# Canadian City Unemployment Rates and the Impact of Economic Diversity

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The difference in unemployment rates between countries, provinces, states, regions, or cities, is an issue that has puzzled regional scientists for several decades, and continues to do so. While a considerable amount of work has been done at the country[1] and province/state/region[2] level, the analysis at the city level is much less developed. This paper will focus on city unemployment rates, with special emphasis on the role of economic diversity, in order to add to the general understanding of variations in the level of unemployment across Canada.

Some of the difficulties in explaining unemployment rate variations across Canadian provinces stem from data aggregation. While few regional scientists would expect urban and rural unemployment rates to be the same, little has been done to incorporate this into models attempting to explain inter province differences. In fact, as indicated in Table 1, there are large differences between rural and urban unemployment rates within, and across, provinces. Since different regions have different proportions of their citizens living in cities and these cities have different characteristics, understanding why unemployment rates differ between cities will add to our overall understanding of provincial/state/country unemployment rate variations.

1. See Bean (1994).
2. See Johnson and Kneebone (1993), Myatt (1992), or Hyclak and Johnes (1989).

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**TABLE 1 Unemployment Rates within Canada 1991**

| | Provincial | Urban | Rural | Urbanization |
|---|---|---|---|---|
| Newfoundland | 27.8 | 20.5 | 37.3 | 53.6% |
| Prince Edward Island | 13.5 | 12.7 | 14.0 | 39.9% |
| Nova Scotia | 12.7 | 11.8 | 13.8 | 53.5% |
| New Brunswick | 15.4 | 12.3 | 18.3 | 47.7% |
| Quebec | 12.1 | 11.7 | 13.6 | 77.6% |
| Ontario | 8.5 | 8.8 | 7.2 | 81.8% |
| Manitoba | 8.1 | 8.6 | 6.9 | 72.1% |
| Saskatchewan | 7.1 | 8.0 | 5.5 | 63.0% |
| Alberta | 7.8 | 8.2 | 6.1 | 79.8% |
| British Columbia | 10.3 | 9.9 | 11.8 | 80.4% |
| National Average | 10.2 | 9.9 | 11.2 | 76.6% |

Source: Census 1991

## The Background and the Theory

The early work, with regards to urban unemployment rates, centred on an observed negative relationship between city size and city unemployment rates (Vipond 1974; Sirmans 1977). During this same period the relationship between city size and economic diversity was also being investigated (Clemente and Sturgis 1971; Brewer and Moomaw 1985). The initial melding of these two streams of literature concentrated more on city employment stability than unemployment rates (Barth et al 1975; Brewer and Moomaw 1985). Only recently has the issue of diversity been analysed with regard to its impact on unemployment rates (Malizia and Ke 1993). This paper will add to the unemployment rate literature with the use of two Canadian pooled data sets.

Economics diversity is hypothesised to impact unemployment rates by affecting the duration of structural unemployment. Two assumptions are used in order to generate this unemployment: downward wage rigidity; and a rigidity in labour mobility between cities. The possible causes of wage rigidity are well known in the labour literature (Benjamin et al 1998). Labours' lack of mobility may be due to social/financial/ or uncertainty concerns which arise when relocating one's family. Generally speaking the longer it takes for wages and labour to adjust, the longer will be the expected duration of unemployment.

In order to determine the effect of industrial diversification on the duration of structural unemployment let us assume that a negative demand shock hits a particular industry. The more industrially diversified the city, the smaller will be the proportion of workers affected by the shock. Workers which are affected will begin to look for employment in different industries and if there are only a small number of workers they may all be employed in the other sectors relatively easily (perhaps in unfilled vacancies or in other sectors which experience positive demand shocks). Cities which have only a few sectors will find a large proportion

of their citizens unemployed and these workers will not all be able to find employment easily. While it is true that cities with a small number of industries are less likely to have the industry which is being affected negatively, it is the duration of the unemployment which causes the variation in unemployment rates. On average the same number of individuals will become unemployed in different cities but less industrially diverse cities will have longer unemployment spells and therefore larger unemployment rates. Therefore one would expect the duration of unemployment to be greater when cities are less industrially diverse as these unemployed workers are forced to undergo retraining or move to different cities.[3]

Occupational diversity within a city will also affect the ability of individuals to find new employment, and therefore will affect the duration of unemployment. Once again assume that a negative industry demand shock occurs. The unemployed will once again attempt to find work in other industries. Cities with a low amount of occupational diversity possess industries that use the same types of workers making it relatively easy for workers to shift industries as little or no retraining will be required. Cities with a large amount of occupational diversity will find that many workers will have to retrain. This retraining will tend to increase the durations of the unemployment spells and therefore lead to more occupationally diverse cities having larger unemployment rates

## The Model and the Variables

The equation to be estimated is composed of two diversity variables and seven control variables. The dependent variable is the annual unemployment rate for Canadian Census Metropolitan Areas.

