THE EFFECT OF EXCHANGE RATE VARIATION ON U.S. TEXTILE AND APPAREL IMPORTS

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In the past 12 years, textile and apparel imports have risen nearly six fold, from $4.3 billion in 1974 to $24.7 billion in 1986. During this time, foreign textile producers increased their U.S. market share from 5 percent to 12 percent while foreign apparel producers increased theirs from 8 percent to 24 percent.

The increase of textiles and apparel imports has often been attributed to the appreciation of the U.S. dollar and the resulting fall in the relative price of foreign goods that occurred from 1981 through 1985. The purpose of this study is to test this hypothesis. More specifically, this study seeks to determine if exchange rate variations significantly influenced the level of U.S. textile and apparel imports during the period from 1977 to 1986.

This study begins with a description of the textile and apparel industries. The specific characteristics of these industries are then related to their competitiveness. Subsequently, two earlier studies of the impact of foreign competition on U.S. textile and apparel industries are reviewed. Finally, we present and explain the results of empirical tests of the effect of exchange rate variation on textile and apparel imports.

INDUSTRY PROFILES

The textile and apparel industries are in some ways similar but in other ways quite different. These similarities and differences figure importantly in determining the susceptibility of these industries to import competition.

Standard Industrial Classification

The textile, or "textile mill products," industry is composed of nine groups of firms that weave fiber into fabric and process fabric into intermediate products. The textile groups include mills weaving cotton, wool, and synthetic fibers. About one-third of textile production is used by the apparel, or "apparel and other textile products," industry. The apparel industry is also composed of nine industry groups among which are manufacturers of clothing, curtains and draperies, and automotive and apparel trimmings.

Characteristics

The U.S. textile and apparel industries are highly competitive. Each is composed of a large number of small manufacturers. In 1984, the U.S. apparel industry comprised about 23,000 establishments employing a total of 1.2 million production workers, and the U.S. textile industry consisted of about 6,000 establishments employing 724,000 production workers. Sixty percent of the textile firms and 75 percent of the apparel establishments employ fewer than 50 employees.[1] Moreover, textile and apparel firms are located all over the world. Textile manufacturing is often one of the first major industries formed in a developing country. Consequently, nearly every country has a textile industry, and apparel industries are also common to most countries.[2]

The textile industry exists in a more competitive environment than the apparel industry because textile products are more standardized than apparel products. Buyers of textiles can easily switch from a firm that sells a standard good at a higher price to one that sells virtually the same good at a lower price. Because they are more differentiated, the products of competing apparel firms are viewed as more distinct and are likely to be less sensitive than textile goods to changes in prices.

Textile and apparel production are labor intensive, giving a competitive edge to producers in low-wage

[1] U.S. Department of Commerce, Bureau of the Census, *County Business Patterns 1984, United States*, 1986. An establishment is defined as a single physical location where business is conducted or where services or industrial operations are performed.

[2] Brian Toyne, Jeffrey S. Arpan, Andy H. Barnett, et al., *The U.S. Textile Mill Products Industry: Strategies for the 1980's and Beyond* (The University of South Carolina Press: Columbia, 1983), p. 4-2.

foreign countries. Apparel production is considerably more labor intensive than textile production. The relative labor intensities of the textile and apparel industries as well as their low capital barriers to entry are apparent in the value of capital equipment per worker. In the U.S. textile industry, the net value of capital equipment per worker in 1980 was $9,020, slightly below the average for all manufacturing. In apparel, however, the net value of capital equipment per worker was $1,909, one-fifth of the U.S. average.[3]

Effects of Economic Conditions

The demand for textiles and apparel is sensitive to the business cycle. Sales of textiles and apparel rise during economic expansions and decline during economic contractions. This procyclical behavior characterizes the major users of textiles: the home furnishing industry, the automobile and marine industries, and the apparel industry. Because of the sensitivity of textile and apparel sales to the business cycle, competition in these industries is intense during a general economic downturn.

