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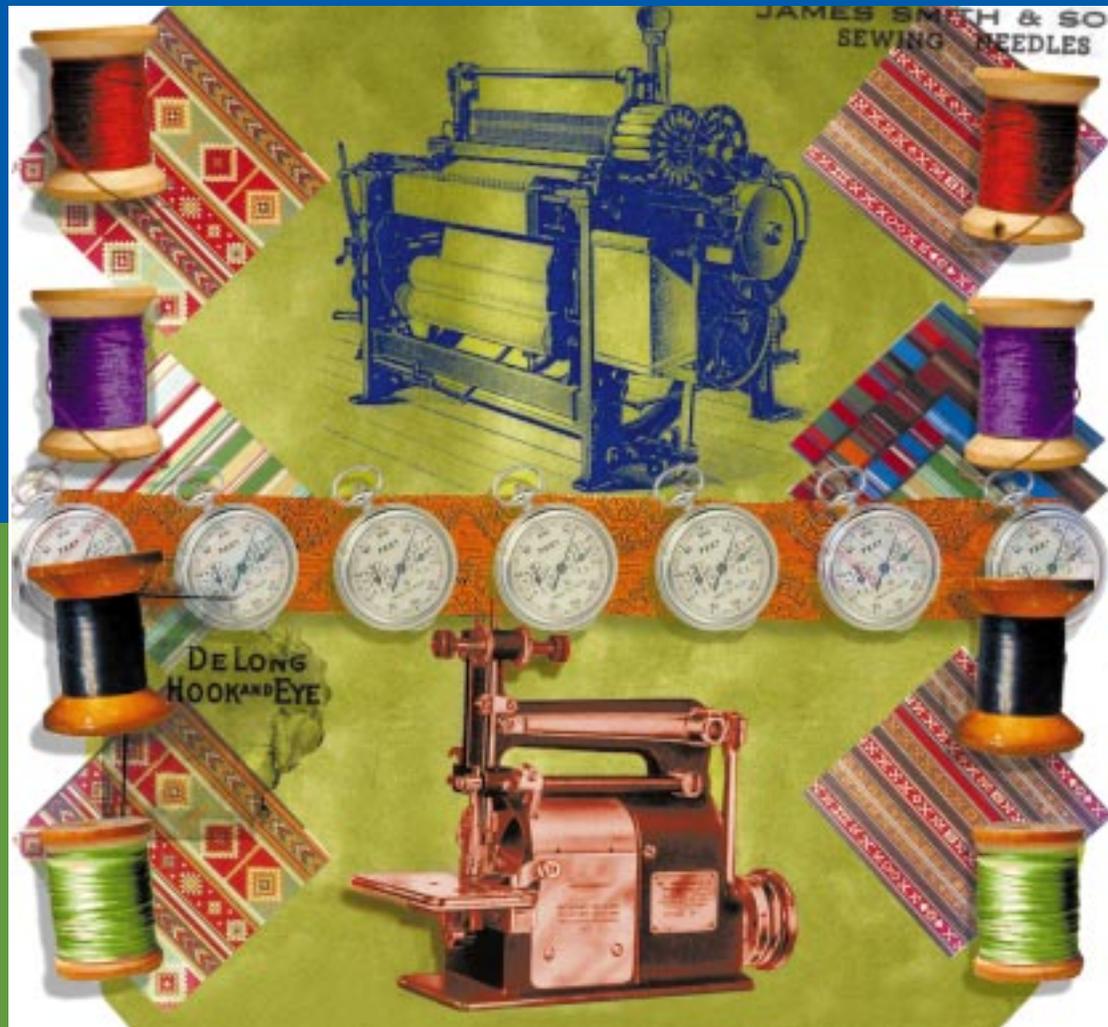
TEXTILES & APPAREL

Economic Development

Economic Impacts

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Economic Impacts of the Textile and Apparel Industries in Massachusetts

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Executive Summary

Findings and Recommendations

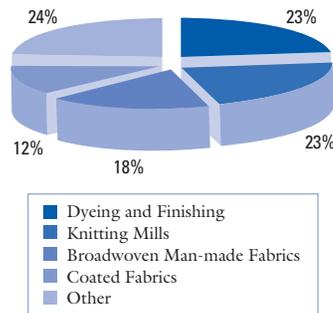
The Massachusetts textile and apparel industries generate 72,316 jobs annually in total economic impacts, with an estimated payroll of nearly \$2.2 billion.

ECONOMIC IMPACTS

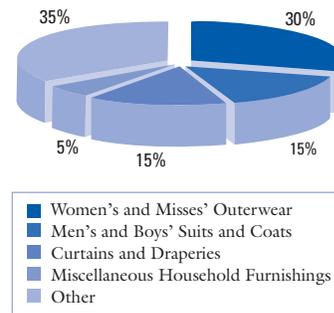
The textile and apparel industries account for 2.3 percent of all employment in Massachusetts and 1.9 percent of the annual wages earned by residents of the state.

The state's textile industry generates two additional jobs in other sectors of the economy for each job created at a textile establishment. The state's apparel industry generates one additional job in other sectors of the economy for each job created at an apparel establishment.

Massachusetts Textile Employment: Distribution by Product Type



Massachusetts Apparel Employment: Distribution by Product Type



These industries are experiencing a process of renewal much like that seen in the natural world, where fire sweeps away old-growth forests and opens space for new growth.

INDUSTRIAL STRUCTURE AND TRENDS

Industry consolidation is more prevalent nationally than locally.

The state's textile employment depends heavily on large, integrated mills operated by industry-leading firms in dyeing and finishing, knitting, broadwoven man-made fabrics, and coated fabrics. Establishments with 250 or more employees account for 32 percent of the sector's total statewide employment and for two-thirds (66.7 percent) of the state textile industry's annual sales. Many of these companies are expanding operations and building new manufacturing facilities in Massachusetts to meet rising demand for their products.

A national trend toward consolidating apparel employment into larger establishments continued during the 1990s, but the sector remains less concentrated in Massachusetts, where 51 percent of apparel employment occurs in establishments with 100 or more persons, compared to 80 percent nationwide. These firms still account for 63.9 percent of apparel industry sales in Massachusetts.

It is estimated that 58 percent of the textile and apparel firms in Massachusetts were established since 1980. Most of these firms employ ten or fewer persons and produce items such as promotional caps and T-shirts, specialized embroidery, curtains and home furnishings, place mats, canvas awnings, and sporting goods. A variety of specialized production niches have opened up recently to revivify the sector.

Since 1980, the two industries combined have lost 368 establishments and 36,399 employees in the state.

Employment continues to decline.

Employment declines in the Massachusetts textile and apparel industries have closely paralleled national trends over the past two decades. In the Commonwealth, they have lost about 56 percent of their total employment base, with more than 36 percent of the total job losses occurring in Bristol County.

In the textile sector, employment losses are mainly the result of automation and productivity gains, which are renewing the industry's competitive position. In the apparel sector, losses result from firms consolidating operations in other states, shifting production to foreign locations, scaling back production levels, or withdrawing from the industry.

Textiles and apparel are uncoupling at many levels.

For the past two decades the textile and apparel industries have been uncoupling at many levels: customer-supplier relationships, technological levels, rates of investment, competitive position in the global and North American markets, and wage levels.

The U.S. textile industry now produces 63 percent of its output for nonapparel uses. Home furnishings and automotive interior products are increasingly important to the Massachusetts textile industry, especially for firms that supply furniture and automotive upholstery to manufacturers in Michigan and Mexico.

Very few direct customer-supplier relationships exist between the state's textile and apparel establishments. It is estimated that only about 700 to 800 (2.6 to 3 percent) of the state's 26,674 textile and apparel manufacturing jobs are dependent on the local purchases of other textile and apparel establishments in the state. This lack of interaction obtains because most inputs are purchased from the southeastern United States or from foreign sources, and most outputs are shipped to manufacturers or retailers elsewhere in the country.

The textile industry has made a sustained long-term effort to increase new capital investment, and during the 1990s Massachusetts textile firms closed the technology gap with substantial new investments. The apparel industry, by contrast, is still a low-tech, labor-intensive one.

Differences in technology, productivity, and unit costs have positioned the textile and apparel industries differently in the global and North American marketplaces. The United States has lower unit costs than Mexican textile producers, and its technological superiority ensures better quality and consistency of output. Canadian textiles are disadvantaged by the North American Free Trade Agreement's general rules of origin because of their greater dependency on Asian yarns and threads. The U.S. textile industry is highly competitive in the North American and global marketplaces. Both the United States and Massachusetts textile industries are benefiting from the relocation of U.S. apparel firms to Mexico.

Differences in technological levels and productivity result in much higher average wage levels in the textile industry than in apparel. The restructuring of textile production means that educational and skill requirements are being elevated in the

textile industry, while apparel production remains a highly labor-intensive, low-wage manufacturing process. However, the apparel sector continues to provide an important entry role for unskilled immigrants in many of the state's urban centers.

In Massachusetts the textile and apparel industries are highly concentrated in Bristol, Middlesex, and Essex Counties. The densest industry concentrations are in Fall River, Lawrence, and New Bedford.

Regional clustering is clearly evident.

In New Bedford, more than 8 percent of the city's total employment — one of every 12 jobs — still depends on the textile and apparel industries. In Lawrence, more than 10 percent of the city's total employment — one of every ten jobs — still depends on these industries. In Fall River, more than 25 percent of the city's total employment — one of every four jobs — still depends on textiles and apparel.

More than a third (34.3 percent) of the state's textile employment is concentrated in Bristol County, and more than two-thirds (69.2 percent) in Bristol, Middlesex, and Essex Counties. Textile density is highest in Bristol County, where textile establishments account for 2 percent of total employment. The highest local densities of textile employment are found in Fall River (10.4 percent), Lawrence (9.7 percent), and Webster (13.3 percent).

As for apparel employment, nearly half (49.3 percent) is concentrated in Bristol County, while more than three-quarters (75.5 percent) is located in Bristol, Suffolk, and Middlesex Counties. Apparel employment density is highest in Bristol County, where the industry accounts for 2.8 percent of total employment. Highest local densities for apparel employment are in Fall River (10.1 percent), New Bedford (5.2 percent), Taunton (3.1 percent), and Warren (12.3 percent).

The Commonwealth's competitive advantage has several contributing factors.

The Commonwealth's older textile and apparel firms are located here in part because of historical inertia. Many of these firms' owners accept the fact that Massachusetts is a high-cost state and that profit levels may be lower than those achievable in the southeastern United States, the Caribbean, or Latin America. A number of offsetting factors have persuaded these owners to remain in Massachusetts.

The textile industry tends to pay wages that are above average for those cities with the densest industry concentrations (Fall River, Lawrence, New Bedford). Textile industry employment in these cities provides wages 5 percent to 20 percent higher than the average wages in their communities.

Local ownership is an important competitive advantage in industries where most firms are privately held corporations, partnerships, or proprietorships. It is estimated that 98 percent of the state's textile and apparel firms are privately held. Local owners have family, friendship, and institutional ties to the state that most of them value.

Owners and managers also cite their workforces as a major reason for remaining in the state. Cost and availability of labor are critical to both industries, since both are more labor intensive than other manufacturing sectors. Consequently, most of the state's textile and apparel firms are located in cities where labor costs fall below the state average and where unemployment exceeds it.

The apparel industry remains a low-wage sector, but it provides a critical entry point to the labor market for the state's least skilled and least educated immigrant population. The state's apparel industry is concentrated in cities with large foreign-born populations, and shifts in the ethnic composition of the apparel industry's workforce reflect the state's immigration patterns. Recent Portuguese immigrants have been a mainstay of the apparel industry's workforce in Bristol County for sev-

The state's transportation infrastructure and its proximity to New York City strongly influence the industries' competitive position.

Fall River has some of the country's lowest industrial water rates.

Executives emphasize that most of the crucial government decisions affecting their industries are the free trade treaties (North American Free Trade Agreement, World Trade Organization, and so on) negotiated at the federal level.

Both industries were increasing investment in new plant and equipment prior to 1996, but when the tax credit became effective that year, investment levels increased noticeably in Massachusetts, bettering national averages by a large margin.

eral decades, although data indicate that the workforce in Bristol, Middlesex, and Suffolk Counties is now drawing large numbers of immigrants from the Caribbean (Puerto Rico, Dominican Republic) and Southeast Asia (Cambodia, Vietnam).

The inputs and outputs of both industries are bulk freight that is typically shipped by truck. It is no accident that most of the state's textile and apparel establishments are located near major highways such as Interstates 195, 495, and 95, which provide rapid access to New York City's apparel sector and to the Southeast's textile producing regions. Massachusetts factories can ship to New York City in less than three hours and send or receive shipments from the southeastern United States in less than 24 hours. Because major markets in Texas, Michigan, and Mexico are no more than 48 to 72 hours from the state's textile and apparel centers, Quick Response and just-in-time inventory strategies are feasible for these industries.

Water-intensive dyeing and finishing plants are heavily concentrated in Fall River, which has an abundant water supply, a secondary treatment plant, and an industrial pretreatment program.

RECOMMENDATIONS

The textile and apparel industries remain important sectors of the state's economy in southeastern and northeastern Massachusetts. They are exceptionally important to the future prosperity of cities such as Fall River, Lawrence, and New Bedford. The industries' employment declines seem to be slowing at the same time that new investment and plant expansions promise additional employment over the next one to three years, particularly in the textile industry.

Many apparel company executives, especially, express the view that "the federal government has given the industry away" and that state or local governments can do little to reverse the impact of those policies. Although textile executives are also concerned about foreign competition, they are more optimistic about the prospects for their industry.

While hardly glamorous, several state and local policies are important to the competitiveness of the textile and apparel industries:

Investment Tax Credit fuels growth.

The textile industry is becoming more capital-intensive, and the newest textile machinery is often quite expensive. The state's apparel industry is also making investments that exceed norms for the industry nationally. Both industries seem to have benefited from the state's Investment Tax Credit. The increased investment that resulted has allowed both industries to achieve value-added and productivity rates that exceed the national average.

The Economic Development Incentive Program (EDIP) has been utilized extensively by the textile and apparel industries. EDIP provides local governments with one of their few tools for keeping companies in the state or encouraging their expansion. EDIP tax abatements have been used heavily in Fall River to aid the growth of large and small firms in both industries.

The two industries are benefiting from continuing improvements to the state's highway transportation system.

Business-higher education partnerships and other industry linkages to the state's universities are virtually nonexistent.

Over the past 40 years the state has withdrawn its support of research and development activities that help the industries.

Massachusetts dyeing and finishing plants are densely clustered in Fall River because of the city's abundant water supply and its historically low water and sewer rates.

Critics argue that the apparel sector has been slow to adjust to the realities of global competition, particularly the need to develop export markets.

Highway maintenance and improvement are needed.

The textile and apparel industries move the vast majority of their inputs and outputs by highway. The transportation infrastructure is vital to textile firms that must adjust to the just-in-time inventory demands of customers and to apparel firms adopting Quick Response strategies to meet foreign competition. Particularly key are our major interstate highways and state routes.

Education and research are important but limited.

Most textile and apparel firms do little in-house research and development. Massachusetts textile and apparel firms generally do not participate in other industry-based research consortia.

The state's textile industry is supported by programs in textile science, textile chemistry, and textile engineering at the University of Massachusetts Dartmouth. This and a program at the University of Rhode Island are the only two such efforts in New England. Both are modest in comparison to similar programs at public universities in the southeastern United States. The state's apparel industry benefits from its proximity to the Rhode Island School of Design and New York's Fashion Institute of Technology.

The University of Massachusetts Dartmouth is establishing one of only two non-southern branches of the federally funded National Textile Center, which should assist the region's textile industry through R&D. The school is designing a \$12 million state-funded Advanced Manufacturing Technology Center, which will also have a strong textile and apparel research orientation. The AMTC is expected to develop a specialized emphasis on the textile industry and will be strategically located near the heart of Fall River's textile and apparel cluster.

Water- and sewer-rate relief contribute to clustering.

Textile dyeing and finishing are water intensive, and firms engaged in these activities benefit from any effort to provide water- and sewer-rate relief. The state has provided rate relief mainly through increased funding for the Massachusetts Water Pollution Abatement Trust, which subsidizes the cost of constructing secondary sewage treatment and combined sewer overflow facilities.

Industries would benefit from export assistance and export promotion.

Though they are subject to intense import competition, most U.S. textile and apparel firms do not export their products. Critics suggest that more active export programs would help offset the import penetration of domestic markets.

U.S. name-brand apparel has cachet in other parts of the world, despite its higher comparative cost. American fashions such as jeans, T-shirts, baseball hats, and other casual wear are prized by Japanese, European, and Latin American youth. A global trend toward the "Americanization" of foreign cultures is likely to open foreign markets as global entertainment media and foreign travel by U.S. citizens carry these fashions into other parts of the world.



Introduction

The textile and apparel industries took root in Massachusetts during the 1820s, and over the next few decades expanded rapidly. By 1883 six of the nation's ten largest textile mills were based in the state's textile manufacturing centers: Adams, Chicopee, Fall River, Lowell, Lawrence, and New Bedford (Yonekawa 1982). Between 1880 and 1930, however, the textile industry migrated to the southeastern United States, especially to North Carolina, South Carolina, and Georgia. Today these three states account for nearly 60 percent of all textile industry employment in the nation. Massachusetts ranks tenth, with 2.4 percent of the nation's textile employment. The U.S. apparel industry is more geographically diffuse: the three southeastern states account for only 15 percent of total employment. The highest apparel-industry concentrations are found in California, New York, and Texas, which account for another 35.1 percent of the industry's employment. With 1.7 percent of the nation's apparel employment, Massachusetts ranks sixteenth.

In the early 1960s, despite their position among the most protected sectors of the U.S. economy, the textile and apparel industries began losing global and domestic market share to foreign

competition. The sector's total employment began declining in the mid-1970s, and it is still declining today. As a result, the textile and apparel cluster has long been viewed as a lost industry in Massachusetts (Wolfbein 1944; Harris 1952, Ch. 26). It no longer shocks the general public or our elected officials when a newspaper announces that Warnaco Corporation will close its Calvin Klein distribution plant in New Bedford (Stewardson 1999), or that Pioneer Finishing will close its Fall River factory and terminate 270 employees (Dion 1998).

Most executives in the textile and apparel industries are dismayed that state economic development policy seems to be focused primarily on glamorous high-tech or service industries. They slight manufacturing sectors that continue to pay above-average wages in distressed regions of the state or that provide an entry point to the labor market for the less educated workers in those regions. The production manager at a state-of-the-art apparel firm in Bristol County believes that state government is completely unaware of the textiles and apparel industry.

On the contrary, the Massachusetts Technology Collaborative has recognized textiles and apparel

The concern most frequently expressed by textile and apparel executives interviewed for this study is that officials at all levels of government have written off their companies as unglamorous "low-tech" firms with no economic development potential.

The Massachusetts Technology Collaborative recently identified textiles and apparel as one of nine key industry clusters that generate new wealth and earnings through national and international sales.

The new global economy is a reality for the textile and apparel industries, which are restructuring operations, carving out specialized niche markets, introducing new technology, and accelerating new product development to meet the challenges of global competition.

as important industries in the state's new economy (MTC 1999, p. 17). The textile and apparel cluster accounts directly for only 1 percent of the state's total employment and 6.1 percent of its manufacturing employment (MDET 1998), but it is concentrated in Bristol, Middlesex, and Essex Counties. The state's most significant production niches are man-made fabrics, knitting, dyeing and finishing, fabrics for home furnishings and automotive interiors, women's apparel, and men's and boys' suits.

Because apparel firms rely on textile mills for their fabric inputs, the textile and apparel industries are typically grouped together as a single cluster or complex. This study has adopted the traditional definition of the textile and apparel cluster based on the federal government's Standard Industrial Classification (SIC), the system used to collect all establishment-based federal economic statistics classified by industry.¹ The SIC permits comparability of data on number and location of establishments, number of employees, and annual earnings paid by establishments in the textile and apparel industries (Executive Office of the President 1987, 3).

The textile and apparel cluster is defined primarily as SIC Major Group 22, "Textile Mill Products," and SIC Major Group 23, "Apparel and other finished products made from fabrics and similar materials" (see Appendix A). Analysis of these two major groups is supplemented by data on firms that manufacture machinery, parts, attachments, and accessories for the textile industry (SIC 3552) and by data on firms engaged in apparel wholesale activity (SIC 5131, 5136, 5137). Other components of the textiles complex, such as industrial sewing machines, waste material, and specialized business services, are incorporated as indirect impacts of the primary SIC Codes.²

While this study continues to view the two industries as interrelated, it does so with the understanding that they have been uncoupling from each other in many ways. Textile manufacturers also produce fabrics and composite materials for many nonapparel applications. Nearly two-thirds of textile manufacturing in the United States is destined for end uses other than apparel, primarily

for the automotive and home furnishings industries. Textile firms produce materials for use in automobile and furniture upholstery, rugs, curtains, filtration devices, and felt-tip pens.

The textile and apparel industries are also uncoupling in terms of their use of technology, cost structures, labor needs, and future prospects. Textile manufacturing has become a capital-intensive "high-tech" industry that employs a great deal of automated machinery to achieve high productivity and low unit costs. Labor costs are sometimes as little as 15 percent of a modern textile firm's total costs. As textile firms invest in new computer-assisted design and computer-assisted manufacturing (CAD-CAM) technology, improved productivity and quality control are allowing many of these firms to compete successfully in the new global economy. However, this also means that successful textile firms demand a more highly educated workforce than previously, along with sustained capital investment and continuous research and development. On the other hand, apparel manufacturing is still a labor-intensive industry in which labor accounts for a high percentage of a firm's total costs. Thus, foreign competition from low-wage countries has continued to erode the U.S. and Massachusetts apparel industries.

A finished textile or apparel good has often been processed at various steps by firms or plants based in many different countries. Thus, international competition and foreign trade are increasingly important aspects of the textile and apparel industries.

The managed-trade regime governing foreign textile and apparel imports is a tangled web of overlapping agreements that is rapidly giving way to a new era of trade liberalization. The World Trade Organization (WTO) Agreement on Textiles and Clothing will eliminate quotas (but not tariffs) on textile and apparel imports by 2005. The prospect that China will be granted entry into the WTO is particularly worrisome, since it is already the largest exporter of apparel, by value, to the United States. The Caribbean Basin Initiative allows certain Caribbean nations to assemble apparel made from U.S.-formed and -cut fabrics. This apparel can reenter the United States under special "guaranteed access" quotas, which for all

NAFTA's main impact on the apparel industry has been to encourage firms to expand in Mexico rather than in Asia.

The past two decades have been turbulent ones for the textile and apparel industries, but there are signs that the textile industry is starting to stabilize in Massachusetts and may even be on the verge of long-term renewal and expansion.

practical purposes eliminate quotas on these products. U.S. tariff provisions also allow foreign-assembled apparel, if cut from U.S.-made fabric, to reenter the country liable only to duty on the value added in the foreign country (tariff provision 9802.00.80). The North American Free Trade Agreement (NAFTA) is scheduled to eliminate tariffs and quotas on textiles and apparel by 2005, but under strict rules of origin.

NAFTA, which took effect January 1, 1994, was expected to divert much of the domestic apparel industry to Mexico, while creating a new market for U.S.-made textiles as industries rationalized operations on a regional basis. Policymakers hope that Mexico will emerge as a world center for apparel production and generate demand for U.S.-produced textiles under the treaty's tightened rules of origin.

NAFTA has already affected textiles and apparel in very different ways. There seems little doubt that it has become more attractive for U.S. apparel firms to relocate or expand existing operations in Mexico. However, apparel firms were already moving offshore and likely would have continued to do so. As expected by its architects, NAFTA has not "caused" the relocation of the apparel industry, but it is diverting some of that trade from Asia to Mexico. The same is true for much of the home furnishings and automobile industries.

The diversion of apparel, home furnishings, and automobile manufacturing to Mexico has benefited the textile industry. This industry has invested millions of dollars in CAD-CAM production technology over the past decade, which has allowed U.S. textile firms to increase productivity, lower unit costs, improve quality, and reduce fabric waste. These factors, combined with NAFTA's strict rules of origin and the remaining tariffs on textile imports from non-NAFTA countries, have made U.S. textiles highly competitive in the North American market. As apparel, home furnishings, and automobile interior production has expanded in Mexico, demand for U.S.-produced textiles has increased.

