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Firms, Industries, and Unemployment Insurance: An Analysis Using Employer-Employee Data

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ABSTRACT

Firms, Industries, and Unemployment Insurance: An Analysis Using Employer-Employee Data*

Administrative data on the universe of employees, firms, and unemployment insurance (UI) recipients in Canada over an 11 year period are used to examine the operation of UI using the firm as the unit of analysis. Persistent transfers through UI are present at both industry and firm levels, and an analysis using firm fixed effect indicates that an important fraction of variation in them can be attributed to firm effects. Calculations of overall efficiency loss are very sensitive to the degree to which firm level information is used. A full appreciation of how UI interacts with the labour market requires recognition of the characteristics and human resource practices of firms.

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I. Introduction

The exploration of newly available administrative data in a number of countries has led to a growing realization that a careful study of the interaction between employer and employee characteristics is needed to fully understand labour market outcomes. Abowd, Kramarz and Marglois (1999) represent one example of the importance of analysing both the demand and supply side sides of the market. They relate wage determination, inter-industry wage differentials, firm-size wage effects, and human resource management to both firm and individual effects. The authors use large linked administrative data sets from France, but other examples of this sort are to be increasingly found. Research in the United States, Canada, and the Nordic countries, particularly in Denmark, has also underscored this general point (Baldwin 1995, and Haltiwanger *et al*. 1999). The objective of this paper is to adopt this theme by introducing a new focus on the impact and design of social policy and its interaction with the labour market. In light of this literature it may be that many of the consequences of unemployment insurance (UI) attributable to individual behaviour in fact reflect the demand side of the market, or in general there may be a need for greater awareness of the roles of both supply and demand to accurately understand the labour market consequences of UI.

It is certainly the case that the interaction between UI and the labour market has received extensive study in all industrialized countries. But the focus of a great many analyses has been on the supply side of the labour market, in part reflecting the importance of search theory as a framework to guide both the development of data and empirical analysis. Consequently, the impact of UI replacement rates and benefit entitlements on the duration of unemployment spells has been a major concern. For example, Atkinson and Micklewright (1991) offer an extensive survey of this literature, while at the same time stressing the need for a broader perspective on the relationship between UI and labour market transitions. Another literature places the focus on the demand side of the labour market and relies on implicit contract theory to examine the incentives for firms to change their hiring and lay-off decisions. Hamermesh (1993, 1990) offers an overview

of this literature, one that dates back at least to Feldstein (1976). These analyses deal for the most part with the US since it is the only country to have made extensive use of experience rating. Our objective is to adopt this approach and to paint a picture of the Canadian UI program from the perspective of firms and industries.

Indeed, these themes have a particular relevance to the Canadian experience. The Canadian UI program has been a relatively significant aspect of the country's social security system, particularly in the aftermath of an important reform in 1971 that significantly increased coverage and benefits. Lin (1998) offers a legislative overview of the program. This reform in the structure of benefits was to have been accompanied by changes in the financial structure that would introduce experience rated premiums. Kesselman (1983) describes the legislation and how the insurance aspects of the financial reforms were delayed and eventually dropped. The economic analysis of the subsequent history of the program has been framed almost entirely in terms of the labour supply effects—the impact on the aggregate unemployment rate and the duration of benefits. Corak (1994) offers a broad survey of this literature, one that has informed successive incremental restrictions in benefits during the 1970s and 1980s. Major changes in the program were introduced in the 1990s in part by the growing realization that a very significant fraction of claimants have repeatedly relied on the program in a predictable way (Corak 1993a,b, Gray and Sweetman 2001, Lemieux and MacLeod 1995, 2000). In a climate focused on deficit reduction this led to substantial reductions in the benefit rates and entitlements, but also to innovative reforms that introduced a measure of experience rating. Tellingly these were made to the supply side of the labour market. A clawback of benefits to higher income recipients became effective in 1997 with the rate depending upon the individual's claim history. An "intensity" rule was also introduced in which benefit rates would be tied to the number of weeks of benefits collected in the past. The benefit rate would decline by one percentage point for every 20 weeks of benefits collected during the past five years beginning in 2001 (to a maximum of five percentage points for those having collected 100 weeks of benefits). These innovations, however, were retracted in 2001, just before the intensity rule was to take affect.

The evolution of Canadian policy reveals a distinct tendency to evaluate the program solely from the supply side of the labour market. Since this tendency has in part to do with the data available to analysts our objective is to bring a new perspective to bear on the operation of UI by relying on large administrative data sets that link information from firms, workers and individual claimants. We follow the framework in

Anderson and Meyer (1993) and build upon related earlier work by Corak and Pyper (1995a) to document patterns in the flow of UI benefits and taxes and to explain—in an accounting sense—the nature of the resulting cross-subsidies. This falls short of examining the consequences of the lack of experience rating in the structure of premiums, something that is not possible in the Canadian context given the universal nature of the program and the lack of variation in tax rates across firms. Rather our analysis should be thought of as documenting the extent of the subsidies that may induce such changes, or perhaps represent their outcome. We also examine what fraction of the variance in these cross-subsidies are industry-specific, region-specific, and firm specific, and also offer estimates of the extent of the associated deadweight loss.

The analysis is conducted both at the industry and firm levels in order to document the between and within industry patterns of cross-subsidization. It should be noted, however, that cross-subsidization between firms and industries will exist even in a perfectly experience rated UI program at any point in time. Certain firms or industries will suffer adverse shocks that necessitate benefit receipt while others will not: that is the nature of insurance. It is persistence in the pattern of cross-subsidization through time, not its existence at any point in time, that suggests a deviation from insurance principles and illustrates both the incentives for firms to change their behaviour, and the results of such changes. We pay particular attention therefore to longitudinal issues.

Section II describes the data and offers an overview of major developments. Our administrative data covers the universe of employers, workers, and UI recipients from 1986 to 1996. These years span a complete business cycle. Patterns of transfers across broad industry categories and provinces are presented. An analysis at a finer industrial level is offered in Section III and an accounting explanation of the observed patterns offered. This involves decomposing industry level measures of Benefit/Tax ratios into components due to separations (both temporary and permanent), benefit rates, benefit durations, and contributions (which are directly related to earning levels). Section IV presents a firm level analysis and a decomposition of variance, and Section V offers estimates of the efficiency losses due to the observed patterns.

We find that the Canadian UI program redistributes significant moneys between industries and provinces, and that these transfers have been long-standing. This will come as no surprise to many observers. The major flow of funds is from the service industries toward the primary sector and construction, and from Ontario toward the provinces east of it. Industries receive a net positive transfer through UI because of higher than average layoff rates, and lower than average wages (and hence contributions). Large net positive transfers are also associated

with higher than average temporary layoff rates. In addition we find that not only do the same industries receive a positive transfer year in - year out, but so do the same firms. In fact, the transfers imposed through UI are heavily concentrated at the firm level. Only 6.25% of firms consistently receive a net positive transfer in each of eleven years, and while they account for 6.6% of all jobs they are responsible for 28% of all UI benefits paid and contribute only 3.6% of total UI taxes; over 22% of firms never receive a transfer, and they represent 48% of all jobs but account for only 28% of UI benefits and 60% of contributions. Almost three-quarters of UI claims in the "always subsidized" firms are due to above average rates of temporary layoffs suggesting not only that the same small fraction of firms receive subsidies every year, but also that the same workers repeatedly use UI year after year with the same employers. While "always subsidized" firms tend to be concentrated in "always subsidized" industries (particularly in construction), a significant fraction of the firms in most industries are of this sort. That is, in addition to considerable between-industry cross-subsidization, the UI program also entails considerable within-industry cross-subsidization. Analysis of variance indicates that almost 60% of explained variation in persistent cross-subsidies can be attributed to firm effects. Firm effects are much more important than geography or industry. As a consequence estimates of overall efficiency losses are very sensitive to the level of aggregation used. Calculations based upon firm level information are five to fifteen times larger than those using industry and province level information only.

II. Data and an Overview

We use a series of administrative files associated with the Canadian tax system, the UI program, and a longitudinal catalogue of enterprises developed by Statistics Canada. Appendix A offers a detailed description of the source files and the procedures used to create the analytical files. Together these files offer universal coverage of firms, workers, and UI recipients. We create firm level information on the number of employees, UI contributions made (by both the employer and employees), number of UI claims, the amount of UI benefits collected, and the average duration of claims. The basic unit in the analysis is the "firm," which should be taken to mean all private or public sector enterprises that remit tax deductions on behalf of their employees to Revenue Canada. Each reporting unit to Revenue Canada (as the Canada Customs and Revenue Agency was referred to during the period under study) is assigned a payroll deduction account, and this account number is the basis for aggregating to the enterprise level and linking across the various data sets.

