

## Productivity growth improves in housefurnishings industry

*Large and medium-sized firms led the pace with plant consolidations, restructuring, and technological advances, while sound marketing strategies and consumer demand all contributed to the industry's progress*

Robert Critchlow

Following periods of decline, productivity in the housefurnishings industry advanced steadily after 1980, reflecting consumer demand, marketing strategies, and other related factors. The industry comprises some 1,000 establishments dominated by a fairly small number of large firms.<sup>1</sup> While the large firms account for the majority of industry production and employment, many of the small firms produce specialty items. The industry's most important products are bedroom and bathroom fabrics—bedsheets, pillowcases, comforters, bath towels, and other similar textile products.

Since the early 1980's, firms have been consolidating and restructuring their manufacturing processes, resulting in an industry with fewer, but larger firms. New, more productive manufacturing equipment allowed firms to increase output more rapidly than employment, resulting in increased productivity.

### Trends in productivity

Productivity in housefurnishings grew at an average annual rate of 1.2 percent between 1972 and 1991 (table 1), compared with 2.5 percent for all manufacturing. The industry's productivity growth (as measured by the change in output per hour) reflects a more rapid increase in output (1.7 percent a year) than in employee hours (0.5 percent a year).

Between 1973 and 1979, however, productiv-

ity declined by an average of 2.3 percent a year. This period includes the recession from late 1973 through early 1975,<sup>2</sup> during which output dropped much more rapidly than employee hours. Even when output began to grow again after 1975, it grew faster than employee hours only in 1977, and declined again in 1979, while employee hours continued to grow.

Steady productivity growth really began after 1980. Between 1979 and 1990, output increased at an average rate of 2.5 percent a year and hours increased 0.3 percent per year. Productivity for this period grew at an average rate of 2.2 percent a year.

### Output and demand

Output in housefurnishings increased at an average annual rate of 1.7 percent from 1972 to 1991. During the 1973-79 period, output fluctuated considerably, falling during the recession years in 1974 and 1975, then growing again through the late 1970's. Overall for this period, output declined at an average annual rate of 0.1 percent, although the period contains 1 year when output fell by almost 18 percent (1974) and a year when output grew more than 12 percent (1977).

From 1979 through 1990, output grew at an average rate of 2.5 percent a year. Output fell by 8 percent during the recession in 1980, but grew strongly afterwards, rising in every year except 1988. Growth took place even through the

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recession years of 1981 and 1982, when purchases of new and existing houses fell sharply.

Several factors affect the overall demand for housefurnishings, which are primarily made up of bedroom and bathroom products. New housing starts generally affect the demand for these products, as new houses often have more bedrooms and baths than older houses or apartments. Also, people frequently decorate their new homes with new furnishings. The frequency with which people seek short-term housing can affect the demand for household furnishings. An aging population may also have an impact on demand, as people who retire sometimes move to new residences. Increased levels of personal income may affect demand if some of the new income is used to upgrade home furnishings.

Manufacturers, of course, try to influence the demand for their products. Their main problem is that products like bed and bath linens generally do not wear out quickly, so manufacturers must tempt consumers with a variety of new and attractive styles. Among the marketing ideas used by manufacturers are coordinated ensembles of bedroom fabrics, including sheets, pillowcases, comforters, bed ruffles, and sometimes window coverings. Most of the major manufacturers created expensive lines of bed and bath linens,

which were added to their standard product lines produced over the years. Manufacturers offer an extremely wider range of patterns and colors to consumers in the 1990's, compared with designs available 20 years ago.<sup>3</sup>

Retail sales of home textiles grew slightly between 1988 and 1992, with some products gaining in popularity and others losing.<sup>4</sup> For example, sales of bedsheets remained fairly constant, while sales for bedding accessories increased. Sales of comforters, quilts, and blankets have grown, but sales of traditional bedspreads have declined, indicating a shift in consumer preferences from the more "traditional bedroom look" to the more colorful and varied appearance provided by comforters and quilts. Blanket sales have increased, especially for light-weight cotton blankets, a fairly new product that has become popular for use under comforters.

Sales of bath items have been mixed since 1988. On the one hand, unit and dollar sales of bath towels, the leading item, have declined slightly. One factor contributing to these declines is the sale of higher quality towels. The towels currently on the market are larger and heavier than the towels sold during the 1970's, but they are not appreciably more expensive. Thus, for a similar price, consumers may be getting better, longer lasting towels. On the other hand, sales of bath rugs, shower curtains, and bath accessories have all grown, which, when combined with the declines of bath towels, sends the mixed market signals.

