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Permanent Layoffs in Canada: Overview and Longitudinal Analysis

by Garnett Picot, Zhengxi Lin and Wendy Pyper

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No. 103

11F0019MPE No. 103

ISSN: 1200-5223

ISBN: 0-660-16975-4

Price: \$5.00 per issue, \$25.00 annually

Business and Labour Market Studies
24, R.H. Coats Building, Ottawa, K1A 0T6

*Statistics Canada (613) 951-8214

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Facsimile Number: (613) 951-5403

September 1997

This paper extends earlier work entitled “Worker Displacement within the Context of a Dynamic Labour Market” by Garnett Picot and Wendy Pyper, presented at the Canadian Employment Research Forum Conference on Displaced Workers, Montreal, December 1994. We thank Pierre Fortin and the CERF conference participants for valuable comments and suggestions. An earlier version was presented at the 1996 CEA meetings. We also thank Arthur Sweetman and the CEA session participants for helpful comments. Errors remaining are the sole responsibility of our own.

This paper represents the views of the author and does not necessarily reflect the opinions of Statistics Canada.

Aussi disponible en français

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Abstract

Canadians are increasingly concerned about permanent layoffs, as many feel job instability and the possibility of job loss has increased in the 1990s. Governments, confronted with a large number of permanent layoffs each year, need to know how to respond to improve labour adjustment and the possibility of quickly finding a new job for displaced workers. Within this context, this paper uses a new longitudinal data source on the separations of workers to address three issues. First, has there in fact been an increase in the permanent layoff rate in Canada in the 1990s, as one might anticipate given concerns about rising job instability? Second, what are the underlying causes of most permanent layoffs? The paper explicitly examines the role played by cyclical variation in aggregate demand, variation in industrial demand which is often associated with structural change, and differences in layoff rates by firm size which is in turn associated with the birth and death process of firms.

Third, with this as background, the core of the paper asks a question of concern to policy analysts: are most permanent layoffs rare events for workers, or are they a continuation of a pattern of repeat layoffs? This is important because a worker who is confronted with a layoff which is a rare event will require very different post-displacement adjustment assistance from someone whose history of employment has been marked with frequent layoffs, suggesting an inability to hold a job or demand-side instability in the firm or industry in which the person has worked. The workers' employment history over 10 years is used to explore the relationship between permanent layoff history and the probability of being laid off. Displaced workers are classified "low-risk", "medium-risk" and "high-risk" based on their layoff history, and multinomial logistic analysis is used to distinguish worker and firm characteristics associated with repeat layoffs or layoffs as rare events.

Key Words: JEL classification: J63 --- Turnover
Job separation, Permanent layoffs, Employment history, Multinomial logistic models

Introduction

Since permanent layoffs may lead to unemployment and the use of unemployment insurance or even social assistance, issues surrounding permanent layoffs have many important public policy implications. The rationale for a policy intervention when worker displacement occurs is based on three ideas. First, the burden of labour adjustment and its related costs should be more equitably distributed among the population (that is, not borne solely by workers losing jobs), since society in general benefits from restructuring in the economy. Second, labour market efficiency is improved by assisting workers, because labour will adjust more quickly and move to more productive segments of the economy. And third, the provision of support fosters a more positive attitude toward structural change, thereby facilitating such change and promoting efficiency, productivity and wealth in the economy.

But to implement effective policy, considerable knowledge regarding the displacement process is needed. There are at least three dimensions to the knowledge required: i) the cause of displacement—permanent layoffs are driven by numerous economic forces, some of which are demand-side while others are supply-side; ii) the type of workers involved - some displaced workers have stable employment histories while others are repeatedly displaced; and iii) the outcomes—layoffs result in a very heterogeneous set of labour market outcomes, many displaced workers gain while others lose in the post-displacement process. Thus, policy decisions regarding who should receive what specific type of assistance will have to be very explicit, as the need for post-displacement adjustment assistance very likely differs across different types of displaced workers.

In this paper, the first goal is to outline the basic features of permanent layoffs in Canada. This overview explores the association between permanent layoff rates and i) cyclical variation in aggregate demand, ii) industrial variation in demand, and (iii) firm size. It also investigates if there has in fact been an increase in the permanent layoff rate in Canada in the early 1990s, as one might anticipate given concerns about rising job instability. The paper then focuses on the layoff histories of displaced workers. We employ for the first time long-term longitudinal data on workers in Canada to address the issue of repeated layoffs and displacements. The displacement history of workers is very important in policy development.

The types of programs required depend to a great extent on whether the worker has experienced a rare layoff following years of stable employment or the worker is repeatedly displaced and experiences short employment spells. The question of repeat layoffs has not been addressed in the Canadian literature. Much of the existing work on worker displacement tends to focus on permanent layoffs in a particular year. In some cases, the analysis is restricted to workers with a particular type of employment history, such as displaced workers who have worked for three or more years prior to the displacement [e.g., Picot and Wannell (1987), Jacobsen et al (1992)].¹ This work extends earlier analysis by using longitudinal data and multinomial logistic analysis to address the issue of repeat layoffs.

1. Permanent Layoffs in Canada: An Overview

This section overviews some features of permanent layoffs in Canada from 1978 to 1993, including cyclical variations of permanent layoffs, industrial variations in employment growth and permanent layoffs, firm size and permanent layoffs, and the trend of permanent layoffs over time. First, a brief description of the main data source and definitions.

¹ A recent exception is Anderson and Meyer (1994). Using US data, they demonstrate that the probability of a worker separating from an employer in a given year is not independent of past separation history. They find that over a three-year period, over 55 percent of total labour turnover is accounted for by only 21 percent of workers. But their measure of total labour turnover includes both temporary and permanent layoff as well as quits.

1.1 Data and Definition

The data used for analysis in this paper are extracted from the Longitudinal Worker File (LWF) created by the Business and Labour Market Analysis (BLMA) Division of Statistics Canada. The LWF is a 10 percent random sample of all Canadian workers, constructed by integrating data from three sources: the Record of Employment (ROE) files of Human Resources Development Canada (on worker separations), the T4 files of Revenue Canada (on all workers), and the Longitudinal Employment Analysis Program (LEAP²) file of BLMA, Statistics Canada.

All employers issue an ROE to every employee working in insurable employment who has an interruption in earnings. The ROE indicates, among other things, the reason for the work interruption or separation. The ROE provides information on all workers (covered by UI) with separations, and can thus be used to determine different types of job separations. In addition, all employers must register with Revenue Canada using payroll deduction (PD) accounts and issue to each employee a T4 slip that summarizes earnings received in the year. Revenue Canada T4 files thus provide information on all Canadian workers.

Therefore, all workers at risk of job separations and those who actually separate from their jobs are known from these two data sources in each year. Together with additional information from the LEAP file, these data sources are combined by the Business and Labour Market Analysis (BLMA) Division of Statistics Canada to create a longitudinal file of all Canadian workers, the Longitudinal Worker File (LWF).

In the LWF, job separations are classified into three categories (quit, layoff and other) according to the reason for separation indicated in the ROE. Layoffs are separations due to shortage of work, and a layoff is defined as temporary if the separated worker returns to the same employer in the same or following year, otherwise it is permanent. If a worker is observed with a firm in one year but not in the previous, this is considered a hire. This includes hiring to replace workers who have left, as well as expansion hiring.³

Permanent separation rates (the quit rate, permanent layoff rate and other permanent separation rate) are calculated as the number of permanent separations divided by total employment at any time during the year (i.e., the total number of person-jobs). The hiring rate is the number of hires divided by total employment in the year. However, the temporary separation rate is calculated by using the number of persons with at least one temporary separation rather than the total number of temporary separations. For more details on the LWF and definitions, see Statistics Canada (1992).

The LWF, with its very large sample size (e.g., 1.8 million records in 1988⁴) allows the possibility of very detailed sub-sample level analysis of job separations (e.g., by detailed age-group or industry). Furthermore, its longitudinal nature allows the possibility of constructing long-term variables such as the permanent layoff history index, average annual earnings per year of employment used in this paper.

² LEAP is a longitudinal file on Canadian businesses at the company level, see G. Picot and R. Dupuy (1996) for more details.

³ Hiring is in fact calculated from the following identity: $H_t = (E_t - E_{t-1}) + S_{t-1}$, where H represents total hirings, E the number of people employed by the firm at any time during the year, and S the number of people permanently separating from the firm. Therefore, $(E_t - E_{t-1})$ represents expansion hiring and S_{t-1} replacement hiring.

⁴ The file is created on a person-job basis and the records are linked longitudinally. The most current year of information available for analysis of job separations is 1993.

Comparisons for the late 1980s with the Labour Market Activity Survey (LMAS) suggests that the number of permanent separations and layoffs are quite comparable⁵ in both the LWF and LMAS, in spite of the fact that one is based on administrative data and the other is a sample survey. The LWF is used here because it is longitudinal, and has a longer time series (1978-94).

1.2 Cyclical Variation

There are a number of basic features of permanent layoffs that are important in establishing policy. First, the number of permanent layoffs remains high over all phases of a business cycle. It has varied from 1.20 million in 1982 at the peak of the recession, to 1.14 million in 1989 at the business cycle peak, and 1.28 million in 1991 in the middle of the 1990-92 recession (Table 1.1). Our labour market is characterized by an ongoing and more or less stable level of layoffs no matter whether during expansions or recessions. The permanent layoff rate does decline during expansions, but not dramatically. It ranged from 8.7% in 1982, to 6.2% in 1989, and 7.6% in 1991. While temporary layoffs increased sharply and quits and hirings fell dramatically during recessions, permanent layoffs were not as cyclically sensitive. Between 1979 and 1982, while the number of temporary layoffs rose by 78% (from 1.14 to 2.03 million), the number of quits fell by 35% (from 1.18 to 0.76 million), and the number of hirings declined by 39% (from 3.29 to 2 million), the number of permanent layoffs increased by under 34% (from 0.9 to 1.2 million). The most recent recession tells a very similar story. Between 1989 and 1991, the number of temporary layoffs increased by 23% (from 1.62 to 2 million), the number of quits declined by 41% (from 1.81 to 1.07 million), and the number of hirings fell by 35% (from 4.76 to 3.08 million), but the number of permanent layoffs rose by only 13% (from 1.14 to 1.28 million). In spite of suggestions that a greater share of job loss was permanent in the 1990s due to cost-cutting and increased structural change, the data suggest the 1980s and 1990s recessions were similar in this regard. Picot, Lemaître and Kuhn (1994) note that while permanent layoffs did increase marginally as a share of all layoffs during the 1990-92 recession, the change was not significant and was not consistent with the view that there was a dramatic economy-wide shift towards more permanent job loss, often associated with restructuring. The pattern of worker displacement does not appear to have been significantly different in the 1990s recession as compared to the 1981-82 experience.

