Drugs manufacturing: a prescription for jobs

Since 1964, employment in drugs manufacturing has grown through recessions and structural changes to the economy, while the industry has continued to make profits, invest in research and development, and pay above-average wages

Stephen Heffler

The job market has shrunk in many manufacturing industries over the past 50 years, but the drugs-manufacturing industry has shown healthy employment gains year after year. Not only are jobs being created in this relatively small industry, but many are high paying, high skilled, and research oriented. The industry surged through the past four recessions with remarkable profit margins and substantial job growth. It also added jobs during the structural change in the economy that has occurred over the past few decades.

The market pressures facing the drugs-manufacturing industry are different from those facing most manufacturing industries. The supply of drug products is not necessarily based on the concept of normal market competition, under which demand is sensitive to changes in price. Instead, consumer demand depends mostly on relief from ill health, which shows little response to price changes. Despite the differences in market pressures, the industry faces new challenges in the 1990's from increased competition and proposed health-care reform. As a result, there is a serious question whether the industry can continue its robust employment growth of the past four decades or whether it will react to the challenges by slowing employment growth or decreasing payrolls.

This article presents a brief history of the drugs-manufacturing industry from 1964, when its rapid growth began, to 1994, and offers details behind the industry's growth since 1980. It surveys the changing conditions within the industry and explores possible future impacts on employment.

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Industry composition

The drugs-manufacturing industry (SIC 283) is a component of the chemicals and allied products industry (SIC 28), accounting for nearly 25 percent of employment in the latter in 1993.[1] The drugs-manufacturing industry is divided into three parts with total 1993 employment of 264,800, or 1.5 percent of manufacturing employment.[2] (See table 1.) The largest part is pharmaceutical preparations (SIC 2834), which accounted for 81 percent of total drugs-manufacturing employment in 1993. Pharmaceutical preparations are manufactured drug products purchased either over the counter or by prescription and used in human or veterinary health care. Most of these products are in a form intended for final consumption and are marketed to both professionals and consumers.

The pharmaceutical preparations segment is the driving force behind the employment trends, the profit and sales movements, and the product costs of the drugs-manufacturing industry. Because of this substantial influence, the characteristics of the segment are used throughout this article as a basis for analyzing the drugs-manufacturing industry.

Diagnostic and other biological products (SIC's 2835, 2836), the second part of the drugs-manufacturing industry, employed 28,500 workers in 1993, or 11 percent of total employment in the industry. Establishments in the diagnostic and other biological products segment manufacture products used in diagnosing or monitoring human or veterinary health. Most of the products produced by this segment are used for testing rather than for therapy.

The last part of the drugs-manufacturing industry is medicinal chemicals and botanical products (SIC 2833), which accounted for just 7 percent of drugs-manufacturing employment (19,700 employees) in 1993. The focus of companies within this segment is the manufacturing and processing of organic and inorganic chemicals and botanical drugs used in the composition of pharmaceutical and diagnostic products. These products are usually not intended for professionals or consumers, but rather, are used most often in the makeup of other manufactured drug products.

Employment

Historical trends. The mid-1960's marked a significant turning point for the drugs-manufacturing industry during its upward growth trend. (See chart 1.) While growth averaged just 2,000 jobs per year in the decade before 1964, the industry added more than 4,000 per year, on average, from 1964 through 1986. The primary reasons for the changing growth pattern in employment during the 1960's were increased third-party health insurance coverage provided by employers and the implementation of medicare, which did not cover drugs, but allowed for greater access to them by enabling beneficiaries to use money that they would otherwise have spent on doctor or hospital bills. Also, a 1962 amendment to the Food, Drug, and Cosmetic Act placed new restrictions on drug development, making drugs safer for public use.[3] Finally, technological innovations relating to production methods, which had limited the need for more workers in the 1950's and early 1960's, slowed in the mid-1960's, and more emphasis was placed on labor-intensive research and development.

Both drugs-manufacturing and total manufacturing employment grew during the 1987–89 period. However, from 1990 through 1993, the drugs-manufacturing industry *added* 8,000 jobs per year, on average, a marked difference from the average *loss* of 347,000 jobs per year across all manufacturing industries. The accelerated employment growth in drugs manufacturing after 1986 resulted from a variety of factors, including rapidly rising drug prices, increased access to export markets, and the large number of patent-protected products.

Performance during recessions. Through each of the past four recessions, the drugs-manufacturing industry not only did not lose jobs, but in fact had slight employment gains; the largest occurred during the 1990–91 recession (2.5 percent). The industry did experience one short period of significant losses that began in the middle

Table 1. **Annual average employment in drugs manufacturing and all manufacturing, selected years, 1973–93**

[Numbers in thousands]

SIC code	Industry	1973		1978		1983		1988		1993		Percent change, 1973–93
		Employees	Percent of drugs manufacturing	Employees	Percent of drugs manufacturing	Employees	Percent of drugs manufacturing	Employees	Percent of drugs manufacturing	Employees	Percent of drugs manufacturing	
	All manufacturing	20,154.0	...	20,505.0	...	18,432.0	...	19,314.0	...	18,003.0	...	–11
283	Drugs manufacturing	161.4	100	187.2	100	201.3	100	227.6	100	264.8	100	64
2834	Pharmaceutcal preparations	128.1	79	149.7	80	159.5	79	188.1	83	215.3	81	68
2835, 2836	Diagnostic and other biological products	18.5	11	21.1	11	23.2	12	21.1	9	28.5	11	54
2833	Medicinal chemicals and botanical products	14.8	9	16.4	9	18.6	9	18.4	8	19.7	7	33
		1973		1978		1983		1988		1993		Percent change, 1973–93
	Drugs manufacturing as a percentage of all manufacturing	.8		.9		1.1		1.2		1.5		88

NOTE: Percent distributions may not add to 100, due to rounding.

