Cosmetics industry achieves long-term productivity gains

But recent declines have beset an industry in which productivity has grown rapidly since 1958; gains have been associated with more efficient plants, improved technology, and an expanding line of products which serve changing markets

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As measured by output per employee hour, productivity in the cosmetics and other toiletries industry rose at an average annual rate of 4.0 percent from 1958 to 1980. The rate of growth was substantially higher than the 2.8-percent gain for all manufacturing.[1]

The rise in productivity resulted from a rapid expansion in output, which increased at an average annual rate of 7.3 percent, and a more moderate increase in employee hours, 3.1 percent. Productivity gains have resulted primarily from a trend toward fewer and larger plants producing a greater level of output, and continued improvements in production and packaging operations, such as those of lipstick and toothpaste.

The movements in output per employee hour have not been steady. From 1958, annual increases in productivity ranged from 14.9 percent to 0.4 percent. Declines in productivity occurred in 6 years, the most recent and largest in 1980, when it dropped 11.4 percent. (See table 1.)

Productivity growth can be divided into three distinct subperiods, 1958–65, 1965–70, and 1970–80. The first period was marked by substantial growth in the industry. Larger capacity plants came on line and productivity grew at a rate of 7.5 percent annually. The growth was associated with a rapid rate of increase in output of 10.9 percent. However, employee hours increased at a slower pace—averaging 3.1 percent.

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From 1965 to 1970, productivity growth slowed significantly, averaging only 0.2 percent a year. Although output continued to expand at a high rate of 7.0 percent per year, employee hours increased at almost the same rate, 6.8 percent. The industry at this time was undergoing a more pronounced period of expansion. Data available for 1963 and 1972 show a 91-percent increase in employment in establishments with 500 persons or more. The increase in the number of these large establishments (from 15 to 27) with the normal staffing and startup problems no doubt retarded productivity growth temporarily.

After 1970, productivity growth resumed at a rapid pace, averaging 5.7 percent annually through 1977. Beginning in 1978, three successive declines in productivity occurred. The decrease recorded in 1978 was less than 1 percent. However, a decline of 6.2 percent in 1979, followed by a drop of 11.4 percent in 1980, reduced the average annual gain in productivity to 2.7 percent during 1970–80. The decreases in 1979 and in 1980, a recession year, were related to similar large declines in output. However, employee hours did not follow output, but instead increased 2.3 percent in 1979 and 1.3 percent in 1980.

Output increases fourfold

Productivity growth in the cosmetics and other toiletries industry is closely linked to output growth, which has increased fourfold since 1958. Factors affcting this growth have been a larger population, the growing

number of working women, and extensive advertising and sales promotions.[2]

The industry is highly competitive, and this competition has spurred manufacturers' efforts to expand the range of their products. Many new products and lines have been introduced to meet changing consumer needs and preferences. For example, because of the increased number of women entering the work force, more products have been developed to meet their needs. Also, greater acceptance of the industry's products by men has been a factor in output growth. They are purchasing more fragrances and skin care products such as colognes, after-shave lotions, and moisturizers. Output growth has also been spurred by new products specifically designed for ethnic populations and for older consumers. Growth has also occurred in skin treatment and sun care products because of an increased concern about aging skin and the rise in the incidence of skin cancer and its relationship to ultraviolet sunrays.[3]

Another factor that has contributed to output expansion has been the greater use of synthetic substances in cosmetic and toiletry preparations. Increased use of synthetics, which are often less expensive, to supplement or replace some of the scarce natural products derived from plants and animals and to serve as the bases for new products has enabled the industry to meet demand and to expand its market.

Because demand for cosmetics and toiletries has been high, some analysts had considered the industry to be nearly recession-proof.[4] Indeed, until 1979, only two decreases in output were noted in this study and both were less than 1 percent. However, in 1979, output declined 4.1 percent and in 1980 a further drop of 10.3 percent occurred. These two decreases in output had the effect of reducing the long-term average annual rate of growth in output from 8.0 percent (through 1978) to 7.3 percent.

