

The pharmaceutical industry: An examination and diagnosis

By Fabienne Leclerc

Canada's pharmaceutical products and drugs industry is one of the nation's most dynamic. Between 1997 and 2001, its net economic output, as measured by gross domestic product, increased by nearly 50%. Furthermore, this industry is one of the most research and development intensive sectors in Canada. In 2001, it accounted for 8% of all industry R&D.

The pharmaceutical and medicine manufacturing industry includes companies whose main activity is to manufacture drugs, medicines and related products for human or veterinarian use.

According to the Canadian Drug Manufacturers Association, the total Canadian pharmaceutical market in 2001 reached \$11.2 billion. Since 1990, spending on R&D has increased seven-fold, and CDMA-member companies have targeted more than \$1 billion for R&D over the next five years.

A better understanding of the characteristics and behaviour of this highly R&D-dependent industry, as well as the aids and obstacles to its growth, will shed light on the causes of its success. This article focuses primarily on how pharmaceutical production is distributed, how this industry differs from other manufacturing industries and what factors favour its long-term growth.

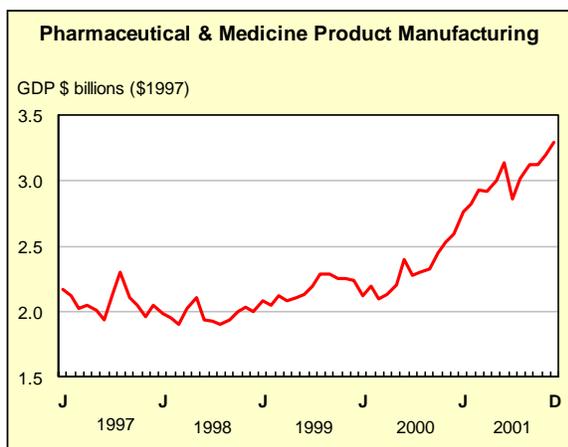
A flourishing industry

The pharmaceutical industry is extremely concentrated: nine companies alone accounted for 68% of total shipments in 2001, according to Statistics Canada's Monthly Survey of Manufacturing. These firms are multinational corporations, whose head offices in most cases are located in the United States or Europe.

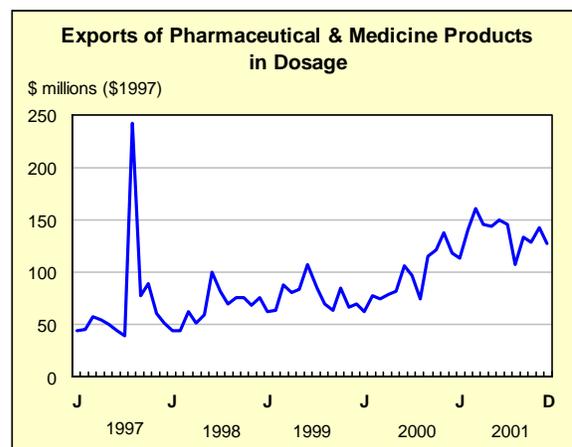
The remaining portion of the industry's output is distributed amongst a myriad of dynamic small businesses that generally occupy a specialized niche not occupied by the large multinationals, such as diagnostic kits or artificial substitutes. They often work in collaboration with universities.

The gross domestic product of the pharmaceutical industry rose at more than twice the pace of the total economy between 1997 and 2001. Net output increased 45% from \$2 billion to \$3 billion, while total economic output rose 16% from \$817 billion to \$947 billion.

Exports of pre-measured pharmaceutical and medicinal products, primarily destined for the United States, followed the same trend as production, more than doubling during this five-year period.



Source: *Industry Measures and Analysis*, STC



Source: *International Trade*, STC

An industry concentrated in Ontario and Quebec

In 2001, the pharmaceutical industry accounted for about 1.2% of all jobs in manufacturing. About 24,000 people worked in this industry in 2001, compared with 19,900 in 1997. During this five-year period, employment in the pharmaceutical sector rose 22%, compared with 9% for the economy as a whole.

