

**EXPORTS AND RELATED EMPLOYMENT
IN CANADIAN INDUSTRIES**

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Science and Technology Redesign Project
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THE INFORMATION SYSTEM FOR SCIENCE AND TECHNOLOGY PROJECT

The purpose of this project is to develop useful indicators of S&T activity and a framework to tie them together into a coherent picture of science and technology in Canada.

To achieve the purpose, statistical measurements are being developed in five key areas: innovation systems; innovation; government S&T activities; industry; and human resources, including employment and higher education. The work is being done at Statistics Canada, in collaboration with Industry Canada and with a network of contractors.

Prior to the start of this work, the ongoing measurements of S&T activities were limited to the investment of money and human resources in research and development (R&D). For governments, there were also measures of related scientific activity (RSA) such as surveys and routine testing. These measures presented a limited and potentially misleading picture of science and technology in Canada. More measures were needed to improve the picture.

Innovation makes firms competitive and more work has to be done to understand the characteristics of innovative, and non-innovative firms, especially in the service sector which dominates the Canadian economy. The capacity to innovate resides in people and measures are being developed of the characteristics of people in those industries which lead science and technology activity. In these same industries, measures are being made of the creation and the loss of jobs as part of understanding the impact of technological change.

The federal government is a principal player in science and technology in which it invests over five billion dollars each year. In the past, it has been possible to say how much the federal government spends and where it spends it. The current report, Federal Scientific Activities (Catalogue 88-204), released early in 1997, begins to show what the S&T money is spent on with the new Socio-Economic Objectives indicators. As well as offering a basis for a public debate on the priorities of government spending, all of this information will provide a context for reports of individual departments and agencies on performance measures which focus on outcomes at the level of individual projects.

By the final year of the Project in 1998-99, there will be enough information in place to report on the Canadian system on innovation and show the role of the federal government in that system. As well, there will be new measures in place which will provide a more complete and realistic picture of science and technology activity in Canada.

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PREFACE

The paper, **Exports and Related Employment in Canadian Industries**, takes data from the Input-Output tables of Statistics Canada and looks at the trends in exports, value added production, and export related employment for the period 1980 to 1992. It concentrates on those industries that sell goods and services in the market place and does not consider the public services of government, health and education. To provide a link to more recent analysis, the paper includes a breakdown of GDP for 1996 and total employment growth for the periods 1980 to 1992 and 1992 to 1996.

This paper is one of four studies for the Information System for Science and Technology Project at Statistics Canada. The objective of all of these papers is to look at characteristics of employment and of the firm across the economy. Each draws upon databases that are unique to Statistics Canada. This paper uses the Input-Output database to look at those industries that have strong export growth and growth in export related employment. Two forthcoming papers, **Business Demographics as Indicators of Innovation Activity**, and **Job Creation, Job Destruction and Job Reallocation**, use the Longitudinal Employment Analysis Programme (LEAP) database to analyse the net creation of firms, and of jobs, by industry. The final paper, **A Dynamic Analysis of the Flows of Canadian Science and Technology Graduates into the Labour Market**, uses the National Graduate Survey (NGS) data base to examine the flow of graduates from Canadian universities to industries and their industrial distribution two and five years after graduation.

Canada has a service economy, with two thirds of gross domestic product and seven out of ten jobs attributable to the service sector. Service industries that sell their production in the market place, domestically and abroad, are a source of economic growth and they consist of firms that evolve in a different market structure and dynamic than those in manufacturing and primary industries. The growth of employment in these service industries is a well established result. The challenge is to relate this growth to the mechanisms of technological change.

Highlights

- Service industries, not related to goods, saw the strongest growth in exports and in export related employment over the period 1980 to 1992. These industries also had the largest number of jobs, and highest value added, for each million dollars worth of gross output.
- Service industries related to goods, goods industries and primary industries follow in order of export growth and related employment growth.

