

Job Creation, Job Destruction and Job Reallocation in the Canadian Economy

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THE INFORMATION SYSTEM FOR SCIENCE AND TECHNOLOGY PROJECT

The purpose of this project is to develop useful indicators of 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, released early in 1997, begins to show what the S&T money is spent on. 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

This paper, **Job Creation, Job Destruction and Job Reallocation**, uses the Longitudinal Employment Analysis Programme (LEAP) data base to analyse the net creation of jobs, by industry. The net number of jobs gained or lost in a year is a measure of the volatility of an industry and that volatility can be examined in the light of technological change, and human resource development.

This paper is one of four related studies in the Working Paper Series of the Information System for Science and Technology Project at Statistics Canada. The objective of the Project is to develop useful indicators of activity and a framework to tie them together into a coherent picture of science and technology in Canada. The indicators to be tied together include employment, exports, and economic growth, linked to research and development, invention, innovation, technology diffusion and the characteristics of the human resources related to these activities. To contribute to this, there were surveys, in 1997, of innovation in selected service industries and of the use and planned use of biotechnologies in selected manufacturing and primary industries, as well as various analytical projects reported in the Working Paper Series. Each of the surveys examine sources, barriers and outcomes of the activity measured, including the characteristics of the human resources involved. The results of the surveys are to be released by mid-1998.

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.

Four studies provide a context for this activity. Each draws upon data bases that are unique to Statistics Canada. This paper and **Business Demographics as Indicators of Innovation Activity** use the Longitudinal Employment Analysis Programme (LEAP) data base to analyse the net creation of firms, and of jobs, by industry. **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. A fourth 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.

The objective of all of these papers is to look at characteristics of employment and of the firm across the economy.

1. Introduction

Growth is a dynamic process. Net change in total employment or output is the outcome of the performance of the individual firms. Some firms continue to grow during recessions, while others retrench even during economic upswings, resulting in the reallocation of jobs between firms, between industries and between regions. Job reallocation means that for every worker added to the payroll, several jobs are eliminated and many more are added in a growing economy as emerging industries expand and aging industries try to compete by focussing on operational efficiency.

Just as the creation of a new job signals a change in the economy, the elimination of a job also provides useful information about on-going changes. As well as being the indicators of change, data on job reallocation illuminate policy issues. Job reallocation implies that some workers have to move, and the transfer of workers -- whether voluntary or involuntary -- means flow of information about new management techniques and new products and processes among organizations involved. Transfer of personnel also provides an indication of the need for training and upgrading skills.

This study presents indicators of employment dynamics. The first indicator is the job creation. It is the increase in the number of jobs contributed by growing firms, defined by employment, and new firms set up during the reference period. The second is job destruction. It is the sum of jobs lost due to retrenchment in declining firms and jobs lost because of business closures. The third indicator is the sum of jobs created and of jobs eliminated and is called job reallocation. It provides an indication of the number of jobs being reshuffled in the economy in any one year. It is a measure of volatility showing which industries are undergoing the most change. All estimates are expressed as percentages of the total number of jobs that existed at the beginning of the period.

The primary purpose of the estimates is to analyze trends and inter-industry differences; they are not intended to be precise estimates of the number of jobs because of the methodology used in deriving them.

Once the indicators of change are given, there is the question of why change has or has not occurred. There are many reasons for the differences, including the pace of technological change; whether the new technology resulted in the introduction of a new product or a better substitute, or whether the innovation led to operational efficiency; the degree of competition; and finally the age profile of the workforce. New technologies not only affect industries producing or adopting them but also other industries that buy goods and services from or sell to these industries.

2. Concepts and Definitions

The focus of the study is on paid jobs. The number of jobs in the economy does not necessarily equal the number of employed persons. Some persons may hold multiple jobs -- a growing phenomenon in the economy because of the increasing numbers of contract and temporary jobs (Grenon and Lee, 1997). Second, paid jobs do not include self-employed individuals, who are growing in number. It means partners in a business who do not draw a salary but nevertheless

provide labour input are excluded.

The unit of measurement is the legal entity, referred to as firm in this paper. A legal entity is a business that must maintain a payroll deduction (PD) account with Revenue Canada and issue a record of earnings (T4 slip) to its employees for personal income tax purposes. A legal entity may operate several establishments and may itself belong to an enterprise. Thus the number of jobs created, of jobs destroyed and of jobs reallocated would be higher if the business unit used was the establishment and lower if it was the enterprise, than the estimates reported in the present study. The bias introduced by unit of measurement would not be uniform across industries because of the differences in their structures.