Industrial diversity has been measured by the Gibbs-Martin index (Gibbs and Martin 1962):

$$1 - \sum_{i=1}^{n} \left( P_i^2 \right) \qquad (1)$$

where $P_i$ is the probability of being employed in industry *i*. This is the probability that two randomly selected individuals, from the same city, are from different industries. This variable will rise as industrial employment becomes more evenly distributed or as new industries enter a city.[4] This same methodology is used to

3. While this movement of workers to new cities may tend to cause cities to become less diversified industrially this impact is hypothesised to occur slowly enough to not cause endogeneity problems in the analysis which follows.
4. In preliminary analyses Theil's entropy index (Theil 1972), the Ogive Index, and the National proportions Index (Conroy 1975) were also used as diversity measures. These other measures generally generated similar, but less significant results, than the Gibbs-Martin measure.

measure occupational diversity.[5]

The control variables are City Size, Youth Population Ratio, Female Labour Force Ratio, and a series of regional dummies. City population size has been included as an exogenous variable as this was found by Alperovich (1993) to be an important explanatory variable. The proportion of the population between the ages of 15 and 24 is included since this group tends to have higher rates of unemployment.[6] We have also included the percentage of females in the labour force since females tend to exhibit a different labour market experience than men. To capture regional differences, four dummy variables representing Atlantic Canada, Quebec, Ontario, the Prairies, and British Columbia (Atlantic Canada is the base) have been included.

## The Data

The data are composed of Canadian Census Metropolitan Areas all of which have a population of at least 100,000.[7] Two samples are used in this study. The first set includes the years 1989 through to 1994, has one hundred and fifty observations (25 cities x 6 years), and is collected from Statistics Canada's publication *Labour Force Annual Averages*.[8] The second data set includes the years 1971, 1981, and 1991, has sixty-six observations (22 cities x 3 years) and is collected from the Canadian Census.[9] The former data set is included to give a more up to date picture of the relationship between economic diversity and unemployment rates. The latter is included to dissuade any doubts the reader may have that what we are observing is a temporary regional aggregate demand driven phenomena which is randomly correlated with city economic diversity levels.

## Empirical Results

As can be seen from the results presented in Table 2, all of the variables except for Youth Population Ratio and Female Labour Force Ratio are highly significant in both samples. The two variables which we are most interested in, the diversity measures, have the predicted sign and are significant.[10]

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5. The industries and occupations used are listed in the Appendix.
6. See Ehrenberg and Smith (1984).
7. The cities used are listed in the Appendix.
8. While most data are available prior to 1989, the data needed to generate the diversity variables are not.
9. Due to the reduced number of Census Metropolitan Areas in 1961 it was not advantageous to extend the sample any further back than 1971.
10. For a visual inspection of the diversity measures associated with each city the reader is referred to Appendix A.

As predicted, the sign of the Industrial Diversity coefficient is negative. This

**TABLE 2 City Unemployment Rates**

| Variable | 1989-1994 Sample | 1971, 1981 and 1991 Sample |
|---|---|---|
| INDUSTRIAL DIVERSITY | -0.346** | -0.117** |
| | (-7.42) | (-3.52) |
| OCCUPATIONAL DIVERSITY | 0.171** | 0.189** |
| | (3.86) | (2.77) |
| CITY SIZE | 0.000005** | -0.00000001** |
| | (3.13) | (-8.26) |
| YOUTH POPULATION RATIO | -0.065 | -0.223** |
| | (-0.89) | (-3.81) |
| FEMALE LABOUR FORCE RATIO | -0.231** | 0.000003 |
| | (-2.79) | (0.001) |
| Dummy Variable for Quebec | -0.011** | 0.02** |
| | (-2.21) | (3.33) |
| Dummy Variable for Ontario | -0.025** | -0.020** |
| | (-5.70) | (-4.38) |
| Dummy Variable for Prairies | -0.021** | -0.027** |
| | (-5.46) | (-5.54) |
| Dummy Variable for B.C. | -0.040** | -0.013* |
| | (-7.14) | (-1.82) |
| Constant | 0.358** | 0.066 |
| | (4.80) | (0.95) |
| Buse $R^2$ | 66.38 | 85.20 |
| SSE | 144.4 | 59.49 |
| Degrees of Freedom | 140 | 56 |