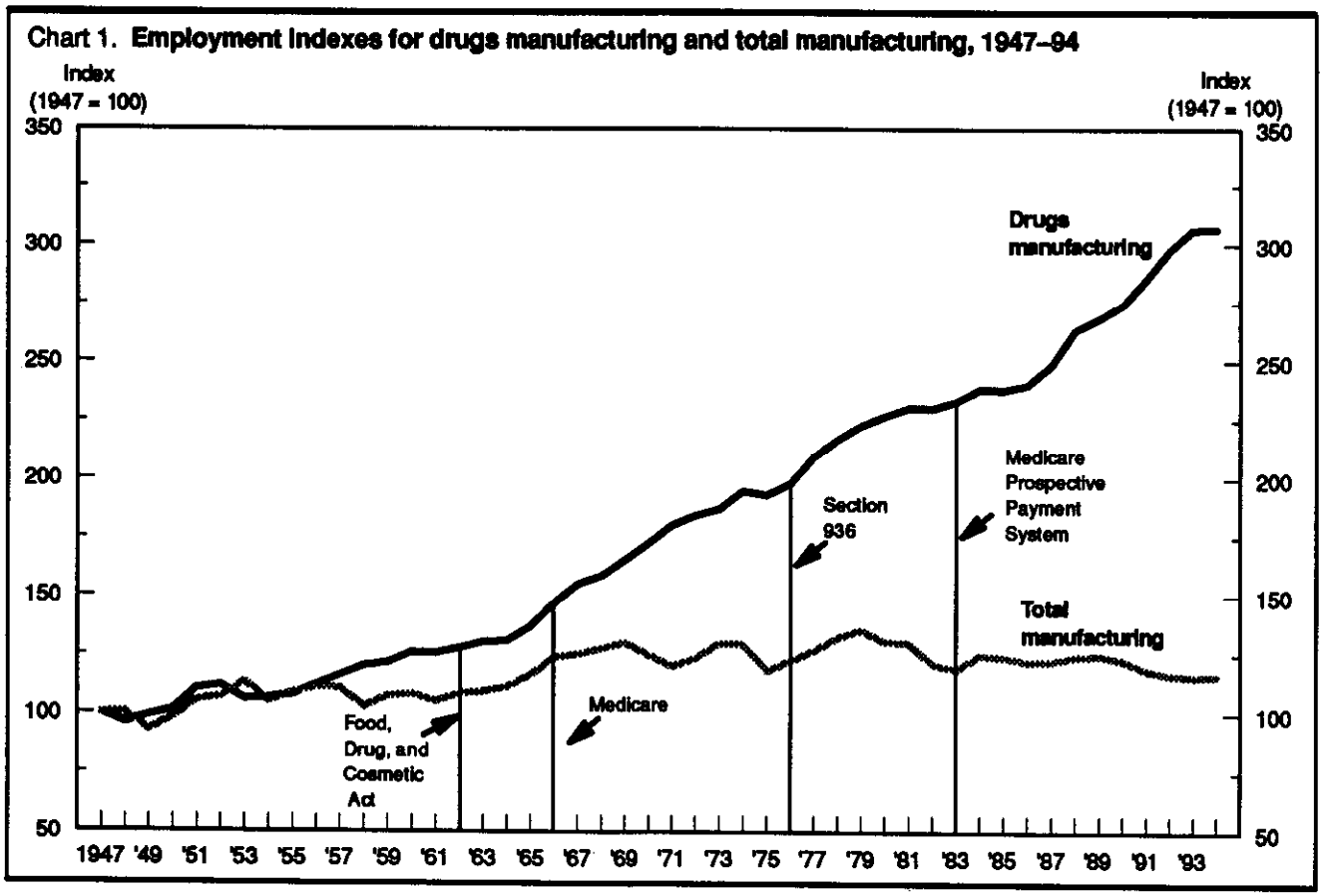


Chart 1. **Employment indexes for drugs manufacturing and total manufacturing, 1947–94**

of the 1974–75 recession and extended a few months into the recovery. However, even this 2.9-percent loss was small compared with the average loss of more than 8 percent in manufacturing during its peak-to-trough periods over the past two decades.

Besides being relatively immune to business cycles, employment in the drugs-manufacturing industry was not adversely affected by the structural changes that took place in numerous industries over the past decade. Many large manufacturing corporations were forced to restructure in the face of less prosperity during the 1980's. The drugs-manufacturing industry, however, continued to flourish without downsizing or restructuring.

Similarity to health services. Essentially, the stellar performance of the drugs-manufacturing industry has mirrored that of the health services segment of the services industry.[4] Since 1986, the drugs-manufacturing industry has added 28 percent to employment, compared with 34 percent in health services. Both face consumer markets in which demand is relatively insensitive to changes in price, but is driven instead primarily by health care needs. In an economy focused on improvements in productivity and cost containment, the unique laws of demand pertaining to drugs manufacturing and health services helped provide an employment hedge throughout the past decade, as many other industries were forced to downsize and streamline to compete.

Component industries. While the trends in the large pharmaceutical preparations segment reflected those in the drugs-manufacturing industry as a whole, the two smaller components grew more slowly; nevertheless, all three far outperformed the average for manufacturing. The diagnostic and other biological products segment grew by nearly 25 percent from 1980 to 1993, yet saw its share of total drugs-manufacturing employment fall by 1 percentage point. Employment movements within the segment were similar to those of the pharmaceutical preparations segment during each of the past four recessions, declining only during the 1982 recession. While products from the diagnostics segment may or may not be packaged for retail sale, the segment is similar in its behavior to the pharmaceutical preparations segment in that demand depends mostly on need rather than price.

The medicinal chemicals and botanical products segment grew much less quickly than the

other two components of the drugs-manufacturing industry over the past decade. The segment's share of total drugs-manufacturing employment declined by 2 percentage points, as less than 8 percent was added to employment from 1980 to 1993. Because medicinal chemicals and botanical products are used predominately as elements in the manufacture of pharmaceuticals and in diagnostics, rather than by consumers concerned with their health, price-based competition plays a larger role within the segment than in the drugs-manufacturing industry as a whole. Despite increasing consumer interest in products with natural ingredients, this competition was a factor in keeping employment growth in medicinal chemicals and botanical products below that of the rest of the drugs-manufacturing industry.

High-paying, high-skilled jobs. In 1993, a worker in the drugs-manufacturing industry earned wages averaging $944 per week, about $320 more than the average for the whole manufacturing sector.[5] The difference was some $60 in 1980. Even workers involved directly in production earned more than their counterparts across all manufacturing industries. Average hourly earnings for production workers in drugs manufacturing were $14.68 in 1993, compared with $11.74 for the manufacturing sector. Adjusted for inflation, from 1980 through 1993, average hourly earnings for production workers in the industry *increased* by $1.03. Over the same period, real average hourly earnings in manufacturing *declined* by $0.48.[6] (See chart 2.)

