Productivity in hardwood dimension and flooring

Productivity in this industry grew less than 1 percent a year during the 1972–91 period; output stood still, and employee hours declined an average of almost 1 percent annually

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Productivity growth in the hardwood dimension and flooring industry averaged 0.9 percent annually from 1972 to 1991.[1] Small firms dominate the industry. Production tends to be labor intensive, with new technology being slow to disperse throughout the industry. The industry also experienced many changes in the demand for its products as consumer preferences changed. As a result, manufacturing efficiency often became expendable, exchanged for greater flexibility in production, in order to produce the largest range of products. Output over the period realized zero net growth, and employee hours fell by 0.8 percent annually.

Productivity declined nine times, and output dropped eight times, during the 1972–91 period. The productivity trends can be divided into two subperiods: 1973–79 and 1979–90. As shown in table 1, during 1973–79, productivity (output per employee hour) fell 0.7 percent per year. The hardwood dimension and flooring industry felt the effects of the 1973–75 recession, with output, hours, and productivity all declining from 1973 to 1979. The second subperiod, 1979–90, was more positive, with industry output and productivity moving upward in response to growth in demand and some industry consolidation.

The productivity indexes developed for the hardwood dimension and flooring industry represent the change over time in the ratio of the weighted outputs of the industry's products to employee hours. The output indexes are developed using a deflated-value technique. Value-of-shipments data for the various product classes within the industry are converted to a constant-dollar basis using BLS producer price indexes. Indexes of constant-dollar values are combined with fixed-period employee hour weights to derive an industry output index. This index is adjusted for industry coverage and the net change in inventories. The result is an index of industry production. Annual output indexes are benchmarked to more comprehensive data available every 5 years in the Census of Manufactures. A more complete description of the methodology used to construct these measures is contained in the appendix.

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Output

The hardwood dimension and flooring industry manufactures primarily hardwood dimension, either semifabricated or ready for assembly; hardwood flooring; wood frames for household furniture; and hardwood dimension lumber. Hardwood dimension is kiln-dried wood, cut and surfaced to a specific thickness, width, and length to meet the specifications of particular customers. It is used primarily for furniture. Hardwood dimension lumber is lumber cut by quarters (1/4

inch thick) and sold in various widths and lengths. Like hardwood dimension, it may be surfaced or sanded, but it is not cut and shaped to the specifications of the buyer. Hardwood flooring is made from lumber, kiln dried to a moisture content of 5 to 6 percent. Examples of the industry's products are oak flooring, parquetry, maple, and plank flooring, as well as parts for beds, chairs, cabinets, desks, tables, and other items of furniture.

Demand in the industry is usually affected by the general strength of the economy, but particularly the housing market, including expenditures on renovation and improvement. Seasonal changes affect demand only slightly, as flooring is installed indoors and furniture part production follows furniture production cycles.

Over the period of the study, there was zero net growth in output. From 1973 to 1979, output fell at an average annual rate of 1.6 percent. The industry recorded a major decline in output during this period, partially as a result of the 1973–75 recession. Output fell 17.2 percent from 1973 to 1974, as housing starts plunged 35.0 percent and sales of existing one-family homes fell about 3.0 percent.[2] The decline in output partially resulted from the diminishing use of hardwood flooring in residential construction after a change in Federal Housing Administration regulations in 1966. In that year, the agency approved the use of then-popular wall-to-wall carpeting as an acceptable flooring substitute for hardwood floors.[3] Output continued to fall until 1976, when it posted a 10.1-percent increase.

From 1979 to 1990, output increased at an average annual rate of 1.4 percent. Rebounding from a slump that started in 1979 and continued through the 1981–82 recession, the industry realized output growth at an average annual rate of 8.5 percent from 1982 to 1987. (See chart 1.) A 52-percent increase in housing starts and a 77-percent increase in sales of existing single-family homes contributed to this growth.[4] Also, during the period, Americans more than doubled expenditures on the repair and renovation of their homes.[5]

Output growth was also strengthened by an increase in the use of hardwood flooring. The use of hardwood flooring in residential construction rose dramatically as consumer tastes shifted away from wall-to-wall carpeting and back to hardwood floors. Improvements in flooring finishes, which reduced maintenance work, helped buoy hardwood flooring use as well. Hardwood flooring shipments jumped from 69.91 board feet per housing start in 1985 to 172.04 board feet per start in 1990, a 146-percent increase.[6] The trend toward larger new homes also affected output during the 1979–90 period. Larger homes often lead to purchases of more home furnishings, which translate into stronger demand for furniture parts. Furthermore, larger homes may lead to the use of more hardwood flooring during construction.