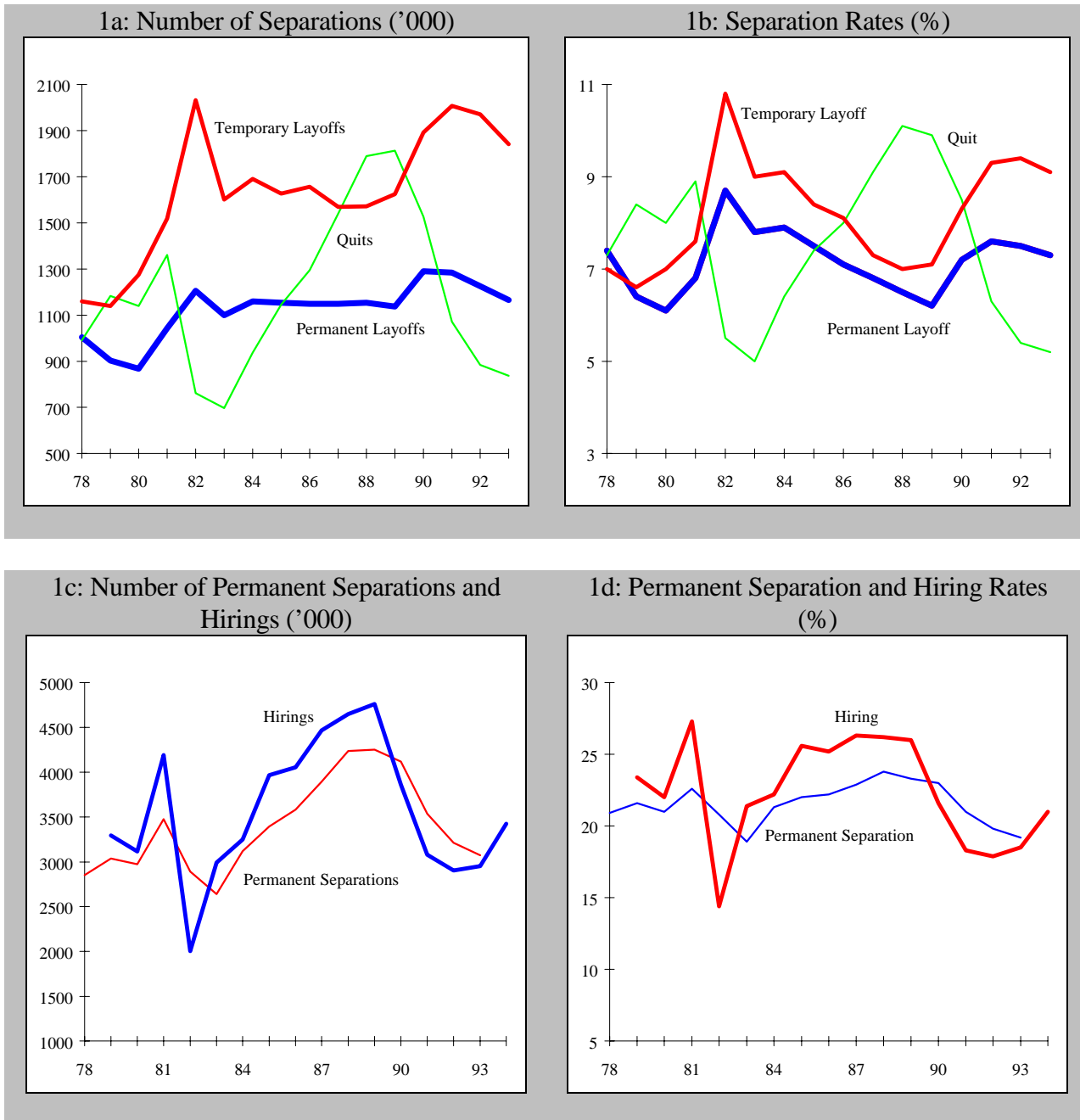
⁵ After adjustments are made to make the two sources comparable. The major adjustment relates to the exclusion of persons working less than 15 hours per week from the ROE data, since they are not eligible for UI.

Table 1.1
Job Separations and Hirings in Canada, 1978-1994

	<u>Number of Separations and Hirings ('000)</u>							<u>Hirings</u>
	<u>Separations</u>						<u>Total</u>	
	Permanent			Temporary				
	Layoffs	Quits	Other	Total	Layoffs	Other	Total	
1978	1,003.7	991.6	858.7	2,854.0	1,159.3	994.1	2,153.4	n.a.
1979	902.7	1,183.5	952.0	3,038.2	1,139.2	1,035.6	2,174.8	3,293.7
1980	867.5	1,139.5	967.5	2,974.4	1,274.6	1,077.9	2,352.5	3,116.5
1981	1,042.9	1,361.4	1,072.2	3,476.4	1,518.7	1,141.1	2,659.8	4,192.1
1982	1,204.8	761.7	927.2	2,893.7	2,031.6	1,291.8	3,323.4	2,003.8
1983	1,098.7	696.8	844.7	2,640.2	1,600.5	998.3	2,598.8	2,992.9
1984	1,159.9	937.0	1,021.4	3,118.4	1,690.5	1,195.3	2,885.7	3,249.2
1985	1,152.8	1,145.4	1,097.3	3,395.5	1,626.6	1,236.2	2,862.8	3,966.0
1986	1,148.4	1,295.0	1,140.9	3,584.2	1,656.3	1,284.2	2,940.5	4,056.2
1987	1,149.4	1,539.6	1,204.5	3,893.6	1,569.6	1,291.0	2,860.6	4,466.5
1988	1,153.6	1,789.6	1,291.8	4,234.9	1,571.8	1,417.0	2,988.8	4,649.5
1989	1,137.4	1,813.0	1,302.2	4,252.6	1,624.0	1,449.4	3,073.5	4,761.4
1990	1,290.3	1,526.8	1,301.3	4,118.4	1,892.3	1,537.7	3,430.0	3,861.1
1991	1,283.8	1,070.5	1,182.9	3,537.2	2,006.3	1,472.8	3,479.1	3,078.6
1992	1,225.3	884.5	1,103.9	3,213.7	1,971.4	1,307.9	3,279.3	2,902.7
1993	1,165.2	837.3	1,071.5	3,074.0	1,840.6	1,245.0	3,085.5	2,952.0
1994	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	3,424.1

	<u>Separation and Hiring Rates (%)</u>							<u>Hiring</u>
	<u>Separation</u>						<u>Total</u>	
	Permanent			Temporary				
	Layoffs	Quits	Other	Total	Layoffs	Other	Total	
1978	7.4	7.3	6.3	20.9	7.0	6.5	12.9	n.a.
1979	6.4	8.4	6.8	21.6	6.6	6.7	12.7	23.4
1980	6.1	8.0	6.8	21.0	7.0	6.8	13.2	22.0
1981	6.8	8.9	7.0	22.6	7.6	6.7	13.6	27.3
1982	8.7	5.5	6.7	20.8	10.8	8.1	17.8	14.4
1983	7.8	5.0	6.0	18.9	9.0	6.4	14.8	21.4
1984	7.9	6.4	7.0	21.3	9.1	7.3	15.8	22.2
1985	7.5	7.4	7.1	22.0	8.4	7.2	15.0	25.6
1986	7.1	8.0	7.1	22.2	8.1	7.2	14.7	25.2
1987	6.8	9.1	7.1	22.9	7.3	6.9	13.7	26.3
1988	6.5	10.1	7.3	23.8	7.0	7.3	13.8	26.2
1989	6.2	9.9	7.1	23.3	7.1	7.2	13.7	26.0
1990	7.2	8.5	7.3	23.0	8.3	7.7	15.3	21.6
1991	7.6	6.3	7.0	21.0	9.3	7.8	16.3	18.3
1992	7.5	5.4	6.8	19.8	9.4	7.2	16.0	17.9
1993	7.3	5.2	6.7	19.2	9.1	7.0	15.5	18.5
1994	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	21.0

Chart 1.1
Permanent Layoffs, Temporary Layoffs, Quits and Hirings in Canada: 1978-1994



To empirically assess the cyclical sensitivity of permanent layoffs, temporary layoffs, quits and hirings, we use the unemployment rate as an indicator of the business cycle trend and regress the permanent layoff, temporary layoff, quit and hiring rates on the unemployment rate from 1978 to 1993.⁶ The results indeed confirm that temporary layoffs, quits and hirings are very cyclically sensitive but permanent layoffs are not as responsive to changes in the unemployment rate --- a one percentage point increase in the unemployment rate leads to a 0.91 percentage point decline in the quit rate, a 0.62 percentage point rise in the temporary layoff rate, a 1.45 percentage point decrease in the hiring rate, but only a 0.33

⁶ The hiring rate regression is from 1979 to 1993.

percentage point increase in the permanent layoff rate. All these estimates are highly statistically significant.⁷

Why do permanent layoffs remain so persistently high, even during recovery and expansion, and are not as cyclically sensitive as temporary layoffs and quits? Answers lie in the different processes which result in these types of job separations. During economic downturns, quits sharply decline as workers face unfavourable demand conditions. Also, employers may reduce workforce by means other than permanent layoff, such as increases in temporary layoffs, increases in separations for other reasons and cutbacks in hirings. During economic upswings, on the other hand, quits increase as workers find increased opportunities for improved job matching, and employers expand their workforce by recalling temporary layoffs and increasing hirings. These relatively simple processes may explain, to a large extent, the ups and downs of temporary layoffs and quits during recessions and expansions.

However, permanent layoffs are caused by more complex processes, including the worker-employer job-matching process, the continuous reallocation of market share and labour demand among firms within industries, structural declines in some industries, and decreases in aggregate demand. First, individuals seeking jobs and employers seeking workers create matches which may or may not be in the best interest of both parties. As workers learn more about the employer, and vice versa, the match is either continued or terminated. The worker terminates the match by quitting; the employer may turn to permanent layoffs. Permanent layoffs triggered by this job-match process occur on a continuous basis, both in recessions and expansionary periods. They may be more common during expansions as hiring increases, and would tend to involve workers who have been with the employer for a relatively short period of time.

Second, within any market or industry at any given point in time, some firms will be more successful than others; some firms increase their market share while others are losing. This reallocation of market share and labour demand among firms will lead to job gain and hirings in some firms but job loss and permanent layoffs in others. This process is also going on continuously, and permanent layoffs resulting from this process can occur even if overall labour demand and total employment in a market or industry is increasing.

Third, the Canadian economy has been experiencing a series of structural changes in the 1980's related to increasing trade globalization and international competition, changing composition of the labour force and accelerating technological advances. Consequently, some industries and sectors have been undergoing long-term decline in labour demand. As these structural changes carry on continuously, job loss and permanent layoffs occur in some industries and sectors even during recovery and expansions, primarily in the goods-producing sectors in the 1980s and 1990s.

Fourth, permanent layoffs can also result from decreases in aggregate demand during recessions. They will tend to be economy-wide in scope and virtually non-existent in expansionary periods.

⁷ Let TL = temporary layoff, Q = quit, PL = permanent layoff, H = hiring and U = unemployment, the following are the detailed regression results (t-ratios in parentheses):

$$\text{TLrate} = 2.4107 + 0.6174 * \text{Urate}, R^2 = 0.73;$$

(2.56) (6.22)

$$\text{Qrate} = 16.0185 - 0.9098 * \text{Urate}, R^2 = 0.81;$$

(14.47) (-7.79)

$$\text{Hrate} = 36.1041 - 1.4453 * \text{Urate}, R^2 = 0.41;$$

(7.75) (-2.97)

$$\text{PLrate} = 4.0837 + 0.3317 * \text{Urate}, R^2 = 0.66.$$

(6.83) (5.27)

While assessing the significance of each process is beyond the scope of this paper, it is clear that the causes are numerous and they together result in a large volume of permanent layoffs in the Canadian labour market on a continuous basis. The following sections explore, indirectly, some of these causes.