In the past two years the number of textile and apparel enterprises in Massachusetts has stabilized, although both sectors continue to shed employ-

A Small Firm... and Happy to Stay That Way

Cape Cod Sports Wear is a small proprietary firm in Mashpee, Massachusetts, owned by Lance Lambros. The firm makes custom-designed printed and dyed T-shirts. Formerly employed at a large printing firm, Lambros decided to take control of his own time and enjoy life on the Cape by going into business for himself. He purchased a printer, opened shop, and drew on his previous sales contacts to start his small business.

Lambros has expanded cautiously by acquiring small printing operations of the type normally found in someone's garage or basement. This strategy has allowed the firm to accumulate new accounts and to purchase used equipment at a large discount from bankrupt firms or from individuals who are leaving the business.

Today Cape Cod Sports Wear is a five-person firm with a small factory and \$300,000 in annual sales. The company provides its owner with a good living, allows an excellent quality of life, is a source of personal satisfaction, and does not demand too much of his time. Not surprisingly, Lambros wonders whether it would be worth "the hassle and demands on my time to ratchet the company up to the next level for \$1 million in annual sales."

ment, for different reasons. In the apparel sector, employment declines are continuing as firms consolidate operations in other states, shift production to foreign locations, scale back production, or go out of business. In the textile sector, however, employment losses are mainly the result of automation and productivity gains, which are renewing the industry's long-term competitive position (Rowan and Barr 1987, 9–10).

More than two decades of employment losses have created an image of industry decline that masks many successes. Malden Mills has received national publicity for its innovative Polartec fabric, but there

The state's textile and apparel firms increasingly identify their competitive advantage with value rather than price.

are other success stories in the state. ROTHTEC, based in New Bedford, is the world's leading producer of CAD-CAM print screens for the textile industry (see sidebar, page 11). Main Street Textiles is building a 595,000-square-foot manufacturing facility that will double the number of employees in its Fall River operations (Freeman 1998; Flynn 1999). Quaker Fabrics quietly reinvented itself during the 1990s and then utilized NAFTA's rules of origin to become the leading U.S. exporter of furniture upholstery to Mexico. Its exports have gone from 5 percent to 25 percent of annual sales, and it is building a state-of-the-art manufacturing facility in Fall River to meet rapidly rising demand for its products. There are many less dramatic stories of one-person stitching and embroidery operations, custom-designed T-shirt makers, or promotional baseball-cap makers that have grown into small companies with three or four employees (see sidebar, page 8). These stories rarely receive attention outside their local area, or they are overshadowed by a constant stream of bad news about the impact of foreign competition.

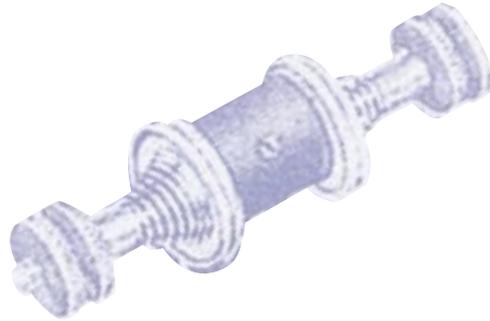
Headlines have been dominated by stories about plant closings, corporate consolidation, and offshore relocation, but underneath these trends a new textile and apparel cluster is starting to take shape.

The firms that are surviving the industry's continuing shakeout are doing so in many different ways. Many textile firms are implementing computer-assisted manufacturing processes or other forms of continuous productivity improvement. Some firms in both textiles and apparel have defined and captured niche markets. These niches are defined in various ways: quality, durability, uniqueness, turnaround time, newness of the product, custom design, and customer service. Mansour Nejad, vice president for engineering at Duro Industries, observes: "No one wants commodities; they want solutions." Consequently, successful firms in the industry must constantly work with suppliers and customers at both ends of the production chain to meet the specific demands of customers.

This report concludes that such success stories represent more than the exceptional occurrences in a declining industry. These stories focus our attention on a silent transformation of the state's textile and apparel industries. Approximately 58 percent of the state's textile and apparel firms have been established since 1980. Many of the "new" firms are the result of name changes, corporate divestitures,

or changes in ownership, but the majority are small start-ups with 20 or fewer employees. Many of these firms are still in an entrepreneurial stage of development, rather than in maturity or decline.

Furthermore, many changes in ownership are the result of venture capital investment and turnaround strategies. Julius Koch USA in New Bedford is one of these. Such strategies have required painful layoffs and downsizing, but they have salvaged moribund firms by turning them into smaller, more competitive, and more profitable enterprises. Most of the state's textile and apparel firms are privately held corporations, proprietorships, or partnerships in which local owners are still actively involved in management. Despite assiduous wooing by economic development agencies in other states, these owners are committed to staying in Massachusetts.



Economic Impacts of the Textile and Apparel Industries

Textiles and apparel manufacturing account for 6.4 percent of the state's total manufacturing employment base.

The statewide economic impact of the textile and apparel cluster was estimated using the Regional Input-Output Modeling System (RIMS II) developed by the U.S. Bureau of Economic Analysis. The state's industry concentration was compared to national averages with location quotients (see Appendix B). The textile and apparel industries are significant employers in Bristol, Middlesex, Essex, and Suffolk Counties. Many of the firms are national and international industry leaders, particularly in the manufacture of broadwoven man-made fabrics, textile finishing, miscellaneous textile goods, and men's and boys' suits and coats.

EMPLOYMENT AND WAGES

Direct Economic Impacts

In 1998 (3rd Q), approximately 13,510 people were employed in the Massachusetts textile industry and 13,164 in apparel making. Another 369 were employed in making and repairing textile machinery, while 4,406 were employed in the wholesale distribution of piece goods and clothing. The textile and apparel industries account directly for only 1 percent of the state's total employment, but the industry is heavily concentrated in Bristol County

and the South Coast. The textile and apparel industries provide 4.8 percent of the total direct employment in Bristol County, 7.3 percent in New Bedford, and 20.5 percent in Fall River (MDET 1998). The industries are also significant employers in Middlesex, Essex, and Suffolk Counties, although density is much lower than in Bristol County.

The textile and apparel industries had a total annual payroll of approximately \$918 million in 1998. Nearly half (49.2 percent) of the cluster's total payroll was in the textile industry, where wages tend to be higher than in other parts of the cluster. The textile industry had a 1998 payroll of \$451.8 million, followed by apparel at \$280.6 million and wholesale distribution at \$171.7 million.

These are not high-wage industries, although textile establishments provide much higher compensation than other segments of the cluster. In 1998 the annual average wage in textiles ranged from a low of \$25,469 in cotton-weaving mills to a high of \$41,936 in miscellaneous textile goods. The average annual wage in the textile industry is average for the state as a whole, although it is slightly lower than in other manufacturing sectors in the state. In 1998 the average hourly wage in the

Textile employment tends to provide compensation 5 to 20 percent higher than annual average wages in cities where the industry is most heavily concentrated.

The average annual wage in the apparel industry is well below the average for the state as a whole and substantially lower than in its other manufacturing sectors.

state's manufacturing establishments was \$13.79, compared to \$12.11 in the state's textile establishments (Current Employment Statistics 1998).

However, given the industry's heavy concentration in Bristol and Middlesex Counties, these comparisons should also be evaluated in relation to the average wages paid in those regions. In 1998 the average annual wage in Fall River was \$27,002; in New Bedford it was \$28,679, and in Lawrence, \$29,714. Furthermore, production-level jobs for operators usually provide stable employment with health care, retirement, and vacation benefits (Rowan and Barr 1987, 96–108).

In 1998 the annual average wage in apparel establishments ranged from a low of \$18,098 in women's and children's undergarments to a high of \$24,709 in miscellaneous fabricated textile products. In 1998 the average hourly wage in the state's manufacturing establishments was \$13.79, but only \$8.61 in its apparel establishments (Current Employment Statistics 1998).

Although annual wages in the apparel industry are low even in comparison to average wage levels in Fall River, New Bedford, and Lawrence, production-level jobs for senior operators can provide stable employment with health care, retirement, and vacation benefits — unlike many of the low-wage service jobs that are replacing manufacturing in these cities. Furthermore, the apparel industry continues to provide an entry point into the labor force for poorly educated immigrants and is therefore a vital component of local economies with large foreign-born populations. The Caribbean and Southeast Asia are the major sources of immigration to the cities where apparel establishments are most densely concentrated, and many of these individuals come to this country with previous experience in the industry (Sum and Fogg 1999, 36–38).

Indirect Economic Impacts

The Massachusetts textile industry had estimated sales of more than \$2 billion in 1998, while the Massachusetts apparel industry registered about \$1.1 billion in sales (iMarket, Inc., 1998). It is estimated that the textile industry made \$186 million in local expenditures and the apparel industry, \$229 million. The \$415 million pumped into

ROTHTEC: High Technology in the Textile Industry

ROTHTEC's worldwide headquarters is located in New Bedford, Massachusetts, although the company has facilities in New York City, North Carolina, California, and Mexico. ROTHTEC's multimillion-dollar investment in cutting-edge technology has made it the world's largest independent textile engraver. The company's proprietary high-tech etching system has won international recognition for its ability to produce intricate designs on metallic screens. Fred Roth is the company's chief executive officer; his brother Bruce is its president.

ROTHTEC employs textile designers and artists who sketch patterns or compose them on computer. The artists' designs are then etched by laser onto the nickel-plated screens used for printing fabrics. Screens produced at ROTHTEC are used to print everything from upholstery fabric to the patterned materials used in aprons, quilts, and handmade items. ROTHTEC provides the vast majority of textile screens for the Malden Mills Polartec and Polarfleece fabrics.

In 1997 the company opened a branch office in New York City that is expected to boost business by providing virtually instantaneous examples of the company's capabilities. When customers come in with a design idea, staff can produce an image of it and a paper printout. They can even print the design on a fabric of the customer's choice. This process allows apparel makers and designers to see immediately whether their ideas look as good on fabric as they had imagined. Average turnaround time is one week, although the company can produce a one-by-two-yard fabric sample within 24 hours if necessary. The technology used at its New York City operation is costly, but it has put the company ahead of its competition.

ROTHTEC began operating in 1971 with seven employees in a 7,000-square-foot facility. It now employs 100 persons at its 34,000-square-foot facility in New Bedford, 50 persons in Mexico, 35 in Charlotte, North Carolina, and ten each at its New York City and California offices.

Source: *New Bedford Standard-Times*, February 23, 1997.

It is estimated that only about 700 to 800 (2.6 percent to 3 percent) of the 26,674 textile and apparel manufacturing jobs are dependent on the local purchases of other textile and apparel establishments in the state.

Despite the industry's density in the Southeast, four of the ten leading textile-producing states are still in New England: Rhode Island, Maine, New Hampshire, and Massachusetts. The Commonwealth ranks tenth among the states in terms of textile employment density, with 2.4 percent of the nation's total textile employment.

the state's economy by these local purchases generates another 7,957 jobs in Massachusetts with total annual earnings of \$201.3 million.

The indirect impacts were specified using the IMPLAN econometric modeling system, which calculates indirect impacts using the Regional Purchase Coefficients and Input-Output tables of the U.S. Bureau of Economic Analysis (see Appendix B). The indirect impacts are widely diffused among a variety of retail vendors and personal and business services. The most significant indirect impacts occur in maintenance and repair services, motor freight transport, and wholesale trade.

The state's textile and apparel firms have very few direct interactions with each other, since most inputs are purchased from the southeastern United States or from foreign sources and most outputs are shipped to manufacturers or retailers throughout the nation. Consequently, local purchases by Massachusetts textile and apparel firms tend to generate indirect impacts outside their immediate industries.

Induced Economic Impacts

Massachusetts textile and apparel industries had a total estimated payroll of \$917.7 million in 1998. Consumer spending by industry employees induces another 40,867 jobs in the state. Induced impacts were specified using the IMPLAN econometric modeling system. The most significant impacts of employee spending occur in retail trade, health services, and eating and drinking establishments.

Total Economic Impacts

The state's textile and apparel industries generate approximately 72,316 jobs annually in total economic impacts. These jobs have a total estimated payroll of nearly \$2.2 billion. The industries account for 2.3 percent of all employment in the state and 1.9 percent of the annual wages earned by residents. The state's textile industry generates two additional jobs in other sectors of the economy for each job created at a textile establishment. The

state's apparel industry generates one additional job in other sectors of the economy for each job created at an apparel establishment. In both instances, the multiplier effect of the textile and apparel industries is higher than the typical multiplier effect of service-sector industries.

The total economic impact of the textile and apparel industries is not diffused evenly throughout the state. The industry's impact is heavily concentrated in Bristol, Middlesex, and Essex Counties, with the largest and densest concentrations occurring in Fall River, Lawrence, New Bedford, and Taunton. The ratios of direct economic impacts to indirect and induced economic impacts are quite striking when applied to these cities. In New Bedford, more than 8 percent of the city's total employment — one of every 12 jobs — still depends on the textile and apparel industries. In Lawrence, one out of every ten jobs depends on these industries. In Fall River, more than 25 percent of the city's total employment — one of every four jobs — depends directly or indirectly on the textile and apparel industries.³

REGIONAL CONCENTRATION

The Textile Industry

The textile industry employs more than 600,000 people and accounts for 0.5 percent of all employment in the United States. The industry has a \$15.5 billion annual payroll. Between 1880 and 1930, much of the industry migrated to the

Location Quotients for Textile and Apparel Activities, 1996

SIC	SIC description	Employment	Total state employment	State employment	Location quotient
		<i>thousands</i>	<i>thousands</i>	<i>%</i>	
222	Broadwoven fabric mills, man-made	2,521	3,052	0.0826	1.60
223	Broadwoven fabric mills, wool	423	3,052	0.0139	1.21
226	Textile finishing, except wool	3,829	3,052	0.1255	2.30
229	Miscellaneous textile goods	3,932	3,052	0.1288	3.13
231	Men's and boys' suits and coats	1,902	3,052	0.0623	2.44
238	Miscellaneous apparel and accessories	1,240	3,052,000	0.0406	1.48

Source: Calculated from ES-202 data provided by U.S. Bureau of Labor Statistics

Comparative Textile Density in the Top 10 States, 1996

	Textile employment	Textile wages <i>millions of \$</i>	Total state employment <i>thousands</i>	Textile employment <i>% of state</i>	Location quotient
United States	627,603	15,459.8	126,708	0.5	1.00
North Carolina	184,636	4,373.4	3,631	5.1	10.27
South Carolina	81,485	2,031.5	1,737	4.7	9.47
Georgia	108,391	2,761.9	3,580	3.0	6.11
Alabama	39,999	891.3	1,981	2.0	4.08
Rhode Island	7,799	209.4	470	1.7	3.35
Virginia	35,787	795.8	3,240	1.1	2.23
Tennessee	19,462	449.4	2,609	0.7	1.51
Maine	4,747	116.0	635	0.7	1.51
New Hampshire	3,637	114.5	598	0.6	1.23
Massachusetts	14,795	487.2	3,052	0.5	0.98

southeastern United States. The heaviest industry concentrations are found in North Carolina, South Carolina, and Georgia, which together account for almost 60 percent of all textile industry employment in the nation (USBLS 1999).

Despite the industry's density in the Southeast, four of the ten leading textile-producing states are still in New England: Rhode Island, Maine, New Hampshire, and Massachusetts (see Appendix C).

When location quotients are calculated at the SIC 3-digit level, Massachusetts emerges as an industry leader in the manufacture of broadwoven man-made fabrics (Quaker Fabric, Mainstreet Textiles), textile finishing (Duro Industries), and miscellaneous textile goods (Haartz Corporation, Shawmut Mills). The three-digit location quotients suggest that many of the state's textile firms occupy leading positions in specialized niche production areas, and it is these firms that are currently adding manufacturing capacity (see Appendix D).

The Apparel Industry

The U.S. apparel industry is more geographically diffuse than the textile sector. The three southeastern states that lead the textile industry account for only 15 percent of total employment in the ap-

parel industry. Heaviest industry concentrations are in California, New York, and Texas, which account for 35.1 percent of apparel industry employment. Massachusetts ranks sixteenth among the states in terms of apparel employment density, with 1.7 percent of the nation's total. The highest location quotient (see explanation in Appendix B.4) for apparel is Alabama, at 3.20. Massachusetts is below average at 0.73, but this ranks it above 34 other states and the District of Columbia (see Appendix I). Although Massachusetts is not a leader in the apparel industry, it continues to benefit from its proximity to New York City.

When location quotients are calculated at the SIC three-digit level, Massachusetts emerges as an industry leader in the manufacture of men's and boys' suits and coats. This segment of the apparel industry includes high-end manufacturers such as Cliftex, American Trend, Shepard Clothing, Riverside Manufacturing, Blauer Manufacturing, Bradley Scott, Southwick, and Sterlingwear of Boston, Inc. These firms tend to manufacture products sold on the basis of quality, name brand, and style. The state also retains a noticeable concentration in miscellaneous apparel and accessories, miscellaneous fabricated textile products, and women's and misses' outerwear.

Comparative Apparel Density in the Top 16 States, 1996

	Apparel employment	Apparel wages <i>millions of \$</i>	Total state employment <i>thousands</i>	Apparel employment <i>% of state</i>	Location quotient
United States	865,986	16,618.0	126,708	0.6835	1.00
Alabama	43,271	701.9	1,981	2.2	3.20
Mississippi	25,386	370.2	1,185	2.1	3.13
South Carolina	28,943	479.8	1,737	1.7	2.44
Tennessee	42,611	737.2	2,609	1.6	2.39
North Carolina	56,187	987.7	3,631	1.5	2.26
Kentucky	25,456	469.3	1,762	1.4	2.11
Georgia	41,327	646.3	3,580	1.2	1.69
California	156,462	2,814.8	14,470	1.1	1.58
New York	86,854	2,270.6	8,100	1.1	1.57
Arkansas	9,141	130.7	1,168	0.8	1.15
Pennsylvania	42,996	806.9	5,590	0.8	1.13
Missouri	19,301	342.5	2,765	0.7	1.02
New Jersey	26,514	627.7	3,869	0.7	1.00
Texas	60,632	1,066.7	9,200	0.7	0.96
Virginia	19,520	298.4	3,240	0.6	0.88
Massachusetts	15,127	315.8	3,052	0.5	0.73

Massachusetts is clearly not leading the textile industry as a whole, but it is also far from a lost industry, particularly given recent plant expansions by several of the state's largest textile employers.



Structure of the Commonwealth's Textile and Apparel Industries

Textile density is highest in Bristol County, where textile establishments account for 2 percent of total employment. Highest local densities of textile employment are located in Fall River (10.4 percent), Lawrence (9.7 percent), and Webster (13.3 percent).

The textile and apparel industries are situated at the center of an extensive production complex that includes agriculture, textile manufacture and finishing, apparel design and manufacture, transportation, wholesale distribution, marketing, and retail sales.

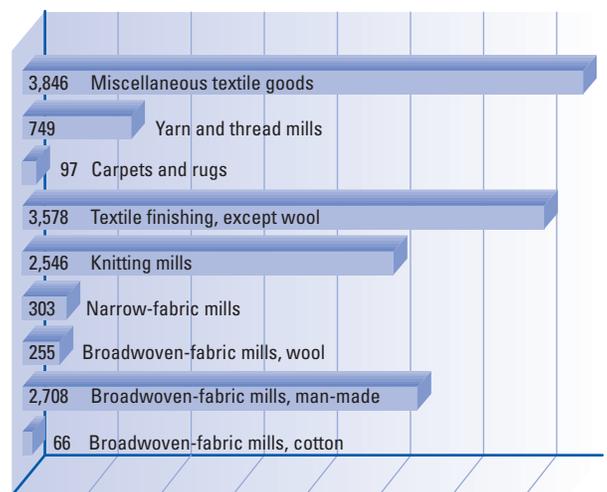
Production of a garment frequently begins with the growing and harvesting of natural fibers such as cotton, wool, and silk (farming and ranching), although the use of man-made fibers such as rayon and nylon (chemicals and allied products) has become increasingly common. Both natural and man-made fibers must be processed into long, thin strands called yarn or thread (spinning mills). Vertical (warp) and horizontal (weft) lengths of yarn are either woven or knit into fabric (weaving and knitting mills). The fabric is bleached, dyed, printed, or otherwise finished for use in the garment, home furnishings, automotive, or other industries (dyeing and finishing mills). Finished fabrics are made into garments, which are purchased by retail firms and sold to consumers. Manufacturers also purchase finished fabrics

to make home furnishings, automotive interiors, and sporting goods, among other products.

THE TEXTILE SECTOR

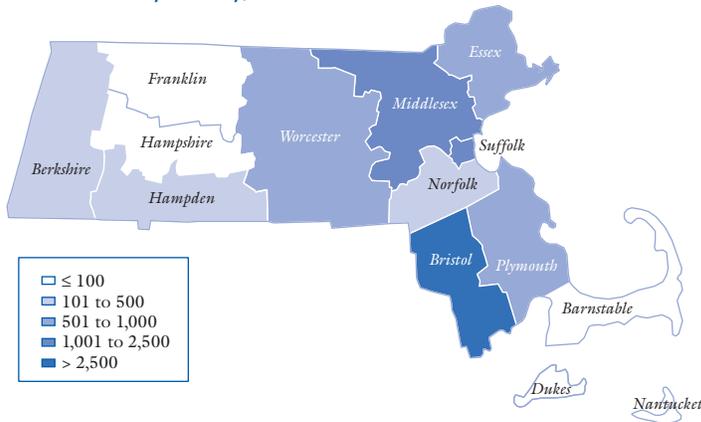
The state's textile employment depends heavily on large, integrated mills operated by industry-leading

Textile Employment in Massachusetts, 1998



Source: Massachusetts Division of Employment and Training

**Massachusetts Textile Employment:
Distribution by County, 1997**



firms in dyeing and finishing, knitting, broadwoven man-made fabrics, and coated fabrics (see Appendix F). In 1997 the Massachusetts textile industry employed 14,498 persons, which is 0.5 percent of the state’s total employment and 3.2 percent of the state’s manufacturing employment. More than a third (34.3 percent) of the state’s textile employment is concentrated in Bristol County, while more than two-thirds (69.2 percent) is concentrated in Bristol, Middlesex, and Essex Counties.

In Massachusetts a small number of large, integrated textile establishments account for 58 percent of the sector’s total statewide employment. Textile employment in Massachusetts is heavily dependent on the fortunes of a few large companies, which tend to be geographically clustered in Bristol, Middlesex, and Essex Counties. Establishments employing 250 or more persons also account for two-thirds (66.7 percent) of annual sales by the state’s textile industry (iMarket, Inc. 1998). Many of these companies are expanding operations and building new manufacturing facilities in Massachusetts to meet rising demand for their products. Each of these operations will require several hundred additional persons, which suggests that textile employment should at least stabilize, if not increase, over the next two to three years as these plants come on-line.

The state’s largest concentrations of textile employment are in dyeing and finishing (23 per-

cent), knitting mills (23 percent), broadwoven man-made fabrics (18 percent), and coated fabrics (12 percent). Employment in these groups is also heavily dependent on a few large firms that each employ several hundred to a thousand persons at one or more densely clustered plants. For example, Duro Industries, a dyeing and finishing company, employs about 1,100 persons at its plants in Fall River. Malden Mills, a knit dye and finishing mill, employs more than 1,500 persons at its operations in Lawrence. Quaker Fabric and Mainstreet Textiles, both of which produce Jacquard-woven fabrics, together employ about 1,700 persons in their Fall River operations and have near-term expansion plans that will increase their combined employment to more than 2,500 in the next five years. Similarly, Haartz Corporation in Acton and Shawmut Mills in West Bridgewater each employ several hundred persons in finishing fabrics with special coatings (SIC 2295).