Earnings and employment

Production worker average hourly earnings in the industry have historically been and remain below the average of all manufacturing. In 1972, production worker average hourly earnings in the industry were $2.48, compared with $3.82 for all manufacturing. By 1991, the industry's average hourly earnings rose to $7.85, with the average in manufacturing increasing to $11.18.

Over the 1972–91 period, total employment in the hardwood dimension and flooring industry decreased 11.0 percent, falling from 36,800 in 1972 to 32,600 in 1991.[7] This represented an average annual decline of 0.6 percent a year. In 1982, 25,500 paid employees in the industry represented the nadir of employment for the entire period. This low point came in the midst of a recession, and the industry lost many small establishments (most of them in Appalachia). Employment declines mainly appeared just prior to and within the early stages of economic downturns. The largest employment decrease from 1972 to 1991 occurred during the 1973–75 recession. Employment fell 10.0 percent between 1973 and 1974 and an additional 20.6 percent in 1975. Employee hours followed suit, with reductions of 11.6 percent and 21.3 percent for the respective periods, reflecting additional drops in average weekly hours. The next major downturn started in 1979 and proceeded through the recession of 1981–82. From 1979 to 1982, employment fell at an average annual rate of 9.4 percent, and employee hours decreased 10.7 percent.

After 1982, employment recovered on the strength of a rejuvenated housing market and an associated increase in demand for flooring materials. Only three employment declines occurred during the 1982–91 period. Over the period, employment increased at an average annual rate of 2.8 percent, and employee hours rose 3.1 percent.

The number of production workers decreased at an average annual rate of 0.8 percent, falling from 32,900 in 1972 to 28,500 in 1991. By contrast, nonproduction worker employment *grew* at an annual rate of 0.3 percent, increasing from 3,900 in 1972 to 4,100 in 1991. The proportion of production workers to total employees remained stable over the period, moving from 89 percent in 1972 to 87 percent in 1991.

Technology

Traditional woodcutting technology, used throughout the hardwood dimension and flooring industry, consists of crosscut and rip meth-

Table 1. **Changes in productivity, output, hours, and all employees, hardwood dimension and flooring, 1972–91**

Year	Productivity (output per employee hour)	Output	All employee hours	All employees
Annual percent change:				
1973	3.6	0.2	–3.3	–1.8
1974	–6.3	–17.2	–11.6	–10.0
1975	26.7	–.3	–21.3	–20.6
1976	–9.3	10.1	21.4	17.8
1977	–1.8	2.3	4.2	4.9
1978	2.8	9.3	6.4	5.7
1979	–11.7	–10.7	1.1	1.8
1980	2.7	–10.6	–12.9	–10.2
1981	2.8	.1	–2.7	–4.2
1982	9.2	–8.3	–16.0	–13.6
1983	–6.4	8.3	15.8	10.9
1984	–3.9	8.5	12.9	12.7
1985	10.3	8.1	–2.0	–1.5
1986	4.2	8.9	4.5	2.2
1987	1.7	8.9	7.1	5.9
1988	–3.0	–1.9	1.1	3.5
1989	–.8	.2	1.1	1.7
1990	–.9	–4.4	–3.5	–2.8
1991	2.3	–4.8	–6.9	–6.3
Average annual rate of change:				
1972–91	.9	.0	–.8	–.6
1973–79	–.7	–1.6	–.9	–.8
1979–90	1.3	1.4	.0	.1

