough comparison was plausible for 50 sectors. The long-run estimates reported here were greater than 42 of those 50 reported by Reinert and Roland-Holst (1992). A table of these comparisons is available upon request.

we find statistically significant differences within most 3-digit SIC industries. Since much of the applied trade policy analysis is conducted at the disaggregated product level, our results highlight the importance of obtaining elasticity estimates at the most disaggregated level that the data allow. While our long-run estimates are somewhat larger than the short-run estimates, they are much smaller than those often used in modeling work (see, for example Harrison, Rutherford and Tarr, 1996).

An important extension of this literature is an analysis of determinants of these elasticities across industries. In a recent paper, Blonigen and Wilson (1999) analyzed whether product, industry, and political characteristics between U.S. and foreign goods are related to systematic differences in Armington elasticities across industries. The authors present evidence that multinational presence in downstream industries and home bias variables, specifically unions and entry variables, may affect substitution patterns. While we do not explore reasons behind the differences across industry elasticities, these Armington estimates should provide opportunities for further such research.

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Table 1. Short-run and long-run Armington elasticity estimates

		Short-Run Coefficients		Long-Run Coefficients				
SIC	Description	Elas	SE	Elas	SE	R2	DW Stat.	obs
2011	Meat packing plants	0.909	0.350 **	1.580	0.592 ***	0.59	-0.89	83
2015	Poultry and egg processing	0.700	0.133 ***	1.249	0.253 ***	0.62	1.80	83
2021	Creamery butter	1.699	0.207 ***	1.699	0.266 ***	0.59	2.65 *	83
2022	Cheese, natural and processed	1.003	0.149 ***	1.346	0.174 ***	0.86	2.59 *	83
2026	Fluid milk	-0.073	0.187	-0.131	0.341	0.31	-1.66	83
2047	Dog and cat food	0.607	0.194 ***	1.397	0.420 ***	0.65	-1.61	83
2075	Soybean oil mills	1.076	0.077 ***	1.436	0.073 ***	0.90	4.60 *	83
2082	Malt beverages	0.783	0.350 **	3.342	1.856 *	0.65	-1.63	83
2241	Narrow fabric mills	0.481	0.130 ***	1.335	0.463 ***	0.58	-1.73	83
2342	Brassieres and allied garments	-0.588	0.234 **	-2.103	0.410 ***	0.88	-4.12 *	83
2386	Leather and sheep lined clothing	1.356	0.309 ***	2.059	0.383 ***	0.84	1.97	73
2389	Apparel and accessories, n.e.c.	1.364	0.093 ***	1.540	0.115 ***	0.89	4.56 *	83
2392	Housefurnishings, n.e.c.	0.086	0.085	0.119	0.120	0.48	-0.20	83
2394	Canvas and related products	0.998	0.161 ***	2.130	0.291 ***	0.90	-0.09	83
2396	Automotive and apparel trimmings	0.735	0.140 ***	1.033	0.169 ***	0.62	-0.21	83
2436	Softwood veneer and plywood	0.839	0.302 ***	3.195	0.925 ***	0.83	-1.07	77
2452	Prefabricated wood buildings	1.032	0.052 ***	1.109	0.071 ***	0.89	3.07 *	83
2491	Wood preserving	0.581	0.124 ***	1.088	0.110 ***	0.89	0.05	83
2657	Folding paperboard boxes	0.798	0.257 ***	3.875	0.495 ***	0.95	-1.16	83
2672	Paper-coated and laminated, n.e.c.	0.974	0.129 ***	1.480	0.475 ***	0.79	9.62 *	83
2813	Industrial gases	0.962	0.032 ***	1.050	0.045 ***	0.94	4.41 *	83
2816	Inorganic pigments	0.483	0.157 ***	1.152	0.476 **	0.52	-1.16	83
2821	Plastics materials and resins	0.873	0.184 ***	4.834	1.248 ***	0.89	-0.13	83
2823	Cellulosic manmade fibers	1.091	0.265 ***	2.094	0.468 ***	0.65	3.36 *	82
2836	Biological products, except diagnostic	0.297	0.155 *	0.675	0.454	0.40	-1.29	83
2841	Soap and other detergents	0.353	0.290	2.929	3.076	0.77	-0.86	83
2879	Agricultural chemical products	1.028	0.200 ***	1.620	0.391 ***	0.68	-0.10	83
2891	Adhesives and sealants	1.181	0.091 ***	1.873	0.115 ***	0.92	2.29	83
2899	Chemical preparations, n.e.c.	1.111	0.094 ***	1.811	0.125 ***	0.91	2.76 *	83
2951	Asphalt paving mixtures and blocks	0.899	0.216 ***	1.079	0.240 ***	0.76	1.27	83
2999	Petroleum and coal products, n.e.c.	0.148	0.153	0.121	0.129	0.24	1.87	83

Table 1, cont'd.

		Short-Run Coefficients			Long-Run Coefficients					
SIC	Description	Elas	SE		Elas	SE		R2	DW Stat.	obs
3089	Plastic products, n.e.c.	0.693	0.150	***	1.223	0.302	***	0.44	0.77	83
3149	Nonrubber footwear	0.363	0.223		0.725	0.371	*	0.51	2.29	81
3255	Clay refactories	0.950	0.246	***	1.463	0.315	***	0.70	2.12	81
3264	Porcelain electrical supplies	0.949	0.033	***	1.023	0.036	***	0.94	4.58 *	83
3274	Lime	0.392	0.233	*	1.814	1.308		0.75	-0.41	83
3291	Abrasive products	1.164	0.124	***	2.382	0.305	***	0.77	-0.04	83
3295	Minerals, ground or treated	1.073	0.063	***	1.128	0.105	***	0.81	1.19	83
3321	Gray iron foundries	0.359	0.107	***	0.757	0.246	***	0.50	-0.05	83
3365	Aluminum foundries	1.121	0.177	***	1.690	0.327	***	0.61	1.21	83
3399	Primary metal products, n.e.c.	1.342	0.126	***	1.232	0.115	***	0.73	4.60 *	83
3412	Metal barrels, drums, and pails	0.940	0.166	***	1.983	0.451	***	0.63	-1.18	83
3421	Cutlery	1.019	0.055	***	1.159	0.067	***	0.86	4.34 *	83
3423	Hand and edge tools, n.e.c.	0.842	0.112	***	1.140	0.138	***	0.71	-0.16	83
3429	Hardware, n.e.c.	0.839	0.122	***	1.519	0.324	***	0.69	0.17	71
3432	Plumbing and heating, except electric	1.026	0.083	***	1.631	0.105	***	0.92	4.05 *	83
3433	Heating equipment except electric	0.879	0.076	***	1.049	0.098	***	0.87	0.18	83
3489	Ordnance and accessories, n.e.c.	0.494	0.082	***	0.568	0.131	***	0.53	1.40	64
3499	Fabricated metal products, n.e.c.	1.339	0.230	***	1.962	0.367	***	0.64	0.80	83
3531	Construction machinery	0.826	0.122	***	0.995	0.108	***	0.53	0.61	83
3534	Elevators and moving stairways	0.851	0.072	***	1.141	0.109	***	0.77	4.37 *	83
3535	Conveyers and conveying equipment	0.823	0.063	***	0.967	0.098	***	0.82	1.38	79
3543	Industrial patterns	0.896	0.062	***	1.229	0.059	***	0.91	1.71	83
3547	Rolling mill machinery	0.507	0.128	***	0.870	0.231	***	0.44	-1.60	83
3555	Printing trades machinery	0.900	0.042	***	0.939	0.047	***	0.90	2.50	83
3567	Industrial process furnaces and ovens	0.868	0.056	***	0.991	0.080	***	0.81	1.62	74
3585	Refrigeration and heating equipment	0.541	0.154	***	1.059	0.383	***	0.57	-0.16	83
3586	Measuring and dispensing pumps	0.978	0.040	***	1.050	0.030	***	0.95	3.56 *	83
3594	Fluid power cylinders and actuators	0.974	0.075	***	1.694	0.118	***	0.86	0.87	83
3596	Scales and balances, except laboratory	0.793	0.086	***	1.030	0.118	***	0.73	3.30 *	83
3613	Switchgear and switchboard apparatus	0.540	0.118	***	2.423	0.690	***	0.83	-0.65	83
3641	Electric lamps	0.203	0.120	*	0.986	0.780		0.78	-2.81 *	83