Textile Employment by County, 1997

	Units average	Average employees	State textile employment	Average annual wage
			%	\$
Barnstable	4	26	0.2	34,805
Berkshire	6	162	1.1	20,761
Bristol	57	4,970	34.3	33,095
Dukes	0	0	0.0	
Essex	26	2,520	17.4	
Franklin	3	19	0.1	
Hampden	13	712	4.9	29,665
Hampshire	7	273	1.9	26,559
Middlesex	47	2,528	17.4	39,551
Nantucket	2	18	0.1	
Norfolk	12	672	4.6	41,438
Plymouth	10	248	1.7	38,391
Suffolk	8	197	1.4	34,125
Worcester	32	2,153	14.9	32,067
State	217	14,498	100.0	35,285

THE APPAREL SECTOR

The state’s apparel employment is anchored by a few large enterprises that produce women’s and misses’ outerwear, men’s and boys’ suits and coats, curtains and draperies, and miscellaneous household furnishings such as towels, bedding, and

tablecloths. In 1997 the Massachusetts apparel industry employed 14,205 persons, which is 0.5 percent of the state's total employment and 3.2 percent of its manufacturing employment. Nearly half (49.3 percent) of the state's apparel employment is concentrated in Bristol County, while more than three-quarters (75.5 percent) is concentrated in Bristol, Suffolk, and Middlesex Counties. Apparel employment density is highest in Bristol County, where the industry accounts for 2.8 percent of total employment. Highest local densities of apparel employment are found in Fall River (10.1 percent), New Bedford (5.2 percent), Taunton (3.1 percent), and Warren (12.3 percent).

The apparel industry is still the single largest purchaser of textile products in the United States — 37 percent of fiber consumed — but it is also the most fragmented and labor-intensive sector in the textiles complex (USITC 1994, IV-10). Production in the U.S. apparel sector is fragmented among numerous

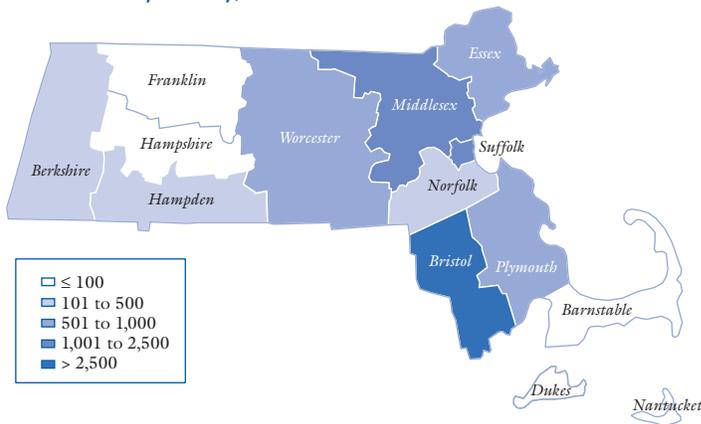
Apparel Employment by County, 1997

COUNTY	Units average	Average employees	State apparel employment	
			%	\$
Barnstable	13	36	0.3	19,447
Berkshire	8	243	1.7	16,443
Bristol	95	6,999	49.3	18,639
Dukes	1	10	0.1	
Essex	35	854	6.0	24,739
Franklin	2	50	0.4	
Hampden	22	338	2.4	20,045
Hampshire	3	35	0.2	19,008
Middlesex	62	1,276	9.0	21,984
Nantucket	0	0	0.0	0
Norfolk	23	486	3.4	28,894
Plymouth	27	523	3.7	26,588
Suffolk	79	2,448	17.2	28,721
Worcester	29	937	6.6	25,959
State	399	14,205	100.0	22,173

Fewer than 20 percent of apparel establishments employ more than 100 persons, but nationally these establishments account for more than 80 percent of the sector's total employment. During the 1990s the trend toward consolidating apparel employment in larger establishments continued. The sector remains less concentrated in Massachusetts, however, where 51 percent of apparel employment is in establishments with 100 or more persons (U.S. Bureau of the Census 1998, 1996). These firms also account for 63.9 percent of the state's apparel industry sales (iMarket, Inc. 1998).

Apparel establishments are classified functionally by the type of garment produced and by the gender and age of the intended consumer. They tend to specialize in particular lines of clothing, such as women's and misses' dresses, girls' dresses, men's sportswear, nightwear (men's, women's, or children's), gloves, winter coats, undergarments (men's and women's), suits and formal wear, infant wear, men's ties, denim, T-shirts, bathrobes and accessories, and so on. Major production segments are further divided into highly specialized concentrations on types of products within each category and on the particular kinds of fabrics used in making the garment (for example, cotton, silk, wool).

Massachusetts Apparel Employment: Distribution by County, 1997



small firms, with about 63 percent of the establishments employing fewer than 20 persons. However, these small establishments account for only 9 percent of the sector's total employment nationwide. In Massachusetts, small establishments with fewer than 20 employees account for 7 percent of the sector's total employment.

The state's largest concentrations of apparel employment are in women's and misses' outerwear (29.5 percent), men's and boys' suits and coats (15.4 percent), curtains and draperies (15 percent), and miscellaneous household furnishings such as towels, bedding and tablecloths (5 percent).

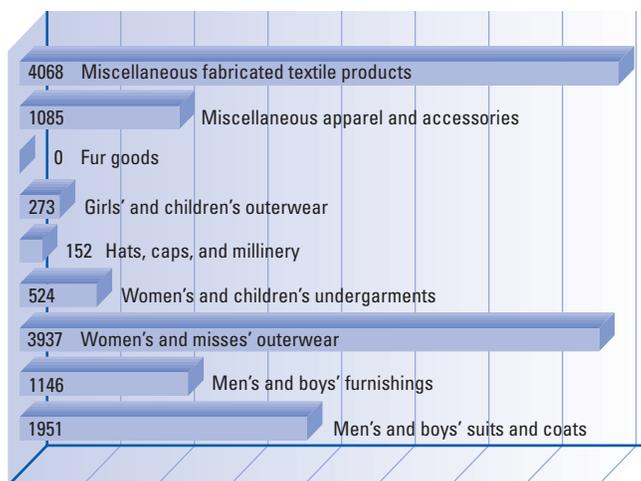
In contrast to the general fragmentation of the apparel sector, the strongest apparel groups in Massachusetts tend to be anchored by a few "large" enterprises. In women's and misses' outerwear about 45 percent of the group's employment is concentrated in enterprises with more than 100 employees. These firms include KGR, Inc. (Lawrence), Kneeland Skirt Co. (Allston), Wellhart Manufacturing (Fall River), Jensen Manufacturing (Fall River), Griffin Manufacturing (Fall River), Mackintosh of New England (New Bedford), and Madeira-Twin Fashions, Inc. (New Bedford). The majority of the large employers in this group are based in Fall River, New Bedford, and Lawrence. Most of the firms specialize in women's and misses' suits, coats, and jackets, a high-end professional-wear market in which people are willing to pay higher prices for quality fashion.

Employment in establishments producing men's and boys' suits, coats, and overcoats is also highly concentrated, with about 73 percent based in firms with 100 or more employees. These firms include American Trend (New Bedford), Riverside Manufacturing (New Bedford), Cliftex (New Bedford), Blauer Manufacturing (Boston), Sterlingwear of Boston, Inc. (Boston), Bradley Scott

(Fall River), Shepard Clothing (New Bedford), and Southwick (Lawrence). The majority of the large employers in this group are based in New Bedford, Fall River, Boston, and Lawrence. Most of the firms specialize in tailored suits and formal jackets, which is also a high-end market in which consumers are willing to pay higher prices for name-brand quality fashion.

Total apparel sales and, therefore, apparel industry employment are driven by economic conditions, demographic trends, and pricing. Fashion plays a limited role in the overall market demand for apparel, but it can have a profound impact on the sales of individual companies (Fraser 1998, 1). Changing tastes and fashions mean that individual firms must anticipate future trends and be nimble in responding to customer preferences. Many of the fastest-growing segments of the apparel market are less price sensitive and more quality or name-brand sensitive. The Commonwealth's major apparel groups are concentrated in this segment of the market (see Appendix F.6). Thus, the current market trends for retail apparel are favorable for the major production groups in Massachusetts, although it is unlikely that such trends signal a significant turnaround for the state's apparel industry. Indeed, Chet Sidell, president of KGR, Inc., in Middlesex County, suggests, "It may be too late for studies."

Apparel Employment in Massachusetts, 1998



Source: Massachusetts Division of Employment and Training

THE HOME FURNISHING AND AUTOMOTIVE INTERIORS SECTORS

The U.S. textile industry now produces 63 percent of its output for nonapparel uses (USITC 1994, IV-10; see Appendix F.3). Home furnishings and automotive interior products are increasingly important to the Massachusetts textile industry, especially for firms that supply upholstery to manufacturers based in Michigan and Mexico. Massachusetts has a significant employment base in miscellaneous fabricated textile products (SIC 239); most of this is concentrated in curtains and draperies (SIC 2391) and miscellaneous household furnishings (SIC 2392). Ap-

The main reason for the decline of the U.S. industry is the technological superiority of foreign machinery, which is the result of heavy R&D investment by Japan and the European Union during the 1960s and 1970s.

Textile executives in Massachusetts report some difficulty in finding skilled technical and managerial personnel, partly because of a labor shortage and partly because of their industry's low-tech image.

proximately half of total employment in this product group (SIC 239) is in curtains and draperies, but in contrast to other key sectors of the state's textile industry, employment here is dispersed among numerous small establishments. There are a few large employers in the group, such as CHF Industries (Fall River), Rennie's Curtain Outlet (Taunton), and Richmark International (Everett), but most of the group's employment is based in small firms with fewer than 20 employees.

Some of the small firms are expanding sales and employment with strategies that rely on direct catalogue and Internet sales to consumers. These firms, such as Country Curtains in Ware, have often identified a specific theme or niche market. Country Curtains has developed a reputation for providing "country" designs with high-quality workmanship and rapid delivery, capitalizing on its location in western Massachusetts. Internet sales, by providing international advertising capacity at very low cost, have become its fastest-growing source of revenue.

The other major employment group within miscellaneous fabricated textile products is miscellaneous household furnishings. This group manufactures tablecloths, towels, and bedding. About two-thirds of the employment in this product group occurs in firms with more than 100 employees. The largest operations are Klear-Vu (Fall River), Louis M. Gerson, Inc. (Middleboro), and Stevens Linen Associates (Dudley).

ANCILLARY SUPPORT

Machinery

In 1992 the U.S. textile machinery industry consisted of only 500 establishments, with 15,000 employees. There are 18 textile-machinery establishments (SIC 3552) in Massachusetts, employing 369 persons and accounting for 0.012 percent of total state employment. Nationally, the group's employment declined by 26 percent between 1994 and 1996 (U.S. Bureau of the Census 1998).

Foreign suppliers' representatives reportedly work closely with their customers to provide better deliv-

ery and service than U.S. manufacturers (USITC 1987). Massachusetts textile executives interviewed for this study state that most of their new machinery is imported from Germany and Italy.

Wholesale/Resale Distributors

Wholesalers and resalers play a strategic role in apparel production by facilitating the movement of goods between large and small manufacturing firms (see Appendix F.9). Massachusetts has 381 apparel, piece goods, and notions wholesale distribution establishments (SIC 5131, 5136, 5137), employing 4,406 persons (U.S. Bureau of the Census 1998). Wholesale firms and resale agents account for 0.15 percent of total state employment. New England Sportswear and Broder Brothers occupy key positions in wholesale distribution for New England's small apparel and textile manufacturers.

Education

With seven faculty members and approximately 60 majors, the University of Massachusetts Dartmouth offers one of only two textile programs in New England. The school recently received an \$800,000 federal grant to establish one of the two nonsouthern branches of the National Textile Center, which should assist the region's textile industry through R&D.⁴ Construction of the \$12 million Advanced Manufacturing Technology Center, which will also have a strong textile and apparel research orientation, is scheduled to begin in June of 2000.

For several decades southeastern states have been investing heavily in textile education and textile technology. Many of the South's most reputable public colleges and universities, such as North Carolina State University, Georgia Institute of Technology, and Clemson University, maintain schools or colleges of textile science with nationally recognized faculty. These institutions provide specialized programs in textile chemistry, textile science, textile engineering, and manufacturing management, at the same time conducting applied scientific and technological research to support the industry.

Quaker Fabric: Combining R&D, Exports, and NAFTA

Quaker Fabric Corporation has been producing upholstery fabrics in Fall River since 1941. It was a moderately successful company until 1988, when it lost \$7.5 million. As the Massachusetts Miracle came to an end the company seemed destined for bankruptcy, but in 1989 the firm was purchased by Larry Liebenow and other partners. The new owners implemented an aggressive turnaround strategy based on acquisition of advanced production technology, workforce retraining, and expansion into new markets.

The new owners first pumped \$25 million into modernizing the firm's production technology. This investment was accompanied by enhanced training for management and production personnel to ensure that the full benefits of the new technology could be realized. By 1992 the firm had introduced 600 new fabric designs, quadrupled its production capacity, and aggressively penetrated new markets, including the upscale retail market and the office-furniture upholstery market.

In 1996 the company introduced more than 700 new fabrics to market, including a select group of better-end products marketed exclusively to high-end furniture manufacturers. Quaker is now the leading designer, manufacturer, and worldwide marketer of woven upholstery fabrics for residential furniture markets. It is one of the largest producers of Jacquard upholstery, and its trademark Ankyra chenille yarns have an abrasion/durability rating nearly three times higher than any comparable chenille product. This rating has allowed the company to expand into markets where superior performance characteristics give its product a competitive advantage.

Quaker Fabric has made a major push to capitalize on NAFTA's rules of origin by emphasizing direct exports from the United States and sales from its Mexico City distribution center. Quaker is now the leading U.S. exporter of residential furniture fabrics to Mexico. Its annual sales increased from \$123.4 million in 1992 to \$250.8 million in 1999, and over the past seven years exports have risen from 5 percent to 25 percent of its annual sales. The company now sells its upholstery fabrics in 45 countries.

Quaker Fabric owns one million square feet of manufacturing space in five plants in Fall River. The firm has grown from 1,700 to 2,400 persons over the past seven years, and 75 percent of its employees reside in Fall River. At least 500 employees owe their jobs to exports. The company recently announced construction of a new \$10 million facility in Fall River that will employ an additional 700 to 800 workers.

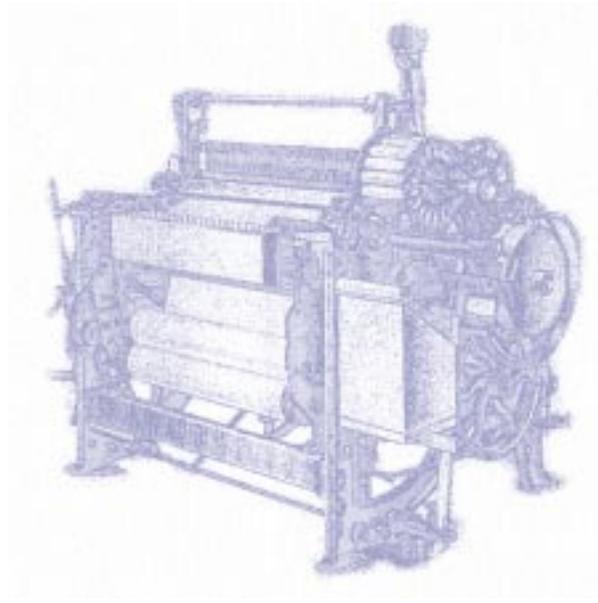
Sources: iMarket, Inc.; New Bedford Standard-Times, May 4, 1999; Fall River Herald News, April 11, 2000

OWNERSHIP STRUCTURES

There are significant differences in the ownership structures of firms in the textile and apparel industries. Approximately 67 percent of Massachusetts textile establishments are registered corporations; more than 61 percent of apparel establishments are proprietorships and partnerships. It is estimated that 98 percent of the state's textile and apparel firms are privately held, since only 16 public companies could be identified (iMarket, Inc. 1998).

Only a small percentage of the state's textile and apparel establishments, including several of the publicly held companies, are headquarters for

multiple plant operations. About 73 percent of the state's textile establishments and 84 percent of its apparel establishments are estimated to be single-location operations. Approximately 97 percent of the state's textile and apparel establishments are freestanding companies, and only 3 percent are subsidiaries of a parent firm, with all the subsidiaries in the apparel sector (iMarket, Inc. 1998). Local ownership is an important aspect of the Massachusetts textile and apparel industries because it acts as a counterweight to many of the relocation incentives offered by southeastern states.



Textile and Apparel Exports

GENERAL AGREEMENT ON TARIFFS AND TRADE

The 1970s saw the emergence of a new global economy that resulted in part from measures passed at the Kennedy Round (1963–1967) of the General Agreement on Tariffs and Trade (GATT) (see Appendix G.1). The Kennedy Round reinvigorated trends toward global trade liberalization, with an overall reduction of 35 percent in the average tariff level among participating nations. Shortly thereafter, between 1971 and 1977, the U.S. balance of payments turned negative. Only three sectors — oil and gas, automobiles, and apparel — account for 89.1 percent of the total U.S. trade deficit (1997).

Textiles and apparel were largely exempted from trade liberalization under GATT, and from 1974 to 1993, these products were governed by the Multi-Fiber Arrangement (MFA) (see Appendix G.1). The MFA established a complex series of product- and country-specific quotas and tariffs that expanded from cotton textiles under the Short-Term and Long-Term Arrangements of the 1960s and early 1970s to an ever-increasing list of natural and man-made fibers. The MFA created multiple managed-trade regimes in textiles and

apparel, so that after 1960 world trade in these sectors was subject to a wide array of bilateral quota arrangements. By 1993 the United States had bilateral quota agreements with 40 countries whose MFA product shipments accounted for approximately 80 percent of all U.S. imports of these goods (USITC 1994, IV–5).

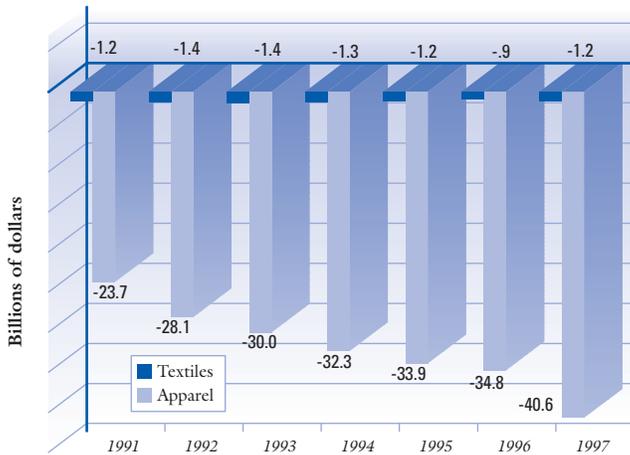
The Uruguay Round of GATT negotiations (1987–1993) resulted in a new Agreement on Textiles and Clothing that brings an end to the MFA by setting a ten-year phaseout of bilateral quotas to be completed in 2005. Nevertheless, the average trade-weighted U.S. tariff on apparel imports will remain just under 18 percent even after the Uruguay Round reductions are fully implemented. Thus, despite significant liberalization, the textile and apparel trade is still one of the most protected sectors of the world economy (Schott 1994, 150–51, 58–59; USITC 1994, IV; OECD 1996, 91; see Appendix G.1).

THE TRADE DEFICIT IN APPAREL AND TEXTILES

The U.S. trade deficit in apparel increased from \$23.7 billion in 1991 to \$40.6 billion in 1997. The value of apparel imports in 1997 was \$50.3

By 1997 the total U.S. trade deficit had reached \$113.7 billion, while the merchandise trade deficit (excluding the trade surplus in services) was \$199 billion.

U.S. Balance of Trade in Textiles and Apparel, 1991 to 1997



Source: U.S. Department of Commerce, Bureau of Economic Analysis

billion, while that of exports was \$9.7 billion. During the 1990s the apparel trade deficit showed some signs of improvement, primarily because of aggressive export initiatives by the federal government. U.S. apparel imports increased by 82 percent on a value basis from 1991 to 1997, but exports increased by 150 percent during the same period. The apparel trade deficit declined from 35.4 percent to 22.3 percent of the total U.S. trade deficit during this time.

There is not a significant trade deficit in textiles; it remained at about \$1.2 billion during the 1990s and has actually declined in real dollars. The value of textile imports in 1997 was \$8.4 billion, while U.S. textile exports were \$7.2 billion. U.S. textile exports have benefited from NAFTA and aggressive export initiatives by the federal government. U.S. textile imports increased by 54.9 percent on a value basis from 1991 to 1997, but during the same period exports increased by 71.4 percent. The textile trade deficit declined from 1.8 percent of the total U.S. trade deficit in 1991 to 0.7 percent in 1997.

Massachusetts is the eleventh largest merchandise exporter in the United States, with \$17.4 billion in international exports in 1997. The state's total exports increased by 50 percent on a value basis (from \$11.6 billion) between 1993 and 1997; its share of total U.S. exports increased during the

same period from 2.49 percent to 2.76 percent. Nevertheless, export growth in the Massachusetts textile and apparel industry has lagged behind other sectors of the state economy. Massachusetts exported \$263.9 million in textile products in 1997, a 19.8 percent increase from 1993 levels. The state exported \$88.6 million in apparel and other textile goods in 1997, a 4.9 percent increase from 1993.

The Massachusetts textile and apparel industries have also lagged in export growth compared to national trends in their sector. The value of U.S. textile exports increased by 65.2 percent and apparel exports by 63.7 percent from 1993 to 1997, compared to only 19.8 percent and 4.9 percent, respectively, for Massachusetts firms.⁵ Thus, the state saw its share of the U.S. textile and apparel export market decline during the 1990s.

Merchandise Export Growth, 1993 to 1997



Source: U.S. Census Bureau, International Trade Administration, 1998

The North American Free Trade Agreement (NAFTA) has produced many of its anticipated effects in a relatively short time.

THE NORTH AMERICAN FREE TRADE AGREEMENT

The region's trading pattern has become more concentrated since NAFTA's passage. For instance, the share of total U.S. world trade with NAFTA partners increased from 28 percent in 1993 to more than 34 percent in 1998. The United States accounted for 76 percent of Canada's total world trade in 1993 and 78.6 percent in 1997 (Statistics Canada 1998). The U.S. share of Mexico's total world trade increased from 76.4 percent in 1993 to 80.1 percent in 1997 (Banco de Mexico 1998).

Unions and Local Ownership Rescue a Company

Warnaco Corporation is a \$1.4 billion publicly traded company based in New York City. In 1997 it purchased Calvin Klein, a manufacturer and distributor of high-fashion jeans with \$480 million in annual sales. Calvin Klein operated two distribution plants in New Bedford that employed 350 people. After the purchase, Warnaco gradually reduced the plants' workforce to 230, and in January 1999 the firm announced its decision to close the New Bedford plants and consolidate operations elsewhere.

On behalf of its members at Warnaco, the Union of Needletrades, Industrial, and Textile Employees (UNITE) organized several informational pickets, a local press campaign, and a boycott of local retail outlets selling the Calvin Klein brand, including Sears, J. C. Penney, Cherry & Webb, and Victoria's Secret. Union members contacted U.S. Congressman Barney Frank, and New Bedford Mayor Fred Kalisz asked U.S. Secretary of Commerce William Daley to help save the distribution facilities.

On February 16, 1999, Warnaco plant employees learned that Frank and Daley had mediated a deal between Warnaco and a local investment group to purchase the facilities. Arnold Simon, a local investor, had formerly controlled the plants as president and chief executive officer of Designer Holdings, a company he sold to Warnaco in 1997. After learning of the impending closure, Simon came forward with a proposal to resume control of the New Bedford operation if Warnaco would waive a no-compete clause that was part of its earlier sales agreement with Designer Holdings.

Led by Simon, a group of investors agreed to purchase a 63.4 percent interest in Aris Industries, which designs and imports the Members Only, Perry Ellis, and "FUBU" lines of men's clothing. Apollo Advisors, a second investment group, was given a 23 percent interest in Aris Industries and \$4 million in cash to retire a \$10.7 million debt. Through a bank group, Aris also obtained a \$65 million revolving credit line. The "new" company agreed to purchase the New Bedford plants from Warnaco; Secretary Daley interceded at various points to broker the deal.

The local ownership arrangement saved 230 jobs and led the New Bedford *Standard-Times* to editorialize: "It reinforces our belief that ownership and management with local connections will almost always be more knowledgeable, creative and supportive when it comes to preserving local jobs. We've seen it again and again [in New Bedford] at such firms as the Acushnet Rubber Co., Titleist, AFC Cable, Aerovox, and so on. We've seen the opposite when ownership is distant and uncommunicative."