Our analysis begins in 1986 because that is the first year in which data files containing the universe of yearly UI claimants is available to us, and ends in 1996 because of a break in the longitudinal consistency of the payroll deduction account numbers in the following year. As it turns out these years represent a complete business cycle beginning with the recovery from the 1981/82 recession and ending with the recovery from the recession of the early 1990s. During 1986 the aggregate unemployment rate was 9.6%, the same rate experienced in 1996 after first falling to 7.5% in 1989 and peaking at 11.4% in 1993. The end year also corresponds to the last year before substantial changes in the structure of the program occurred in 1997. Most notably these involved a change in coverage and eligibility to an hours based scheme (as opposed to the number of weeks worked subject to a minimum number of hours), a clawback of benefits from higher income claimants, and the introduction of the worker experience rating as described above.

In covering the entire population of employers, employees, and UI claimants over an eleven year period our data is much more comprehensive than the US analysis by Anderson and Meyer (1993) and the Canadian by Corak and Pyper (1995a,b) that are precursors to our study. Anderson and Meyer offer an aggregate analysis of 22 states covering about 55 percent of UI-covered employment to establish the degree and persistence in cross-subsidies for major industries (two digit SIC). However, their more disaggregated analysis exploring the underlying causes of these patterns relies on eight states accounting for between 5 and 20 percent of the states' covered workers; their analysis at the firm level is based on just two states using only large employers and about 10 percent of covered workers over a four to six year period. The structure of the data used by Corak and Pyper (1995a) is similar to that used in our work, but more limited in nature. Their aggregate analysis covers the years 1986 to 1990, but because of underlying changes in the way in which industries were coded the more detailed industry and longitudinal firm analysis is restricted only to 1986 to 1988. In addition their analysis falls short of examining the independent role of firms in determining the extent of cross-subsidization.

Table 1 provides an overview of the program's operation between 1986 and 1996 using aggregates derived from our data, expressed in constant 1997 dollars. For the most part the UI program was in deficit during the mid to late 1980s and early 1990s. The deficit was around $1.8 billion in both 1989 and 1990, and was over $2.5 billion in 1991. However, the system turned to surpluses after 1992, recording a peak surplus of $8.2 billion in 1996. During this 11 year period the program collected $17.2 billion in premiums on

average per year, while paying out about $15.2 billions in benefits to 2.5 million claimants. These results are consistent with those in Lin (1998). Basically, the UI balance is quite sensitive to the business cycle, and as mentioned this period covers a complete cycle. While the average annual balance over this period is roughly a $2 billion surplus, the yearly balances are quite different during the recovery and expansion of the early to mid 1990s than they were a decade earlier during the expansion following the 1981/82 recession. Significant surpluses were recorded during the 1990s despite the average unemployment rate being higher than during the mid to late 1980s. Lin (1998) suggests that theses surpluses may be attributed to a number of factors. First, there was a rapid increase in tax revenue after 1991, due to the recovery of the economy but also to increases in premium rates (see Appendix B). Another factor has to do with the declining amount of benefits, most likely associated with legislated reductions in benefit rates and eligibility.[1] A final notable feature of the data in Table 1 is the significant fraction of claims due to temporary separations.[2] On average, half of UI claimants were separated from work temporarily, with a slight rise over the period.

Tables 2 to 4 present information similar to that offered in Corak and Pyper (1995a) but over a longer time horizon. The absolute value of UI transfer (total benefits less taxes) by province and major industry are offered in Table 2. A positive value denotes a net transfer and negative denotes a surcharge.[3] Generally, provinces east of Ontario receive net transfers from the rest of Canada (except British Columbia and the two territories). Ontario alone contributes on average $1.95 billion each year, while Quebec is the largest recipient (about $960 million annually). At the industry level, UI funds were transferred from Services and the Public Sector to Construction: the latter receiving $1.58 billion each year, with the former together contributing $1.79 billion. The largest individual contributor is the Service Sector in Ontario, being surcharged $805 million annually. On the other hand, Construction in Quebec received the largest transfer, an average of $529 million.

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[1] The benefit rate was reduced to 57% from 60% in 1993, and to 55% (60% for low-income claimants) in 1994. In addition, those quitting without just cause were no longer eligible for benefits beginning in 1993.

[2] Our definition of a temporary separation may be more liberal than often used. Individuals are considered to have experienced a temporary separation if they are found to have employment income from the same firm in the tax year after the year of separation. In the extreme this would classify an individual who experienced a separation of almost two years from the same firm as temporary if the separation occurred early in the year and the rehire late in the next year. See Appendix A for more details.

[3] The entries for tables 2 and 3 are calculated using the formula $B_i - T_i(B/T)$, where B_i represents benefits received and T_i taxes paid by a particular industry/province (B and T represent benefits and taxes for Canada as a whole). The industry/province contributions are multiplied by the country wide Benefit/Tax Ratio (B/T) because the UI account was not exactly in balance over the period. In essence, the $1.95 billion annual surplus is allocated to each industry/provinces in proportion to the contributions made. The result represents the excess of benefits over taxes for each industry/province that would prevail if the overall program were in balance. In a similar manner the entries for table 4 are derived as $(B_i/T_i) / (B/T)$.

Table 3 presents these transfers on a per-job basis. The primary sectors receive the greatest per-job transfers: $4,735, $2,005, and $1,336 for Fishing, Forestry, and Construction. The per-job transfers are relatively smaller in the surcharged industries, the largest being $519 in the Public Sector followed by $419 in Transportation and $391 in Finance. With respect to inter-provincial transfers, Newfoundland and Prince Edward Island receive transfers of $1,782 and $1,371 per job respectively. On the other hand, the largest per-job contributor to UI is Ontario at $251. The most notable recipients are those in goods producing industries in Atlantic Provinces. The largest per-job transfer is the Fishing industry in Newfoundland and PEI receiving with about $6,800 annually per job. On the other hand, the Service industries as well as Mining and Manufacturing west of the Ottawa River pay substantial contributions on a per-job basis, the largest being the Public Sector in Ontario at about $766 per job.

The Relative Benefit/Tax ratio (RBT) is presented in Table 4. This is defined as $RBT_i = (B_i / T_i) / (B/T)$, a number greater than one indicating that the industry/province receives a subsidy and a value less than one indicating a surcharge. For example, the RBT should be interpreted as indicating that for every dollar of UI contributions from the Agriculture industry in Newfoundland $10.86 in UI benefits are received, while only 37 cents of benefits are received for every dollar of contribution from the Public Sector in Ontario. The patterns of cross-subsidization presented in Table 4 are consistent with those in Corak and Pyper (1995a) despite their use of a much shorter time horizon. In addition these data also paint the same general picture as those reported by Karagiannis (1986) who documents the patterns of cross-subsidization over the 1975-1982 period. Together these studies suggest that there is a long established and stable pattern of cross-subsidization in the Canadian UI program that is little influenced by the business cycle and extends back at least to the years immediately following the introduction of the 1972 legislative changes.[4]

Details outlining the time series patterns of the RBT by province and industry are provided in an appendix available upon request. In summary, developments in the RBT can be divided into three distinct types at the provincial level. Regardless of the magnitudes, the Atlantic Provinces as well as Quebec display a very similar pattern over time. The ratios are greater than one throughout the period, rising slightly during

[4] A careful reading of these three studies will reveal notable variations in RBT ratios in certain industries (especially in primary sectors) but no change in status between subsidized and surcharged status. Further, some important part of the explanation for these variations has to do with differences in the industry coding (SIC 1970 versus SIC 80). We produced information similar to that presented in tables 1 through 3 for 1997 and this general conclusion would continue to hold using this additional year of data, the first full year in which substantial changes associated with legislation that renamed the program "Employment Insurance" came into effect.

1986-1989, dropping in 1990, then rising (with the exception of Newfoundland) since then. It is not known why there is a drop during 1990 in these regions. This may reflect the temporary suspension of the Variable Entrance Requirement between January and November of that year.[5] In contrast, the RBT in the provinces west of Ontario are below one and generally declining through time. (British Columbia changed status from being subsidized to being surcharged.) Finally, in Ontario the evolution of the RBT is unique, with a value below 0.8 over the entire period representing the largest surcharge. There isn't a simple relationship between provincial variations in the RBT and the business cycle. This is expected because standardizing by the national ratio in RBT formula should remove cyclical effects.

Developments in the RBT by industry are, with a few exceptions, also relatively stable over time. Some industries always receive net transfers, while others always contribute, manufacturing being the sole exception. Cross-subsidization over the entire period is not, therefore, the result of a particularly bad few years requiring extensive readjustment and reliance on UI. Rather, it reflects a structural pattern in which some industries receive a net subsidy year-in and year-out, while others are repeatedly surcharged. In sum, it is something about the way in which employment is structured within provinces or about the way that industries operate that determines the pattern of persistent cross-subsidization embodied in the UI program.

