FIVE ESSAYS ON UNIONIZATION AND LABOUR MARKETS IN CANADA AND THE UNITED STATES

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AUTHOR: Susan Thompson Johnson, B.A. (University of Toronto)
M.A. (University of Western Ontario)

SUPERVISORS: Professor Peter Kuhn
Professor John Burbidge
Professor Michael Veall

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ABSTRACT

This thesis consists of five essays in the discipline of labour economics. The first essay uses cross-section time series analysis to estimate the impact of mandatory votes and card check on union certification success. The second examines the behaviour of Canadian union density from 1980 to 1998 and uses projections to look at the future of the Canadian union movement. The third investigates the decline of private sector U.S. union density from1983 to 1999. The fourth essay considers the impact of three factors on the Canada-U.S. union density gap from 1980 to 1999: the difference in overall economic performance between the U.S. and Canada; structural change; and union recognition procedures. The fifth essay describes the behaviour of earnings per week, wages per hour and hours per week of prime-aged males by skill-group (identified by earnings quintile) in the U.S. and Canada from 1981 to 1997. This essay also provides evidence on relative downward wage rigidity in Canada.

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I dedicate this work, with love, to my family: David, Sarah and Daniel - your support, patience and encouragement has made this dream a reality.

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INTRODUCTION

This thesis comprises five essays in the area of labour economics. The first four essays focus on unionization and are my own work. The fifth essay is a comparison of labour market adjustment in the U.S. and Canada and is co-authored with Professor Peter Kuhn.

The first essay uses cross-section time-series analysis of nine Canadian jurisdictions over nineteen years to identify the effect of mandatory votes/card check on certification success. The results indicate that mandatory votes reduce certification success rates by approximately 9 percentage points below what they would have been under card check. This result is robust across specifications and significant at above the 99 per cent confidence level.

The second essay examines Canadian union density from 1980 to 1998 and uses projections to look at the future of the union movement in Canada. An examination of factors that determine Canadian union density reveals there has been a long run decline in union membership growth. A stock-flow growth accounting analysis decomposes union membership growth into net growth due to 'recognition' and net growth due to 'economic and other' factors. These components are compared and then each is more closely examined. Net growth due to 'recognition' is dissected to reveal the importance of organizing activity and certification success. Regression and shift-share analysis are used to test for

the impact of cyclical and structural change on net growth due to 'economic and other factors'. Projections of union density are used to consider the implications of changes that have occurred in the last two decades for the future of Canadian union density.

The third essay examines private sector U.S. union density. This paper investigates the sources of the decline in private sector U.S. union density from 1983 to 1999. The research updates Dickens and Leonard (1985) and Freeman (1988). I describe the behaviour of union density, union membership growth and employment growth over the period. A stock-flow growth accounting identity examines the sources of union membership growth. Regression and shift-share analyses are used to examine the impact of structural change on union membership growth and union density. The stock-flow identity is explicitly linked to union density and other variables that affect union density are considered.

The fourth essay looks at the Canada-U.S. union density gap. It provides empirical evidence concerning the impact of three factors on the Canada-U.S. union density gap from 1980 to 1999: the difference in overall economic performance between the U.S. and Canada; structural change; and union recognition procedures. To examine the impact of the difference in the economic experience of the two countries, Canadian union density is simulated using U.S. employment growth rates. The results suggest that at most 3 percentage points of

the 19 percentage point gap can be attributed to this factor. The impact of structural change is measured using shift-share analysis. Differences in structural change between the two countries over the period account for only one percentage point change in the gap. Simulation analysis, based on the empirical results presented in the first essay, is used to examine the role of union recognition procedures in the gap. It is discovered that the increasing use of mandatory votes across Canadian jurisdictions has narrowed the gap by about one percentage point. Differences between existing union recognition procedures in Canada and the U.S. account for at least 3 to 5 percentage points of the gap in 1998.

The fifth essay describes the behaviour of earnings per week, wages per hour and hours per week of prime-aged males by skill-group (identified by earnings quintile) in the U.S. and Canada over the last 20 years. Two descriptive statistics are used: (1) plots of mean log weekly earnings, mean log hours per week and mean log wages by quintile from 1981 to 1997 for each country and; (2) a comparison of percentage changes in these same variables between years when Canada and the U.S. are at similar points in the business cycle. The results reveal the contribution of wages and hours to the increase in earnings inequality in Canada and the U.S. They also provide indirect evidence that Canadian labour market institutions (social programs and minimum wage) may result in relatively downwardly rigid wages in Canada.