Note: 1. * = significant at the 10% level and ** = significant at the 5% level.

implies that as a city becomes more diversified in the make-up of its industrial base, its unemployment rate will decline. As stated above, this is due to the increased ability of more industrially diverse cities to absorb structural changes.[11]

The sign of the Occupational Diversity coefficient is positive and highly significant. Once again this is consistent with the *a priori* belief that increased occupational diversity makes it more difficult for workers to find new work once they have been laid off. This is because an increase in occupational diversity implies that there are proportionately fewer replacement jobs available for anyone

11. While this result supports those found by Malizia and Ke for the United States between 1972 and 1988, the level of significance for the Canadian sample is greater. When Malizia and Ke's definition of industrial diversity was used, the coefficient for the 1989-1994 sample was twice the size of the coefficient they generated while the 1971/81/91 coefficient is only slightly larger. Canadian unemployment rates therefore appear to be more sensitive to this feature of economic organisation.

trained in a specific occupation.[12]

Vipond (1974) and Sirmans (1977) observed that city size was negatively related to unemployment rates. This factor was hypothesised to be due to the fact that larger cities are typically more diversified and it is this diversity that results in lower unemployment rates. If diversity were the only reason why larger cities tend to have lower unemployment rates, then the coefficient on city population size should be insignificant once this factor has been controlled. The significance of the city coefficient may indicate that: first, the Gibbs-Martin measure with the industry and occupational breakdowns used does not control for diversity completely; or second, there may be other characteristics about larger cities that lead to lower unemployment rates.[13] In attempting to explain the change in sign of the coefficient on City Size across the two samples, the 1971/81/91 sample was rerun with a dummy for 1991 which was interacted with City Size, Youth Population Ratio, Female Labour Force Ratio, and the Quebec dummy (all variables which changed sign between the two samples). This was done to test for the existence of a structural shift prior to the late eighties and earlier nineties, the years comprising the first data set. The regression results indicated that there was a change in the manner that City Size and the Quebec dummy variable reacted during this time period. The above sample sets are therefore in accord with one another in that the two coefficients which change sign, and were significant (city size and Quebec dummy), show a structural shift between 1971/81 and 1991.

The insignificant and negative Youth coefficient, in the respective samples, may be due to the mobile nature of this group.[14] While these individuals may be the first to suffer from increased unemployment, they are also likely to be the first to leave a city in search of prospects elsewhere. This endogeneity makes the relationship between this variable and city unemployment rates uncertain. The negative coefficient in the second regression would indicate that these individuals tend to flee high unemployment areas in sufficient numbers that their presence in a city would indicate a low level of unemployment.

The negative and significant Female Labour Force variable, in the 1979-94 sample, and the insignificant results in the census data set are not inconsistent with other observations. Canadian unemployment rates by gender indicate that women's rates are not always higher than men's (Benjamin et al 1998). Women's rates are typically higher during economic booms while men's are higher during recessions. Two explanations of this phenomenon are: women dominate

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12. Once again this result is consistent with that found in Malizia and Ke although it is significant at a higher level. When using Malizia and Ke's definition of occupational diversity, Theil's entropy index, the 1979-94 regression yielded insignificant results with regards to this variable while the 1971-91 sample again yielded a value slightly larger than their's.
13. This city size result differs from the insignificant result found by Malizia and Ke's study which also included diversity.
14. Ehrenberg and Smith (1994).

industries/occupations which are affected less by business cycles; and an endogeneity **TABLE 3 Provincial Unemployment Rates: 1994**

| Province | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Nfld. | 20.4 | 19.8 | 16.8 | 18.8 | 20.4 | 16.2 |
| N.S. | 13.3 | 14.0 | 12.9 | 14.1 | 14.2 | 13.4 |
| N.B. | 12.4 | 12.3 | 12.1 | 12.4 | 12.4 | 12.3 |
| Que. | 12.2 | 11.9 | 11.9 | 12.0 | 12.0 | 12.1 |
| Ont. | 9.6 | 9.8 | 9.8 | 10.4 | 9.8 | 10.3 |
| Man | 9.2 | 8.1 | 8.0 | 8.9 | 7.8 | 8.6 |
| Sask | 7.0 | 7.5 | 8.1 | 7.6 | 7.5 | 8.3 |
| Alta. | 8.6 | 8.2 | 8.2 | 8.8 | 8.2 | 8.7 |
| B.C. | 9.4 | 9.0 | 9.0 | 9.4 | 9.0. | 9.3 |
| Std. | 3.961 | 3.915 | 2.946 | 3.464 | 4.134 | 2.679 |