No dramatic growth is expected for housefurnishings over the next several years. One estimate projects at most 3 percent growth annually; and even this growth will mostly be attributable to quality upgrades of home textiles, not increases in the actual number of items sold.<sup>5</sup>

## Industry description and structure

The housefurnishings industry is comprised of establishments primarily engaged in the manufacture of products such as bedsheets, pillows, pillowcases, bedspreads, comforters, blankets, tablecloths, towels, shower curtains, cushions, mops, and dusters. Woven fabric is the most common material used; and other materials include nonwoven and knit fabrics, plastic, and fillers such as foam, feathers, and fiber. In this industry, the finished goods are made from purchased materials.<sup>6</sup> Housefurnishings that are produced from fabrics (or other materials) made at the same establishment are classified in other portions of the textile mill products industry.

The industry is dominated by a fairly small number of large firms (with 100 or more employees) that account for most of the production and employment. In 1987, 15 percent of the industry's establishments were responsible for 72 percent of industry value of shipments and 69 percent of industry employment. These firms produce most of the standardized household linens—bedsheets and pillowcases, bath

**Table 1. Changes in productivity, output, hours, and all employees in the housefurnishings industry, 1972-91**

| Year                                  | Productivity<br>(output per<br>employee<br>hour) | Output | All<br>employee<br>hours | All<br>employees |
|---------------------------------------|--|--------|--------------------------|------------------|
| 1973.....                             | 5.8  | 5.5    | -0.2                     | 1.8              |
| 1974.....                             | -10.9  | -17.5  | -7.4                     | -5.2             |
| 1975.....                             | 2.4  | -1.9   | -4.3                     | -7.5             |
| 1976.....                             | -2.6   | 7.9    | 10.8                     | 9.5              |
| 1977.....                             | 6.7  | 12.1   | 5.1                      | 5.1              |
| 1978.....                             | -5.8   | 2.3    | 8.6                      | 8.1              |
| 1979.....                             | -2.6   | -9     | 1.6                      | 1.3              |
| 1980.....                             | -1.8   | -8.0   | -6.2                     | -5.1             |
| 1981.....                             | 2.8  | 2.1    | -7                       | -2.2             |
| 1982.....                             | 7.8  | 1.4    | -5.9                     | -3.9             |
| 1983.....                             | -1.1   | 9.2    | 10.4                     | 6.6              |
| 1984.....                             | 2.3  | 4.9    | 2.6                      | 4.2              |
| 1985.....                             | 10.6   | 4.8    | -5.2                     | -4.7             |
| 1986.....                             | 1.3  | 1.8    | .5                       | -4               |
| 1987.....                             | 6.7  | 12.7   | 5.6                      | 4.3              |
| 1988.....                             | -1.8   | -1.4   | .4                       | 1.5              |
| 1989.....                             | -4.7   | .4     | 5.4                      | 3.8              |
| 1990.....                             | 2.7  | .7     | -2.0                     | -6               |
| 1991.....                             | 7.9  | .9     | -6.5                     | -4.8             |
| <b>Average annual rates of change</b> |  |        |                          |                  |
| 1972-91.....                          | 1.2  | 1.7    | .5                       | .5               |
| 1973-79.....                          | -2.3   | -1     | 2.2                      | 1.7              |
| 1979-90.....                          | 2.2  | 2.5    | .3                       | .3               |
| 1990-91.....                          | 7.9  | .9     | -6.5                     | -4.8             |

NOTE: The housefurnishings industry is designated as sic 2392 in the *Standard Industrial Classification Manual* (Washington, Office of Management and Budget, 1987).

towels and wash cloths, and such. The smaller establishments, which make up more than 85 percent of all establishments, but less than 30 percent of the shipments, include firms that produce specialty and high-priced "designer" items.

Some restructuring took place in the home textiles industry during the 1980's. According to one source, "... eight of 10 top companies changed hands in the 1980's." While this includes companies that are not part of sic 2392, it does illustrate the kind of change taking place throughout the entire textile products and apparel industry.

The restructuring is reflected in industry statistics. (See table 2.) The number of establishments in the industry has decreased slightly over the years, while the average size of establishments has increased a bit. According to the 1987 Census of Manufactures, in 1972 there were 1,111 establishments (classified in sic 2392) with 50,300 employees; and in 1987 there were 944 establishments with 50,500 employees. This represents a 15-percent decrease in the number of establishments and almost no change in the number of employees between 1972 and 1987. Average employees per establishment increased from 45 in 1972 to 53 in 1987.