1. INTRODUCTION

In this note, the input-output database at Statistics Canada is used to survey industry characteristics, and especially exports, in order to see where there is growth in both exports and export related employment. This raises the question of why growth is occurring.

Baldwin and Johnson (1995) observed that firms that are innovative, export, on average, three times the sales of firms that are not innovative. An innovative firm in this context was one that had introduced new or improved products or processes. An earlier survey of the use and planned use of a list of advanced manufacturing technologies found that firms that used at least one of the technologies had a higher propensity to export (Statistics Canada, 1991). The presence, then, of a strong signal of growth in exports may be attributable to innovation and/or technology use. It may not, but such a signal does invite further probing and there are surveys of innovation in selected service industries, conducted as part of the Science and Technology Redesign Project at Statistics Canada, to do this.

This note identifies sectors where there is export growth and examines the trends in employment related to exports and in the value added produced by the industries. It is based on Statistics Canada input-output data for the period 1980 to 1992. For the more recent period of 1992 to 1996, data on gross domestic product (GDP) and employment by industry are used.

The principal observation is that service industries are not just a source of employment, but they are also responsible for high value added production and high growth in exports.

2. COMPARISON OF GOODS AND SERVICES INDUSTRIES

2.1 Goods Industries

In 1992, exports by goods industries represented 70% of all exports (Table 1). By contrast, the value added embodied in these exports, in proportion to gross output, was relatively low (32% compared with 42% for all the industries). This can be explained in

part by the fact that imported goods are largely used as production inputs in goods industries (imported goods accounted for 90% of all imports in 1992).

The goods industries allocated more jobs to exports, compared with all industries. Jobs related to exports in the goods industries represented 40% of all jobs related to exports, whereas they accounted for only 28% of total employment (Table 4).

Nonetheless, since 1980 employment growth related to exports in the goods industries has been below the average. Based on the 1992 data, job creation resulting from increased exports in the goods sector would be proportionally less than in the services sector, as goods industries have the lowest number of jobs related to exports for each million dollars worth of gross output. The number of jobs is five, which is around a third of the equivalent number in service industries.

2.2 Services Industries

Service industries export the least in volume (Table 1). However, their exports have grown the most since 1980: their annual composite growth rate was about 16%, or double that of the goods industries. Moreover, the value added embodied in the exports from service industries is high when it is calculated in proportion to gross output (64%), and was double that of the goods industries.

Since 1980, the service industries have posted the most vigorous employment growth with an annual increase of about 6% for export related employment (four times as much as in the goods industries).

Assuming the market is not saturated, the data suggest that service industries have more export-related job creation potential than goods industries for two reasons: the current level of exports is low compared with the level of exports in the goods sector, and the number of jobs related to exports for each million dollars worth of gross output is higher (14 jobs) than in the goods sector (5 jobs).

While these results are robust, within the input-output model, there is an on-going debate on measurement issues in service industries which is reviewed by Melvin (1996).

3. SERVICES IN MORE DETAIL

3.1 Communication Services

Communication Industries

Like other utility industries, exports by communication industries have the highest value added in proportion to gross output. This ratio was 76% for communication industries compared with 30% for manufacturing industries (Table 2). Retail and wholesale trade industries, and community, business and personal services industries, follow closely

behind with ratios of approximately 65%.

By contrast, although exports by communication industries increased 9% annually since 1980, the impact of exports on employment has been limited with an annual growth rate of about 1% over the same period.

Table 3 gives a more detailed picture of the two telecommunications industries that make up the communication sector: telecommunication carriers and, telecommunications broadcasting.

Telecommunications Carriers

Exports by the telecommunications carriers industry and the business service industry were among those containing the most value added (79%). The growth in the exports of these two industries was quite significant. What distinguished the telecommunications carriers industry, however, was its performance regarding employment. For every 17 jobs allocated by the business service industry for each million dollars worth of gross output, telecommunications carriers allocated only a third that number, or 6 jobs. In addition, employment growth in the telecommunications carriers industry appeared to be at a virtual standstill, whereas annual employment growth in the business service industry was about 5%.