Plant size and employment

An important factor affecting productivity growth in the industry has been the trend toward larger, more efficient establishments. This is reflected in the steady increase in the number of establishments with 500 employees or more. During 1958–80, the number of these establishments tripled (from 11 to 33), as did employment in these plants. An insight into their efficiency is gained from information on value added per employee. In 1977, the most recent year for which data are available, value added per employee in the large establishments was more than $100,000. This was about 37 percent greater than the level in plants having fewer than 500 employees. The trend toward larger plants with their greater production volume has resulted in significant economies of scale, which in turn has aided the industry's productivity growth.[5] Large establishments now account for about 65 percent of the industry's

Table 1. Productivity and related indexes for the cosmetics and other toiletries industry, 1958–80

[1977=100]

Year	Output per hour			Output	Employee hours		
	All employees	Production workers	Nonproduction workers		All employees	Production workers	Nonproduction workers
1958	40.0	39.0	41.7	22.7	56.8	58.2	54.5
1959	43.9	41.9	47.7	26.5	60.3	63.3	55.5
1960	45.1	44.1	46.7	26.9	59.7	61.0	57.6
1961	46.9	47.0	46.6	29.1	62.1	61.9	62.4
1962	49.6	49.7	49.6	32.0	64.5	64.4	64.5
1963	57.0	58.1	55.4	38.2	67.0	65.7	68.9
1964	63.8	65.3	61.4	42.6	66.8	65.2	69.4
1965	65.7	66.6	64.5	47.6	72.4	71.5	73.8
1966	65.2	65.1	65.4	52.1	79.9	80.0	79.7
1967	62.5	63.1	61.6	51.8	82.9	82.1	84.1
1968	67.5	67.4	67.7	59.8	88.6	88.7	88.3
1969	64.8	64.7	65.1	62.0	95.7	95.9	95.3
1970	65.9	68.9	61.6	66.8	101.4	97.0	108.5
1971	73.3	80.4	64.2	68.0	92.8	84.6	106.0
1972	82.5	89.1	73.9	77.8	94.3	87.3	105.3
1973	87.2	97.4	74.9	84.7	97.1	87.0	113.1
1974	91.6	95.2	86.4	88.1	96.2	92.5	102.0
1975	94.0	95.6	91.6	87.5	93.1	91.5	95.5
1976	94.4	94.3	94.6	95.5	101.2	101.3	101.0
1977	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1978	99.3	98.6	100.6	104.5	105.2	106.0	103.9
1979	93.1	93.8	92.0	100.2	107.6	106.8	108.9
1980	82.5	80.2	86.5	89.9	109.0	112.1	103.9
	Average annual rates of change (in percent)						
1958–80	4.0	4.2	3.8	7.3	3.1	2.9	3.3
1976–80	−3.4	−3.8	−2.6	−1.2	2.2	2.7	1.4

value of shipments, compared with 35 percent in 1958.

Overall employment in the industry expanded by more than 90 percent between 1958 and 1980, rising at an average annual rate of 3.1 percent. Employment, at 29,900 in 1958, had risen to 57,200 by 1980. Total employee hours grew at the same rate as employment.

The largest increase in employment occurred during 1965–70, when the industry was expanding more rapidly. Although employment rose 28 percent from 1958 to 1965, it grew 39 percent during 1965–70. Employment growth from 1970–80 moderated substantially, declining in 5 years. The overall increase in employment during the last period was only 7.9 percent.

Compared with all manufacturing, the number of female employees in the industry is high. They accounted for 57 percent of total employment in 1958, increasing to 60 percent in 1980. By contrast, women made up 26 percent of manufacturing employment in 1958 and 31 percent in 1980.

The proportion of nonproduction workers in the industry is higher than in most other manufacturing industries—37 percent of total employment in 1980, compared with 30 percent for all manufacturing. The higher proportion reflects the larger number of professional, technical, clerical, and sales personnel employed.

Although data on the occupational composition of employees in the industry are not available, some insights can be obtained from the broader aggregation, soaps and cosmetics.[6] In 1978, an estimated 5 percent of all workers employed in the manufacture of soaps and cosmetics were chemical and industrial engineers, chemists, and chemical technicians. Sales and clerical personnel accounted for 26 percent of total employment. The industry also employs many semiskilled workers, such as packers, wrappers, examiners, assemblers, and mixers, who made up 33 percent of the work force in 1978.