1.3 Industrial Variation in Employment Growth

Just as the permanent layoff rate is not highly correlated with changes in the business cycle, too there is not a strong association between the aggregate economic performance of an industry and the permanent layoff rate. Industries with rapid employment growth do not necessarily have low layoff rates, and those with declining employment do not necessarily experience high rates. Put another way, permanent layoffs are not necessarily concentrated in industries that are in long-term structural decline as indicated by declining aggregate employment. The highest permanent layoff rate in 1988 was registered in construction --- the industry with one of the highest rates of employment growth in that year at 7.8% (Table 1.2). There is not a statistically significant correlation between the permanent layoff rate and net employment growth in either 1983 (business cycle trough) or 1988 (peak) (Table 1.3). This was tested using two levels of industrial aggregation, 280 and 52 industries.

There are other underlying characteristics of industries such as the level of the quit rate in the industry, and the volatility of employment at the level of the company within the industry that determine the permanent layoff rate. In industries with very high quit rates, job loss⁸ in the industry may be handled through on-going attrition, rather than permanent layoffs.

But it is well known that this job loss and gain phenomenon has been largely associated with idiosyncratic changes in particular firms, rather than changing economic conditions at the level of the industry or the aggregate economy (Baldwin and Gorecki (1990), Davis & Haltiwanger (1992)). It is factors that are influencing employment levels in particular firms, rather than the industry as a whole (e.g., industrial restructuring of employment) or the entire economy (e.g., cyclical variation in employment) that results in most job loss and gain. And this job loss and gain phenomenon plays a major role in determining permanent layoffs. Anderson and Meyer (1994) estimate that 42% of all permanent worker reallocation (including quits, permanent layoffs and hires) are associated with job loss and gain at the company level.⁹

Thus, it is not surprising that changing economic conditions at the industry level (as measured by net change in employment) is not a good predictor of the permanent layoff rate. Events which are occurring at the company level within industries are more important. Some industries have highly volatile employment at the company level, even during expansions, leading to higher job loss and hence potentially higher permanent layoff rates (depending upon attrition rates and hiring practices).

⁸ In this work, job loss refers to the loss of a job in a company (i.e. a decline in employment levels), not the exit of a worker from a firm.

⁹ It seems likely that job gain and loss in companies plays a larger role in determining the level of permanent layoffs than that of quits. Quits are mainly worker decisions related to seeking improved job opportunities, while layoffs are related to changing employment levels in the establishments (as indicated by job losses).

Table 1.2
Job Loss and Permanent Layoff Rate by Industry in Canada, 1988

	Job Loss Rate* Due to			Permanent Layoffs			Net Employment Change, 1987-88 %
	Disappearance of companies %	Firms with declining employment %	Total job loss %	Permanent layoff rate %	Dist'n of permanent layoffs %	Dist'n of total employment %	
Total Commercial Economy	2.9	8.1	11.0	7.9	84.7	74.7	3.5
Forestry/Mining	2.0	7.0	9.0	15.5	5.4	2.7	3.8
Manufacturing	1.8	6.8	7.9	6.0	15.1	21.2	4.3
Construction	4.1	13.2	17.5	21.5	18.2	5.4	7.8
Transportation	2.3	6.0	8.3	5.6	2.8	4.2	-0.2
Communication	0.7	0.6	1.3	2.2	0.7	2.8	-1.3
Utilities	0.6	1.0	1.6	1.4	0.2	1.5	8.7
Wholesale Trade	2.3	8.6	10.9	5.9	3.7	4.9	3.9
Finance	1.7	5.0	6.7	1.4	0.5	3.2	5.1
Insurance	0.4	2.0	2.4	4.6	0.8	1.4	2.5
Real Estate	3.3	12.0	15.3	3.8	0.8	1.6	4.1
Business Management	3.3	9.5	12.8	6.2	4.3	4.7	9.4
Retail Trade	2.9	6.7	9.6	7.4	14.6	11.6	3.2
Consumer Service	4.7	10.9	15.6	8.9	17.4	9.4	1.2
Health				2.8	3.4	8.6	
Education				3.9	4.3	8.4	
Public Administration				7.1	7.6	8.4	
All Industries				7.1	100.0	100.0	
<i>Source:</i>	<i>Longitudinal Employment Analysis Program, BLMA, Statistics Canada.</i>			<i>Labour Market Activity Survey, Statistics Canada.</i>			

* Job loss is simply the negative employment change in a company between 1987 and 1988. A company is a legal entity. The job loss in an industry is the sum of employment change across all firms that disappeared or had declining employment between the two years in that industry. The job loss rate is the number of job losses divided by total employment in the industry during the base year (1987).

Table 1.3
Permanent Layoff Rate and Net Employment Change at the Industry Level in Canada

	For 280 Industries		For 52 Industries	
	1983	1988	1983	1988
B ₁	-0.27	0.063	0.23	0.19
t	0.8	1.6	1.7	2.3
R ²	0.02	0.006	0.04	0.07

Note: The regression model is $PL_{it} = B_0 + B_1\Delta EMP_i$, where PL_{it} = permanent layoff rate for industry i in year t and ΔEMP_i = change in employment in industry i between year t-1 and t.

1.4 Firm Size and Permanent Layoffs

While cyclical variation in aggregate demand is only weakly correlated with permanent layoffs, and cross-sectional differences in employment change at the industry level do not explain differences in layoff rates at all, differences by firm size are significant. When layoffs are discussed in the media, the image presented is often one of major cutbacks in large firms leading to worker displacement (e.g., a large manufacturer closes a number of plants displacing many workers, or one of the large airlines permanently lays off a significant proportion of its workforce to cut costs). Such stories lead to an image of significant job loss in large firms. Reality however, does not conform to this image.

It is from small- and medium-size firms that most permanent layoffs emanate. In 1988, small firms (those with less than 20 employees) accounted for 20% of employment but 41% of permanent layoffs. Firms with over 500 employees had 40% of employment, and only 17% of permanent layoffs (Table 1.4). About 1 in 8 persons in small firms were laid off permanently in 1988, compared with only 1 in 29 in large firms (Chart 1.3).

Table 1.4
Permanent Layoffs by Firm Size in Canada, 1988

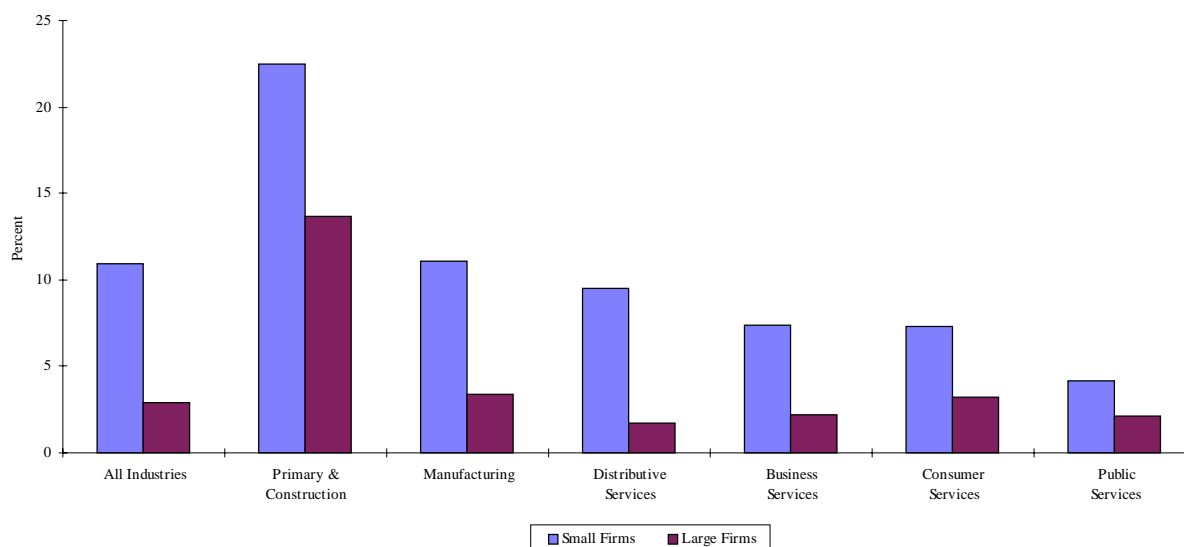
	Permanent Layoff Rate %	Dist'n of Permanent Layoffs %	Dist'n of Total Employment* %
1-19 Employees	12.0	41.4	19.9
20-99 Employees	7.6	17.0	15.6
100-499 Employees	5.7	9.7	13.0
500+ Employees	3.4	16.6	40.0
Size Unknown	8.4	15.2	11.6
Total	7.1	100.0	100.0

* This is the number of hours of employment observed in a particular group (for example, small firms) as a percentage of all hours of employment in the economy for 1988. A part-time job has a lower weight in this calculation than a full-time job.

Source: Labour Market Activity Survey, Statistics Canada.

A number of explanations are possible. The first relates to the industrial distribution of large and small firms. If small firms were concentrated in industries with volatile employment patterns due to rapidly shifting patterns of demand, then we would naturally observe high layoff rates among small firms. This would probably be a characteristic of the industry rather than of the size of firms. But firm size differentials in layoff rates are observed in all major industries (Chart 1.2). This is confirmed in the multivariate analysis to follow (both Table 1.6 and Table 2.1).

Chart 1.2
Permanent Layoff Rate by Firm Size and Industry in Canada, 1988



Source: Worker Turnover in the Canadian Economy, Statistics Canada (1992), Catalogue 71-539.

The second possible explanation involves differences in the characteristics of workers employed in small and large firms. Workers in large firms have, on average, a higher level of education, are members of a union and are older and more experienced than their counterparts in small firms (Morissette (1993)). All

of these characteristics are associated with lower permanent layoff rates. Logistic regressions are performed in the next section to estimate the probability of permanent layoffs as a function of firm size and a number of other variables, including permanent layoff history, gender, age, province, and industry. The results indeed indicate that the estimated relative probability of being laid off in a small firm as opposed to a large firm remains, after controlling for these worker characteristics, roughly 4:1 (Table 2.1), the same as observed in raw data

A third possible explanation relates to the stability of small and large firms. The small firm sector is highly volatile; companies are much more likely to disappear and be replaced by others, obviously affecting layoffs. In 1988, among small firms, employment fell 5.3% due to the disappearance of companies and an additional 11.6% due to workforce downsizing in declining (but continuing) firms. Thus, 16.9% of total employment in small firms was lost in declining or disappearing firms (Table 1.5). Among large firms, only 5.6% of employment was lost in declining or disappearing companies (0.9% in disappearing firms and 4.7% in declining). With a rate of job loss three times higher than that of large firms, it is not surprising that small firms could have three to four times the permanent layoff rate.

