Measuring Competition for Textiles: Does the U.S. Make the Grade?

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ABSTRACT

U.S. textile manufacturing is coming under increasing pressure from foreign competition. This paper evaluates the U.S. competitive position in the yarn segment using established quantifiable measures and provides an overall competitive assessment. The study found the industry in a relatively weak competitive position but that U.S. competitive position is improving.

Key Words: competitiveness, cotton yarn, revealed comparative advantage, tariff equivalent.

JEL Classifications: F29, L67, O57.

Measuring Competition for Textiles: Does the U.S. Make the Grade?

The textile industry is affected by a drastically changing economic environment as global free trade initiatives provide for unrestricted competition. U.S. textile manufacturers face an industry environment in which low cost imports and the elimination of trade barriers decrease domestic profitability. Almost all of the labor intensive cut-and-sew apparel segment, "the needle" in industry vernacular, have responded to these competitive forces by moving production facilities overseas. The impact on less labor intensive industry segments remains unclear.

The purpose of this study is to better understand the competitive position of the U.S. cotton textile industry in relation to international rivals. The primary focus of this analysis will be on that portion of the industry which initially transforms raw cotton into cotton yarn. The textile industry has experienced a recent migration, especially to Asian countries, which seem to be following a discernable pattern. First, developing countries are able to attract labor intensive cut and sew apparel industries using imported fabric from developed countries. Fabric production soon follows using imported yarn. Finally, a yarn industry emerges in the developing country based on the importation of raw fiber (MacDonald).

The consequences of the movement of virtually all textile production to developing countries will alter the structure of the global textile industry. The purpose of this paper is to appraise the current competitiveness of U.S. yarn producers and evaluate their potential in meeting the challenges of this evolving competitive landscape. This paper accomplishes this analysis by comparing the competitive advantage or disadvantage of the U.S. relative to other nations producing cotton yarns using several measures. With the further elimination of quota protection for U.S. producers at the end of 2004, trade barriers will fall and competitive forces will increase. Analysis of U.S. competitiveness will provide those with an interest in the

viability of domestic yarn manufacturing with a key indicator of whether this industry as a whole may follow the needle overseas or whether a future remains for core aspects of this industry in the United States.

This study evaluates the competitiveness of U.S. manufacturers of cotton yarn products compared to international rivals by analyzing the current competitive state of this industry and by identifying competitive trends. This will be accomplished by comparing objective measures of market share of textile products, a price-based comparison of goods offered in the market place, a comparison of costs of production between major market participants, and an evaluation of the efficiencies/inefficiencies associated with the transport of initially processed textile products in contrast to the shipment of raw cotton.

Revealed Comparative Advantage

A key aspect of evaluating whether a producer of a given good is competitive in his/her market offering depends on both a definition and measure of the term 'competitiveness'. Drescher and Maurer cite Bellendorf's definition of competitiveness as the ability of firms and industries "…to protect and/or improve their position in relation to competitors which are active in the same market" (p. 162). This definition is consistent with that of Sharples and Kennedy and Rossen who define competitiveness as the ability to achieve market share. A producer who attains a market share for his/her product is by definition competitive. A product for which market share is increasing can be said to be increasing in competitiveness and, conversely, a product is regarded as decreasing in competitiveness if the market share for that product is in decline. In the following discussion, market share will both define competitiveness and serve as its primary measure.

Market share as an empirical measure of competitiveness is founded on the performance of a given product in the marketplace. Since the focus of this paper is the global marketplace, export shares will be used as indicators of international competitiveness. These relative shares will be analyzed for the clues they may provide as to how and in which direction the competitiveness of a given industry may be changing (Drescher and Maurer). Balassa asserts that an analysis of the trade performance of individual countries would indicate the comparative advantage one nation holds over others in the marketing of manufactured goods. This analysis is based on a comparison of "…the relative shares of a country in the world exports of individual commodities and indicating changes in relative shares over time (Balassa, p.105). Thus, comparative advantage as described by Balassa is consistent with the concept of competitiveness used here. Direct observation of trade performance may then reveal comparative advantage (competitiveness) in the production of that commodity. Balassa introduces an index called "Revealed Comparative Advantage" (RCA) as a means of measuring comparative advantage.