Sources: Attleboro Sun-Chronicle, January 12, 1999; New Bedford Standard-Times, February 18 and 28, 1999

Trade regionalization has affected the textile and apparel industries quite differently. The trade deficit in apparel has continued growing at its previous pace, but there is some evidence that NAFTA is diverting a portion of the apparel trade from East Asia to Mexico (USITC 1994, IV-14). The United States had a \$42.2 billion trade deficit in apparel for 1998, but approximately half (49.5 percent) of this deficit occurred in trade with China, Hong Kong, Taiwan, South Korea, and the ASEAN countries (USITA 1999a). Foreign imports presently account for 54 percent of the U.S. apparel wholesale market, which is up from 40 percent in 1991 (OTA 1993, 175; Fraser 1998, 8). The Mexican share of U.S. apparel imports increased from 2 percent in the early 1980s to 13 percent in 1998 (OTA 1993, 175; USITA 1999b), while East Asia's share of the apparel trade has been shrinking since NAFTA's passage.

About 80 percent of the apparel made in Mexico uses U.S. yarns and fabrics; apparel imported from China and the Far East uses practically none (Fraser 1998, 12). The diversion of the apparel and fabricated textile products trade to Mexico, therefore, is having a beneficial effect for export-oriented U.S. textile producers. The United States had a \$528 million total trade deficit in yarn and fabric in 1998 but a \$1.1 billion trade surplus in textiles trade with Mexico. Textile exports to Mexico more than doubled (105 percent increase) from 1995 to 1998, which exceeds the increase in U.S. textile exports to the world by a considerable margin during the same period. The United States also has a \$712 million trade surplus in its textiles trade with Canada (USITA 1999a).

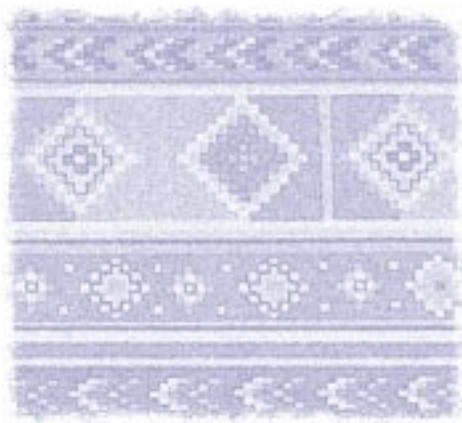
Technological superiority gives the U.S. textile industry a competitive advantage within the

Share of U.S. Total World Trade with NAFTA Partners, 1983 to 1998



Source: U.S. International Trade Commission

North American market, and this edge is reinforced by NAFTA's strict rules of origin (see Appendix G.2). The superior quality and lower unit cost of U.S. textiles have made them more competitive in Canada and Mexico, since apparel and other textile products cannot qualify for NAFTA preferences unless they meet what is called a triple transformation rule. This has made U.S.-produced textiles more attractive, since Canadian textiles have relied heavily on East Asian yarn and thread. On the other hand, non-NAFTA textiles labor under the double disadvantage that they are subject to most-favored-nation tariff rates and nontariff barriers, while apparel (or other textile goods) produced with non-NAFTA textiles will not qualify for NAFTA preferences. Textile and apparel imports from non-NAFTA countries will still face higher-than-average tariff rates and more pervasive nontariff barriers than other products, even after the phaseout of Multi-Fiber Arrangement quotas. Thus, the diversion of the apparel trade from East Asia to Mexico is increasing the demand for U.S. textiles, and this demand is accelerating as we enter the seventh year of NAFTA's ten-year transition period.



Anatomy of the Commonwealth's Textile and Apparel Industries

The U.S. textile and apparel industries are often characterized as lost industries because of long-term declines in employment, business units, and global market share. Total employment in the U.S. textile industry peaked at 1,342,000 in 1942 and fell to 568,533 in 1999. Total employment in the U.S. apparel industry peaked at 1,438,000 in 1973 and fell to 698,533 in 1999. The federal government responded to declining employment with protectionist policies, mainly tariffs and quotas, that resulted in a complex system of managed trade under the Multi-Fiber Arrangement (MFA).

The irony of this protectionist policy is that it failed to stop employment losses and may have made both industries less competitive over the long run, since productivity increases — the real key to global competitiveness — declined in these industries during this time. Prior to 1973 productivity growth — output per worker — in the textile industry was slightly higher than the 1.2 percent annual average increase in U.S. manufacturing productivity. Apparel was

already lagging at 0.6 percent annual productivity growth. Following the imposition of MFA quotas, productivity growth in both industries slipped below manufacturing norms. Between 1973 and 1986, total factor productivity growth for manufacturing averaged 1.4 percent annually but slipped to 0.6 percent in textiles and 0.5 percent in apparel (Finger and Harrison 1994, 24).

BUSINESS AND EMPLOYMENT TRENDS IN MASSACHUSETTS

Employment declines in the Massachusetts textile and apparel industries have closely paralleled national trends over the past two decades. Since 1980 the two industries combined have lost 368 establishments and 36,399 employees. The cluster has shed about 56 percent of its total employment base in Massachusetts, with more than 36 percent of the job losses in Bristol County (-13,296).

Textile Establishments and Employment in Massachusetts, 1980 to 1998



Source: Massachusetts Division of Employment and Training

The Textile Industry

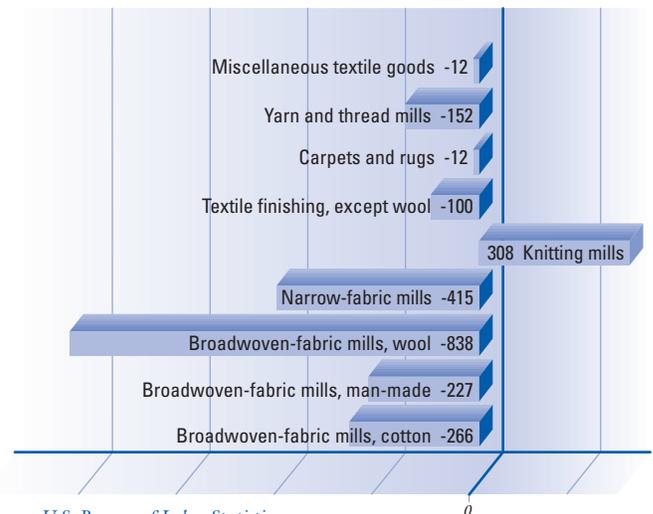
Between 1980 and 1997 the number of textile establishments in Massachusetts declined by 24 percent, from 287 to 217, although the number of establishments seems to have stabilized in the past three years. Average size of establishments decreased from 88 to 67 employees as a result of the loss of numerous large plants and establishments. Total employment in the state's textile industry declined by 42 percent, from 25,145 to 14,498, during the same period. Employment levels in the textile industry seem to have recovered from their lows of the 1990–91 recession, although employment has been affected negatively over the past three

years by the Malden Mills fire and declining exports related to the Asian economic crisis. The state's most significant employment losses in textiles have occurred in Worcester County (-2393), Bristol County (-2276), and Middlesex County (-1606). These three counties recorded 59 percent of the total employment loss in textiles between 1980 and 1997, although every county lost from 32 percent (Bristol County) to 69 percent (Suffolk County) of its total textile employment base during this time (see Appendix H).

Job losses occurred in nearly every segment of the state's textile industry, although the heaviest losses were concentrated in woolen broadwoven fabric mills, narrow-fabric mills, and cotton fabric mills. Between 1988 and 1996 these three groups lost 1,518 jobs, and by 1998 only 654 employees remained in these sectors. Significantly, employment has been stable or has increased in those areas where Massachusetts has

its highest quotient of textile employment: man-made fabrics, knitting, dyeing and finishing, and miscellaneous textile goods.

Change in Massachusetts Textile Employment (number of jobs), 1988 to 1997



Source: U.S. Bureau of Labor Statistics

Apparel Establishments and Employment in Massachusetts, 1980 to 1998



Source: Massachusetts Division of Employment and Training

The Apparel Industry

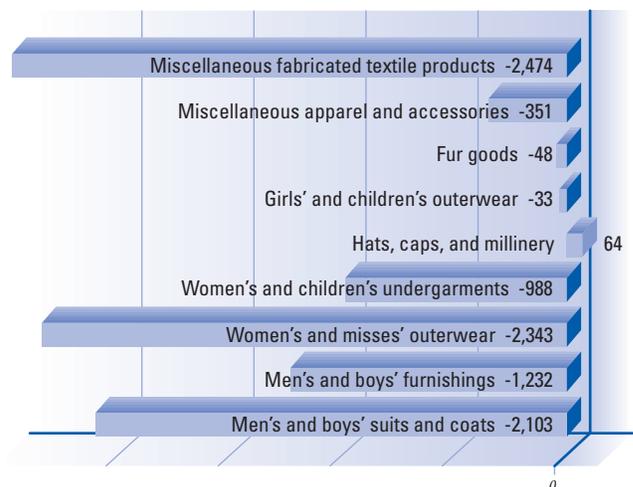
Between 1980 and 1997 the number of apparel establishments in Massachusetts declined by 43 percent, from 697 to 399, although over the past three years the number of establishments seems to have stabilized. The loss of several large employers has reduced the average size of apparel establishments from 57 to 36 employees. Total employment in the state's apparel industry declined by 64 percent, from 39,957 to 14,205, during the same period. Employment levels in the apparel industry have continued declining since the 1990–91 recession and show no signs of imminent recovery. The state's most significant

losses in apparel employment have occurred in Bristol County (-11,020), Suffolk County (-5,283), and Middlesex County (-2,605). These three counties account for 73 percent of the total employment loss in apparel between 1980 and 1997, although every county lost from 58 percent (Worcester County) to 90 percent (Hampshire County) of its total apparel employment base during this time (see Appendix H).

Job losses in apparel also occurred in every segment of the industry, except for hats, caps, and millinery. The heaviest losses were concentrated in men's and boys' suits, women's and misses' outerwear, and miscellaneous fabricated textile products. Between 1988 and 1996 these three groups lost 6,357 jobs. These are the state's strongest and most

competitive apparel groups, and the ones in which Massachusetts still has its heaviest concentration of firms and employment.

Change in Massachusetts Apparel Employment (number of jobs), 1988 to 1997



Source: U.S. Bureau of Labor Statistics

PRODUCTIVITY AND INVESTMENT

A number of researchers have tried to determine the extent to which imports and productivity influence employment in the textile and apparel industries. In general, they conclude that labor productivity growth has a more significant impact than imports on employment; however, productivity rates may have increased as a result of the threat posed by foreign goods. It is difficult to separate the effects of the two forces on industry employment levels, but it is clear that imports play a more significant role in explaining employment losses in the apparel sector than in textiles (Dickerson 1995, 303).

Between 1958 and 1986, U.S. textile employment declined by 30 percent while apparel employment declined by 20 percent, despite stiffer foreign competition in the apparel sector. The difference in rates of downsizing, when combined with the small trade deficit in textiles, suggests that a significant part of the textile industry's employment decline was the result of rapid technological advances rather than foreign imports (Finger and Harrison 1994, 23–24). The textile industry has invested heavily in new machinery and is considered a medium-tech, if not a high-tech, industry. Apparel, in contrast, remains decidedly low tech and labor intensive, particularly in the sewing phase of garment manufacturing. It is likely that both industries will lose employment nationally in the short run, although they will do so for different reasons. The textile industry may shed some additional employment because productivity increases have made it possible to manufacture high-quality textiles, both in large volumes and small-batch runs, with fewer people. The apparel industry will continue to lose em-

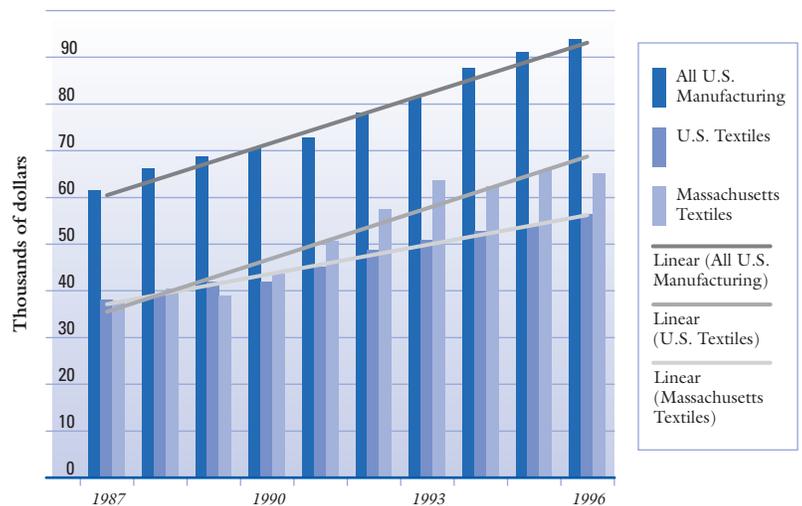
ployment as producers shift operations to countries with lower labor costs.

The textile and apparel industries are both more labor intensive than other manufacturing sectors. They are classic examples of traditional “blue-collar” or “pink-collar” establishments that provide significant employment for unskilled and semi-skilled workers (Rowan and Barr 1987, 7). Apparel firms especially have long provided immigrants with an entry point into the labor market, and the ethnic composition of the industry's workforce continues to shift with the state's immigration patterns (Sum and Fogg 1999, 64–66). The ratio of production workers in U.S. manufacturing establishments is about 65 percent, compared to 84 percent for apparel and 85 percent for textile establishments. Massachusetts textile and apparel firms have a somewhat lower ratio of production workers than the national industry, which may indicate that high rates of investment are starting to result in higher employee productivity.

Rates of Value Added in the Textile Industry

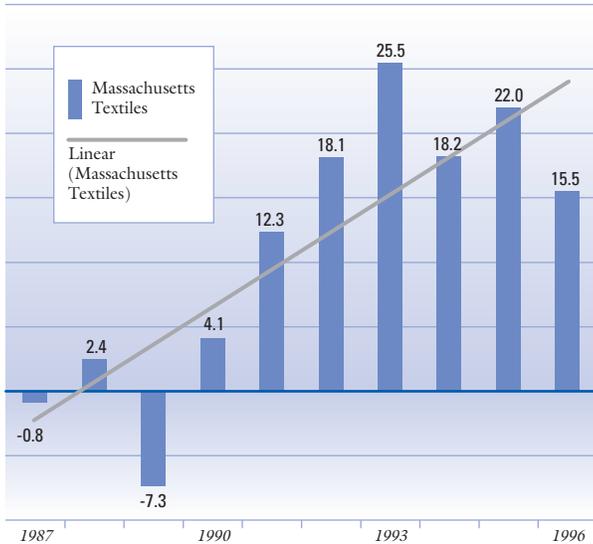
Measured against other manufacturing industries, the textile industry is a low- to medium-value-added sector of the economy (see Appendix I.1). In 1996 U.S. textile firms generated \$56,480 per employee in value added, compared to an average

Value Added per Employee: Textiles, 1987 to 1996



Source: U.S. Census Bureau, Annual Survey of Manufactures, 1996

Percent Differential in Value Added per Employee: Massachusetts to U.S. Textiles, 1987 to 1996



Source: Calculated from data in U.S. Census Bureau, Annual Survey of Manufactures, 1996

of \$93,776 for all manufacturing sectors. Between 1988 and 1996 the value added per employee increased an average 52.4 percent for all manufacturing sectors but only 47.9 percent for the textile industry.

In contrast to the national trend, Massachusetts textile firms increased value added per employee by 72.2 percent between 1988 and 1996, and now have value-added ratios 15.5 percent above the national average for the textile industry.

Investment in the Textile Industry

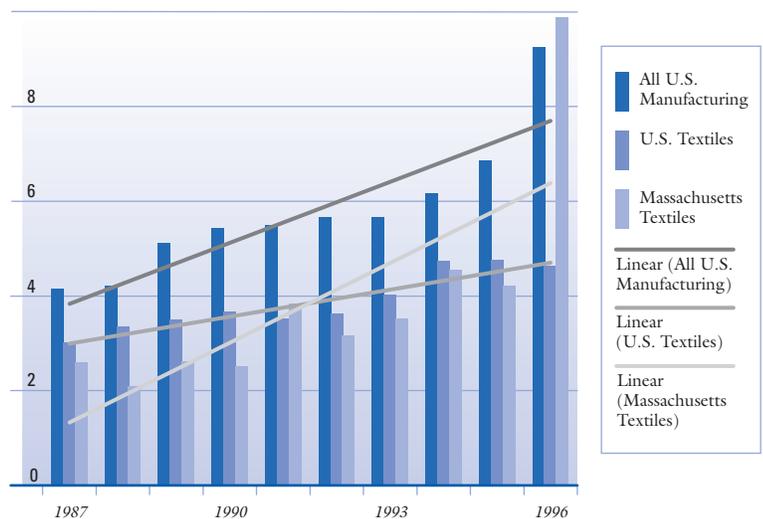
It is tempting to suggest that the rising rates of value added in the Massachusetts textile industry are simply an indicator of high labor costs rather than productivity and technology. Yet the data

indicate that the state's textile firms have been increasing their investment in new technology and plant modernization. The U.S. textile industry makes \$2 billion to \$3 billion in new capital investments each year. The rate of investment has been increasing more slowly than in other manufacturing sectors, although in Massachusetts new capital investment in textiles more than tripled, from \$44.2 million in 1987 to \$140.3 million in 1996.

The average annual rate of new capital investment by the state's textile firms is on a trend line that exceeds the industry's national average and that outstripped that of other manufacturing sectors in 1996, when the Massachusetts Investment Tax Credit took effect. These rates of investment suggest that the Massachusetts textile industry is becoming a state-of-the-art, high-tech manufacturing sector, since technical innovation is likely to have its greatest impact on the industry through the acquisition of new machinery (Singleton 1997, 8).

The textile industry also appears to have benefited from the Massachusetts Economic Development Incentive Program (EDIP). The EDIP was established in 1993 to stimulate job creation in distressed areas by attracting new businesses and encouraging existing businesses to expand (see Appendix I.2.). There are currently 13 certified pro-

New Capital Expenditures per Employee: Textiles, 1987 to 1996 (thousands of dollars)



Source: U.S. Census Bureau, Annual Survey of Manufactures, 1996

jects in the textile industry receiving EDIP tax incentives. It is estimated that the firms receiving these incentives will create 2,005 new permanent, full-time jobs over the incentives' lifetime (five to 20 years), due to \$374.2 million dollars in new industry investment (MOBD 1999).

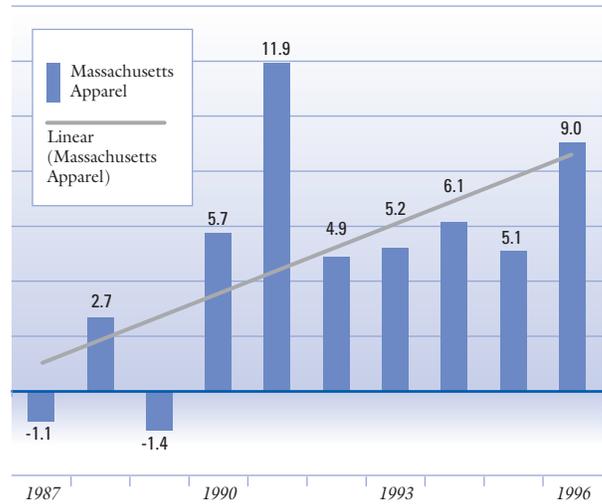
The vast majority of the new EDIP-related jobs are located in Bristol County (45.6 percent) and Middlesex County (50.1 percent). Most of the new investment linked to EDIP incentives is also occurring in Middlesex County (83 percent) and Bristol County (13.3 percent).⁶ While textile projects account for only 13 (3 percent) of 439 EDIP certified projects since 1993, they account for 6.6 percent of the new jobs created under the program and 11 percent of new private investment linked to the program.

Rates of Value Added in the Apparel Industry

When measured against textiles or other manufacturing industries, the apparel sector represents a very low value-added sector of the economy (see

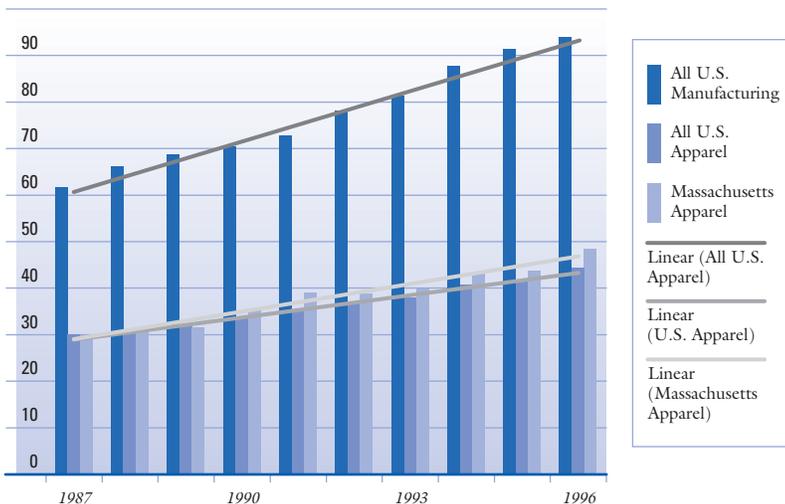
Appendix I.1). In 1996 U.S. apparel firms generated \$44,480 per employee in value added, compared to an average of \$93,776 for all manufactur-

Percent Differential in Value Added per Employee: Massachusetts to U.S. Apparel, 1987 to 1996



Source: Calculated from data in U.S. Census Bureau Annual Survey of Manufactures, 1996

Value Added per Employee: Apparel, 1987 to 1996 (thousands of dollars)



Source: U.S. Census Bureau, Annual Survey of Manufactures, 1996

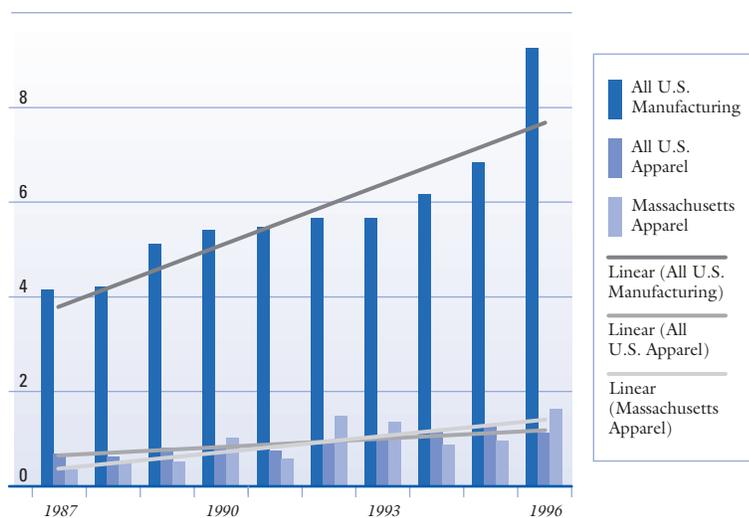
ing sectors. Furthermore, between 1988 and 1996 the value added per employee increased an average 52.4 percent for all manufacturing sectors but only 47.4 percent for the apparel industry.

Yet in contrast to the national trend, Massachusetts apparel firms increased value added per employee by 65.2 percent between 1988 and 1996. Their value-added ratios are now 9 percent above the national average for the apparel industry.

Investment in the Apparel Industry

The data indicate that apparel firms in Massachusetts and the United States generally continue to lag behind other manufacturing industries in new technology and plant modernization investments. The U.S. apparel industry made an average of \$891 million annually in new capital investments between 1987 and 1996. New investment in the apparel industry has been increasing at a rate below that of other manufacturing sectors, although new capital investment in the Massachusetts apparel industry has more than doubled, from \$9.3 million

New Capital Expenditures per Employee: Apparel, 1987 to 1996
(thousands of dollars)



Source: U.S. Census Bureau, Annual Survey of Manufactures, 1996

TECHNOLOGICAL DIVERGENCE OF THE TEXTILE AND APPAREL INDUSTRIES

The divergence in the technological levels of the textile and apparel industries results from differences in industry structure and opportunities for innovation (see Appendix I.2). The push toward mechanization and technological advance in textiles has been spurred mainly by innovations introduced by machinery manufacturers in Germany, Switzerland, Japan, and Italy (Cline 1990, 85; see Appendix F.8). The U.S. textile industry has steadily increased its capital expenditures to modernize and automate production by importing the latest technology. In some years the industry has deployed up to 80 percent of its retained earnings to new capital spending. By the 1990s textile manufacturing was becoming a high-tech enterprise, despite its lingering image as an old, traditional industry.

As for apparel, it has proved difficult to fully automate production because for economic and technical reasons no replacement for the heavy-duty sewing machine has been found (see Appendix I.3). Computer-assisted design programs and the automatic cutter are the most significant technological innovations in the apparel industry, but other aspects of apparel manufacturing have changed little over the past 30 years. Highly automated apparel production has proved cost effective only for large production runs of the standardized commodities that account for a declining percentage of total apparel employment.