CHAPTER ONE

Card Check or Mandatory Vote? How the type of union recognition procedure affects certification success.[1]

1. Introduction

This paper provides empirical evidence on how two alternative union recognition procedures, mandatory votes and card check, affect certification success.[2] Mandatory votes require that a union receive majority support in a secret ballot in order to be recognized. In contrast, card check allows recognition based solely on membership evidence collected by the union and does not necessarily require a vote. In Canada unions are recognized on the basis of either card check or mandatory representation votes.[3] Canada is a federal state consisting of ten provinces and labour law is primarily the responsibility of the

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[1]I thank John Burbidge, David Johnson, Peter Kuhn, Mike Veall, Felice Martinello, the editor and two anonymous referees from the *Economic Journal* for valuable comments, Felice Martinello for providing updated data on certification and Nathan Braun for helpful research assistance. Funding for this research was provided by the Social Sciences and Humanities Research Council of Canada and the Canadian International Labour Network. A slightly shorter version of this paper (without appendices) has been accepted for publication at the *Economic Journal*.

[2]Other terms used for card check are 'card-based recognition' and 'automatic recognition'.

[3]An employer may also voluntarily recognize a union. Only a very small proportion of unions are voluntarily recognized.

provinces. There is considerable variation over time and across jurisdictions in the use of these two forms of union recognition. I conduct an econometric analysis of cross-section time-series data for nine Canadian provinces over the period from 1978 to 1996 to identify how the type of union recognition procedure affects union certification success.[4] The empirical results show that mandatory votes reduce certification success rates by approximately 9 percentage points below what they would be under card check. This result is robust across specifications and significant at above the 99 percent confidence level. The evidence suggests the type of union recognition procedure has a substantial effect on certification success and therefore it is likely more difficult for unions to maintain or to expand membership under mandatory representation votes than under card check. This helps explain why the labour movements in North America and the U.K. have supported card check recognition procedures while business has preferred mandatory votes. The evidence also provides empirical support for the argument made by other researchers that differences in recognition procedures between the U.S. and Canada may provide a potential explanation for why Canada's unionization rate is higher than that of the U.S.

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[4]All of the results presented in this paper exclude Prince Edward Island and the federal sector. PEI has a population of approximately 100,000. Certification data are not readily available for this province. The federal sector is omitted because data are not available that properly measure the explanatory variables for this sector.

2. Motivation

Empirical evidence concerning the impact of different union recognition procedures is important for three reasons. First, it informs policymaking. Second, it contributes insight into the behaviour of unions and employers. Third, it provides evidence relevant to understanding the Canada-U.S. union density gap.

Information for policymakers

Reform of union recognition procedures has been an important policy issue in Canada, the U.S. and the U.K. Union recognition procedures in Canada have changed substantially over time. In 1976 all Canadian jurisdictions relied on card check. Since that time a number of jurisdictions have adopted mandatory votes and by 1997 almost sixty percent of the labour force was covered by this type of legislation. In the U.K. in June 2000 formal statutory recognition procedures (based on card check) were introduced for the first time.[5] During the formulation of this legislation consideration was given to both card check and mandatory vote recognition procedures. In the U.S. in 1994, where union recognition procedures are based almost exclusively on mandatory votes, "The Commission on the Future of Worker-Management Relations" recommended changes to the existing mandatory vote procedure and encouraged firms to

[5]The Trade Union Recognition Order came into force on June 6, 2000. Details of the legislation can be found at http://www.dti.gov.uk/er.

voluntarily recognize unions based on card check.[6]

Insight into union and employer behaviour

Second, the empirical results contribute to an understanding of union and management behaviour. In the 1999 round of collective bargaining in the North American auto industry, the unions (the United Automobile Workers and the Canadian Automobile Workers (CAW)) attempted to negotiate voluntary recognition of unions at the auto-makers' suppliers' plants if the union could demonstrate majority support based on signed membership cards. This was an attempt by the unions to circumvent existing mandatory vote procedures in effect in the U.S. private sector and in the province of Ontario and replace them with card check. Suppliers strongly resisted pressure to comply with this demand. The CAW's president, Buzz Hargrove, threatened to strike over the issue. In the U.K. in 1998 and 1999 during consultations surrounding the introduction of formal union recognition procedures labour supported card check while business preferred mandatory votes.