The export based RCA index used here is based on an application of Balassa's RCA by Leishman, Menkhaus and Whipple and is calculated in three steps. First, a country's market share in the production of a specific good (x^t_{ij}) is calculated as a country's export of a certain good divided by the world exports of that good,

(1) $X^t_{ij}/X^t_{iw} = x^t_{ij}$,

where X^t_{ij} equals the exports of commodity i by country j in time t and X^t_{iw} equals the world w exports of commodity i in time t.

Second, a country's market share in the export of all manufactured goods (x^t_{kj}) is calculated by dividing its own exports of all manufactured goods by the combined world exports of all manufactured goods,

(2) $X^t_{kj}/X^t_{kw} = x^t_{kj}$,

where X^t_{kj} equals the exports from country j of all manufactured goods k in time t and X^t_{kw} equals the world w exports of all manufactured goods k in time t.

Third, dividing the market share of a country in the production of a certain good by its market share in the export of all goods yields the current RCA index in time t for country j in commodity i:

(3) $x^t_{ij}/ x^t_{kj} \times 100 = RCA^t_{ij}$.

The higher the RCA, the greater importance of that good relative to all manufactured exports. An index value of 120 indicates that a country's exports of that good for a given year is 20% higher than its share in total world exports of all manufactured goods. An index value of 80 reveals that a country's exports for a given good are 20% lower than its share of world exports of all manufactured goods.

Export data for textile yarn, fabric, etc.(SITC Rev. 3 code 65) and all manufactured goods (SITC Rev. 3 code 6) were gathered for years 1989 through 2001 for the major textile producing nations of China, Indonesia, Pakistan, and the United States as well as total world trade in each classification. Figures are available online from the Comtrade database of the United Nations Statistics Division (trade statistics were not reported for all nations for all years). RCA index values were calculated for each of these nations and are shown in Figure 1.

The data indicate that the United States holds the weakest competitive position among the textile producers reported here. The export of U.S. textile products was 13.13 % lower than that of all U.S. manufacturing exports in 1989 (it's high for the time range) and 15.64% lower in 2001. Pakistan is shown to be the country in which the exportation of textile products is highest relative to other manufacturing exports, with the export share for textiles exceeding all

manufacturing by 400%. Indonesia has seen the greatest percentage gains in RCA values from 1989 to 2001, increasing 55%.

From this analysis, two points seem particularly pertinent. First, the production of textile products, as a percentage of all manufacturing, is significantly higher in China, Indonesia, and Pakistan than in the United States. Using Balassa's RCA, each of these nations is significantly more competitive in this aspect of the textile trade than are U.S. producers. It would appear that these nations are committed to the development of the textile component of their respective economies and are capitalizing on competitive advantages they may possess. The second point addresses the issue of reallocation of resources in an economic climate characterized by trade liberalization and open markets. The degree to which trade restrictions artificially support U.S. market share in the textile products trade will greatly determine the impact on these producers when current support policies are eliminated at the end of 2004. Given that the current trade agreements provide substantial support to U.S. producers allowing them to maintain market share at current levels, then U.S. competitiveness is overestimated in the current model. The quota elimination scheduled for January 1, 2005 will likely reduce U.S. market share, decrease U.S. competitiveness, and shift the textile trade further to those nations who possess a competitive advantage.

Tariff Equivalents

In the attempt to determine a country's ability to compete in global markets, bilateral price comparisons across nations represent another method of measuring competitiveness among international industry participants. A comparison of the price of goods plus transportation costs to major ports can reveal those nations which are more likely to import goods as opposed to those who will likely supply a particular market (Hayes, Green, Jensen, and Erbach).

The United States is currently the highest priced producer of cotton yarns among the international manufacturers whose prices are reported by *Cotton Outlook* (see Table 1). While interesting, these prices become relevant as indicators of competitiveness only when transportation costs between countries are added to the domestic prices. A decline in yarn prices since 2001 has lowered the U.S. price of 20-count yarn from $3.40 per kilogram to $2.70, a 21% price decline in 30 months (see Figure 2). The average international price as of August 1, 2003 is $1.96, $0.74 below the U.S. price. The decline in the U.S. price has created some price convergence, but the U.S. remains priced above the rest of the international market by 27%.

To allow for the transportation adjustment of the prices in Table 1, a calculation is made for a bilateral tariff equivalent (Hayes, Green, Jensen, and Erbach). This tariff equivalent (TE) is also referred to as a "price wedge" as it represents the amount of protection domestic producers of a good enjoy based on the cost of transporting foreign produced goods into a domestic market. Competitiveness of nations will be measured by estimating this TE or price wedge

The calculation of TE's takes into account the impact of monetary policies that contribute to fluctuations in currency exchange rates and expresses the price competitiveness among producers that exists at a given point in time. Of course, shipping rates play a large role in the calculation of a TE. The rates used for this study are based on publicly available shipping quotations for dry ocean freight port to port. No adjustments are made for inland freight costs.

