Unraveling employment trends in textiles and apparel

Both of these industries continue to shed large numbers of workers; although textiles and apparel are closely related, the reasons for their job losses, and the prognosis for their future, differ

Lauren A. Murray

The U.S. textiles and apparel industries employ about 1.6 million U.S. workers—1 in 10 manufacturing workers and more than the auto and aircraft industries combined.[1] Textiles and apparel reached employment peaks long ago and both have been influenced by similar forces, including productivity, foreign trade, competition and business cycles. While employment losses have affected the two industries, the duration and depth of those losses differ.

The textiles industry produces base products such as threads, yarn, and cordage and woven fabrics, carpets, and rugs; in contrast, the apparel industry produces finished clothing products made from base fabrics. Employment in the textiles industry peaked in 1948, 25 years before the apparel industry. The textiles industry has lost one-half of its employment base since its peak level; the apparel industry has trimmed one-third of its jobs since its peak in 1973. And since 1970, the industries have lost 30 percent of their combined work force; in the current expansion, the industries have failed to participate in the strong cyclical growth that has been prevalent in much of manufacturing. (See table 1.)

Although the textiles and apparel industries are closely related, different reasons account for their respective job losses. Both industries will continue to face intense global competition in the current decade, and, while some manufacturers may become more profitable, employment will most likely continue to fall.

Lauren A. Murray is an economist formerly with the Division of Monthly Industry Employment Statistics, Bureau of Labor Statistics.

This article focuses on the employment trends in textiles and apparel over the past half century, with an emphasis on developments since the 1970's. The underlying causes of the protracted employment declines in each industry are examined and some of the issues that will affect future employment needs are discussed.

Long-term trends

Employment in the U.S. textiles industry reached an all-time high of 1.3 million jobs in June 1948, reflecting the overwhelming dominance of the United States in the world economy following World War II. Employment subsequently declined through several business cycles, with new levels rarely returning to 1 million. However, this long-term decline in employment is not reflected in a corresponding drop in production. On the contrary, production *increased* by nearly 190 percent between 1948 and 1994 while employment *dropped* by nearly 50 percent.[2] (See chart 1.) Labor productivity grew by 180 percent in the textiles industry between 1950 and 1973.[3] In contrast, the apparel industry experienced productivity growth of only 73 percent during that same period, which was more in line with total manufacturing labor productivity growth of 84 percent. Thus, labor productivity growth in the textiles industry was twice the rate of all of manufacturing, while labor productivity growth in the apparel industry lagged behind other manufacturing.

The apparel industry's all-time peak employment level of 1.4 million occurred in April 1973. (See chart 2.) The level of apparel employment appears to have been greatly influenced by the amount of apparel imports entering the United States. Beginning in the 1960's, imports of apparel products increased rapidly and gained a larger share of the domestic market, contributing to the subsequent employment declines in the industry. In the early 1960's, imports comprised about 2 percent of domestic consumption; by 1980 the proportion had risen to nearly 15 percent,[4] and in 1988 it was 26 percent. (See chart 3.)

Since its peak in 1973, the long-term employment trend of the apparel industry has closely followed that of the textiles industry. Through successive business cycles, apparel manufacturers failed to fully recover jobs lost during downturns. Moreover, underscoring the industry's long-term, noncyclical decline, periods of employment growth have been shorter, while the periods of job loss have become more persistent. The most recent employment contraction lasted 7 years and followed a growth cycle of only 16 months. The industry lost 220,000 jobs between its April 1984 peak and April 1991 recession trough, while productivity increased by 13 percent and imports continued to expand.

The textiles industry

Increased spending by textile manufacturers in the 1970's set the stage for productivity advances that occurred in the 1980's. The increased spending boosted productivity levels substantially, which helped manufacturers compete with rising imports. Several recessions, combined with continued technological advances and rising imports, produced a period of rapid employment losses.

Productivity and structural changes. In the late 1960's and early 1970's, textiles manufacturers made major strides in automation. Although the industry has historically spent considerable amounts of money on capital investments, spending in the 1970's was significant because most of it was invested in radical new technologies. Before 1968, the primary source of productivity gains was decreased manual handling of materials.[5] For more than 100 years the industry had updated and modified existing machinery. But in the 1970's, completely new technology, such as open-end spinning and shuttleless looms, became available. These technologies drastically reduced the time and number of workers needed to produce fabrics. For example, a water- or air-driven shuttleless loom not only produced fabric three times faster than its wooden fly shuttle predecessor, but it also could produce seven or eight times more fabric because it was able to weave wider widths. Open-end spinning boosted the rate of production of yarn four times over the older ring-spinning technique and reduced the number of steps involved in manufacturing some kinds of yarn from 15 to 3.6

Table 1. Employment in apparel and textiles, selected years, 1939–94

Year	Textiles		Apparel	
	Employment in thousands	Percent change	Employment in thousands	Percent change
1939	1,193.0	(1)	924.0	(1)
1949	1,187.0	-0.5	1,173.0	26.9
1959	945.7	-20.3	1,225.9	4.5
1969	1,002.5	6.0	1,409.1	14.9
1979	885.1	-11.7	1,304.3	-7.4
1989	719.8	-18.7	1,075.7	-17.5
1990	691.4	-3.9	1,036.2	-3.7
1991	670.0	-3.1	1,006.0	-2.9
1992	674.1	.6	1,007.2	.1
1993	674.8	.1	984.6	-2.2
1994	672.0	-.4	954.3	-3.1

[1] Data are not available.

While the technology available was revolutionary, it also was expensive. U.S textile manufacturers spent an average of $3.1 billion (in constant 1987 dollars) annually between 1969 and 1974 on capital purchases, 90 percent of which was for new equipment purchases. During the first half of the decade, manufacturers spent between 6 percent and 7 percent of their value of shipments on capital investment. In the latter half of the decade the spending dropped to about 5 percent of the value of shipments, or $2.4 billion annually. During much of the 1970's, capital expenditures for the industry were greater than profits.[7]

