2002 BELTWIDE COTTON CONFERENCES, ATLANTA, GA – JANUARY 8-12

EXCHANGE RATES AND PATTERNS OF COTTON TEXTILE TRADE

G.A. Raines, III and M.A. Messura
Strategic Planning Division
Cotton Incorporated
Cary, NC

Abstract

The surge in imported textiles and apparel, specifically cotton textiles and apparel, has been attributed in large part to the increased appreciation of the dollar and the resulting relative price decline of foreign goods imported into the United States. The objective of this paper was to study exchange rate patterns relative to the U.S. dollar of countries that are major cotton textile and apparel trading partners with the United States and to determine the impact and strength of correlation between exchange rates and the rate of growth in cotton textile and apparel imports from these countries into the United States. Findings suggest that although changes in exchange rates are a significant factor, changes in the growth rate of the gross domestic product (GDP) may be more important for explaining the variation in import volume.

Introduction

Over the past twelve years, imports of textiles and apparel into the United States have almost tripled and cotton products, accounting for approximately 60% of the market for all textiles and apparel sold at retail in the U.S., have seen a similar three-fold increase in imports over this period. Reflecting this trend, imports of apparel sold at retail in the early 1990s accounted for 30% market share, while domestically produced goods accounted for the remaining 70%. Yet by 2000, imported goods represented 70% market share, while domestics accounted for only 30%.

Since the dissolution of the Bretton Woods Agreement in the early 1970's, several countries around the world ceased fixing their currencies to the U.S. dollar and began a "managed float" system, where currencies may rise and fall in value relative to one another depending on each one's available supply and demand, but also where central banks may intervene to stabilize volatile exchange rate fluctuations. This type of system causes the relative prices of imports and exports around the world to fluctuate, affecting quantities supplied and demanded. International trade in cotton textiles and apparel is no exception.

Several previous studies evaluated the effects of exchange rate valuation on foreign trade, and many different variations of dollar indices have been employed to monitor the foreign exchange value of the U.S. dollar. In a 1987 study prepared by Christine Chmura for the Federal Reserve Bank of Richmond, a textile and apparel dollar index was constructed to measure the effects of strength of the dollar on net imports of textiles and apparel. Chmura formulated a regression model based upon the index value and a measure of income (real GNP) to explain the variation in the volume of net imports of textiles and apparel. Chmura concluded that while the foreign exchange value of the U.S. dollar and national income both play a statistically significant role in determining the volume of net imports for both textiles and apparel, changes in national income had a larger effect compared to changes in the exchange rate of the U.S. dollar.

This study presents empirical evidence of exchange rates and national income (U.S. real GDP) experienced since the earlier study and revisits Chmura's conclusions for total textiles and apparel to test if exchange rates and national income are significant drivers in determining the level of cotton-product imports into the U.S. market.

Data and Methodology

The time period employed for this study is from January 1989 through December 2000. The period was chosen for two reasons. First, the period encompasses a complete economic cycle in the United States: economic activity slowed in 1989-1990, contracted from third quarter 1990 through first quarter 1991, experienced unprecedented expansion for over ten straight years, and began to slow again by fourth quarter 2000. By encompassing a full cycle, income variables drawn from the model are likely to be from any point in the cycle, ensuring correlation is not due purely to a trend factor. Secondly, the period includes pronounced variations in the exchange rate of the U.S. dollar against several major foreign currencies. The dollar has experienced periods of ups and downs over the period, swinging as much as ten percent in a year in aggregate comparisons, and far greater in bilateral comparisons.

Construction of an appropriate dollar index is critical in testing the validity of the hypothesis that the value of the dollar is a significant factor in cotton-product import growth. The index chosen is limited to the relative value of the dollar in terms of currencies of major cotton-product supplying nations. The index is restricted in this fashion in order to minimize distortion

caused by non-supplying countries and to employ the proper allocable influence of each of the major suppliers. Our study identified the top 22 cotton-product importers to the United States over the period, accounting for 80% - 87% of total U.S. imports of cotton products in each year over the period studied. The sample of countries included in the index represented a diverse group of industrial and developing nations from the Indian Subcontinent, Pacific Rim, Caribbean Basin, NAFTA, Africa, and Europe. The index weighted each country according to its share of cotton-product imports into the United States.