A TE for cotton yarn for a given nation is calculated by combining the domestic yarn price in country A with the transportation costs from country A to country B and comparing this cost to the price of yarn in country B. The difference between the price of yarn in country B and the price of a comparable product from country A being sold in B (adjusted for transportation costs) is expressed as a percentage of the delivered price.

(4) $$TE = \frac{\text{Price in B} - (\text{Price in A} + \text{transportation to B})}{(\text{Price in A} + \text{transportation to B})} \times 100$$

A negative TE indicates that the domestic price is lower than adjusted import prices. A country with negative TE's with other trading nations would not be a major export market for other producers. Positive TE's indicate the likelihood of a country serving as an export market for other producers since its domestic price is greater than the price of delivered imported goods. As an example, TE's are calculated here for the U.S. market and are reported in Table 2. The positive TE's calculated indicate that the United States is a profitable export market for Pakistan, India, and Indonesia, and to a lesser extent, Turkey. Conversely, with its higher relative yarn prices, the United States will have a negative TE for each country in this analysis.

For the most recent prices reported, the United States has an average TE for 20-count yarn of 22.69%. This represents the equivalent tariff that would need to be instituted to equate domestic U.S prices with those of the international competitors for which prices are available. Figure 3 reflects U.S. Tariff Equivalents since January 2001. A similar pattern is found when calculating TE's for 30-count yarn.

From the data presented, the U.S. is most likely to serve as an export market for international yarn producers. However, there has been a substantial decline in the TE's of each country in this study since January 2001. This would indicate that while the U.S. remains a lucrative export market, the price wedge between these competitors has declined dramatically, especially in the case of 20-count yarn. As trade limiting quotas are reduced, TE's provide an indication of those nations that may be competitively positioned to capture significant portions of the U.S. cotton yarn market.

Given that China's is the world's largest manufacturer of apparel ("Assessment of the Economic Effects on the United States of China's Accession to the WTO"), this method can be

used to measure the price competitiveness which exists between U.S. produced cotton yarn and cotton yarn in the domestic Chinese market. Using prices for 30-count carded cotton yarn reported for China of $2.35/kg at the end of September 2003 ("Cotton Yarn Prices in China"), the price of U.S. carded 30s in August 2003 of $3.20/kg (Table 1), and a weighted average container shipping rate from the USDA Ocean Rate Bulletin, China's TE with U.S. producers can be calculated:

$$(5) \qquad TE = \frac{2.35 - (3.20 + .12)}{(3.20 + .12)} \times 100 = -29.22.$$

This TE estimates a 29% price-based advantage for domestic producers of cotton yarn in China over competitors from the United States.

Cost of Production Comparison

To understand the global dynamics of the textile industry requires an examination of the relative costs of production of major competitors. Such a cost of production (COP) comparison is an important gauge of competitiveness and is useful for gaining insight into the relative competitiveness of U.S. manufacturers (Barkema, Drabenstott, and Tweeten). Of interest here is a comparison of the costs different countries have in the components of a specific yarn production process in order to ascertain the competitiveness of yarn produced in the United States. Whether the U.S. textile industry survives may center on the ability of domestic processors to offset the lower labor costs of overseas producers with comparative advantages the U.S. may still hold in other areas of the yarn manufacture.

This analysis will compare the costs associated with the major components of ring spun yarn production by utilizing data from the *International Production Cost Comparison 2003* provided by the International Textile Manufacturers Federation (ITMF). The countries included in this survey include Brazil, China, India, Italy, Korea, Turkey, and the United States. This

comparison will indicate the sources of differences in COP's for each country and identify the forces which shape competitiveness in this industry (Fang and Fabiosa).