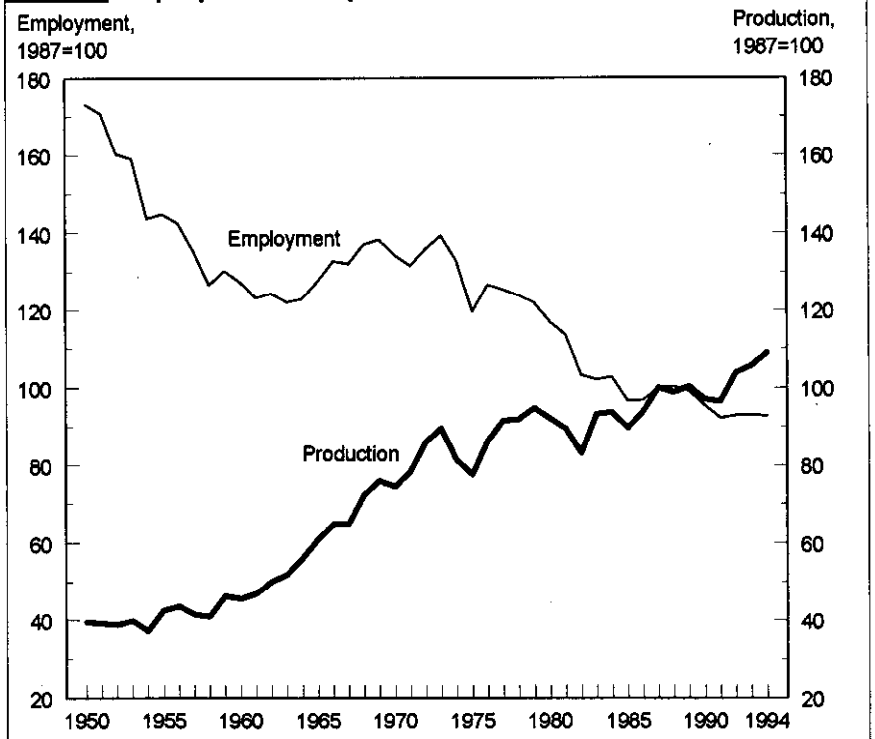
As a result of the automation during the 1970's, labor productivity, expressed in terms of output per employee hour, increased 56 percent between 1969 and 1979. Constant dollar shipments[8] rose by $11.5 billion annually during the decade, while employment declined by more than 125,000 jobs. In the early and mid-1980's, profits in the textile industry began to decline dramatically due to the rising value of the dollar, a substantial drop in exports of textile products, and two recessions in the early 1980's. Capital spending declined to an average of $2.2 billion, and in 1986, fell to $1.8 billion, its lowest level since 1963. In the mid-1980's, textile manufacturers took part in several mergers and acquisitions. This restructuring led to the establishment of several dominant firms in the industry.[9]

Many textiles companies were the targets of leveraged buyouts. Because the industry had a history of erratic earnings, many manufacturers' stock was traded below book value. Its low was attractive to buyers who were able to raise capital by using the company's assets as collateral. This was the case for at least four major manufacturers: Cannon Mills, Cone Mills, Dan River Inc., and Burlington, which were purchased during the 1980's. The size of the new firms lent

itself to achieving greater economies of scale, and gave the newly formed companies a larger capital base with which to invest in emerging technologies. Capital investments rebounded to an average of $2.4 billion between 1987 and 1990.[10]

Between December 1978 and the April 1991 employment trough, employment declined 26 percent, or 230,000 jobs. Labor productivity gains averaged 2.7 percent a year between 1979 and 1991, more in line with total manufacturing productivity growth of 2.6 percent. Production grew even as employment losses persisted, and reached a new all-time high in April 1989, before the most recent recession began and demand weakened. Following the 1990–91 recession, the textile industry enjoyed 2 years of employment growth before it again began trimming payrolls in June 1993. However, production continued to increase: December 1994 levels were 8 percent above the April 1989 peak level.

Chart 1. **Employment and production in textiles, 1950–94**



SOURCES: Employment data from the Bureau of Labor Statistics; production data from the Federal Reserve Board

Imports and exports. A second reason for the decline in textile employment was increased imports. The textile industry fared far better than the apparel industry against rising imports in the 1970's. The textile industry not only kept its share of the domestic market throughout the decade, but it also maintained a trade surplus for the latter half of the decade and into the early 1980's. The ability of the industry to maintain its market share was, very likely, due to the technological advances that reduced needed labor and accelerated the production process. Capital expenditures required to obtain this type of technology were prohibitive to many developing countries, particularly those with a large number of small, fragmented producers. Low wages in developing countries may also have limited pressures on those textile manufacturers to introduce new labor-saving technologies.[11] Thus, U.S. manufacturers were more competitive with the low-wage countries.

The U.S. textiles industry also performed much better than its European counterparts. The United States was the only major industrialized country to maintain its domestic market share in the 1970's; imports comprised only 4.5 percent of domestic market share in 1970 and 1980. Germany's and the United Kingdom's textile import penetration increased substantially. Import penetration by Japan, the largest post-World War II exporter, and Italy, while still posting a trade surplus in the textiles industry, also increased.[12]

From 1980 to 1988, the import share of total U.S. textile consumption increased by less than 3 percentage points, rising to 7 percent of domestic consumption. In contrast, the apparel industry's import penetration had reached 26 percent by 1988, an increase of 13 percentage points from 1980. In 1992, imports still accounted for a relatively small 11 percent of all domestic textile consumption.

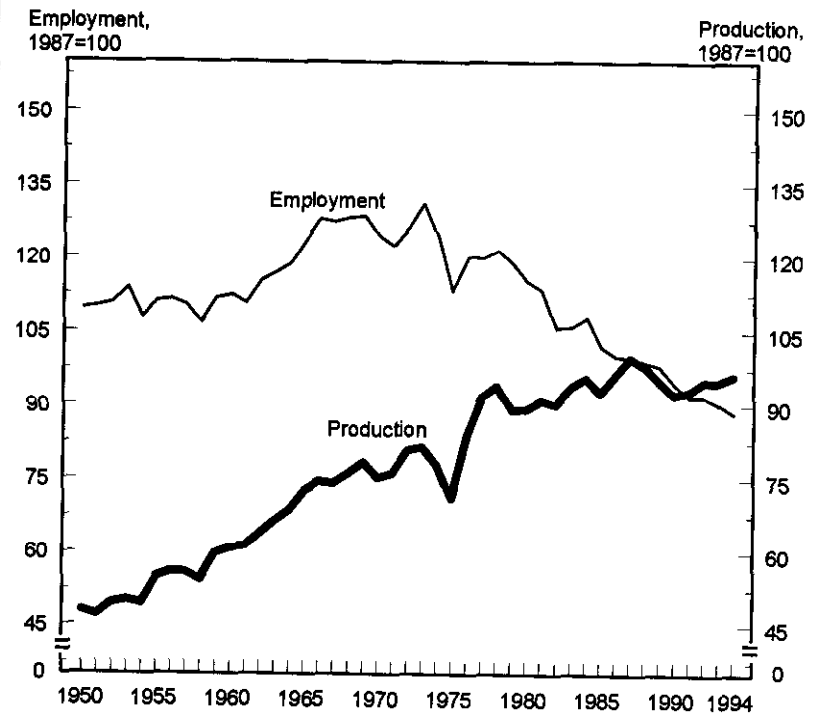
Exports offset some of the increase in textile imports during the late 1980's. Although exports fell during the first half of the decade because of an overvalued dollar, they began to rebound in 1986, providing some stimulus for the industry. In 1989, exports comprised 4 percent of industry shipments. The impact of exports on employment is even greater when indirect exports, such as the use of fabric in clothing that is exported, is considered; nearly 10 percent of textile employment was related to direct and indirect exports in 1989.[13]

As was indicated above, the U.S. textiles industry does not appear to have greatly suffered from direct imports. However, the industry was significantly affected by the surge of apparel imports. The U.S. textile industry supplies most of the textile products required by domestic apparel producers. As apparel imports rose and continued to gain domestic market share, U.S. apparel producers required less domestic textile products.