Since the primary purpose of the study is to examine the employment dynamics, the estimates of job creation and job destruction are gross concepts, that is, job creation is the total number of jobs created in the economy before accounting for job losses. It is calculated by adding the increase in jobs contributed by growing firms and by new firms. Similarly, job destruction is the total number of jobs lost and not the net decline in employment. It represents the loss in employment due to retrenchment in declining firms and jobs lost because of the business closures during the reference period. The difference between the number of jobs created and of jobs lost yields the net increase in employment. The sum of the two components gives an estimate of job reallocation.

New firms (entrants during the year), business closures (exits) and continuing firms are identified by comparing firms between two years. A firm is an entrant if it appears in the last year of the reference period but did not exist in the first year. It may be a greenfield operation; a new entity born of the merger of two or more firms; the result of the de-construction of a large firm into smaller ones; the outcome of reclassification to a different Standard Industrial Classification code; or finally a change in the form of organization of the firm, for example, from a proprietorship composed of only partners to a firm with employees. Similarly, a firm is defined as an exit if it was found in the database in the first year but did not appear in the last year of the reference period. As an entrant is not always a new business start-up, so is an exit not necessarily a bankruptcy. Finally, firms that appear in both years provide an estimate of continuing firms. Continuing firms are sub-divided into firms that create jobs and those that reduce their workforce.

While starting or closing a business is purely an economic decision made in the light of market conditions, the data compilation is also influenced by statistical methods. A PD account may give false signals: it may be a new or an additional account number for an existing firm, and the closure of a firm may not be recorded until several years after the firm has ceased operations, pending fulfilment of administrative requirements. At a finer level of industrial disaggregation, misclassification of firms is an additional source of statistical error.

The study draws on the database set up for the Longitudinal Employment Analysis Program. A detailed description of the database is given in Statistics Canada (1989) and a summary with up-to-date developments is available in Picot and Dupuy (1996). Implications of the underlying methodology for data quality are discussed in Hamdani (1997a and 1997b).

The choice of time span chosen to study change and job reallocation is important. Most industries undergo change over a long period. On the other hand, if the reference period is short, that is, covers a business cycle or a phase of it, it is hard to argue whether inter-industry differences are due to business cycles or product cycles. Any choice is subject to some bias. The present study uses the period 1984 to 1994 -- the period for which relevant data are presently available -- in the discussion related to the economy as a whole and to the goods- and services-producing sectors.. However, a shorter time frame, 1991 to 1994, is used in the analysis of inter-industry differences in order to highlight differences between the stable and volatile industries.

3. Estimates of Employment Dynamics

The results reveal the dynamic nature of the Canadian labour market. Job creation and job destruction occur simultaneously and in large magnitudes -- over time, in the upswing phases of the business cycle as well as the downswings, and across industries.

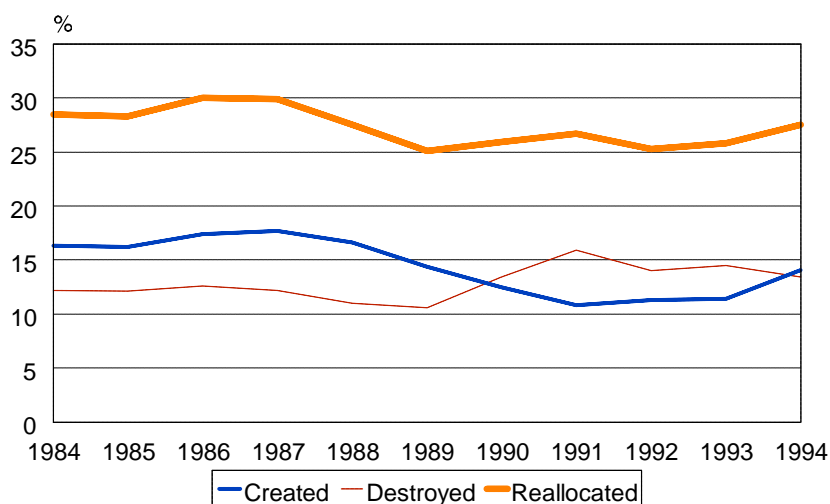
3.1 Magnitude of Job Reallocation

The magnitude of change is striking. Job creation in the economy (excluding agriculture, fishing, public administration and social services) exceeded 9 per cent in each year of the reference period. Job losses were lower but still above 8 per cent in each year. Job reallocation rates varied from a low of 21.3 per cent in 1989 -- the peak of the business cycle -- to a high of 25.1 per cent in 1986 (Chart 1), with some firms creating jobs and others retrenching. On average, during 1984-94, 23.2 per cent of the total jobs were involved in redistribution within firms, between firms and between provinces and territories. The actual job reallocation in the economy is greater than the estimates presented here because reallocation resulting from the transfer of employees between establishments and plants belonging to the same firm is not included.