On the other hand, in most segments of the apparel industry short production runs and sensitivity to fashion work against efforts to automate production. Yet import penetration is highest in fashion-sensitive apparel, and most of the industry's employment is concentrated in this area. Women's outerwear is the most fashion-sensitive apparel group and accounts for more than 40 percent of total employment in the industry, while menswear is considered moderately fashion sensitive.

Producers of fashion-sensitive apparel are thus buffered between the two opposing forces of price

in 1987 to \$19.6 million in 1996. However, the level of new investment nationally and statewide remains quite low when compared to textiles or other manufacturing sectors.

The apparel industry has not benefited significantly from the Massachusetts Economic Development Incentive Program (EDIP), since it is not a capital-intensive industry, nor do the incentives appear to be stimulating any movement in that direction. There are currently seven certified projects in the apparel industry receiving EDIP tax incentives. It is estimated that the firms receiving these incentives will create 579 new permanent, full-time jobs over the incentives' life-time (five to 20 years) due to \$45.2 million dollars in new industry investment (MOBD 1999).

The vast majority of the new EDIP-related jobs (65 percent) are located in Bristol County, while a significant proportion of the new investment linked to EDIP incentives is also occurring in Bristol County (36.2 percent). Apparel projects account for only 1.6 percent of 439 EDIP certified projects since 1993, 1.9 percent of the new jobs created under the program, and only 1.3 percent of new private investment linked to the program.

"In the textile industry, costs are calculated in pennies per yard, so there is constant pressure to monitor costs and improve productivity."

Mansour Nejad,
Vice President for
Engineering,
Duro Industries

NuStart: Relocating the Apparel Industry to Save Jobs in Textiles

NuStart is a 64-acre industrial park designed specifically for U.S. apparel companies looking to relocate or expand operations in Mexico. Considered one of the best in the country, the park provides water, sewer, and electricity hookups, fire protection, and an on-site day-care facility. NuStart is a joint development of Guilford Mills and Grupo Alfa, a Mexican conglomerate; Burlington Industries and Du Pont de Mexico are also partners.

NuStart was conceived by Chuck Hayes, chief executive officer of Guilford Mills in North Carolina, as a way to recapture the North American textile market from Far East competitors. Between 1992 and 1997, as apparel manufacturers continued to shift operations across the Pacific, Guilford Mills lost 25 percent of its apparel-fabric business to Asian suppliers. (Asian apparel firms are far likelier to purchase fabric from local producers.) Hayes is convinced that if Mexico can offer garment makers low-cost manufacturing sites, they will stay in North America and purchase fabric from U.S. firms.

The federal government of Mexico and the state of Morelos committed \$8 million to build a highway exit ramp, roads, and sewer lines to a cactus-covered mountaintop 40 miles south of Mexico City. With long experience in handmade traditional crafts, the local workforce is well suited to apparel operations. Jobs pay approximately \$1.50 per hour and include employer contributions to government-provided medical insurance, housing, and retirement programs. NuStart factories must sign covenants requiring them to comply with U.S. Occupational Safety and Health Administration sanitary and safety regulations. Terrence Geremski, senior vice president and chief financial officer at Guilford, suggests that the Apparel City is “a model for how developing nations should utilize their entry-level labor. This facility will withstand any scrutiny from any group.”

All employees are filtered through an on-site training center run by Kurt Salmon & Associates, an Atlanta-based apparel consulting firm. The training center teaches workers the latest sewing techniques before they move into jobs in NuStart’s seven manufacturing plants, which are owned exclusively by Mexican (2), U.S. (4), and Canadian (1) firms. The center ensures that NuStart’s tenants can obtain workers trained to American standards of quality and productivity. Trainees receive a 90- to 120-day minimum wage scholarship from the World Bank that is administered by the Mexican Ministry of Labor.

An early proponent of NAFTA, Chuck Hayes played a leading role in crafting the agreement’s textiles provisions. He considers NAFTA “the beginning of a renaissance for the textile industry in the United States.” After NAFTA’s passage in 1993, Hayes began encouraging his apparel company clients to move to Mexico to take advantage of lower labor costs and tariff preferences. In response to NAFTA critics, Hayes answers: “The jobs we’re creating in Mexico are the jobs that we’ve already lost to the Far East.” By moving apparel jobs to Mexico instead of Asia, higher-paying positions in the textile industry are being saved or created at the same time. Enrique Espinosa, a former NAFTA negotiator for Mexico, also sees NuStart as “a positive development.” The emerging Mexican apparel industry provides a point of entry into the labor market for impoverished rural inhabitants who would otherwise emigrate to overcrowded cities or to the United States in search of work.

NAFTA has been a key to NuStart’s success. Aimed at smaller apparel firms that could not otherwise move to a foreign location, the park has on-site customs agents. This allows companies to clear imported fabric coming in from the United States and finished garments before they’re shipped back north. Although the World Trade Organization’s Agreement on Textiles and Clothing will eliminate Multi-Fiber Arrangement quotas by 2005, textile imports from outside the NAFTA countries will still be subject to higher-than-average tariffs.

The Mexican government regards NuStart as a model for future apparel parks. Alfa is hoping to start as many as 30 more such facilities in Mexico by 2002.

Source: Greensboro News & Record, January 19, 1997; The Miami Herald, April 6, 1997; International Fiber Journal (August 1997); Apparel City: The Investor’s Handbook.

Retailers prefer to stock new styles in small amounts that can be replenished quickly if demand warrants it. This strategy allows retailers to avoid the risks of marking down goods that do not sell or running out of popular styles. The upshot is that QR has become more critical than automation to the viability of the U.S. apparel industry.

The Massachusetts apparel industry benefits from its proximity to New York City, which gives it quick access to many specialized services and markets.

and fashion. Fashion-sensitive items are made in small lots with hand labor, and therefore offshore establishments in low-wage countries can often undercut U.S. production costs by a large margin. Nevertheless, the frequency of design changes and retailers' demand for quick delivery have allowed U.S. producers to offset some of their cost disadvantages through better customer service.

The Quick Response (QR) advantage has increased with the number of fashion seasons and the frequency of shifts in fashion tastes. The necessity of gearing production to fashion trends and seasons tends to limit the size of production runs and makes flexibility more important than the large-volume operations and economies of scale made possible with automation. Like other segments of the new economy, competitiveness is based not only on productivity but on quality, variety, customization, convenience, and timeliness (Carnevale 1991, 2).

Even the most standardized apparel items, such as jeans and underwear, once available in limited styles and colors, are now sold in many cuts and hues. At the same time, shifts in retail marketing have led to a proliferation of fashion seasons. In earlier decades there were three fashion seasons — fall, winter, summer. Now designers change their lines five or six times a year. As a result, retailers prefer to maintain low inventories.

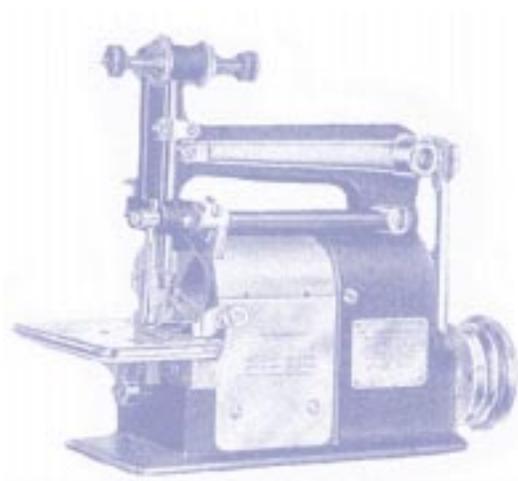
QR is particularly important toward the end of a season, when retailers are most reluctant to stock large inventories. Apparel is a bulk item that overseas producers usually ship by sea freight, which takes from one to three weeks to arrive in the United States. By the time an order is received abroad, manufactured, shipped overseas, transported to the retailer by truck, and stocked on the display floor, the season may have ended. Moreover, if the product has arrived damaged or in the wrong mix of styles, sizes, and colors, there is no time to correct errors before the season ends.

Apparel executives interviewed for this study agree that QR is critical to the success of their firms, and the ratio of establishments adopting QR appears

to be higher in Massachusetts than nationwide, where only 10 to 15 percent of establishments have implemented this strategy (OTA 1993, 180). Still, QR cannot entirely offset the cost differentials between U.S. and foreign producers. A well-run foreign plant, particularly in Mexico, can achieve the same QR advantages at lower cost, while air freight can be a viable option for overseas producers shipping small lots to retail outlets.

Consequently, fashion-sensitive producers, especially of women's wear, have long relied on immigrant labor to control costs. U.S. apparel producers tend to be located in parts of the Northeast, California, and Texas that have large immigrant populations. Many of these workers arrive in the United States with some sewing skills or previous experience in the apparel industry (Bailey and Waldinger 1991; Waldinger 1986). The cost advantages of immigrant labor are reinforced by the fact that New York City and Los Angeles are fashion design and marketing centers, with numerous small shops providing specialized services in design, cutting, technical support, repair, equipment leasing, and apparel-related educational programs (OTA 1993, 175–79).

Not coincidentally, the state's apparel manufacturers are located in cities with large immigrant workforces (Fall River, New Bedford, and Lawrence, for example). Portuguese immigrants have been a mainstay of the apparel industry in Bristol County for several decades, although data indicate that Bristol, Middlesex, and Suffolk Counties' workforces are increasingly drawing large numbers of immigrants from the Caribbean (Puerto Rico, Dominican Republic) and Southeast Asia (Cambodia, Vietnam) (Sum and Fogg 1999, 39–42).



Conclusion

Alfred D. Chandler, Jr., an acclaimed business historian, observes that U.S. businesses evolved in a common pattern during the late nineteenth and twentieth centuries. New firms in new industries are normally founded by a small group of investors, linked together by family or business ties, who hold most of the firm's stock privately. As the company grows and capital requirements increase, entrepreneurs gradually relinquish control of the firm to outside stockholders through public offerings and to professional managers whose main concern is to maximize return on investment (to satisfy boards of directors and major stockholders).

The textile and apparel industries are significant exceptions to Chandler's rule: most companies remain tightly held private firms (Wortzel 1982). The owners/executives of the state's textile and apparel firms report that their professional managers frequently advise them to relocate to the southeastern United States, but this advice is often rejected. Owners report that they keep their firms in Massachusetts, among other reasons, because of family and business ties in the state and quality of life issues (e.g., sailing, skiing, the arts).

Executives and managers interviewed for this study report that economic development officers,

governors, and U.S. senators frequently court them with attractive incentive packages that may include one-stop permitting, job training funds, tax abatements, lower utility rates, and university-business partnerships for research and development. The states identified as options for the relocation of existing facilities or construction of new ones are North Carolina, Tennessee, Georgia, South Carolina, and Alabama. Foreign sites are usually an option only for larger firms with multiple plants. However, there is a great deal of pressure on apparel firms to shift the most labor-intensive activities such as sewing to areas with low cost labor (e.g., Texas and California) and to areas that take advantage of NAFTA and other trade preferences.

Utility charges, unemployment insurance, workers' compensation, and taxes are important elements of the cost differential, although Massachusetts textile and apparel executives acknowledge that the state improved its competitive position in these areas during the 1990s (MTF 1993; Moore and Moscovitch 1994; NFIB 1995). The Economic Development Incentive Program (EDIP) has given local development agencies in Massachusetts another tool for meeting the challenge of interstate competition. EDIP has been utilized

extensively in Fall River, which has the state's largest concentration of textile and apparel firms (Dion 1998b; Flynn 1999b).

The prospects for the Commonwealth's textile industry appear promising, especially if the state's firms continue to invest in the latest production technology, basic information technology, workforce training, and export development. However, import competition will continue to put pressure on the state's apparel industry. The short-term advantages of the Quick Response strategy is being eroded by NAFTA as border firms develop the capacity to match U.S. turnaround times. The on-going improvements to border crossings and to Mexico's transportation infrastructure will make it possible for firms based in Mexico's interior to adopt Quick Response strategies in the future. Finally, as producers of apparel and textile goods move into specialized niche markets where products are custom designed and manufactured in small batches, air transportation is becoming a more common method of shipping, which erodes the Quick Response advantage of U.S.-based firms. As Mexican apparel producers improve the quality of their workforce, there are reports that even high-skill sectors, such as specialized embroidery, are being moved to Mexico.

There are also future shocks from continuing trade liberalization on the horizon. China's potential entry into the WTO would give the leading exporter of apparel products to the United States greater access to the domestic market as quotas are phased out over the next five years. While it did not pass in the last Congressional session, there is pending legislation that will open U.S. markets to textile and apparel producers exporting from sub-Saharan Africa. Furthermore, Asian apparel producers are opening operations inside Mexico to take advantage of NAFTA trade preferences.

Nevertheless, product cycles are getting shorter and shorter, which means that Quick Response must be a central element in the competitive strategy of both industries. This is particularly true in women's, misses', and juniors' fashions, which are the most fashion- and season-sensitive segments of the apparel industry. Notably, California is one of the few states where apparel employment increased

during the past decade, from 126,749 in 1988 to 156,463 in 1996 (USBLS 1999, ES-202). The vast majority of California's apparel industry expansion has occurred in the manufacture of womens', misses', and juniors' outerwear (63.5 percent of employment growth) and miscellaneous fabricated textile products (13.3 percent of employment growth). These firms are located close to major fashion designers and major retail markets and continue to draw on a large immigrant work force for sewing operations. The California case demonstrates that individual states can have a growing apparel industry despite global competitive pressures.

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Appendix A

Major Segments of the Textile and Apparel Industries Defined by SIC Code

MAJOR GROUP 22. Textile Mill Products

This major group includes establishments engaged in any of the following operations: (1) preparation of fiber and subsequent manufacturing of yarn, thread, braids, twine, and cordage; (2) manufacturing broadwoven fabrics, narrow-woven fabrics, knit fabrics, and carpets and rugs from yarn; (3) dyeing and finishing fiber, yarn, fabrics, and knit apparel; (4) coating, waterproofing, or otherwise treating fabrics; (5) the integrated manufacture of knit apparel and other finished articles from yarn; and (6) the manufacture of felt goods, lace goods, nonwoven fabrics, and miscellaneous textiles.

BROADWOVEN FABRIC MILLS, COTTON

2211 Broadwoven Fabric Mills, Cotton

BROADWOVEN FABRIC MILLS, MAN-MADE FIBER AND SILK

2221 Broadwoven Fabric Mills, Man-made Fiber and Silk

BROADWOVEN FABRIC MILLS, WOOL (INCLUDING DYEING AND FINISHING)

2231 Broadwoven Fabric Mills, Wool (Including Dyeing and Finishing)

NARROW FABRIC AND OTHER SMALLWARES MILLS: COTTON, WOOL, SILK, AND MAN-MADE FIBER

2241 Narrow Fabric and Other Smallwares Mills: Cotton, Wool, Silk, and Man-made Fiber

KNITTING MILLS

2251 Women's Full-Length and Knee-Length Hosiery, Except Socks
 2252 Hosiery, Not Elsewhere Classified
 2253 Knit Outerwear Mills
 2254 Knit Underwear and Nightwear Mills
 2257 Weft Knit Fabric Mills
 2258 Lace and Warp Knit Fabric Mills
 2259 Knitting Mills, Not Elsewhere Classified

DYEING AND FINISHING TEXTILES, EXCEPT WOOL FABRICS AND KNIT GOODS

2261 Finishers of Broadwoven Fabrics of Cotton
 2262 Finishers of Broadwoven Fabrics of Man-made Fiber and Silk
 2269 Finishers of Textiles, Not Elsewhere Classified

CARPETS AND RUGS

2273 Carpets and Rugs

YARN AND THREAD MILLS

2281 Yarn Spinning Mills

2282 Yarn Texturizing, Throwing, Twisting, and Winding Mills

2284 Thread Mills

MISCELLANEOUS TEXTILE GOODS

2295 Coated Fabrics, Not Rubberized

2296 Tire Cord and Fabrics

2297 Nonwoven Fabrics

2298 Cordage and Twine

2299 Textile Goods, Not Elsewhere Classified

MAJOR GROUP 23. Apparel and Other Finished Products Made from Fabrics and Similar Materials

This major group, known as the cutting-up and needle trades, includes establishments producing clothing and fabricated products by cutting and sewing purchased woven or knit textile fabrics and related materials, such as leather, rubberized fabrics, plastics, and furs.

MEN'S AND BOYS' SUITS, COATS, AND OVERCOATS

2311 Men's and Boys' Suits, Coats, and Overcoats

MEN'S AND BOYS' FURNISHINGS, WORK CLOTHING, AND ALLIED GARMENTS

2321 Men's and Boys' Shirts, Except Work Shirts
 2322 Men's and Boys' Underwear and Nightwear
 2323 Men's and Boys' Neckwear
 2325 Men's and Boys' Separate Trousers and Slacks
 2326 Men's and Boys' Work Clothing
 2329 Men's and Boys' Clothing, Not Elsewhere Classified

WOMEN'S, MISSES', AND JUNIORS' OUTERWEAR

2331 Women's, Misses', and Juniors' Blouses and Shirts
 2335 Women's, Misses', and Juniors' Dresses
 2337 Women's, Misses', and Juniors' Suits, Skirts, and Coats
 2339 Women's, Misses', and Juniors' Outerwear, Not Elsewhere Classified

WOMEN'S, MISSES', CHILDREN'S, AND INFANTS' UNDERGARMENTS

2341 Women's, Misses', Children's, and Infants' Underwear and Nightwear
 2342 Brassieres, Girdles, and Allied Garments

HATS, CAPS, AND MILLINERY

2353 Hats, Caps, and Millinery

GIRLS', CHILDREN'S, AND INFANTS' OUTERWEAR

- 2361 Girls', Children's, and Infants' Dresses, Blouses, and Shirts
2369 Girls', Children's, and Infants' Outerwear, Not Elsewhere Classified

FUR GOODS

- 2371 Fur Goods

MISCELLANEOUS APPAREL AND ACCESSORIES

- 2381 Dress and Work Gloves, Except Knit and All-Leather
2384 Robes and Dressing Gowns
2385 Waterproof Outerwear
2386 Leather and Sheep-Lined Clothing
2387 Apparel Belts
2389 Apparel and Accessories, Not Elsewhere Classified

MISCELLANEOUS FABRICATED TEXTILE PRODUCTS

- 2391 Curtains and Draperies
2392 House Furnishings, Except Curtains and Draperies
2393 Textile Bags
2394 Canvas and Related Products
2395 Pleating, Decorative and Novelty Stitching, and Tucking for the Trade
2396 Automotive Trimmings, Apparel Findings, and Related Products
2397 Schifflli Machine Embroideries
2399 Fabricated Textile Products, Not Elsewhere Classified
3552 Textile Machinery
Establishments primarily engaged in manufacturing machinery for the textile industries, including parts, attachments, and accessories.
3559 Special Industry Machinery, Not Elsewhere Classified
This classification includes industrial sewing machines and attachments (a very small component of this code). Note: Excluded from definition of the industry, since most machinery manufactured elsewhere in the world.
4226 Special Warehousing and Storage, Not Elsewhere Classified
This classification includes textile warehousing as a small component of the code.
5084 Industrial Machinery and Equipment
Establishments primarily engaged in the wholesale distribution of industrial supplies, not elsewhere classified. This classification includes the wholesale distribution of textile machinery and equipment as a small part of the code.

- 5085 Industrial Supplies
Establishments primarily engaged in the wholesale distribution of industrial machinery and equipment, not elsewhere classified. This classification includes the wholesale distribution of textile printers' supplies as a small part of the code.
5093 Scrap and Waste Materials
Establishments primarily engaged in assembling, breaking up, sorting, and wholesale distribution of scrap and waste materials.
This classification includes wholesale firms engaged in the distribution of textile waste.
513 Apparel, Piece Goods, and Notions
This classification includes wholesale distributors of apparel products.
7389 Business Services, Not Elsewhere Classified
This classification includes textile cutting services, textile designers, textile folding and packing services, textile sponging or shrinking services for tailors and dressmakers among many others.

Source: Executive Office of the President, Office of Management and Budget (1987)

Appendix B

Methodology for Calculating Economic Impacts

B.1 Definition of Economic Impacts

Economic impacts measure the importance of an industry primarily in terms of the employment and payroll generated by the industry's establishments. Economic impacts consist of direct impacts, indirect impacts, and induced impacts. Direct impacts are the employment and payroll attributable to the economic activities occurring at textile and apparel establishments, such as dyeing and finishing, fabric weaving, or embroidery. Direct impacts are an immediate consequence of establishment-based economic activity that would not occur in the absence of those establishments.

Indirect impacts result mainly from off-site economic activities that are directly attributable to the industry. These economic activities occur as the result of nonpayroll local expenditures by industry establishments. Local expenditures include a range of operating expenses such as the purchase of manufacturing inputs, business services, freight shipment, equipment repair, office supplies and furniture, utilities, landscaping, etc. Indirect impacts differ from direct impacts because they originate away from the establishment, although the indirect impacts would not have occurred in the absence of the industry's local expenditures.

The industry's local expenditures are calculated by applying a Regional Purchase Coefficient (RPC) to estimates of the industry's annual sales. The Regional Purchase Coefficient represents the proportion of goods and services that will be purchased regionally under normal circumstances, based on the area's economic characteristics described in terms of actual trade flows within the area. The RPC takes into account the state's particular industry configuration, such as the availability in the local area of the goods and services used by that industry. The RPCs used for this study are quite conservative (5 to 10 percent), since most of the textile and apparel industry's inputs (i.e., yarn and fabric) are purchased from vendors in the southeastern United States or from overseas.

Induced impacts are the multiplier effects of the direct and indirect impacts created by successive rounds of spending. Most of the take-home income earned by textile and apparel employees is spent locally. Some of this spending becomes income to local individuals who provide services to those employees. Some of the spending by textile and apparel employees goes to local businesses and becomes income to the business owners and their employees. Subsequently, part of these second-round incomes are also spent locally and thus become income

to another set of individuals. As successive rounds of spending occur, additional income is created in the local area, region, and state. Total impacts are the sum of the direct, indirect, and induced impacts.

B.2 Multipliers and the Regional Input-Output Modeling System II (RIMS II)

The use of multipliers is the most common way of calculating the induced impacts of additional rounds of spending. The multipliers in RIMS II and the Regional Purchase Coefficients are derived from the Bureau of Economic Analysis' Benchmark Input-Output table, which shows the input and output structure of nearly 500 U.S. industries. The BEA's regional economic accounts are used to adjust the national I-O table to reflect a particular state's industrial structure and trading patterns. RIMS II is widely used in both the public and private sectors by university researchers, government agencies, and private consulting firms. Empirical tests have documented that RIMS II estimates are similar in magnitude to much more expensive industry surveys and provide a cost-effective mechanism for measuring economic impacts.

B.3 Specification of Indirect and Induced Impacts Using IMPLAN

The indirect and induced economic impacts of the textile and apparel industry were specified by industry using IMPLAN (IMPact Analysis for PLANning), which is an econometric modeling system developed by applied economists at the University of Minnesota and the U.S. Forest Service. The IMPLAN modeling system has been in use since 1979 and is currently employed by more than 500 private consulting firms, university research centers, and government agencies. The IMPLAN modeling system uses input-output analysis to construct quantitative models of trade-flow relationships among businesses and between businesses and final consumers. Using this data, one can examine the effects of a change in one or several economic activities to predict its effect on a specific state, regional, or local economy (impact analysis).

The IMPLAN input-output accounts capture all monetary market transactions for consumption in a given time period. These accounts are based on the industry survey data collected periodically by the U.S. Bureau of Economic Analysis and follow a balanced account format recommended by the United Nations. IMPLAN also includes social accounting data (e.g., personal in-

come and gross state product) that makes it possible to measure nonindustrial transactions, such as the payment of indirect taxes by businesses and households. The IMPLAN database provides coverage for the entire United States by county and has the ability to incorporate user-supplied data at each stage of the model-building process to ensure that estimates of economic impacts are both up to date and specific to an economic area.⁷ IMPLAN can construct local input-output models in units as small as five-ZIP-code clusters.

IMPLAN's Regional Economic Accounts and the Social Accounting Matrices are used to construct local, county, and state-level multipliers specific to a target economic area. Multipliers describe the response of an economy to a change in demand or production. The multipliers allow economic impact analysis to move from a descriptive input-output model to a predictive model. Each industry that produces goods or services generates demand for other goods and services, and this demand is multiplied through a particular economy until it dissipates through "leakage" to economies outside the specified area. Thus, multipliers calculate the response of the targeted economic area to a change in demand or production.