The apparel industry

Employment in the apparel industry declined significantly in the 1970's and 1980's. Technology introduced in this period was less revolutionary than that in the textiles industry. Most likely, apparel imports had the principal influence on employment. Apparel employment peaked in 1973 with production peaking in July 1987; both production and employment have continued to decline in the 1990's.

Chart 2. **Employment and production in apparel, 1950–94**



SOURCES: Employment data from the Bureau of Labor Statistics; production data from the Federal Reserve Board.

Productivity and structural changes. Technological innovations in the apparel industry during the 1970's and 1980's were less sweeping and more incremental than changes in the textiles industry. Examples of technologies that were developed in the 1970's and 1980's are programmable sewing machines that allow operators to work more than one machine at a time, Computer Aided Design (CAD) that reduces lead time, and computer controlled cutting of material. Labor productivity increased by 26 percent between 1969 and 1979; this was slightly less than the 33-percent rate for all manufacturing.

In the 1970's, the apparel industry spent more on capital investments than it had during the 1950's and 1960's combined. However, the industry still spent at only two-fifths of the textiles industry's rate, primarily due to a lack of new technology. (See chart 4.) The new technology that was available to apparel manufacturers was not as powerful or expensive as that available to textile manufacturers. However, another reason for the low level of spending, and perhaps the limited new technology available, can be explained by the structure of the apparel industry: firms in the apparel industry are typically smaller and more disconnected than firms in the textiles industry. For example, 23,600 domestic apparel establishments employed about 1.3 million people in January 1976. By contrast, about 7,300 textile establishments employed slightly more than 900,000 workers. Twenty-four percent of textile workers were employed in establishments of more than 1,000 employees in 1976 compared with only 8 percent in the apparel industry; at the other extreme, nearly 20 percent of apparel workers were employed in establishments of fewer than 50 workers, versus less than 7 percent of textile workers.[14]

The size of many apparel firms was often an obstacle to large capital investments. Small firms typically operate on a low profit margin, and the cost of new, technologically advanced equipment would be prohibitive to many of them. But labor productivity continued to rise in the 1980's as production of apparel products grew by 7 percent while employment fell. Labor productivity grew at an annual average rate of 2.4 percent between 1979 and 1991.[15] Yet it is impossible to know if employment would have declined less without the productivity gains, because the higher labor costs would have made the industry even less competitive with imports.

In 1990, 30 percent more labor was required for every dollar of output in the apparel industry than in the textiles industry.[16] The textiles industry continued to invest far more in capital in the 1980's than the apparel industry, spending $23 billion, or 4 percent of the industry's value of shipments, while the apparel industry spent only $8 billion, or 1.5 percent of that industry's value of shipments. In addition, the apparel industry directed only half of those expenditures to new equipment, while the textiles industry spent three-fourths of its outlays on new equipment.

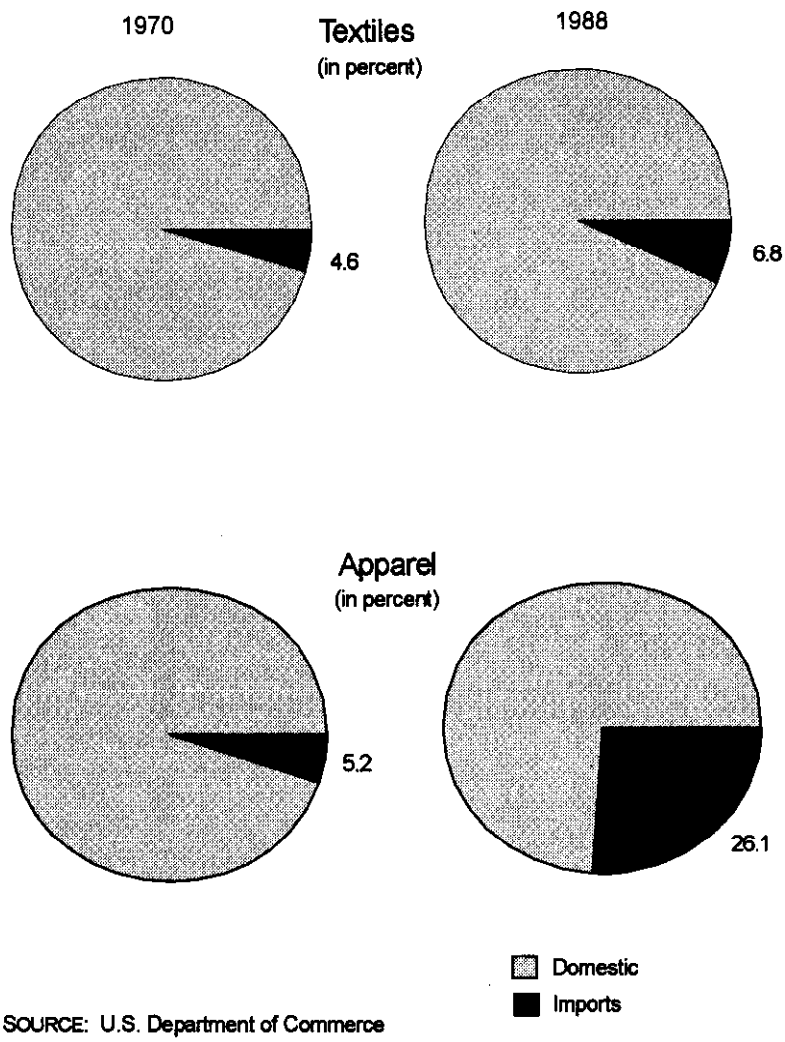
Imports and exports. Imports in the apparel industry increased from 5 percent of total consumption in 1970 to 26 percent in 1988, or from $1.3 billion to $22 billion annually. This contrasts with the textiles industry, which lost less mar-

ket share to overseas productions. Apparel imports not only grew rapidly, but comprised a large share of total sales. This import growth led to large-scale employment declines.

The apparel industry was particularly hard hit by imports from developing countries. Less developed countries traditionally have begun industrialization with the apparel and textiles industries because raw materials are relatively common, and because the two industries require less capital than most other manufacturing activities.[17] Thus, developing countries with an abundance of cheap labor but very little capital can produce textiles and apparel products.

An example of this type of industrialization policy can be seen in Japan following World War II. Faced with the destruction of much of their manufacturing base, the Japanese focused on the textiles and apparel industries to rebuild. In 1950, textiles accounted for 24 percent of total shipments and 48 percent of exports. By 1980, the figures had dropped to 5.2 and 4.8 percent. Textiles and apparel declined in importance as Japan became more industrialized and wage pressures grew. Japanese industrial policy focused more on high technology industries with larger profit margins. Japanese textile producers today are similar to U.S. producers: they are more capital intensive, and they also manufacture more expensive fabrics.