Table 1, cont'd.

		Short-Run Coefficients			Long-Run Coefficients					
SIC	Description	Elas	SE		Elas	SE		R2	DW Stat.	obs

3692	Primary batteries, dry and wet	0.473	0.157 ***	1.326	0.409 ***	0.82	-0.92	83
3721	Aircraft	0.548	0.102 ***	0.930	0.148 ***	0.56	2.13	81
3732	Boat building and repairing	0.462	0.095 ***	1.191	0.245 ***	0.81	0.64	83
3825	Instruments to measure electricity	1.036	0.139 ***	1.779	0.293 ***	0.63	-0.51	82
3851	Ophthalmic goods	0.852	0.123 ***	1.353	0.171 ***	0.73	1.50	83
3861	Photographic equipment and supplies	0.918	0.197 ***	4.003	1.229 ***	0.78	0.36	83
3915	Jewelers' materials and lapidary work	0.989	0.031 ***	1.055	0.033 ***	0.97	4.20 *	83
3944	Games, toys, and children's vehicles	0.512	0.212 **	0.579	0.255 **	0.31	0.63	83
3991	Brooms and brushes	0.150	0.083 *	0.209	0.128	0.31	-0.92	83
3993	Signs and advertising displays	0.780	0.094 ***	1.080	0.174 ***	0.65	5.53 *	83

The regressions are corrected for heteroskedasticity using White's correction method; the standard errors are heteroskedastic-consistent. *** denotes significance at the one-percent level, ** denotes significance at the five-percent level, * denotes significance at the ten-percent level.

Table 2. Ratios of long-run to short-run elasticities, in decending order

SIC	Description	Ratio
2821	Plastics materials and resins	5.54
2657	Folding paperboard boxes	4.86
3613	Switchgear and switchboard apparatus	4.48
3861	Photographic equipment and supplies	4.36
2082	Malt beverages	4.27
2436	Softwood veneer and plywood	3.81
2342	Brassieres and allied garments	3.58
3692	Primary batteries, dry and wet	2.80
2241	Narrow fabric mills	2.78
3732	Boat building and repairing	2.58
2816	Inorganic pigments	2.39
2047	Dog and cat food	2.30
2394	Canvas and related products	2.13
3321	Gray iron foundries	2.11
3412	Metal barrels, drums, and pails	2.11
3291	Abrasive products	2.05
3585	Refrigeration and heating equipment	1.96
2823	Cellulosic manmade fibers	1.92
2491	Wood preserving	1.87
3429	Hardware, n.e.c.	1.81
2015	Poultry and egg processing	1.78
3089	Plastic products, n.e.c.	1.76
3594	Fluid power cylinders and actuators	1.74
2011	Meat packing plants	1.74
3825	Instruments to measure electricity	1.72
3547	Rolling mill machinery	1.72
3721	Aircraft	1.70
2899	Chemical preparations, n.e.c.	1.63
3851	Ophthalmic goods	1.59
3432	Plumbing and heating, except electric	1.59
2891	Adhesives and sealants	1.59
2879	Agricultural chemical products	1.58
3255	Clay refactories	1.54
2672	Paper-coated and laminated, n.e.c.	1.52
2386	Leather and sheep lined clothing	1.52
3365	Aluminum foundries	1.51
3499	Fabricated metal products, n.e.c.	1.46
2396	Automotive and apparel trimmings	1.41
3993	Signs and advertising displays	1.39
3543	Industrial patterns	1.37
3423	Hand and edge tools, n.e.c.	1.35
2022	Cheese, natural and processed	1.34
3534	Elevators and moving stairways	1.34
2075	Soybean oil mills	1.33
3596	Scales and balances, except laboratory	1.30

Table 2, cont'd.

SIC	Description	Ratio
3531	Construction machinery	1.20
2951	Asphalt paving mixtures and blocks	1.20
3433	Heating equipment except electric	1.19
3535	Conveyers and conveying equipment	1.18
3489	Ordnance and accessories, n.e.c.	1.15
3567	Industrial process furnaces and ovens	1.14
3421	Cutlery	1.14
3944	Games, toys, and children's vehicles	1.13
2389	Apparel and accessories, n.e.c.	1.13
2813	Industrial gases	1.09
3264	Porcelain electrical supplies	1.08
2452	Prefabricated wood buildings	1.07
3586	Measuring and dispensing pumps	1.07
3915	Jewelers' materials and lapidary work	1.07
3295	Minerals, ground or treated	1.05
3555	Printing trades machinery	1.04
2021	Creamery butter	1.00
3399	Primary metal products, n.e.c.	1.00