IMPLAN models discern and calculate leakage from local, regional, and state economic areas based on workforce configuration, the inputs required by specific types of businesses, and the availability of both inputs in the economic area. Consequently, economic impacts that accrue to other regions or states as a consequence of a change in demand are not counted as impacts within the economic area. The model accounts for substitution and displacement effects by deflating industry-specific multipliers to levels well below those recommended by the U.S. Bureau of Economic Analysis. In addition, multipliers are applied only to personal disposable income to obtain a more realistic estimate of the multiplier effects from increased demand. The reliability of these estimates has been proved through empirical testing (Department of Commerce 1981; Brucker et al. 1990).

A predictive model is constructed by specifying a series of new expenditures in a specific economic area (e.g., new employment or construction) which is then applied to the industry multipliers for that particular region. Based on these calculations, the model estimates final demand, which includes employment, employee compensation (excluding benefits), and point-of-work personal income (including benefits). The initial IMPLAN data details all purchases in a given area, including imported goods and services. Importantly, IMPLAN's Regional Economic Accounts exclude imports to an economic area, so the calculation of economic impacts

identifies only those impacts specific to the targeted economic area.

IMPLAN calculates this distinction by applying Regional Purchase Coefficients (RPCs) to predict regional purchases based on an economic area's particular characteristics. The Regional Purchase Coefficient represents the proportion of goods and services that will be purchased regionally under normal circumstances, based on the area's economic characteristics described in terms of actual trade flows within the area. IMPLAN also contains a Local Purchase Coefficient (LPC) that allows one to calculate the maximum possible economic impacts on an area if all inputs that can be purchased within the area are purchased within that area. The LPC is useful for calculating the potential impact of local vendor and employment preference arrangements.

B.4 Industry Density and Location Quotients

By itself, the estimate of an industry's employment and payroll impacts does not provide a comparative evaluation of the industry's significance to the state or local economy. The simplest measure of significance is to estimate the percentage of total employment in a region (state, county, local) that is attributable to the industry. Another common statistical measure used to evaluate the regional significance of industries is called a location quotient (LQ). The LQ is calculated by computing the ratio of state employment in textiles or apparel to total employment in the state. This number can be compared to the same ratio of textiles and apparel employment in the national economy. The LQ is calculated by dividing the state's ratio by the national ratio. If the result is greater than 1, then the state has a greater share of textile and apparel activity than the nation as a whole, and it may be considered a leading region in the industry.

Appendix C

Comparative Textiles Density in the 50 States

	Textile Employment	Textile Wages	Total State Employment	Percent of State Employment	Location Quotient
North Carolina	184,636	4,373,409,360	3,631,000	5.1	10.27
South Carolina	81,485	2,031,566,833	1,737,000	4.7	9.47
Georgia	108,391	2,761,890,128	3,580,000	3.0	6.11
Alabama	39,999	891,313,215	1,981,000	2.0	4.08
Rhode Island	7,799	209,425,259	470,000	1.7	3.35
Virginia	35,787	795,827,386	3,240,000	1.1	2.23
Tennessee	19,462	449,419,202	2,609,000	0.7	1.51
Maine	4,747	116,034,684	635,000	0.7	1.51
New Hampshire	3,637	114,477,184	598,000	0.6	1.23
United States	627,603	15,459,842,760	126,708,000	0.5	1.00
Massachusetts	14,795	487,168,586	3,052,000	0.5	0.98
Kentucky	8,482	167,840,035	1,762,000	0.5	0.97
Pennsylvania	22,417	552,388,957	5,590,000	0.4	0.81
Arkansas	4,082	88,075,266	1,168,000	0.3	0.71
Mississippi	3,924	95,941,548	1,185,000	0.3	0.67
Delaware	1,093	37,414,981	363,000	0.3	0.61
Louisiana	4,891	91,808,586	1,863,000	0.3	0.53
New Jersey	9,796	341,952,775	3,869,000	0.3	0.51
New York	17,697	484,481,987	8,100,000	0.2	0.44
Vermont	553	12,578,247	310,000	0.2	0.36
West Virginia	1,127	20,929,089	747,000	0.2	0.30
California	20,030	469,773,739	14,470,000	0.1	0.28
Connecticut	2,070	59,618,621	1,621,000	0.1	0.26
Wisconsin	2,933	83,974,720	2,815,000	0.1	0.21
Oregon	1,473	38,140,811	1,619,000	0.1	0.18
Ohio	4,386	135,967,964	5,365,000	0.1	0.17
New Mexico	531	12,797,791	735,000	0.1	0.15
Minnesota	1,694	44,151,070	2,505,000	0.1	0.14
Florida	4,090	103,321,274	6,586,000	0.1	0.13
Oklahoma	885	22,690,963	1,513,000	0.1	0.12
Illinois	3,072	80,470,106	5,778,000	0.1	0.11
Maryland	1,462	33,394,543	2,650,000	0.1	0.11
Arizona	1,138	26,788,795	2,125,000	0.1	0.11
Utah	460	7,992,057	964,000	0.0	0.10
Washington	1,011	31,204,925	2,699,000	0.0	0.08
Iowa	517	11,897,101	1,539,000	0.0	0.07
Nebraska	315	6,025,309	886,000	0.0	0.07
Michigan	576	16,036,749	4,572,000	0.0	0.03
Kansas	168	3,605,847	1,279,000	0.0	0.03
District of Columbia	25	1,201,405	249,000	0.0	0.02
Idaho	39	728,655	587,000	0.0	0.01
Montana	9	71,991	423,000	0.0	0.00
Alaska	0	0	291,000	0.0	0.00
Colorado	0	0	2,013,000	0.0	0.00
Hawaii	0	0	553,000	0.0	0.00
Indiana	0	0	2,945,000	0.0	0.00
Missouri	0	0	2,765,000	0.0	0.00
Nevada	0	0	798,000	0.0	0.00
North Dakota	0	0	333,000	0.0	0.00
South Dakota	0	0	377,000	0.0	0.00
Texas	0	0	9,200,000	0.0	0.00
Wyoming	0	0	245,000	0.0	0.00

Source: Calculated from ES-202 data provided by U.S. Bureau of Labor Statistics, 1996

Appendix D

Location Quotients for Massachusetts Textiles and Apparel by Three-Digit SIC

SIC Code	SIC Description	Employment	Percent of State Employment	Percent of U.S. Employment	Location Quotient
221	Broadwoven fabric mills, cotton	58	0.0019	0.0005908	0.03
222	Broadwoven fabric mills, man-made	2,521	0.0826	0.0005161	1.60
223	Broadwoven fabric mills, wool	423	0.0139	0.0001143	1.21
224	Narrow fabric mills	306	0.0100	0.0001685	0.60
225	Knitting mills	3,020	0.0990	0.0014315	0.69
226	Textile finishing, except wool	3,829	0.1255	0.0005460	2.30
227	Carpets and rugs	85	0.0028	0.0004852	0.06
228	Yarn and thread mills	620	0.0203	0.0006887	0.29
229	Miscellaneous textile goods	3,932	0.1288	0.0004119	3.13
231	Men's and boys' suits and coats	1,902	0.0623	0.0002549	2.44
232	Men's and boys' furnishings	1,506	0.0493	0.0017713	0.28
233	Women's and misses' outerwear	4,478	0.1467	0.0020358	0.72
234	Women's and children's undergarments	629	0.0206	0.0003202	0.64
235	Hats, caps, and millinery	149	0.0049	0.0001464	0.33
236	Girls' and children's outerwear	311	0.0102	0.0002836	0.36
237	Fur goods	0	0.0000	0.0000000	0.00
238	Miscellaneous apparel and accessories	1,240	0.0406	0.0002753	1.48
239	Misc. fabricated textile products	4,912	0.1609	0.0017403	0.92

See Appendix B.4 for description of location quotient.

Source: Calculated from ES-202 data provided by U.S. Bureau of Labor Statistics, 1996

Appendix E

Comparative Apparel Density in the 50 States

	Apparel Employment	Apparel Wages	Total State Employment	Percent of State Employment	Location Quotient
Alabama	43,271	701,955,778	1,981,000	2.2	3.20
Mississippi	25,386	370,199,547	1,185,000	2.1	3.13
South Carolina	28,943	479,844,456	1,737,000	1.7	2.44
Tennessee	42,611	737,244,170	2,609,000	1.6	2.39
North Carolina	56,187	987,728,338	3,631,000	1.5	2.26
Kentucky	25,456	469,338,831	1,762,000	1.4	2.11
Georgia	41,327	646,324,101	3,580,000	1.2	1.69
California	156,462	2,814,801,783	14,470,000	1.1	1.58
New York	86,854	2,270,597,281	8,100,000	1.1	1.57
Arkansas	9,141	130,705,293	1,168,000	0.8	1.15
Pennsylvania	42,996	806,867,165	5,590,000	0.8	1.13
Missouri	19,301	342,490,286	2,765,000	0.7	1.02
New Jersey	26,514	627,697,985	3,869,000	0.7	1.00
United States	865,986	16,618,043,291	126,708,000	0.7	1.00
Texas	60,632	1,066,694,063	9,200,000	0.7	0.96
Virginia	19,520	298,368,048	3,240,000	0.6	0.88
Massachusetts	15,127	315,788,239	3,052,000	0.5	0.73
Oklahoma	7,112	107,786,816	1,513,000	0.5	0.69
Louisiana	8,634	125,695,908	1,863,000	0.5	0.68
Michigan	19,139	734,777,627	4,572,000	0.4	0.61
South Dakota	1,561	24,819,100	377,000	0.4	0.61
Utah	3,904	59,556,940	964,000	0.4	0.59
Florida	25,943	456,771,623	6,586,000	0.4	0.58
Hawaii	2,118	42,798,292	553,000	0.4	0.56
New Hampshire	2,048	41,744,510	598,000	0.3	0.50
Maine	2,113	40,277,019	635,000	0.3	0.49
Vermont	982	17,221,326	310,000	0.3	0.46
Iowa	4,777	87,829,593	1,539,000	0.3	0.45
Delaware	1,102	28,099,760	363,000	0.3	0.44
Indiana	8,752	174,788,791	2,945,000	0.3	0.43
West Virginia	2,156	27,270,682	747,000	0.3	0.42
Washington	7,765	141,055,145	2,699,000	0.3	0.42
Connecticut	4,512	136,746,241	1,621,000	0.3	0.41
Kansas	3,476	73,034,418	1,279,000	0.3	0.40
Ohio	13,725	272,714,177	5,365,000	0.3	0.37
Maryland	6,197	139,406,259	2,650,000	0.2	0.34
Wisconsin	6,503	138,434,259	2,815,000	0.2	0.34
New Mexico	1,681	32,295,098	735,000	0.2	0.33
Illinois	12,992	293,168,870	5,778,000	0.2	0.33
Colorado	4,045	80,209,393	2,013,000	0.2	0.29
Rhode Island	896	18,783,078	470,000	0.2	0.28
Nebraska	1,653	28,379,726	886,000	0.2	0.27
Minnesota	4,284	83,956,846	2,505,000	0.2	0.25
Montana	704	9,213,964	423,000	0.2	0.24
Oregon	2,675	49,589,540	1,619,000	0.2	0.24
Arizona	2,873	54,722,617	2,125,000	0.1	0.20
Nevada	1,032	18,212,661	798,000	0.1	0.19
North Dakota	278	3,520,987	333,000	0.1	0.12
Wyoming	177	2,152,444	245,000	0.1	0.11
Idaho	386	5,245,965	587,000	0.1	0.10
Alaska	44	717,533	291,000	0.0	0.02
District of Columbia	16	400,719	249,000	0.0	0.01

Source: Calculated from ES-202 data provided by U.S. Bureau of Labor Statistics, 1996

Appendix F

Industry Structure

F.1 Textile Industry: Types and Sizes of Establishments

There are three types of textile establishments: integrated mills, contract mills, and converters. Integrated mills purchase materials from outside suppliers, produce textiles and related articles within the establishment, and then sell the finished product. They tend to be larger and more stable employers than contract mills, which process materials owned by others on a contract or commission basis. The materials processed by contract mills are often owned by integrated mills, which subcontract orders to meet seasonal spikes in demand or when sales of a particular product exceed in-house production capacity.⁸ Contract mills also receive materials from establishments known as converters. Converters are nonmanufacturing establishments that perform the entrepreneurial functions of a manufacturing company, such as buying the raw material, designing and preparing samples, and assigning yarns to others for knitting products on their account.⁹

The federal government's Standard Industrial Classification does not identify whether textile establishments are integrated mills, contract mills, or converters, although establishment size can be used as an imperfect indicator. Most large establishments (100+ employees) tend to be integrated mills, although many highly automated integrated mills have fewer than 50 employees. Converters tend to be very small establishments. The majority of establishments (five to 99 employees) are a mix of contract and integrated mills.

In 1996 there were 6,763 textile establishments in the United States, and 219 (3.2 percent) of these establishments were located in Massachusetts (USBLS 1998). Most employment in the U.S. textile industry is in medium-size facilities that employ from 20 to 100 persons per establishment (Rowan and Barr 1987, 91–93). Only 20 percent of textile establishments employ more than 100 persons, while 44 percent of textile establishments employ fewer than 20 persons.

F.2 Textile Industry: Types of Establishments and Stages of Production

Textile manufacturing involves several stages of processing, and individual establishments usually specialize in one phase of the process or in a specific type of product. Spinning mills (SIC 228) receive raw fibers that are processed into yarn or thread. These mills tend to specialize in either natural or man-made fibers, and often

spin only a single type of fiber, such as cotton or nylon. Dye can be integrated into this stage of the process to produce colored yarn and thread, or it can be introduced at a later stage of the production cycle.

Yarn and thread are knitted (SIC 225) or woven (SIC 221, 222, 223, 224) into fabrics known as gray goods (i.e., unfinished fabric). Converters and contract mills are most frequently found at this stage of the process, where converters supply yarn or thread to contract mills, which return gray goods to the converter for dyeing and finishing. The final stage of the textile production cycle is dyeing and finishing (SIC 226, SIC 229). Dyeing and finishing mills receive gray goods from converters or weaving mills and add color or prints to the fabric. Finishing can include the addition of fabric lamination, waterproofing, and other chemical coatings to complete the fabric. Woolen mills traditionally do their own dyeing and finishing (SIC 223).

F.3 Miscellaneous Fabricated Textile Products

There are many uses for specialized textile products, including military uses (helmets and uniforms), parachutes, canvas sports products (e.g., backpacks, tents, bags, sails), cordage, rope and twine, banners, emblems, pennants, badges, filters, diapers, and composite materials. Many of these products are classified as miscellaneous fabricated textile products (SIC 239). Two of the largest nonapparel markets are home furnishings and automotive interiors. Textile firms supply yarns, threads, and fabrics to the home furnishings industry for use in furniture upholstery, curtains and drapes, carpets and rugs, tablecloths, towels, and bedding (blankets, comforters, sheets, cushions, pillows, and mattresses). Textile firms supply fabrics to the automotive industry for use in automobile interiors and tough fibers for tire production.

F.4 Apparel Industry: Types and Sizes of Establishments

There are three types of apparel establishments: inside factories, contract factories, and jobbers. Inside factories are the apparel industry's equivalent of an integrated mill, which performs all the usual manufacturing functions within the production facility. Contract factories manufacture apparel from materials owned by others and on the basis of designs provided by others. Jobbers are the apparel industry's equivalent of textile converters, who perform the entrepreneurial functions of a

manufacturing company, such as buying raw materials, designing and preparing samples, arranging for the manufacture of clothing from their materials, and selling the finished apparel to retail companies.

The federal government's Standard Industrial Classification does not identify whether apparel establishments are inside factories, contract factories, or jobbers, although once again establishment size can be used as a very imperfect indicator. Very large establishments (500+ employees) tend to be inside factories, while jobbers tend to be very small establishments. However, within that range an establishment could be a contract factory or an inside factory, depending on the type of apparel and the stage of the manufacturing process. In 1996 there were 25,762 apparel establishments in the United States and 408 (1.6 percent) of these establishments were in Massachusetts (USBLS 1998).

F.5 Apparel Industry: Types of Establishments and Stages of Production

Apparel manufacturing involves several stages of production, and establishments frequently specialize in only one stage of the manufacturing process, which requires a great deal of cooperation among different firms, including the textile manufacturers. The steps required to produce a finished garment are design, pattern making, marking and grading, cutting and sewing, trimming, and retail sales.

Design. The design industry is based in New York City and other international fashion centers such as Paris, Milan, and Tokyo. Fashion designers are usually hired by fashion houses to design apparel styles based on season, fabrics, and colors. Fashion-house designers often work with textile converters and large integrated suppliers to ensure that the appropriate fabrics, prints, and colors are available for the upcoming season and anticipated design styles. Hence, at this stage converters play a strategic brokering role in adjusting the type and volume of fabric manufacturing in anticipation of future fashion trends. Apparel firms with inside factories also hire designers.

Designers work with retailers at the final end of the production process to evaluate the fashion market and trends so that product lines can be adjusted to the coming season, based on manufacturers' and retailers' evaluation of what designs will sell best. Using this assessment, the designers combine fabrics, styles, and colors to create a silhouette, a style of garment defined by features such as type of buttons, collar, neckline, pockets, belt, hemline, knit fabric, and so on. The silhouette becomes the basis for creating a line of clothing for a particular season defined by fabrics and styles. Five apparel seasons determine

the designers' use of color, fabric, and style: 1) summer (white, light red, powder blue); 2) back-to-school; 3) fall; 4) winter (considered a dressy and formal season); and 5) spring. Spring is the highest-volume season for apparel manufacturers, but the season literally "shades" into summer as colors and fabrics are changed.

Manufacturers typically buy apparel "groupings" from designers to show retail buyers (see below) and to solicit orders for the coming season. An example of a grouping would be the same print dress in five different colors or a man's cotton dress shirt in four or five colors. The grouping allows a manufacturer to produce the same garment style and cut in varying hues, grades, and sizes so that production can be adjusted to meet market demand if a particular color or size takes off during the season.

Once an apparel manufacturer has purchased its groupings, there are showings (i.e., fashion shows and display areas) for retail buyers who select lines for the season and sign contracts with manufacturers for a volume of groupings. The manufacturers (or jobbers) make out cutting tickets based on the number of buys received for each grouping. Apparel manufacturers usually buy patterns and fabric based on the number of contracts and cutting tickets with retail firms. Depending on buyer volume, jobbers and inside mills can subcontract work to contract mills to bring additional capacity on-line, while upstream converters and integrated mills can adjust production in the same way to meet unexpected demand for a particular fabric.

Pattern Making. The pattern-making process is based in a design house or an inside factory. Pattern makers draw patterns on a length of fabric so it can be cut to produce different size ranges of a particular garment. Professional pattern makers tend to specialize in drawing size groupings such as juniors, misses, super, etc. The original patterns are made to form; that is, to an ideal or average size. The made-to-form patterns are then graded up and down within this form (e.g., size 4, size 5), including half-size patterns. A made-to-form garment is cut and sewn based on the original pattern and then fitted on a "sample model," where it is adjusted to a real fit.

Marking and Grading. Marking and grading is also based in a design house or an inside factory. Real-fit patterns are graded to size from the sample model. The pattern maker then makes a "marker" to lay out the different parts of a garment (sleeve, cuff, collar) for each size on a piece of fabric. Marking is a highly specialized skill that can cost or save an apparel establishment significant amounts of material, depending on how efficiently the fabric is marked to avoid wastage. The marking determines the "yards per garment" required for

each size, and at this stage, profitability is often measured in pennies per yard.

Cutting and Sewing. The next stage of apparel production is to cut the fabric based on the pattern marking. The various pieces of the pattern are then sewn together to produce a garment. Trim is purchased directly from trim manufacturers or trim jobbers for sewing onto the garment. It is not uncommon for a garment to be designed, graded, marked, and cut in the United States, shipped to a foreign contract mill for sewing, and then imported back to the United States as a finished garment.

Sewing is the most labor intensive and the lowest-paying phase of the manufacturing process. Consequently, the sewing phase is where contract mills are most frequently employed by jobbers or subcontracted by inside factories. Sewing is also the part of apparel production that is most frequently outsourced to offshore establishments. Design, pattern making, and marking and grading of garments are highly skilled processes that tend to be centered in the major fashion enclaves and are heavily influenced by large retail firms. The labor intensity of the cutting process can be reduced by the new automatic cutter, which eliminates 15 to 20 people from the production process and if used to capacity can pay for itself in 18 months. There is also a preference among jobbers and other offshore contractors to limit offshore subcontracts to sewing. This preference is related partly to trade laws (e.g., the maquila system) that levy import duties only on the value added in the foreign location, and partly to theft and cheating on fabric by foreign establishments. Theft and cheating can be controlled at the sewing phase, since a contractor knows exactly how many cuts or pieces were shipped to the offshore establishment and therefore how many garments should be returned after sewing.

Trimming. Trim manufacturers are small textile companies specializing in the production of linings, lace, buttons, zippers, shoulder pads, belts, and other accessories needed to finish a garment. Trim jobbers are a small subtrade within the industry that buys product from trim manufacturers or imports trimming from overseas and distributes it to apparel manufacturers. Designers and manufacturers also work with trim manufacturers and trim jobbers to ensure that the appropriate styles and textiles are available for the coming season. Trimming production is a separate manufacturing operation that occurs in different establishments. Apparel manufacturers purchase trimming directly from trimming factories.

Retail Sales. Finished apparel is shipped to retail stores for sale to consumers. Retail firms are the direct customers of apparel manufacturers, and this makes the relationship between the two industry segments particu-

larly important. Historically, department stores and department chain stores — including J.C. Penney, Sears, and Wards — were the largest source of retail apparel sales in the United States. But in the 1970s and 1980s the major department stores were challenged by stores such as The Limited and The Gap, which offered specialized instead of mass fashion. However, as consumers became more cost conscious, particularly after the 1990–91 recession, the major retailers and specialty stores steadily lost market share to discount stores and other low-cost retailers, including Wal-Mart and Kmart.

In 1997 discount stores, off-price retailers, and factory outlets accounted for 26 percent of apparel sales in the United States. Specialty stores accounted for 22 percent of apparel sales and department stores for 21 percent. Major chains now account for only 14.5 percent of retail apparel sales, direct mail/catalogues for 8 percent, and other means of distribution for 8.5 percent. Most apparel manufacturers must compete for retail accounts, since they do not produce their own “name brand” apparel. The U.S. apparel market is divided into two tiers: national brands and other apparel. National brands are produced by approximately 20 large companies, such as Hanes and Levi Strauss, and currently account for 30 percent of all U.S. wholesale apparel sales. The second tier, which accounts for 70 percent of all wholesale apparel distribution, is comprised of small brands, private labels, and store goods produced under contract for retail firms (Fraser 1998, 8).

The rise of discount stores has resulted in vigorous price competition in retail apparel sales, and these pressures have been shifted onto apparel manufacturers. Because of their volume purchases, discount retailers wield immense market power within the apparel industry. The large retailers have responded to the discounters by consolidating their own distribution channels and entering the market as new megabuyers demanding better prices and better service. Overcapacity and oversaturation in the apparel sector mean that competition is intense for manufacturers to obtain and keep large retail accounts. Where domestic firms are unable to meet these demands, many retailers simply turn to imports for a growing share of their apparel selections (Dickerson 1995, 298–300). The larger apparel firms (Hanes, Levi Strauss) are better able to meet these demands through automation, international production arrangements, and superior economies of scale.

F.6 Trends in the Apparel Industry: Consolidation

Apparel production will probably continue to develop in a schizophrenic manner. Commodity production, where there is lower import penetration, will continue consolidating in larger establishments, while small and flexible

contract establishments will be used to challenge foreign import competition in other areas of the apparel market. On the one hand, the consolidation of apparel manufacturing is driven by the economies required to utilize automated production technology efficiently. On the other hand, many segments of the apparel industry continue to have low entry barriers with respect to capital and technical knowledge requirements, inexpensive access to low-tech production machinery, and the ready availability of raw materials from jobbers. The ease of entry accounts in part for the large number of small firms in the sector as well as the high failure rate.