The demand for textiles and apparel is also influenced by long-term economic conditions. As income has steadily risen in the United States, apparel and textile consumption has also risen. For example, in 1974 U.S. apparel consumption in real terms was $178 per capita while real disposable personal income was $703. By 1985, real apparel consumption had risen 52 percent to $270 per capita while real disposable personal income had risen 25 percent to $878.[4]

TWO RECENT STUDIES

This section reviews two recent reports on the effect of the dollar's value in foreign exchange markets on U.S. textile and apparel industries. The first report, by the Economic Consulting Services (ECS), studies the impact of the exchange rate on U.S. imports of textiles and apparel. The second report, by the Congressional Budget Office (CBO), considers the effect of the exchange rate on production levels of U.S. manufacturing industries, including textiles and apparel.

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[3] Statistical Abstract of the United States 1985, pp. 413, 525, and U.S. Department of Commerce, unpublished data in Daniel P. Kaplan, Has Trade Protection Revitalized Domestic Industries? (Washington, D.C.: Congressional Budget Office, 1986), p. 17.

[4] Numbers are deflated by the consumer price index (CPI) for all items and for the "apparel and upkeep" expenditure class where 1967 = 100.

The ECS Report

A report prepared by ECS examines the effect of the U.S. dollar appreciation during the years 1981 through 1984 on the increase in U.S. imports of textiles and apparel.[5] The study focuses on the 25 countries supplying the largest quantities of U.S. imports of textiles and apparel. The ECS study uses a nominal exchange rate rather than a real exchange rate.[6]

The ECS study begins by identifying a "control" group of countries. The logic is that in countries where the currencies have maintained a stable rate of exchange with the dollar or have appreciated against the dollar, the growth in textile and apparel imports cannot be attributed to the appreciating U.S. dollar. Six "exchange rate neutral" countries comprise this control group.[7] These six countries were responsible for 11 percent of textiles and 27 percent of apparel imported from the 25 top suppliers.

The U.S. imports of textiles from the exchange rate neutral countries rose 84 percent during 1981 through 1984, while imports of apparel from these countries rose 48 percent. The remaining countries, whose currencies depreciated against the U.S. dollar between 1981 and 1984, showed a 98 percent increase in textile imports and a 49 percent increase in apparel imports. These figures seemed to indicate little difference between the two cases. Therefore, ECS concluded that U.S. dollar appreciation had only a small impact on the increase in U.S. imports of textiles and had a negligible impact on the increase in U.S. imports of apparel. In country by country comparisons, however, the ECS study found that the U.S. dollar appreciation had a greater effect on imports from countries with wage rates comparable to those in the United States.

CBO Study

In a report prepared by Elliot Schwartz for the CBO, quarterly data from 1973.3 through 1985.1

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[5] Economic Consulting Services Incorporated, The Impact of the Appreciation of the Dollar on U.S. Imports of Textiles and Apparel, (Washington, D.C., 1985). This study was prepared for the American Textile Manufacturers Institute.

[6] For an explanation of the importance of using a real exchange rate to determine international competitiveness, see Dallas S. Batten and Michael T. Belongia, "The Recent Decline in Agricultural Exports: Is the Exchange Rate the Culprit?" The Federal Reserve Bank of St. Louis, Review 66 (October 1984), pp.5-14.

[7] They are the Dominican Republic, Haiti, Malaysia, Singapore, Taiwan, and Egypt.

are used to study the effects of imports on production.[8] Schwartz's regression equations contain explanatory variables for the nominal exchange rate, income effects, and price effects.

His results suggest that nominal exchange rate changes have no effect on U.S. textile and apparel production. None of the explanatory variables are significant in his textile regression equation. The only significant variable in his apparel regression is the income effect, included to capture short-term changes in the business cycle.

REEXAMINATION OF THE EVIDENCE

This section describes the method used here to estimate the impact of exchange rate variation and other factors on the level of U.S. imports of textiles and apparel.

