

The office furniture industry: patterns in productivity

Product proliferation and short production runs limited the use of laborsaving equipment in office furniture establishments; as a result, productivity grew only moderately during 1958–80

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Productivity growth (as measured by output per employee hour) in the office furniture industry¹ has been low, in large part because of relatively short production runs engendered by product proliferation. Between 1958 and 1980, the industry posted an average annual productivity gain of 1.8 percent, substantially below the 2.8-percent rate for all manufacturing industries. The gain resulted from growth in output of 5.5 percent, annually, and employee hours of 3.6 percent.

In many industries, declines or small gains in output are associated with reduced or even negative growth in productivity. This seems to be true of the office furniture industry as a whole. (See table 1.) Thus, in the 9 years in which output either declined or grew at a less than average rate, productivity either fell or grew at a less than average rate in 5 of these years.

The trend in productivity for the overall office furniture industry must be viewed in light of the underlying trend movements of the two component industries—wood office furniture and metal office furniture. Metal furniture is the dominant industry in the office furniture group, employing about two-thirds of the 53,000 workers and accounting for roughly the same percent of shipments. Although both industries exhibited nearly the same growth in productivity between 1958 and 1980 (1.7 percent for wood furniture and 1.8 percent for metal furniture), the growth in output and employee hours was more diverse, with both output and hours grow-

ing at much higher rates in the wood component (7.2 percent and 5.5 percent) than in metal (4.6 percent and 2.8 percent).

The metal office furniture industry, which experienced five output downturns between 1958 and 1980, was, nevertheless, able to maintain productivity growth in all but 2 of these years. This suggests that the industry's work force is flexible and can be rapidly reduced if industry sales are declining. However, the wood office furniture industry was never able to maintain positive productivity during the six declines in output from 1958 to 1980. The more highly skilled work force, utilizing craftworkers, in the wood segment may be more difficult to periodically layoff and rehire.

Productivity trends have varied

The industry's long-term productivity growth can be divided into three periods (table 1). From 1958 to 1966, productivity grew at a rate of 3.6 percent annually. Slowing dramatically, productivity growth advanced by only 0.1 percent per year during the middle time span—1966 to 1975. However, from 1975 to 1980, the rate of advance increased to 5.1 percent per year.

Recession-induced falloffs were particularly acute from 1966 to 1975. During the 1970 recession, industry output dropped 17 percent while employee hours were reduced by 6.6 percent. Consequently, productivity in 1970 fell by more than 11 percent. During the 1974–75 recession, output declined 5.3 percent in 1974 and 17.7 percent in 1975 while productivity posted its largest falloff in 1974 (–8.3 percent). More recently, productivity exhibited positive growth during the short reces-

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Table 1. Productivity and related indexes for the office furniture industry, 1958-80

[1977 = 100]

Year	Output per employee hour	Output	All employee hours	Employees
1958	64.0	33.1	51.7	51.8
1959	69.8	37.5	53.7	52.9
1960	70.4	39.4	56.0	54.7
1961	72.5	38.4	53.0	51.8
1962	74.4	42.1	56.6	55.8
1963	75.9	45.6	60.1	58.7
1964	82.1	50.8	61.9	60.0
1965	84.2	57.5	68.3	64.9
1966	86.7	67.9	78.3	74.7
1967	86.5	69.7	80.6	78.2
1968	85.2	70.9	83.2	78.7
1969	88.0	81.4	92.5	88.9
1970	78.2	67.6	86.4	82.7
1971	83.9	64.8	77.2	74.9
1972	91.8	82.7	90.1	87.3
1973	90.6	87.5	96.6	94.4
1974	83.1	82.9	99.8	98.9
1975	85.5	68.2	79.8	81.8
1976	89.7	75.8	84.5	85.6
1977	100.0	100.0	100.0	100.0
1978	100.1	108.1	108.0	107.8
1979	107.3	121.1	112.9	110.9
1980	108.9	125.9	115.6	118.4
Average annual rates of change				
1958-80	1.8	5.5	3.6	3.8
1958-66	3.6	8.4	4.6	4.1
1966-75	0.1	1.4	1.4	2.0
1975-80	5.1	13.9	8.3	8.0

sion in 1980. However, this gain in productivity (1.5 percent) was somewhat less than the industry's long-term growth (1.8 percent per year).