ods. These methods reflect various ways of using circular saws to cut horizontally and vertically in order to produce defect-free rectangular pieces of wood. The process, however, cannot avoid certain inefficiencies. For example, often after a first cut, another clear area will be made shorter or narrower in the process. The clear material is wasted because it is cut into smaller pieces than desired. From 5 to 8 percent of this waste is caused by the *kerf*, which is the channel made by the blade of the saw. Thus, decreasing the kerf increases the yield per board.[8] In an industry in which material costs can account for 40 percent to 50 percent of sales, it becomes increasingly important that firms obtain the most efficient use of their materials as the availability of harvestable timber diminishes and costs for lumber escalate. Efficiency in a hardwood dimension plant is measured by the percentage of surface board feet of rectangular parts cut from total board feet of rough lumber brought to the plant. Yields of 40 percent to 60 percent are common in hardwood dimension mills that use graded hardwood lumber. Factors that influence yield include grade of lumber, quality and size of the required part, and limitations of the processing equipment used.[9] The challenge is to remove defective areas without cutting into other parts of the board that are acceptable, thus maximizing yield.

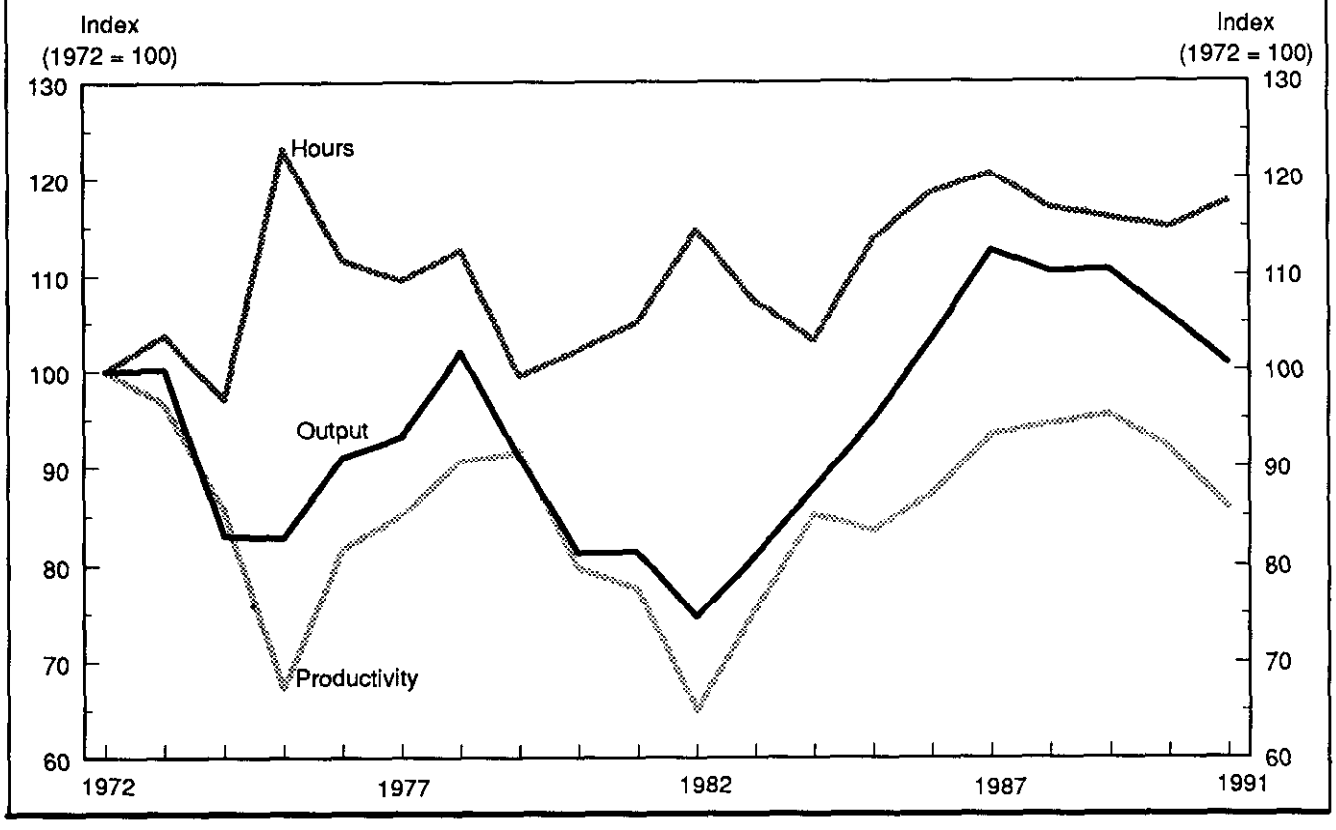
According to industry sources, new technology introduced over the last 4 years may help maximize output and increase productivity.[10] Included are scanners to detect defects, automatic feeders, lasers to assist in cutting, computers, computer-controlled blades, and electronic memory devices. Diffusion of this new technology has been slow because the industry still consists of hundreds of small firms, many of which simply cannot afford the equipment.