A piece of the Canada - U.S. union density gap puzzle

Third, a number of researchers (Weiler (1983), Meltz (1985), Gunderson and Meltz (1985), Rose and Chaison (1985,1990), Freeman (1985) and Chaison

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[6]Commission on the Future of Worker-Management Relations. 1994, pp.42.

and Rose (1994)) have argued that union density is higher in Canada than in the U.S. because Canada has relied heavily on card check while the U.S. has used mandatory votes.[7] The evidence presented in this paper is relevant to this argument.[8]

3. Mandatory Representation Votes and the Canadian Industrial Relations Environment

This section describes the difference between mandatory representation votes and card check procedures in Canada. It also discusses two other features of the industrial relations legal environment in Canada that may affect certification success: *compulsory dues checkoff* and *first agreement arbitration.* Finally, it provides an overview of the Canadian industrial relations legal environment and a description of the variation in legislation over time and across provinces.

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[7]Care needs to be taken when making this argument. In the mid-sixties U.S. and Canadian union densities were approximately equal at approximately 30 percent of the non-agricultural labour force. Since then Canadian union density has remained relatively stable while U.S. union density has fallen to less than 15 percent. As noted above, the use of mandatory votes in Canada has increased over time and therefore union recognition legislation in the two countries has converged. This might suggest that the union densities should converge as well. However over most of this period only a small portion of the Canadian labour force was covered by mandatory votes. In the mid 1990s three provinces introduced this legislation and coverage increased to almost sixty percent of the labour force. Because this legislation operates on certification success rates and therefore affects the flow of newly certified union members it will take time for changes in union recognition legislation to have an impact on the stock of union members and on union density.

[8]Johnson (2000) performs simulations based on these results and finds that by 1995, 17 to 26 percent of the Canada- U.S. union density gap can be attributed to mandatory votes.

Mandatory Representation Votes and Card Check Certification Procedures

Mandatory representation votes and card check are two alternative legal procedures for obtaining bargaining rights in Canada. Both procedures involve four stages.[9] First, union organizers collect evidence of support in the form of signed union membership cards. Second, the union files an application for certification that includes the evidence of union support collected at the first stage. Third, a hearing is held before an adjudication body commonly called the Labour Relations Board (LRB). The hearing, involving all interested parties, determines the composition of the bargaining unit, considers any allegations of unfair labour practices and examines the membership evidence.

The first three stages are the same for either recognition procedure. The fourth stage is different. Under a system of mandatory representation votes, if there is a minimum level of support for the union (based on the membership evidence) then a secret ballot is conducted to determine if the union has enough support from the bargaining unit to be certified. Under a card check procedure it is not always necessary to hold a vote. If the membership evidence indicates sufficient support for the union it is certified immediately without a vote. Only if the membership evidence is above some minimum level of support but below the threshold required for automatic certification will a representation vote be held.

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[9]This description is a generalization of the certification process as it occurs across Canadian jurisdictions.The details of exact procedures differ across the jurisdictions but all procedures contain these elements.

In either process the application for certification is dismissed if membership evidence is below the minimum level of support.[10]

Compulsory Dues Checkoff and First Agreement Arbitration.

In order to identify the effect of different union recognition procedures on certification success it is important to control for other elements of the legislative environment that may also affect certification success. Two such elements are: *compulsory dues checkoff* and *first agreement arbitration.*[11]

Compulsory dues checkoff (also called the Rand Formula) requires that, at the union's request, a clause be included in a collective agreement that obligates the employer to deduct union dues directly from the wages of all employees in the bargaining unit *whether or not they are members of the union* and remit the funds to the union. Such clauses provide unions with financial security and an increased ability to represent their members effectively. Unions may be more

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[10] Support deemed sufficient for automatic certification is typically 50 to 55 percent. If a representation vote is held bargaining rights are granted if a majority of those voting (or of the bargaining unit, depending on the time period and jurisdiction) support the union. An application for certification is dismissed if less than 25 to 40 percent of the bargaining unit signed cards (depending on the time period and jurisdiction).

[11] Legislation that extends coverage to previously ineligible sectors of the economy also affects certification success. From 1978 to 1996 there have been two changes in coverage in Canada. In 1988 British Columbia passed legislation granting teachers collective bargaining rights. In that year teachers' associations were certified. Certifications associated with this change in coverage are eliminated from the data. From January 1, 1993 to November 10, 1995 Ontario extended coverage to a group of previously ineligible workers (some groups of professionals and domestic workers employed in private homes). When this legislation was revoked all units that had been certified under the earlier legislation were decertified. I have not controlled for this change in the analysis. Results based on a sample for the period from 1978 to 1992 do not differ qualitatively from those over the longer period.

likely to organize in such an environment and may also receive more employee support. On the other hand employers may increase their resistance to unionization if they perceive this type of clause increases union power and some employees may no longer support the union if they had hoped to be free riders. Though its expected effect on certification success is ambiguous this type of legislation is generally considered to support the union movement.