Another structural obstacle to industry consolidation is the need to specialize in narrow product lines. Apparel manufacturing is segmented into highly specialized areas based on the type of fabric used by the manufacturer and the type of garments produced. This specialization makes it difficult to consolidate many segments of the apparel industry and limits the potential size of individual firms and manufacturing establishments. Thus, despite a general trend toward industry consolidation, the U.S. Office of Technology Assessment (1987) describes the apparel industry as a textbook example of perfect competition, but this competition does not necessarily bode well for the future of the industry in Massachusetts.

F.7 Trends in the Apparel Industry: Sales

The general health of the economy and consumer confidence has a significant impact on consumer expenditures for apparel and, indirectly, on fabric orders. During economic slowdowns consumers can delay purchases, scale back buying, or substitute less expensive items until the economy improves. These factors also influence textile orders in nonapparel sectors, since much nonapparel textile production is related to new automobile purchases, home sales, and home improvements.

In the 1980s, as glitz and success were once again fashionable and consumer confidence soared to new highs, consumers made extravagant apparel expenditures. Apparel spending doubled, from \$90 billion in 1980 to \$170 billion in 1989. By 1990, however, the impact of recession, stagnant personal incomes, and high unemployment made consumers more cautious in their apparel spending. The annual rate of growth in apparel expenditures declined from an average of 7.3 percent in the 1980s to 3.1 percent in 1990, 1.3 percent in 1991, and 2.9 percent in 1992 (Standard & Poor's 1992, 1993). Today, the annual rate of increase in apparel expenditures has still not returned to its 1980s level (2.2 percent in 1996 and 4.9 percent in 1997) (Fraser 1998, 2).

Major demographic shifts can also affect apparel expenditures. Apparel spending increased during the 1960s

and 1970s as the baby boom generation matured into teens and young adults, the period when apparel expenditures are usually highest for individual consumers (Dickerson 1995, 301). Similarly, the point at which consumers purchase first homes and new automobiles both have an impact on textile production, which supplies these industries.

Finally, long-term developments in personal income and short-term cyclical effects can buffet the apparel industry and shape the price structure of the final market. The shift toward discount retailers is partly explained by shifts in consumer preference and fashion (from glam to grunge) during the 1990s, but it was mainly the result of stagnant and declining real incomes among a large percentage of American families (Mishel et al. 1999). Consequently, it is consumers with annual household incomes over \$60,000 who are now driving most of the growth in apparel spending. Apparel expenditures by upscale households have been increasing at more than twice the average rate (12.2 percent in 1997). Consumers in this bracket account for 40 percent of all retail apparel spending (1997), up from 32 percent in 1993. By contrast, apparel expenditures by consumers with annual household incomes of \$15,000 to \$24,999 actually declined by 9.2 percent in 1997, despite a robust national economy (Fraser 1998, 2).

F.8 Textile Machinery

Textile and apparel firms generally do not produce their own machinery or manufacturing equipment. Textile machinery (SIC 3552) and industrial sewing machines (SIC 3559) are made by other firms that specialize in industrial equipment. The availability of advanced machinery — whether to improve products, reduce labor, or speed production — is critical to the competitiveness of the U.S. textile industry. Many of the manufacturing advances in the textiles complex have resulted from utilizing new machinery produced by equipment firms.

The U.S. textile machinery industry began in the early 1800s, when enterprising industrialists began smuggling the machinery from England to Massachusetts. These machines were improved incrementally in the United States, while new inventions were patented with regularity. By the 1860s firms such as the Whitin Machine Works and the Lowell Machine Shop made Massachusetts the leading producer of textile machinery in the United States. The invention of the ring spindle in 1831 and the Northrop automatic loom in 1894 contributed to making Massachusetts one of the leading textile machinery producers in the world by the late 1890s (Kane 1988). These inventions increased the speed of production and output per worker, and allowed the substitution of lower-cost unskilled labor for skilled craftsmen.

As recently as 1970, U.S. textile machinery manufacturers supplied nearly 70 percent of the domestic market for such equipment. The market share dropped to 47 percent by 1984 and to about 40 percent in 1987 (Dickerson 1995, 286–87).

Germany, Switzerland, Japan, and Italy have become the world's leading exporters of textile machinery, accounting for 60.3 percent of the world market by 1977. Similarly, Japan, Germany, and Italy accounted for 63.4 percent of the world market for industrial sewing machines. U.S. producers account for only 7.1 percent of the world's textile machinery exports and 8 percent of the world's industrial sewing machine exports (Clairemont and Cavanagh 1981, 225).

Thus, another significant trend in the machine industry is that spare parts and replacement parts are a higher share of shipments for the U.S. industry than for the industry in other countries. Ninety-two percent of all U.S. textile machinery sales were for parts, compared to 27 percent in Italy, 49 percent for Germany, and 51 percent for Great Britain (USITC 1987). The large sales of spare parts by the U.S. textile machinery industry is a lag effect of previous machinery sales, but it offers limited prospects for the future. As older machinery is replaced by imports from Europe, the parts replacement industry will gradually shift to those countries as well. Consequently, employment in the textile machinery industry may continue to decline nationally and within Massachusetts.

F.9 Wholesale/Resale Distributors

The largest U.S. apparel and textile goods producers have maintained their competitiveness in global markets by mass-producing basic goods. These firms are able to achieve economies of scale and fully realize the benefits of automation through high-volume production. Hanes and Fruit of the Loom, for example, produce many different goods, such as men's and women's underwear, T-shirts, hats and caps, shirts, tablecloths, towels, banners, and other products.

Often these goods are semifinished, since final consumers may want custom-tailored products in limited runs or small batches — T-shirts for local Little League teams, baseball caps with a corporate logo, dress shirts with a special embroidery, monogrammed towels for a small hotel, embroidered place mats for an upscale restaurant, for instance. Large manufacturers of basic apparel and textile goods rarely sell in volumes of less than 10,000 (e.g., 10,000 white T-shirts), and rarely produce customized products in small batches.

Consequently, customized product and niche markets have become an entire new area of competition occupied by thousands of small firms in the United States. These

enterprises have minimal start-up capital requirements and often begin as a one- or two-person operation in a garage or basement. Such establishments may for example produce emblems and attach them to baseball caps, print and dye T-shirts for a 10K road race, or add fine stitching, lace, and embroidery to girls' prom and wedding dresses. By its very nature this kind of custom-designed garment or textile good is rarely susceptible to mass production, so these establishments are necessarily small. In Massachusetts, for example, 32 percent of apparel and miscellaneous textile goods manufacturers (SIC 239) employ four or fewer persons, while 48 percent employ fewer than ten persons (U.S. Census 1998).¹⁰

The microfirms that produce these finished goods do not generate sufficient volume to purchase directly from large manufacturers. Instead, wholesalers and resale agents act as their suppliers. Wholesale distribution firms purchase a variety of bulk goods from large manufacturers and then resell smaller batches at higher prices to firms too modest to purchase directly. The market will bear the additional price mark-up because consumers are purchasing a special product for a special event, or one that is custom-designed to their preferences. Without wholesale distributors acting as resale agents and suppliers, this entire segment of the apparel and textile goods industry would not be possible.

Appendix G

The Managed Trade Regime

G.1 The General Agreement on Tariffs and Trade

The General Agreement on Tariffs and Trade (GATT) is the most important contractual arrangement governing global trading. GATT was established in 1947 by 23 countries, including the United States, Canada, Great Britain, Western Europe, Japan, Australia, and New Zealand.¹¹ The agreement has four parts with 38 articles that define the basic principles of the trading system, rules for dealing with special problems, and mechanisms for implementing and enforcing the agreement's provisions (Whalley 1989, 8).

Article I of GATT establishes “most-favored-nation” (MFN) status as the trading system’s fundamental principle of nondiscrimination against imports on the basis of national origin. The principle requires every country participating in GATT to grant other parties to the agreement no less favorable treatment than it grants to countries receiving the most favorable treatment under its national trade laws. Thus, if a participating country decides to grant the imports of one country better or more favorable treatment than is required by GATT, the better treatment is automatically extended to goods imported from all countries that are parties to GATT (Graham 1996, 46).

Since the end of World War II, GATT has defined the framework for eight rounds of multilateral trade negotiations. The first round, in Geneva (1947), resulted in significant tariff reductions, particularly by the wealthy developed countries that had initiated the agreement. Subsequent negotiations failed to produce any significant results until the Kennedy Round (1963–1967) adopted a single tariff-cutting formula that achieved an overall reduction of 35 percent in the average tariff level among participating nations. The Tokyo Round (1973–1979) achieved an additional overall reduction of 34 percent in average tariff levels. By the early 1980s the average tariff on most goods imported by the advanced industrial countries had been lowered to less than 10 percent, even though GATT left peak tariffs intact in import-sensitive areas such as agriculture, textiles, and apparel (Schott 1994, 60). Moreover, starting in the Tokyo Round, governments began negotiating new and improved rules on the use or removal of nontariff barriers (Whalley 1989, 9).¹²

GATT’s Multi-Fiber Arrangement (MFA) provided “patchwork protection” to the textile and apparel industries and did not prevent significant downsizing of the

sector (Finger and Harrison 1994, 23; Friman 1990). It is estimated that by 1986 MFA quotas and tariffs provided the equivalent of a 23 percent tariff on textiles and a 48 percent tariff on apparel, compared to an average 5 percent tariff for other industries (Schott 1994, 58). MFA protections slowed import penetration of the U.S. market, but more so for textiles than for apparel. Import penetration in textiles was only 9.7 percent of total market share in 1993 on a customs value basis. Foreign apparel import penetration increased steadily, from 2.1 percent in 1961 to 43.2 percent in 1993 (USITC 1994, IV–9, IV–13; Dickerson 1995, 306). Import penetration is highest in products with high labor requirements and in price-sensitive apparel lines. Cline (1990) estimates that in 1986 there would have been 21,000 fewer jobs in the U.S. textile industry and 214,000 fewer jobs in the apparel industry without MFA protections.

Nevertheless, the MFA network of bilateral agreements was extremely porous, especially with respect to apparel, because it actually encouraged firms to shift production to locations where MFA quotas were either not applicable or more lenient. Consequently, the quotas were never able to keep pace with the increasing number of new producer nations (Schott 1994, 55). Instead of managing global competition in textiles and apparel, quotas and tariffs actually increased the number of producing nations as manufacturers moved to circumvent trade restraints through relocation or overseas expansion. An unintended consequence of the MFA, therefore, was destabilization and thus increased competition of world trade in textiles and apparel, rather than effective management.

Furthermore, in GATT’s first seven rounds, multilateral negotiations were largely confined to the major developed countries, and this resulted in significant trade liberalization among these nations. Very little trade liberalization by developing countries could be attributed to GATT. For the most part, developing countries pursued import substitution strategies that relied on high tariffs, import licensing, foreign exchange rationing, and balance-of-payment restrictions as allowed under GATT’s Article 18-B. By the mid-1980s, however, many developing countries began to unilaterally abandon import substitution policies or move toward trade liberalization through bilateral and regional trade arrangements negotiated with other developing countries. This movement was stimulated partly by dissatisfaction with the results of import substitution strategies and partly by the convic-

tion that the export-oriented policies of the “Asian tigers” were proving more successful in promoting development and investment (Whalley 1989, 15–16, 32).

As a result, the United States initiated the Uruguay Round (1987–1993) as the eighth session of multilateral trade talks held under GATT auspices. After seven years of negotiations, this round culminated in the World Trade Organization (WTO) Treaty, signed in Marrakesh, Morocco (April 1994), which took effect January 1, 1995. The Uruguay Round cut the developed countries’ tariffs by an average of 38 percent and hence lowered their average tariff level to 3.9 percent. Average tariff reduction was 34 percent for the United States, 37 percent for the European Union, 47 percent for Canada, and 56 percent for Japan. These reductions improved the United States’ competitive position, since they brought the tariffs of other developed countries closer to those of the United States (Schott 1994, 9, 61).

The destabilization of world trade in textiles and apparel was one of many issues addressed by the Uruguay Round, and the talks resulted in a new Agreement on Textiles and Clothing. This agreement brings an end to the MFA by setting a ten-year phaseout of the bilateral quotas negotiated under the MFA umbrella but does not go as far in reducing the higher tariffs that protect the apparel industry in developed countries and the textile industry in some developing nations (Schott 1994, 11, 55). The United States cut tariffs on textiles an average of 24 percent under the WTO Treaty, the European Union (EU) reduced them an average of 31 percent, and Japan lowered them 39 percent.¹³ Yet there remain more than 50 textile items with tariffs above 15 percent, particularly wool and wool-blended textiles. The agreement reduced tariffs on U.S. apparel by 9.2 percent on average, while the EU reduced tariffs by 12 percent and Japan by 34 percent (USITC 1994, IV-14).¹⁴

Thus, many countries retain substantial tariff protection under the new agreement, and the most restrictive quotas will not be removed until the very end of the transition period, in 2005. The new agreement also allows countries to deploy safeguards to protect against dumping or import surges by any country still subject to MFA quotas and where imports cause or threaten “serious damage” to the domestic industry (Schott 1994, 57).

G.2 The North American Free Trade Agreement

A paradoxical consequence of global trade liberalization has been the simultaneous development of regional free trade arrangements in Europe, the Pacific Rim, Latin America, and North America. World trade is already

heavily regionalized, and it is becoming increasingly concentrated within the three major regional trading blocs defined by the European Union (EU), Japan (Pacific Rim), and the United States (North America) (Hinojosa-Ojeda 1996, 89). Regional trading arrangements are an exception to the GATT’s most-favored-nation principle (Article I) authorized by Article XXIV, which allows the establishment of free trade areas and customs unions. In recent years the trend toward regionalization has accelerated, with 34 different regional trading arrangements reported to GATT from 1990 to 1994 (Safadi and Nicholas 1996, 4). The most important regional trading zones are the Asia-Pacific Economic Co-operation Forum (APEC), the European Union, Australia–New Zealand, the Common Market of the Southern Cone (Mercosur),¹⁵ the Caribbean Community (Caricom),¹⁶ the Andean Group,¹⁷ the Central American Common Market, and the North American Free Trade Agreement (NAFTA). In addition, a complex overlapping network of bilateral free trade arrangements has been established in each of these areas between individual countries and also between individual countries and the regional trading blocs. Most of the Latin American free trade zones are patterned on the Canada–U.S. Free Trade Agreement (1989), which provided the basic framework for much of NAFTA (Hufbauer and Schott 1993b; Hinojosa-Ojeda 1996, 87, 99–100; Laird 1996, 187).

NAFTA was passed by the legislative bodies of Canada, Mexico, and the United States in 1993 and became effective January 1, 1994. It is unquestionably the most comprehensive free trade pact, short of a common market, ever negotiated between regional trading partners (Hufbauer and Schott 1993a; Weintraub 1993). NAFTA is a historic free trade accord because it abolishes most tariffs and quantitative trade restrictions between Canada, Mexico, and the United States by the year 2004.¹⁸ NAFTA strengthens the protection of intellectual property rights and provides for “national treatment” of foreign direct investment among the three countries. It is also the first regional trade agreement between advanced industrial nations and a developing nation. As a result of subsequent side agreements, the treaty has stimulated the first efforts to establish cross-border policies on working conditions and environmental standards.

NAFTA provides for the immediate elimination of tariffs on a number of goods and the elimination of tariffs and nontariff barriers on substantially all trade by 2004.¹⁹ It was always widely accepted that NAFTA would yield significant benefits for U.S. suppliers of intermediate goods and producers of capital goods, high-technology products (e.g., telecommunications, computer equipment,

software, pharmaceuticals), and financial and professional services. The textiles and apparel sector was more controversial, and the agreement's impact on the two groups has been quite different.

Canada and Mexico are the United States' two largest trading partners and its two largest markets for textile and apparel exports (USITC 1994, IV-11). NAFTA immediately eliminated all quotas in textiles and apparel for products that comply with the agreement's rules of origin. The agreement phases out quotas (but not tariffs) on Mexican textile and apparel exports to the United States that do not qualify for preferential treatment under the agreement's rules of origin. NAFTA phases out tariffs over a ten-year period on all textiles and apparel that qualify for preferential treatment under the treaty's rules of origin.²⁰ It immediately eliminated tariffs on more than 20 percent of U.S. textile and apparel exports to Mexico, and tariff barriers are now eliminated on 80 percent of textile and apparel exports (Fraser 1998, 12). These provisions mark the first time that imports from a developing country supplier of textiles and apparel have been significantly liberalized by the United States and Canada (Hufbauer and Schott 1993a, 3).

However, the elimination of tariffs and quotas in textiles and apparel, unlike other products, occurs under very strict rules of origin. The NAFTA rule of origin for fabric and apparel is generally "yarn-forward," which means that to qualify for preferences textiles and apparel must be made from yarn spun in North America or from textiles fabricated from North American fibers. This covers most of the products in the textile and apparel industry, since yarn spinning and fiber processing occur at the very early stages of production. The rule of origin was supported by U.S. textile producers, who (in contrast to the apparel industry) generally favored NAFTA. The rule of origin has a highly favorable and differential impact on U.S. textile producers that enhances their competitive advantage.

NAFTA establishes a "triple transformation test" that is actually more restrictive than the double transformation stipulated by the Canada-U.S. Free Trade Agreement (Hufbauer and Schott 1993a, 6, 44). To qualify for preferential treatment, finished textile and apparel goods must be cut and sewn with fabric spun from North American fibers (fiber to fabric to clothing is the triple transformation). The Canada-U.S. Free Trade Agreement allowed preferential treatment for a finished good cut and sewn in the U.S. or Canada, even if it used foreign-made yarn or fiber.

The NAFTA rule of origin effectively forces North American textile producers to use fabrics made from North American yarn and, for some products, North

American fibers in order to gain preferential treatment (Ramirez de la O 1993, 75).²¹ NAFTA also contains several bilateral safeguard provisions that permit member nations to take "emergency actions" during the ten-year transition period (Article 801). Such actions can be taken in cases where import surges from a NAFTA partner are "a substantial cause of serious injury or threaten serious injury" to the domestic industry. However, the agreement establishes a special safeguard for sensitive agricultural products, textiles, and apparel, which requires only that an import surge cause or threaten "serious damage" to the domestic industry. Emergency actions against goods that meet the rules of origin must take a tariff form and can consist of 1) Tariff Reduction Suspension (a temporary suspension of further scheduled tariff reductions), and 2) Tariff Snapback (a tariff "snapback" to the most-favored-nation rate in existence at the time or to the rate when NAFTA took effect, whichever is lower).²² An emergency action can be taken only once during the ten-year transition period.

The most important macroeconomic rationale for NAFTA is that it will increase the efficiency of the regional economy, as each country will tend to export the goods and services in which it has a competitive advantage (Hufbauer and Schott 1993a, 23). This rationalization was expected to occur first and most visibly in those sectors where differences in comparative advantages are most significant within or between industries. The Institute for International Economics, which gave one of the most favorable early estimates of NAFTA's impact on U.S. job creation, agrees that "increased two-way trade between the United States and Mexico will cause employment to shift within and between U.S. industries" (Hufbauer and Schott 1993a, 21). Similarly, a recent report by the Organization for Economic Cooperation and Development (OECD) concludes that in those sectors where rules of origin apply to NAFTA preferences, "the rules of origin may divert trade in favour of NAFTA members." Mexico's recent application of bound rates (from 20 to 35 percent) on clothing, footwear, and manufactured leather products for nonpreferential (i.e., non-NAFTA) imports "may also reinforce the argument of potential trade diversion effects for non-participating parties to the regional trading arrangement" (OECD 1996, 111).²³ Likewise, in an early analysis of NAFTA's likely effect on the U.S. economy, economist Sidney Weintraub (1993, 20) predicted a bilateral trade surplus with Mexico extending over several decades but acknowledged that "there will almost surely be intersectoral shifts and thus dislocations in particular industries and communities." Mexican economists shared the view that NAFTA would increase Mexico's trade deficit with the United States due to high

import growth, while encouraging significant trade diversion in the auto industry, textiles, and agriculture (Ramirez de la O 1993, 79–84).

NAFTA's rules of origin strengthen the competitive advantages of the U.S. textile industry in two ways. First, the rules were designed to prevent East Asian textile and apparel makers from using Mexico as a duty-free export platform for their trade with the United States. The U.S. and Canadian textile industries already enjoy a competitive advantage over Mexican textile producers in terms of unit costs because of their quality of inputs, automation, and labor productivity. Their comparative advantage over the Mexican textile industry becomes more pronounced as the NAFTA partners move deeper into the transition period, which gradually reduces tariffs to zero through incremental decreases each year. Weintraub (1993, 17) observes: "The cost of [textile] mill production in Mexico is considerably higher than in the United States because of inferior inputs, outdated technology, and capacity underutilization" (see Botella et al. 1991; Hufbauer and Schott 1992, 267).

The U.S. textile sector has achieved some of the highest levels of productivity in the world, particularly in high-volume commodity products, printing, and dyeing and finishing operations. U.S. textile mills are especially competitive in areas where fabric quality, product innovation, and quick response are major factors. The sector's excellent competitive position is the result of significant investment in new technology, coordination of production with the needs of the apparel industry, and extensive restructuring and consolidation to realize technical economies of scale. Consequently, direct competition from foreign imports is relatively low in most textile groups, as indicated by the low levels (9.7 percent) of import penetration. Direct foreign competition is especially low in groups where Massachusetts has a high concentration of textile activity: knit fabrics, nonwoven fabrics, carpets, and home furnishings (USITC 1994, IV–10).

Canada's textile manufacturing industry has been revolutionized by the same trends that transformed the U.S. industry. Investment in new technologies has made the industry modern, efficient, and decreasingly labor intensive, with resulting increases in productivity. However, Canadian textile and clothing manufacturers rely more on inputs from the rest of the world, particularly from East Asia, than do their U.S. competitors. Consequently, NAFTA's effect has been to divert supplier relations from East Asia to U.S. textile producers.

The Canada–U.S. Free Trade Agreement (CUFTA) contained a single transformation rule and provided exceptions to the rules of origin in the form of three tariff

rate quotas (TRQs) for nonwool fabrics, nonwool apparel, and wool apparel. Moreover, under CUFTA, Canadian textile producers heavily utilized their TRQ — 79 percent of the quota in 1989, 98 percent in 1990, and 81 percent in 1991 — to achieve steady increases in their exports to the United States. In fact, Canada increased its textile exports to the United States by 28 percent in 1990, 15 percent in 1991, and another 30 percent in 1992. The more restrictive NAFTA rules of origin are therefore expected to impair the Canadian industry's access to the U.S. market, despite comparable rates of productivity. Since Mexico supported the U.S. position on this issue, Canada found itself without negotiating leverage, acceded to the U.S. position, and won compensation in the form of expanded and extended tariff-rate quotas under NAFTA for products failing to comply with the stricter rules of origin (Barry and Siwicki 1993, 131–46).

On the other hand, the Mexican apparel industry enjoys a competitive advantage over U.S. producers largely because apparel is a labor-intensive industry (Weintraub 1993, 17). The restrictive quotas on Mexican apparel imports to the United States that existed under the GATT's Multi-Fiber Arrangement were immediately eliminated under NAFTA for textile and apparel products that meet the rules of origin. For Mexican textile and apparel exports to the United States that do not meet the origin tests, quotas will be gradually phased out, but GATT tariffs will remain largely intact. Meanwhile, import duties and MFA quotas on textiles and apparel imported from non-NAFTA countries remain in force.

Indeed, based on these general market dynamics and the specific comparative advantages of each nation in textiles and apparel, Hufbauer and Schott (1992, 278) predicted from the beginning of NAFTA negotiations that U.S. exports of textiles to Mexico would increase, while Mexican exports of finished apparel to the United States would do likewise. Similarly, in another preliminary analysis of NAFTA's potential impact, Weintraub (1993, 18) predicts: "If the MFA is retained, one should expect diversion of production and hence exports to the United States and Canada from other suppliers to Mexico." Thus, NAFTA's effect is to encourage the migration of U.S. apparel firms to Mexico but to advantage the U.S. textile producers who supply them, particularly since low-cost East Asian textiles are competitively disadvantaged by the comparatively high Mexican tariffs that remain under GATT. This migration is secured by the national treatment provisions on foreign direct investment, which creates additional security and incentives for apparel firms that migrate to Mexico.