Scope of the Study

The period chosen for the empirical tests extends from the first quarter of 1977 through the first quarter of 1986. This period is chosen for three reasons. First, the Multifiber Arrangement was in effect during the entire period, therefore there were few changes in foreign trade arrangements.[9] Second, the period includes pronounced variations in the exchange rate. The foreign exchange value of the dollar declined between the second quarter of 1976 and the first quarter of 1979, appreciated between the fourth quarter of 1979 and the first quarter of 1985, then declined through the first quarter of 1986. Third, the volume of textile imports increased 256 percent and the volume of apparel imports increased 380 percent over this period. (See Chart 1.)
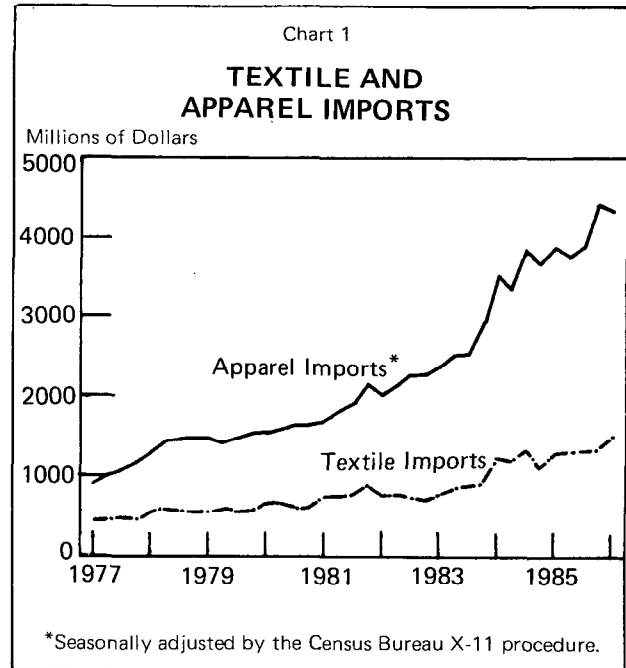
Real Exchange Rate Changes

The importance of using real, rather than nominal, exchange rates in studies of import competition is well documented.[10] The nominal exchange rate is

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[8] Elliot Schwartz, "The Dollar in Foreign Exchange and U.S. Industrial Production," Staff Working Paper, The Congress of the United States, Congressional Budget Office, December 1985.

[9] The Multifiber Arrangement (MFA) established a set of rules for developed countries to regulate imports of textiles and apparel made of cotton, wool, and man-made fiber. Although such barriers to trade interfere with estimations of the effect of exchange rate changes on imports, the constancy of these barriers is less damaging than frequent changes in the barriers.

[10] Belongia, op. cit.

Chart 1

TEXTILE AND APPAREL IMPORTS

Millions of Dollars

*Seasonally adjusted by the Census Bureau X-11 procedure.

simply the amount of one foreign currency that can be obtained for a unit of another currency. The real exchange rate, however, is the nominal exchange rate adjusted for the difference in price levels in the two countries. It shows the real quantity of imports the country gets per unit of export given up. (See Appendix A.)

Table I provides comparisons of the percentage changes in individual countries' real exchange rates with their associated percentage changes in textile and apparel imports to the United States. Inspection of these percentage changes, does not, however, suggest any strong correlation between real exchange rates and textile and apparel imports. Indeed, the correlation coefficient between percentage changes in the real exchange rates and textile imports is only 50 percent, and for apparel only 56 percent, for these 24 countries over the period examined.[11]

As Michael Belongia has argued, however, it is misleading to consider only individual countries because changes in relative prices cause many forms of substitution among users. Thus, a number of bilateral exchange rate movements will not capture the substitution possibilities as well as a single measure of changes in the dollar's value relative to

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[11] The correlation coefficients are distorted by the large percentage changes in textile and apparel imports from Sri Lanka and Indonesia. When these two countries are deleted from the comparison, the correlation coefficient between percentage changes in the real exchange rates and textile imports is only 7 percent, and for apparel only 37 percent.