Table 3. Short-run and long-run Armington elasticity estimates

		Short-Run Coefficients			Long-Run Coefficients					
SIC	Description	Elas	SE		Elas	SE		R2	DW Stat.	obs
2043	Cereal breakfast foods	0.642	0.169	***	0.794	0.281	***	0.43	2.26	83
2045	Blended and prepared flour	0.967	0.221	***	2.885	0.250	***	0.62	2.08	83
2051	Bread, cake, and related products	0.404	0.221	*	1.745	0.245	***	0.83	2.23	83
2062	Cane sugar refining	0.932	0.095	***	1.005	0.025	***	0.84	1.93	83
2121	Cigars	1.019	0.016	***	0.980	0.009	***	0.96	2.22	83
2131	Chewing and smoking tobacco and snuff	-0.275	0.281		-0.629	0.459		0.34	2.28	83
2257	Circular knit fabric mills	1.465	0.148	***	2.873	0.367	***	0.81	2.73	83
2258	Lace and warp knit fabric mills	1.374	0.118	***	1.050	0.351	***	0.83	2.44	83
2281	Yarn spinning mills	1.611	0.234	***	0.881	1.053		0.67	2.57	83
2311	Men's and boys' suits and coats	1.177	0.402	***	1.054	1.504		0.73	2.81	83
2384	Robes and dressing gowns	0.890	0.257	***	1.167	0.467	**	0.73	2.42	83
2395	Pleating and stitching	0.983	0.041	***	0.841	0.082	***	0.94	2.24	83
2656	Sanitary food containers	0.780	0.144	***	0.415	0.263		0.59	2.41	83
2835	Diagnostic substances	0.492	0.187	**	0.001	0.606		0.53	2.38	83
2851	Paints and allied products	1.287	0.071	***	1.034	1.080		0.92	2.51	83
3142	House slippers	0.344	0.189	*	-1.322	1.252		0.83	2.51	83
3449	Miscellaneous metal work	0.833	0.190	***	1.059	0.248	***	0.53	2.03	83
3469	Metal stampings, n.e.c.	0.921	0.046	***	1.202	0.235	***	0.88	2.45	83
3536	Hoists, cranes, and monorails	0.507	0.058	***	0.529	0.068	***	0.78	1.84	83
3537	Industrial trucks and tractors	0.820	0.056	***	0.815	0.037	***	0.89	2.14	71
3561	Pumps and pumping equipment	0.962	0.046	***	1.134	0.069	***	0.91	2.32	83
3565	Packaging machinery	1.020	0.055	***	1.017	0.059	***	0.88	2.03	83
3566	Speed changers, drives, and gears	0.918	0.089	***	1.134	0.079	***	0.69	2.10	83
3633	Household laundry equipment	1.072	0.031	***	1.176	0.049	***	0.93	2.40	83
3713	Truck and bus bodies	0.975	0.035	***	0.952	0.113	***	0.96	2.21	83
3715	Truck trailors	0.880	0.103	***	1.351	0.610	**	0.63	2.42	83
3951	Pens and mechanical pencils	0.743	0.275	***	0.864	0.363	**	0.56	2.03	83
3952	Lead pencils and art goods	1.040	0.203	***	2.148	0.198	***	0.68	2.30	83

The regressions are corrected for heteroskedasticity using White's correction method; the standard errors are heteroskedastic-consistent.
*** denotes significance at the one-percent level, ** denotes significance at the five-percent level, * denotes significance at the ten-percent level

Table 4. Short-run Armington elasticity estimates

SIC	Description	Elas	SE		R2	D-W Stat.	Obs
2023	Condensed and evaporated milk	0.590	0.280	**	0.34	2.72	83
2024	Ice cream and frozen desserts	0.496	0.146	***	0.29	2.61	70
2032	Canned specialties	0.505	0.194	**	0.35	2.99	83
2033	Canned fruits and vegetables	1.190	0.208	***	0.65	2.30	83
2034	Dehydrated fruits, vegetables, and soups	0.958	0.087	***	0.69	2.90	83
2035	Pickles, sauces, and salad dressings	0.925	0.189	***	0.66	2.18	83
2037	Frozen fruits and vegetables	1.362	0.162	***	0.54	2.75	83
2041	Flour and other grain mill products	1.390	0.079	***	0.88	2.46	83
2044	Rice milling	0.602	0.297	**	0.22	2.87	83
2046	Wet corn milling	0.350	0.175	**	0.32	2.93	83
2048	Prepared feeds, n.e.c.	0.864	0.055	***	0.81	3.04	83
2064	Candy, confectionary products, chewing gu	0.925	0.186	***	0.66	2.94	83
2066	Chocolate and cocoa products	0.376	0.373		0.40	2.80	83
2068	Salted and roasted nuts and seeds	0.090	0.248		0.58	2.60	83
2074	Cottonseed oil mills	2.351	0.179	***	0.69	2.96	83
2076	Vegetabel oil mills, n.e.c.	2.105	0.176	***	0.66	2.35	83
2077	Animal and marine fats and oil	1.978	0.304	***	0.45	2.84	83
2079	Shortening and cooking oils	0.882	0.231	***	0.42	2.91	83
2083	Malt	3.135	0.230	***	0.72	2.79	83
2085	Distilled liquor, except brandy	0.005	0.204		0.61	2.88	83
2086	Bottled and canned soft drinks	0.560	0.377		0.53	2.18	83
2087	Flavoring extracts and syrups, n.e.c.	0.973	0.135	***	0.54	2.57	83
2095	Roasted coffee	0.319	0.213		0.38	2.45	83
2111	Cigarettes	0.946	0.249	***	0.84	2.00	83
2231	Weaving and finishing mills, wool	0.456	0.209	**	0.34	2.84	83
2252	Hosiery, n.e.c.	-0.381	0.103	***	0.36	2.61	83
2273	Carpets and rugs	0.909	0.099	***	0.63	2.84	83
2284	Thread mills	0.772	0.199	***	0.31	2.81	83
2295	Coated fabrics, not rubberized	0.871	0.089	***	0.71	2.85	83
2296	Tire cord and fabric	1.346	0.516	**	0.48	2.47	83
2297	Nonwoven fabrics	0.789	0.302	**	0.48	3.03	71

Table 4, cont'd.