Chart 3. **Textile and apparel imports as a proportion of domestic consumption, 1970 and 1988**



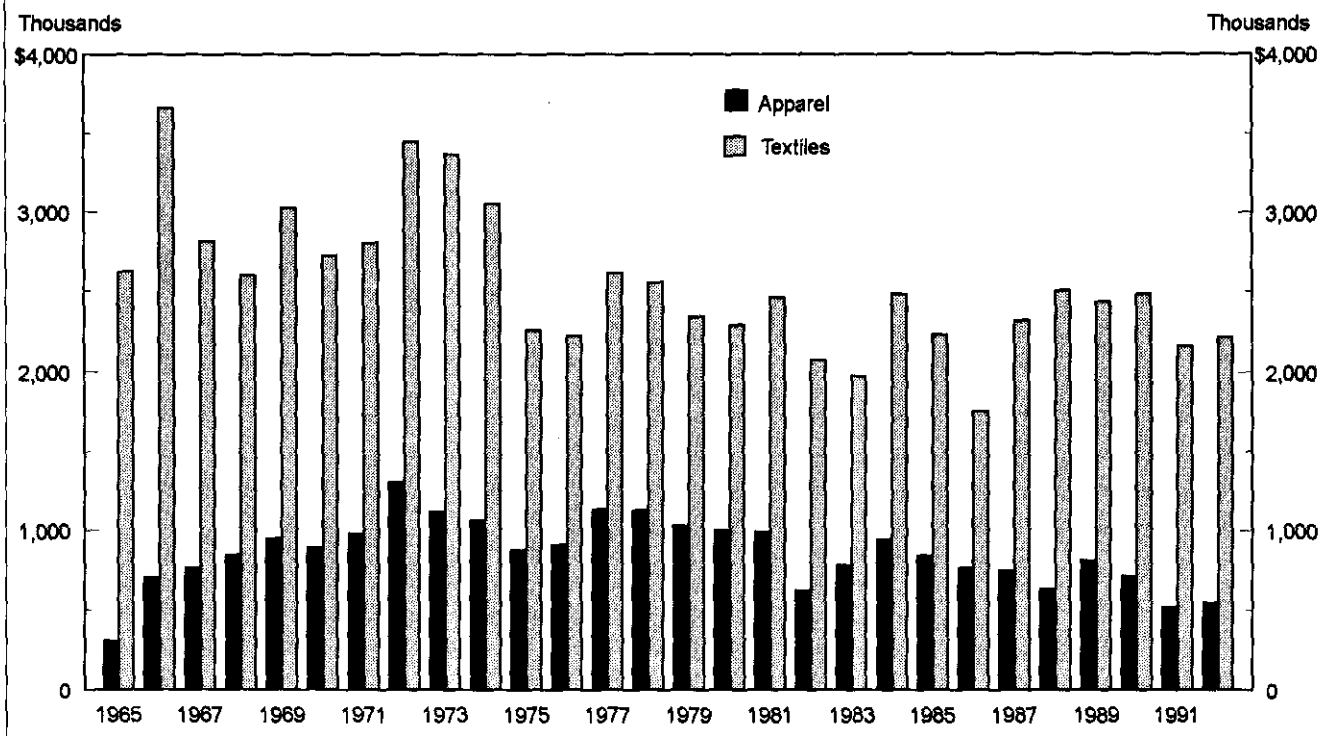
SOURCE: U.S. Department of Commerce

Developing countries rapidly increased their share of the world export market in apparel. In 1965, world apparel exports totaled $3 billion and developing countries supplied only 14 percent; by 1991, world apparel exports totaled $119 billion and developing countries supplied 59 percent. The developing economies in Asia (China, Korea, Mongolia, and Vietnam) supplied half of the world's apparel exports in 1991, while the United States supplied less than 3 percent. At the same time, the Unites States received 19.4 percent of world exports, including a third of the exports from developing countries.[18] (See table 2 and chart 5.)

Despite the loss of international market share in the 1970's, U.S. apparel exports increased in value. During the first half of the 1980's, apparel exports declined as the value of the dollar rose (in 1984, U.S. apparel exports accounted for only 1.8 percent of world apparel exports), and grew modestly in the latter half. But in contrast to the textiles industry, the apparel industry never experienced a trade surplus. In 1989, exports accounted for only 4 percent of total shipments (the same ratio as for textiles), and were overwhelmed by imports. The industry's trade imbalance has steadily worsened since 1980. In 1992, the apparel industry's trade deficit was nearly $26 billion, eight times greater than the textile industry's imbalance, and the worst imbalance of all the manufacturing industries. (See chart 6.)

The apparel industry's practice of using manufacturing workers in Caribbean countries contributed to a portion of increased imports. "Sourcing," or "807 Sourcing," as it is called in the apparel industry, refers to cutting material in the United States and assembling it in other nations.[19] The

Chart 4. **Capital investment by the apparel and textiles industries in constant dollars, 1965–92**



Source: U.S. Department of Commerce

product is then imported back to the United States, with duties paid only on the value added, and shipped by the U.S. manufacturer for sale.[20] Thus, the count of imports includes the value added by assembly in these sourcing arrangements.

Although this practice began in the late 1960's, the amount of shipments allowed to reenter the United States was limited by quotas. In 1985, under new bilateral agreements with the Caribbean Basin countries,[21] unlimited access was negotiated for firms that, in addition to cutting the material in the United States, also used U.S.-made material. This new sourcing agreement is termed 807a, a traditional type of outsourcing. Firms in the United States operate under 807 and 807a sourcing methods. As a result of this lifting of import quotas, imports from the Caribbean Basin have grown rapidly. Between 1987 and 1992, imports under the 807 sourcing programs increased by 180 percent, to $3.8 billion in 1992. Nevertheless, this was still just 14 percent of total U.S. apparel imports.[22]

Despite the use of labor that is outside the United States, determining the precise impact on jobs is impossible. Many industry leaders—in the American Apparel Manufacturers Association, the U.S. Department of Commerce, and other organizations and agencies—believe that, without the practice of 807 sourcing, many U.S. apparel manufacturers would go out of business, causing a significant loss of jobs in the industry. Because of this arrangement, domestic manufacturers have been able to take advantage of the relatively cheap labor in Mexico and the Caribbean to manufacture apparel products that are more competitively priced compared with East-Asian products. For this reason, 807 sourcing may have reduced the demand for imports from Asia, protecting the employment of domestic workers who contribute to some parts of the manufacturing process. As a result, although some apparel assembly jobs in the United States have moved to the Caribbean Basin or Mexico, even more might have been lost to East-Asian imports without this legislation.

Meanwhile, the apparel industry is still confronted by growing imports. While imports under section 807 are comprising a larger share of total imports, most imports continue to come from developing Asia (nearly 80 percent in 1990).[23] In 1992, apparel imports accounted for 31 percent of domestic consumption.