Among the component industries, the same midterm pattern of productivity slowdown is evident. (See table 2.) From 1958 to 1966, productivity advanced in both industries at about 3.6 percent per year. But from 1966 to 1975, productivity fell at an annual rate of 1.1 percent in the wood component while advancing by only 0.5 percent per year in the metal furniture industry. Rebounding from the recession-marked middle period, productivity advanced sharply from 1975 to 1980 in the wood and metal industries—7.2 and 3.8 percent, respectively. Output in this recovery period was up sharply in both industries, paced by the nearly 22-percent average annual growth in wood furniture. Lagging somewhat behind wood furniture, the output of metal furniture increased by about 10 percent per year during this later period, as market share was lost to the more natural look and feel of wood.

Office furniture demand growing

Between 1958 and 1980, output of the office furniture industry grew at an average annual rate of 5.5 percent per year, substantially above the 3.8-percent average rate for all manufacturing industries. A number of factors have shaped the demand for office furniture and the

industry's output growth. Some of these factors have included the amount of available office space, growth of the white-collar work force, replacement demand, and the introduction of new products.

The most important factor influencing the long-term growth of office furniture undoubtedly has been the growth of the white-collar or office work force. Between 1958 and 1980, white-collar workers have grown from about 27 to nearly 53 million. Currently, offworkers account for slightly more than one-half of the total employed work force.² This translates into a 2.9-percent average annual increase. Available office space also is a determinant of office furniture demand. The amount of public and private detached office space doubled between 1958 and 1980.³

As the stock of existing office furniture grows, the demand for replacement of wornout or obsolete equipment grows also. The data suggest that in recent years roughly one-third of office furniture production has been consumed by the replacement market.⁴

The introduction of new products also stimulates increased demand for office furniture. In the past, office furniture usually consisted of desks, chairs, tables, and storage equipment, sold as individual pieces. Now, modular or systems furniture is sold as complete integrated packages that include movable partitions, storage components, and service modules. Advantages claimed

Table 2. Productivity indexes for the office furniture and two component, 1958-80

[1977=100]

Year	All office furniture	Wood furniture	Metal furniture
1958	64.0	67.1	64.5
1959	69.8	69.5	71.6
1960	70.4	68.0	72.7
1961	72.5	70.5	74.7
1962	74.4	69.9	77.9
1963	75.9	80.4	75.9
1964	82.1	84.5	82.9
1965	84.2	82.8	86.3
1966	86.7	85.9	88.3
1967	86.5	88.1	87.6
1968	85.2	87.7	86.2
1969	88.0	91.9	88.5
1970	78.2	83.9	78.0
1971	83.9	81.2	86.4
1972	91.8	84.5	96.7
1973	90.6	78.5	97.9
1974	83.1	83.0	84.5
1975	85.5	80.5	88.9
1976	89.7	81.9	94.8
1977	100.0	100.0	100.0
1978	100.1	100.7	99.9
1979	107.3	110.7	104.8
1980	108.9	109.2	108.6
Average annual rates of change			
1958-80	1.8	1.7	1.8
1958-66	3.6	3.5	3.6
1966-75	0.1	-1.1	0.5
1975-80	5.1	7.2	3.8

for systems furniture include design flexibility, more efficient use of floor space, low rearrangement costs, and built-in electrical outlets. In recent years, systems furniture has outpaced the growth of conventional office furniture. Currently, systems furniture accounts for about 20 percent of the total office furniture market. Computers and word processors, which require support furnishings, have also resulted in increased demand for office furniture.

Industry employment more than doubles

The number of employees in the office furniture industry increased from 23,000 in 1958 to about 53,000 in 1980. Sustained expansion of the work force during the 1960's accounted for much of this growth.

While the overall employment growth for the industry was 3.8 percent per year from 1958 to 1980, employment trends varied among the subindustries. The work force in the wood office furniture industry expanded at an average of 6.0 percent per year. The metal furniture industry grew at less than half of that—2.8 percent per year.