Telecommunications Broadcasting

Exports by the telecommunications broadcasting industry also have high value added (65%) and, as for the telecommunications carriers industry, the impact of exports on its employment level is almost nil.

3.2 Community, Business and Personal Services

Community, Business and Personal Service Industries

While exports of the community, business and personal service industries accounted for only 8% of the total value of exports by the manufacturing industries, its 373,144 export related jobs represented half the jobs in the manufacturing sector (Table 2). These industries also posted the largest employment growth (about 8% annually) and, in 1992, there were 20 export-related jobs for each million dollars worth of gross output, one of the highest ratios.

As well, exports by these industries have relatively high value added (65%) corresponding to more than double the value added of exports by manufacturing industries.

Table 3 gives a more detailed picture of the industries that make up the community, business and personal sector.

Business Service Industries

Despite the fact that exports by the business service industries have experienced moderate annual growth (11%), their value added content is very high (70%). Since 1980, employment related to exports has risen annually by about 5% in these industries, a smaller increase than that of all community, business and personal service industries but nonetheless twice as large as that for all industries.

Accommodation and Food Services

Exports by the accommodation and food services industry have high value added (56%) and, above all, they have a positive impact on the level of employment. In fact, the employment level related to exports has increased 17% annually since 1980. In this industry, there were 27 jobs for each million dollars worth of gross output, one of the best performances. A large part of these exports are, in fact, the spending of tourists who visit Canada.

3.3 Retail Trade Industries

Retail trade industries combined high value added in proportion to gross output (64%) and the largest number of jobs for each million dollars worth of gross output. The 27 jobs were five times larger than the same ratio for the manufacturing industries). (Table 2)

4. RECENT DATA FOR GDP AND EMPLOYMENT

So far, this note has looked at exports, value added, and export related employment based on input-output data for the period 1980 to 1992. To provide some more current information, GDP and total employment data for 1996 are examined along with the growth rates from 1992. To link to the earlier period, the total employment for 1992 and the growth from 1980 is given in Table 4.

Table 5 provides GDP and total employment data for 1996, for the four sectors examined in this note. It excludes public services such as government, health and education. For the whole economy, services accounted for about two-thirds of GDP and seven out of ten jobs in 1996.

Among the services industries, the communication industries have experienced the most vigorous economic growth since 1992, namely, 6.1% annually compared with 3.3% for the economy as a whole. By contrast, their labour needs have not been directly related to this economic growth since the employment level rose only 1.4% between 1992 and 1995. This is consistent with the observations on export related employment in the previous section.

Annual growth in the Community, Business and Personal Services sector was identical to that of the entire Canadian economy, but annual employment growth (4.6%) was twice that of the economy as a whole (2.1%). In fact, employment growth was the highest in this sector. Within this sector, Business Services represented about a third of the economic activity and employment. The annual growth in Business Service, 4.7 % for GDP and 7.0 % for employment, was higher than for the Community, business and personal services sector as a whole.

The Finance, Insurance and Real Estate Industry experienced more moderate economic growth (2.3% annually) than the economy as a whole, whereas its annual employment growth was almost nil (-0.2%).

5. CONCLUSION

Assuming that the markets are not saturated, service industries offer significant potential for export-related job creation. Service industry exports embody high value added compared with exports from the goods sector. With the exception of communications and other utility industries, service industries with exports that embody high value added give rise to more jobs than those with less value added.

As innovative firms, and firms that use advanced technologies, have a higher propensity to export, there is additional work to be done on examining the links in service industries between innovation and technology use and employment and exports.