SIC	Description	Elas	SE		R2	D-W Stat.	Obs
2299	Textile goods, n.e.c.	0.531	0.120	***	0.41	2.78	83
2321	Shirts, men's and boy's	1.183	0.476	**	0.73	2.65	83
2322	Men's and boy's underwear and nightwear	0.368	0.411		0.26	2.89	83
2323	Men's and boy's neckware	0.849	0.150	***	0.71	2.91	83
2325	Men's and boys' trousers and slacks	0.040	0.484		0.62	2.67	83
2329	Men's and boy's clothing	0.860	0.160	***	0.88	2.44	83
2331	Women's blouses and waists	-0.100	0.370		0.79	2.76	83
2335	Women's dresses	0.622	0.252	**	0.82	2.67	83
2337	Women's suits and coats	1.055	0.213	***	0.82	2.80	83
2339	Women's outerwear, n.e.c.	1.063	0.180	***	0.78	1.96	83
2341	Women's and children's underwear	1.123	0.260	***	0.55	3.05	83
2353	Hats and caps	0.368	0.188	*	0.24	2.87	83
2369	Girls' and children's outwear, n.e.c.	0.123	0.278		0.67	2.79	83
2371	Fur goods	0.827	0.104	***	0.79	2.91	83
2385	Waterproof outergarments	0.881	0.059	***	0.85	2.28	83
2391	Curtains and draperies	1.091	0.160	***	0.62	2.97	83
2393	Textile bags	1.020	0.219	***	0.56	2.61	83
2399	Fabricated textile products, n.e.c.	1.184	0.186	***	0.32	3.12	83
2411	Logging	0.616	0.127	***	0.54	2.93	83
2426	Hardwood dimension and flooring mills	0.799	0.183	***	0.20	2.98	83
2429	Special product sawmills, n.e.c.	-0.674	0.736		0.45	2.72	71
2431	Millwork	1.006	0.057	***	0.83	2.83	83
2499	Wood products, n.e.c.	1.379	0.462	***	0.63	2.48	83
2514	Metal household furniture	1.326	0.135	***	0.86	3.00	71
2515	Mattresses and bedsprings	0.795	0.079	***	0.69	2.90	83
2591	Drapery hardware, blinds, and shades	0.978	0.073	***	0.79	2.70	83
2611	Pulp mills	0.994	0.673		0.19	3.03	83
2621	Paper mills	1.055	0.062	***	0.91	2.56	83
2631	Paperboard mills	0.887	0.407	**	0.29	3.01	83
2652	Setup paperboard boxes	0.757	0.358	**	0.30	2.94	83
2653	Corrugated and solid fiber boxes	1.501	0.175	***	0.74	2.74	83
2673	Bags- plastics, laminated, and coated	0.960	0.101	***	0.79	2.87	83

Table 4, cont'd.

SIC	Description	Elas	SE		R2	D-W Stat.	Obs
2674	Bags, uncoated paper and multiwall	1.006	0.185	***	0.54	2.73	83
2675	Die-cut paper and board	0.865	0.248	***	0.46	2.87	83
2676	Sanitary paper products	0.393	0.156	**	0.27	2.70	83
2677	Envelopes	1.044	0.116	***	0.68	2.71	83
2678	Stationary products	1.541	0.244	***	0.53	2.68	83
2679	Converted paper products, n.e.c.	1.074	0.192	***	0.56	2.76	83
2711	Newspapers	1.077	0.037	***	0.90	2.36	83
2721	Periodicals	1.119	0.114	***	0.68	2.75	83
2731	Book publishing	1.056	0.072	***	0.80	2.71	83
2741	Miscellaneous publishing	1.124	0.077	***	0.84	2.73	83
2761	Manifold business forms	0.927	0.155	***	0.58	2.51	83
2782	Blankbooks and looseleaf binders	0.919	0.110	***	0.61	2.46	83
2796	Platemaking services	0.827	0.096	***	0.67	3.19	83
2812	Alkalies and chlorine	0.760	0.163	***	0.94	2.98	83
2822	Synthetic rubber	-0.016	0.377		0.45	2.67	83
2824	Organic fibers, noncellulosic	1.117	0.261	***	0.60	3.06	83
2833	Medicinals and botanicals	0.881	0.048	***	0.90	2.69	83
2842	Polishes and sanitation goods	0.624	0.170	***	0.30	2.87	83
2843	Surface active agents	0.800	0.125	***	0.57	2.73	83
2844	Toilet preparations	0.692	0.100	***	0.60	3.06	83
2874	Phospatic fertilizers	1.215	0.386	***	0.47	1.70	83
2892	Explosives	0.917	0.057	***	0.85	2.61	83
2893	Printing ink	0.709	0.126	***	0.54	2.67	83
2895	Carbon black	-0.242	0.204		0.34	2.84	83
2911	Petroleum refining	0.848	0.376	**	0.17	2.61	83
3011	Tires and inner tubes	0.789	0.136	***	0.58	2.97	83
3021	Rubber and plastics footwear	0.380	0.346		0.60	2.52	83
3052	Rubber and plastics hose and belting	1.225	0.173	***	0.72	3.03	83
3053	Gaskets, packing and sealing devices	1.073	0.105	***	0.67	2.03	83
3069	Fabricated rubber products, n.e.c.	0.814	0.072	***	0.68	2.82	83
3081	Unsupported plastics film and sheet	0.951	0.149	***	0.59	2.95	83
3082	Unsupported plastics profile shapes	0.960	0.028	***	0.95	2.24	83

Table 4, cont'd.

SIC	Description	Elas	SE		R2	D-W Stat.	Obs
3111	Leather tanning and finishing	0.961	0.168	***	0.59	2.75	83
3143	Men's footwear except athletic	0.662	0.202	***	0.63	2.57	83
3144	Women's footwear, except athletic	0.662	0.232	***	0.72	2.67	83
3151	Leather gloves and mittens	0.402	0.161	**	0.58	2.55	83
3171	Women's handbags and purses	1.120	0.183	***	0.83	2.73	83
3172	Personal leather goods, n.e.c.	0.531	0.274	*	0.61	2.41	83
3211	Flat glass	0.889	0.062	***	0.83	2.58	83
3221	Glass containers	0.962	0.190	***	0.57	2.93	83
3229	Pressed and blown glass, n.e.c.	4.847	0.777	***	0.37	3.02	83
3231	Glass products, made of purchased glass	1.107	0.094	***	0.82	2.71	83
3241	Cement, hydraulic	0.729	0.067	***	0.78	2.68	83
3253	Ceramic wall and floor tile	0.529	0.484		0.43	2.86	83
3261	Vitreous plumbing fixtures	0.784	0.083	***	0.67	2.85	83
3272	Concrete products, n.e.c.	1.027	0.060	***	0.88	2.54	83
3275	Gypsum products	-1.703	0.693	**	0.34	2.41	83
3281	Cut stone and stone products	0.874	0.049	***	0.82	2.69	83
3297	Nonclay refractories	0.797	0.202	***	0.26	2.80	83
3299	Nonmetallic mineral products, n.e.c.	1.211	0.094	***	0.68	3.02	83
3312	Steel works, blast furnaces	2.042	0.354	***	0.72	2.70	83
3315	Steel wire and related products	0.540	0.266	**	0.61	2.90	83
3334	Primary aluminum	0.648	0.369	*	0.34	2.76	83
3339	Primary Nonferrous metals smelting, excep	2.757	0.706	***	0.40	2.63	80
3351	Copper rolling and drawing	1.935	0.423	***	0.41	2.92	83
3353	Aluminum sheet, plate, and foil	1.576	0.652	**	0.26	2.85	83
3354	Aluminum sheet, plate, and foil	1.643	0.348	***	0.56	3.10	83
3357	Nonferrous wire drawing and insulating	2.026	0.168	***	0.77	2.63	83
3411	Metal cans	1.435	0.101	***	0.77	2.57	83
3431	Metal sanitary ware	0.896	0.113	***	0.62	2.90	83
3441	Fabricated structural metal	-0.146	0.250		0.25	2.82	83
3442	Metal doors, sash, and trim	0.186	0.167		0.30	2.67	83
3443	Fabricated plate work, boiler shops	0.958	0.039	***	0.93	2.92	83
3444	Sheet metal work	0.769	0.161	***	0.37	2.53	83

Table 4, cont'd.