These jobs were located primarily in two provinces: Ontario and Quebec. In 2001, companies in Ontario employed about 12,000 people, or 50% of the total. Companies in Quebec employed around 8,700, or 37% of the total. Quebec's share has decreased slightly since 1997 when it accounted for 41% of employment in the pharmaceutical industry nationwide.

Although they do not have comparable levels of production, Nova Scotia, Saskatchewan and British Columbia saw a significant increase in employment in this field.

In 2000¹, Ontario, which accounted for half the jobs in the pharmaceutical industry, recorded 44% of all Canadian R&D expenditures. Quebec, with 37% of employment, accounted for 42%. Ontario's ratio of R&D to employment in this industry is lower because the large "generic drugs" producers are in Ontario.

Ontario and Quebec share of employment and expenditures in the pharmaceutical industry in relation to Canada as a whole

2000	Ontario	Quebec
Proportion of employment	50%	37%
Proportion of R&D expenditures*	44%	42%

*Expenditures=current expenditures + capital expenditures (equipment + depreciation)

Source: Patented Medicine Prices Review Board (PMPRB), Survey on employment, Payrolls and hours (SEPH)

Best sellers show strong growth

Of the drugs produced by the nine largest drug companies in Canada, some big sellers are those used against cholesterol, diabetes, rheumatism and osteoporosis. Other best-selling products include limited-spectrum drugs, which target a specific behaviour of a particular disease, such as immunostimulants or products used in chemotherapy.

According to the Patented Medicine Prices Review Board (PMPRB), in 2000 these best-sellers accounted for the strongest growth in sales of patented drugs².

In return for freer access to patents in 1987, Canadian drug research companies made a commitment to increase their spending in research to 10% of sales by 1996. This commitment appears to have had an impact on production since companies with a previous strong R&D orientation contributed significantly to the recent increase in production.

¹ According to the Patented Medicine Prices Review Board (PMPRB) and the Survey of Employment, Payrolls and Hours,(SEPH).

² Annual Report 2000, PMPRB.

Pharmaceutical R&D: long, costly and risky

The pharmaceutical industry is one of the most innovative industries in Canada.

Although the industry produced 1.9% of manufacturing GDP in 2001, it accounted for 8% of the total manufacturing spending in R&D, according to the Survey on Research and Development in Canadian Industry. Moreover, in twenty years, their pace of growth was triple than that of total manufacturing.

Spending in R&D (\$ millions)

	1981	2001 (prelim)
Total manufacturing spending	1,692	8,359
% of growth		394%
Pharmaceutical industry spending	52	666
Share of total R&D for manufacturing	3%	8%
% of growth		1180%

Source: Survey of Research and Development in Canadian Industry 2001, Statistics Canada

The innovators in this industry do so mostly to develop new products. The most frequent answer given by the pharmaceutical industry to the question, "Why do you innovate?" asked in the 1999 Survey of Innovation³, was "to extend product range". For manufacturing industries in general, the most frequently cited reason was "to improve product quality".

Yet pharmaceutical research is a relatively long process. For almost 3% of innovators in the overall manufacturing sector, more than 61 months elapsed between the idea and the finished product. This was the case with more than 20% of innovators in the pharmaceutical industry.

This is corroborated by the research by the Boston Consulting Group (BCG)⁴, which found that the process of developing a drug in the United States takes 15 years of research and costs an average of US\$880 million. The increase in production in 1997 may thus be explained in part by the increased R&D efforts since 1987.

Drug research also appears to be going through a period of great uncertainty. According to the Survey of Innovation, a large proportion of innovation projects are uncompleted or unsuccessful. Some 70% of innovators in the pharmaceutical industry reported having at least one uncompleted or aborted project between 1997 and 1999.

This put the industry in third place for the most uncertain research, after the communications equipment industry (76%) and the semiconductors and other electronic components industry (74%). This is also corroborated by BCG, which estimated that three-fourths of R&D expenditures undertaken each year go to drugs that will never reach the market.