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Table 1: Impact of Exports by the Four Broad Industrial Sectors¹

	Exports \$ Millions 1992	Annual Composite Growth in Exports 1980-1992	Imports \$ Millions 1992	V.A./ Gross Output 1992	Employment Thousands 1992	Annual Composite Growth in Jobs 1980-1992	# Jobs/ \$ Million Gross Output 1992
Primary Industries	21,408	1.3 %	1,711	48 %	294	-2.0 %	7
Goods Industries	113,192	7.1 %	40,325	32 %	798	1.6 %	5
Services Industries related to goods	17,178	7.2 %	1,485	57 %	398	2.1 %	12
Services Industries	12,248	16.1 %	1,437	64 %	478	6.3 %	14
Total	164,027	6.5 %	44,958	42 %	1,969	1.9 %	7

Source: Input-Output Division, Statistics Canada (authors' calculations)

Table 2: Impact of Exports by Industry (S level)

	Exports \$ Millions 1992	Annual Composite Growth in Exports 1980-1992	Imports \$ Millions 1992	V.A./ Gross Output 1992	Employment Thousands 1992	Annual Composite Growth in Jobs 1980-1992	# Jobs/ \$ Million Gross Output 1992
Primary Industries							
Agricultural & rel. Serv. Ind.	5,220	-1.2 %*	537	43 %	155	-3.0 %	19
Fishing & Trapping Ind.	485	6.3 %	80	59 %	28	1.8 %	22
Logging & Forestry Ind.	203	4.5 %*	108	39 %	36	-2.1 %	6
Mining, Quar. & Oil well Ind.	15,500	2.1 %	986	52 %	75	-1.3 %	3
Goods Industries							
Manufacturing Ind.	112,360	7.2 %	39,978	30 %	749	1.7 %	5
Construction Ind.	-	-	174	52 %	26	-0.1 %*	11
Other Utility Ind.	833	-4.6 %	173	75 %	23	-0.6 %*	4
Services Industries related to goods							
Transportation & Stor. Ind.	11,339	7.6 %	1,204	50 %	165	0.6 %*	9
Wholesale Trade Ind.	5,548	8.6 %	232	67 %	160	3.7 %	13
Retail Trade Ind.	291	14.7 %	49	64 %	74	2.8 %	27
Services Industries							
Communication Ind.	822	9.4 %	85	76 %	30	1.2 %	8
Finance, Ins. & Real Est. Ind.	2,290	15.9 %	276	58 %	76	3.3 %	6
Com, Bus. & Pers. Serv. Ind.	9,135	17.2 %	1,076	65 %	373	7.7 %	20
Total	164,027	6.5 %	44,958	42 %	1,969	1.9 %	7

Source: Input-Output Division, Statistics Canada (authors' calculations)

*: These values are not significant at 5% confidence level

Note: These are preliminary data

¹ **Primary Industries:** Agricultural & Related Services Ind.; Fishing & Trapping Ind.; Logging & Forestry; Mining, Quarrying & Oil Well Ind.

Goods Industries: Manufacturing Ind.; Construction Ind.; Other Utility Ind.

Services related to Goods Industries: Transportation & Storage Ind.; Wholesale Trade Ind.; Retail Trade Ind.

Services Industries: Communication Ind.; Finance, Ins. & Real Estate Ind.; Community, Business & Personal Services Ind.