The increase in earnings of workers in the drugs-manufacturing industry was accompanied by a shift toward professional and technical occupations.[7] (See table 2.) While the largest percentage of employment is still in production and support occupations, most new jobs created since 1980 have been in professional and technical occupations. More than 40,000 jobs were added in these occupations from 1980 through 1992, while fewer than 14,000 were added in production, operating, and related occupations during the same period. Thus, the percentage of workers in production-related occupations in the drugs-manufacturing industry declined to just 33 percent in 1992, from nearly 40 percent in 1980.

Factors affecting employment growth

Employment in drugs manufacturing has registered steady growth primarily because the demand for pharmaceutical products has increased in bad times as well as good. Output in the industry increased at a rate more than 1-1/2 times that of all manufacturing industries in the past decade.[8] Also, drug companies have been able to raise prices on this growing production to keep profits high. Thus, they have avoided the downsizing and restructuring common among manufacturing industries in recent years. The discussion that follows explores these and other factors that have enabled the drugs-manufacturing industry to add significant numbers of well-paying jobs to the economy. Also addressed is the likely impact of such factors over the next few years.

Demand for drugs. Over the past 13 years, real sales of pharmaceuticals have increased by more than 100 percent.[9] (See chart 3.) Drug treatment, as an alternative to other forms of medical treatment, has taken on more importance in the past few decades. Prescription and over-the-counter drugs are now used in many medical situations that once were treatable only through inpatient or outpatient hospital care. For example, the development of drugs to treat bleeding ulcers has drastically reduced the need for surgery for this condition.[10] Because the third-party payment system exists within the drugs market, as in the overall health care market,[11] the cost of drugs is usu-

Table 2. **Percent distribution of employment in drugs manufacturing, by occupation, selected years, 1977–92**

Occupational group	1977	1980	1983	1986	1989	1992
Production, operating, and related occupations	36.7	39.6	39.2	35.7	35.3	33.3
Professional and technical occupations	23.8	24.7	25.4	25.9	28.8	32.2
Clerical and administrative support	19.8	18.4	16.7	17.4	17.5	15.7
Managerial and administrative occupations	10.4	11.0	10.0	11.3	10.7	10.5
Sales and related occupations	5.3	2.8	3.5	5.0	4.1	5.2
Service occupations	4.1	3.5	3.6	3.3	2.8	2.7
Agricultural and related occupations	—	—	.8	.7	.8	.5

NOTE: Columns may not add to 100, due to rounding. Dash indicates less than 0.5 percent.
SOURCE: Occupational Employment Statistics program, Bureau of Labor Statistics.

ally not relevant to the decision-making process of the consumer.

The demand for drugs should continue to grow as the aging U.S. population continues to place more emphasis on health care. A recent national survey found that one of the reasons employers' drug benefit costs rose rapidly between 1990 and 1992 was that the employee population was getting older, and older people tend to use more drugs.[12] Also, the drugs market continues to be based on need rather than on price. These market forces have enabled drug sales to rise steadily and drug manufacturers to increase prices consistently.

Price increases. Drug prices have grown faster than prices of other manufactured products, in part because of price-insensitive demand and in part because of the lack of price-based competition in the supply of patented drugs. Patents afford new drugs a period during which imitation drugs cannot be used as substitutes. This protection eliminates the ability of rival firms to compete through the use of lower prices. From 1985 to 1993, producer prices in the drugs-manufacturing industry grew at more than 4 times the rate of those in nondurable manufactured goods, with prices of pharmaceutical preparations growing even faster.[13] (See chart 4.) Explosive price growth for the industry's products allowed for high profit margins despite increases in employment, wages, and research and development costs.

The rapid growth of wholesale prices for drugs led to increases in consumer prices of prescription drugs at a rate 4 times that of retail prices for all nondurable goods since 1980.[14] While consumer prices for over-the-counter drugs did not grow as fast as the prices of prescription drugs, their growth rate was twice as fast as that for all nondurable goods over the same period. Since 1992, drug prices have increased at a much slower rate.

Technology. The most rapid period of technological advancement in the *production* methods of drugs occurred in the 1950's and 1960's, but continuous strides have been made in the technology used to *discover* drugs throughout the past four decades. The most important recent development was the introduction of biotechnology in the early 1980's. Biotechnology, which is the productive use of living organisms and their byproducts, has led to the discovery of drugs that would have remained unknown in prior decades. The progress made has been astounding, with

Chart 2. Real average hourly earnings of production workers in drugs manufacturing and total manufacturing, 1947–93