Table I

REAL EXCHANGE RATES AND IMPORTS BY COUNTRY

| | Real Exchange Rate* | | | Million SYE** | | | | | |
| | | | | Textile Imports | | | Apparel Imports | | |
Country	1977	1985	Percent change 1977-85	1977	1985	Percent change 1977-85	1977	1985	Percent change 1977-85
Brazil	773.43	1615.12	108.8	38.3	157.3	310.7	6.4	41.9	554.7
Canada	245.60	298.78	21.7	68.9	239.3	247.3	6.9	14.6	111.6
Dominican Republic	239.62	475.07	98.3	2.1	12.2	481.1	25.5	107.2	320.4
Egypt	267.77	295.46	10.3	8.7	42.5	388.5	0.2	0.8	300.0
France	246.17	368.54	49.7	99.9	100.4	0.5	12.9	22.8	76.7
Germany	198.31	327.14	65.0	191.7	326.7	70.4	3.9	10.3	164.1
Haiti	235.56	208.85	−11.3	0.8	4.2	425.0	43.0	80.6	87.4
Hong Kong	246.87	347.75	40.9	214.3	222.9	4.0	601.0	824.9	37.3
India	217.88	289.40	32.8	115.1	153.9	33.7	50.5	116.2	130.1
Indonesia	280.62	542.64	93.4	0.2	130.8	65300.0	2.7	136.3	4948.1
Italy	283.47	366.59	29.3	153.5	455.1	196.5	37.7	73.3	94.4
Japan	198.75	234.66	18.1	773.8	593.0	−23.4	169.3	130.2	−23.1
Korea	316.58	410.92	29.8	84.8	472.1	456.7	439.6	671.0	52.6
Malaysia	207.04	254.75	23.0	11.6	60.3	419.8	9.1	91.9	909.9
Mexico	326.77	347.76	6.4	76.3	135.2	77.2	78.7	109.6	39.3
Pakistan	233.58	365.27	56.4	57.2	219.4	283.6	10.2	70.1	587.3
Peru	890.06	1460.00	64.0	19.7	68.2	246.2	0.1	1.6	1500.0
Philippines	269.90	318.04	17.8	14.0	13.4	−4.3	128.0	257.4	101.1
Singapore	212.92	245.59	15.3	18.9	7.7	−59.3	42.3	152.8	261.2
Sri Lanka	297.84	584.52	96.3	0.01	11.9	118900.0	4.1	110.6	2597.6
Spain	320.70	447.70	39.6	10.1	106.4	953.5	4.2	4.9	16.7
Taiwan	168.72	182.33	8.1	91.2	644.6	606.8	547.5	957.9	75.0
Thailand	257.79	337.57	30.9	23.5	145.2	517.9	22.0	130.6	493.6
United Kingdom	258.40	304.28	17.8	122.3	176.1	44.0	8.1	27.1	234.6

* Units of foreign exchange per U.S. dollar, adjusted for inflation.

** Standard yard equivalents.

Note: Import numbers are for cotton, wool, and man-made fibers textiles and apparel.
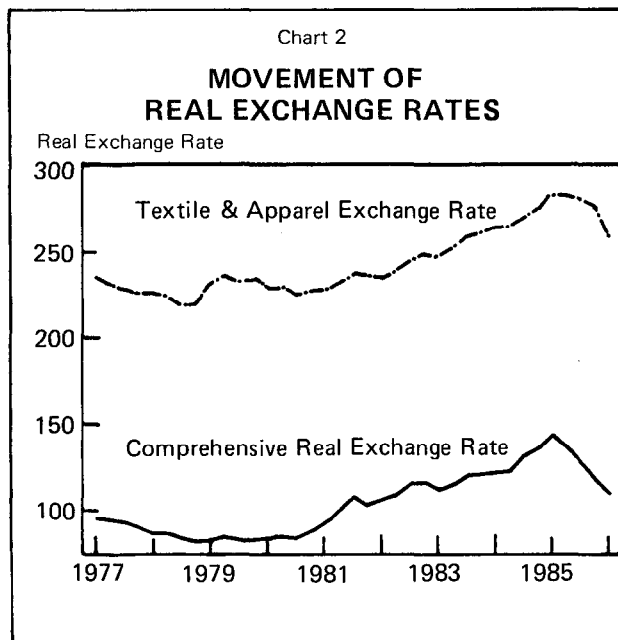
Sources: See Appendix A.

multiple currencies.[12] For that reason, aggregate imports and a trade-weighted exchange rate are used in the regression equations in this paper.