The comparison of total manufacturing costs of major international producers can be seen in Table 3 and Figure 4. As expected, the cost of labor in the manufacturing process is highest in the developed nations of Italy and the United States, accounting for 24 and 19 percent of all manufacturing costs respectively, compared to 2 percent of costs in China, India, and Brazil. The waste component in U.S. production is, along with Italy, the lowest reported. Power costs are lower in the U.S. than any rival other than Korea and Brazil. The costs associated with auxiliary material (spare parts, lubricants, cleaning materials, maintenance work, etc.) are virtually the same for each country. Capital costs (depreciation and interest) are lowest in China and Italy followed by Korea and the U.S. The U.S. enjoys a substantial advantage in the procurement costs of cotton over each competitor except India. Given that an average 50 percent of the cost of producing ring spun yarn is associated with raw materials, this results in the U.S. becoming much more competitive. India is the producing nation with the lowest overall costs (2.45), then Brazil (2.61), Korea (2.68), China (2.76), Turkey (2.85), the U.S. (2.86), and Italy (3.59).

The result of this analysis shows that the cost of producing yarn in the United States is 15% higher than India, 9% higher than Brazil, 6% higher than Korea, 3% higher than China, virtually the same as Turkey, and 25% lower than Italy. It would appear that U.S. producers of ring spun cotton yarn have costs of production which are only marginally higher than those of its fiercest rivals. In comparison with Chinese producers, the U.S. is shown to possess a competitive advantage in terms of costs associated with waste and raw material procurement that practically offset China's advantage of lower labor and capital costs. It should be noted that the

costs surveyed for this comparison are for a single, specific yarn production process. Other processes may result in different results than those of this study. However, based on these results, if the United States is losing trade to Chinese producers, it may be due to factors other than those that relate to the recovery of the costs of production. This may suggest that yarn products are being offered for sale at below the costs of production.

Shipping Efficiencies of Cotton and Yarn

The United States has become the world's largest exporter of raw cotton, supplying the raw material for textile producers around the world. However, cotton, as the raw material for ring spun yarn, has an estimated waste component of 18% (Simonton). While some of this waste is recoverable, a cost must still be incurred with its shipment as a component of raw cotton. Yarn, the product of the initial phase of cotton processing for textiles, is virtually 100% useable and thus incurs no expense as regards the cost of transporting a waste component.

The question arises as to the efficiency gained in the shipment of yarn as opposed to raw cotton. To gauge the relative efficiency of shipping each product, a comparison will be made between the cost of shipping raw cotton and cotton yarn to the largest overseas importers of U.S. upland cotton. Mexico, the single largest importer of U.S. upland cotton, is not included in this comparison as it has an inherent advantage in transportation of products due to its geographic proximity to the United States. This analysis will include the next five largest importers of U.S. cotton for the 2003 marketing year: China, Turkey, Indonesia, Thailand, and Taiwan (U.S. Export Sales). The cost of transporting the waste component of cotton in the ring spinning process will be calculated to demonstrate the amount this adds to the cost of production of ring spun yarn for the textile manufacturer who utilizes imported cotton. Conversely, this will represent a cost savings to the manufacturer who can rely on domestic supplies of raw materials.

The shipping costs used for this analysis are for average container rates for 19.5 kiloton dry, forty foot containers published by USDA (Ocean Rate Bulletin), with the exception of the rates to Turkey which were obtained by a private industry source. No differential for freight rates between raw cotton and cotton yarn are used here as the container requirements and capacities for compressed cotton are assumed to be the same as those required for the transportation of cotton yarn. An additional cost of yarn shipping would likely be in the area of cargo insurance since the value per container would be higher for yarn as opposed to raw cotton, but this difference is not used for these calculations.

Table 4 reports the results of these calculations. Shipping costs add from between $14 and $29 per bale to the cost of imported cotton and the shipping cost of waste in terms of costs per bale ranges from $2.40 to $4.97. In additional costs per kilogram of yarn, the shipment of the waste component of raw cotton adds from $0.0134 to $0.0278 to the cost of ring spun yarn production for the overseas manufacturer who must rely on imports of raw materials.

As an example, for a yarn producer in Indonesia who receives a price of $1.90 per kilogram of 20-count yarn (Table 1), the shipment of the waste component associated with raw cotton adds $.0214 to the cost of yarn production (Table 4), an increase of approximately 1.13%. From this perspective alone, an apparel manufacturer operating in Indonesia would save 1.13% in his/her cost of production by utilizing imported yarn from the United States rather than imported U.S. cotton which must be transformed into yarn. These calculations are applicable only for the waste component of ring spinning and do not consider the cost of waste which would continue to be incurred in latter stages of the textile production process.