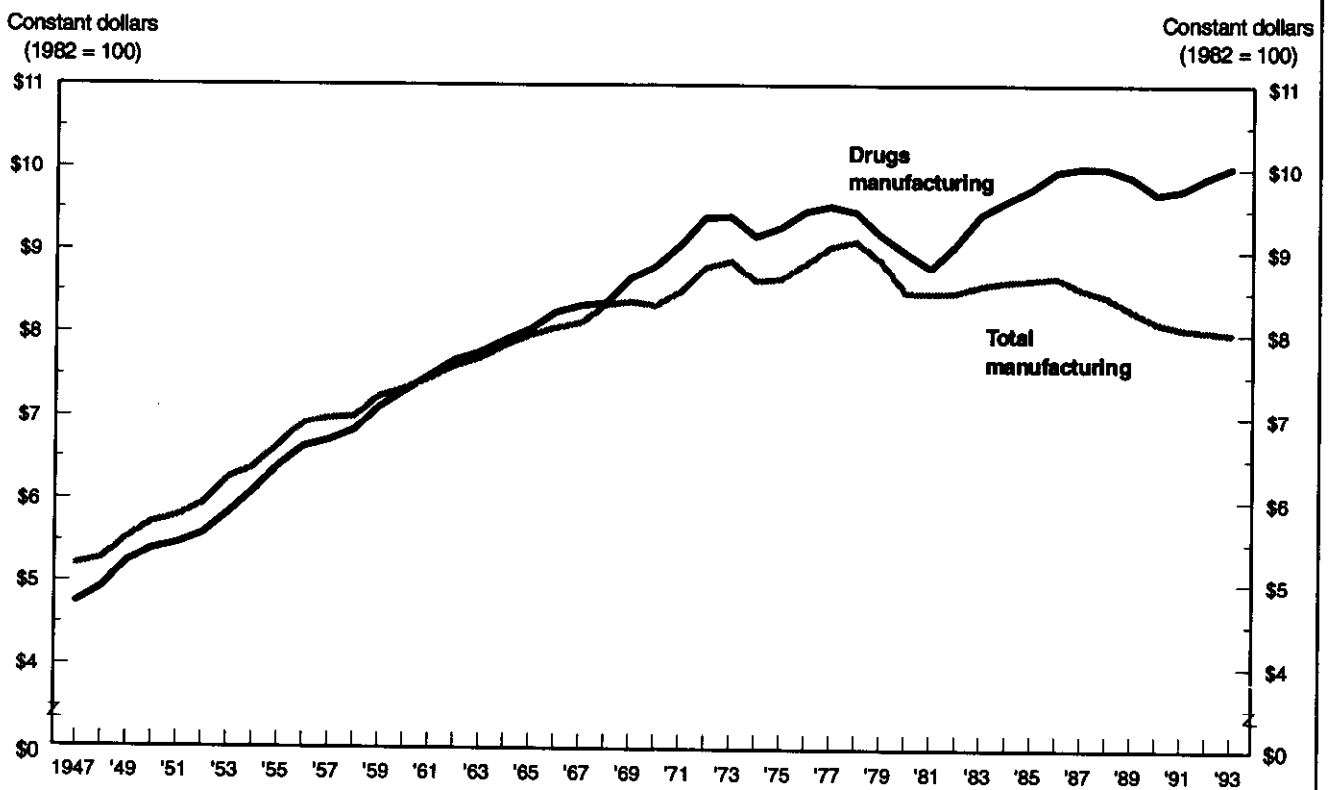
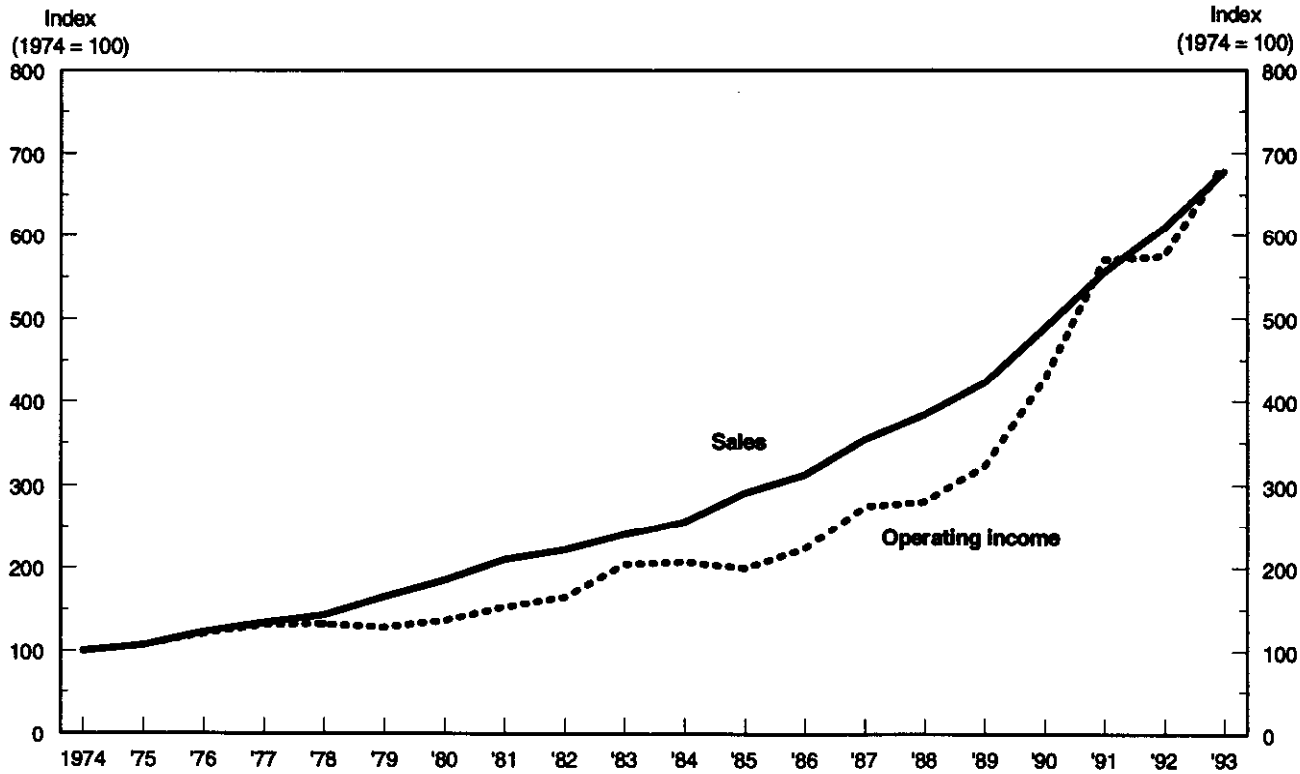


Chart 3. **Indexes of sales and operating income for drugs manufacturing, 1974–93**



SOURCE: Bureau of the Census.

33 percent of research projects of major pharmaceutical companies in 1992 being based on biotechnology, compared with a mere 2 percent in 1980. Most of the drugs discovered through biotechnology have come from small, new firms that concentrate their investigations using this research technique.[15]

Because of the complexity of biotechnological research and the time required to obtain Federal approval to introduce new drugs, little of the output from the 1980's has reached consumer markets. Just 14 biotechnology medicines had been approved by 1991, while 132 were awaiting approval.[16] Technological advancements have enabled the drugs-manufacturing industry to develop better and more sophisticated drugs, but have not sped up the drug development process. Thus, unlike the situation in most other manufacturing industries, where technological advances lead to increased productivity and the need for fewer workers, in the drugs-manufacturing industry manufacturers may require more workers in order to be able to follow through on the development of improved drugs.