### Employment and earnings

Total employment in the housefurnishings industry increased slightly during the 1972-91 period, growing from 47,000 in 1972 to 51,700 in 1991—an average growth rate of 0.5 percent a year. This compares quite favorably with the 1.7 percent decline in employment experienced by the total apparel and other textile products industry (sic 23) as well as the 0.2-percent decline in total manufacturing employment during the same period.

Despite a drop in output during the 1973-79 period, employment and all-employee hours rose. In the 1973-75 recession, employment declined 6.4 percent and employee hours, 5.9 percent, compared with the 10.0-percent decline in output. From that point on, employment and employee hours rose steadily, giving an average annual growth rate of 1.7 and 2.2 percent, respectively, for the 1973-79 period.

In the 1979-90 period, when output was rising by an average annual rate of 2.5 percent, employment and employee hours barely changed; each by 0.3 percent a year. Employment began to decline in 1980, and continued through 1982; then it began to rise slowly again. Although employment growth was slight during this period, the housefurnishings portion of the total textile and apparel industry did better than some other portions of the industry, in which employment declined rather sharply.

Employment among production workers grew from 39,300 in 1972 to 43,000 in 1991; an average annual growth rate of 0.5 percent. Fluctuations in production worker employment have basically mirrored the movements for all employees. Consequently, the proportion of production workers remained fairly stable over this period, at 84 percent of all employees in 1972, and 83 percent in 1991. During this period, employment for nonproduction workers grew from 7,700 to 8,700, an increase averaging 0.6 percent per year.

Average hourly earnings for the industry's production workers historically have been lower than the average for those in all manufacturing. Average hourly earnings (current dollars) in housefurnishings were \$2.40 in 1972, which was 63 percent of the \$3.82 average for all manufacturing. By 1991, the figure had grown to \$6.89, but remained at about the same proportion (62 percent) of the average hourly earnings for all manufacturing, which had increased to \$11.18.

### Job skills and training

Most of the jobs in the industry involve operating or maintaining sewing machines. A standardized test, available for new job applicants, is used to indicate a person's potential sewing proficiency. Training for production workers varies from very informal at small plants to well organized programs at large plants.

The experiences at one large bed linens plant visited by BLS staff are probably fairly typical of the large plants in this industry. At this plant, employees operating sewing machines are paid a base salary with additional incentive pay tied to output levels. Fourteen weeks of training are considered necessary to teach a person to hem bedsheets and pillowcases well enough to earn the base pay rate. Another 6 weeks of practice is required to acquire the skills necessary to consistently earn 10 to 15 percent more than the base rate. Many more months of practice are necessary to regularly reach higher incentive rates.

Several years ago, the plant invested in automated hemming machines for sheets and pillowcases. Management's objective was to increase output and reduce labor requirements.

It was the department manager's belief that people who were already experienced in manual sewing operations could more easily be trained to operate the new equipment than would people who had no previous sewing experience.

**Table 2. Establishments, employment, and value of shipments in housefurnishings industry, 1972 and 1987**

| Period    | Number of establishments | Number of employees (thousands) | Employees per establishment | Value of shipments (in million dollars) |
|-----------|--------------------------|---------------------------------|-----------------------------|---|
| 1972..... | 1,111.0                  | 50.3                            | 45                          | \$1,526.9                               |
| 1987..... | 944.0                    | 50.5                            | 53                          | 4,530.0                                 |

NOTE: The housefurnishings industry is designated as sic 2392 in the *Standard Industrial Classification Manual* (Washington, Office of Management and Budget, 1987).

SOURCE: Bureau of the Census, U.S. Department of Commerce.

Therefore, all of the new machines are run by operators who were retrained from manual sewing positions. The manager had enough of those operators who were willing to be retrained that there was no need to hire new people from outside of the plant. About 1 week of training was needed for experienced manual sewing machine operators to become basically proficient with the new machines, then about 3 months of working on the machines to become skilled.

The firm successfully reduced labor requirements. Operators, using the new equipment, could hem sheets and pillow cases much more rapidly than was possible with manual sewing operations. As labor requirements declined, the number of employees was reduced via attrition, thereby avoiding employee layoffs because of new technology.