Figure 1 provides comparisons of the respective regional weightings of three indices for comparison: The Atlanta Fed Index, the Chmura textile index, and the cotton-product index. The Atlanta Fed Index, a nominal index of 18 countries, was constructed in 1984, readjusted in 1995, and is based upon total U.S. international trade across all industries. The index is heavily weighted toward Canada, the United States' largest trading partner, and Europe, accounting for a combined 58.7% of the total weightings. The Chmura index is a real index of 24 countries constructed in 1987 and weighted based upon the primary apparel and textile traders with the United States during the period 1977 through 1986. This index is heavily weighted toward the Pacific Rim, home to the largest foreign textile suppliers to the U.S. during the period, with a 66.8% share. The cotton-product index is a real index of the top 22 cotton textile and apparel supplying countries to the United States. This index is more geographically and economically diverse than the others, with no region accounting for more than 30.5%, and no one country accounting for more than 14% of total cotton-product imports. Figure 1 shows not only how aggregate U.S. trade patterns differ from trade patterns in textiles and apparel, but shows a pronounced shift in the geographic sourcing of textiles and apparel over the last two decades. Over this time, a substantial share of sourcing of textiles and apparel has migrated out of Asia and diversified throughout the rest of the world.

The cotton-product index utilized real, as opposed to nominal, exchange rates. Each country's exchange rate to the dollar was deflated by using the value of the consumer price index of the individual country relative to the U.S. consumer price index. Doing so allows for correcting distortions that outlier inflation rates can introduce when a currency is evaluated. The index was constructed using base-year (2000) weightings. The alternative, annually-updated rolling weightings, have a major disadvantage if weights assigned to various currencies are revised because of shifts in trade shares, thereby changing the value of an aggregate index even if no exchange rates change.

The final weighting issue concerns the technique used to aggregate or average the various weighted exchange rates. Of the two options available, analytical arguments strongly favor the geometric over the arithmetic averaging technique. An arithmetic averaging technique merely multiplies each currency's weight in the index by its percentage change and sums up these weighted changes. The major drawback of this approach is that it does not treat increases and decreases symmetrically and could result in an upward bias. Geometric averaging emphasizes proportional, rather than absolute, changes, and therefore is the primary approach used in calculating many indices, including the cotton-product index.

By utilizing a sample of the top 22 cotton-product importing nations and their respective weightings from base year 2000, along with inflation-adjusted exchange rates and a geometric averaging technique, the trade-weighted cotton dollar index was calculated based upon the following formula:

$$I_t = \left[\prod_{i=1}^{22} \left(\frac{E_t^{\,i}}{E_B^{\,i}} \bullet \frac{CPI_t^{\,US}}{CPI_t^{\,i}} \right)^{W_t^{\,i}} \right] \bullet 100$$

where

I_t = the cotton textile and apparel index in month (or quarter) t,
$E_t^{\,i}$ = the number of units of currency i per U.S. dollar in month (or quarter) t,
$E_B^{\,i}$ = the number of units of currency i per U.S. in the base period (either January 1989 = 100 or first quarter 1989 = 100),
$CPI_t^{\,i}$ = the consumer price index of country i in (month or quarter) t,
$CPI_t^{\,US}$ = the consumer price index of the U.S. in (month or quarter) t,
$W_t^{\,i}$ = $\dfrac{M_t^{\,i}}{\sum_{i=1}^{22} M_t^{\,i}}$ trade weight, and
$M_t^{\,i}$ = U.S. imports from country i in year t.

Monthly data of total aggregate cotton product imports were determined for each of the 144 months in the period. Monthly nominal exchange rates to the dollar were obtained for each of the top 22 foreign cotton-product suppliers, along with annual consumer inflation rates for the United States and each foreign supplier.

Figure 2 shows how this index has varied since 1989 relative to the Atlanta Fed Index and the Chmura index. All three indices show relatively stable dollar values from 1989 to early 1997. During the Asian financial crisis of 1997/1998, each index experienced significant increases in the value of the dollar, as various component countries experienced sharp declines in the foreign exchange values of their currencies. After leveling off in late 1998 through early 2000, all three indices again experienced sharp increases throughout the remainder of 2000 as the dollar rose relative to the value of foreign currencies.