Comprehensive real trade-weighted exchange rates covering all exported and imported goods are available.[13] Because of their breadth of coverage,

however, such indexes are not appropriate for studies of imports of specific types of goods. For that reason, this study uses a specially constructed index composed of trade-weighted data from countries that accounted for an average 84 percent of U.S. textile and apparel imports during the period 1977 through 1986. Chart 2 shows how the behavior of this special index for textiles and apparel differs from the behavior of the Federal Reserve's comprehensive index designed to cover all goods. (See Appendix A for a description of the textile and apparel index.)

[12] Michael T. Belongia, "Estimating Exchange Rate Effects on Exports: A Cautionary Note," The Federal Reserve Bank of St. Louis, *Review* 68 (January 1986), p. 5.

[13] One such index is published monthly by the Board of Governors of the Federal Reserve System. The countries used in this index were collectively responsible for only 22 percent of U.S. imports of textiles and apparel in 1984.

Chart 2

MOVEMENT OF
REAL EXCHANGE RATES

The Model

The model used below to test the exchange rate's affect on import demand focuses on the principal factors likely to affect the U.S. demand for imports of textiles and apparel. In addition to the real exchange rate, the model includes an explanatory variable for shifts in U.S. income. The primary purpose of the model is, of course, to determine if real exchange rate changes affect textile and apparel imports. A second purpose is to see if imports of textiles are affected differently from imports of apparel by changes in real exchange rates.

The model used in this paper posits a linear relationship between the dependent variable, imports (real dollar volume), and two independent ones, namely the real trade-weighted exchange value of the dollar, and the level of income (real GNP). In equation form:

imports = b_1 + b_2(real exchange rate) +
b_3(real GNP) + error term

where the import variable is in terms of textiles or apparel.[14]

The independent variables are lagged by one quarter to capture the effect of time delays occurring before import levels respond to changes in

[14] Import data were obtained from the American Textile Manufacturers Institute, Inc., *Textile Hi-Lights*, various issues, and unpublished data. See appendix for real exchange rate data. GNP data (1982 = 100) were obtained from the Department of Commerce.

income and real exchange rates.[15] All variables are in the form of their natural logarithms.[16] Therefore, their coefficients can be interpreted as elasticities. In other words, the coefficient value of a particular explanatory variable represents the percent change in the imports of the textile or apparel industry with respect to a 1 percent change in the explanatory variable, holding other variables constant.

The explanatory variable representing the exchange rate is the real trade-weighted exchange value of the U.S. dollar. It is expected to be related positively to the quantity of textile and apparel imports. As the dollar appreciates in value, imports should rise, all else equal.

The explanatory variable for shifts in income (real GNP) should be positively related to imports. The higher the level of U.S. real economic activity, the higher the demand for textile and apparel goods (including imports), all else equal.

The Results

As shown in Table II, all of the coefficients of the explanatory variables for both the textile and apparel regression equations are statistically significant. Results for both textiles and apparel indicate that changes in the exchange value of the dollar affect the quantity of imports. For both textiles and apparel, a 1 percent increase in the exchange rate is associated with about a 1.4 percent increase in imports.[17]

These findings suggest that the exchange value of the dollar has the same effect on imports of apparel as on imports of textiles. At first blush, this result may seem surprising because imports of the more standardized textile goods might be expected to be more sensitive to price changes via the exchange rate than the more differentiated apparel goods. On the other hand, the high labor intensity of the apparel industry might lead one to expect a greater influence of the exchange rate on this industry's import competition. It might be easier to combat the import-

[15] Alternatively, when the delay is specified as a second-degree polynomial distributed lag, the effect of the exchange rate changes are shown to persist for a period of four quarters for both textile and apparel imports. In the textile equation, the effect of real GNP is shown to persist for four quarters; lagged effects were not found for the real GNP variable in the apparel equation.