Table 3: Impact of Exports for Chosen Industries

Industries	Exports \$ Millions	Annual Growth in Exports	Imports \$ Millions	VA/ Gross Output	Employment 1992	Annual Composite Growth in Jobs	# Jobs/ \$ Million Gross Out- put, 1992
M & L levels	1992	1980-1992	1992	1992	Thousands	1980-1992	
MANUFACTURING IND.							
Crude Petrol. & nat. gas	9,655	1.5% *	377	50%	22	1.8%	2
Quarry & Sand Pit Ind.	52	14.3%	13	52%	2	3.5%	8
Serv. rel. mineral extract	21	2.5% *	67	44%	10	4.2%	10
Food Ind.	5,749	5.2%	680	31%	43	1.2%	5
Beverage Ind.	1,010	4.7%	99	49%	5	-1.1% *	4
Tobacco Prod. Ind.	482	8.8%	20	50%	1	-0.3% *	2
Rubber Prod. Ind.	1,439	9.1%	446	45%	15	2.4%	7
Plastic Products Ind.	1,367	13.4%	537	41%	20	8.6%	8
Leather & all. Prod. Ind.	187	6.7%	71	41%	3	1.7% *	13
Primary Textile Ind.	1,169	9.6%	498	40%	17	3.3%	8
Clothing Ind.	873	11.8%	210	42%	15	6.5%	14
Wood Ind.	7,222	5.4%	378	30%	57	-1.2%	6
Furniture & Fixture Ind.	936	10.8%	158	43%	12	7.2%	12
Paper & all. Prod. Ind.	11,484	4.7%	1,046	28%	64	-0.6% *	5
Printing, Publishing Ind.	723	10.3%	166	56%	23	3.7%	10
Primary Metal Prod. Ind.	10,198	4.9%	2,929	24%	62	-1.1%	4
Fabric. Metal Prod. Ind.	3,418	5.3%	810	43%	55	2.6%	9
Machinery Ind.	3,869	5.4%	1,023	43%	39	0.9% *	8
Transportation equip Ind	39,945	9.1%	21,047	24%	166	3.0%	4
Electrical & Electro. Prod	10,504	12.8%	5,574	30%	71	3.9%	6
N-metal Miner. Prod Ind	876	7.4%	169	46%	11	0.7% *	7
Ref. Petro. & coal Prod.	2,475	2.6% *	1,738	6%	4	-2.6%	1
Chemical & ch. prod Ind.	6,001	7.7%	1,715	33%	37	1.7%	3
Other Manufacturing Ind	2,431	7.3%	627	45%	30	3.9%	10
Sub-total	112,360	7.2%	39,978	30%	749	1.7%	5
COMMUNICATION IND.							
Telecom Broadcasting	107	12.4%	43	65%	4	0.6% *	7
Telecom Carriers & other	519	7.6%	24	79%	15	0.5% *	6
Sub-total²	822	9.4%	85	76%	30	1.2%	8
FINANCE, INS. & REAL ESTATE							
Finance & Real Est. Ind.	1,354	19.8%	185	54%	62	3.5%	7
Insurance Ind.	937	11.9%	92	23%	14	2.5%	8
Sub-total	2,290	15.9%	276	58%	76	3.3%	6
COMMUNITY, BUSINESS & PERSONAL SERV.							
Business Service Ind.	4,179	11.1%	449	70%	178	4.6%	17
Educational Serv. Ind.	163	16.4%	6	63%	2	11.3%	13
Health Services Ind.	11	4.9%	2	74%	-	4.6%	12
Accommodation & Food Ser	3,334	61.4%	394	56%	115	17.4%	27
Amuse. & Recreat. Serv.	1,026	53.5%	143	52%	15	24.0%	11
Pers. & Household Serv.	6	37.3%	9	64%	2	5.0%	24
Other Services Ind.	404	10.6%	74	70%	60	5.3%	26
Sub-total	9,135	17.2%	1,076	65%	373	7.7%	20

Source: Input-Output Division, Statistics Canada (authors' calculations)

*: These values are not significant at 5% confidence level

Note: These are preliminary data

² Sub-total for Communication Industries includes Postal Service Industry.