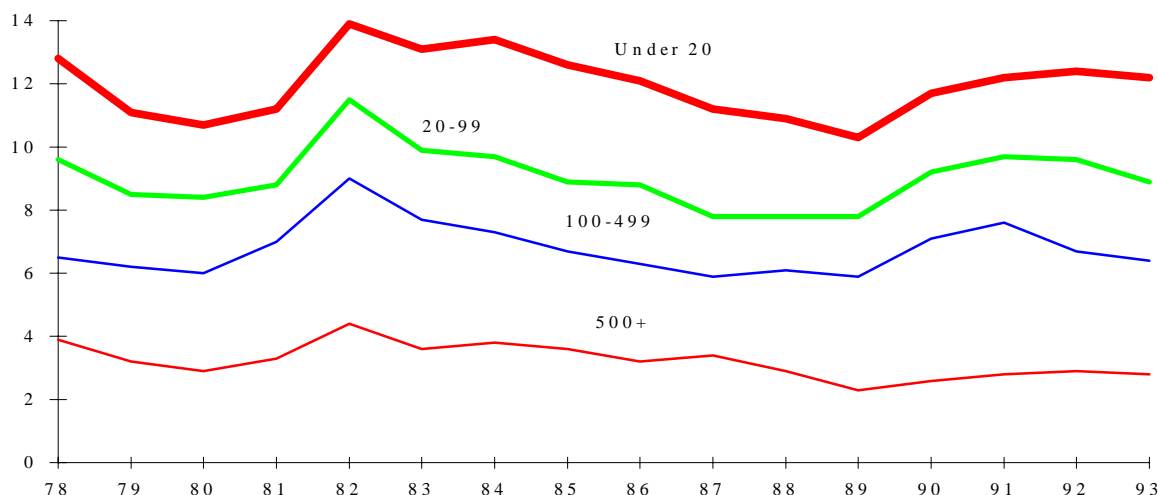
Table 1.5
Rate of Employment Loss and Gain by Firm Size in Canada, 1988

	Rate of Employment Loss Due to:			Rate of employment Gain Due to:		
	Total employment loss rate	Disappearance of companies	Companies with declining employment	Total employment gain rate	Appearances of companies	Companies with expanding employment
	%	%	%	%	%	%
1-19 Employees	16.9	5.3	11.6	26.5	6.5	20.0
20-99 Employees	12.5	3.0	9.5	16.6	3.6	13.1
100-499 Employees	11.8	3.1	8.8	12.6	2.3	10.3
500+ Employees	5.6	0.9	4.7	5.3	0.3	5.0
Total	10.8	2.8	8.0	13.9	2.8	11.1

* Private commercial sector only for 1988-89, excluding health, education and government.

Source: Longitudinal Employment Analysis Program, BLMA, Statistics Canada.

Chart 1.3
Permanent Layoff Rate by Firm Size in Canada, 1978-1993 (%)



The difference between the layoff rate in small and large firms persists over the course of the business cycle. During the 1980s, the likelihood of being displaced (permanently laid off) from a large firm, even during a severe recession like that of 1981-82, does not approach the probability of being laid off from a small firm during the best of economic times (Chart 1.3).

Thus, permanent layoff rates are not determined primarily by cyclical fluctuations in aggregate demand or factors affecting economic performance at the industry level, such as structural decline in particular industries. Rather, the process is more complex, relating to the job-worker match process, and in particular the reallocation of market share and labour demand among firms within industries. This process is continuous and on-going, and results in relative stability in the level of permanent layoffs in the Canadian economy. This reallocation process is also more evident among small than large firms, resulting in a concentration of permanent layoffs in the small firm sector.

1.5 Did Permanent Layoffs Increase in the late 1980s and 1990s?

Concern about job instability has increased in the 1990s. There is a general sense in the population that jobs are not as stable as they once were. There are a number of potential reasons for this belief. During the recession of the early 1990s there was a sense of increased structural change, as firms and industries reorganized to better meet the competition. A related belief suggests that in response to increased international competition, firms are cost-cutting through labour shedding, even if profitable. As well, the public sector, burdened with high public deficits and debt, are reducing their labour forces in order to reduce expenditures. All of these could have contributed to increased job instability and permanent layoffs.

An attempt is made to look at comparable years in the business cycle to answer this question. This can be done either from the raw data (Table 1.1) or using regression analysis. An inspection of the raw data indicates little upward trend in the permanent layoff rate, aside from cyclical variation. In the regression, five periods have been selected: recessions (1982-83 and 1990-92), recovery (1984-86), and expansionary (1978-81 and 1987-89). We compare the recessions and expansionary periods. These periods are entered as dummy variables in a logistic equation that regresses the permanent layoff rate on age, gender, province, industry, firm size, and period. In this way, changes in, say the age, industrial or firm size distribution of workers over the time period is controlled for in the comparison. Some of these distributions changed significantly over the 15-year period. The results, shown in Table 1.6, are reported in terms of the estimated coefficients, and perhaps more usefully, the estimated probability of permanent layoff (evaluated at the mean value of the sample). These results suggest that the estimated probability of permanent layoff was the same in the expansionary period of the 1980s (1987-89), at 4.2%, as during the similar period in the late 1970s (1978-81), at 4.27%. When the 1980s recession is compared with that of the 1990s, the permanent layoff rate appears higher in the former (at 5.57%) than the latter (at 5.0%). Thus, there is little evidence in these data that the probability of a Canadian worker losing his/her job had significantly increased in the late 1980s or early 1990s, when compared to earlier comparable periods in the business cycle.¹⁰

It may be that as data for later periods in the 1990s become available this conclusion will change, or that in particular industries or regions of the country (such as Ontario), the probability of layoff was indeed

¹⁰ The sample used in this regression is a 0.3% random sample of all Canadian workers not employed in agriculture, extracted from the Longitudinal Worker File.

higher. We will await further data to test this.¹¹ In the aggregate, up to 1992, there was little evidence of such a trend.

¹¹ Future research will not only incorporate more years of data but also carry out sub-sample analysis such as by gender, by age, by province, by employer size, by industry and by workers' earnings level to empirically investigate whether or not permanent layoffs in Canada have increased in the 1980s and early 1990s as compared to the late 1970s among particular groups of workers.

Table 1.6
Logistic Regression Results and Estimated Probabilities in Canada, 1978-1992

	Permanent Layoffs			Total Permanent Separations		
	Coefficient	T-ratio	Probability(%)	Coefficient	T-ratio	Probability(%)
Constant	-2.5141	-122.64		-1.0058	-81.11	
Male	Control Case		5.24	Control Case		19.99
Female	-0.2619	-21.83	4.07	-0.0043 ^a	-0.64	19.91 ^b
Age 15-24	Control Case		5.18	Control Case		27.87
Age 25-34	-0.0592	-4.59	4.89	-0.3666	-47.61	20.93
Age 35-44	-0.1972	-13.06	4.29	-0.7105	-75.75	15.71
Age 45-54	-0.2181	-12.25	4.20	-0.8987	-77.47	13.34
Age 55-64	-0.1999	-9.05	4.28	-0.6962	-50.45	15.90
Newfoundland	1.2595	44.35	12.90	0.2645	11.70	23.51
PEI	0.7501	11.59	8.13	0.0723 ^a	1.52	20.15 ^b
Nova Scotia	0.6720	24.89	7.56	0.1159	6.26	20.87
New Brunswick	0.8294	29.52	8.75	0.1951	9.61	22.25
Quebec	0.5586	41.69	6.80	0.0584	7.14	19.92
Ontario	Control Case		3.99	Control Case		18.98
Manitoba	0.0348 ^a	1.10	4.13 ^b	-0.0118 ^a	-0.69	18.80 ^b
Saskatchewan	0.1536	4.68	4.63	0.0466	2.48	19.73
Alberta	0.2311	12.63	4.99	0.2296	21.87	22.87
British Columbia	0.4966	29.74	6.41	0.1691	16.42	21.79
North West Territory	0.2953	3.55	5.30	0.2402	4.68	23.06
Yukon	0.5356	4.62	6.65	0.4715	6.35	27.57
Small	Control Case		7.20	Control Case		22.00
Medium	-0.1625	-12.22	6.18	0.1048	11.91	23.91
Large	-0.3607	-23.12	5.12	0.0214	2.20	22.38
Very Large	-0.8949	-59.26	3.06	-0.3501	-40.61	16.47
Manufacturing	Control Case		5.91	Control Case		21.49
Primary	0.6173	23.74	10.47	0.2924	15.15	27.01
Construction	1.3221	79.17	19.32	0.7883	62.56	38.34
Distributive Services	-0.2996	-15.29	4.44	-0.1900	-16.10	18.39
Business Services	-0.3558	-16.94	4.20	-0.1244	-10.37	19.42
Consumer Services	-0.3295	-20.34	4.31	0.0862	9.04	23.02
Health, Education + Welfare	-1.1289	-41.05	1.98	-0.6903	-51.51	11.93
Public Services	-0.3841	-14.60	4.09	-0.5377	-34.47	13.66
Year 78/81	Control Case		4.27	Control Case		19.47
Year 82/83	0.3197	18.27	5.57	-0.0301	-2.66	18.28
Year 84/86	0.2204	14.22	5.04	0.0918	9.71	20.10
Year 87/89	0.0303	1.95	4.20	0.1543	17.07	21.13
Year 90/92	0.2218	14.59	5.00	0.0999	10.70	20.05
N	689622			689622		
χ^2	36214.9			37880.9		

Note: The estimated probability is evaluated at the mean. For dummy variables, this is done by using the sum of the unweighted coefficient of the variable and weighted coefficients of other groups of dummy variables, where the weight is the corresponding variable's share of population in the sample.

a - Insignificantly different from zero at 10%.

b - Insignificantly different from the control case in the regression at 10%.

2. The Layoff History of Displaced Workers: How Important Is It?

With the first part of this paper as background, this section focuses on repeat incidence of permanent layoffs. New longitudinal data on Canadian workers over thirteen years are used to assess the importance of workers' layoff histories. First, to what extent does past layoff history influence the present possibility of a layoff? Past history is often one of the best predictors of present or future labour market behaviour. Is this true for worker displacement? And is the layoff history more important than, say, differences in age, industry or firm size in influencing the probability of displacement in any given year?

Second, how common are repeat permanent layoffs? The potential client base for a worker displacement program will include a mix of workers, those who are experiencing a displacement for the first time following many years of stable employment, as well as those who are repeatedly displaced, and a group which falls in-between. It is important to know both the magnitude of these groups and their characteristics. The programs which are required will differ substantially, depending upon the workers' displacement history.

For example, a worker who is confronted with a permanent layoff as a rare event will require very different post-displacement adjustment assistance from someone whose history of employment has been marked with frequent occurrences of permanent layoffs. For the former, job-seeking skills are likely rusty and the job search process may appear daunting. Furthermore, firm- or industry-specific skills are likely to have been built up, possibly resulting in adjustment difficulties. Therefore, in addition to providing training and related services for upgrading skills, it is more appropriate for post-displacement adjustment programs to provide assistance aimed at improving job-hunting skills, such as resumé preparation, approaching prospective employers and interview handling. On the other hand, workers with a history of repeated permanent layoffs are likely to be confronted with very different difficulties. For them the primary problem may not be finding a new job but rather keeping it. It may also be that the types of firms or industries in which they work lead to repeated displacements. Layoff policies vary across firms and industries. Workers may continuously find themselves in firms or industries that are more often than others to resort to permanent layoffs as a mechanism for workforce adjustment.¹² It may also be that workers' characteristics, work habits or skills result in a continuous layoff pattern among particular groups of workers. Whatever the reasons, the issues associated with the job separation are very different and hence, the appropriate policy interventions would have to be differentiated.

To better identify displaced workers' different specific needs for adjustment assistance it is important to differentiate displaced workers on the basis of their displacement history. This section addresses these issues. First the data source and methodological issues regarding the sample selection are outlined. Multivariate analysis is then employed to assess the significance of the repeat displacement.