Conclusions

The purpose of comparing measures of competitiveness is to reveal, from an international perspective, the competitive advantage one nation may have over others in the production of textile products. The importance of this issue stems not only from the current financial stress of U.S. producers, but also from the pending elimination of trade protection for U.S. manufacturers at the end of 2004. In such a dynamic economic environment, measures of a nation's competitive position are of increasing importance. The measures of competitiveness identified above provide empirical and quantifiable insight as to the competitive status of U.S. yarn producers who must compete in a global marketplace. The tools of this analysis are not without limitations, but do allow for some conclusions to be drawn as to the challenges facing the U.S. textile industry as it continues on its journey into a new competitive landscape.

As is evident from the information presented here, the United States fails to 'make the grade' in several categories but by margins which are narrow in most cases and narrowing in others. The measure which shows the poorest and non-improving competitive position of U.S. yarn manufacturers is the Revealed Comparative Advantage. This index indicates that the United States is lagging behind China, Indonesia, and Pakistan in terms of market share in exports of yarn, fabric, etc. However, this situation may be indicative of a broader problem associated with the global market share of all U.S. manufactured exports.

Price-based measurements of tariff equivalency show that the price of U.S. produced yarn is such that it is profitable for overseas producers to export here. However, yarn price declines over the past three years have reduced the amount by which these producers have a competitive advantage over United States producers. This disadvantageous tariff equivalency is based upon

the fact that the U.S. price for cotton yarn is approximately 30% higher than that of its major rivals even though its costs of production are shown to be on a par with major competitors.

In terms of cost of production, the United States is only marginally higher than producers who are generally regarded as possessive of advantages in manufacturing for which we cannot compete, namely the cost of labor. As shown, the U.S. has advantages in other areas which offset most of the advantage gained by cheap labor in competitor countries.

This study does show a competitive advantage for the U.S. textile producer in the area of raw material procurement. This advantage will be of increasing consequence as the gap between the U.S. and international rivals in the areas of cost of production and yarn price continues to narrow. The cost savings associated with the shipment of yarn over raw cotton are especially significant for competitors with costs of production that are virtually equivalent.

As such, the U.S. cotton textile industry is faced with an uncertain future. Some would suggest that the pragmatic thing to do in light of current events is to let the industry go (Stanford). However, others feel the competitive playing field is only temporarily skewed to favor foreign producers and that the domestic textile industry can respond if given adequate resources and support (May). The foregoing analysis of competition in the textile industry is presented to inform this discussion and provide insight into this evolving competitive situation.

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Tables

Table 1. Domestic Yarn Prices, $U.S. per kg.

	Country	Price ($/kg)	Ratio of U.S. Price
Yarn Count 20's	Pakistan	1.72	63.70
	India	1.82	67.41
	USA	2.70	100.00
	Turkey	2.40	88.89
	Indonesia	1.90	70.37
Yarn Count 30's	Pakistan	2.18	68.13
	India	2.04	63.75
	USA	3.20	100.00
	Turkey	2.45	76.56
	Indonesia	1.98	61.88

Source: *Cotton Outlook*, Volume 81 No. 31. August 1, 2003.

Table 2. U.S. Tariff Equivalent

January 1, 2001	U.S.	Pakistan	India	Indonesia	Turkey
20's	-	62.50	76.04	44.44	41.17
30's	-	58.02	61.34	53.60	48.84
January 1, 2002					
20's	-	72.61	64.24	43.39	13.19
30's	-	56.22	62.69	53.92	24.11
January 1, 2003					
20's	-	39.79	45.11	34.85	11.05
30's	-	34.35	39.82	45.07	21.18
August 1, 2003					
20's	-	33.66	27.36	25.58	4.48
30's	-	29.03	36.75	43.50	21.67

Table 3. Total Costs 2003: Ring Yarn, (% of total costs)

	Brazil	China	India	Italy	Korea	Turkey	USA
	($U.S. per kg of yarn)						
Waste	0.19 (7%)	0.31 (11%)	0.17 (7%)	0.23 (6%)	0.22 (8%)	0.22 (8%)	0.17 (6%)
Labor	0.06 (2%)	0.04 (2%)	0.05 (2%)	0.85 (24%)	0.21 (8%)	0.13 (4%)	0.55 (19%)
Power	0.11 (4%)	0.23 (8%)	0.30 (12%)	0.37 (10%)	0.17 (6%)	0.25 (9%)	0.16 (6%)
Auxiliary material	0.11 (4%)	0.11 (4%)	0.11 (5%)	0.12 (3%)	0.11 (4%)	0.11 (4%)	0.12 (4%)
Capital (Dep. and Int.)	0.84 (32%)	0.39 (14%)	0.57 (23%)	0.60 (17%)	0.57 (21%)	0.73 (26%)	0.60 (21%)
Raw Material	1.30 (50%)	1.68 (61%)	1.25 (51%)	1.42 (40%)	1.41 (53%)	1.41 (49%)	1.26 (44%)
Total Yarn Costs	2.61	2.76	2.45	3.59	2.68	2.85	2.86