Employment outlook and trade agreements

GATT and the Multi-Fiber Arrangement. Among the factors that are expected to have a substantial impact on employ-

Table 2. Developing and developed countries' share of the world export market, in percent, 1965-90

Year	Textiles		Apparel	
	Developing market economies	Developed market economies	Developing market economies	Developed market economies
1965	16.0	76.4	14.8	69.7
1970	15.4	77.6	21.1	63.5
1975	17.6	74.6	32.0	54.5
1980	22.1	69.8	36.5	51.2
1985	28.0	62.2	47.9	41.5
1990	39.0	59.1	56.4	41.3

NOTE: Based on SITC 65 for textiles and SITC 84 for apparel.
SOURCE: United Nations

ment in the textiles and apparel industries, perhaps the most influential will be the trade policy agreed to in the General Agreement on Tariffs and Trade (GATT). With the support of the United States, the Multi-Fiber Arrangement will be phased out over 10 years. This arrangement has been the textiles and apparel trade agreement in effect among most nations since 1974, and has been renegotiated and ratified four times, most recently in 1986.[24]

The Multi-Fiber Arrangement, a network of bilateral trade agreements, operates outside the regulations of GATT, and allows countries to place import quotas on textiles and apparel products that, under GATT, would not be permitted. The Multi-Fiber Arrangement permits importing countries to place quotas on apparel and textile products from selected countries to avoid domestic market disruption. While the arrangement has undoubtedly protected some domestic jobs, it was criticized by consumer groups, several academics, and proponents of free trade because of its cost to consumers and its protectionist type quotas. A study by William Cline found that 214,000 jobs were saved in the apparel industry due to the Multi-Fiber Arrangement, at a cost to consumers of $46,000 annually per job.[25] A separate study by Gary Clyde Hufbauer, Diane Berliner, and Kimberly Ann Elliott found that the Multi-Fiber Arrangement had saved 460,000 jobs in the apparel industry at a consumer cost of $39,000 per job.[26]

With the phase-out of the Multi-Fiber Arrangement, textile and apparel trade will be conducted under rules and regulations of GATT. The phase-out of the Multi-Fiber Arrangement will allow increased imports by releasing some products from quota limits at set intervals, while the quota limits on the remaining protected products are raised each year. These regulations will be set for participating countries and should allow for freer trade of textile and apparel products among these countries. As a result of the phase-out, import restrictions will be eliminated 10 years after it is enacted.[27]

Several groups have estimated the impact on employment from the phase-out of the Multi-Fiber Arrangement, but estimates vary dramatically. Estimating effects on employment is difficult because several important facets of the agreement have not yet been decided.[28] For example, the status of quota limits for products from China is unknown because that country is not a member of GATT.[29] Estimating demand for U.S. products from foreign countries that will have freer markets also is difficult. In a study published in January 1992, Wharton Economic Forecasting Associates states that the "direct and indirect impact on the textile and apparel industries is estimated to be a job loss of 647,000 . . .".[30] A study by the American Textile Manufacturers Institute estimates that number of jobs will fall by 1.4 million during the same period, leaving only 300,000 jobs in the industries.[31] However, the U.S. International Trade Commission estimated that eliminating all import quotas and tariffs would reduce employment in the two industries by between 230,000 and 290,000. The Congressional Budget Office notes that the losses may be even lighter than the trade commission estimates because the commission's study did not take into account the proposal that all industrialized countries remove their restrictions at the same time; the continued application of import quotas to countries that are not members of GATT, such as Taiwan and China; and that tariffs on the products may still remain even after quotas are removed.[32]

The apparel industry, which is far more labor intensive and less competitive internationally than the textile industry, will probably sustain most of the losses from the new trade environment. As noted, the textiles industry does not suffer from severe import competition as does the apparel industry, but is affected more indirectly: less domestic apparel production means fewer domestic textiles are needed.

A possible advantage of the new agreements would be the opening of markets in developing countries that restrict imports of U.S. textile and apparel products. Because the U.S. textiles industry uses fairly efficient production processes, demand from foreign apparel producers could increase.

NAFTA. Future employment levels also will be affected by the North American Free Trade Agreement (NAFTA). The agreement, which took effect January 1, 1994, created a free-trade zone among the United States, Canada, and Mexico. NAFTA is expected to contribute to employment declines in the apparel industry but may generate job growth in the textiles industry.

With the relatively cheap labor that is available in Mexico, some apparel manufacturers are likely to move their operations south to be more competitive. NAFTA also may cause apparel manufacturers to slowly discontinue 807 sourcing operations in the Caribbean as they reinvest in Mexico, where finished products would not be subject to duties. A study by the International Trade Commission concluded that a free

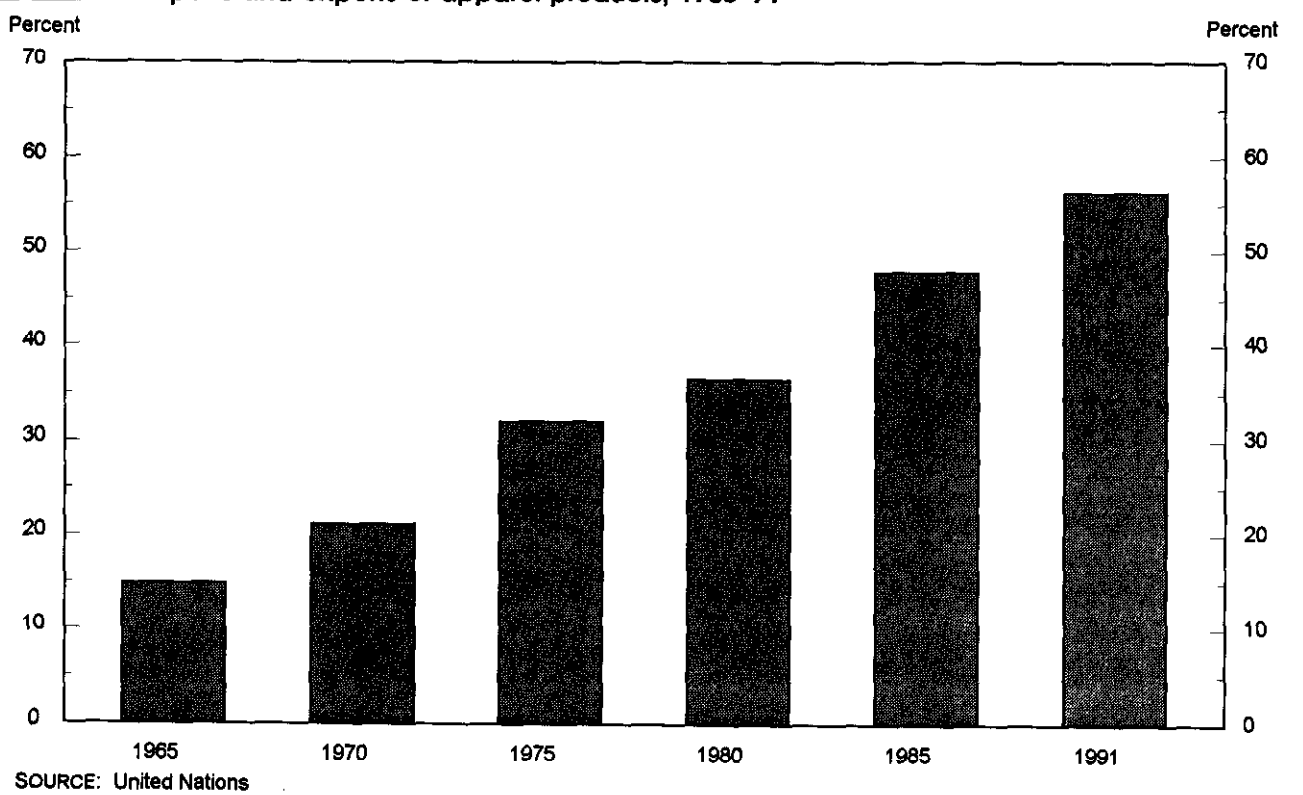
trade agreement would introduce incentives that favor apparel investment shifts from Caribbean Basin countries to Mexico; but the study could not quantify any effects of this shift.[33] According to this study, companies that already have invested heavily in the Caribbean may invest in Mexico to remain competitive, although this would require large capital expenditures.