G.3 Trade Liberalization and Employment

Trade liberalization has a more pronounced effect on the composition of employment in an economy than on its level. The overall total increase or decrease of trade due to liberalization is marginal as a ratio of total economic activity. Total economic activity in a national economy is still primarily determined by macroeconomic conditions and policies, particularly by policies that increase the productivity of workers (Schott 1994, 33; Krugman 1994). It is the composition of employment, not the level of total employment, that is the crux of the debate on international trade, particularly those aspects of the debate that emphasize the competitive or comparative advantage of particular industries. The model developed by Cline (1990), when adjusted to reflect the results of the Uruguay Round, predicts that by 2005 U.S. imports of apparel will increase by about \$20 billion (in 1989 dollars), or 31 percent more than would occur in the absence of reform. The model also projects that U.S. job losses in the apparel industry will increase by an additional 77,000 by 2005, lowering the level of employment in the apparel sector by about 10 percent, compared with continued protection. This model does not include the potential impact of China's entry into the WTO or a possible treaty on textiles and apparel with the nations of sub-Saharan Africa (USITC 1998, 149–159).

Appendix H

Changes in Numbers of Establishments and Employees by County

Change in Textile Establishments and Employment by County, 1980 to 1997

COUNTY	1980		1997	No. of Units (Lost) or Gained	Average Employment		No. of Jobs (Lost) or Gained	Average No. of Employees per Unit	
	1980	1997			1980	1997		1980	1997
Barnstable	CI*	4			26			6.5	
Berkshire	CI	6			162			27.0	
Bristol	66	57	(9)		7,246	4,970	(2,276)	110.0	87.0
Dukes	CI	CI							
Essex	CI	CI							
Franklin	CI	CI							
Hampden	20	13	(7)		1,512	712	(800)	76.0	55.0
Hampshire	10	7	(3)		790	273	(517)	79.0	39.0
Middlesex	54	47	(7)		4,134	2,528	(1,606)	77.0	54.0
Nantucket	CI	CI							
Norfolk	17	12	(5)		1,615	672	(943)	95.0	56.0
Plymouth	7	10	3		475	248	(227)	68.0	25.0
Suffolk	25	8	(17)		634	197	(437)	25.0	25.0
Worcester	54	32	(22)		4,546	2,153	(2,393)	84.0	67.0
State	287	217	(70)		25,145	14,498	(10,647)	88.0	67.0

Source: ES-202 data, calculated from Massachusetts Division of Employment and Training, 1997
CI * = confidential information

Change in Apparel Establishments and Employment by County, 1980 to 1997

COUNTY	1980		1997	No. of Units (Lost) or Gained	Average Employment		No. of Jobs (Lost) or Gained	Average Annual Wage	Average No. of Employees per Unit	
	1980	1997			1980	1997			1980	1997
Barnstable	6	13	7		105	36	(69)	9,018	17.5	2.8
Berkshire	4	8	4		138	243	105	7,594	34.5	30.4
Bristol	164	95	(69)		18,019	6,999	(11,020)	9,055	109.9	73.7
Dukes	CI	CI								
Essex	56	35	(21)		2,797	854	(1,943)	11,224	49.9	24.4
Franklin	CI*	CI								
Hampden	30	22	(12)		1,755	338	(1,417)	7,813	58.5	15.4
Hampshire	4	3	(1)		343	35	(308)	10,172	85.8	11.7
Middlesex	99	62	(37)		3,881	1,276	(2,605)	9,263	39.2	20.6
Nantucket	0	0	0		0	0	0	0		
Norfolk	27	23	(4)		1,268	486	(782)	11,920	47.0	21.1
Plymouth	45	27	(18)		1,600	523	(1,077)	10,152	35.6	19.4
Suffolk	219	79	(140)		7,731	2,448	(5,283)	10,550	35.3	31.0
Worcester	39	29	(10)		2,237	937	(1,300)	10,489	57.4	32.3
State	697	399	(298)		39,957	14,205	(25,752)	9,692	57.3	35.6

Source: ES-202 data, calculated from Massachusetts Division of Employment and Training, 1997
CI* = confidential information

Appendix I

Technology and Investment in the Textile and Apparel Industries

I.1 Value-Added and Wage Levels

Value added is the difference between the input price of a good and its final sales price. It is the amount added by a business over the input factor to produce the final product (Shim and Siegel 1995). Thus, value added measures how much of the final market value of a product is generated by local factors that remain in the state after a sale. High-value-added industries tend to pay higher-than-average compensation to employees, while low-value-added industries tend to pay lower-than-average compensation. The ability to add value to a final product is therefore directly related to the average earnings and income levels in an industry.

I.2 Massachusetts Economic Development Incentive Program

The Massachusetts Economic Development Incentive Program (EDIP) was established by enactment of Chapter 19 of the Acts of 1993 for the purpose of stimulating job creation in distressed areas. The program's objective is to attract new businesses and encourage existing businesses to expand in distressed areas.

The program is administered by an 11-member Economic Assistance Coordinating Council (EACC). Four of the EACC's members are appointed by statute, and seven are appointed by the governor. The EACC is co-chaired by the state director of economic development and the state director of housing and community development.

The EACC is charged with responsibility for designating economic target areas (ETAs), economic opportunity areas (EOAs), and certified projects. An economic target area is three or more contiguous census tracts in one or more municipalities meeting one of nine statutory criteria for economic need. There are 36 designated ETAs in Massachusetts. An economic opportunity area is an area or several areas within a designated ETA that have exceptional needs and are considered priorities for economic development. There are 306 designated EOAs in 89 of the Commonwealth's cities and towns.

A certified project is a business that is expanding its existing operations, relocating its operations, or building new facilities and creating permanent new jobs within an EOA. The EEAC approved 439 certified projects in 79 cities and towns from July 1, 1993, through July 1, 1999.

For certified projects, the EDIP provides a 5 percent state investment tax credit for tangible, depreciable investments and a 10 percent abandoned building tax deduction for costs associated with renovating an abandoned building. It authorizes additional municipal tax incentives, including a special tax assessment or tax increment financing.

The special tax assessment (STA) covers existing and new value of real estate owned or leased by a certified project. In year one, the real estate tax is 0 percent of the existing and new assessed value of the property. In year two, 25 percent of the assessed value is taxed by the municipality, and in year three, up to 50 percent of the assessed value is taxed. In year four, up to 75 percent of the assessed value is taxed, and in years five and after, up to 100 percent of the assessed value is taxed by the municipality. The STA is extended by municipalities for a period of no fewer than five years and no more than 20 years.

Tax increment financing (TIF) is an agreement between a municipality and a certified project that awards a property tax exemption based on a percentage of the value added through new construction or significant improvement for a period of no less than five and no more than twenty years. The real estate taxes generated by the new increased assessed value is allocated by percentage to one or more of three categories, which may change from year to year as stipulated in the agreement: (1) exemption from real estate taxes, (2) payment of real estate taxes, and (3) payment of a betterment fee in lieu of taxes to finance project-related infrastructure.

As a result of EDIP tax incentives conferred from July 1, 1993, through July 1, 1999, MOBD claims that 30,190 new permanent full-time jobs will be created, 3.39 billion in additional private investment will occur, and 53,780 jobs will be retained over the next 5 to 20 years. (MDED 1999)

I.3 Technology and Productivity

Industrial historians have placed a great deal of emphasis on the importance of cheap labor in luring northern textile mills to the southern United States after 1880 (Kane 1988, 115–137). However, new evidence suggests that technological superiority was an equally important reason for the rise of southern textile mills. Massachusetts textile firms fell “behind the curve” in technology after the Civil War. As early as 1890, ring

spindles constituted more than 90 percent of all southern spindles, while northern mills reported only a 60 percent share. In 1919, 71.5 percent of southern looms were automatic, while only 38.5 percent of northern looms were (Kane 1988, 18–24; Wortzell 1982).

Numerous technological advances have been made in textile machinery over the past two decades, while apparel sewing has not changed substantially. In the 1970s open-end spinning allowed producers to quadruple the rate of yarn production over that of the old ring-spinning technique that had been used for nearly a century. In fabric weaving, wooden fly shuttles that move back and forth across looms were replaced by shuttles driven by jets of air and water. The new shuttleless looms tripled production speed and, because increased fabric widths were now manageable, multiplied fabric production by a larger ratio. By 1988 about 40 percent of domestic looms were shuttleless (Kane 1988, 147).

Technological advances in the production of man-made fiber polymers multiplied production rates tenfold during the 1950s, and spindle speeds on texturing machines increased fortyfold. Operating speeds in knitting were increased by adding minicomputer controllers to existing machinery, while operating speeds were doubled in synthetic carpet making in the same way. These machines are safer, quieter, and require fewer tenders than older equipment (Cline 1990, 84–85). The new technology has also improved product quality. In 1980 fabrics averaged 25 flaws per 100 linear yards; by 1985 automation and other production improvements had reduced this to fewer than eight (Kane 1988, 148).

The new technology has allowed the textile industry to remain competitive in domestic and international markets, but it is stimulating textile firms to downsize their workforces, since fewer employees are needed to produce larger volumes. Today's equipment operators often need higher levels of computer skill or formal education than previous textile workers. The new technology has also sparked a trend toward industrial concentration to capitalize on the efficiencies and economies of scale made possible by new machinery, but these economies are also resulting in a continuing reduction in workforce size throughout the industry. Fewer establishments and fewer employees are required to produce a higher volume and value of output.

In a fully automated textile plant, labor costs are reduced to only 10 or 15 percent of manufacturing costs compared to 50 percent in a traditional plant (Kane 1988, 148). For example, Burlington Industries (North Carolina) invested \$1.5 billion in advanced textile machinery between 1978 and 1985 while cutting its workforce from 66,000 to 53,000. J. P. Stevens invested more than

\$480 million in equipment from 1980 to 1985, while reducing employees from 41,400 to 32,700 (Cline 1990, 85). Technological innovation and new capital investment have made the textile industry more productive and competitive, but it is now less labor intensive and requires a more highly skilled and educated workforce.²⁴

It has proved difficult to fully automate apparel production, because for economic and technical reasons, no replacement for the heavy-duty sewing machine has yet been devised. Apparel production is one of the most highly labor-intensive manufacturing processes, and two-thirds of the apparel workforce consists of sewing machine operators. Sewing requires considerable skill, but operators with little or no formal education can become proficient at it in a matter of weeks or months. At approximately \$2,000 each, state-of-the-art industrial sewing machines are inexpensive, so a 20-person factory can be capitalized at very low cost and set up in a shell-type building with minimal rent.²⁵ Used equipment is always available at low prices, because apparel firms have been closing or downsizing their operations for many years (OTA 1993, 175).

On the technical side, once a garment is designed, the marker used for cutting fabric can be reproduced and stored in a computer. This allows cutting to be automated. Sewing, however, has resisted automation because it is nearly impossible to manipulate limp fabric mechanically, particularly where partially assembled garments must take on a three-dimensional shape (a cuff or sleeve, for example). Trimming operations such as making buttonholes, sewing on buttons, preparing collars, and attaching pockets can be completed before assembly, but at some point a human operator must guide the pieces of the garment through a sewing machine by hand.

The structure of the apparel market also works against technological innovation. The market can be broadly divided into fashion-sensitive items and standardized commodities sold year-round and produced in large runs. The most standardized garments include items such as underwear, nightwear, dresses, blouses, shirts, foundation garments, and infant wear. Automated sewing is feasible in these product areas because fashions and seasons do not change rapidly (e.g., men's underwear or T-shirts) and the garments involve no extensive or complicated sewing processes. Standardized apparel can therefore be mass-produced with automated equipment, and these markets tend to be dominated by a few large brand-name producers (Hanes, Fruit of the Loom, Levi Strauss). Still, these products account for only 18 percent of total employment in the U.S. apparel industry. While import penetration has been lowest for this group of commodities, employment is still declining, due to automation (OTA 1993, 175–76).

In the early 1960s the apparel industry was estimated to be only 5 percent automated, and by the early 1970s this rate had increased to only 15 percent (Ghadar et al. 1987). By the late 1970s automation had grown to 25 percent and by the mid-1980s to about 40 percent. Automated production helped retain large shares of the U.S. market in certain apparel categories, such as men's knit briefs, underwear, and T-shirts (Dickerson 1995, 308). Automation not only reduces unit labor costs, it adds production flexibility and standardizes product quality. However, studies have found that the apparel sector has made only limited investments in capital equipment beyond design, cutting, and the production of standardized commodities (Cline 1993). The sector as a whole has chosen to meet foreign competition by discontinuing operations, shifting production offshore, and relying on high tariffs and MFA quotas. Furthermore, as mentioned, major segments of the industry, particularly sewing, are not readily susceptible to automation.

Appendix J

Sources of Data

Government Statistics

Most of the data used in this report are collected by federal agencies, such as the Bureau of Labor Statistics, Census Bureau, Bureau of Economic Analysis, and the U.S. International Trade Administration. The basic data file is the ES-202, which is collected from quarterly tax reports submitted to the Massachusetts Division of Employment and Training by employers subject to the unemployment insurance law. The ES-202 program collects information on the location and industrial activity of each reported establishment and assigns location and 4-digit standard industrial classification codes accordingly. The program also collects information on the number of people employed and the total wages paid to employees at each establishment. The establishment-level data is aggregated, by SIC code, and reported for each town and city, county, labor market area, and at the state level.

The ES-202 reports have several advantages as a data source, including comprehensiveness, timeliness, and consistency. They represent one of the most comprehensive sources of establishment, employment, and wage data, since establishments covered by unemployment insurance and unemployment compensation capture approximately 90 percent of all civilian employment in the United States. The self-employed account for approximately 83 percent of workers outside the ES-202 program. The quarterly data are usually available nine months following the end of the reference quarter, and annual-average data are typically released in August or September of the subsequent year. Furthermore, the ES-202 files go back several decades, and thus provide a consistent basis for tracking industry developments over long periods of time.

Despite its advantages, the usefulness of ES-202 data is often limited at lower levels of aggregation (e.g., establishment or town) by confidential disclosure restrictions. The ES-202 program does not release establishment or company information. The federal government requires that publicly released ES-202 reports suppress employment and wage data for any industry level (1) that consists of fewer than three establishments; (2) in which a single establishment accounts for 80 percent or more of the industry's employment.

The U.S. Bureau of Labor Statistics conducts a Current Employment Statistics (CES) Survey on a monthly basis. This survey of business establishments provides estimates of employment, hours, and earnings by industry

for the nation as a whole, the 50 states, and most major metropolitan areas. The CES survey has been conducted since 1939.

The U.S. Census Bureau conducts an economic census every five years as mandated by Title 13 of the United States Code (sections 131, 191, and 224). The most recent economic census was completed in 1992, although some preliminary data from the 1997 Census of Manufacturing was available during the study period. The Census of Manufacturing provides a detailed portrait of manufacturers from the national to the local level, based on survey questionnaires mailed to more than five million large and medium-size firms. A sample of small firms is also surveyed, although most data on small, single-establishment firms is collated and estimated from the existing records of other federal agencies. The Census of Manufacturing provides detailed information on the number of businesses and employees and the value of shipments, sales, receipts, revenue, and payroll. It thus provides some additional data that supplements the ES-202 reports, although federal law also requires the Census Bureau to maintain confidentiality and to refrain from publishing any data that could reveal the identity or activity of individual businesses.

The U.S. Census Bureau also publishes County Business Patterns and the Annual Survey of Manufactures, which are annual data series providing subnational economic data by industry. The series are useful for analyzing economic changes over time, especially between the economic censuses. The County Business Patterns' basic data units are extracted from the Census Bureau's Standard Statistical Establishment List (SSEL). The SSEL is a file of all known single and multi-establishment companies. The data on multi-establishment companies is supplemented with information from the annual Company Organization Survey, while information on single establishment companies is extracted from records of the Internal Revenue Service, the Social Security Administration, and other Census Bureau programs. The Annual Survey of Manufactures provides annual data by state and industry on new capital investment and value added, among other items.

In addition to the various sources of national data on the textile and apparel industries, the study also draws on international trade statistics. The Bureau of Economic Analysis is the primary collector of data on U.S. international transactions in private goods and services. The BEA uses these data to compile the U.S. international transac-

tions (or balance of payments) accounts, which are used by other federal agencies, such as the U.S. International Trade Administration, to make trade policy and to monitor trade agreements.

This study has attempted to draw on the most up-to-date data, but in many cases data are collected periodically or become available only after a reporting delay.

Financial Data

IMarket Inc.'s MarketPlace is the most reliable source of information on the financial aspects of private firms in the textile and apparel industries. IMarket compiles up-to-date financial and credit data on more than 12 million business establishments in the United States. These data are compiled from Securities and Exchange Commission filings, all federal bankruptcy filing locations, all secretaries of state, trade and bank transactions, public utilities, the U.S. Postal Service, daily newspapers, and electronic news services. The data are classified in much the same way as government data using SIC codes, so they can be cross-referenced with federal statistics. Standard & Poor's annual Industry Surveys also report data on sales.

Additional Sources Used in the Study

This study utilizes a wide range of statistical data on the textile and apparel industry. The author has reviewed scholarly books and articles, government policy monographs, and trade publications for background on the structure of the industry and its historical development. The study also draws on information provided by interviews conducted in 1994 and 1998. In 1994 the author interviewed 16 textile executives representing 13 companies that collectively employed more than 4,600 people. In 1998 the author interviewed another 15 textile and apparel executives representing 13 companies employing 2,100 people. The 1994 interviewees were concentrated in the dyeing and finishing sector, while the 1998 interviewees were selected to provide a cross-section of the state's economic regions, firm size, and production sector. The purpose of the interviews was to gain additional insights into industry structure and operations, market trends, key innovations, and challenges facing the industry.

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Endnotes

1 The Standard Industrial Classification for establishments differs from a classification for enterprises (companies) or products (commodities) (Executive Office of the President 1987, 11).

2 The study utilizes a highly restrictive definition that may slightly underestimate the total impact of the textile industry in Massachusetts. SIC Code 22 does not capture nonwoven fabrics, composite materials, filters, cables, fiber optics, and glass fibers, which are often included as part of the textile industry. For example, the manufacture of rayon fibers (SIC 2823), elastomeric fibers (SIC 2824), and nylon resins (SIC 2831) is conducted by firms classified under Major Group 28 "Chemicals and Allied Products." The U.S. Census Bureau (1998, 6) reports no Massachusetts employment in SIC 2823 and 2831 and only four establishments with approximately 600 persons employed in SIC 2824.

3 These figures assume that 33 percent of the total employment impacts leak into adjacent communities in the same labor market area and therefore that not all jobs in the industry are held by city residents. The leakage estimate is based on IMPLAN econometric modeling system local-area models.

4 The University of Rhode Island also offers a textile program. Philadelphia University is the other nonsouthern member of the National Textile Center.

5 These figures may slightly understate textile and apparel exports from Massachusetts firms, since exports are recorded at the port of departure. If a firm ships its product through seaports and airports in Rhode Island, Connecticut, or New York, the exports will be recorded in those states. Interviews with textile and apparel executives indicate there is no reason to believe that the discrepancies are significant.

6 The large investment in Middlesex County is mainly the result of reconstructing the Malden Mills facility in Lawrence.

7 The IMPLAN modeling system draws on a variety of statistical sources, including the Bureau of Labor Statistics Growth Model, Bureau of the Census, ES-202 employment and earnings data, the Regional Economic Information System (REIS), and the Bureau of Economic Analysis Gross State Product data.

8 Employment in contract mills is often seasonal and unstable because these mills partly depend on receiving overflow demand from integrated mills. For the same reason, contract mills are usually the first to experience employment declines at the start of a recession and the last mills to add employment during an economic recovery.

9 Converters involved in assigning yarn are classified in SIC 225. Converters not involved in assigning yarns for knitting are classified in nonmanufacturing industries.

10 This number is probably low. IMarket, Inc. MarketPlace data (1998), which seem to capture very small companies better than government survey data, suggest that as many as 51 percent of the state's apparel and miscellaneous textile firms employ four or fewer persons, and that 66 percent employ fewer than ten persons.

11 The GATT/WTO now has 135 members (WTO 2000).

12 The OECD (1996, 11–12, 59–63) defines nontariff barriers

to trade as "border measures other than tariffs that may be used by countries, usually on a selective basis, to restrict imports." Approximately 20 percent of world trade now encounters nontariff barriers, and the trade coverage of these measures has been growing as tariff barriers are lowered. The United Nations Trade and Development Administration identifies 72 different types of NTBs in its classification scheme. NTBs include volume restraining measures (e.g., prohibitions and quotas), import authorizations (e.g., licensing, health and safety standards, technical standards, censorship), price controls (e.g., minimum prices, antidumping actions), and other barriers such as subsidies, favorable tax treatment (Laird and Yeats 1990, 4, 17–19), and anticompetitive practices by private firms (Hay 1996, Janow 1996, Warner 1996).

13 The United States reduced its trade-weighted average tariff to 8.3 percent on textile products covered by the WTO Agreement on Textiles and Clothing. The EU and Japan agreed to reduce the trade-weighted average tariff on textile products to 5.9 percent and 4.8 percent, respectively (USITC 1994, IV-10-11).

14 The United States reduced its trade-weighted average tariff to 17.5 percent on apparel products covered by the WTO Agreement on Textiles and Clothing. The EU will maintain tariffs on apparel between 5.3 and 14 percent and Japan will maintain tariffs on apparel between 11.2 and 16.8 percent (USITC 1994, IV-10-11).

15 The members of Mercosur are Brazil, Argentina, Paraguay, and Uruguay.

16 The members of Caricom consist of the Caribbean island nations and coastal nations, including Belize, St. Kitts, St. Lucia, Antigua, Monserrat, Bahamas, Guyana, Barbados, Trinidad, and Tobago.

17 The members of the Andean Group are Colombia, Venezuela, Bolivia, Ecuador, and Peru.

18 NAFTA provides for the immediate elimination of tariffs on a number of goods and the elimination of tariffs and nontariff barriers on substantially all trade over ten years. There are numerous exceptions and nuances to this general rule that are mostly phased out over the ten-year transition period. For a lucid and detailed analysis of NAFTA's provisions, see Hufbauer and Schott (1993a).

19 There are numerous exceptions and nuances to this general rule that are mostly phased out over the ten-year transition period. For a lucid and detailed treatment of NAFTA's provisions, see Hufbauer and Schott (1993a).

20 Most U.S. and Mexican tariffs on textiles and apparel will be eliminated after six years (January 1, 2000), with the rest phased out after ten years (January 1, 2004). Tariffs on the textile and apparel trade between Canada and the United States were phased out by 1999 according to the Canada-U.S. Free Trade Agreement schedule (Hufbauer and Schott 1993a, 5, n. 20).

21 There are some exceptions to the rule of origin. A single transformation test applies to 13 fabrics that are in short supply (e.g., silk and linen). The rule of origin for cotton, man-made knits, and man-made nonwoven fabrics is a double transformation, or "fiber-forward," rule. Coated fabric is classed under a "fabric-forward" rule. Sweaters made from man-made fibers are fiber-forward between the United

States and Mexico. There are also Tariff Preference Levels in force for many products that do not meet the rule of origin (e.g., yarns, fabrics, and apparel) up to specified import levels (a concession to Canadian textile firms and Mexican apparel makers). The products can be imported up to the quota level and receive NAFTA's preferential duty, while any imports over the remaining quota restrictions will continue paying the most-favored-nation rate.

22 The snapback tariff level can be imposed for up to three years for most products and up to four years for the most sensitive products during the ten-year transition period. For goods that do not meet the rules of origin, emergency actions can also take the form of quotas, imposed for three to four years.

23 This advantage may not be permanent, since Mexico has already established bilateral free trade agreements, modeled on NAFTA, with other Latin American countries. In addition to NAFTA, Mexico has free trade agreements with Chile (1991), Costa Rica (1994), and as the G-3 with Colombia, and Venezuela (1994) (see Hufbauer and Schott 1993b, 4). It is also seeking participation in APEC and exploring free trade arrangements with the European Union (OECD 1996, 112).

24 The introduction of automated technology is a strategic business decision that many textile firms made in the 1980s to choose capital-intensive sectors over labor-intensive sectors of the industry. These decisions were often made specifically for the purpose of competing globally in high-tech production sectors where the companies would enjoy a competitive advantage. Thus J.P. Stevens, for instance, shifted its focus from apparel fabrics that could be produced at lower cost in developing countries to home furnishings (e.g., towels and sheets).

25 Industrial space of the type used by garment factories can be leased in New Bedford or Fall River for approximately \$2.50 to \$3.00 per square foot per year. Thus a 10,000-square-foot facility can be leased for \$25,000 to \$30,000 per year.

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