Source: *International Production Cost Comparison 2003*

Table 4. Shipping Costs of Cotton Waste for Ring Spun Yarn

	China	Turkey	Indonesia	Thailand	Taiwan
2003 cotton imports (1000 bales)	1758.5	1452.2	747.3	529.3	465.3
Ocean freight container rate ($US)	$2282.00	$1194.00	$1897.00	$2470.00	$1985.00
Shipping cost per bale ($US)	$26.85	$14.05	$22.32	$29.06	$23.35
Shipping cost of waste per bale($US)	$4.60	$2.40	$3.82	$4.97	$4.00
Shipping cost of waste to the importer ($US per kilogram of yarn)	$0.0257	$0.0134	$0.0214	$0.0278	$0.0223

Figures

Figure 1. Revealed Comparative Advantage

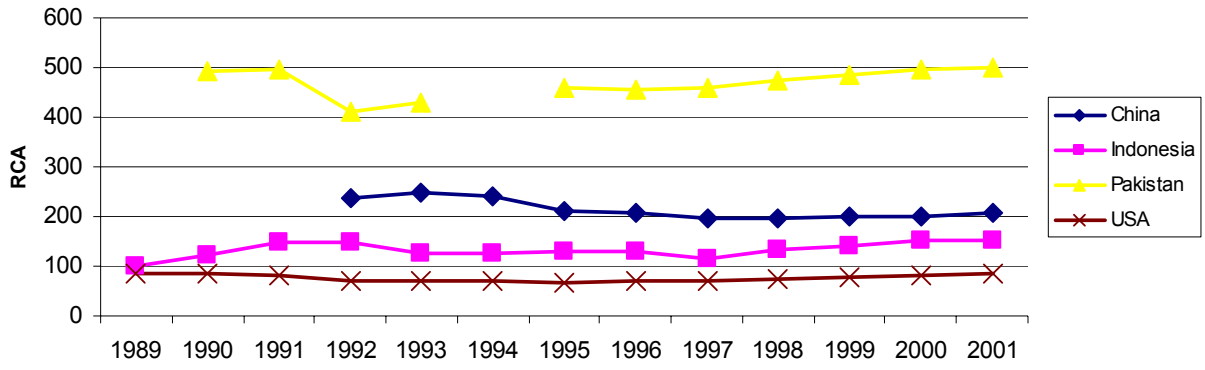
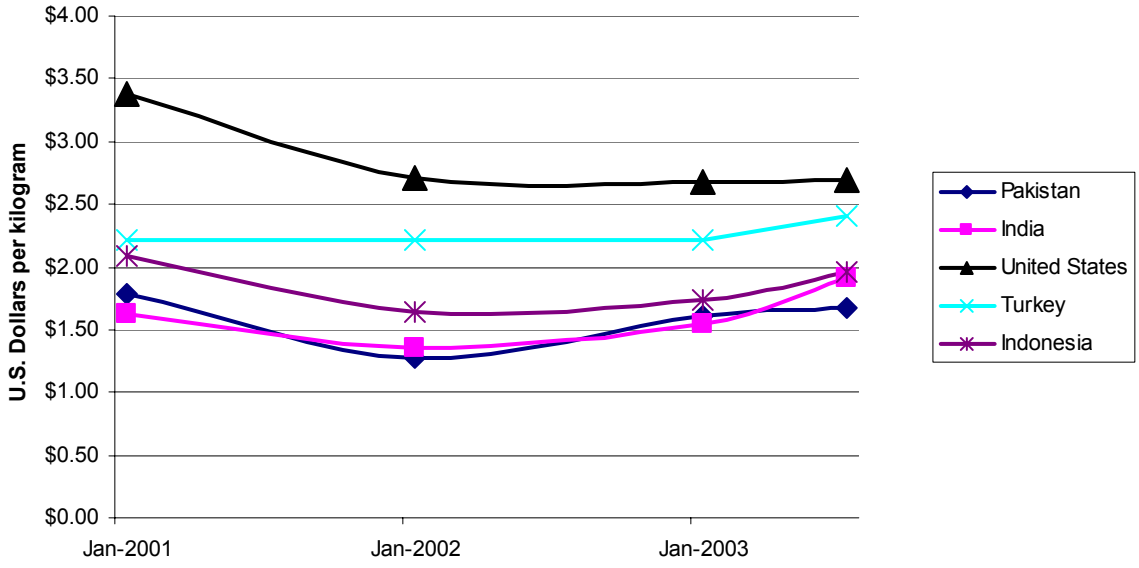