Compared with other manufacturing industries, office furniture production is relatively labor intensive. About 10 percent more production worker hours are needed to generate \$1 of added value in office furniture than in all manufacturing. Among the component industries, wood office furniture is the most labor intensive.

Production workers accounted for 79 percent of total industry employment in 1980, down slightly from the 81 percent reported in 1958. About 25 percent of the industry's workers in 1980 were women, slightly less than the 31 percent level for all manufacturing. Average hourly earnings of production workers—\$5.92 in 1980—were somewhat below that of the all manufacturing rate of \$7.27. Over the long term, employee turnover has been slightly below that of the all manufacturing rate.

Industry establishment size increasing

Although office furniture production is geographically dispersed throughout the United States, there is a large concentration of firms in Ohio, Indiana, Illinois, Michigan, and Wisconsin, with many plants clustered in and around Grand Rapids, Mich. Until World War II, the Grand Rapids area had been a major center for household furniture. After the war, the household furniture industry dispersed, and commercial and office furniture manufacturers moved in to fill the void.

From 1958 to 1977, the number of establishments in the industry has been growing. In the wood segment, the number of establishments more than doubled, while in metal furniture, the number increased by only 25 percent. For the industry as a whole, average employment size per establishment increased by about 12 percent. During the same period, companies primarily manufac-

turing office furniture increased from 289 in 1958 to 486 in 1977—most of this growth occurring in the wood furniture segment. At the same time, the proportion of industry shipments accounted for by the four largest companies in each industry increased modestly.

Between 1975 and 1980, the average annual growth in capital expenditures per employee was lower for the office furniture industry than for all manufacturing. For example, from 1958 to 1975, capital expenditures per employee grew at an annual rate of 6.3 percent in office furniture, while the all manufacturing rate over the same time period was 7.5 percent. Productivity growth over this period was also lower in the office furniture industry than in all manufacturing. From 1975 to 1980, however, capital expenditures per employee accelerated to 29.6 percent per year, compared with a rate of 11.1 percent for all manufacturing. Productivity from 1975 to 1980 increased sharply also, growing at a rate of 5.1 percent. The level of expenditures per employee, however, has been substantially less than all manufacturing. In 1980, the office furniture industry expended roughly \$2,900 per employee for new capital equipment while the all manufacturing average was almost \$3,700.

Manufacturing innovations limited

Typically, production in the office furniture industry takes place at mechanized work stations with workpiece transfer accomplished by conveyor line, forklift truck, or handcart. The wood furniture industry employs general purpose woodworking machinery such as saws, planers, glue presses, and sanders. Basic operations in the metal furniture industry include metal cutting, stamping, welding, and tubefforming. With minor differences, both industries have common operations such as painting and upholstering. Obviously, many of the processes used for manufacturing wood furniture bear little resemblance to those used for metal furniture. However, even within the component industries, variations in equipment and processes are evident. This is particularly true of wood furniture. Some of the finer grades are produced almost entirely by hand, while the less expensive grades are produced in assembly line fashion.

Product proliferation is a problem within the office furniture industry, and this has hindered the introduction of special purpose and highly efficient machinery and equipment. While the household furniture industry finds it relatively easy to drop product lines and styles, office furniture companies must maintain the capacity to produce old as well as new product lines. This problem is particularly acute in the more expensive wood office furniture lines. Reorders of wood furniture must match style as well as wood grain pattern and color (which may not be the same as when the pieces were new).

Therefore, the potential number of product types, styles, and colors, coupled with the bulkiness of furni-

ture, discourage factories from accumulating large inventories of finished goods. Most office furniture, perhaps as much as 90 percent, is for order rather than inventory. Office furniture dealers do not stock large inventories either; rather, an accumulation of customer orders is periodically sent to the factory. This results in short production runs of individual items.

This diminished ability to control production runs may be one of the reasons productivity growth in the office furniture industry has been less than that of the household furniture industry.⁵ The office furniture industry must remain even more flexible in terms of production capabilities than household furniture manufacturers, many of whom are also troubled by short, inefficient production runs and difficulty in incorporating highly specialized and efficient equipment. Nevertheless, some notable advances in the technology of manufacturing office furniture have been introduced.