Research and development. The research-oriented drugs-manufacturing industry increased its percentage of net sales spent on research and development from 6.1 percent in 1980 to 9.7 percent in 1991.[17] The industry invests in research and development at nearly twice the average rate of all manufacturing. In spite of this, the rapid price growth of pharmaceutical products over the past two decades has enabled drug manufacturers to earn 2 to 4 times the profits of the average manufacturing firm.[18]

The rising cost of bringing new drugs to market is a major concern to an industry dependent on patent protection and long product life cycles to be profitable. The Pharmaceutical Research and Manufacturers of America reported that "it still takes 12 years and an average of $231 million to develop a new drug."[19] With the dramatic increase in market share attained by generic drugs in the past decade, brand-name drugs-manufacturing companies have devoted more resources to the research and development of new drugs. Despite already high levels of investment, the drugs-manufacturing industry still increased research and development as a percentage of net sales by 59 percent from 1980–91.[20] These investments were intended to help ease the situation produced by products that faced increasing competition after their exclusive patent protection expired.

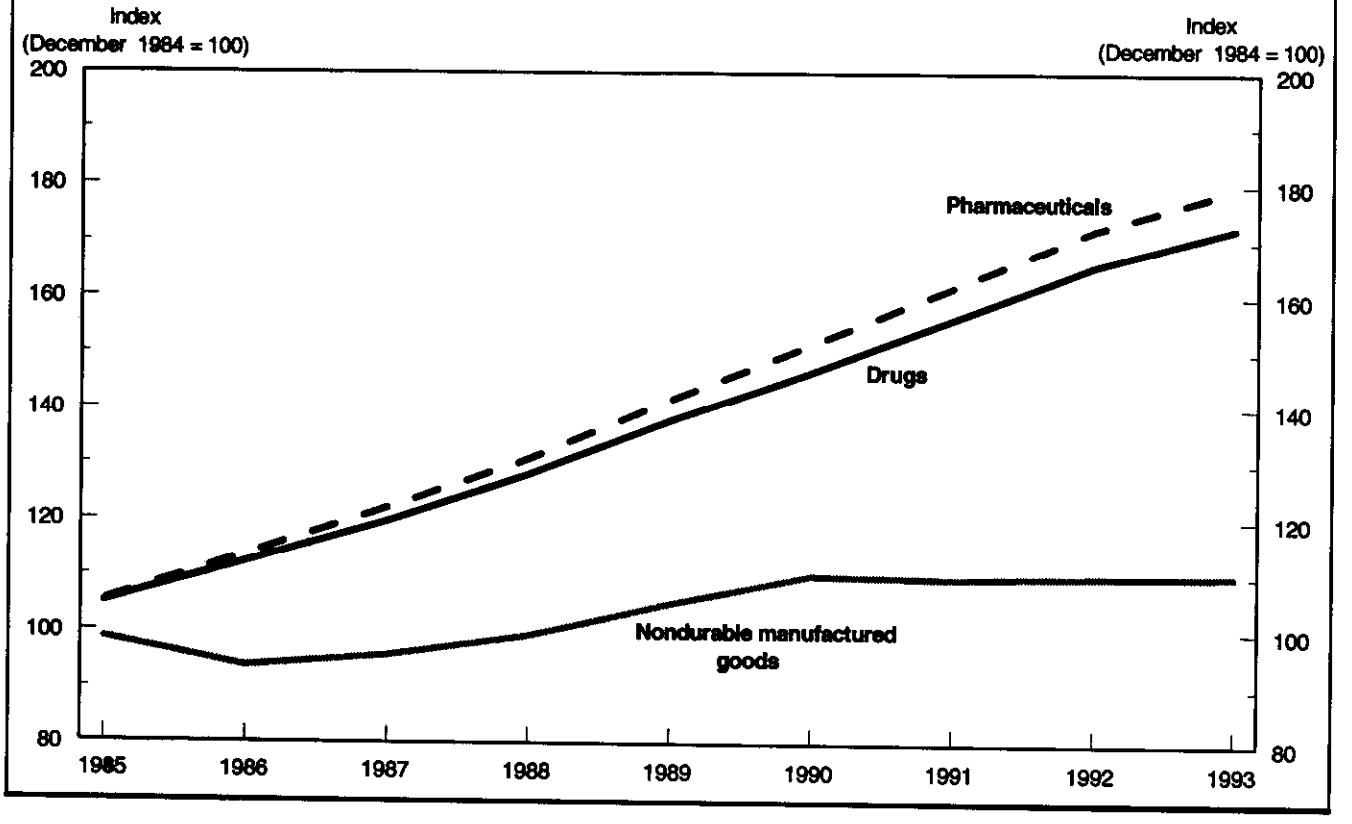
Profits. The relatively large profit margins of the drugs-manufacturing industry provide capital for the large amounts of research required to develop drugs. However, the rapid growth in profits (operating income) of drug manufacturers in the late 1980's slowed temporarily in the early 1990's.[21] (See chart 3.) Also, operating income, although nearly flat in 1992, resumed its strong growth pattern in 1993.[22] Without the ability to increase prices as they had in the past, and under the pressures wrought by generic drugs, managed care, and the expiration of patents, drug companies contained costs by slowing employment growth, thereby allowing profits to return to their historical rates. In 1993, the industry added its fewest number of jobs in 7 years.

Competition from generic drugs. The growing medical and consumer acceptance of generic drugs presents a challenge to established, brand-name drugs-manufacturing companies. The 17-year patent protection afforded new drugs has shielded the products of these companies from competition. Patents not only protect profits, but also make possible long product life cycles, which allow for the entrenchment of the product in the market without the initial threat of competition.

Once the patent protection period is over, generic drugs become a threat to brand-name drugs because they are less expensive. Two reasons explain why generics are more affordable. First, generic drug companies copy brand-name drugs when their patents expire, instead of devoting large amounts of resources to research and development. Second, because generic drug manufacturers have to gain a share of what is essentially a monopoly market built during the first 17 years of a drug's existence, the generic drug must be priced low enough to draw consumers away from a known brand.