The figures are impressive when seen in the context of net increases in employment: for every net addition to the employment rolls, the marketplace reshuffled about 10 jobs between firms and sectors of the economy.

Chart 1: Job Reallocation Rates

1984-1994



Source: Statistics Canada

3.2 The Cyclical Pattern

The behaviour of job creation and job destruction during the business cycles also provides an indication of the degree of employment dynamics. Innovative firms that introduce new products, more efficient processes or develop new markets for the existing products continue to prosper during economic declines, while firms that do not foresee changes in buyers' preferences and do not adopt new technologies divest and retrench even at the peak of the business cycle. The magnitudes are striking. In 1991, net employment declined, but new firms set up during that year and expanding firms, together, posted an average increase of 9.7 per cent, and the gain was broadly-based. On the other hand, net employment increased at a robust rate in 1987 but the declining firms reduced their workforce, on average, by 10 per cent.

Another noteworthy feature is the change in the components of job reallocation over the cycle. As the economy approached the peak of the last full business cycle, job creation rate began to fall. And as the recession set in, the job destruction rate began to rise (Chart 1). After 1988, the job reallocation rate has remained below the levels of the earlier years. Fewer jobs were created and more jobs were eliminated every year in the 1990s as compared with the second half of the 1980s. The drop in job reallocation in the 1990s meant that fewer people had to change jobs, but finding a job became more difficult for those who were affected.

3.3 More Job Reallocation in the Service Sector than Goods Sector

The goods-producing and services-producing sectors experienced job reallocation in different degrees, but the differences tended to narrow over time. More jobs were involved in redistribution in the service sector than in the goods-producing sector (Chart 2). Commercial services (services excluding government, education and health services) recorded a job reallocation rate of 27.9 per cent, composed of 15.0 per cent job creation and 12.9 per cent job destruction, averaged over 1984-94. In the goods-producing sector (excluding agriculture and fishing), by comparison, the job redistribution rate was lower, at 26.2 per cent, and dropped to 22.8 per cent when the construction industry was also excluded. Because of the project-by-project nature of the construction work, it is especially difficult to distinguish between a new firm and a new or an additional payroll deduction account for an existing firm, raising the possibility of a larger statistical error in the construction industry.

A significant change emerged in the relationship between the services- and goods- producing sectors with respect to job reallocation. Differences between the two sectors narrowed over time, almost disappeared in 1992 and reversed in 1994 when the rate in the goods sector exceeded that

in the service sector for the first time in the 11-year period covered by the study. The convergence could be a statistical artifact, the result of industrial restructuring in the economy or a cyclical phenomenon. As for the statistical factors, the change in the Business Register in 1989 may suggest a caution in interpreting the shift. Further, the construction sector, where the risk of statistical error is higher as noted earlier, played a sizeable role in the change in the relationship (Chart 2). However, it remains to be determined what the size of the statistical error is and whether its time pattern has changed.

Statistical explanation notwithstanding, the tendency for job reallocation rates to converge appears to persist. The trend seems to be consistent with structural changes in the economy which point to a strengthening of the link between the

services- and goods-producing sectors. These developments include an increase in the amount of outsourcing by goods-producing firms to service-sector firms, the growth of services-producing firms acting as intermediaries between goods-producing firms and their clients and an increase in the number of firms that only design and develop new products and perform the marketing and advertising functions.