III. Inter-industry Patterns in Detail

An analysis at a finer industrial level allows a closer examination of the underlying causes of these persistent patterns. The results in Table 5 summarize the longitudinal patterns in the RBT for three-digit industries. The RBT is calculated for each of 228 industries defined according to SIC 1980 in each of 11 years. The distribution according to the number of years each industry had an RBT greater than one is concentrated at the two extremes: industries are either "never subsidized" or "always subsidized" over the eleven years under study. Nearly 39% of industries never received a transfer over an 11-year period. The never subsidized industries account for 45% of all jobs, 34% of UI benefits, but contributed 61% of total UI contributions. In

[5] Potential claimants had to accumulate between 10 and 14 insured weeks of employment in order to qualify for UI benefits. The exact number of weeks depended upon the unemployment rate in the applicant's region of residence. This eligibility rule was known as the Variable Entrance Requirement (VER). It was introduced in December 1977, but with the stipulation that it would expire after three years. Each year successive governments passed enabling legislation to prevent it from sun-setting. This was done until 1990 when the government of the day bundled the enabling legislation with a broader legislative package associated with the introduction of the Goods and Services Tax. Passage of this package was delayed in third reading with the result that the VER was suspended and reverted to14 weeks in all regions regardless of economic conditions. This had a disproportionate impact in high unemployment regions, notably many parts of the Atlantic provinces where the entrance requirement had historically been 10 weeks. This was the case from mid February to mid November.

contrast more than 30% of industries received a positive transfer in every year during 1986-1996, accounting for 32% of all employment, but 45% of total UI benefits and only 18.6% of total UI taxes.

We use the same decomposition method as Anderson and Meyer (1993) to develop an understanding of the underlying causes of the RBT in each industry. Equation (1) breaks the RBT into its constituent components.

$$RBT_i = \frac{B_i / T_i}{B / T} = \frac{(n_i d_i b_i)/(t_i w_i)}{(ndb)/(tw)} = (\frac{n_i}{n})(\frac{d_i}{d})(\frac{b_i}{b})(\frac{tw}{t_i w_i}) \quad (1)$$

Where n_i represents the total number of UI claimants in industry i, d_i is the average duration (in weeks) of benefit recipient of these claims, b_i is the average weekly benefit amount, and $t_i w_i$ is the total premium paid by the employers and employees in the industry. Variables without subscripts represent the corresponding country-wide totals. As such an RBT greater than one can be attributed to: (a) an excessive number of claimants; (b) a longer benefit duration; (c) a higher benefit amount; and (d) a lower contribution. Since there is no experience rating in Canadian UI system t/t_i equals one. This implies that the value of the last term is governed by the relative earnings in the industry, (w/w_i). Industries paying relatively lower wages will make relatively lower contributions, resulting in this term being greater than one and implying the industry is subsidized. Likewise industries paying higher than average wages will make relatively more contributions and the last term in equation (1) will be less than one, implying a tendency for the industry to be surcharged.

As an illustration Table 6 shows the decomposition of the RBT ratio by major industry. The numbers in Columns (2) to (5) correspond to the four components of equation (1), their product being the RBT in column (1). In Forestry, Fishing and Construction, all of the terms (with one small exception) contribute to the cross-subsidization of these industries but a higher than average number of claimants is the major factor. The net subsidy in Agriculture is mainly caused by a higher value in Column 5 (meaning a lower tax contribution). For most surcharged industries, lower claim rates and/or higher contribution rates appear to be the leading causes of a lower RBT. In Mining and Manufacturing higher than average wages (and hence contributions) offset higher than average layoff and benefit rates leading both industries to be surcharged. Trade and Services pay a surcharge because lower claim rates dominate and override the fact that wages are lower than average. For the remaining surcharged industries (Transportation, Finance, and the Public Sector) both claim and contribution rates work together to reduce the RBT.

The claim rate can be considered as the sum of two parts: one for temporary separations (n_{ti}/n) and another for permanent separations (n_{pi}/n). These are illustrated in Columns (6) and (7) respectively. In all cross-subsidized industries the claim rate due to temporary separations is greater than that due to permanent separations.

A complete tabulation of this sort for 228 industries defined at the three digit SIC is presented in working paper version of our paper.[6] The minority of industries (100 out of 228) have an RBT ratio greater than one. Of these 84 have a value between 1 and 3, and 16 have a value greater than 3. We calculate covariances of the RBT ratio with each of the components described in equation (1) using these 228 observations. As expected, all covariances have positive signs and they are significantly different from zero, with the exception of the benefit rate. The number of claimants and contribution rates have the highest covariances with the RBT ratio (0.84 and 0.51 respectively). The covariance of RBT and duration is also significant but with a very small magnitude (0.08). With this in mind Table 7 summarizes the information from the 228 industries by cross-classifying subsidized and surcharged industries by their relative claim and contribution rates. A large proportion of subsidized industries (42 out of 100) tend to have both a higher than average separation rate and a lower than average wage rate. This is consistent with the theoretical prediction of an equilibrium under a system without experience rating. Hamermesh (1993) points out that if UI taxes are not tied to expected benefit receipt the program offers a subsidy that presents an incentive for firms to increase layoffs and/or reduce wages. In spite of this, however, a significant proportion of subsidized industries are either low layoff-low wage industries (33 out of 100) or high layoff-high wage industries (25 out of 100). In a similar vein, 76 out of the 128 surcharged industries (or almost 60%) are low layoff-high wage industries, but 28 (22%) are high layoff-high wage industries, and 23 (18%) are low layoff-low wage industries. Only one surcharged industry is classified as high layoff-low wage industry (Platemaking, Typesetting and Bindery with an RBT of 0.97).

In sum, a higher incidence of separation (especially temporary separations) as well as a lower than average wage rate are the major—though not exclusive—reasons for persistent inter-industry subsidies. This is consistent with theoretical predictions of firm behaviour under less than perfectly experience rated UI programs, and resonates with the fact that firms have much more ability to influence wages and layoff

[6] This is available at www.statcan.ca.

decisions than they do the other components in equation (1). In this sense it is not surprising that these two terms are important influences, in an accounting sense, of the RBT. That being said there remains considerable variation in these results even at the three digit industry level and it may therefore be important to model firm level effects directly rather than assume they are simply industry effects writ large.

IV. Firm Level Analysis

This challenge is taken up by examining firm-level patterns in the flow of UI benefits and contributions. Table 8 shows the distribution of firms by the number of years a positive transfer is received during the 11 years under study. The table contains two panels: one based on information for firms in operation for at least one year; another for those in operation all eleven years. There are about 2.2 million firms that operated in at least one of the 11 years under study, and almost 320,000 that operated during all 11 years. The underlying data used to develop the table reveals that these long-lived firms account for 71.4% of all job-years that existed over this period. They are the focus of our analysis for this reason but also because credible implicit contracts between employers and employees are most likely to have evolved in this sector. Of these firms more than one-fifth (22%) never received a subsidy. These "never subsidized" firms represent almost half of total employment, contributed over 60% of total UI taxes but received only about 28% of all benefits. At the other extreme, there is a small fraction of firms (6.25%) that received subsidies every year during this 11-year period. These "always subsidized" firms account for only 6.6% of all jobs, contributed only 3.6% of total UI taxes, but received fully 28% of all benefits. These firms represent less than 1% of all firms that ever existed during this period (see panel B of Table 8), but still account for about one-fifth of all UI benefits paid.

Table 9 provides a closer look at the characteristics of the never- and always-subsidized firms, focusing just on those firms operating in all eleven years. The first row shows the distribution of employees by firm size. More than half (54%) of jobs are in large enterprises (those with more than 500 jobs), while only 11% are with small firms (less than 20 jobs). This distribution is quite different for never- and always-subsidized firms. Mid-size enterprises (with between 20 and 500 jobs) account for 56% of the total in the always-subsidized firms, while nearly four-fifths of all jobs in never-subsidized firms are in large enterprises. The second row of the table presents information on the fraction of claims by type of separation. In never-subsidized firms the proportion of UI claims due to temporary and permanent layoff is about the same (each

accounting for just over 40%), but over 70% of claims in always-subsidized firms are the result of temporary layoffs with only about one-fifth being due to permanent separations. In the context of the work by Corak (1993a,b), Gray and Sweetman (2001), and Lemieux and MacLeod (1995, 2000) on the high degree of repeat UI use at the individual level this suggests that the same workers repeatedly use UI supported by employment with the same employers. The third and fourth rows of the table deal with the distribution of firms both across and within industries. Always-subsidized firms are not necessary concentrated in always-subsidized industries. For example, 24% and 11% of always-subsidized firms belong respectively to Services and Trade. This suggests that significant cross-subsidization also occurs within industries. The final rows of Table 9 displays the distribution across and within provinces, and show, in the first instance, that both Quebec and Ontario consist of a significant portion of always subsidized and never subsidized firms. This reflects the absolute size of these provinces. Almost 38% of always-subsidized firms are located in Quebec, and a further 15% in Ontario; this percentages are almost exactly the same with respect to never-subsidized firms but reversed.

The within-industry distributions suggest that up to 35% of firms in the Forestry sector are always subsidized and about 30% in fishing. In contrast 45% in Finance and about a quarter in Services and Mining are never subsidized. The within-province distributions are different, with 27% of all firms in Newfoundland being always subsidized, and one-fifth in Prince Edward Island and New Brunswick.