The hardwood dimension and flooring industry provides the furniture industry with furniture parts and wood frames for household furniture. Like clothing, furniture can be subject to short product life cycles as styles change. Thus, the hardwood dimension and flooring industry is required to respond quickly to the needs of furniture producers. Automation, which in other industries is a common way of increasing responsiveness, is often cost prohibitive in the hardwood dimension and flooring industry. Hence, unlike some industries—electronics, for example—in which a technological advance such as the introduction of personal computers changes the entire industry and forces firms to adapt in order to stay competitive, the hardwood dimension and flooring industry's firms remained competitive using outdated and less efficient production methods. Some firms have even been willing to trade efficiency for the ability to change production processes quickly in order to meet the shifting styles and designs of furniture.

Industry description and structure

According to the Census of Manufactures, the number of establishments in the hardwood dimension and flooring industry declined steadily from 933 to 737 between 1972 and 1987, as the value of shipments almost tripled (from $579.0 million to $1,714.0 million). Historically, the industry consisted of hundreds of small establishments, but more recently, consolidation has taken place through mergers and acquisitions, as well as the effects of recessions. The reduction in the number of establishments appears to be coming at the expense of smaller firms. In 1972, the number of firms with fewer than 20 employees represented 61 percent of all establishments; by 1987, the figure decreased to 53 percent. The size of establishments increased, rising from slightly less than 34 employees per establishment in 1972 to about 41 in 1987. Almost 50 percent of those employed in the industry are located in North Carolina, Tennessee, Mississippi, and Arkansas.

Chart 1. **Output, hours, and productivity in the hardwood dimension and flooring industry, 1972-91**



Outlook

The continuing economic recovery will likely lead to increased activity in the housing sector and increased demand from the furniture industry for wood furniture parts and frames. During recessions, consumers are reluctant to make large purchases, because of job security concerns, slower income growth, and a heavy debt load. Also, during times of economic uncertainty, furniture purchases, which are generally of a discretionary nature, are often postponed, thus keeping demand low for hardwood dimension products.

Conversely, in recoveries, the hardwood flooring segment of the industry may expect to realize steady increases in shipments and demand,[11] as a result of increasing housing starts, rising sales of existing homes, and increasing furniture purchases. Furthermore, the proportion of people aged 35 to 54 years is projected to expand by the year 2000.[12] This segment of the population, which generally enjoys a higher level of discretionary income, is the principal market for upscale, brand-name furniture produced by U.S. manufacturers.

Productivity improvements in the hardwood dimension and flooring industry will likely receive higher priority as the cost of labor and materials continues to increase. Manufacturers will search for new technologies and processes to improve efficiency and quality in order to lower production costs.

Footnotes

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[1] The hardwood dimension and flooring industry is designated by the Office of Management and Budget as SIC 2426 in the 1987 *Standard Industrial Classification Manual.* 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.*

[2] *Statistical Abstract of the United States: 1993* (Bureau of the Census, 1993), pp. 718, 720.

[3] News release OF–2–276-/D25 from National Oak Flooring Manufacturers' Association, Memphis, June 1991.

[4] *Statistical Abstract: 1993,* pp. 718, 720.

[5] *1987 U.S. Industrial Outlook* (Department of Commerce, 1987), p. 4–7.