Note: A ≡ Actual Unemployment Rate (UR); B ≡ Estimated UR; C ≡ An adjustment has been made to rural labour forces only until each province has 37% (the national average) of their total labour force outside cities; D = Setting the industrial diversity level in all cities to 0.7485 (the national average); E ≡ Setting the occupational diversity level in all cities to 0.801 (the national average); F ≡ Setting the percentage of the labour force in urban areas, industrial and occupational diversity to the national average level.

problem may exist in that high unemployment rates may discourage female participation more than male, leading to a negative correlation between unemployment rates and female labour force ratios.

## Inter City Comparison

As stated in the introduction, a fuller understanding of unemployment at the city level will allow for a clearer explanation of inter-province differences. Table 3 highlights these differences for 1994 and presents conditional unemployment rates when some of the explanatory variables are held constant across cities.

Column B shows the estimated unemployment rates, and their standard deviations, when using the results generated with the proposed model and the 1989-94 data set.[15] As can be seen, the estimated values are quite similar to the true values (column A) for all provinces, except Manitoba. When one restricts all provinces to have the national average of their labour force in cities (column C), the standard deviation in estimated provincial unemployment rates declines substantially from 3.961 to 2.946. This calculation indicates that less than 75%

15. The model was used to predict city unemployment rates which were then used to calculate raw unemployment numbers. Rural unemployment numbers were collected from Statistics Canada and the overall provincial unemployment rates were then determined and presented in Table 3.

of the unemployment variation that exist across provinces can be attributed to inter-province labour immobilities, industrial makeup, and the other traditional explanations for Canada's unemployment variations.

A reduction in inter-province unemployment rate variations is also observed when industrial diversity (column D) is held constant at the national average. Although equating this variable across provinces only succeeded in reducing the standard deviation by twelve percent, it does indicate that Newfoundland (the province with the highest unemployment rates) would benefit from a more diversified industrial base. The other three maritime provinces, however, would realise a slight increase in their unemployment rates if national average industrial diversity rates existed across all provinces.

There is one case where holding a variable constant across cities results in an increase in the unemployment rate variation. This is the case for occupational diversity (column E). Table 3 indicates that the higher unemployment provinces tend to have lower than average occupational diversity making it easier for their unemployed to find new employment opportunities. A movement towards the national average for these provinces is predicted to cause an increase in the rate of unemployment.

When one controls for rural/urban mix as well as industrial and occupational diversity (column F), the variation in provincial unemployment rates drop from 3.961 to 2.679. A reduction of 32%!

## Conclusion

Unemployment rates across Canadian provinces vary a great deal and it has been the goal of this paper to explain a portion of this variation. We have discovered that a considerable amount of the variation in provincial unemployment rates can be explained by the choice of residents to live in rural versus urban settings as well as the industrial and occupational composition of urban areas. In the more recent data set we discovered that urban population increases tend to lower urban unemployment rates while in the earlier data set the trend was reversed. As hypothesised, increasing industrial diversity tends to reduce unemployment while increasing occupational diversity tends to increase it.

The support that this paper provides for the importance of diversity with respect to city unemployment rates is useful in that the first step in being able to control a phenomenon is to be able to explain it. This paper would suggest that when governments are attempting to lower inter-province unemployment rate differences they should: first, compare rates that have accounted for urban/rural population differences; second, encourage a diverse industrial mix without encouraging a diverse occupation mix in cities with above average unemployment rates.

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## *Appendix*

**TABLE A1 The Industries Used for Each Sample**

| | 1989-94 sample | 1971/1981/1991 sample |
|---|---|---|
| Primary and agriculture | X | |
| Agriculture and related services | | X |
| Fishing and trapping | | X |
| Logging and forestry | | X |
| Mining (incl. milling), quarrying & oil wells | | X |
| Manufacturing | X | X |
| Construction | X | X |
| Transportation, comm. and other utilities | X | X |
| Trade | X | |
| Wholesale and retail trade | | X |
| Finance, insurance & real estate | X | X |
| Service | X | |
| Bus., edu., health and social, accom., food and beverage, and other services | | X |
| Public administration | X | |
| Government services | | X |