More detail on the industrial distribution of always- and never-subsidized firms is presented in Tables 10 and 11. The twenty three-digit SIC industries accounting for the highest proportions of always-subsidized firms is presented in Table 10. These twenty industries account for over 71% of always-subsidized firms. Most of the always-subsidized firms belong to the always-subsidized industries with fully one-third in the construction industries (SIC 420, 401, 412, 456, and 402). However, almost six percent of always-subsidized firms operate in surcharged industries (SIC 601 Food Stores, but notably also SIC 830 local government and SIC 457 public transit). Table 11 presents the twenty industries with the highest proportions of never-subsidized firms. These twenty industries account for 62% of never-subsidized firms. A large fraction of never-subsidized firms (31%) belong to the service industries, while there are no industries in this table associated with the manufacturing and public sectors. Fully half of these industries have an RBT greater than one. Further, six out of the twenty also appear in the first panel of the table among industries with a large

fraction of always-subsidized firms. Cross-subsidization, in other words, exists not only between industries but also within them.

This point is made more clearly in Table 12, albeit at a more aggregated industrial classification. Between-industry cross-subsidization is clearly illustrated in these data. Over 70% of firms in the Forestry and Fishing sectors are either frequent or always subsidized but only 5% in the Financial sector belong to that class. At the same time, however, within-industry cross-subsidization is also apparent. In both Mining and Transportation, 49% of firms never or only occasionally receive positive transfers from UI, while a large percentage (34% and 32% respectively) always or frequently received transfers. Even in the Public sector (a sector with the lowest RBT ratio) almost one-third of enterprises always or frequently account for more benefits than contributions made. This within industry cross-subsidization is sometimes more important than between industry cross-subsidization. For instance, Agriculture is a subsidized industry with an RBT ratio of 3.2, but a third of firms in this industry never received a subsidy and a further one-quarter received a subsidy for only one, two, or three years out of the eleven under study. It is the minority of firms (27%) that lead benefits to be persistently greater than contributions for the industry as a whole. The same story holds, though perhaps not to the same degree, in other cross-subsidized industries. In Construction nine percent of firms never receive a positive net transfer and a further 17 percent receive one for just one to three years. In a similar fashion a significant fraction of firms operating in surcharged industries frequently or always receive a subsidy. In Mining as many firms receive a net transfer in seven or more years out of eleven as do those in three or fewer. A substantial one-quarter to one-third of firms in Manufacturing, Transportation, and the Public Sector also fall into the former category.

In sum these data suggest that the behaviour and characteristics of individual firms may play a significant role in determining both between- and within-industry patterns in the flows of UI funds. It may therefore be informative to explore what fraction of the variance in RBT ratios is industry-specific, firm-specific, or due to other factors. We adopt the approach used in Anderson and Meyer (1993) by estimating the following equation.

$$RBT_{jpt} = \alpha_t + \beta_p + \delta_i + \gamma_j + \varepsilon_{jpt} \qquad (2)$$

The dependent variable is RBT ratio for firm j in province p in year t. This is modeled as a function of a number of fixed effects: α_t captures changes from year to year; β_p and δ_i are province and industry effects

respectively; γ_j captures differences between firms; and ε_{jpt} serves as an error term. Note that the subscript for dependent variable is *jpt* because each firm may have more than one plant located in different provinces in a given year. Province fixed effects are included in the model because assessments of the nature of cross-subsidies through UI are often cast in regional terms. Using Least Squares we estimate a series of models of this sort by successively adding each block of fixed effects, with the change in the adjusted R^2 from the most restrictive to least restrictive versions providing a measure of the relative contribution of province, industry, firm and other factors to the total variance in the RBT ratio. The data cover firms located in the ten provinces. Self-employed firms, those located in one of the territories, as well as those with an unknown industry are excluded from sample.[7]

Table 13 shows the changes in adjusted R^2 by five different specifications from the most restrictive to least restrictive respectively. Column (1) includes only year dummies in the regression and shows no year effect. The impact of business cycle or any other year effect is likely removed by the standardization on the countrywide RBT ratio. In column 2, the province effect significantly increases adjusted R^2 by 10 percentage points showing substantial cross-subsidies between provinces. The next two columns include respectively one-digit and three-digit industry indicators. Adding the one-digit industry dummies (column 3) further increases the adjusted R^2 another 10 percentage points, and an additional 3.6 percentage points when the finer industry categories are used (column 4). The most significant gain in adjusted R^2, however, is found when firm dummies are introduced. The final column shows that adding firm dummies results in a large increase in the adjusted R^2: an additional 35 percentage points to the explained variance, leaving 41% of total variance unexplained. The effect of province and industry may be influenced by the order in which we have introduced the blocks of fixed effects. To assess this we reverse the order by adding industry dummies first then the province dummies. The results are in the second row of the top panel. The between industry effect now has a larger impact with a 13 percentage points increase in adjusted R^2. The size of inter-industry effect is about the same as before but the inclusion of province effect only adds about 6.7 percentage points. Both results suggest that variations in the RBT ratio across firms are much greater than that across industry and province. Among the explained variation in the RBT, 59% can be attributed to firms, about 11 to 17% to province-specific factors, and the remaining 24 to 30% to industry-specific factors.

[7] There were 457 long-lived plants located in the northern territories and 207 with an unknown industry classification.

We also extend the estimation by examining each 1-digit industry as well as each of 10 provinces separately, offering the lower panel of Table 13. Once again there is no year effect, but adding province fixed effects produces quite distinct results across industries. For example, provincial controls increase the explained variation by as much as 25 percentage points in Forestry, but only 2.6 percentage points in Finance. The inter-industry variation (at the 3 digit level) is generally unimportant except in manufacturing, registering a gain of 17 percentage points in the adjusted R^2. Firm effects are still dominant but the impacts are quite different across industries. Adding firm dummies results in an additional 42 percentage-point gain in the explained variance for Agriculture, Transportation and Trade, but only 27 points for Fishing and Finance. These results echo findings from Table 12. Industries that have a high proportion of both subsidized and surcharged firms tend to have more important firm effects.

Similarly, the effects of industry are also different across provinces. Adding 1-digit industry dummies increase the adjusted R^2 by nearly 35 percentage points in New Brunswick, but less than 6 percentage points in Alberta. The within-industry variation is largest in the Atlantic Provinces (especially in Newfoundland), least important in Alberta. Adding firm dummies again results in a significant increase in explained variation for most provinces. It is, however, surprising that industry-specific variation is more important than firm-specific variation in provinces such as PEI and New Brunswick, suggesting heterogeneity among industries rather than firms is significant factor in determining cross-subsidization in these provinces.

The conventional view of high UI cross-subsidization in Canada is often interpreted as the result of geography and an unavoidably large proportion of seasonal employment. However, estimates from these fixed effect models suggest that a substantial proportion of explained variance in RBT ratios is firm-specific. Geography and industry are not as important in determining cross-subsidization once across-firm variations are considered. These results suggest that within-industry cross-subsidization may be a more important source of persistent cross-subsidization. There are a considerable number of firms predictably and persistently receiving subsidies year after year regardless their geographical and industrial conditions.

V. Estimating Efficiency Costs

The economic framework for an analysis of the efficiency costs associated with cross-industry/firm subsidies is well known. The simple static model assumes that there are only two firms (or sectors of identical firms)

and that workers are completely mobile between them. One sector has a stable demand for labour and the other doesn't. If a perfectly experience rated unemployment insurance program is in operation, one in which expected benefits paid are equal to contributions, a competitive labour market leads to an equilibrium allocation of labour at a common wage rate. If UI is not perfectly experience rated the less stable sector receives a subsidy from the stable sector, which reduces its labour costs and shifts its demand for labour so that it increases its size at the expense of stable sector. This transfer results in a misallocation of labour characterized by a welfare or deadweight loss (DWL). For a given sector this can be calculated as ½·ΔW·ΔN. Our data can be used to estimate dollar values of the efficiency loss associated with the Canadian UI program for every year from 1986 to 1996. The DWL can be expressed as a fraction of total payroll:

$$\frac{DWL}{WN} = \frac{1}{2} \cdot \frac{\Delta W \cdot \Delta N}{WN} = \frac{1}{2} \cdot \left(\frac{\Delta N}{N} \cdot \frac{W}{\Delta W}\right) \cdot \left(\frac{\Delta W}{W}\right)^2 = \frac{1}{2} \cdot \eta_{LL} \cdot S^2 \qquad (3)$$

Where η_{LL} is the wage elasticity of demand for labour and S represents the dollar subsidy to an industry over its total payroll. Our analysis is not an attempt to make a definitive estimate of these costs in large part because of the uncertainty in the literature over the true value of the elasticity of labour demand and the appropriate level of aggregation. Rather our calculations are intended to illustrate the sensitivity of the results to these issues. For this reason we calculate DWL for an elasticity of one and invite readers to scale the results according to their reading of this literature.[8] The DWL is estimated at four different levels by deriving the subsidy at the 1-digit SIC, the 1-digit SIC and province, the 3-digit SIC and province, and the firm level. As mentioned by Anderson and Meyer (1993), the first three estimates are likely understatements because they all assume firms in a given industry (and by extension province) have the same subsidy rate. The use of industry aggregates disguises the across-firm variation and would result in a lower estimate of efficiency loss. We are able to assess the significance of this by also calculating the subsidy at the firm level.