[6] Data from the National Oak Flooring Manufacturers' Association, Memphis, January 1992.

[7] Data pertaining to employment and hours are from *Employment, Hours, and Earnings, United States, 1909–90*, Vol. 1, Bulletin 2370 (Bureau of Labor Statistics, March 1991); and *Employment, Hours, and Earnings, United States, 1981–93*, Bulletin 2429 (Bureau of Labor Statistics, August 1993).

[8] Henry A. Huber and Powsiri Klinkhachorn, "Lumber Processing: A Glimpse of the Future," *Wood & Wood Products*, September 1991, p. 55.

[9] Henry A. Huber, "The Development of ALPS (Automated Lumber Processing System) in the U.S.A.," *Proceedings: The First International Conference on Automated Lumber Processing Systems and Laser Machining of Wood* (East Lansing, MI, Michigan State University, 1990), pp. 139–47.

[10] Telephone conversation with S.V. Lawser, executive director, National Dimension Manufacturing Association, March 1992.

[11] Telephone conversation with Patsy Davenport, National Oak Flooring Manufacturers' Association, Oak Flooring Institute, March 1992.

[12] *Statistical Abstract: 1993*, p. 17.

APPENDIX: Measurement techniques and limitations

Indexes of output per employee hour measure changes in the relationship between the output of an industry and the employee hours expended on that output. The indexes do not measure the specific contributions of labor, capital, or any other single factor. Rather, they reflect the joint effect of factors such as changes in technology, capital investment, capacity utilization, plant design and layout, skill and effort of the work force, managerial ability, and labor-management relations. An index of output per employee hour is derived by dividing an index of output by an index of industry employee hours.

Output indexes measure the change in industry output over time. The output indexes for the hardwood dimension and flooring industry were constructed in two stages. First, output indexes were constructed using the deflated-value technique. This technique removes the price change from the current-dollar value of the industry's production. The hardwood dimension and flooring industry consists of one four-digit industry, SIC 2426, which contains four five-digit product classes: SIC 24261, hardwood flooring; SIC 24262, hardwood dimension stock, furniture parts, and vehicle stock; SIC 24266, wood furniture frames for household furniture; and SIC 24260, hardwood dimension and flooring, n.s.k. (not specified by kind). The value of shipments for each product class, obtained from the Bureau of the Census, is deflated with matching BLS producer price indexes.

The deflated value-of-shipments indexes are combined with employee hour weights to derive the industry quantity-of-shipments index. This index is adjusted for net changes in inventory and for coverage to bring the data on establishment-coded product class shipments up to the level of data on total industry shipments. The annual industry output series is adjusted, using linear interpolation, to the index levels of the benchmark output series.

Benchmark indexes are developed every 5 years, based on data from the quinquennial Census of Manufactures. The benchmark series incorporates the more comprehensive, but less frequently collected, economic census data. The procedure for developing benchmark indexes follows the deflated-value methodology stated above. To arrive at the final benchmark output index of production, adjustments are made to reflect both net changes in inventories and changes in industry coverage.

Employment indexes and employee hour indexes measure the change in the aggregate number of employees and employee hours, respectively, over a period of time. Employment and employee hours are considered homogeneous and additive. Hence, changes in employment characteristics, such as the skills, education, and experience of persons, are not reflected in the employee hour indexes. The employee hour data relate to the total time expended by the employees in establishments that are classified in the industry and include hours spent on the production of primary and secondary products.

The indexes of all employees, all employee hours, production workers, production worker hours, nonproduction workers, and nonproduction worker hours developed for the hardwood dimension and flooring industry are based on data published by BLS. The index of employee hours is derived from (1) production worker hours, (2) the number of nonproduction workers, and (3) an estimate of average weekly hours paid for nonproduction workers. Estimates of nonproduction worker average weekly hours were prepared by BLS for SIC 24—lumber and wood products, except furniture—and were derived primarily from studies undertaken by the Department of Labor.

Average hours for nonproduction workers are multiplied by the number of nonproduction workers to obtain total nonproduction worker hours. Nonproduction worker hours are added to production worker hours to derive total employee hours.