Generic drugs represent a choice for the consumer—a goal achieved by the repeal of anti-substitution laws in the 1970's. These State laws, which prohibited the replacement of brand-name drug prescriptions with prescriptions for generic drugs, were eliminated to save the consumer money.[23] Now more widely accepted, generic drugs have ushered in an era of increased price-based competition for market share in the pharmaceuticals industry. It is likely that in the future, expanded competition from generic drugs in the postprotection segment of the market will keep brand-name pharmaceutical companies' rates of return closer to their costs of capital.[24]

Chart 4. **Producer price indexes for nondurable manufactured goods, drugs, and pharmaceuticals, annual averages, 1985–93**



Drugs-manufacturing jobs in Puerto Rico

In 1976, Congress created tax credits under Section 936 of the Internal Revenue tax code for U.S. companies operating in U.S. territories. The purpose of Section 936 was to create jobs, attract capital investments from the mainland, and further develop the economies of U.S. possessions. (See Sean Holton, "Puerto Rico would lose tax break to statehood; loss of lucrative credit is top issue in upcoming vote to test sentiment," *The Houston Chronicle,* Nov. 7, 1993, p. 23A.) Pharmaceutical companies used the opportunity to establish manufacturing plants in Puerto Rico, and by 1993, they employed 22,000 workers. (Puerto Rico is not included in U.S. job counts, but employment estimates are prepared by the Commonwealth under the Current Employment Statistics program.) The credit was attractive to drug companies because their low per-unit raw material, manufacturing, and shipping costs made production at a remote site feasible, and the large profit margins they required to recover their costly research investments would be covered by the credit.

The Pharmaceutical Research and Manufacturers of America claims that the tax credit has had a positive impact on all economies involved. The organization maintains that the credit created thousands of indirect jobs in Puerto Rico during the past two decades, allowed thousands of mainland jobs to support exports to the territory, and was a key aid to international competitiveness. The credit also has been a positive influence on research and development investments. (See Pharmaceutical Research and Manufacturers of America, "Benefits of Section 936, *The Case for the Pharmaceutical Industry,* July 1992, pp. 1–4.) Opponents of Section 936, however, have attacked the law by claiming that the tax credit has sacrificed high-paying jobs in the drugs-manufacturing industry on the U.S. mainland.

The pharmaceutical industry has been the largest beneficiary of the tax credit in Puerto Rico, without providing a proportional increase in jobs for Puerto Ricans. In a study of the effects of Section 936 in Puerto Rico, the General Accounting Office determined that pharmaceutical corporations eligible for the tax credit received nearly half of all estimated tax benefits accruing from Section 936 in 1989. Yet the industry employed less than 18 percent of the Section 936 manufacturing work force, despite the fact that nearly all pharmaceutical firms in Puerto Rico benefited from that section of the tax code. (See *Tax Policy: Puerto Rico and the Section 936 Tax Credit,* GAO/GGD–93–109 (General Accounting Office, 1993), pp. 47–50.) Also, these same pharmaceutical companies received $71,678 in tax credits per employee, while compensation per employee was $33,757. (See *Tax Policy*, pp. 52–53.)

Recently, Congress weakened the Section 936 credit in an attempt to reduce the Federal deficit and tied the payment to the size of a firm's payroll. The impact this will have on the pharmaceutical industry in Puerto Rico is unknown.

This situation is markedly different from that of the 1950's and 1960's, when rates of return were much higher than the cost of capital.

Manufacturers of generic drugs have made impressive gains in market share, accounting for 40 percent of prescriptions filled in 1992, compared with 15 percent in 1983.[25] This is partly because brand-name drugs remain more expensive and there have been no replacements for drugs coming off patent protection. Not only are Canadian and other exporters of generic drugs attracted to the U.S. pharmaceutical market, but also, foreign and U.S. brand-name companies alike recently have become involved in other aspects of the market. For example, one major trend has been the merger of drug manufacturers with companies that provide low-cost drug benefit services. Also, the rapid growth of managed health care has contributed to the rising market share of generics, as insurance plans that utilize managed care require the use of generics whenever they are available. Indeed, generic drugs have had such an impact that the drugs-manufacturing industry is scrambling to boost its revenue and defend its earnings by selling more units, brand name or generic.

Newly emerging factors

The pattern of employment growth in the drugs-manufacturing industry over the past three decades may not continue in the face of new challenges. Both the Bureau of Labor Statistics and the Department of Commerce expect employment to continue to grow in the industry over the next 5 to 15 years.[26] The share of total employment in the industry held by professional and technical occupations is expected to continue to increase as well, with research and development taking on added importance. However, BLS projects the in-

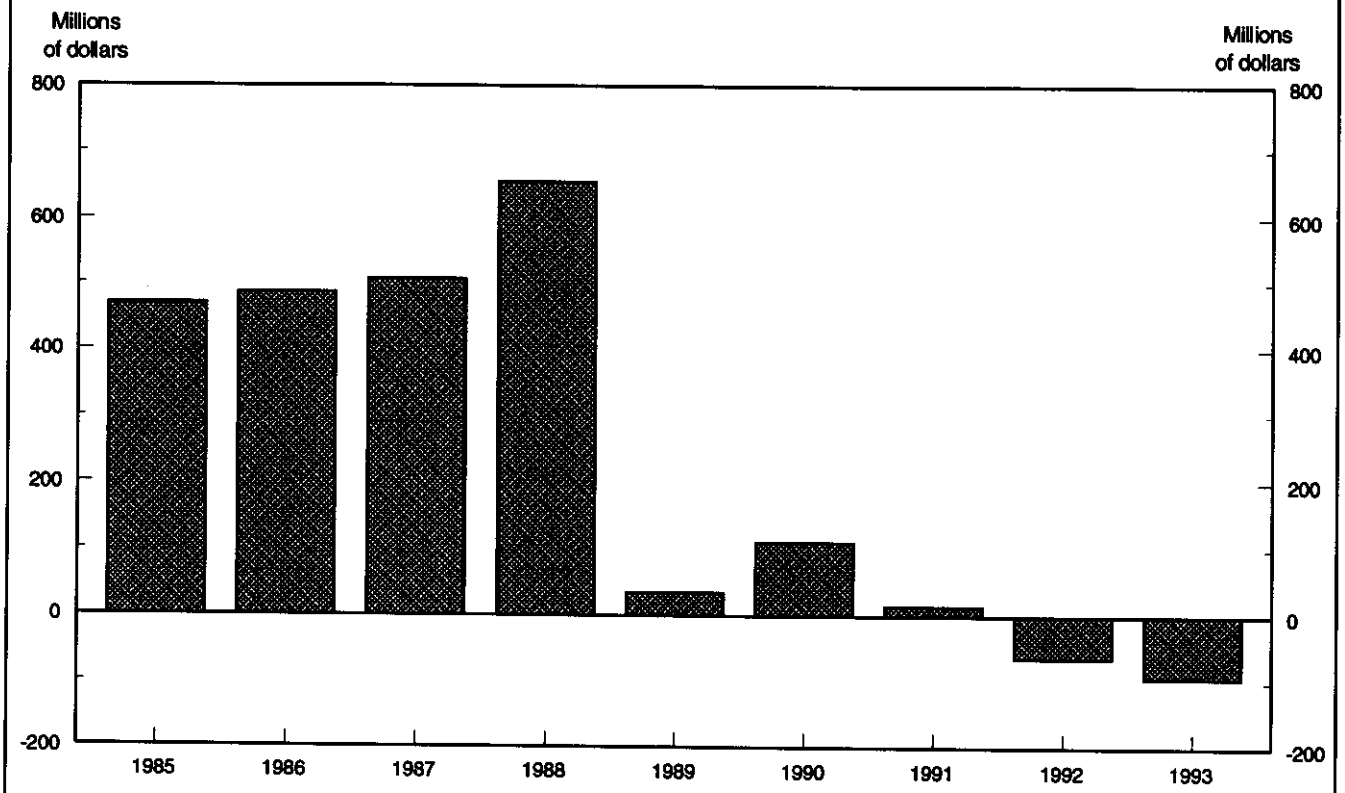
dustry to grow into the next century at less than half the rate it did over the 1979–92 period. Newly emerging factors, such as health care reform and international competition, will challenge the industry and its historic pattern of employment growth.