The sample used in these derivations includes all firms operating in any year between 1986 and 1996 in the ten provinces. Owner operated firms without paid employees and firms in unknown industries are

[8] Hamermesh (1993) reviews various studies of the estimates of constant-output labour demand elasticity among developed countries from both aggregate and micro economic data. In his summary, the mean estimate of $-\eta_{LL}$ is 0.39 for studies using aggregate data, while the mean value is 0.45 for those using micro-economic data. He suggests that a reasonable range for $-\eta_{LL}$ is probably between 0.15 and 0.75 for the typical firm. However, several studies suggest that Canada has a relatively higher elasticity of labour demand. Appendix C summarizes estimates of labour demand elasticity for Canada. In general, nearly all-Canadian studies produce estimates greater than 0.5. The magnitudes could go as high as 2.6 in Symons and Layard (1984) or 2.24 in Lawrence (1989). Lawrence shows the own price elasticity of labour demand increases from 0.21 in 1962 to 2.24 in 1980. He suggests that the Canadian economy has become more price responsive in recent decades owing to increasing openness in international trade, deregulation, and associated improvements in flexibility.

excluded. An example of the calculation is provided in Table 14 using information on the subsidy at the 1-digit SIC level. Estimates of DWL for other levels are calculated in a similar way with more cells (provinces, 3-digit SIC, or firms) involved. Columns (1) through (3) represent total industry employment, annual payroll, and annual subsidy respectively. Column (4) offers the percent of subsidy over payroll which is labeled *S* in equation (3). The dollar value of the subsidy per employee is given in Column (5). Finally, the DWL is presented in column (6) assuming η_{LL}= 1. This example is based on data for 1986. The primary industries (agriculture, forestry and fishing) have fairly high subsidies over their payroll. For example, in the fishing industry the subsidy amounts to nearly 66% of total payroll, and annual subsidies per worker are as high as $5,321. On the other hand, every worker in transportation as well as in the public sector was paying a $440 surcharge. The total DWL in this example is about $126 million, with almost one-third ($41 million) coming from construction alone, and 24% and 18% from fishing and forestry respectively. In this example the DWL from manufacturing comprises only 2% of the total loss. As mentioned, these calculations likely underestimate the true value because of the assumption that all firms in a given industry in all provinces have the same subsidy rate. Total UI benefits paid in this year accounted for just over $10 billion, orders of magnitude greater that the estimated DWL.

Estimates of the total dollar value of the DWL for the years 1986 to 1996 inclusive is offered in Table 15 for each one-digit industry and using different levels of aggregation in the calculation. The DWL is calculated for each cell and then summed across all cells in each broad industry. The estimates are very sensitive to the level of aggregation used in deriving the subsidy level. When the calculation is based on one-digit industries the total DWL is about $1.75 billion, about one percent of total benefits paid in this period. However, the estimated DWL increases rapidly as finer industry and across-province variations are considered. When across-firm variations are taken into account it reaches a $27.6 billion, about 16.5% of total UI benefits. This is nearly 16 times larger than the estimate based on the one digit SIC, and five times larger than the estimate using the three digit SIC/province variations.

Table 15 also shows that the increases of DWL are not distributed proportionally across industry when a finer level of aggregation is used. The most significant change concerns the role of the manufacturing sector. Manufacturing's share of the total DWL rises from 0.4% ($6.8 million) with one digit SIC information to 21.7% ($6 billion) with firm level information, indicating a good deal of heterogeneity among firms in this

sector. Surprisingly, Services and Trade surpass Construction and are the second and third largest contributors ($4.9 billion and $4.3 billion respectively) to the total DWL when firm level information is used. Construction's share of the total drops from as high as 45% based on one digit SIC to only 14% when across-firm sources of variations are recognized.

Once again it should be stressed that all of these estimates are based on the assumption of the unit labour demand elasticity. As such they are not meant to represent estimates of the actual DWL. If we apply the lower ($\eta_{LL} = 0.5$) and upper ($\eta_{LL} = 2.6$) bounds of elasticity suggested by a survey of the existing literature the total deadweight loss could be as low as $13.8 billion or as high as $71.8 billion. Furthermore, Anderson and Meyer (1993) also note that the true deadweight loss would be even larger if a distinction could be made between the average and marginal subsidy.

VI. Conclusion

The research summarized in this paper uses administrative data on the universe of Canadian firms, workers, and UI claimants to paint a picture of patterns in the use of UI. Firms and industries are the units of analysis. We document patterns in the flow of UI benefits and contributions, and examine their nature.

There are at least four major findings. First, the Canadian UI program—in spite of significant changes in eligibility rules and benefit entitlements and rates since the early 1970s—entails a relatively stable and long-lasting pattern of transfers across industries and provinces. Second, when examined at a finer level these patterns reflect subsidies and surcharges that are concentrated among particular industries. Some industries never receive a net transfer from the program; others always do. To some important degree these patterns reflect greater than average separation rates (particularly temporary separations) and lower than average wages (and hence contributions). In contrast to the other determinants of cross-subsidization—benefit durations and weekly benefit rates—both of these dimensions can be significantly influenced by the firm or reflect the implicit or explicit contract between employers and employees. The third major conclusion deals with the finding that individual firm effects are very important in understanding the variations in Benefit/Tax ratios across and within industries. Our analysis of firm effects focuses on long-lived firms, those operating in all eleven years under study, for two reasons: they represent a significant proportion of economic activity, accounting for over 70% of all jobs; and credible long-term contracts (either implicit or explicit) between

employers and employees are most likely to have evolved among this sector. We find that cross-subsidies occur not only between industries but also within them. Most "always-subsidized" firms belong to "always-subsidized" industries, but many "never subsidized" firms are also part of these same industries. Our fourth major finding refines this point and suggests that while industry and province effects represent 20 to 25% of the total variation in Benefit/Tax ratios, firm effects account for as much as 35%. In addition, the impact of firm effects is very different across industries, accounting for over 40% of explained variation in some industries but as less than 30% in others.

Our work raises two major implications for the economic analysis of the labour market consequences of UI. First, we point out that estimates of the Dead-Weight Loss associated with no experience rating of UI contributions are very sensitive to the level of aggregation. Incorporating firm level information in the calculation of efficiency losses leads to much higher estimates than those based just on industry information. More generally, our findings also suggest that it is important to use perspectives on the interaction between UI and the labour market that recognize the role of the demand side of the market in future analysis and policy making. Implicit contract models might in this sense prove particularly valuable.

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Table 1
Overview of the Canadian UI program from Administrative Data: 1986 to 1996

Year	Number of Firms	Total UI Benefits ($ millions)	Total UI Contributions ($ millions)	Account Balance ($ millions)	Total Jobs ('000s)	Total UI Claims ('000s)	Fraction of Claims due to Temporary Separations	Unemployment Rate
1986	839,832	14,239	13,720	-519	19,211	2,612	0.47	9.6
1987	871,068	13,153	14,351	1,198	20,284	2,449	0.46	8.8
1988	895,058	13,723	15,087	1,364	21,193	2,492	0.46	7.8
1989	915,217	14,762	13,016	-1,746	21,746	2,578	0.47	7.5
1990	925,314	17,011	15,188	-1,823	21,308	2,767	0.48	8.1
1991	915,244	19,111	16,572	-2,539	20,165	2,780	0.50	10.3
1992	915,008	20,289	19,868	-421	19,271	2,913	0.51	11.2
1993	918,720	17,309	19,879	2,570	18,976	2,614	0.52	11.4
1994	926,873	12,821	20,947	8,126	19,460	2,315	0.52	10.4
1995	932,169	13,194	20,812	7,618	19,656	2,430	0.50	9.4
1996	935,029	11,445	19,636	8,191	19,647	2,323	0.53	9.6
Average		15,187	17,189	2,002	20,083	2,572	0.49	9.5

All dollar figures are expressed in constant 1997 dollars.
Derivations by the authors using Statistics Canada Administrative Data.
The unemployment rate is obtained from the Labour Force Survey.