The textiles industry would probably not undergo the same shift in its manufacturing base. Because the textiles industry is much less labor intensive than the apparel industry, U.S. companies would not have the same incentive to relocate production. Further, the United States is the largest supplier of textile goods to Mexico's clothing manufacturers and, for apparel products to remain duty-free throughout the free-trade zone, the apparel products must be made from North American fiber, spun in North American mills. With an efficient production process in place, U.S. textiles manufacturers would benefit from increased production in the free-trade zone. The U.S. textiles manufacturers are more efficient than Mexican textile manufacturers, and the elimination of tariffs would make U.S. textile products more attractive to Mexican apparel producers. Mexican textile manufacturers could, in the long run, invest in better facilities, but the large capital outlays required for efficient plants, coupled with a water supply that is inadequate for dyeing and finishing yarns will impede investments in the near future.[34] This will provide further stimulus to the U.S. textiles industry. In addition, NAFTA will boost production and imports of U.S.-made fabrics, according to the Wharton Economic Forecasting Associates.[35]

The impact of NAFTA on imports, exports, and employment would be expected to occur incrementally over many years. During 1994, the first year after NAFTA took effect, annual average employment in textiles was relatively flat for the third consecutive year, and declines in apparel continued. Both developments were in line with expectations for employment trends under NAFTA.

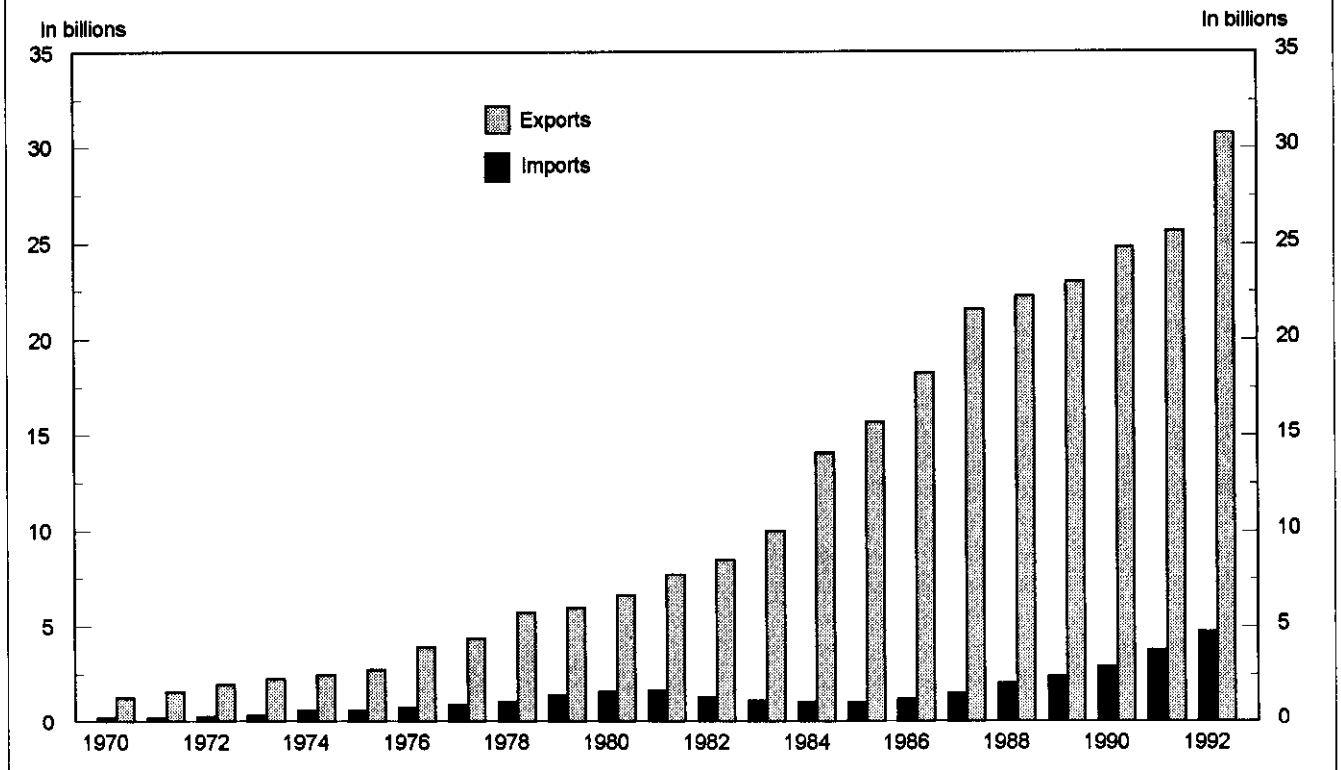
Eastern Europe. The changing political and economic status of Eastern Europe also may negatively affect employment prospects for apparel. With the opening of Eastern European markets, these countries have the ability to become bigger players internationally. Unlike many apparel workers in East Asia, those in Eastern European countries are very skilled. This level of skill, coupled with the very low wages, may allow these countries to produce more expensive apparel products, such as tailored suits and coats, at a fraction of the price paid by U.S. manufacturers. For example, in 1991 the aver-

Chart 5. **Imports and exports of apparel products, 1965–91**



SOURCE: United Nations

Chart 6. **Developing countries' share of world exports in apparel products, 1965–92**



SOURCE: Department of Commerce

age U.S. apparel worker earned $6.77 an hour; a similarly skilled worker in the former Soviet Union earned $0.36.[36] As incomes rise, however, the appeal of U.S. clothing could attract buyers in these same countries.

Productivity

Even if the current trade regime were to remain unchanged, the industries' employment levels would still be expected to decline. The Bureau of Labor Statistics estimates that, depending on the economy's growth, the textiles industry will lose between 85,000 and 160,000 jobs between 1992 and 2005, while losses in the apparel industry will range from 240,000 to 350,000.[37] Under the current trade regulations, the Wharton estimate is that the textile and apparel industries, combined, will lose 400,000 jobs during the 1993-2002 period. This estimate also is based on expected productivity increases and the domestic industries' competitive disadvantages.