Health care reform. The current debate over health care reform has brought about uncertainty regarding future employment growth in drugs manufacturing. The immediate concern comes from the growing political and market pressures on the cost of drugs.[27] Health care reform plans are still in the early stages, and implementation may be years away. Initial proposals for reform include granting drug prescription benefits to medicare patients, requiring rebates from brand-name drug companies to the medicare system, and establishing a special advisory council to monitor the prices of new drugs, which enter the market facing little or no competition.[28] While not calling for direct controls on drug prices, the reform does entail a radical change in the availability of and treatment associated with health care and seems likely to have a major impact on the prescription drugs market.

The short-term effects of reform on employment in the drugs-manufacturing industry are uncertain. The pressure to keep prices, and likely payrolls, under control may be offset by a rise in demand from previously uninsured citizens and the growing number of elderly consumers. In 1990, the number of persons over 65, while accounting for just 12 percent of the total population, consumed 36 percent of the dollars spent on health care.[29] Health care reform proposals that affect new drugs are being approached cautiously so that the industry's commitment to research and development is not hindered.[30] Research on new drugs may take on more importance for brand-name companies if generics continue to encroach upon the market share of drugs that are beyond the patent-protection period.

Previous legislation provides little insight into possible effects of the currently proposed health care reform on employment in drugs manufacturing. Neither the introduction of medicare in 1966 nor the implementation of the Medicare Prospective Payment System in 1983 included specific provisions about pharmaceuticals. The 1966 reform excluded drugs from medicare payments,[31] and the 1983 reform dealt mainly with the establishment of medicare prospective payments for hospitals' inpatient operating costs.[32] In both cases, employment in the drugs-manufacturing industry continued to grow rapidly after the reform was implemented. (See chart 1.)

Chart 5. **Balance of trade for drugs manufacturing, 1985–93**



SOURCE: U.S. Department of Commerce.

Work on the current Administration's proposal for health-care reform began early in 1993. Drugs-manufacturing employment was virtually unchanged in 1993 and 1994, after the industry added nearly 9 percent to employment over the previous 2 years. Although the drugs-manufacturing industry was not influenced directly by previous medicare legislation, the proposed new health care reform was expected to have a much more significant impact on the industry. Because provisions of this reform were directed at pharmaceuticals, and because doubts surround its time of implementation, drugs-manufacturing payrolls were probably affected in 1993 and 1994 in anticipation of its impact.

Foreign competition. A prominent long-term issue concerning employment in the drugs-manufacturing industry is the increased competition that is emerging from foreign drug companies. Pharmaceutical imports into the United States have grown at a faster rate than U.S. drug exports since 1985, culminating in trade deficits for the industry in 1992 and 1993.[33] (See chart 5.) The recent passage of the North American Free Trade Agreement (NAFTA) and the ratification of the General Agreement on Tariffs and Trade (GATT) are making it easier for foreign drug manufacturers to participate in U.S. markets. These agreements, however, make involvement of U.S. drug companies in foreign markets more practical as well.

Trade has had both positive and negative effects on employment in the drugs-manufacturing industry in countries throughout the world. Canadian pharmaceutical firms added jobs before the ratification of NAFTA, under free trade with the United States from 1989 to 1992.[34] Also, the Irish pharmaceutical industry, one of that country's strongest exporters, is expecting to increase its work force under GATT.[35] And Canadian manufacturers of generic drugs plan to increase their participation in the attractive U.S. generic drug market because of the early 1993 passage of a Canadian law extending patent protection for brand-name drugs to 20 years.[36] By contrast, the United Kingdom's pharmaceutical industry is faced with manufacturers moving offshore and jobs being eliminated in a single European market confronted by overcapacity in production.[37] And with the possibility of more foreign involvement in the U.S. pharmaceuticals market under new trade agreements, U.S. drug companies could see further declines in their share of domestic markets. Finally, patent applications originating outside the United States have increased their share of total drug-related patents applied for in the United States between 1979 and 1992.[38]

On the other hand, the possibility of increasing U.S. market share abroad under new trade agreements may counterbalance the loss of domestic market share or even be the source of new jobs. Export-related employment represented nearly 16 percent of the drugs-manufacturing work force in 1989, and 13.5 percent of the industry's shipments were related to exports.[39] The Pharmaceutical Research and Manufacturers of America maintains that the industry is the most competitive U.S. industry in international markets and the world leader in innovation.[40] If this is true, the recent easing of trade barriers may work to the U.S. drug companies' advantage.