SIC	Description	Elas	SE		R2	D-W Stat.	Obs
3452	Fasteners	0.860	0.080	***	0.74	2.82	83
3484	Small arms	1.020	0.340	***	0.43	2.97	77
3492	Fluid power valves and hose fittings	1.208	0.091	***	0.84	3.03	83
3493	Steel springs, except wire	0.735	0.291	**	0.76	2.94	83
3494	Valves and pipe fittings, n.e.c.	0.741	0.907		0.21	2.49	81
3496	Miscellaneous fabricated wire products	0.916	0.263	***	0.58	2.93	83
3497	Metal foil and leaf	0.980	0.116	***	0.53	2.68	83
3511	Turbines and turbine generator sets	0.559	0.079	***	0.55	2.55	83
3519	Internal combustion engines, n.e.c.	0.900	0.065	***	0.81	2.66	83
3523	Farm machinery and equipment	1.151	0.078	***	0.82	2.67	76
3532	Mining machinery	0.740	0.056	***	0.76	2.90	83
3541	Machine tools, metal cutting types	0.583	0.108	***	0.41	3.31	83
3542	Machine tools and conveying equipment	0.493	0.105	***	0.44	3.03	83
3544	Special dies, tools, jigs, and fixtures	0.917	0.066	***	0.76	2.73	66
3545	Cutting tools, machine tool accessories	0.525	0.130	***	0.46	2.81	83
3546	Power-driven handtools	0.422	0.167	**	0.57	3.03	83
3548	Welding apparatus	0.236	0.045	***	0.59	2.95	83
3552	Textile machinery	0.952	0.085	***	0.72	3.19	81
3553	Woodworking machinery	0.751	0.151	***	0.33	3.08	83
3554	Paper Industries machinery	0.902	0.054	***	0.83	2.90	80
3556	Food products machinery	0.945	0.037	***	0.91	2.49	80
3559	Special industry machinery, n.e.c.	1.021	0.026	***	0.95	2.94	83
3562	Ball and roller bearings	0.436	0.259	*	0.27	2.96	83
3563	Air and gas compressors	0.799	0.296	***	0.20	2.90	76
3564	Blowers and fans	0.297	0.181		0.85	2.30	83
3568	Power transmission equipment n.e.c.	0.928	0.051	***	0.83	2.67	83
3569	General industrial machinery, n.e.c.	0.966	0.132	***	0.57	2.65	83
3571	Electronic computers	0.231	0.354		0.50	2.83	79
3572	Computer storage devices	0.976	0.116	***	0.71	2.56	83
3577	Computer peripheral equipment, n.e.c.	0.981	0.183	***	0.62	2.53	83
3578	Calculating and accounting equipment	1.078	0.145	***	0.53	2.81	83
3579	Office machines, n.e.c.	1.097	0.127	***	0.64	2.59	83

Table 4, cont'd.

SIC	Description	Elas	SE		R2	D-W Stat.	Obs
3581	Automatic merchandising machines	0.867	0.053	***	0.86	2.51	83
3582	Commercial laundry equipment	1.275	0.058	***	0.97	2.48	41
3589	Service industry machinery, n.e.c.	0.993	0.019	***	0.96	2.90	83
3593	Fluid power cylinders and actuators	0.905	0.058	***	0.82	2.82	83
3599	Industrial machinery, n.e.c.	0.805	0.084	***	0.80	2.98	83
3612	Power, distribution and specialty transmiss	0.871	0.058	***	0.85	2.60	83
3621	Motors and generators	1.024	0.192	***	0.91	2.40	83
3624	Carbon and graphite products	1.332	0.199	***	0.51	3.04	83
3625	Relays and industrial controls	0.713	0.129	***	0.54	2.87	83
3629	Electrical industrial apparatus, n.e.c.	0.706	0.095	***	0.54	3.23	83
3631	Household cooking equipment	0.784	0.142	***	0.53	2.68	83
3632	Household refrigerators and freezers	0.988	0.144	***	0.64	2.81	83
3634	Electric housewares and fans	0.979	0.072	***	0.86	2.27	83
3635	Household vacuum cleaners	1.036	0.125	***	0.69	2.28	83
3651	Household audio and video equipment	-0.227	0.625		0.25	2.86	83
3671	Electron tubes	0.983	0.092	***	0.65	2.70	81
3672	Printed circuit boards	0.553	0.380		0.24	2.06	81
3674	Semiconductors and related devices	0.497	0.168	***	0.62	2.75	83
3675	Electronic capacitors	1.188	0.304	***	0.45	2.48	83
3676	ELECTRONIC RESISTORS	1.376	0.426	***	0.34	2.77	83
3677	Electronic coils and transformers	0.745	0.139	***	0.57	2.98	83
3678	Electronic connectors	0.956	0.073	***	0.79	3.00	63
3679	Electronic components	0.789	0.075	***	0.64	2.71	83
3691	Storage batteries	0.755	0.168	***	0.38	2.63	83
3694	Engine electrical equipment	0.742	0.103	***	0.67	2.58	83
3695	Magnetic and optical recording media	1.524	1.516		0.15	2.72	56
3699	Electrical machinery, equipment and suppl	1.514	0.623	**	0.57	1.33	72
3711	Motor vehicles and passenger car bodies	0.940	0.041	***	0.94	2.55	83
3714	Motor vehicles parts and accessories	1.659	0.241	***	0.94	2.48	83
3724	Aircraft engines and engine parts	0.897	0.060	***	0.87	2.56	83
3731	Ship building and repairing	0.779	0.201	***	0.34	3.04	76
3751	Motorcycles, bicycles, and parts	1.359	0.532	**	0.48	2.48	83

Table 4, cont'd.