Figure 2. Cotton yarn prices, 20-count, 2001-2003



Source: *Cotton Outlook*

Figure 3. U.S. Tariff Equivalents, 20-count yarn.

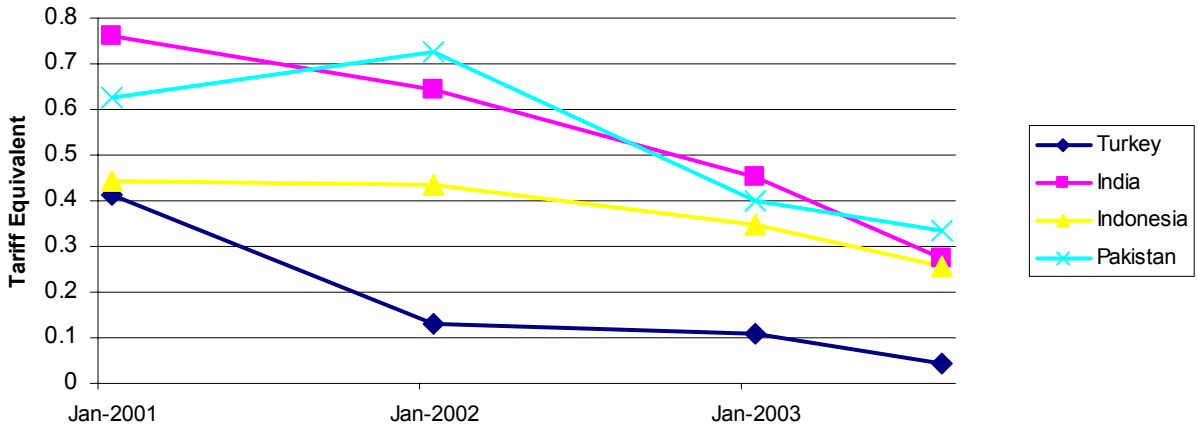
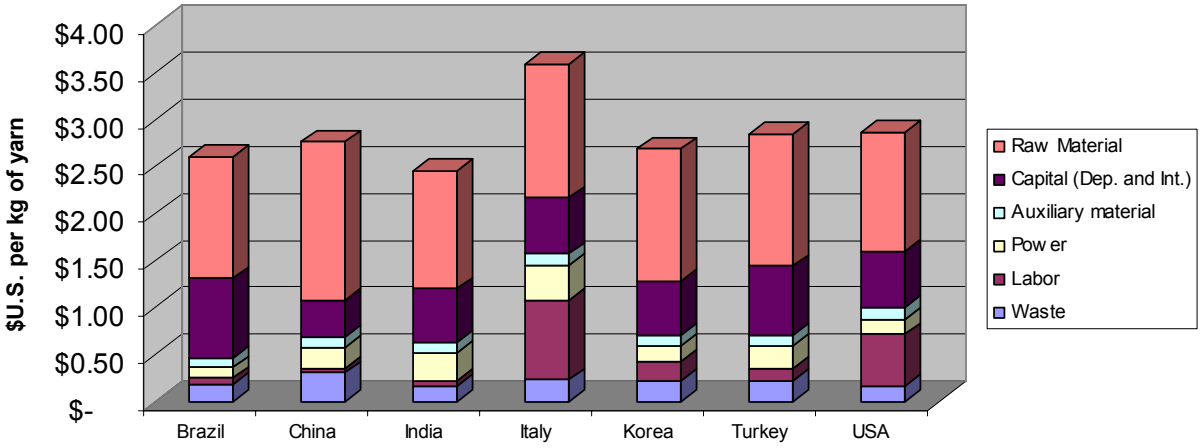


Figure 4. Total Costs 2003: Ring Spun Yarn



Source: *International Production Cost Comparison 2003*