Productivity will continue to have a major impact on employment in the 1990's. Productivity advances will continue to build on the uses of computer integrated manufacturing and quick response. Use of computer integrated manufacturing already has begun in the textiles industry. A fully computer-integrated spinning mill that virtually eliminates the need for laborers already has been established in Japan. The entire process, from placing bales in the opening line to loading trucks for shipment, is achieved without human hands touching the material; maintaining and controlling the entire plant requires only nine employees.

In the United States, many plants use some form of computer integration in manufacturing. For example, a Mountain City, TN, automated yarn spinning plant produces 600,000 pounds per week of cotton yarn with fewer than 200 employees. The only handling of material occurs when cotton is unloaded from trucks and when packed yarn is reloaded for delivery.[38] Computer integrated manufacturing reduces labor costs and enhances quality and reduces error. Optical scanning can detect errors and alert operators immediately.

Fully automated apparel plants are only in the early stages of development. A fully operational computer integrated manufacturing system has the potential to reduce the time needed to complete a season's line from 30 weeks to between 5 and 6 weeks.[39] Many apparel manufacturers already have started using computer-aided design systems and modular manufacturing. These systems have allowed garment manufacturers

to substantially reduce the time needed for design. Modular manufacturing consists of units or small teams of employees who produce an entire garment. This team system has increased quality and minimized downtime in many plants.[40]

Dean Vought, president of Textile and Clothing Technology Corp., an independent research firm, believes that "advances in manufacturing technology, while needed and welcome, have a limited impact. . .the wide variety of style changes and limp fabrics that must be accommodated in manufacturing make it unlikely that we could reduce direct labor content by more than 25 percent through all currently conceivable mechanization and automation." That still may not be enough to compete with low wage countries. Vought emphasized that resources may be better spent "on developing technology to reduce calendar time rather than cost. Time, service and more accurate response to consumer demand are where we have an advantage that can be strengthened through technology." Thus, computer integrated man-ufacturing in the apparel industry may be focused on time-saving techniques. This type of technology takes the form of improved communications, data manipulation, graphics, video imaging, and satellite transmissions and can be used in product development, marketing and customer service.[41]

Quick response manufacturing follows the time-oriented concept that quicker is better, and is becoming the norm in the apparel and textiles industry. Quick response programs use computers to speed the goods, services, and information in domestic apparel production, tying apparel producers with textile suppliers and retailers.[42] Quick response has become important in the apparel industry because more retailers are demanding it as they seek to minimize inventories and markdowns while restocking popular items. For apparel manufacturers to provide retailers with goods on a quick-turnaround basis, they must be able to receive their manufacturing inputs quickly. Therefore, this chain of demand is requiring closer partnerships among retailers, apparel manufacturers, and textile manufacturers.

Quick response helps the U.S. apparel industry to compete against foreign manufacturers. Many retailers have little control over the quality of the products they purchase from abroad, and many times the quality of the products is not consistent among shipments. Quick response gives domestic manufacturers an advantage because they can deliver better quality items more quickly. The link between manufacturers and retailers also provides incentives for producers to deliver better quality items. One survey of apparel manufacturers found that 61 percent of respondents had quick response programs with their retail partners in 1991, up from 51 percent in 1990, while 32 percent had such programs with their textile partners, up from 23 percent in 1990.[43]

All of the above technologies and trends are combining to enable producers to create better quality products, more quickly and for less money in both industries. In a time of rapidly changing economies, and with prospects of freer trade on the horizon, these practices can enable the textiles and apparel industry to maintain, or perhaps increase, their share of the world market.

IN SUM, employment has declined in the textile and apparel industries over the past two decades—together they have lost more than 750,000 jobs. Although the industries are closely linked, their operations are very different. The textiles industry is concentrated, automated, and efficient. Because the apparel industry is still very labor intensive, despite new technologies, it has difficulty competing with foreign producers in low-wage countries. The apparel industry also is not as concentrated as the textiles industry. In the United States in 1987, 21,000 apparel companies shipped goods valued at $64 billion. The textiles industry had only 5,000 companies producing $63 billion in shipments.[44]

Between 1949 and 1991, labor productivity in the textiles industry grew at an average annual rate of 3.9 percent, much faster than the annual average rate of 2.5 percent for all manufacturing. Labor productivity in the apparel industry grew at an annual average rate of only 2.2 percent during the same time period, slightly slower than the rate for all manufacturing.

Imports in the textile industry gained about 5 percentage points of domestic market share from 1970 to 1993, rising from 4.5 percent to 9 percent. The apparel industry, by contrast, saw imports rise from about 5 percent to 31 percent during the same period. Textile production continues to reach new heights, but apparel production has not returned to its peak level that occurred in 1987. Industrial production in the apparel industry is off 6 percent from its July 1987 peak, according to December 1994 data.

Although the apparel industry continued to lay off workers in 1994, employment in textiles was relatively flat. Over the long term, declines are expected to continue, particularly in apparel. Competition will be even fiercer with stepped up global trade and the lifting of import restrictions. Labor-saving and time-saving technologies will help domestic manufacturers compete against low-wage countries to maintain (and perhaps expand) domestic and world market share. Therefore, emerging technologies and opening markets should be the main forces behind the employment trends in the next 10 years. □

Footnotes

[1] Employment data are from the Current Employment Statistics Survey and appear in *Employment, Hours, and Earnings, United States, 1909–1990, Volume II*, Bulletin 2370, and *Employment, Hours, and Earnings, United States, 1981–93*, Bulletin 2429 (Bureau of Labor Statistics, 1991 and August).

[2] Production data from *Federal Reserve Statistical Release, Industrial Production and Capacity Utilization*, (Federal Reserve System), various issues.

[3] Productivity data based on unpublished data from the Office of Productivity and Technology, Bureau of Labor Statistics, September 1992. Productivity data for apparel and textiles are available only through 1991.

[4] William R. Cline, *The Future of World Trade in Textiles and Apparel* (Washington, Institute for International Economics, 1987), table 2.5.

[5] Centre on Transnational Corporations, *Transnational Corporations in the Man-made Fibre, Textile and Clothing Industries* (United Nations, 1987), p. 75.

[6] Fariborz Ghadar, William H. Davidson, and Charles S. Feigenoff, *U.S. Industrial Competitiveness, The Case of the Textile and Apparel Industries* (Lexington, MA, Lexington Books, D.C. Heath and Co., 1987), pp. 19–20.

[7] Data are "corporate profits before taxes" obtained from U.S. Department of Commerce, Bureau of Economic Analysis, *National Income and Products Accounts, 1959–1988*, vol. 2, (July 1992), table 6.17.

[8] Constant-dollar shipments were deflated using the Producer Price Index for textile and apparel products. The base year is 1982.