Findings

Along with dollar index values for each period, U.S. real gross domestic product data over the entire period were collected to include in a multiple regression model of the form below:

$$\text{Imports} = c + b_1(\text{real exchange rate}) + b_2(\text{real GDP}) + \text{error term}$$

The independent variables in the cotton-product model were lagged nine months to capture the effect of time delays occurring before import levels respond to changes in income and real exchange rates. The import variable is defined as the dependent variable in this model and all variables are expressed in the form of their natural logarithms. As shown in Table 1, the coefficients of the explanatory variables in both the Chmura study and the cotton-product study are statistically significant at the 99% level. Results for both studies indicate that changes in either independent variable positively affect the level of imports.

In both regression equations, the income variable (real GNP or real GDP) has a positive effect on both textile imports and cotton-product imports. This result was expected as intuitively, the more income growth a nation has, the more consumption of apparel and textiles (normal goods) would be expected. For example, in the textile and cotton product models, for every one percent rise in real GNP or real GDP, imports would be expected to rise 2.91% and 3.13%, respectively. Meanwhile in both models, for every one percent increase in the real exchange rate, imports would be expected to rise 1.33% and 1.05%, respectively. In both models the independent variables explain approximately 87-88% of the variation in the level of imports. Similar to Chmura's analysis, our research also suggests that the income variable has a greater effect on imports of total textiles and cotton products than does the real exchange rate.

Discussion

The conclusions from this study suggest that the foreign exchange value of the dollar and growth in national income both have a direct and significant impact on the volume of cotton textiles and apparel imported into the country. The growth of national income, as measured by gross domestic product, is shown to have a larger effect than that of a cotton-product weighted dollar index.

Perhaps the impact of real GDP is amplified by the divergence seen over the last decade between the rates of economic expansion felt among the largest economies in the world – the U.S., Europe, and Japan. The rate of economic growth of the latter two have lagged, while America's economic expansion continued unabated at unprecedented rates over much of the 1990s**.** Figure 3 highlights the gap in economic expansion witnessed over the last decade between the United States and that of Europe and Japan, the three largest consumer economies in the world. Over the period, the U.S. has enjoyed average annual growth of 3.2%, while the European and Japanese economies have only experienced average annual growth rates of 2.3% and 2.1%, respectively. As a result, of the major consumers of world imports of cotton products, only the U.S. has seen its appetite expand quickly, while the other two regions have grown more slowly**.** With other large consumer markets growing more slowly in the world market, foreign suppliers appear to have shifted their focus to the expanding consumer market in the United States in order to sell their goods. This shift resulted in even more intensive pressure to raise the level of cotton textile imports above what possibly would have occurred had there been stronger economic growth in major consumer markets other than the United States.

References

Chmura, Christine, "The Effect of Exchange Rate Variation on U.S. Textile and Apparel Imports." Federal Reserve Bank of Richmond Economic Review 73 (May/June 1987): 17-23.

Consumer purchase data based on unit sales from the NPD Group.

International Monetary Fund, World Economic Outlook.

Mudd, Shannon B., "Disaggregating the Dollar Index: Trade in Textiles and Apparel." Federal Reserve Bank of Atlanta Economic Review 73 (March/April 1988): 28-32.

Rosenweig, Jeffrey A., "A New Dollar Index: Capturing a More Global Perspective." Federal Reserve Bank of Atlanta Economic Review 71 (June/July 86): 12-23.

Rosenweig, Jeffrey A., "Constructing and Using Exchange Rate Indexes." Federal Reserve Bank of Atlanta Economic Review (Summer 1987): 4-16.

Werner International, Inc. Werner InfoTex Division, Reston, VA.