³ Survey of Innovation 1999, Statistics Canada

⁴ Boston Consulting Group, A revolution in R&D: The Impact of Genomics, BCG Focus, June 2001:3

The discovery of new drugs ends with several clinical trials that are also expensive, long and uncertain. However, it is no surprise that the industry considers the heavy regulations and the high cost of development as the major barriers to innovate. For innovators in general, the most frequently named obstacle to innovate was the lack of staff to assign at development projects, following by the cost of development.

R&D: emphasis on teamwork and training

As a direct consequence of R&D expenditures, 81% of companies in the pharmaceutical industry conducted training, compared with 69% in manufacturing as a whole.

Because of the emphasis on R&D as well as the length of the project and the uncertainty surrounding the results, there was a tendency to form multidisciplinary teams within the research environment. The Survey of Innovation showed that 70% of drug companies rated the importance of creating teams of employees with different skills as moderately high to high, compared with 54% for manufacturing industries in general.

The time and the financial effort devoted to developing a product led the pharmaceutical industry to collaborate closely with other firms, government research institutes, universities and hospitals to keep costs to a minimum. Nearly twice as many innovative companies in the pharmaceutical industry have collaborated with other firms than in the manufacturing sector as a whole.

The main reasons given by the pharmaceutical industry for collaborating are to share costs and spread risk. For manufacturing industries in general, the main concern appears to be access to knowledge and new markets. Concentrating research in a separate unit also seems to be a widespread practice. About 81% of innovative establishments in the pharmaceutical industry reported having a separate research department, compared with 45% for innovators in the manufacturing sector as a whole.

Innovators' reasons for co-operating*

Manufacturing sector as a whole	Pharmaceutical industry
Access critical expertise 55%	Share costs 62%
Access R&D 52%	Access R&D 62%
Access new markets 45%	Spread risk 56%
Share costs 42%	Access critical expertise 56%

*Among the 33% and 61% respectively of innovators in these two categories who reported co-operating.

Splitting the research process is another favoured strategy. The clinical trials phase, for example, can be contracted out to a research centre or hospital. While most research is carried out by the companies themselves, between 1997 and 2001 there was a substantial increase in contracts awarded to government research institutes, individuals or private clinics⁵.

Powerful trends signal dynamic growth prospects

Several powerful trends are working in favour of dynamic growth in production for Canada's pharmaceutical and medicine manufacturing industry.

⁵ PMPRB, op. cit.

The population is ageing. According to the 2001 Census, the proportion of the population over the age of 55 rose from 18% in 1980 to 22% in 2001. With the extension of life expectancy, ailments related to lifestyles and old age will become increasingly common in North American society, stimulating the demand for new drugs and, thus, for basic and applied research. The proportion of expenditures on pharmaceuticals compared to total personnel expenditures increased significantly during our reference period⁶.

According to the PMPRB, sales of patented drugs in relation to sales of non-patented drugs rose from just under 50% in 1990 to 72% in 2000. On the other hand, the price of patented drugs increased less rapidly than that of non-patented drugs⁷. In addition, the commitment made by drug companies in 1987 to conduct research and development is only beginning to bear fruit, owing to the sizable time lag between the initial spending and the marketed product.

In addition, among the companies that saw their production rise sharply between 1997 and 2001, a large proportion have a very high R&D-to-sales ratio compared with the average for this industry; a pattern that bodes well for the future.

Conversely, some companies with little current production have spent massively in R&D, indicating real optimism regarding future production⁸. Furthermore, some leading companies in this field are devoting a fairly sizable portion of their total R&D spending to biotechnology, which should enhance their future prospects.

Another long-term advantage is the close ties between companies and academic institutions in this field, creating a critical mass of specialized manpower, especially in Toronto and Montreal. And according to the Survey of Innovation, the pharmaceutical industry has not suffered from labour shortages.

Considering the high level of job specialization in this industry, this finding also sounds a note of optimism for the future.

⁶ Income and Expenditures Accounts Division, Statistics Canada

⁷ PMPRB, *op cit.*

⁸ PMPRB, *op cit.*, Table 12.