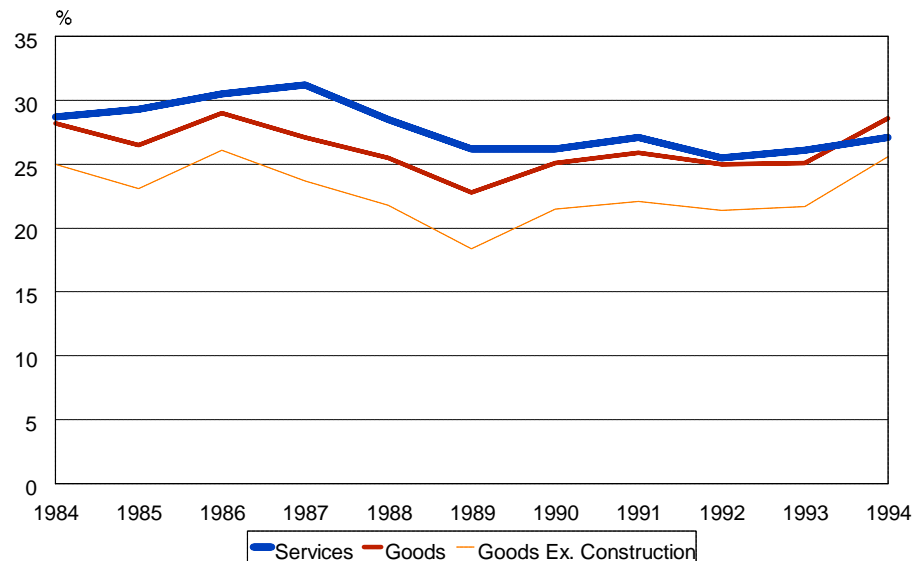
Whether and to what extent the cyclical factors account for the convergence will become clearer once the current business cycle is complete, and data are available to compare movements of job reallocation rates over two full business cycles.

4. Inter-industry Differences

The economy is comprised of heterogenous industries. Some industries are the engines of growth, while the growth of other industries is dependent upon increases in population and income. Industries also differ considerably with respect to the adoption of new technologies, R&D spending and skill levels of the workers. In terms of the technological sophistication and scale of operations, firms range from a shoe-shine operation to large, highly sophisticated, capital-intensive financial

Chart 2: Job Reallocation Rates, 1984-94

Commercial Goods and Services



Source: Statistics Canada

institutions, aircraft manufacturers and communication utilities which can not only afford to purchase complex and expensive technologies but also manage their conception, design and development. Further, in some industries, products hardly change; in others, substitutes and complements are introduced with a high frequency. Moreover, industries operate in different types of markets. Some markets are regulated and therefore entry of new firms is controlled. Other industries face highly competitive markets in which product life cycles are short and firms enter and exit frequently. These as well as other features have created structures characterized both by increased concentration and increased fragmentation and affect the degree of job reallocation experienced by individual industries.

4.1 Technological Change and Job Reallocation

Industrial patterns of job creation, job destruction and job reallocation can be examined from different angles, depending upon the purpose of the study. From the point of view of the technological change, industries in which the technology changes rapidly can be expected to experience both higher job creation and job destruction rates than other industries. Viewed from this angle, two dominant patterns stand out (Table 1): the industries that are considered to be at the forefront of implementing or introducing new technologies apparently do not display similarities with respect to employment dynamics; second, the industries not known for their technological sophistication experience as much, or more, volatility in the labour market as the innovative industries.

As expected, the business services sector (Major Group 77) experiences high rates of job reallocation. The high degree of volatility is consistent with the fact that the principal products of this sector are information and knowledge, both of which are at the centre of the economic change currently under way. As such, the sector both produces and uses new technologies. It had among the highest job creation and job destruction rates over the period 1991-94. The average job reallocation rate of 32.7 per cent was the second highest rate in the services-producing sector and well above the economy-wide average of 26.4 per cent. We should note that the use of paid jobs instead of the labour input does not provide a full measure of the change taking place in this industry because of the high concentration of professional services industries in which partners and the owners of sole proprietorship do not draw a salary and are, therefore, excluded from the analysis.

In contrast, other industries that are understood to apply and produce complex technologies appear to be relatively stable. The job reallocation rates in transportation and storage and financial service industries were high but still lower than in most other industries. The communication industry, in particular, was relatively stable at an average job reallocation rate of 11.4 per cent -- less than half the rate for the economy overall. Both the job creation and job destruction rates in this industry were lowest among the major industry groups. This is surprising because all the three industries have undergone substantial changes in the past few years, including the introduction of new products (goods and services), product substitution, process innovation, and the de-regulation that opened up markets and competition. The following paragraphs explain why job destruction caused by the phase-out of obsolete products and job creation resulting from the introduction of new technology do not show up in the data.

These industries are dominated by very large firms. New entrants and firms that go out of business are relatively small in size in terms of jobs, and their impact on the total number of jobs in the industry is quite small, as compared to other industries where there is less concentration. This is corroborated by the analysis of data on firm entry and exit which shows that these industries rank among the most volatile industries (Hamdani, 1997a).