Technological advances

The industry produces a vast array of products, including shaving preparations, perfumes, colognes, hair preparations, dentifrices, mouthwashes, lipsticks, deodorants, nail products, creams, and lotions. Standards for the materials used in these products have been upgraded and many are now equal to the material specifications for the pharmaceutical industry.[7]

Although the basic processes involved in the production of cosmetics and toiletries have changed little over the period, there have been improvements in the equipment and methods used. Many of these changes have occurred on an in-house basis, with individual plants developing some of their own equipment and modifying or integrating production lines to improve efficiency. An improvement that is widespread throughout the industry is the increased speed of filling and packaging lines.

One of the major processes involved in the production of cosmetics and toiletries is batch preparation of the products prior to packaging. Some improvements have occurred that have increased efficiency in preparing the batches. As volume warrants, the more frequently used raw materials are stored in large tanks and then transferred directly to the mixing tanks via a pipeline system. Previously, the raw materials were received in drums and were manually dumped into the mixing tanks. Semiautomatic controls allow the operator to easily select the necessary raw materials. The final product is moved via pipes to stainless steel storage tanks, where air-controlled pumping systems transfer the batches to the filling lines.

Manufacturers have developed and adopted high-speed filling and packaging equipment for use with large-volume production runs. Small-volume runs or products requiring complex or delicate operations are generally less automated. Much of the equipment used in high-speed production can automatically perform such operations as bottle feeding, product coding, and packing of bottles and boxes into cartons for shipment. One recent innovation in this area is the automatic unscrambler and bottle feeder. Bottles, jars, or caps are automatically sorted and fed directly to the filling lines.

Products in the form of sticks. For lipsticks and other items such as eye shadow, deodorant, and perfume, the basic processing method first involves melting and mixing the base products. Next, the forms, castings, or molds are filled and cooled. Most products are then removed from the forms and are placed into holders. In a few cases, particularly deodorant sticks, filling directly into the holders for molding is possible.[8]

One of the more complicated operations is the production of lipsticks. Preparation of bulk material for lipstick production is done using batch processing. The most complex step is molding the sticks. Their production was formerly performed as a manual operation; however, many manufacturers have adopted automatic or semiautomatic equipment. The equipment consists of a storage container with an attached dosing device and a circular molding table with interchangeable molds that can handle different shapes and sizes of lipsticks. The equipment also includes a feeding table for lipstick bases, and pressurized-air equipment for pushing solidified sticks into the bases. Lipstick covers and bottom labels are automatically put onto the bases. Automatic equipment places the completed sticks into cartons.[9]

Toothpaste production. In the manufacture of toothpaste, automated equipment is now being used that makes the batch process almost one continuous operation—reducing labor requirements. The filling process is done using high-speed equipment and an automated tube feeder. With the high-speed equipment, a dental cream line can

now be operated with two persons; previously four or five were needed.

There has also been a change in the material used for toothpaste tubes. The trend has been to switch from metal to laminated plastic tubes, which are generally easier to handle and can be processed about 10 percent faster. Heat sealing the laminated tubes is quicker than crimping metal, thus increasing production speed.[10]

Tubes leaving the filling line are packaged using automatic case packers and palletizers. It now requires two or three fewer people to strap cases, and this equipment has increased the number of pallets that can be packed. The entire pallet load is now automatically wrapped with shrink film (a form of clear plastic wrap).

Fragrances. The production process for perfumes and colognes has changed little because of the unique storage requirements for aging. The batch process is not a continuous operation because, prior to filling and completion, these products must be pumped into storage tanks and left for 3 to 7 days to age. However, some improvements have occurred in the equipment used in filtration and in filling. After aging, perfumes and colognes are chilled to a temperature near freezing. To obtain a crystal-clear product, they are processed through a filter press to remove sediments. The liquids are then pumped to the filling lines through pipelines. Advanced equipment is being more widely used to assure proper filtration and filling. The filling and packaging equipment that is used for other cosmetic products is also used for perfumes and colognes. Considerable labor reductions have occurred because of the availability of more sophisticated high-speed equipment.[11]

Aerosol products. A technological innovation which became widespread in the industry in the 1960's was the aerosol dispenser. Substantial improvements to the aerosol unit, which have reduced labor requirements, have occurred during the last several years. Valves and stems are automatically placed into the aerosol units on the filling line. Previously, this operation was done manually. The valves are then mechanically crimped to allow pressurization. After filling, the aerosol units pass through an explosion-proof area for pressurization and safety checking. The units are also inspected for leakage and are automatically scanned for liquid content.