2.1 Methodological Issues in the Construction of the Sample

There are methodological issues regarding the construction of the sample. It can be argued that the characteristics and layoff history of workers permanently laid off in one period (e.g., recession) may differ significantly from that in other periods (e.g., recovery or expansion). Focusing on permanent layoffs in one particular period may result in cyclically biased findings. Thus, we investigate the determinants of permanent layoffs in 1988 and 1991, representing the peak and trough of the business cycle. Included in

¹² Although referring to both temporary and permanent layoffs that result in unemployment, Corak (1994) finds a very high degree of concentration of repeat UI usage among a relatively small number of firms.

the analysis is the workers' layoff history over a ten year period, which covers a complete business cycle, either from peak to peak (1979 to 1988) or trough to trough (1982 to 1991).

The data set used in this section contains one record for each worker. Information on personal characteristics (such as age and gender) and job-specific characteristics (such as province, firm size and industry) relates to the reference year, either 1988 or 1991.¹³ Employment in the construction industry or marginal jobs (i.e., those with earnings less than \$4,750 during the year of the layoff and during the previous year in 1988 constant dollars) are excluded from the sample. Jobs in the construction sector are excluded because they exhibit unusually frequent occurrences of permanent layoffs; marginal jobs are excluded because we are concerned with layoffs from jobs where there is a strong attachment to the labour force. For the workers, annual earnings reported (per year of employment) is the average annual earnings over the 10 years prior to the layoff. This is a better estimate of long-term earnings than the reported earnings in any given year.

There is also an issue of representativeness. Workers with frequent occurrences of permanent layoffs will be more likely than those with rare occurrences to be selected into a sample of permanently laid off workers in any given year. In other words, workers with unstable employment patterns will likely be over-represented and workers with stable employment history under-represented in the sample of permanently laid off workers selected in any particular year. For the question posed here, this is the correct way of proceeding. We are interested in the implications for policy intervention required for workers observed to be laid off at some given time (say during a year). This work does not address the question "what is the likelihood of multiple layoffs for workers over their working life?" (or some very long period). Rather, it answers the question, "what is the likelihood of multiple layoffs given a layoff in a particular year?"

There is also a measurement issue regarding permanent layoff history. Not everyone will have been at risk of displacement for an equal number of years over the ten year period selected. The young will have been in the sample relatively few years, as will many women who work some years but not others. Other workers may have withdrawn from the labour market in some years as well. If we included only those who were employed all ten years, this would almost certainly bias the sample towards those with the more stable employment patterns. In order to keep the sample intact, we standardize for the number of years employed by calculating, for each worker, the average number of permanent layoffs per year employed.¹⁴

Finally, there is the issue of truncation of employment spells due to quits or separations for other reasons. For example, if a firm is in decline, its workers may quit in anticipation of potential permanent layoffs. If the worker had not quit, there is some likelihood that a permanent layoff would have occurred. But if the worker had quit, the likelihood of a permanent layoff is not observable. Thus, the employment spell is truncated in cases of quits and other types of separations. While the total number of quits and other separations can be identified, the extent to which these separations would have otherwise been permanent layoffs is unknown. This truncation is not of great importance from a policy perspective, however. People who quit are very likely to either have other jobs to which they can go, or voluntarily withdraw from the labour market, and hence would not likely be candidates for program intervention.

2.2 The Incidence of Permanent Layoffs and the Displacement History

Given that a permanent layoff is observed during a year, we would like to know not only the profiles of the displaced workers, but also the relationship between permanent layoff history and the incidence of a

¹³ In case of workers who held more than one job in the reference year, information on job-specific characteristics is taken based on the main job (i.e., with the highest earnings).

¹⁴ Employment means having positive employment earnings during the year.

permanent layoff. This is achieved by estimating the probability of a worker encountering a permanent layoff through non-linear maximum likelihood techniques.

At any given point in time t , worker i is observed with a vector of personal and employer characteristics X_{it} . In a longitudinal setting, the worker is also observed with a certain history of permanent layoffs H_{it} . Define $Y_{it} = 1$ if worker i is observed with a permanent layoff in time t and $Y_{it} = 0$ otherwise. In the logistic model, the probability of worker i being permanently laid off in time t is given by:

$$(1) \text{Ln}\{\text{Pr}(Y_{it} = 1)/[1 - \text{Pr}(Y_{it} = 1)]\} = \beta(X_{it}, H_{it}), \text{ or}$$

$$(2) \text{Pr}(Y_{it} = 1) = e^{\beta(X_{it}, H_{it})}/[1 + e^{\beta(X_{it}, H_{it})}],$$

where β is a vector of parameters to be estimated.

In our data, the vector X_{it} contains information on age, gender, province, firm size and industry, and H_{it} is the average number of permanent layoffs per year of employment over the 9-year period prior to the reference year.

Table 2.1 presents the logistic regression results and, perhaps more usefully, the estimated probability of permanent layoff in 1988 and 1991 (evaluated at the mean value of the sample), respectively (see Appendix B for variable definitions and Appendix C for sample statistics).

The results indicate that past layoff history is indeed valuable information regarding the probability of layoff in any given year. Persons with a history of layoffs are more likely to be laid off than others, after controlling for age, gender, industry, firm size and province. How much more likely? The results suggest a 0.1 increase in the mean number of layoffs per year employed increases the probability of being laid off by over 20% in both 1988 and 1991 (e.g., in 1988 the estimated probability of a layoff goes from 2.43% at the mean value to 2.99% at the mean value plus 0.1). And how much of an increase is 0.1? The mean number of layoffs per year employed is around 0.35 (i.e., an average three and one half layoffs over the past 9 years) for persons displaced in these two years, with a standard deviation of 0.27. And almost 15% of all displaced workers in these years had more than 0.5 layoffs per year employed. Thus, an increase of one standard deviation would increase the probability of layoff by nearly 60%, quite a significant difference. As between a person with few layoffs historically, say 0.18 (or 2 layoffs over the past 9 years), and those with a lot, say 0.45 (or 5 layoffs over the past 9 years), the difference in the probability of being laid off in 1988 increases by nearly 75% from 3.3% to 5.72%.

Turning to other variables now. The likelihood of being permanently laid off in both 1988 and 1991 declines with age up to 54, and then rises again. In other words, other things be equal, young and old workers are hit much harder than their prime-aged counterparts by permanent layoffs, either in the peak of the business cycle or in recession. In 1988, Ontario workers experienced the lowest rate of permanent layoffs; but by 1991, a worker's likelihood of being permanently laid off was lower in both Manitoba and Saskatchewan, although still higher in other provinces. In both 1988 and 1991, a worker in the primary industries was four times as likely to be displaced as compared to a public sector worker, and someone employed by a small firm was also four times as likely to be laid off in comparison to someone employed by a large company.

Table 2.1
Logistic Regression Results and Estimated Probability of Permanent Layoffs in Canada

	1988			1991		
	Coefficient	T-ratio	Probability(%)	Coefficient	T-ratio	Probability(%)
Constant	-2.9252	-144.1		-2.4066	-131.51	
Index of PL History:	2.1246	68.32		1.9275	68.84	
Mean Value			2.43			3.30
Mean Value + 0.1			2.99			3.99
0.18			3.30			4.35
0.45			5.72			7.13
Male	Control Case		2.73	Control Case		3.80
Female	-0.2671	-20.23	2.10	-0.3221	-28.76	2.77
Age1524	Control Case		2.87	Control Case		3.73
Age2534	-0.1227	-7.82	2.54	-0.0638	-4.09	3.50
Age3544	-0.2575	-14.39	2.23	-0.2027	-12.14	3.06
Age4554	-0.3393	-15.71	2.06	-0.2607	-13.72	2.89
Age5564	-0.1417	-5.58	2.50	-0.1386	-6.19	3.26
Newfoundland	0.8865	22.61	4.21	0.6136	18.15	5.61
PEI	0.6304	7.87	3.29	0.1198 ^a	1.63	3.49 ^b
Nova Scotia	0.4841	13.56	2.86	0.121	3.9	3.50
New Brunswick	0.5865	16.07	3.15	0.1946	6.1	3.76
Quebec	0.5677	36.16	3.10	0.1678	12.71	3.66
Ontario	Control Case		1.78	Control Case		3.11
Manitoba	0.2847	8.11	2.34	-0.2067	-6.38	2.55
Saskatchewan	0.5009	14.56	2.90	-0.1994	-5.78	2.56
Alberta	0.4976	22.93	2.89	0.0776	4.13	3.36
British Columbia	0.5631	28.58	3.08	0.0876	5.18	3.39
Primary	0.8305	37.24	5.69	0.6342	29.64	6.09
Manufacturing	0.2067	11.81	3.12	0.3298	21.7	4.56
Distributive Services	-0.0367	-1.84	2.46	0.0508	3.01	3.49
Business Services	-0.0296 ^a	-1.42	2.49 ^b	0.0903	5.28	3.62
Public Services	-0.601	-26.36	1.42	-0.6088	-30.44	1.83
Consumer Services	Control Case		2.55	Control Case		3.31
Small	Control Case		5.83	Control Case		7.84
Medium	-0.4782	-29.7	3.68	-0.4142	-30.68	5.31
Large	-0.7691	-41.8	2.78	-0.7339	-47.97	3.91
Very Large	-1.3969	-83.65	1.50	-1.4285	-92.76	1.99
N		972531			996732	
χ^2		26173.18			29006.21	

Note: The estimated probability is evaluated at the mean. For dummy variables, this is done by using the sum of the unweighted coefficient of the variable and weighted coefficients of other groups of dummy variables, where the weight is the corresponding variable's share of population in the sample.

a - Statistically insignificantly different from zero at 10%; and

b - Statistically insignificantly different from the control case in the regression at 10%.

2.3 Rare and Frequent Occurrence of Permanent Layoffs

Given that a worker is observed with a permanent layoff during a particular period, is this a rare event or one of many permanent layoffs he/she has experienced? We will empirically differentiate the characteristics associated with rare layoffs from those associated with those workers whose history of employment has been interrupted by frequent permanent layoffs. This is done by classifying displaced workers into three groups according to their average number of permanent layoffs per year of employment and estimating the probability that a permanent layoff is a rare or a frequent event over a 10-year period using multinomial logistic analysis.

2.3a Permanent Layoffs over a Decade: Some Patterns

The layoff of 1988 was a fairly rare event for about one-third of all workers displaced during that year.¹⁵ That is, their expected number of layoffs per year was below 0.2 (Table 2.2). If they worked 10 years, one would expect to see two layoffs or less, including that observed in 1988. For about another one-sixth of the displaced workers the layoff was a continuation of a long string of layoffs; the expected number of layoffs over a ten-year period was five or more for these workers. The remaining displaced workers almost one half fell in-between these two extremes. Similar results are observed for 1991 (Table 2.2). These results are presented by age, industry, gender and province. These differences are explored more systematically in a multivariate analysis in the next section, but the table itself outlines the major differences.

There is some variation by age. Since layoff rates are generally higher among the young, it is not surprising that the proportion with less than 0.2 layoffs per year is smaller for the young; 15% among displaced workers under 25, 56% among workers over 55. Thus, the layoff is much more likely to be a rare event for older displaced workers (at least over the previous decade). And the likelihood of a layoff being part of a string of recent layoffs is much higher among younger displaced workers. Similarly, workers in high unemployment provinces such as those on the east coast are more likely to see the layoff as a continuation of a long string. About one quarter of laid off workers in Newfoundland and New Brunswick were among the repeat layoffs group, as compared to 10% to 15% in Ontario and Manitoba.