The introduction of automated equipment in this plant has also changed the skill requirements of plant electricians—which has happened in a number of manufacturing industries, such as auto and steel manufacturing.<sup>8</sup> New production machinery uses solid-state electronic controls and is often equipped with a computer terminal or at least a programmable controller. The skills necessary for maintaining and repairing electronic equipment are very different from those required for the electrical and mechanical controls used on older machinery. Before the new equipment was installed, the company began training their electricians in solid-state electronic theory and maintenance work. Presently, training programs exist that allow plant electricians to become progressively skilled, and thereby gain promotions and pay increases. These programs have brought about a general increase in the skill level of the entire electronic maintenance staff at this plant.

Introducing new, more automated equipment into this plant, and retraining workers already employed at the plant to operate and maintain the equipment has increased productivity, according to plant managers. Output for the plant is 10 to 15 percent higher than it was several years ago, prior to bringing in the new equipment, while the number of employees has declined by about one-third.

## Operations and technology

The housefurnishings industry, as noted above, manufactures a diverse range of products, from bedsheets and bath towels to dust mops, polishing cloths, and shoe bags. Roughly half of the industry's value of shipments are concentrated in the manufacture of bedspreads and bed sets, sheets and pillowcases, towels and wash cloths, comforters and quilts, mattress protectors, and blankets.<sup>9</sup>

Many of these products are fairly basic in terms of manufacturing operations: fabric or some other material is cut to a set size or pattern, the edges are hemmed, and the finished product is folded and/or bagged for shipment to customers. Sometimes, fancy stitching may be used on the hems. Zip-

pers may be sewn into pillows. Comforters, pillows, and other quilted products will have stuffing or fiberfill inserted and sewn in place.

Also, most of these products are very standardized. Bedsheets, for example, come in a small range of sizes that are pretty much the same from one manufacturer to another. The same is true for bath towels. These products are often made in large quantities and are produced year around. Because of the long production runs and standardized nature of the products, manufacturing establishments are often dedicated to the production of only certain products. These particular mills have become highly mechanized.

The manufacture of bedsheets begins with a roll of fabric that can be anywhere from 100 yards to 2,000 yards long, depending upon the size of the particular order. After the proper amount of fabric has been cut off the roll, a sewing machine operator feeds the material through a sewing machine to put a hem in the edge of the material. With manual sewing, only the top and bottom of the sheets are hemmed (on all but the most expensive sheets), to avoid the labor cost of sewing hems in all four sides. Now, all four sides are hemmed automatically.

New automated hemming machines for sheets and pillowcases have become available that can operate at higher speeds, with fewer operators, than the older sewing machines. To utilize the new equipment, plants have to adopt a new "width for length" measuring process that has come into use in the industry over the past several years. This process reduces the number of roll widths to two per style. The idea behind this is that certain mattress sizes are the same length from top to bottom, and vary only in how wide they are. Single- and double-size mattresses are the same length, and queen- and king-size mattresses are the same length. A roll of material wide enough to form the length of a single-size sheet is also wide enough to form the length of a double-size sheet, so both sizes of sheets can be made from the one roll. The only difference is that a longer piece of material will be cut from the roll to make a double-size sheet.

Reducing the number of roll widths simplifies the scheduling and material handling operations and reduces inventories required. At one time, the rolls came in as many as eight different widths per style, as there are four mattress sizes in use and two sizes of sheets (fitted bottom sheet and flat top sheet) for each mattress size. In fact, the introduction of automatic sheet sewing (hemming) machines might not have been economically feasible if these machines had to handle a large number of different roll sizes.

The new equipment performs all of the sewing operations automatically, and can hem all four sides of a bedsheets more rapidly than is possible with manual sewing. The roll of fabric is mounted onto the machine, and the leading edge of the fabric is manually fed into the machine. Once the ma-

chine is turned on, it automatically unrolls the fabric, bringing it through the machine. The fabric passes through a pair of sewing heads (one on each side of the machine) that fold both edges of the fabric under and automatically sew a continuous hem down each side of the fabric. The fabric is automatically cut to the size needed for the particular width of sheet being made, rotated (if all four sides are to be hemmed), and the remaining two sides are hemmed. The result is a finished flat sheet.

Several more steps are required to make a fitted sheet. The machines that make fitted sheets cut the corners out of a flat sheet, insert a strip of elastic, then sew the edges together and sew the elastic strip around the newly made corner. As with hemming the edges of a flat sheet, this is a fully automated sewing process. An operator does no sewing, but does load and unload fabric, keep the machine supplied with thread and elastic strips, and monitor machine operations.