SIC	Description	Elas	SE		R2	D-W Stat.	Obs
3792	Travel trailor and campers	0.900	0.150	***	0.78	2.07	83
3799	Transportation equipment, n.e.c.	0.859	0.096	***	0.75	2.41	83
3812	Search and navigation equipment	0.722	0.072	***	0.67	2.98	83
3822	Environmental controls	0.934	0.151	***	0.57	3.07	83
3823	Process control instruments	0.758	0.157	***	0.42	2.69	83
3824	Fluid meters and counting devices	0.549	0.180	***	0.32	2.54	83
3826	Analytical instruments	0.955	0.122	***	0.48	2.81	83
3827	Optical instruments and lenses	0.910	0.224	***	0.50	2.44	51
3829	Measuring and controlling devices, n.e.c.	1.022	0.112	***	0.52	2.87	83
3841	Surgical and medical instruments	0.940	0.072	***	0.75	2.99	83
3842	Surgical appliances and supplies	1.006	0.167	***	0.53	2.45	83
3843	Dental equipment and supplies	0.947	0.062	***	0.82	2.80	83
3844	X-ray apparatus	0.539	0.088	***	0.62	2.77	81
3845	Electromedical equipment	1.107	0.060	***	0.90	2.99	83
3873	Watches, clocks, and watchcases	0.863	0.415	**	0.36	3.02	83
3931	Musical instruments	0.871	0.077	***	0.82	2.54	83
3949	Sporting and athletic goods, n.e.c.	0.766	0.104	***	0.71	2.87	83
3955	Carbon paper and inked ribbons	0.686	0.113	***	0.61	2.48	83
3965	Fasteners, buttons, needles, and pins	0.825	0.190	***	0.58	2.27	83
3999	Manufacturing industries, n.e.c.	0.699	0.141	***	0.72	2.22	83

The regressions are corrected for heteroskedasticity using White's correction method; the standard errors are heteroskedastic-consister
*** denotes significance at the one-percent level, ** denotes significance at the five-percent level, * denotes significance at the ten-perce

Table 5. Results of Means Tests

Short-run estimates			Long-run estimates		
3-digt	**Test**	**t-stat**	**3-digit**	**Test**	**t-stat**
201	2011v.2015	-5.10 *	201	2011v.2015	4.68 *
202	2021v.2022	24.90 *	202	2021v.2022	10.15 *
	2021v.2023	29.07 *	204	2045v.2047	-27.76 *
	2021v.2024	42.06 *		2043v.2047	-10.87 *
	2021v.2026	57.99 *		2043v.2045	-50.64 *
	2022v.2023	11.90 *	238	2386v.2389	11.15 *
	2022v.2024	21.26 *	239	2395v.2396	9.32 *
	2022v.2026	41.11 *		2394v.2396	29.70 *
	2023v.2024	2.67 *		2394v.2395	38.79 *
	2023v.2026	17.97 *	281	2813v.2816	-1.96 *
	2024v.2026	21.13 *	329	3291v.3295	-35.41 *
203	2032v.2033	-21.96 *	342	3423v.3429	-9.18 *
	2032v.2034	-19.48 *		3421v.3429	-9.19 *
	2032v.2035	-14.17 *		3421v.3423	1.16
	2032v.2037	-30.94 *	353	3536v.3537	32.96 *
	2033v.2034	-9.35 *		3535v.3537	-12.88 *
	2033v.2035	-8.57 *		3535v.3536	-32.94 *
	2033v.2037	5.95 *		3534v.3537	25.67 *
	2034v.2035	1.45		3534v.3536	43.47 *
	2034v.2037	-20.00 *		3534v.3535	10.68 *
204	2041v.2043	36.45 *	356	3566v.3567	-11.29 *
	2041v.2044	23.39 *		3565v.3567	2.32 *
	2041v.2045	16.40 *		3565v.3566	-10.87 *
	2041v.2046	49.40 *	358	3585v.3586	0.21
	2041v.2047	34.11 *	359	3594v.3596	36.27 *
	2041v.2048	49.77 *	371	3713v.3715	-5.87 *
	2043v.2044	1.08	395	3951v.3952	-28.27 *
	2043v.2045	-10.63 *			
	2043v.2046	10.92 *			
	2043v.2047	1.23			
	2043v.2048	-11.34 *			
	2045v.2046	19.93 *			
	2045v.2047	11.15 *			
	2045v.2048	4.12 *			
	2047v.2048	-11.61 *			
206	2062v.2064	0.29			
	2062v.2066	13.18 *			
	2062v.2068	28.91 *			
	2064v.2066	-12.02 *			
	2064v.2068	-24.58 *			
	2066v.2068	5.81 *			
207	2074v.2075	59.48 *			
	2074v.2076	8.92 *			
	2074v.2077	9.63 *			
	2074v.2079	45.72 *			

Table 5, cont'd.

	Short-run estimates	
3-digt	**Test**	**t-stat**
207	2075v.2076	-48.72 *
	2075v.2077	-26.16 *
	2075v.2079	7.24 *
	2076v.2077	-3.30 *
	2076v.2079	-38.31 *
	2077v.2079	-26.11 *
208	2082v.2083	-51.18 *
	2082v.2085	17.50 *
	2082v.2086	3.94 *
	2082v.2087	-4.63 *
	2083v.2085	92.82 *
	2083v.2086	53.08 *
	2083v.2087	73.95 *
	2085v.2086	-11.79 *
	2085v.2087	-36.11 *
	2086v.2087	9.40 *
225	2252v.2257	-93.06 *
	2252v.2258	-101.86 *
	2257v.2258	-4.37 *
228	2281v.2284	24.86 *
229	2295v.2296	-8.26 *
	2295v.2297	2.20 *
	2295v.2299	20.74 *
	2296v.2297	-8.30 *
	2296v.2299	-14.00 *
	2297v.2299	-6.74 *
232	2321v.2322	11.79 *
	2321v.2323	6.09 *
	2321v.2325	15.33 *
	2321v.2329	5.84 *
	2322v.2323	10.00 *
	2322v.2325	-4.70 *
	2322v.2329	10.15 *
	2323v.2325	14.55 *
	2323v.2329	-0.47
	2325v.2329	14.66 *
233	2331v.2335	14.67 *
	2331v.2337	24.64 *
	2331v.2339	25.73 *
	2335v.2337	-11.98 *
	2335v.2339	-12.98 *
	2337v.2339	0.24
234	2341v.2342	44.63 *
238	2384v.2385	0.34
	2384v.2386	-10.16 *

Table 5, cont'd.