¹⁵ As noted earlier, this excludes construction workers and layoffs from marginal jobs.

Table 2.2
Distribution of Average Number of Permanent Layoffs per Year of Employment in Canada (%)

	1988			1991		
	= 0.2	0.2 to 0.5	> 0.5	= 0.2	0.2 to 0.5	> 0.5
All Displaced Workers	37.81	45.52	16.67	40.49	46.36	13.15
Gender:						
Male	35.70	46.36	17.94	39.08	46.18	14.74
Female	42.02	43.85	14.14	43.12	46.70	10.18
Age:						
15-24	15.36	56.77	27.87	7.19	68.90	24.10
25-34	42.95	45.18	11.87	42.60	46.72	10.68
35-44	44.38	41.53	14.09	47.38	41.43	11.19
45-54	48.55	37.78	13.67	50.96	36.90	12.14
55-64	56.28	30.82	12.89	58.96	31.04	10.00
Province:						
Newfoundland	28.61	46.49	24.91	38.60	45.13	16.27
PEI	40.88	43.09	16.02	39.62	48.11	12.26
Nova Scotia	37.55	42.78	19.67	36.77	48.59	14.64
New Brunswick	30.00	47.45	22.55	36.52	46.48	17.00
Quebec	36.76	47.13	16.10	39.10	47.80	13.10
Ontario	42.42	43.29	14.29	46.31	43.86	9.83
Manitoba	45.65	40.58	13.77	46.15	44.05	9.80
Saskatchewan	40.42	42.33	17.25	38.22	45.39	16.39
Alberta	36.86	46.82	16.32	35.90	48.54	15.55
British Columbia	33.59	46.88	19.53	33.45	48.32	18.23
Industry:						
Primary	26.75	48.53	24.71	26.45	50.14	23.41
Manufacturing	39.00	44.60	16.40	44.95	43.92	11.13
Distributive Services	41.92	44.07	14.01	45.71	43.47	10.82
Business Services	37.10	46.75	16.15	41.74	47.00	11.26
Public Services	44.04	42.73	13.23	40.82	45.82	13.36
Consumer Services	37.40	46.36	16.24	36.73	49.19	14.08
Firm Size:						
Small	34.00	47.74	18.26	36.48	49.07	14.45
Medium	36.14	47.29	16.57	40.97	46.20	12.83
Large	41.15	43.50	15.35	42.82	44.97	12.21
Very Large	44.25	41.02	14.73	46.30	42.05	11.65

Note: The average number of permanent layoffs per year of employment is over a 10-year period for workers with a permanent layoff in the reference year (i.e., 1979 to 1988 for workers with a permanent layoff in 1988 and 1982 to 1991 for workers with a permanent layoff in 1991).

The proportion for whom layoffs are rare events rises marginally as economic conditions worsen, as the relative probability of layoff among those with more stable employment backgrounds rises. For example, the share of displaced workers for whom layoff was a rare event rose from 38% in 1988, a boom year, to 41% in 1991, a recessionary year. But the increase was not consistent across age, province and industry categories.

Describing the results in this univariate manner is very informative, as one observes, for example, where and among what types of workers the share that are experiencing a rare event is the highest, such as in Ontario (at around 42% to 46%), among older workers (at around 50%), and workers in large firms (at around 45%). From a policy perspective, it is important to know this, even if the results for Ontario relate more to the fact that Ontario has a different industrial structure than that of, say, Newfoundland. But if one wants to determine the relative likelihood of a layoff in Ontario being a rare event as compared to, say, in Newfoundland, after controlling for differences in industrial structure and other variables, one must turn to multivariate analysis. To do this we use multinomial logistic regression.

2.3b *Multinomial Logistic Analysis*

We classify workers into three groups and define $Y = 1$ for workers whose average number of permanent layoffs per year of employment is 0.2 or below (i.e., on average of one permanent layoff every five years), those workers for whom the occurrence of permanent layoffs is a rare event in their history of employment; $Y = 2$ for workers whose average number of permanent layoffs per year of employment is between 0.2 and 0.5; and $Y = 3$ for workers whose average number of permanent layoffs per year of employment is above 0.5 (i.e., on average of one permanent layoff every two years), those workers with high repeat layoffs. The probability that a permanent layoff is a rare or frequent event over a 10-year period can be estimated through non-linear maximum likelihood techniques, such as multinomial logistic analysis. Details are provided in Appendix A.

Table 2.3a reports the multinomial logistic regression results estimated on our final empirical samples of workers with a permanent layoff in 1988 and 1991.¹⁶ The vector of explanatory variables X contains information on average annual earnings per year of employment, gender, age, province, firm size and industry (see Appendix C for sample statistics).

We are interested in the permanent layoff as a rare or repeated event. The values of the estimated probabilities are reported in Table 2.3b. These values indicate the estimated probability for any variable, while holding all others at their mean value.¹⁷ They demonstrate that for example, after controlling for other characteristics, the likelihood of a layoff being a rare event increases by nearly two percentage points with a \$1,000 increase (from the mean value) in annual earnings. This suggests income (the average over a decade) makes a very big difference. For instance, given that a layoff occurs, the likelihood of it being a rare event is about 30% among displaced workers with long-term annual earnings of \$10,000 as compared to 80% among those with earnings of \$40,000 per year. Thus, layoffs among the higher skilled, higher income workers are usually rare events; they are more likely to be a continuation of a stream of layoffs among workers with lower annual earnings.¹⁸ Long-term annual earnings is one of the most discriminating variables found in this work.

Other defining features of workers among whom a layoff is likely to be a rare event includes gender and age. When a layoff occurs, it is more likely to be a rare event among women (48% as compared to 31% among men) and older workers (50% as compared to 11% to 21% among 15-24 year olds). Where one works, as defined by industry and size of company, is less discriminating than income, age and gender.¹⁹ This is likely in part due to the relatively high degree of mobility among locations of work, so that at any given time there may be a mixture of workers for whom the layoff is a rare and continuous event. Thus,

¹⁶ Because of multiple equations in a multinomial logistic model which is always fully saturated (i.e., probabilities over all outcomes always sum up to 1 under any circumstances), cautions are warranted in interpreting the coefficients of explanatory variables in any particular equation. Most of the time, a positive/negative coefficient of an explanatory variable in a particular equation implies higher/lower probability for that outcome, just like in logistic models. However, it can occasionally be true that the probability of other outcome(s) increases/decreases even more due to that explanatory variable and thus a positive/negative coefficient can actually imply lower/higher probability of that outcome.

¹⁷ For a set of dummy variables (e.g., all provinces), the coefficient value for the control case (i.e., mean value) is determined by calculating the weighted mean of all the coefficients on all of the dummy variables in the group (e.g., the weighted mean of all coefficients on the province variables), the weight being the corresponding variable's share of the population of in the sample.

¹⁸ Of course, one of the reasons for the lower annual earnings would be the repeated layoffs. For this reason we calculate earnings as the average over a decade, thus reducing the impact of layoffs on annual income in any single year.

¹⁹ There is one exception, however. The likelihood that a layoff is a "rare" event for a displaced worker in the primary sector is somewhat lower than in other industries (21% to 26% as compared to 38% to 40% for all displaced workers).

even though at any given time layoffs are much more likely in small than large firms, this does not mean that workers laid off from small firms are much more likely to have had a string of layoffs.

Thus, young men with low annual earnings capability are much more likely than others to experience a string of repeat layoff. If a worker has a capacity for high annual income, the layoff is almost certainly to be a rare event, particularly among older workers.

In short, given that a worker has been laid off during a year, the likelihood of it being a rare event or a continuation of a stream of layoffs varies dramatically across income levels, age and gender. For young low-skilled male workers, an observed layoff in any given year is almost certain to be just one of many layoffs throughout their employment history. In contrast, older high-skilled female workers, although being laid off in a particular year, are not likely to be permanently laid off very frequently in their recent working life. These findings do not vary significantly by where a worker works, defined in terms of industry and employer size. These results exclude the construction sector, where repeat layoffs are extremely high because of the nature of the work, and marginal jobs where the earned income is quite low.

Table 2.3a
Multinomial Logistic Regression Results on Rare and Frequent Permanent Layoffs in Canada

	1988		1991	
	Rare (β^1)	Frequent (β^3)	Rare (β^1)	Frequent (β^3)
Constant	-1.9356 (-36.24)	-0.5103 (-8.66)	-2.9966 (-50.74)	-1.0057 (-18.8)
Avg. Annual Earnings*10 ⁻³	0.0679 (37.19)	-0.0397 (-13.63)	0.0788 (49.49)	-0.0124 (-4.99)
Female	0.6593 (20.96)	-0.2794 (-7.14)	0.6079 (22.74)	-0.4134 (-11.21)
Age2534	0.9309 (22.94)	-0.4723 (-11.02)	1.8137 (34.84)	-0.3869 (-9.34)
Age3544	0.7536 (16.15)	-0.1085 (-2.13)	1.6441 (29.86)	-0.1649 (-3.42)
Age4554	0.8674 (15.88)	-0.0232* (-0.36)	1.6981 (28.62)	0.0525* (0.93)
Age5564	1.2876 (20.53)	0.0734* (0.93)	2.0557 (31.37)	-0.0226* (-0.31)
Newfoundland	-0.1894 (-2.06)	0.3639 (3.81)	0.2371 (3.17)	0.3449 (3.67)
PEI	0.5106 (2.93)	-0.1267* (-0.57)	0.2652* (1.64)	-0.0392* (-0.18)
Nova Scotia	0.1985 (2.43)	0.2094 (2.18)	0.0563* (0.79)	0.1659 (1.82)
New Brunswick	-0.0575* (-0.67)	0.1838 (1.99)	0.1258 (1.74)	0.3451 (3.88)
Quebec	-0.0831 (-2.33)	0.0122* (0.27)	-0.049 (-1.65)	0.1626 (3.85)
Manitoba	0.2982 (3.78)	-0.0164* (-0.15)	0.2171 (2.96)	-0.0788* (-0.71)
Saskatchewan	0.1617 (2.05)	0.1308* (1.36)	-0.0722 (-0.89)	0.3483 (3.54)
Alberta	-0.2608 (-5.25)	0.0695* (1.12)	-0.3148 (-7.24)	0.2785 (5.0)
British Columbia	-0.394 (-8.61)	0.2402 (4.41)	-0.3944 (-9.94)	0.4367 (8.91)
Primary	-0.5171 (-9.94)	0.3925 (7.2)	-0.593 (-11.53)	0.3741 (7.04)
Manufacturing	-0.1076 (-2.74)	0.1076 (2.21)	0.0111* (0.33)	-0.1049 (-2.27)
Distributive Services	-0.0155* (-0.35)	-0.0377* (-0.65)	0.1079 (2.86)	-0.1469 (-2.79)
Business Services	-0.2941 (-6.15)	0.0879* (1.49)	-0.2056 (-5.29)	-0.1042 (-1.96)
Public Services	0.0805* (1.56)	-0.1321 (-1.89)	-0.0916 (-1.96)	0.0447* (0.71)

(continued)

Table 2.3a (concluded)
Multinomial Logistic Regression Results on Rare and Frequent Permanent Layoffs in Canada

	1988		1991	
	Rare (β^1)	Frequent (β^3)	Rare (β^1)	Frequent (β^3)
Medium	-0.0584* (-1.59)	-0.0247* (-0.56)	0.0483* (1.59)	-0.0236* (-0.59)
Large	0.0471* (1.11)	0.0238* (0.45)	-0.0576* (-1.64)	0.0095* (0.2)
Very Large	0.0786 (2.01)	0.1053 (2.12)	0.0748 (2.05)	0.0351* (0.69)
n ₁ (Dep. Var. = 1)	11431 (37.81%)		16514 (40.49%)	
n ₂ (Dep. Var. = 2)	13761 (45.52%)		18906 (46.36%)	
n ₃ (Dep. Var. = 3)	5040 (16.67%)		5361 (13.15%)	
N	30232		40781	
χ^2	6132.44		9821.13	

Note: Dependent variable = 1 (rare) if average number of permanent layoffs per year of employment over a 10-year period ≤ 0.2 ; = 2 (medium) if average number of permanent layoffs per year of employment over a 10-year period is between 0.2 and 0.5; and = 3 (frequent) if average number of permanent layoffs per year of employment over a 10-year period > 0.5 .