[16] The dependent variable, imports, increases at different percentage rates over the time period studied. For that reason, the natural logarithms are a better measure than the natural numbers.

[17] Statistically significant results were obtained using the Board of Governors real exchange rate in the regression. However, the coefficients for the real exchange rate varibles were much lower (0.004 for textiles and 0.78 for apparel).

Table II

REGRESSION RESULTS FOR THE PERIOD
1977.1 TO 1986.1

Variable	Textiles*	Apparel*
Intercept	− 29.41	− 35.09
	(− 11.20)†	(− 11.35)†
Log of Real Exchange Rate	1.33	1.40
	(3.54)†	(3.39)†
Log of Real GNP	2.91	3.69
	(5.94)†	(7.23)†
R-Square	.87	.84

* A two-step full transform method was used to correct for first order autocorrelation.

† T-statistic significant at the 1 percent level.

promoting effects of increases in the value of the dollar in a capital intensive industry where equipment can be modernized to lower cost than in a labor intensive industry. In a labor intensive industry in which there is little available capital to substitute for labor, it is probably harder to cut costs because it is difficult to decrease wages.[18]

In both regression equations, the income variable (real GNP) has a positive effect on imports. This result was expected as textile and apparel consumption have historically risen with increases in income. In addition, the income variable has a greater effect on textile and apparel imports than does the exchange rate. In other words, if the economy were to continue to grow at its trend rate of 2 percent and real exchange rates did not vary, then the dollar volume of imports of textiles would double by the year 2011 and the dollar volume of imports of apparel would double by 2006. However, an increase in the volume of imports does not necessarily mean production in the United States will decline by the same amount. In fact, although the market share of foreign imports

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[18] Indeed, the evidence on capital investment in the textile and apparel industries in the last few years lends credence to this argument. As a result of the dollar appreciation in the 1980s, domestically produced textiles and apparel became more expensive than their foreign-produced counterparts. Because of increased capital expenditures and modernization in the textile industry, productivity in that industry rose 14 percent from 1981 through 1985. In the apparel industry, however, productivity rose only 6 percent during the same period. The industries' consequent loss in competitiveness with foreign producers is apparent in the share of the U.S. market gained by foreign producers: foreign market share in the textile industry increased from 5 percent in 1977 to 12 percent in 1986 while in the apparel industry foreign market share increased from 10 percent to 24 percent over the same period.

has increased in the past ten years, production in the U.S. textile and apparel industries has held steady in real terms.

Variations of the Model

An alternative model providing more information about trade flows than that presented above would account for supply as well as demand factors affecting imports. Appendix B contains a model of this type. Specifically, one variable affecting the supply of U.S. imports is the foreign price of particular imports relative to the foreign general price level. Unfortunately, however, there is no price index of U.S. textile and apparel imports. The domestic wholesale price index (WPI) for textile and apparel goods is used as a proxy for the price of U.S. imports of those goods. As with the model already presented above, the alternative version shown as Model 2 in Appendix B supports the conclusion that real exchange rate variations affect the volume of imports of textiles and apparel.

Still another way to measure the effect of exchange rate variations on imports is to use a commodity-specific real exchange rate. Such a measure was employed in the third version of the model, designated Model 3 in Appendix B. The results of this version again support the conclusion that exchange rate variations affect the volume of imports of textiles and apparel.

SUMMARY AND CONCLUDING COMMENTS

Although two recent studies indicate that exchange rate variations do not influence overall textile and apparel imports or production, the empirical tests conducted here suggest to the contrary that exchange rate variations do indeed have a significant effect on textile and apparel imports. Changes in income are found to have a greater impact than changes in the exchange rate on textile and apparel imports.