One of the plants visited by BLS staff has installed these machines over the last few years. The plant has been able to raise output by 10 to 15 percent over the level that it had when all sewing operations were done manually, but with only two-thirds the number of people previously required. Manual sewing is now limited to production of very high quality sheets and for making occasional repairs to the machine-made sheets.

As with making bedsheets, towel manufacturing has become highly mechanized. In a plant dedicated to towel production, cotton cloth, sometimes folded in 6-foot by 6-foot stacks, is fed into machines that automatically measure towel-sized lengths of cloth, cut them to size, and sew hems into them. Finally, the finished towels are folded, manually in some plants, mechanically in others. Huge quantities of identical towels, which are a staple product in the housefurnishings market, can be produced in such plants. But these plants do not handle small runs of special products very well. Embroidered towels, for instance, are considered a specialty item needed in only small quantities or on certain occasions. Large towel plants commonly subcontract to establishments that specialize in embroidery work.<sup>10</sup>

One of the changes that has taken place in the housefurnishings industry is the entry of new and reorganized medium-sized firms that are often bringing in new technology and fresh production and marketing ideas. These firms are smaller than the traditional established plants, and are very agile and competitive. They tend to produce for specialty markets and for the high-priced designer market. Given the nature of their markets, production runs may be small. At one plant visited by BLS staff, some orders were for as few as 100–150 units. The ability to make frequent and fast changes of patterns and materials are a necessary part of their operations.

Production operations at these plants are sometimes, but not always, highly automated. Production runs of specialty and designer fabrics can be so small, and require such fre-

quent changes, that the cost of automated equipment will not be justified.

For example, a plant owned by a medium-sized firm that produces a range of products (including comforters, ruffled shams, sheets, and pillowcases) conducts most of the sewing operations manually. An operator sits in front of a sewing machine and runs the fabric through the sewing head by hand. These operations include the sewing done to make fitted bedsheets, dust covers, pillow shams, and comforters with piping around the seams, as well as any attachments of lace or wide borders to sheets.

Other operations at this plant, however, are highly automated. For instance, the plant recently replaced 4-year-old computerized quilting equipment with even newer computerized equipment, and was in the process of building a highly automated product sorting and warehousing system, all as part of a new, technologically advanced production and distribution center.

The sorting and warehousing system is probably more advanced than is usual in this industry. Finished products, with bar code labels placed on them during the manufacturing process, enter the warehouse area on conveyors, and are electronically scanned. Once identified, the products are sent either to particular areas of the loading dock for immediate shipment to customers, or to particular pallets, each of which has an electronic address, for warehouse storage. All of the sorting and pallet loading is done automatically. When the pallets are loaded, they are moved by one of several large forklifts, each equipped with a computer terminal. The forklift operator uses a handheld barcode reader to identify the product, enters the identification into the computer terminal, and finds out where to store the pallet.

The computerized quilting and sewing equipment that has become available offers the advantages of high speed sewing operations, improved flexibility in design and sewing operations, and reduced floor space requirements for machinery.

This equipment is more complex than earlier types of machinery, and the skill requirements for equipment operators and maintenance personnel have changed. As has been discussed elsewhere in this article, operators must be trained to use the computer terminals that often are part of this equipment, and maintenance personnel must be trained, or retrained, as is often the situation, in solid-state electronic theory and applications.

Using computer aided design (CAD), a wide range of design patterns and stitching speeds can be programmed into computerized quilting machines. These new machines sew at speeds up to 30 percent faster than conventional cam-driven quilting machines. The quality of the stitching is improved because the computerized machines sew in perfectly straight lines, can eliminate crowded stitches and inaccurate curves, and can stop and sew anywhere, while cam-

driven machines have problems in all of these areas. Patterns can be changed in less than three minutes, compared with the 20- to 40-minute requirement in conventional machines. One firm estimates that productivity has increased 15 percent using the new computerized quilting machines. The new machines, however, are expensive. A computerized quilter with CAD capabilities can cost more than \$100,000, compared with the \$3,000 cost of a used, noncomputerized, hand-guided machine. Because of the high cost and the present financial state of many establishments in this industry, only about one-quarter of all quilting firms have invested in CAD and computerized quilting equipment.<sup>11</sup>

High-speed folding machines are available to home textile manufacturers that can fold a range of different products. There is a four-sided folding machine available for sleeping bags and comforters, and a high-speed folding machine that handles products up to 45 inches in width, which will fold products such as pillowcases and towels, at a rate of 30 per minute. One plant uses two machines that automatically fold bedsheets at a rate of 3,500 sheets in an 8-hour shift, compared with the 1,400 sheets that were folded manually during an 8-hour shift before the folding machines were installed several years ago.