In the wood office furniture industry, one of the most pronounced trends in innovation has been increased use of particleboard. While the primary impetus for the expanded usage of particleboard has been its lower cost in relation to the cost of solid lumber, the industry has focused considerable attention on new technologies to handle the material. A wide variety of surface laminates and films and application techniques have eliminated several time-consuming production and assembly operations. Groove-folding, a technique whereby V-shaped grooves are cut in the particleboard substrate, but not through the flexible surface material, produces seamless furniture edges which are held in place by the continuous outer wrap.⁶

Although somewhat hampered by increased petrochemical prices in recent years, the use of plastic materials has simplified construction and added strength to furniture components, and can also produce mar-resistant surfaces. Reconstituted wood veneer, another advance in materials, has uniform thickness, grain, and quality and can be evenly stained. Its use eliminates the need for the labor intensive procedure of manually grading, selecting, and removing defects from natural veneers.

In addition to new materials, notable advances have occurred in woodworking machinery. Abrasive planing, introduced in the early 1960's, combines heavy stock removal with direct dimensioning at the sanding machine.⁷ Machines which glue and trim veneer strips to the edges of particleboard can eliminate the complicated set of clamps and pressure bands which formerly had to be locked in place until the glue dried.

In the metal office furniture industry, machines have recently been installed that automatically position and cut shapes into the large flat metal blanks that later will be fashioned into desks, file cabinets, and so forth. This equipment is more efficient because it does not require

moving the workpiece to a separate machine for each cut. Also, setup time is considerably reduced.

Savings in the time needed to produce tubular shapes have been accomplished by new tubefforming and cutting equipment. Tubemaking, which starts from flat coiled steel, has been speeded up by the use of automatic welders which join the ends of the coils so that the tubefforming equipment need not be shut down while coils are being changed.

Metallic inert gas (MIG) welding has largely supplanted most other forms of welding. Its advantage is that the parts being joined do not have to be as thoroughly cleaned as with brazing. Although robot welders are not common, automatic welding is. Once travel and angle of the welding arm have been adjusted, a worker is required only to load and unload workpieces onto and from the equipment.

Although not designed specifically for the metal office furniture industry, automated parts inventory storage and retrieval systems are being used by several plants in the industry. Operating under the control of a computer which "explodes" or breaks down orders for the required number of finished pieces of furniture into the necessary parts demand, robot crawlers and unmanned forklift trucks retrieve and deliver the parts to various pickup stations where they are transferred to the assembly line in the correct sequence for manufacture.

Upholstering, an operation which is similar in both wood and metal office furniture, is a particularly labor intensive operation and requires a skilled work force. Although still used in many plants, manual pattern layout and fabric cutting have in some cases been phased out, superseded by diecutting of fabric. Computer-controlled cutting equipment, which combines high speed with accuracy and eliminates manual pattern layout, is also available.⁸ Steam tables, installed at upholsterers' work stations, expand the cut fabric workpiece. Once removed from the steam and stapled around the foam rubber cushion, the fabric shrinks back to its normal size and becomes taut. Airpowered plunger tables, used to compress the fabric-covered foam shape, have made button insertion and tiedown operations easier.

Electrostatic finishing, used widely by the metal furniture industry, can be used successfully on wooden furniture,⁹ resulting in increased labor productivity in the finishing area and a substantial reduction in material and maintenance costs. Automatic electrostatic spray lines allow closer spacing of pieces to be painted and, thus, greater efficiency. With these automatic lines, color changeover is automatic and can be done in 30 seconds rather than the 2 minutes previously required on the nonautomatic electrostatic lines. Electrodeposition lines, which are powdered coatings in a medium of either air or water, are particularly efficient with respect to labor, materials, and solvent emissions.

Likewise, both the metal and wood office furniture industries have shared the advances made in portable, handheld power fastening tools, resulting in added worker efficiency through more power, greater capacity, and less weight and maintenance. Productivity has also been enhanced by improved workflow layout, computerized recordkeeping, and new materials such as quick-setting glues and improved finishes.

Recent trends may continue

If continued, the industry's capital spending surge of the last few years may provide the plant and equipment necessary to maintain the recent above average growth in productivity. However, the current economic downturn may have a negative effect on demand and productivity.