[9] Some of the larger consolidations were West Point-Pepperell's acquisition of J.P. Stevens and Cluett, Peabody & Co.; the subsequent acquisition of West Point-Pepperell by a majority stockholder of Fruit of the Loom; the merger of Spring Industries and M. Lowenstein; and the sale of Cannon Mills to Fieldcrest, becoming Fieldcrest Cannon. *Standard and Poor's Industry Surveys*, Nov. 28, 1991, pp. T76–T77.

[10] The information on leveraged buy-outs was primarily obtained from *Standard and Poor's Industry Surveys*, Nov. 28, 1991, pp. T76–T77.

[11] United Nations Centre on Transnational Corporations, *Transnational Corporations in the Man-made Fibre, Textile and Clothing Industries*, p. 80.

[12] Cline, *The Future of World Trade*, table 5.5. The high level of import penetration in the European countries also reflects a higher degree of intraindustry trade in the European Economic Community.

All international trade statistics are based on Standard Industrial Trade Classification codes 65 for textile products and 84 for apparel products. SITC 65 includes fabricated textile products; SIC 22 does not. SITC 84 includes only clothing while SIC 23 includes clothing and fabricated textile products. Therefore, SIC's 22 and 23 are not strictly comparable to SITC's 65 and 84.

[13] *Exports From Manufacturing Establishments, 1988 and 1989*, AR89-1 (Bureau of the Census, November 1992), p. 30.

[14] Bureau of Labor Statistics, Office of Employment and Unemployment Statistics, unpublished data. Data available beginning in 1976.

[15] The labor productivity rates may be overstated because some U.S. apparel products are shipped to the Caribbean or Mexico for assembly or other work, and then shipped to the United States where they are included in the U.S. industry's total shipments. Therefore, some labor used in manufacturing the product may not be included in the productivity measures.

[16] This figure was derived using the annual average aggregate hours from the Current Employment Statistics Survey and total shipments from the Bureau of the Census.

[17] Ghadar and others, *U.S. Industrial Competitiveness*, pp. 16–17.

[18] *Monthly Bulletin of Statistics*. vol. XXXV, no. 5, special table D, and vol. XI, no. 2, special table C and various other issues including special tables C and D. (New York, United Nations, Department of Economic and Social Development, Statistical Division, May 1981). The makeup of countries included in the developing economies has changed as centrally planned economies, such as Eastern European countries, shift to open markets.

[19] "The term 807 refers to a tariff paragraph in Schedule 8 of the U.S. Tariff Code that defines the covered articles as follows: 'Articles assembled abroad in whole or in part of fabricated components, the product of the United States, which a) were exported in condition ready for assembly without further fabrication, b) have not lost their physical identity in such articles by change in form, shape or otherwise, and c) have not been advanced in value or improved in condition abroad except by being assembled and except by operations incidental to the assembly process such as cleaning, lubricating, and painting.'" See *U.S. Apparel Imports Under 807* (Arlington, VA, American Apparel Manufacturers Association, undated). p. 1.

[20] Although most of tariff code 807 imports are from the Caribbean Basin, the same agreement is in effect with Mexico and is called Special Regime. These imports from Mexico still enter the United States under tariff code 807 and any reference here to 807 imports includes imports from the Caribbean and Mexico.

[21] Belize, Costa Rica, the Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, and Jamaica are the primary countries in the Caribbean Basin initiative.

[22] "U.S. 807 Apparel Imports," Table 1.

[23] *Monthly Bulletin of Statistics*, vol. XLVII, no. 5 (New York, United Nations, Department of Economic and Social Development, Statisticals Division), special table D.

[24] Four multi-fiber arrangements were negotiated between 1973 and 1986 (MFA I - MFA IV). The Multi-Fiber Arrangement was not negotiated and ratified again upon its expiration in 1991 because most countries had agreed that it would be eliminated. But until negotiations for elimination of the arrangement were completed, MFA IV was extended.

[25] Cline, *The Future of World Trade*, p. 193.

[26] Gary Clyde Hufbauer, Diane Berliner, and Kimberly Ann Elliott, *Trade Protection in the United States: 31 Case Studies* (Washington, Institute for International Economics, 1986), p. 148.

[27] The information on the schedule of the Multi-Fiber Arrangement phase-out was obtained from "Multilateral Trade Negotiations, The Uruguay Round," UR-91-0185 (New York, Trade Negotiations Committee, General Agreement on Tariffs and Trade Secretariat, December 20,1991).

[28] Three studies from the Wharton Economic Forecasting Association, American Textile Manufacturers Institute, and U.S. International Trade Commission assume that import quotas will be lifted from all countries.

[29] According to the *Executive Summary, Results of the GATT Uruguay Round of Multilateral Trade Negotiations* "China will not be permitted to sign the agreement on textiles and clothing until it becomes a member of GATT, and, until then, will not be the beneficiary of any quota liberalization by the United States."

[30] "The Impact of Eliminating the Multi-Fiber Arrangement on the U.S. Economy, Isolating the Textile and Apparel Components of GATT" (Philadelphia, the WEFA Group, 1992).

[31] Carlos Moore, "Phasing Out the Multi-Fiber Arrangement in the Uruguay Round: The Impact on U.S. and Foreign Producers" (Washington, DC, American Textile Manufacturers Institute, March 1991).

[32] "Trade Restraints and the Competitive Status of the Textile, Apparel, and Nonrubber Footwear Industries" (Congressional Budget Office, 1991).

[33] "Potential Effects of a North American Free Trade Agreement on Apparel Investment in CBERA Countries" Report to the U.S. Trade Representative (Washington, United States International Trade Commission, July 1992) p. 72.

[34] "Potential Impact on the U.S. Economy and Selected Industries of the North American Free-Trade Agreement," Publication 2596 (Washington, U.S. International Trade Commission, January, 1993) p. 8–3.

[35] "A brighter day is dawning for U.S. textiles in 1993," *Textile World*, January 1993, p. 40.

[36] The hourly wage figure for workers in the former Soviet Union was obtained from "Labor costs - From Pakistan to Portugal," *Bobbin Magazine*, September 1992, pp. 116–119.

[37] James C. Franklin, "Industry output and employment," *Monthly Labor Review*, November 1993, p. 54, table 50.

[38] "Mountain City: Oh, What a Mill!" *Textile World*, June 1991, p. 50.

[39] "The Impact of Technology on Apparel, Part 1," *1991 Report of the Technical Advisory Committee*, American Apparel Manufacturers Association, p. 12.

[40] *Industry Trade and Technology Review* (Washington, U.S. International Trade Commission, October, 1992), p. 9.

[41] "Time is of the Essence at [TC]²," *Bobbin Magazine*, May 1992, p. 24.

[42] *Industry Trade and Technology Review* (Washington, U.S. International Trade Commission, October, 1992), p. 9.

[43] *Ibid.*, p. 9.

[44] *1987 Census of Manufacturers: Concentration Ratios in Manufacturing*. MC87-S-6 (Bureau of the Census, February 1992), table 5.