The base group is that the occurrence of permanent layoffs is a medium event, i.e., dependent variable = 2.

T-ratios are given in parentheses.
 * - Insignificantly different from zero at 10%.

Table 2.3b
Estimated Probability of Rare, Medium and Frequent Permanent Layoffs in Canada (percent)

	1988			1991		
	Rare	Medium	Frequent	Rare	Medium	Frequent
Avg. Annual Earnings*10 ⁻³ :						
Mean Value	36.00	48.95	15.05	32.88	52.95	14.17
Mean Value + 1	37.79	48.02	14.19	34.70	51.65	13.65
\$10,000	29.52	51.92	18.56	25.12	58.34	16.54
\$40,000	79.71	18.31	1.99	79.32	17.30	3.38
Male	30.60	51.88	17.52	27.93	55.13	16.94
Female	47.61	41.74	10.66	43.61	46.86	9.52
Age1524	21.44	57.30	21.26	11.17	67.48	21.35
Age2534	43.52	45.86	10.61	45.52	44.84	9.64
Age3544	37.35	47.00	15.65	40.32	47.06	12.63
Age4554	39.53	44.38	16.09	40.41	44.69	14.90
Age5564	49.21	36.30	14.49	49.69	38.42	11.89
Newfoundland	32.17	48.05	19.78	39.58	45.95	14.48
PEI	51.85	38.46	9.69	42.18	47.61	10.22
Nova Scotia	42.18	42.74	15.08	36.26	50.45	13.29
New Brunswick	36.24	47.44	16.31	36.95	47.94	15.11
Quebec	36.60	49.16	14.24	33.88	52.37	13.75
Ontario	38.62	47.73	13.66	35.71	52.56	11.73
Manitoba	45.97	42.16	11.87	41.17	48.77	10.06
Saskatchewan	41.77	43.91	14.32	32.45	51.32	16.23
Alberta	32.30	51.81	15.89	27.70	55.84	16.46
British Columbia	28.58	52.37	19.05	25.40	55.45	19.15
Primary	25.74	52.08	22.18	21.20	56.57	22.23
Manufacturing	36.06	48.43	15.51	35.55	51.84	12.62
Distributive Services	39.00	47.77	13.23	37.99	50.28	11.73
Business Services	31.98	51.76	16.26	30.75	55.69	13.57
Public Services	41.78	46.50	11.72	32.54	52.59	14.87
Consumer Services	39.17	47.24	13.59	34.80	51.32	13.87
Small	35.85	49.31	14.84	32.49	53.30	14.20
Medium	34.64	50.52	14.84	33.67	52.63	13.70
Large	36.81	48.30	14.89	31.20	54.21	14.59
Very Large	37.08	47.15	15.77	33.99	51.73	14.28

Note: The estimated probability is evaluated at the mean. For dummy variables, this is done by using the sum of the unweighted coefficient of the variable and weighted coefficients of other groups of dummy variables, where the weight is the corresponding variable's share of population in the sample.

3. Concluding Remarks

Permanent layoffs are an on-going feature of a market economy in which there is "creative destruction". Workers are being laid off and hired in large numbers, more than a million per year, in all years, no matter in which part of the business cycle. Increases in permanent layoffs are not the defining feature of a recession in the way that a rise in temporary layoffs or a decline in hirings and quits are. Permanent layoffs are much less cyclically sensitive than are the other methods firms use to adjust their workforce in the face of a decline in product demand (i.e., temporary layoffs, quits and hires). This is as true in the early 1990s as in the 1980s.

And there is no evidence that permanent layoffs played a larger role (relative to temporary layoffs) in firms adjustments to changing demand in the 1990s recession than during the 1980s recession. The permanent layoff rate was if anything lower in the early 1990s than the early 1980s, after controlling for gender, age, province, firm size and industry.

Thus, a decline in aggregate demand, as manifested in recessions, is not the principle cause of permanent layoffs. Another often mentioned candidate is structural change, as reflected by declining labour demand and employment in some industries, and increasing demand in others. Here again, however, we found little evidence to support the notion that the level of permanent layoffs is related to such changes in employment. There was no correlation between changes in net employment in an industry, and the layoff rate. Some declining industries have the lowest layoff rates, while some expanding sectors have the highest. There are other aspects within an industry that determine the layoff rate. These aspects are probably related to the level of gross job gain and loss at the company level in an industry, independent of the changes in aggregate demand that are occurring in the industry. For example, permanent layoffs are highly concentrated in the small firm sector, where the volatility of employment at the company level is the greatest. Workers in small firms are three times more likely to face permanent layoff than their counterparts in large companies.

But for public policy, it is important to know whether the layoff faced by workers is the continuation of a string of repeat layoffs, or whether it is a rare event. The public policy response to a job displacement will be very different for the rare event than for the repeat layoff. In the former, methods of finding a new job may be foremost in any program; whereas in the latter, methods of keeping a job may be more important.

In Canada, only around 40% of layoffs in any given year are “rare” events. Thus, it is not reasonable to think of all worker displacements as being of this nature. There is a significant minority of workers, around 15% in any given year, for whom repeat layoffs are the norm. These workers experience more than five layoffs a decade, on average. The data suggest that long-term earnings (annual average over a decade) to a great extent distinguishes workers for whom layoffs are rare events from others. Among workers with high potential income (as demonstrated by past history), a layoff is very likely to be a rare event. This is particularly true among older workers. For these people, the issue is one of finding the next job, not one of dealing with a sequence of job displacements. This is not the case among younger, low income displaced workers, where keeping a job may be more the issue. Generally speaking, where one works, as defined by industry and firm size, does not influence the likelihood that an observed layoff will be a “rare” or “repeat” event as much as age, gender and long-term income, even though the probability of layoffs at any given point in time varies significantly across industries and firm size. This is likely due to the high degree of worker mobility among industry and firm size.

This pattern of repeat layoffs may be related to demand side features, such as the more volatile labour demand for low skilled workers, the hiring and layoff practices of some firms, and the instability of employment in particular firms in a sector. It may also be related to supply side characteristics, such as the skill levels, motivation or work habits of the workers. There is nothing in our analysis that can distinguish between these sets of possible reasons for the patterns observed. It is evident, however, that not all worker displacements can be observed in the same light from a public policy perspective.

Appendix A

The Multinomial Logistic Regression

Suppose X is a vector of explanatory variables, and β^1 , β^2 , and β^3 are sets of estimated coefficients corresponding to each outcome group $Y = 1$, $Y = 2$ and $Y = 3$. In the multinomial logistic model, the probability of the layoff being a ‘rare’ event ($Y=1$), or repeated event ($Y=3$) is given by Equations (A1):²⁰

$$(A1) \quad \begin{aligned} \Pr(Y = 1) &= e^{X\beta^1} / (e^{X\beta^1} + e^{X\beta^2} + e^{X\beta^3}), \\ \Pr(Y = 2) &= e^{X\beta^2} / (e^{X\beta^1} + e^{X\beta^2} + e^{X\beta^3}), \text{ and} \\ \Pr(Y = 3) &= e^{X\beta^3} / (e^{X\beta^1} + e^{X\beta^2} + e^{X\beta^3}). \end{aligned}$$

The model is, however, unidentified in the sense that there is more than one solution to β^1 , β^2 , and β^3 that leads to the same probabilities for outcomes $Y = 1$, $Y = 2$ and $Y = 3$. In order to identify the model, one set of coefficients (β^1 or β^2 or β^3) has to be arbitrarily parameterized, say, by setting them equal to 0.²¹ If β^1 are set to 0, the estimated β^2 and β^3 measure the change relative to the $Y = 1$ group. If β^2 are instead set to 0, the estimated β^1 and β^3 measure the change relative to the $Y = 2$ group, and so on. It does not matter which set of coefficients is parameterized because although the resulting sets of estimated coefficients will differ as they have different interpretations, the predicted probabilities for $Y = 1, 2$ and 3 will remain the same. Thus, any parameterization is a solution to the same underlying model.

Setting $\beta^2 = 0$, Equations (A1) become Equations (A2):

$$(A2) \quad \begin{aligned} \Pr(Y = 1) &= e^{X\beta^1} / (1 + e^{X\beta^1} + e^{X\beta^3}), \\ \Pr(Y = 2) &= 1 / (1 + e^{X\beta^1} + e^{X\beta^3}), \text{ and} \\ \Pr(Y = 3) &= e^{X\beta^3} / (1 + e^{X\beta^1} + e^{X\beta^3}). \end{aligned}$$

The probabilities for outcome groups of $Y = 1$ and $Y = 3$ relative to the base group of $Y = 2$ is given in Equations (A3) and (A4):

$$(A3) \quad \Pr(Y = 1) / \Pr(Y = 2) = e^{X\beta^1}, \text{ and}$$

$$(A4) \quad \Pr(Y = 3) / \Pr(Y = 2) = e^{X\beta^3}.$$

Suppose $X = (x_1, x_2, \dots, x_k)$, $\beta^1 = (\beta_1^1, \beta_2^1, \dots, \beta_k^1)'$ and $\beta^3 = (\beta_1^3, \beta_2^3, \dots, \beta_k^3)'$. For a one-unit change in x_j , the ratio of the probability for the outcome group of $Y = 1$ relative to the base group of $Y = 2$ is given in Equation (A5):

$$(A5) \quad e^{[\beta_1^1 x_1 + \dots + \beta_j^1 (x_j + 1) + \dots + \beta_k^1 x_k]} / e^{(\beta_1^1 x_1 + \dots + \beta_j^1 x_j + \dots + \beta_k^1 x_k)} = e^{\beta_j^1},$$

and the ratio of the probability for the outcome group of $Y = 3$ relative to the base group of $Y = 2$ is given in Equation (A6):

$$(A6) \quad e^{[\beta_1^3 x_1 + \dots + \beta_j^3 (x_j + 1) + \dots + \beta_k^3 x_k]} / e^{(\beta_1^3 x_1 + \dots + \beta_j^3 x_j + \dots + \beta_k^3 x_k)} = e^{\beta_j^3}.$$

In words, the exponentiated value of a coefficient for an outcome group is the ratio of the probability for a one-unit change in the corresponding explanatory variable, relative to the base group.

²⁰ For examples of illustrations on multinomial logistic models, see Greene (1990, Chapter 20), Hosmer and Lemeshow (1989, pp. 216-238).