	Short-run estimates	
3-digt	**Test**	**t-stat**
238	2384v.2389	-15.81 *
	2385v.2386	-12.95
	2385v.2389	-40.20 *
	2386v.2389	0.21
239	2391v.2392	50.43 *
	2391v.2393	2.37 *
	2391v.2394	3.74 *
	2391v.2395	5.96 *
	2391v.2396	15.24 *
	2391v.2399	-3.46 *
	2392v.2393	-36.16 *
	2392v.2394	-45.56 *
	2392v.2395	-86.18 *
	2392v.2396	-36.03 *
	2392v.2399	-48.84 *
	2393v.2394	-0.76
	2393v.2395	-1.53
	2393v.2396	-9.99 *
	2393v.2399	5.19 *
	2394v.2395	0.82
	2394v.2396	11.21 *
	2394v.2399	-6.90 *
	2395v.2396	-15.45 *
	2395v.2399	9.62 *
	2399v.2396	-17.56 *
	2399v.2395	9.62 *
242	2426v.2429	16.43 *
243	2431v.2436	4.75 *
249	2491v.2499	-6.80 *
251	2514v.2515	29.22 *
265	2652v.2653	-17.01 *
	2652v.2656	-0.53
	2652v.2657	0.57
	2653v.2656	-29.01 *
	2653v.2657	-20.59 *
	2656v.2657	-0.57
267	2672v.2673	0.76
	2672v.2674	-1.32
	2672v.2675	3.53 *
	2672v.2676	26.09 *
	2672v.2677	-3.67 *
	2672v.2678	-18.72 *
	2672v.2679	-3.94 *
	2673v.2674	2.00 *
	2673v.2675	-3.22 *

Table 5, cont'd.

	Short-run estimates	
3-digt	**Test**	**t-stat**
267	2673v.2676	-27.76 *
	2673v.2677	4.95 *
	2673v.2678	20.04 *
	2673v.2679	4.78 *
	2674v.2675	4.15 *
	2674v.2676	23.09 *
	2674v.2677	-1.56
	2674v.2678	-15.92 *
	2674v.2679	-2.31 *
	2675v.2676	-14.66 *
	2675v.2677	5.94 *
	2675v.2678	17.69 *
	2675v.2679	6.06 *
	2676v.2677	-30.46 *
	2676v.2678	-36.10 *
	2676v.2679	-25.09 *
	2677v.2678	-16.77 *
	2677v.2679	-1.22
	2678v.2679	13.73 *
281	2812v.2813	-11.06 *
	2812v.2816	11.16 *
	2813v.2816	27.15 *
282	2821v.2822	19.29 *
	2821v.2823	-6.15 *
	2821v.2824	-6.94 *
	2822v.2823	-21.84 *
	2822v.2824	-22.48 *
	2823v.2824	-0.61
283	2833v.2835	18.31 *
	2833v.2836	32.69 *
	2835v.2836	-7.28 *
284	2841v.2842	-7.36 *
	2841v.2843	-12.90 *
	2841v.2844	-10.08 *
	2842v.2843	7.58 *
	2842v.2844	3.13 *
	2843v.2844	6.14 *
287	2874v.2879	3.91 *
289	2891v.2892	22.36 *
	2891v.2893	27.64 *
	2891v.2895	57.95 *
	2891v.2899	4.86 *
	2892v.2893	-13.68 *
	2892v.2895	-49.76 *
	2892v.2899	-42.83 *

Table 5, cont'd.

	Short-run estimates	
3-digt	**Test**	**t-stat**
289	2893v.2895	-36.05 *
	2893v.2899	23.29 *
	2895v.2899	-54.81 *
305	3052v.3053	6.85 *
308	3081v.3082	-0.57
	2081v.3089	11.10 *
	3082v.3089	-15.97 *
314	3142v.3143	-10.47 *
	3142v.3144	-9.68 *
	3142v.3149	-0.59
	3143v.3144	0.00
	3143v.3149	-8.97 *
	3144v.3149	8.40 *
317	3171v.3172	16.27 *
322	3221v.3229	-44.23 *
325	3253v.3255	-7.05 *
326	3261v.3264	-16.80 *
327	3272v.3274	24.08 *
	3272v.3275	35.76 *
	3274v.3275	-26.11 *
329	3291v.3295	6.00 *
	3291v.3297	14.13 *
	3291v.3299	-2.76 *
	3295v.3297	-11.90 *
	3295v.3299	11.18 *
	3297v.3299	-16.97 *
331	3312v.3315	30.92 *
333	3334v.3339	-23.76 *
335	3351v.3353	4.21 *
	3351v.3354	4.85 *
	3351v.3357	-1.82
	3353v.3354	-0.83
	3353v.3357	-6.09 *
	3354v.3357	9.02 *
341	3411v.3412	23.18 *
342	3421v.3423	12.92 *
	3421v.3429	11.42 *
	3423v.3429	-0.16
343	3431v.3432	-8.44 *
	3431v.3433	1.17
	3432v.3433	11.98 *
344	3441v.3442	-10.06 *
	3441v.3443	-39.77 *
	3441v.3444	-28.07 *
	3441v.3449	-28.41 *

Table 5, cont'd.

	Short-run estimates	
3-digt	**Test**	**t-stat**
344	3442v.3443	40.89 *
	3442v.3444	22.89 *
	3442v.3449	23.27 *
	3443v.3444	10.39 *
	3443v.3449	5.85 *
	3444v.3449	2.34 *
348	3484v.3489	13.10 *
349	3492v.3493	14.12 *
	3492v.3494	4.61 *
	3492v.3496	9.56 *
	3492v.3497	14.12 *
	3492v.3499	-4.86 *
351	3511v.3519	-30.37 *
353	3531v.3532	5.87 *
	3531v.3534	-1.57
	3531v.3535	0.22
	3531v.3536	21.56 *
	3531v.3537	0.46
	3532v.3534	11.06 *
	3532v.3535	8.85 *
	3532v.3536	-26.42 *
	3532v.3537	8.80 *
	3534v.3535	2.60 *
	3534v.3536	33.81 *
	3534v.3537	3.02 *
	3535v.3536	33.09 *
	3535v.3537	-0.36
	3536v.3537	33.95 *
354	3541v.3542	5.39 *
	3541v.3543	-22.96 *
	3541v.3544	-23.24 *
	3541v.3545	3.11 *
	3541v.3546	7.38 *
	3541v.3547	4.10 *
	3541v.3548	26.96 *
	3542v.3543	30.07 *
	3542v.3544	29.97 *
	3542v.3545	1.71
	3542v.3546	-3.31 *
	3542v.3547	0.77
	3542v.3548	-20.47 *
	3547v.3548	-18.26 *
	3543v.3544	-1.92
	3543v.3545	23.51 *
	3543v.3546	24.32 *

Table 5, cont'd.