Some housefurnishing manufacturers are incorporating quick-response procedures into their operations. This is a method of electronic order placing that was originally developed in the apparel industry. It allows retailers to minimize inventory stock (which becomes very important to small specialty retailers, or to any retailer carrying small stocks of expensive designer fabrics) because they can quickly reorder what they need, or place new orders in response to changes in consumer taste. As some bed and bath textile manufactur-

ers aim their products toward the designer segment of the market, the retailers, whom they supply, will increasingly need this quick ordering capacity.

This technology was not widely used in household furnishing plants until the early 1990's. A survey conducted in 1991 by an industry trade publication indicated that, while interest in quick-response processes was high, only a relatively small number of firms in the textile and apparel industry had actually invested in quick-response technology, and investments had primarily been made by the larger firms in the industry with annual sales exceeding \$200 million.<sup>12</sup> One quilting firm, for instance, has provided office space within its plant for several customers, who in turn have quick-response connections with their own largest retail customers.<sup>13</sup>

Since 1993, however, the use of quick-response technology has become much more commonplace, in part because of easier access to the technology through personal computer systems and software. Presently, companies that do not adopt quick-response procedures have difficulty fitting into the distribution chain of most retail and mail order customers.<sup>14</sup>

NEW TECHNOLOGY AND PROCESSES are capable of improving productivity in the housefurnishings industry. Over the past several years, these technologies were introduced in some large and mid-sized plants, but the pace of technological change is not very rapid in the industry as a whole. Many establishments in this industry are small, with limited capital resources and limited needs for high output and "high-tech" equipment. These small establishments, while slowly diminishing in number and importance, still have a strong impact on the overall pace at which new technology is introduced in the housefurnishings industry. □

## Footnotes

<sup>1</sup> The housefurnishings industry is designated by the Office of Management and Budget as SIC 2392 in the *Standard Industrial Classification Manual*. (Washington, Office of Management and Budget, 1987). The industry consists of the following 5-digit product classes:

23921 - Bedspreads and bedsets

23922 - Sheets and pillowcases

23923 - Towels and washcloths

23924 - Other housefurnishings

23920 - Housefurnishings, not elsewhere classified

All average annual rates of change pertaining to the industry and mentioned in the text or in tables are based on the compound interest method of computation. The indexes for productivity and related variables are updated and published annually in the BLS publication, *Productivity Measures for Selected Industries and Government Services*.

<sup>2</sup> As designated by the National Bureau of Economic Research, Cambridge, MA.

<sup>3</sup> Marita Thomas, "Special report: Home textiles in the 1990s," *Textile World*, October 1989, p. 61.

<sup>4</sup> "By the numbers: The five year report," *Home Fashions Magazine*, June/July 1993, pp. 27, 28, 30, 32, 36, 38, and 40.

<sup>5</sup> Data provided by industry sources.

<sup>6</sup> Housefurnishings that are produced from fabrics or other materials that are made at the same establishment are classified in other portions of the textile products industry—in SIC 2211, 2221, 2231, or 2299, depending upon the materials used.

<sup>7</sup> Jules Abend, "Winds of change," *Bobbin*, February 1993, p. 52.

<sup>8</sup> *The Impact of Technology on Labor in Four Industries*, Bulletin 2228 (Bureau of Labor Statistics, 1985), p. 47; and *Technology and Its Impact on Labor in the Steel Industry*, Bulletin 2435 (Bureau of Labor Statistics, 1994).

<sup>9</sup> *1987 Census of Manufactures, Miscellaneous Fabricated Textiles Products*, table 6a-1.

<sup>10</sup> Information provided by industry sources.

<sup>11</sup> Dee Palaganas, "Quilting with computers," *Apparel Industry Magazine*, March 1992, pp. 34, 36, 38.

<sup>12</sup> Steven D. Sprinkle, Christopher C. Hooper, and Henry L. Mix, "U.S. textiles is slow implementing info systems," *Textile World*, January 1992, pp. 81, 82.

<sup>13</sup> Dee Palaganas, "Clients get the ax," *Apparel Industry Magazine*, March 1992, pp. 40-42.

<sup>14</sup> Information provided by industry source.