Table 2
UI Income Transfers Across Industries and Provinces: Annual Averages, 1986-1996
(UI Benefits less UI Taxes expressed in millions of 1997 dollars)

	Nfld	PEI	NS	NB	Quebec	Ontario	Man	Sask	Alberta	BC	NWT	Yukon	Outside Canada	Canada
Agriculture	6.89	14.77	12.10	18.48	66.11	26.65	6.10	12.58	2.38	53.41	0.05	0.07	-0.02	218.67
Forestry	22.94	2.25	19.44	42.79	106.52	7.89	1.05	3.07	4.00	63.42	0.45	0.09	0.01	273.37
Fishing	19.58	13.90	26.25	33.44	9.45	2.98	1.17	0.07	-0.03	5.76	0.09	0.01	0.00	113.43
Mining	2.51	0.23	-0.57	5.56	15.32	-20.13	-1.40	-3.88	-31.42	0.05	1.42	3.22	-0.07	-28.93
Manufacturing	178.00	26.64	64.75	95.05	134.36	-519.31	-20.81	-10.38	-36.87	-8.04	0.29	0.23	-0.85	-96.95
Construction	96.66	18.16	82.75	104.80	528.90	389.97	43.02	36.97	111.79	151.22	6.71	4.19	0.13	1,575.26
Transportation	15.58	3.45	-2.63	5.83	-94.83	-286.14	-32.57	-25.32	-46.52	-77.04	1.78	0.06	-0.27	-538.63
Trade	62.92	14.85	37.16	35.01	122.73	-288.44	-20.93	-18.28	-61.18	-36.47	0.62	0.94	-0.02	-151.08
Finance	2.68	0.40	-5.95	-0.86	-68.95	-268.72	-17.13	-13.25	-32.77	-51.26	0.20	0.00	-0.10	-455.70
Service	92.05	12.50	18.62	48.49	16.20	-804.79	-57.23	-45.24	-115.15	-105.14	3.33	3.69	-0.75	-933.41
Public admin	27.50	10.93	-36.98	-11.36	-136.66	-404.41	-41.05	-23.46	-121.94	-104.58	-1.99	0.16	-14.37	-858.23
Total	597.24	129.72	261.43	416.97	958.78	-1,950.77	-115.05	-69.55	-260.74	19.33	15.25	14.32	-16.93	

Table entries are $B_i - T_i(B/T)$, where B_i represents total UI benefits received in sector i, T_i total contributions made and unsubscripted totals are for the entire country. Unclassified industries are included in the Total

Table 3
UI Income Transfer per Job: By Industry and Province, Annual Average (1986 -1996)
(UI Benefits less UI Taxes divided by number of Jobs, expressed in millions of 1997 dollars)

	Nfld	PEI	NS	NB	Quebec	Ontario	Man	Sask.	Alberta	BC	NWT	Yukon	Canada
Agriculture	2,863	2,206	1,029	2,068	1,218	239	396	532	78	1,237	535	2,200	710
Forestry	5,422	4,645	2,653	4,953	3,202	544	1,166	1,480	701	1,092	1,749	1,053	2,005
Fishing	6,849	6,828	5,329	6,503	5,210	1,547	3,233	1,131	-279	1,339	713	972	4,735
Mining	535	2,395	-31	957	463	-425	-272	-263	-289	9	412	1,860	-111
Manufacturing	3,979	2,596	897	1,357	160	-384	-235	-257	-199	-25	241	566	-33
Construction	3,963	2,688	2,173	2,776	2,094	989	1226	1007	733	888	1,167	1,965	1,336
Transportation	767	610	-81	196	-312	-605	-538	-512	-386	-413	352	34	-419
Trade	1,102	996	352	430	138	-208	-164	-171	-169	-77	111	257	-42
Finance	237	123	-229	-51	-252	-521	-421	-396	-328	-357	77	48	-391
Service	899	424	97	385	9	-282	-212	-199	-145	-101	242	484	-126
Public admin	455	763	-417	-124	-390	-766	-486	-368	-681	-692	-97	24	-519
Total	1,782	1,371	438	860	197	-251	-158	-116	-127	13	239	498	

Table 4
Relative Benefit - Tax Ratios: By Industry and Province, Annual Average (1986 -1996)

	Nfld	PEI	NS	NB	Quebec	Ontario	Man	Sask	Alberta	BC	NWT	Yukon	Outside Canada	Canada
Agriculture	10.86	10.01	4.87	8.63	4.69	1.73	2.16	2.99	1.22	4.74	3.37	8.67	0.20	3.18
Forestry	16.35	18.29	8.49	13.45	9.05	1.85	4.39	4.62	2.89	2.93	7.4	5.55	0.77	5.06
Fishing	25.54	27.42	21.35	22.15	17.99	3.31	16.09	7.67	0.69	4.68	6.4	4.34	0.61	14.76
Mining	1.35	7.32	1.02	1.79	1.36	0.68	0.78	0.76	0.74	0.98	1.38	3.58	1.5	0.90
Manufacturing	7.75	5.59	2.07	2.7	1.16	0.64	0.75	0.72	0.78	0.98	1.29	1.82	0.39	0.95
Construction	9.36	6.2	5.13	7.06	4.7	2.45	3.15	3.02	2.38	2.71	3.85	5.18	2.3	3.29
Transportation	1.8	1.75	0.93	1.19	0.72	0.46	0.54	0.52	0.59	0.6	1.47	1.02	0.29	0.61
Trade	3.28	3.09	1.65	1.82	1.24	0.65	0.71	0.69	0.71	0.88	1.27	1.47	2.52	0.92
Finance	1.32	1.17	0.74	0.94	0.73	0.42	0.48	0.51	0.59	0.6	1.13	1.09	0.37	0.56
Service	2.57	1.87	1.17	1.82	1.02	0.57	0.65	0.66	0.74	0.84	1.49	2.32	0.47	0.80
Public admin	1.49	1.85	0.63	0.9	0.64	0.37	0.55	0.65	0.45	0.44	0.89	1.04	0.28	0.55
All Industries	3.74	3.44	1.62	2.27	1.27	0.68	0.79	0.83	0.82	1.02	1.38	1.74	0.32	

Table 5
Longitudinal UI Status of Industries, 1986-1996

Number of Years in which RBT >1	Number of Industries	Proportion of All Industries	Proportion of All Jobs	Proportion of All UI Benefits	Proportion of All Taxes Paid
0	88	38.6	45.0	34.0	61.2
1	12	5.3	1.9	1.9	2.5
2	9	3.9	3.5	3.2	3.2
3	6	2.6	3.2	3.5	3.6
4	9	3.9	4.1	3.1	3.1
5	5	2.2	1.6	1.2	1.2
6	7	3.1	2.7	2.2	2.1
7	5	2.2	1.7	2.0	1.7
8	9	3.9	1.6	1.1	0.9
9	2	0.9	1.4	1.2	1.0
10	7	3.1	1.1	1.5	1.0
11	69	30.3	32.3	45.0	18.6
Total	228	100	100	100	100

Table 6
Causes of Cross-Subsidization by Major Industry, 1986-1996

	RBT Ratio	Relative Number of Claims (n_i/n)	Relative Duration of Benefits (d_i/d)	Relative Benefit Rate (b_i/b)	Relative Taxes Paid (tw/t_iw_i)	Contribution of Separations	
						Temporary (n_{ti}/n)	Permanent (n_{pi}/n)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Agriculture	3.18	1.413	1.113	0.876	2.316	0.800	0.613
Forestry	5.06	2.335	1.107	1.297	1.513	1.412	0.923
Fishing	14.76	4.055	1.302	1.273	2.195	2.002	2.053
Mining	0.90	1.150	0.896	1.335	0.652	0.679	0.471
Manufacturing	0.95	1.342	0.895	1.063	0.748	0.791	0.552
Construction	3.29	1.967	0.989	1.283	1.315	1.079	0.888
Transportation	0.61	0.831	0.944	1.113	0.701	0.492	0.339
Trade	0.92	0.785	1.074	0.855	1.281	0.289	0.497
Finance	0.56	0.593	1.107	0.992	0.859	0.254	0.339
Service	0.80	0.760	1.002	0.864	1.219	0.384	0.376
Public admin	0.55	0.734	1.046	1.058	0.671	0.483	0.251

Table 7
Distribution of Cross-Subsidization by Relative Separation Rate and Relative Contributions (1986-1996)

	High Lay-off Industries $(n_i/n) > 1$	Low Lay-off Industries $(n_i/n) < 1$
NET UI RECIPIENTS (RBT>1)		
High Wage Industries (tw/twi) < 1	25	0
Low Wage Industries (tw/twi) > 1	42	33
NET UI CONTRIBUTORS (RBT<1)		
High Wage Industries (tw/twi) < 1	28	76
Low Wage Industries (tw/twi) > 1	1	23