Table 1. Comparison of Regression Results

Variable	Chmura Study*	Cotton-Product Study
Intercept	-29.41	-20.07
	(-11.20)	(-13.72)
Log of Real Exchange Rate	1.33	1.05
	(3.54)	(2.66)
Log of Real GNP/GDP	2.91	3.13
	(5.94)	(24.03)
R-Square	0.87	0.88
Durbin-Watson Test		1.88

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

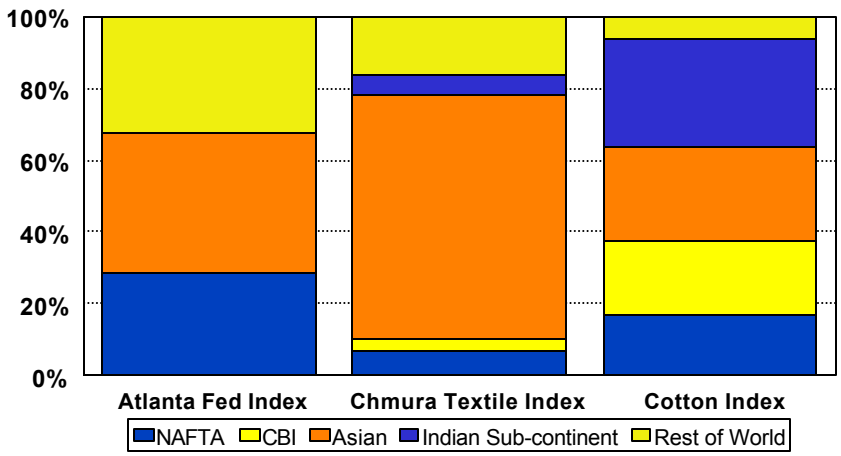

Figure 1. Distribution of Weights by Index.

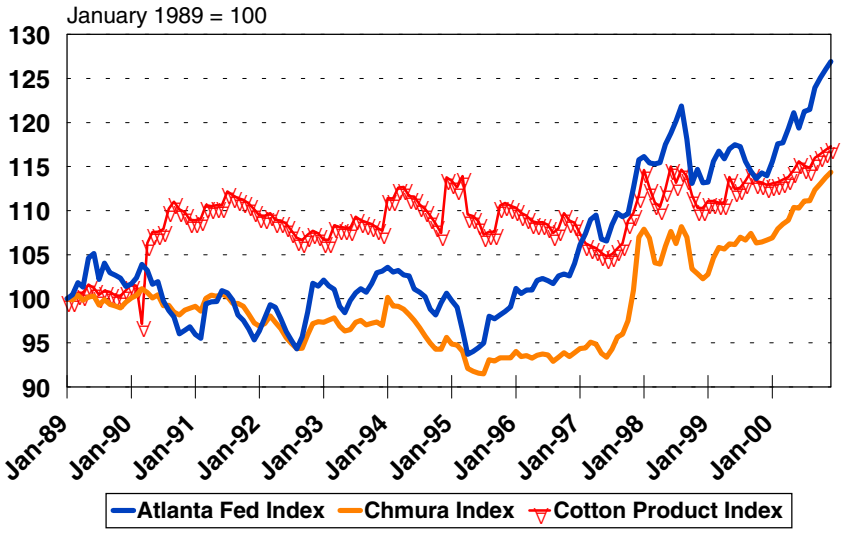

Figure 2. Dollar Indices.

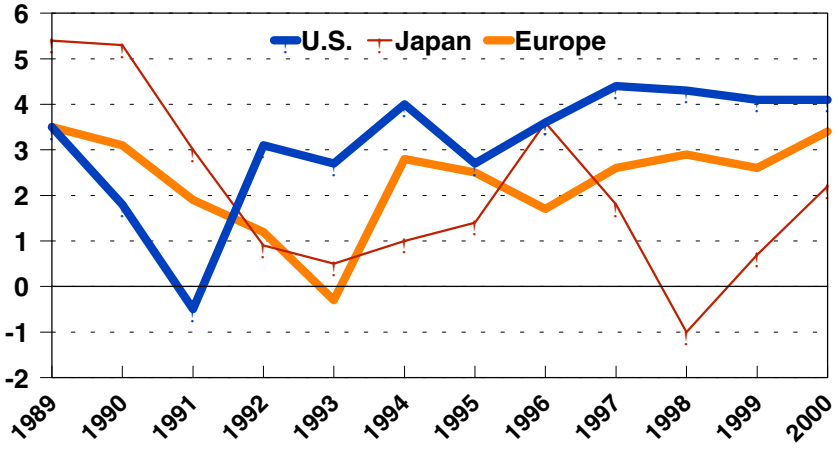

Figure 3. Annual Real GDP Growth Rates.