Job reallocation can occur within firms but not show up in the data if firms have training programs and transfer workers from products which are being phased out to new products. For example, it has been suggested that in the banking industry, the workers rendered redundant because of the proliferation of automated banking machines (72 per cent increase between 1991 and 1994), and the introduction of virtual banking are being trained and assigned to telephone banking and mutual funds (Chrominska, 1997).

Table 1: Job Creation, Job Destruction and Job Reallocation Rates			
Average 1991-1994			
(% of total employment)			
Industry	Gross Job Creation	Gross Job Destruction	Job Reallocation
Goods-producing Industries*	11.4	14.8	26.1
- Forestry	20.1	17.1	37.2
- Mining	10.2	14.2	24.4
- Manufacturing	9.9	12.3	22.2
- Construction	16.6	23.5	40.1
Service-producing Industries**	12.1	14.3	26.4
- Transportation and storage	9.8	12.3	22.1
- Communication and other utilities	5.4	6.0	11.4
- Wholesale trade	12.1	15.8	27.9
- Retail trade	12.0	13.2	25.2
- Finance and insurance	7.9	11.8	19.6
- Real estate operators, etc	13.4	20.6	34.0
- Business Services	15.4	17.3	32.7
- Traveller accommodation and food service	15.3	16.1	31.4
Total Economy*	11.9	14.5	26.4
* Excludes agriculture and fishing.			
**Excludes government, education and health services.			

Job reallocation is also kept low by the stiff competition which makes it imperative that any innovation introduced by the pioneer is quickly adopted by the few large firms in the industry. The technology diffuses rapidly because in some cases it is embodied in the hardware which is available on the market.

Segments of these industries are regulated. The impact of recent changes, such as de-

regulation of long-distance telephone service, has not yet been fully captured in the data.

The second noteworthy result is the high degree of job redistribution affecting industries which are not commonly thought of as innovative and technologically sophisticated. The traveller accommodation and food service industry and the real estate operators and insurance and real estate agent industries (Major Groups 75 and 76) registered among the highest job reallocation rates -- 31.4 per cent and 34.0 per cent respectively. Both industries recorded high job creation and job destruction rates.

The high job reallocation rates in these industries are due to the skills levels of the workforce and a large element of seasonality in their business. Jobs in the food service industry and the real estate operators and agent industry, tend to be low skilled, part-time and seasonal. It is easier for workers in these industries to find a job in another firm in the same industry just as it is easy for the employer to fill a vacancy from the abundant supply of labour in these skills. Whereas in the high-tech industries, movements of workers between firms largely arise from the strong demand for high skills and a shortage of supply.

Finally, in the goods-producing sector, the relatively high rates of job reallocation observed in the construction and forestry industries could partly be the result of the methodology used. A significant amount of economic activity in the construction industry takes place on a project-by-project basis, increasing the likelihood that some entries and exits of firms and the employment associated with them in this industry pertain to projects rather than firms. The statistical error is also higher in industries in which there are many vertically-integrated firms. This applies in particular to the forestry industry. The relatively low rate in the manufacturing sector is a reflection in part of the presence of several mature and aging industries.

5. Relevance of Job Reallocation to Knowledge Flows and Training

Reallocation of jobs between firms and industries means that workers have to move, although not necessarily in the same magnitudes as the job reallocation.

The role of personnel exchange in information and knowledge flows is well-recognized. It is practised by mutual agreement in varying degrees and at different levels of policy and management hierarchies. At the management level, executive exchange is growing. At policy-making levels, interdependent organizations use co-optation, and interlocking directorships are common among competitors (Pfeffer, 1976). At the extreme, mergers and joint ventures are created to bring together in one place the knowledge possessed by two or more firms. The marketplace spreads knowledge through the process of job reallocation, saving firms the time that it would take to train employees and millions of dollars that they would have spent on learning about the practices, policies and values of their competitors.

The large size of job reallocation, especially when the reallocation is driven more by job destruction than job creation as has been the case in recent years, also indicate the need for training in order to make the adjustment easier.

6. Conclusions

The magnitude of job reallocation in the economy is striking. The heterogeneity of industries means large variations in the job reallocation rates. Business services, with their strong upstream and downstream linkages with other sectors of the economy, experience very high rates but low rates characterize other high-tech industries such as transportation and communication, largely because of the structures of the industries and the nature of the market. Where low-tech industries have high job reallocation rates it is because the jobs are low skilled and part-time and it is easy for the employer to fill a vacancy as it is for the worker to find a job.

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