**TABLE A2 The Occupations Used for Each Sample**

| | 1989-94 sample | 1971/1981/1991 sample |
|---|---|---|
| Managerial and other professional | X | |
| Managerial, admin. and related occ. | | X |
| Clerical and related occupations | | X |
| Clerical | X | |
| Sales | X | X |
| Service | X | X |
| Primary Occupation | X | |
| Farming, horticulture and animal husbandry | | X |
| Fishing, trapping and related occupations | | X |
| Forestry and logging | | X |
| Mining & quarrying incl. oil & gas field | | X |
| Processing, machining, and fabrication | X | |
| Processing | | X |
| Machining and related occupations | | X |
| Product fabricating, assembling, & repairing | | X |
| Construction trades | X | X |
| Transportation equipment operator | X | X |
| Material handling and other crafts | X | |
| Material handling and related occupations | | X |
| Natural sciences, engineering serv. and math | | X |
| Social sciences and related fields | | X |
| Religion | | X |
| Teaching and related occupations | | X |
| Medicine and health | | X |
| Artistic, literary, rec. and related occupations | | X |
| Other crafts and equipment operating | | X |
| Not elsewhere classified | | X |

**TABLE A3 Cities Used in Each Sample**

| | 1989-94 sample | 1971/1981/1991 sample |
|---|---|---|
| St. John's | X | X |
| Halifax | X | X |
| St. John | X | X |
| Chicoutimi-Jonquière | X | X |
| Québec | X | X |
| Trois-Rivières | X | |
| Sherbrooke | X | |
| Montréal | X | X |
| Ottawa-Hull[1] | X | X |
| Sudbury | X | X |
| Oshawa | X | |
| Toronto | X | X |
| Hamilton | X | X |
| St. Catherines-Niagara | X | X |
| London | X | X |
| Windsor | X | X |
| Kitchener-Waterloo | X | X |
| Thunder Bay | X | X |
| Winnipeg | X | X |
| Regina | X | X |
| Saskatoon | X | X |
| Calgary | X | X |
| Edmonton | X | X |
| Vancouver | X | X |
| Victoria | X | X |

Notes: 1. Hull (Québec) has been included as part of Ottawa (Ontario).

**TABEL A4 Diversity Measures for 1994 (1989-94 Sample) and 1991 (1971/1981/1991 Sample)**

| | Industrial Diversity | | Occupational Diversity | |
|---|---|---|---|---|
| | 1989-94 | 1971/81/91 | 1989-94 | 1971/81/91 |
| St. John's | 0.676 | 0.772 | 0.717 | 0.896 |
| Halifax | 0.752 | 0.786 | 0.769 | 0.891 |
| St. John | 0.751 | 0.798 | 0.783 | 0.902 |
| Chicoutimi-Jonquière | 0.671 | 0.786 | 0.810 | 0.908 |
| Québec | 0.744 | 0.778 | 0.774 | 0.892 |
| Trois-Rivières | 0.748 | -- | 0.767 | -- |
| Sherbrooke | 0.624 | -- | 0.766 | -- |
| Montréal | 0.764 | 0.785 | 0.805 | 0.896 |
| Ottawa-Hull | 0.752 | 0.770 | 0.736 | 0.882 |
| Sudbury | 0.772 | 0.792 | 0.823 | 0.891 |
| Oshawa | 0.787 | -- | 0.852 | -- |
| Toronto | 0.778 | 0.497 | 0.802 | 0.909 |
| Hamilton | 0.766 | 0.789 | 0.829 | 0.911 |
| St. Catherines-Niagara | 0.770 | 0.785 | 0.871 | 0.909 |
| London | 0.766 | 0.776 | 0.822 | 0.905 |
| Windsor | 0.739 | 0.764 | 0.864 | 0.907 |
| Kitchener-Waterloo | 0.769 | 0.808 | 0.837 | 0.905 |
| Thunder Bay | 0.724 | 0.797 | 0.774 | 0.908 |
| Winnipeg | 0.786 | 0.791 | 0.824 | 0.898 |
| Regina | 0.760 | 0.789 | 0.765 | 0.894 |
| Saskatoon | 0.759 | 0.763 | 0.829 | 0.905 |
| Calgary | 0.775 | 0.792 | 0.807 | 0.894 |
| Edmonton | 0.779 | 0.794 | 0.805 | 0.902 |
| Vancouver | 0.769 | 0.781 | 0.808 | 0.898 |
| Victoria | 0.732 | 0.759 | 0.787 | 0.893 |