Although the full consequences of the current economic downturn cannot be foreseen, it is worth noting that previous recessions have had only limited ef-

fects on the growth of the white-collar work force, one of the key factors in the output growth of the office furniture industry. In fact, even though there have been four recessions since 1958, the total white-collar work force has never declined. With the forecasted continued expansion in the white-collar work force,¹⁰ demand for the industry's products should continue to increase and may, therefore, present the industry with opportunities to expand productivity. Also, the industry's output should be further bolstered if the growth of systems furniture continues.

While the "paperless office" is not as yet a reality,¹¹ over the long term, the increasing sophistication of electronic office equipment may result in officeworkers becoming more productive. This, in turn, can influence output of the office furniture industry by dampening growth in the white-collar work force and affecting demand and productivity in the office furniture industry. □

FOOTNOTES

¹ The office furniture industry is classified as SIC 252 in the 1972 *Standard Industrial Classification Manual* and its 1977 supplement, issued by the U.S. Office of Management and Budget. The subindustries within the office furniture group include establishments that are primarily engaged in manufacturing furniture commonly used in offices—wood (SIC 2521) and metal (SIC 2522).

² *Employment and Training Report of the President*, 1981 Report (The White House, 1981), pp. 148-49; see also table 3, p. 73, of the April 1982 issue of the *Monthly Labor Review*.

³ See P. W. Daniels, ed., *Spatial Patterns of Office Growth and Location* (New York, John Wiley & Sons, Inc., 1979), pp. 67-69.

⁴ "Equipment Purchases Planned by Readers in 1980," *The Office*, January 1980, p. 26.

⁵ See J. Edwin Henneberger, "Productivity Growth Below Average in the Household Furniture Industry," *Monthly Labor Review*, Nov-

ember 1978, pp. 23-29.

⁶ Darrell Ward, "Groove Folding for Contract and Contemporary," *Woodworking and Furniture Digest*, June 1981, pp. 42-45.

⁷ —, "Abrasive Planing Challenges Your Knife Cutting Techniques," *Hitchcock's Wood Working Digest*, November 1963, pp. 29-32.

⁸ Robert Michael, "New Techniques of Computerized Fabric Cutting," *Furniture Methods and Materials*, June 1971, pp. 12-15.

⁹ Richard D. Rea, "Electrostatic Disks Win," *Woodworking and Furniture Digest*, April 1982, pp. 22-25.

¹⁰ *Economic Projections to 1990*, Bulletin 2121 (Bureau of Labor Statistics, 1982), pp. 34-47.

¹¹ See Paul Lieber, "Office Automation: The Job Threat that Never Happened," *The Office*, May 1980, p. 158.

APPENDIX: Measurement techniques and limitations

Indexes of output per employee hour measure changes in the relation between the output of an industry and employee hours expended on that output. An index of output per employee hour is derived by dividing an index of output by an index of industry employee hours.

The preferred output index for manufacturing industries would be obtained from data on quantities of the various goods produced by the industry, each weighted (multiplied) by the employee hours required to produce one unit of each good in some specified base period. Thus, those goods which require more labor for production are given more importance in the index.

Because data on physical quantities are not reported for the entire office furniture industry, real output was estimated by a deflated value technique. Changes in price levels were removed from current-dollar values of production by means of appropriate price indexes at various levels of subaggregation for the variety of products in the group. To combine segments of the output

index into a total output measure, employee hour weights relating to the individual segments were used, resulting in a final output index that is conceptually close to the preferred output measure.

The indexes of output per employee hour relate total output to one input—labor. The indexes do not measure the specific contribution of labor, capital, or any other single factor. Rather, they reflect the joint effects of factors such as changes in technology, capital investment, capacity utilization, plant design and layout, skill and efforts of the work force, managerial ability, and labor-management relations.

The average annual rates of change presented in the text are based on the linear least squares trend of the logarithms of the index numbers. Extensions of the indexes appear annually in the BLS bulletin, *Productivity in Selected Industries*. A technical note describing the methods used to develop the indexes is available from the Division of Industry Productivity Studies.