Total Industries: 228

Table 8
Longitudinal UI Status of Firms: 1986-1996

Number of Years Cross-Subsidized (RBT>1)	Number of Firms	Percent of Firms	Percent of Jobs	Percent of UI Benefits Paid	Percent of UI Taxes Paid
A. Firms in Operation in all Eleven Years					
0	70,275	22.1	48.1	28.4	60.3
1	42,645	13.4	10.4	6.8	10.8
2	37,016	11.6	6.7	5.0	6.2
3	31,730	9.97	5.2	4.2	4.3
4	26,118	8.21	4.6	4.0	3.6
5	21,292	6.69	4.0	3.9	2.9
6	17,458	5.49	3.1	3.2	2.0
7	14,621	4.59	3.0	3.3	1.7
8	12,595	3.96	2.9	3.9	1.8
9	11,725	3.68	2.5	3.7	1.4
10	12,853	4.04	2.9	5.7	1.5
11	19,889	6.25	6.6	27.9	3.6
Total	318,217	100	100	100	100
B. Firms in Operation for at least One Year					
0	1,087,890	48.9	41.2	21	54.9
1	484,653	21.8	12.6	9.1	12.0
2	225,297	10.1	9.2	8.0	7.7
3	135,522	6.1	7.1	7.1	5.5
4	87,409	3.9	5.9	6.5	4.4
5	59,143	2.7	4.8	6.0	3.5
6	41,319	1.9	3.7	4.9	2.4
7	30,164	1.4	3.2	4.6	2.0
8	22,568	1.0	2.9	4.6	1.9
9	17,650	0.8	2.3	4.3	1.4
10	15,585	0.7	2.4	5.0	1.4
11	19,889	0.9	4.7	19.1	2.9
Total	2,227,089	100	100	100	100

Table 9
Characteristics of Always Subsidized and Never Subsidized Firms, Annual Average

	All firms	Always subsidized firms	Never subsidized firms
1. Distribution of Employees by Firm Size			
less than 19	11.0	11.3	3.2
20 to 99	16.8	27.4	5.0
100 to 499	18.4	28.4	12.7
500 or more	53.8	32.9	79.7
2. Distribution of UI Claims by Reason for Separation			
Temporary	0.478	0.715	0.432
Permanent	0.370	0.211	0.404
Unknown	0.152	0.074	0.164
3. Distribution Across Industries (top three)			
	Services (36.5)	Construction (30.7)	Services (41.4)
	Trade (23.2)	Services (23.8)	Trade (19.1)
	Construction (10.8)	Trade (10.7)	Finance (14.1)
4. Distribution Within Industries (top three)			
		Forestry (34.7)	Finance (45.4)
		Fishing (29.0)	Services (26.1)
		Construction (17.6)	Mining (24.1)
5. Distribution Across Provinces (top three)			
	Ontario (33.1)	Quebec (37.8)	Ontario (38.5)
	Quebec (23.5)	Ontario (15.0)	Quebec (14.7)
	British Columbia (13.2)	New Brunswick (9.7)	Alberta (14.6)
6. Distribution Within Provinces (top three)			
		Newfoundland (27.3)	Saskatchewan (31.7)
		Prince Edward Island (21.4)	Alberta (30.6)
		New Brunswick (19.5)	Manitoba (27.4)

Derivations are based on the subset of firms in operation in all eleven years between 1986 and 1996.

Table 10
Distribution of Always Subsidized Firms by 3-digit Industry (the highest 20 industries)

Sic-80	Industry	RBT Ratio	Number of Firms	Percent of Always Subsidized Firms
420	Trade Contracting Industries	3.21	3,910	19.7
010	Agricultural Industries	4.21	1,384	7.0
401	Residential Building & Development	3.82	944	4.8
041	Logging Industry	5.10	816	4.1
412	Highway And Heavy Construction	3.94	777	3.9
965	Sports And Recreation Clubs Service	2.54	719	3.6
921	Food Services	1.39	692	3.5
456	Truck Transport Industries	1.38	649	3.3
911	Hotels Motels And Tourist Courts	1.37	626	3.2
031	Fishing Industries	17.08	498	2.5
601	Food Stores	0.92	418	2.1
690	Other Retail Store And Non-store Retail Industries	1.20	399	2.0
830	Local Government Services	0.52	400	2.0
910	Accommodation Service Excluding Motels, Hotels	4.74	390	2.0
457	Public Passenger Transit System Industries	0.63	321	1.6
402	Non-Residential Building & Development	3.21	284	1.4
990	M&E Rental ,Other Repair, Other Service	1.81	249	1.3
960	Commercial Spectator, Sport & Recreation	1.03	234	1.2
995	Services To Buildings And Dwellings	1.92	215	1.1
102	Fish Products Industry	13.23	213	1.1
Total			14,138	71.1

Table 11
Distribution of Never Subsidized Firms by 3-digit Industry (the highest 20 industries)

Sic-80	Industry	RBT Ratio	Number of Firms	Percent of Never Subsidized Firms
865	Office of Physicians, Surgeons and Dentists	0.77	6,255	8.9
981	Religious Organizations	0.53	5,797	8.25
010	Agricultural Industries	4.21	5,097	7.25
720	Investment Intermediary Industries	0.94	3,468	4.93
750	Real Estate Operator, Insurance Industries	0.96	3,162	4.5
761	Insurance And Real Estate Agencies	0.56	2,188	3.11
690	Other Retail Store And Non-store Retail	1.20	1,910	2.72
420	Trade Contracting Industries	3.10	1,888	2.69
777	Management Consulting Services	1.01	1,493	2.12
456	Truck Transport Industries	1.38	1,461	2.08
980	Membership Org Industries, Excl Religious	1.10	1,336	1.9
775	Architectural, Engineering And Other Scientific	0.90	1,324	1.88
974	Private Households	1.86	1,203	1.71
776	Offices Of Lawyers And Notaries	0.68	1,166	1.66
601	Food Stores	0.92	1,082	1.54
990	M&E Rental, Other Repair, Other Service	1.81	1,044	1.49
773	Accounting And Bookkeeping Services	1.02	1,030	1.47
590	Other Products Industries, Wholesale	0.97	1,014	1.44
779	Other Business Services	0.95	969	1.38
635	Motor Vehicle Repair Shops	1.42	919	1.31
Total			43,806	62.33

Table 12
Within Industry Distribution of Firms by UI Status: For firms in operation in each year from 1986 to 1996

Industry (One Digit SIC 80)	Never Subsidized	Occasionally Subsidized	Sometimes Subsidized	Frequently Subsidized	Always Subsidized	Total
Agriculture	6,798	5,662	3,112	3,822	1,995	21,389
	(32.0)	(26.0)	(15.0)	(18.0)	(9.0)	
Forestry	155	262	336	1,009	913	2,675
	(6.0)	(10.0)	(13.0)	(38.0)	(34.0)	
Fishing and Trapping	138	116	194	822	516	1,786
	(8.0)	(6.0)	(11.0)	(46.0)	(29.0)	
Mining	447	493	312	432	239	1,923
	(23.0)	(26.0)	(16.0)	(22.0)	(12.0)	
Manufacturing	3,050	8,915	6,616	4,653	1,484	24,718
	(12.0)	(36.0)	(27.0)	(19.0)	(6.0)	
Construction	3,304	6,140	7,695	12,734	6,035	35,908
	(9.0)	(17.0)	(21.0)	(35.0)	(17.0)	
Transportation	2,512	3,447	2,340	2,699	1,220	12,218
	(21.0)	(28.0)	(19.0)	(22.0)	(10.0)	
Trade	12,498	30,574	17,365	9,359	2,159	71,955
	(17.0)	(42.0)	(24.0)	(13.0)	(3.0)	
Finance	9,966	8,654	2,728	944	153	22,445
	(44.0)	(39.0)	(12.0)	(4.0)	(1.0)	
Business & Per. Service	30,311	45,844	23,336	14,338	4,750	118,579
	(26.0)	(39.0)	(20.0)	(12.0)	(4.0)	
Public Administration	964	1,238	814	957	413	4,386
	(22.0)	(28.0)	(19.0)	(22.0)	(9.0)	
Total	70,275	111,391	64,868	51,794	19,889	318,217

Never subsidized is based on RBT never > 1 ; Occasionally Subsidized is defined as RBT > 1 for 1 to 3 years; Sometimes Subsidized is defined as RBT > 1 for 4 to 6 years; Frequently Subsidized is defined as RBT >1 for 7 to 10 years; and Always Subsidized is defined as RBT >1 for all 11 years.

Numbers in ( ) are row percentages.

Table 13
Analysis of Variance in Relative Benefit-Tax Ratios: Long-Lived Plants, 1986-1996

Dependent variable: RBT ratio for firm *j* in year *t* and province *p*

Specifications	Adjusted R^2				
	(1) Year	(2) (1) + Province	(3) (2) + 1 digit SIC	(4) (3) + 3 digit SIC	(5) (4) + Firms
All	0.0005	0.1027	0.2071	0.2435	0.5888
All*	0.0005	0.1316	0.1766	0.2435	0.5888
By 1- digit industry					
Agriculture	0.0042	0.1516	-	0.1737	0.6024
Forestry	0.0049	0.2457	-	0.2466	0.5910
Fishing/Trapping	0.0790	0.1777	-	0.1810	0.4472
Mining	0.0072	0.2055	-	0.2490	0.5836
Manufacturing	0.0004	0.1043	-	0.2709	0.5888
Construction	0.0080	0.1612	-	0.1657	0.4785
Transportation	0.0009	0.1247	-	0.1488	0.5696
Trade	0.0006	0.0872	-	0.1036	0.5190
Finance	0.0003	0.0257	-	0.0388	0.3161
Service	0.0010	0.0678	-	0.1462	0.5140
Public Administration	0.0023	0.1476	-	0.1479	0.5239
By province					
Newfoundland	0.0046	-	0.0817	0.2191	0.6388
PEI	0.0082	-	0.2463	0.3186	0.5813
Nova Scotia	0.0026	-	0.2038	0.2974	0.6545
New Brunswick	0.0082	-	0.3455	0.4014	0.6959
Quebec	0.0014	-	0.1022	0.1580	0.5494
Ontario	0.0052	-	0.0843	0.1237	0.3855
Manitoba	0.0024	-	0.1217	0.1630	0.4333
Saskatchewan	0.0039	-	0.1249	0.1670	0.4573
Alberta	0.0056	-	0.0555	0.0809	0.2801
BC	0.0067	-	0.0853	0.1374	0.4149

Note: There are 1058 firms drop because of location outside 10 provinces, and further 4920 are drop due to a known industry. The resulting sample for long-lived firm is 2,907,757.
* The adjusted-R^2 with reverse regression order for SIC and province variables. Here 1-digit SIC is added after year effect in (2), then 3-digit SIC in (3) and province effect in (4).