	Short-run estimates	
3-digt	**Test**	**t-stat**
354	3543v.3547	24.99 *
	3543v.3548	78.46 *
	3546v.3547	3.71 *
	3546v.3548	9.80 *
	3544v.3545	-23.86 *
	3544v.3546	-24.73 *
	3544v.3547	-25.28 *
	3544v.3548	-71.44 *
	3545v.3546	4.44 *
	3545v.3547	0.87
	3545v.3548	19.11 *
355	3552v.3553	10.51 *
	3552v.3554	4.46 *
	3552v.3555	4.93 *
	3552v.3556	0.63
	3552v.3559	-6.97 *
	3553v.3554	-8.53 *
	3553v.3555	-8.63 *
	3553v.3556	-11.36 *
	3553v.3559	-16.03 *
	3554v.3555	-0.25
	3554v.3556	5.92 *
	3554v.3559	17.73 *
	3555v.3556	-7.28 *
	3555v.3559	-22.17 *
	3556v.3559	14.94 *
356	3561v.3562	18.21 *
	3561v.3563	2.60 *
	3561v.3564	32.49 *
	3561v.3565	-7.35 *
	3561v.3566	3.99 *
	3561v.3567	11.42 *
	3561v.3568	4.55 *
	3561v.3569	-0.27
	3562v.3563	8.19 *
	3562v.3564	-4.02 *
	3562v.3565	20.09 *
	3562v.3566	16.04 *
	3562v.3567	14.79 *
	3562v.3568	16.96 *
	3562v.3569	16.61 *
	3563v.3564	12.76 *
	3563v.3565	-6.39 *
	3563v.3566	-3.37 *
	3563v.3567	-1.98 *

Table 5, cont'd.

	Short-run estimates	
3-digt	**Test**	**t-stat**
356	3563v.3568	-3.73 *
	3563v.3569	-4.52 *
	3564v.3565	34.88 *
	3564v.3566	28.11 *
	3564v.3567	27.34 *
	3564v.3568	30.58 *
	3564v.3569	27.25 *
	3565v.3566	8.87 *
	3565v.3567	17.17 *
	3565v.3568	11.20 *
	3565v.3569	3.42 *
357	3571v.3572	-17.85 *
	3571v.3577	-16.82 *
	3571v.3578	-19.75 *
	3571v.3579	-20.54 *
	3572v.3577	0.19 *
	3572v.3578	4.98 *
	3572v.3579	6.41 *
	3577v.3578	-3.77 *
	3577v.3579	-4.74 *
	3578v.3579	0.91
	3566v.3567	4.31 *
	3566v.3568	-0.83
	3566v.3569	-2.75 *
	3567v.3568	6.95 *
	3568v.3569	-2.49 *
358	3581v.3582	37.79 *
	3581v.3585	-18.25 *
	3581v.3586	15.34 *
	3581v.3589	20.48 *
	3582v.3585	38.25 *
	3582v.3586	29.22 *
	3582v.3589	30.12 *
	3585v.3586	25.06 *
	3585v.3589	26.55 *
	3586v.3589	-2.91 *
359	3593v.3594	-6.60 *
	3593v.3596	9.83 *
	3593v.3599	8.98 *
	3594v.3596	14.43 *
	3596v.3599	0.84
361	3612v.3613	22.87 *
362	3621v.3624	-10.15 *
	3621v.3625	12.31 *
	3621v.3629	13.57 *

Table 5, cont'd.

	Short-run estimates	
3-digt	**Test**	**t-stat**
362	3624v.3625	23.80 *
	3624v.3629	25.85 *
	3625v.3629	-0.38
363	3631v.3632	-9.22 *
	3631v.3633	-18.11 *
	3631v.3634	-11.18 *
	3631v.3635	-12.17 *
	3632v.3633	5.17 *
	3632v.3634	-0.53
	3632v.3635	2.27 *
	3633v.3634	10.82 *
	3633v.3635	2.57 *
	3634v.3635	-3.60 *
367	3671v.3672	9.88 *
	3671v.3674	23.06 *
	3671v.3675	-5.87 *
	3671v.3676	-8.22 *
	3671v.3677	-8.22 *
	3671v.3678	1.93 *
	3671v.3679	14.85 *
	3672v.3674	-1.22
	3672v.3675	11.78 *
	3672v.3676	13.06 *
	3672v.3677	4.26 *
	3672v.3678	9.32 *
	3672v.3679	5.46 *
	3674v.3675	-18.13 *
	3674v.3676	-17.49 *
	3674v.3677	-10.37 *
	3674v.3678	-22.27 *
	3674v.3679	-14.44 *
	3676v.3677	12.84 *
	3675v.3676	3.29 *
	3675v.3677	-12.08 *
	3675v.3678	-6.68 *
	3675v.3679	-11.62 *
	3676v.3678	8.81 *
	3676v.3679	12.38 *
	3677v.3678	-11.89 *
	3677v.3679	-2.53 *
	3678v.3679	13.58 *
369	3691v.3692	11.18 *
	3691v.3694	0.62
	3691v.3695	-3.78 *
	3691v.3699	-10.03 *

Table 5, cont'd.

	Short-run estimates	
3-digt	**Test**	**t-stat**
369	3692v.3694	13.03 *
	3692v.3695	5.17 *
	3692v.3699	13.81 *
	3694v.3695	-3.85 *
	3694v.3699	-10.41 *
	3695v.3699	0.04
371	3711v.3713	-5.86 *
	3711v.3714	-26.82 *
	3711v.3715	4.98 *
	3713v.3714	12.67 *
	3713v.3715	-2.70 *
	3714v.3715	14.16 *
372	3721v.3724	-26.73 *
373	3731v.3732	12.48 *
379	3792v.3799	2.10 *
382	3822v.3823	7.38 *
	3822v.3824	14.95 *
	3822v.3825	-4.52 *
	3822v.3826	-0.99
	3822v.3827	0.66
	3822v.3829	-4.26 *
	3823v.3824	7.99 *
	3823v.3825	-12.07 *
	3823v.3826	-9.05 *
	3823v.3827	-4.28 *
	3823v.3829	-12.49 *
	3824v.3825	-19.50 *
	3824v.3826	-17.04 *
	3824v.3827	-9.77 *
	3824v.3829	-20.36 *
	3825v.3826	3.97 *
	3825v.3827	3.59 *
	3825v.3829	-0.72
	3826v.3827	1.30
	3826v.3829	3.67 *
	3827v.3829	3.30 *
384	3841v.3842	-3.30 *
	3841v.3843	-0.66
	3841v.3844	31.84 *
	3841v.3845	-16.23 *
	3842v.3843	-3.01 *
	3842v.3844	-22.49 *
	3842v.3845	5.20 *
	3843v.3844	34.22 *
	3843v.3845	-16.94 *

Table 5, cont'd.

Short-run estimates			
3-digt	**Test**	**t-stat**	
	3844v.3845	-48.16	*
394	3944v.3949	-9.81	*
395	3951v.3952	7.91	*
	3951v.3955	1.76	
	3952v.3955	13.86	*
399	3991v.3993	-45.66	*
	3991v.3999	-30.56	*
	3993v.3999	-4.31	*

* denotes significance at the five-percent level.