The results reported here are good news for the U.S. textile and apparel industries. If, as our study indicates, the exchange value of the dollar does affect imports, then the recent exchange rate depreciation should cause a decline in the quantity of imports. In addition, as our study indicates that textile and apparel imports are related to income and thus demand increases, part of the reason why imports are rising may be that the U.S. demand is expanding. If so, then the potential exists for domestic production to expand with a rise in demand. Consequently, although the market share of foreign imports has increased, production in the U.S. textile and apparel industry has held steady in real terms.

APPENDIX A

Calculating a Real Exchange Rate for Textile and Apparel Imports

The multilateral real exchange rate for this study consists of 24 foreign countries that supplied the United States with an average of 84 percent of its textile and apparel imports from 1977 through 1986.[1]

The index is constructed on a quarterly basis for the period 1977.1 through 1986.1 by using the following formula:

$$I_t = \left[\prod_{i=1}^{24} \left(\frac{E_t^i}{E_B^i} \cdot \frac{CPI_t^{US}}{CPI_t^i} \right)^{W_t^i} \right] 100$$

where

I_t = the textile and apparel index in quarter t,

E_t^i = the number of units of currency i per U.S. dollar in quarter t,

E_B^i = the number of units of currency i per U.S. dollar in the base period (first quarter 1977),

CPI_t^i = the consumer price index of country i in quarter t,

CPI_t^{US} = the consumer price index of the U.S. in quarter t,

$W_t^i = \dfrac{M_t^i}{\sum\limits_{i=1}^{24} M_t^i}$ trade weight,

M_t^i = U.S. imports from country i in year t.

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[1] These countries are: Taiwan, Korea, Hong Kong, Japan, Italy, Pakistan, Mexico, Canada, Germany, Philippines, Indonesia, India, Thailand, United Kingdom, Brazil, Malaysia, Singapore, Dominican Republic, Sri Lanka, France, Haiti, Spain, Egypt, and Peru. Although the People's Republic of China provides the second largest quantity of textile and apparel imports to the United States, it is not included in the exchange rate computation because CPI data is not available on a quarterly basis.

APPENDIX B

Variations of the Model for the Period 1977.1 to 1986.1

Model 2

Variable	Textiles*	Apparel*
Intercept	−24.75	−16.10
	(−3.71)†	(−2.42)†
Log of Real Exchange Rate	1.14	0.83
	(2.49)†	(2.05)‡
Log of Real GNP	2.58	2.19
	(3.91)†	(3.32)†
Log of Real Price Index	−0.18	−0.75
	(−0.76)	(−3.14)†
R-Square	.87	.88

$$\text{Real Price Index} = \left[\prod_{i=1}^{24} \left(\frac{WPI_t^{US}}{CPI_t^i} \right)^{W_t^i} \right] 100$$

Model 3

Variable	Textiles*	Apparel*
Intercept	−25.89	−19.63
	(−5.24)†	(−3.85)†
Log of Commodity-Specific Real Exchange Rate	1.13	0.99
	(3.79)†	(3.29)†
Log of Real GNP	2.63	2.05
	(4.36)†	(3.38)†
Time Trend	0.01	0.02
	(2.88)†	(5.46)†
R-Square	.91	.93

Commodity-Specific Real Exchange Rate =

$$\left[\prod_{i=1}^{24} \left(\frac{E_t^i}{E_B^i} \cdot \frac{WPI_t^{US}}{CPI_t^i} \right)^{W_t^i} \right] 100$$

$W_t^i = \dfrac{M_t^i}{\sum\limits_{i=1}^{24} M_t^i}$ trade weight,

M_t^i = U.S. imports from country i in year t.

Time trend = the trend that may be attributed to variables that are not in the regression equation, such as a relative price variable.

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* A two-step full transform method was used to correct for first order autocorrelation.

† T-statistic significant at the 1 percent level.

‡ T-statistic significant at the 5 percent level.