Table 14
Example of Estimating Deadweight Loss from Labour Misallocation (1986) – account for subsidy on 1 digit SIC level (excluded self-employment firms)

(Expressed in 1997 dollars)

Industry (one digit SIC 80)	Employment (1) ('000s)	Annual Payroll (2) ($ '000s)	Annual Subsidy (3) ($ '000s)	% subsidy over payroll (4)	$ value of subsidy per employee (5)	$ value of Deadweight loss (6) ($'000s)
Agriculture	294	2,124,633	250,583	11.79	852.69	14,777
Forestry	125	1,615,523	267,584	16.56	2,149.01	22,160
Fishing	18	142,500	93,518	65.63	5,320.80	30,687
Mining	277	9,224,763	89,826	0.97	324.42	437
Manufacturing	3,077	70,985,163	-200,478	-0.28	-65.15	283
Construction	1,115	16,726,608	1,173,121	7.01	1,051.97	41,138
Transportation	1,201	33,106,311	-527,324	-1.59	-439.13	4,200
Trade	3,356	47,163,421	-149,713	-0.32	-44.61	238
Finance	1,167	25,157,384	-402,524	-1.6	-344.94	3,220
Service	6,609	87,912,063	-630,242	-0.72	-95.36	2,259
Public admin.	1,654	40,905,769	-727,505	-1.78	-439.81	6,469
Total	18,892	335,064,138	-763,155			125,869

Column (1) - (3) are derived directly from BNOP files. Column (1) represents the number of T4s issued.
Column (4)=[(3)/(2)]*100
Column (5)=(3)/(1)
Column (6)= ½ *(column 4)^2 *η_{LL} *(2) assuming η_{LL}=1

Table 15
Variations in Estimates of Deadweight Loss by level of Aggregation (1986-1996)

Industry (one digit SIC-80)	Level of Aggregation upon which calculation of subsidies is based			
	1 digit SIC	1 digit SIC within province	3 digit SIC within province	Firm level
	(thousands of dollars)			
Agriculture	116,276	220,473	296,288	1,239,740
Forestry	228,773	547,112	564,925	1,260,322
Fishing	361,982	578,376	596,200	2,301,065
Mining	1,602	12,191	64,439	222,002
Manufacturing	6,761	454,164	1,744,463	5,982,893
Construction	786,193	1,158,460	1,228,539	3,917,573
Transportation	49,382	65,934	173,516	2,025,111
Trade	2,817	98,473	272,808	4,306,576
Finance	44,107	49,364	70,112	397,981
Service	50,593	166,092	685,773	4,937,575
Public admin.	100,827	132,320	146,862	976,109
Total	1,749,313	3,482,958	5,843,925	27,566,949
% of total UI Benefits	1.05	2.08	3.50	16.5

Expressed in thousands of 1997 dollars.

Appendix A
Data Development

The analysis is based upon a number of administrative data sets. These include the Benefits and Overpayments (BNOP) file, T4 information, and data from the Longitudinal Employment Analysis Program (LEAP). The BNOP contains information on all UI claims initiated in a given year. Data from 1986 through 1996 is used to derive the total number of claims, the total amount of benefits paid, and the average duration of benefit receipt for the workers of each firm. Each BNOP record contains a Payroll Deduction Account Number associated with a particular firm. These account numbers are established and used by Revenue Canada for tax remittance purposes. A firm may have several account numbers. These are all aggregated up to the firm level using the information in LEAP, a longitudinally consistent catalogue of all firms operating in Canada. (See Statistics Canada (1988) for a detailed description of this file.) A firm is defined according to the Longitudinal Business Register Identifier as used in LEAP. The categorization of a claim as being due to a temporary or a permanent separation is also done in the manner of Statistics Canada (1992). A temporary separation is said to have occurred if the individual had any employment earnings from the same firm in the year following the separation. This is determined by whether or not the firm has issued a T4 indicating some earnings for that individual. If an individual initiates more than one UI claim in a given year the firm information on each record in the BNOP is used to determine if the claims were supported with employment from the same firm and the first claim is categorized directly as resulting from a temporary or permanent separation.

The T4 is also the source of information on the amount of UI contributions made. T4s are issued by firms to all paid employees, and used for tax purposes. They also have a payroll deduction account number and these are aggregated to the firm level using the LEAP in the same manner as the BNOP information. Total contributions by the workers of a firm are summed from the T4 file, and employer contributions are derived by marking these up by 1.4, reflecting the legislated employer contribution rate. No adjustments are made for contribution reductions to those firms participating in a wage loss reduction plan. The error introduced by this is small. UI contributions of self-employed fishermen are not available in the T4. As such this group is not included in any of the tabulations. The number of T4s issued is used as an indication of the number of jobs in each firm or industry over the course of a given year. While there are a small number of cases in which employers issue more than one T4 per job to their paid employees, equating a T4 with a job does not entail too much of an error. (The exception to this is the fishing industry which is dominated by self-employed fishermen. It is not uncommon for these individuals to receive 2 or 3 T4Fs in a single calendar year).

The structure the Payroll Deduction Account Numbers changed in 1997 with the result that a longitudinally consistent labeling of firms beyond this year is not possible.

Appendix B
UI Contribution Rates and Maximum Insurable Earnings, 1986-2001

Year	Contribution Rate		Maximum Annual Insurable Earnings	Maximum Annual Contribution
	Employer	Employee		
1986	$3.29	$2.35	$25,740	$1,452
1987	$3.29	$2.35	$27,560	$1,555
1988	$3.29	$2.35	$29,380	$1,657
1989	$2.73	$1.95	$31,460	$1,473
1990	$3.15	$2.25	$33,280	$1,797
1991	$3.15 ($3.92)	$2.25 ($2.8)	$35,360	$1,910 ($2,377)
1992	$4.20	$3.00	$36,920	$2,659
1993	$4.20	$3.00	$38,740	$2,790
1994	$4.30	$3.07	$40,560	$2,990
1995	$4.20	$3.00	$42,380	$3,052
1996	$4.13	$2.95	$39,000	$2,762
1997	$4.06	$2.90	$39,000	$2,714
1998	$3.78	$2.70	$39,000	$2,527
1990	$3.57	$2.55	$39,000	$2,387
2000	$3.36	$2.40	$39,000	$2,246
2001	$3.15	$2.25	$39,000	$2,107

Note: The rates indicated by ( ) became effective part-way through 1991.

Appendix C
Selected Studies on the Estimates of Labour Demand elasticity for Canada

Study	Category	Description	Elasticity ($-\eta_{LL}$)
Homogeneous labor			
Pindyck (1979)	Constant-output demand elasticity	Aggregate on large industries, annual 1963-1973, translog cost function	0.66
Symons and Layard (1984)	Varying-output demand elasticity	Manufacturing employment, quarterly 1956-1980	2.6
Halvorsen and Smith (1986)	Constant-output demand elasticity	Aggregate on small industry (Metal mining), annual 1954-1974, translog cost function	0.51
Lawrence (1989)		Aggregate import and export industries, 1962-1980, flexible functional form	0.21 to 2.24
Wylie (1990)	Constant-output demand elasticity	Aggregate on small industry (four 2-digit manufacturing), annual 1900-1929, translog cost function	0.51
Card (1990c)	Constant-output demand elasticity	Aggregate on firm level (union contracts), 1968-1983	0.62
Currie (1991)	Constant-output demand elasticity	Aggregate on firm level (Ontario's teachers' contracts), 1975-1983,	0.53 to 0.68
Christofides and Oswald (1991)	Constant-output demand elasticity	Aggregate on firm level (union contracts), 1978-1984	< 0 to 0.22
Heterogeneous Labor			
Merrilees (1982)		Aggregate, annual 1957-1978, 4 labor types Young man Young women Adult men Adult women	 -0.56 0.44 0.07 -0.11
Ferguson (1986)		Atlantic provinces, 1966-1979, 7 labor types	0.33 to 1.00

Source: Hamermesh (1993) chapter 3.

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