²¹ In fact, any parameterization will do the job. Setting it equal to 0 greatly simplifies the computations.

Appendix B

Variable Definitions

Index of PL History	= Avg. # of PL per year of emp. over the 9-year period prior to the ref. year
Avg. Annual Earnings*10 ⁻³	= Avg. annual earnings per year of emp. over the previous decade/1,000
Gender:	
Male	= 1 for male workers in the ref. year
Female	= 1 for female workers in the ref. year
Age:	
15-24	= 1 for workers 15 to 24 years of age in the ref. year
25-34	= 1 for workers 25 to 34 years of age in the ref. year
35-44	= 1 for workers 35 to 44 years of age in the ref. year
45-54	= 1 for workers 45 to 54 years of age in the ref. year
55-64	= 1 for workers 55 to 64 years of age in the ref. year
Province:	
Newfoundland	= 1 for workers residing in Newfoundland in the ref. year
PEI	= 1 for workers residing in Prince Edward Island in the ref. year
Nova Scotia	= 1 for workers residing in Nova Scotia in the ref. year
New Brunswick	= 1 for workers residing in New Brunswick in the ref. year
Quebec	= 1 for workers residing in Quebec in the ref. year
Ontario	= 1 for workers residing in Ontario in the ref. year
Manitoba	= 1 for workers residing in Manitoba in the ref. year
Saskatchewan	= 1 for workers residing in Saskatchewan in the ref. year
Alberta	= 1 for workers residing in Alberta in the ref. year
British Columbia	= 1 for workers residing in British Columbia in the ref. year
Industry:*	
Primary	= 1 for workers employed in the primary sector in the ref. year
Manufacturing	= 1 for workers employed in the manufacturing sector in the ref. year
Distributive Services	= 1 for workers employed in the distributive services sector in the ref. year
Business Services	= 1 for workers employed in the business services sector in the ref. year
Consumer Services	= 1 for workers employed in the consumer services sector in the ref. year
Public Services	= 1 for workers employed in the public services sector in the ref. year
Firm Size:	
Small	= 1 for workers employed by firms with 1 to 19 employees in the ref. year
Medium	= 1 for workers employed by firms with 20 to 99 employees in the ref. year
Large	= 1 for workers employed by firms with 100 to 499 employees in the ref. year
Very Large	= 1 for workers employed by firms with 500 employees or more in the ref. year

* --- See Statistics Canada (1992) Catalogue 71-539 for detailed industry aggregation.

Appendix C

Sample Statistics for All Workers (Corresponding to Logit Regressions in Table 2.1)

	1988		1991	
	Mean	Std. Dev.	Mean	Std. Dev.
Index of PL History	0.0324	0.1047	0.0323	0.1073
Avg. Annual Earnings*10 ⁻³	21.3812	16.4967	21.1744	16.8555
Male	0.5563	0.4968	0.5348	0.4988
Female	0.4437	0.4968	0.4652	0.4988
Age:				
15-24	0.1856	0.3888	0.1257	0.3315
25-34	0.3257	0.4686	0.3212	0.4669
35-44	0.2566	0.4368	0.2862	0.4519
45-54	0.1517	0.3587	0.1806	0.3847
55-64	0.0804	0.2179	0.0863	0.2808
Province:				
Newfoundland	0.0163	0.1267	0.0160	0.1256
PEI	0.0039	0.0624	0.0041	0.0638
Nova Scotia	0.0301	0.1709	0.0301	0.1709
New Brunswick	0.0232	0.1507	0.0238	0.1523
Quebec	0.2493	0.4326	0.2466	0.4311
Ontario	0.4063	0.4911	0.3993	0.4898
Manitoba	0.0391	0.1937	0.0375	0.1900
Saskatchewan	0.0297	0.1696	0.0292	0.1685
Alberta	0.0926	0.2898	0.0951	0.2934
British Columbia	0.1095	0.3123	0.1181	0.3228
Industry:				
Primary	0.0356	0.1853	0.0337	0.1804
Manufacturing	0.2250	0.4176	0.1926	0.3944
Distributive Services	0.1407	0.3477	0.1354	0.3421
Business Services	0.1249	0.3307	0.1371	0.3439
Consumer Services	0.1948	0.3961	0.2006	0.4005
Public Services	0.2789	0.4485	0.3006	0.4585
Firm Size:				
Small	0.1764	0.3812	0.1911	0.3931
Medium	0.1569	0.3638	0.1741	0.3792
Large	0.1582	0.3649	0.1737	0.3789
Very Large	0.5085	0.4999	0.4612	0.4985
N		972531		996732

Appendix D

Sample Statistics for Permanently Laid Off Workers (Corresponding to Multinomial Logit Regression in Tables 2.3a and 2.3b)

	1988		1991	
	Mean	Std. Dev.	Mean	Std. Dev.
Avg. # of PL per Year	0.3705	0.2779	0.3496	0.2597
Avg. Annual Earnings*10 ⁻³	13.7899	10.3511	14.6463	10.8566
Male	0.6657	0.4718	0.6506	0.4768
Female	0.3343	0.4718	0.3494	0.4768
Age:				
15-24	0.2541	0.4354	0.1629	0.3693
25-34	0.3555	0.4787	0.3685	0.4824
35-44	0.2082	0.4060	0.2486	0.4322
45-54	0.1106	0.3136	0.1399	0.3469
55-64	0.0716	0.2578	0.0799	0.2712
Province:				
Newfoundland	0.0268	0.1616	0.0267	0.1611
PEI	0.0059	0.0771	0.0052	0.0719
Nova Scotia	0.0316	0.1749	0.0305	0.1719
New Brunswick	0.0311	0.1736	0.0293	0.1686
Quebec	0.3208	0.4668	0.2845	0.4512
Ontario	0.2602	0.4387	0.3404	0.4739
Manitoba	0.0319	0.1759	0.0268	0.1614
Saskatchewan	0.0347	0.1830	0.0239	0.1528
Alberta	0.1103	0.3132	0.1001	0.3002
British Columbia	0.1465	0.3536	0.1326	0.3392
Industry:				
Primary	0.1218	0.3271	0.0877	0.2828
Manufacturing	0.2559	0.4364	0.2559	0.4364
Distributive Services	0.1434	0.3504	0.1568	0.3636
Business Services	0.1206	0.3257	0.1468	0.3539
Consumer Services	0.2551	0.4359	0.2503	0.4332
Public Services	0.1033	0.3043	0.1026	0.3034
Firm Size:				
Small	0.4079	0.4914	0.3946	0.4888
Medium	0.2199	0.4142	0.2506	0.4334
Large	0.1521	0.3591	0.1709	0.3764
Very Large	0.2201	0.4143	0.1839	0.3874
N		30232		40781

Bibliography

- Anderson, P. and B. Meyer (1994), "The Extent and Consequences of Job Turnover", Brookings Papers on Economic Activity, Microeconomics 1994, pp. 177-236.
- Baldwin, J., T. Dunne and J. Haltiwanger (1992), "Job Creation and Destruction in the Manufacturing Sectors of Canada and the United States", paper presented at the American Economic Association Meetings.
- Baldwin, J. and P. Gorecki (1990), Structural Change and the Adjustment Process: Perspectives on Firm Growth and Worker Turnover, Statistics Canada and the Economic Council of Canada: Catalogue EC22-166/1990E.
- Baldwin, J. and P. Gorecki (1989), "Dimensions of Labour Market Change in Canada: Intersectoral Shifts, Job and Worker Turnover", Statistics Canada: Analytical Studies Branch Research Paper No. 25.
- Blanchard, O. and P. Diamond (1990), "The Cyclical Behaviour of the Gross Flows of U.S. Workers", Brookings Papers on Economic Activity, 1990 (2), pp. 85-143.
- Bound, J. and A. Krueger (1991), "The Extent of Measurement Error in Longitudinal Earnings Data: Do Two Wrongs Make a Right?", Journal of Labour Economics, 9 (1), pp. 1-24.
- Corak, M. (1992), "Repeat Users of the Unemployment Insurance Program", Statistics Canada: Canadian Economic Observer, January 1992.
- Corak, M. (1994), "Unemployment Insurance, Temporary Layoffs and Recall Expectations", Statistics Canada: Canadian Economic Observer, May 1994.
- Corak, M. and W. Pyper (1995), Workers, Firms and Unemployment Insurance, Statistics Canada: Catalogue 73-505E.
- Davis, S. and J. Haltiwanger (1990), "Gross Job Creation and Destruction: Microeconomic Evidence and Macroeconomic Implications", NBER Macroeconomics Annual, 5, pp. 123-185.
- Davis, S. and J. Haltiwanger (1992), "Gross Job Creation, Gross Job Destruction and Employment Reallocation", Quarterly Journal of Economics, 107 (3), pp. 819-863.
- Feldstein, M. (1976), "Temporary Layoffs in the Theory of Unemployment", Journal of Political Economy, 84 (5), pp. 937-957.
- Greene, W. (1990), Econometric Analysis, New York: Macmillan.
- Hall, R. and E. Lazear (1984), "The Excess Sensitivity of Layoffs and Quits to Demand", Journal of Labour Economics, 2 (2), pp. 233-257.
- Hosmer, D., Jr. and S. Lemeshow (1989), Applied Logistic Regression, New York: John Wiley and Sons.

- Jacobson, L., R. Lalonde and D. Sullivan (1992), "Earnings Losses of Displaced Workers", Federal Reserve Board of Chicago Working Paper No. 92-28.
- Jovanovic, B. (1979), "Job Matching and the Theory of Turnover", Journal of Political Economy, 87 (5) Part 1, pp. 972-990.
- Lin, Z. (1996), "Coverage Exclusion in the Canadian Unemployment Insurance System: Evidence, Determinants and Policy Implications", Statistics Canada: Analytical Studies Branch Research Paper No. 96.
- McLaughlin, K. (1991), "A Theory of Quits and Layoffs with Efficient Turnover", Journal of Political Economy, 99 (1), pp. 1-29.
- Morissette, R. (1993), "Canadian jobs and firm size: do smaller firms pay less?", Canadian Journal of Economics, XXVI (1), pp. 159-74.
- Picot, G. and T. Wannell (1987), "Job Loss and Labour Market Adjustment in the Canadian Economy", Statistics Canada: Analytical Studies Branch Research Paper No. 5.
- Picot, G. and J. Baldwin (1990), "Patterns of Quits and Layoffs in the Canadian Economy", Statistics Canada: Canadian Economic Observer, October and December 1992.
- Picot, G. and W. Pyper (1993), "Permanent Layoffs and Displaced Workers: Cyclical Sensitivity, Concentration and Experience Following the Layoff", Journal of Income Distribution, 3 (2), pp. 181-230.
- Picot, G., G. Lemaître and P. Kuhn (1994), "Labour Markets and Layoffs During the Last Two Recessions", Statistics Canada: Canadian Economic Observer, March 1994.
- Picot, G. and W. Pyper (1994), "Worker Displacement within the Context of a Dynamic Labour Market", paper presented at the Canadian Employment Research Forum Conference on Displaced Workers, Montreal, December 1994.
- Picot, G. and R. Dupuy (1996), "Job Creation by Company Size Class: Concentration and Persistence of Job Gains and Losses in Canadian Companies", Statistics Canada: Analytical Studies Branch Research Paper No. 93.
- Statistics Canada (1992), Worker Turnover in the Canadian Economy: Separations and Hirings, 1978-1989, Catalogue 71-539.