Scientific instrumentation. For new product development and quality control, the industry now utilizes sophisticated instrumentation such as gas and high-pressure liquid chromatography, mass spectroscopy, and nuclear magnetic resonance.[12] This equipment has reduced labor requirements and increased the speed of the chemical analytical process.

Computer technology has aided productivity growth in several ways. Computers are increasingly being used for jobs such as flow and measurement of raw materials, formula calculations, mixing operations, and are already widely used in the batch operations for verification of the individual batches. Also, computers have assisted in reducing the turnaround time for products and in decreasing the amount of paperwork.[13] They are being used more often in warehouses to perform such tasks as product location, inventory control, and shipping documentation. In the important area of sales, marketing analysis is more easily accomplished with computer-based information systems.

PRODUCTIVITY GROWTH should continue because of improvements in the production processes and in the equipment used. Increased utilization of computer technology may also contribute to productivity gains.

Demand for the industry's products is expected to rise. According to industry analysts, some of the fastest growing categories are facial treatments, hair straighteners, manicuring products, after-shampoo products, sun care products, and men's fragrances. Factors which are believed to be important for future industry growth include increased use of cosmetics and fragrances by men, growth in products promoted for the ethnic populations, more products to meet the needs of older consumers, and the growing awareness of skin care. □

FOOTNOTES

[1] The cosmetics and other toiletries industry comprises establishments primarily engaged in manufacturing perfumes (natural and synthetic), cosmetics, and other toilet preparations. This industry also includes establishments primarily engaged in blending and compounding perfume bases; and those manufacturing shampoos and shaving products, whether from soap or synthetic detergents. The industry is designated as SIC 2844 in the Office of Management and Budget's *Standard Industrial Classification Manual, 1972.* Data prior to 1958 are not comparable. All average annual rates of change are based on the linear least squares trends of the logarithms of the index numbers. Extensions of the indexes will appear in the annual BLS Bulletin, *Productivity Measures for Selected Industries.*

[2] *U. S. Industrial Outlook,* various issues. See also, "Beauty Chemicals '80," *Chemical Marketing Reporter,* June 23, 1980, p. 29.

[3] *Industrial Outlook,* 1980, p. 155.

[4] "Chemical Finance," *Chemical Business,* Aug. 24, 1981, pp. 39–45. See also, "Beauty Chemicals '80," *Chemical Marketing Reporter,* June 23, 1980, pp. 29–47.

[5] Based on conversations with officials of the Noxell Corporation and Helene Curtis Industries, Inc.

[6] *The National Industry-Occupation Employment Matrix,* 1970, 1978, and Projected 1990, Vol. 1, Bulletin 2086, Bureau of Labor Statistics, April 1981, pp. 155–58. The data cited relate to soaps and cosmetics (SIC 2841 and 2844). However, because cosmetics employs 63 percent of the total work force in both industries, these data should be representative for cosmetics.

[7] *Industrial Outlook,* 1970, p. 184.

[8] Peter Weckerle, "Molding Process for the Production of Lipsticks," *Cosmetics and Toiletries*, Vol. 95, May 1980, p. 81.

[9] Wendel Dinkel, "Processing of Lipsticks," *Cosmetics and Toiletries*, Vol. 92, February 1977, pp. 30–34.

[10] The discussion on toothpaste production is based on conversations with representatives of Colgate-Palmolive Co. and Lever Brothers Co.

[11] The discussion on perfumes and colognes is based on conversations with Heinz J. Eiermann, director, Division of Cosmetics Technology, Food and Drug Administration, Washington, D. C.

[12] *Industrial Outlook*, 1977, p. 152. Also conversations with Heinz J. Eiermann, Food and Drug Administration.

[13] Information contained in a statement by Kenneth R. Cerra, quality control director, Noxell Corporation, before the Society of Cosmetic Chemists Annual Scientific Seminar, reprinted in *FDC Reports, Toiletries, Fragrances and Skin Care*, May 25, 1981, p. 6.

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 time to produce are given more importance in the index.

In the absence of physical quantity data, the output index for the cosmetics and other toiletries industry was constructed using a deflated value technique. The value of shipments of the various product classes were adjusted for price changes by appropriate Producer Price Indexes to derive real output measures. These, in turn, were combined with employee hour weights to derive the overall output measure. These procedures result 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 time. The indexes do not measure the specific contribution 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.