Table 4: Total Employment by Industry

	Total Employment 1992 Thousands	Annual Composite Growth in Jobs 1980-1992
Agricultural & Rel. Serv. Ind.	450	-1.0 %
Fishing & Trapping Ind.	38	2.0 %
Logging & Forestry Ind.	53	-0.9 %*
Mining, Quarrying & Oil Well Ind.	125	-1.5 %
Primary Industries	666	-0.9 %
Manufacturing Ind.	1,669	0.1 %
Construction Ind.	740	1.8 %
Other Utility Ind.	113	1.5 %
Goods Industries	2,522	0.6 %*
Transportation & Storage Ind.	459	0.2 %
Wholesale Trade Ind.	623	3.1 %
Retail Trade Ind.	1,476	1.3 %
Services Industries Related to Goods	2,557	1.5 %
Communication Ind.	203	0.2 %
Finance, Ins. & Real Estate Ind.	704	2.8 %
Community, Business & Personal Services	2,352	4.1 %
Services Industries	3,259	3.5 %
Total	9,004	1.7 %

Source: Input-Output Division, Statistics Canada (authors' calculations)

*: These values are not significant at 5% confidence level

Note: These are preliminary data

Table 5: GDP and Total Employment by Industry, More Recent Data

	GDP 1996 \$ Millions	GDP Share 1996	GDP Growth 92-96	Employ- ment† 1996 Thousands	Employ- ment Share 1996	Employ- ment† Growth 92-96
Agricultural & Rel. Serv. Ind.	11,876.1	2.6 %	4.0 %	468	4.8 %	0.5 %
Fishing & Trapping Ind.	835.2	0.2 %	-5.7 %	37	0.4 %	-4.6 %
Logging & Forestry Ind.	2,622.9	0.6 %	2.0 %	58	0.6 %	4.2 %
Min., Quar. & Oil Well Ind.	24,387.0	5.3 %	4.6 %	125	1.3 %	0.9 %
Primary Industries	39,721.2	8.6 %	4.0 %	688	7.0 %	0.6 %
Manufacturing Ind.	103,746.1	22.5 %	4.5 %	1,781	18.2 %	1.9 %
Construction Ind.	26,688.8	5.8 %	-1.5 %	765	7.8 %	0.9 %
Other Utility Ind.	17,193.3	3.7 %	2.4 %	105	1.1 %	-0.4 %
Goods Industries	147,628.2	32.0 %	3.1 %	2,651	27.0 %	1.5 %
Transportation & Stor. Ind.	24,231.5	5.3 %	3.3 %	472	4.8 %	1.7 %
Wholesale Trade Ind.	34,643.3	7.5 %	5.4 %	700	7.1 %	2.8 %
Retail Trade Ind.	32,544.5	7.1 %	2.5 %	1,516	15.5 %	0.6 %
Services Ind. Rel. to Goods	91,419.0	19.8 %	3.8 %	2,688	27.4 %	1.4 %
Communication Ind.	24,387.2	5.3 %	6.1 %	203	2.1 %	1.4 %
Finance, Ins. & Real Est. Ind.	88,448.7	19.2 %	2.3 %	719	7.3 %	-0.2 %
Com., Bus. & Pers. Serv.	69,201.5	15.0 %	3.3 %	2,851	29.1 %	4.6 %
. <i>Business Service*</i>	26,547.6	5.8 %	4.7 %	944	9.6 %	7.0 %
Services Industries	182,037.4	39.5 %	3.2 %	3,774	38.5 %	3.4 %
Total	460,805.8	100 %	3.3 %	9,800	100 %	2.1 %

Source: Input-Output Division, Statistics Canada (authors' calculations)

†: These growth rates are not significant due to the small number of years.

*: **Business Service is included in Community, Business and Personal Services industry.**

Note: These are preliminary data.

Definitions

Employment: Employment data comes from several sources and the major sources are the Labour Force Survey (LFS) and the Survey on Employment, Payroll and Hours (SEPH). Many other surveys focusing on specific industries are also included as the Survey of Manufacturing Industries in Canada.³

GDP: Gross Domestic Product at a factor cost in \$ 1986.

Growth rate: annual composite growth rate.

³ For more details, see *Aggregate Productivity Measures*, Catalogue no. 15-204, annex 2.

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