SHIELDED BY THE RELATIVELY inelastic demand for health care products, the drugs-manufacturing industry has added high-paying, high-skilled jobs throughout the past three decades, despite recessions and structural changes in the economy. While drug manufacturers continued to add jobs in the 1990's, job growth once thought of as certain could be challenged by some of today's issues. Increased competition from generic drugs and international companies, in addition to a reformed health care system, could have a negative impact on the industry and cause companies to consider eliminating jobs. But increased demand from previously uninsured citizens and reimbursed medicare patients, as well as freer international trade, could have a positive effect on the industry, enabling it to continue employment growth. These challenges have led BLS to project that drugs-manufacturing employment will grow slower in the future than it has in the past. □

Footnotes

[1] The drugs-manufacturing industry is defined in the *Standard Industrial Classification Manual* (Executive Office of the President, Office of Management and Budget, 1987), pp. 137–39.

[2] Employment data cited in this article are taken from the Current Employment Statistics survey and appear in *Employment, Hours, and Earnings, United States, 1909–1994, Vols. I and II*, Bulletin 2445 (Bureau of Labor Statistics, September 1994). The article uses annual averages for year-to-year comparisons. Employment estimates are for the 50 States and the District of Columbia; therefore, the 22,000 drugs-manufacturing employees in Puerto Rico are not included in the estimates.

[3] Meir Statman, *Competition in the Pharmaceutical Industry: The Declining Profitability of Drug Innovation* (Washington, DC, American Enterprise Institute for Public Policy Research, 1983), p. 59.

[4] For further analysis of employment in the health services industry, see David R. H. Hiles, "Health services: the real jobs machine," *Monthly Labor Review*, November 1992, pp. 3–16, especially p. 6.

[5] Based on data on average weekly wages from the BLS ES–202 program. These data appear in *Employment and Wages: Annual Averages* (Bureau of Labor Statistics, various issues).

[6] Based on data on average hourly earnings from the BLS Current Employment Statistics survey. Earnings were deflated using the Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W, 1982 = 100).

[7] Based on BLS Occupational Employment Statistics (OES) estimates for 1980, 1983, 1986, 1989, and 1992. The last year data were available was 1992 because the OES program gathers data in 3-year cycles.

[8] *Industrial Production and Capacity Utilization*, G.17(419) (Board of Governors of the Federal Reserve System, various releases).

[9] *Quarterly Financial Report for Mining, Manufacturing, and Trade Corporations* (Bureau of the Census, various releases).

[10] Pharmaceutical Research and Manufacturers of America, "Modern Medicines: Saving Lives and Money," *The Case for the Pharmaceutical Industry*, 1993, p. 1.1.

[11] See Hiles, "Health services," p. 4.

[12] Greg Muirhead, "Employers' Drug Benefit Costs per Employee Jump," *Drug Topics*, May 3, 1993, p. 58.

[13] Based on BLS Producer Price Index estimates with December 1984 = 100. Monthly data are available beginning in 1986.

[14] Based on BLS Consumer Price Index estimates, 1982–84 = 100.

[15] Pharmaceutical Research and Manufacturers of America, "Biotechnology: Its Importance and Its Challenges," *The Case for the Pharmaceutical Industry*, 1993, p. 21.1.

[16] *Ibid.*

[17] *Selected Data on Research and Development in Industry: 1991*, NSF 93–322 (National Science Foundation, 1993), p. 18.

[18] *Quarterly Financial Report*, various releases.

[19] Pharmaceutical Research and Manufacturers of America, "Modern Medicines," p. 5.

[20] *Selected Data on Research and Development in Industry*, p. 18.

[21] *Quarterly Financial Report*, various releases.

[22] Operating income is defined as net sales, receipts, and operating revenues, less (1) all operating costs and expenses, and (2) depreciation, depletion, and amortization of property, plant, and equipment.

[23] Statman, *Competition in the Pharmaceutical Industry*, pp. 65–66.

[24] *Ibid*, p. 65.

[25] "Do We Pay Too Much for Prescriptions," *Consumer Reports*, October 1993, p. 668.

[26] See James C. Franklin, "Industry Output and Employment," *Monthly Labor Review*, November 1993, pp. 41–57, especially p. 54; and *U.S. Industrial Outlook: 1993* (U.S. Department of Commerce, January 1993), p. 43–3.

[27] "Do We Pay Too Much for Prescriptions."

[28] "HHS Official Justifies Necessity of Monitoring Breakthrough Drug Prices," *BNA Health Care Daily*, November 17, 1993.

[29] Martha Glaser, "Employers Put New Controls on Mounting Retiree Prescription Costs," *Medical Economics Publishing: 1993*, May 17, 1993, p. 69.

[30] "Monitoring Breakthrough Drug Prices."

[31] Rashi Fein, *Medical Care, Medical Costs* (Cambridge, MA, Harvard University Press, 1986), p. 74.

[32] Louise B. Russell, *Medicare's new hospital payment system: Is it working?* (Washington, Brookings Institution, 1989), p. 8.

[33] *Trade and Employment* (Bureau of Labor Statistics, Bureau of the Census, various issues), tables 1 and 5.

[34] "Study This: The Hurtin's About to End," *The Financial Post*, December 11, 1993, p. 7.

[35] "Sutherland Confident of GATT Agreement; Manufacturing May Make Most Job Gains," *Irish Times*, December 15, 1993, p. 1.

[36] "Drug Companies; Rebels with a Pill," *The Economist*, Oct. 30, 1993, p. 76.

[37] "UK Pharmaceutical Investment Under Threat," *Pharmaceutical Business News*, September 20, 1993.

[38] *Patenting Trends in the United States, 1963–1991* (U.S. Patent and Trademark Office, September 1992), p. a4. Applications for patents are distributed in the year they are filed and are more likely to reflect changes in technological activity compared to patents granted. Also, fractional counts are used in order to eliminate multiple patent counts across different fields.

[39] *Exports from Manufacturing Establishments: 1988 and 1989*, AR89–1 (U.S. Bureau of the Census, November 1992), p. 24.

[40] Pharmaceutical Research and Manufacturers of America, "America's Pharmaceutical Industry: A Key Competitive Force," *The Case for the Pharmaceutical Industry*, July 1992, p. 1.