First agreement arbitration allows the first collective agreement between a bargaining agent and an employer to be settled by binding arbitration if a negotiated agreement cannot be reached. Such legislation ensures that if a union is granted bargaining rights it will be able to obtain a first collective agreement. Under such circumstances unions are more willing to organize workers and workers are more likely to support these efforts. However employers may intensify their resistance to the union during the organizing period since the strategy of resisting the union at the bargaining table will no longer be as effective. This type of legislation is considered to be supportive of the union movement however its impact on certification success is ambiguous.

Canada's Industrial Relations Legal Environment.

As mentioned the industrial relations legal environment in Canada is decentralized. The federal government has jurisdiction over its own public servants and also over a number of inter-provincial activities such as railways,

trucking and shipping. The provincial governments have jurisdiction over all other activities within their geographical area in the remaining industries. While there are many similarities in labour legislation across the various jurisdictions there are also significant differences.

Mandatory representation votes, compulsory dues checkoff and first agreement arbitration have been introduced in various Canadian jurisdictions at different points in time. Table 1 shows when each of these types of labour legislation was in force for each jurisdiction in Canada over the period from 1976 to 1997. Table 2 gives the number of observations (province/year cells) corresponding to each of the eight possible legislative regimes (as defined by the presence of mandatory votes, compulsory dues checkoff and first agreement arbitration) for the sample of nine jurisdictions from 1978 to 1996. It is clear from examining both Table 1 and Table 2 that there is substantial variation in legislation across jurisdictions and over time. Prior to the introduction of mandatory representation votes in Nova Scotia in 1977 all Canadian jurisdictions employed card check for union recognition. Since this time mandatory votes have become more prevalent across Canada. B.C. introduced them in 1984 and repealed this legislation in 1993. Alberta introduced mandatory vote legislation in 1988. In the mid-1990s Newfoundland (1994), Ontario (1995) and Manitoba (1997) introduced mandatory votes. Both compulsory dues checkoff and first agreement arbitration have been more common in the sample. Table 2 shows that

over the sample period there are 42 province/year cells when mandatory vote legislation was in place, 79 province/year cells when first agreement arbitration was in place and 105 province/year cells when compulsory dues checkoff was in place. The variation in legislation across provinces and over time within provinces allows the impact of mandatory votes/card check on certification success to be estimated.

4. Background Information

There are two reasons mandatory votes may reduce certification success. The first, provided by Weiler (1983), recognizes that under mandatory votes there is greater opportunity for employers to discourage unionization. He argues that in a mandatory vote environment the delay between a petition for certification and the election provides the employer with the opportunity to influence the outcome of the election.[12] He also suggests that unfair labour practices are frequently used to discourage union support because the penalties for doing so are neither timely nor large.[13] In contrast under card check it is possible for the union

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[12]In the U.S. there is no time limit imposed by legislation between the petition for certification and the representation vote. The delay is usually two to three months. In Canada the time between petition and vote is legislated and varies across jurisdictions from 5 to 7 working days after the application is filed. There is some evidence for the U.S. that the length of time delay reduces certification success, for example, Roomkin and Juris (1978) and Cooke (1983).

[13] A number of studies link employer resistance and/or unfair labour practices to reduced certification success, for example, Dickens (1980), Seeber and Cooke (1983), Freeman (1985), Thomason (1992) and Riddell (1996). Bronfenbrenner and Jurvich (1998) provides information on various tactics that employers use to discourage unionization.

to sign-up members without the employer's knowledge and to present the employer with a fait accompli once the application is filed. There is another reason to suspect mandatory representation votes may reduce certification success. In the context of a union organizing drive peer pressure from fellow workers and from the union to sign union membership cards may make it difficult for an employee to express genuine feelings about the union. Therefore membership evidence used to determine recognition under a card check procedure may overstate employees' true support for a union and certification success is more likely than when there is a secret ballot.

Empirical evidence concerning the impact of mandatory votes is very limited. Weiler (1983), Meltz (1985) and Gunderson and Meltz (1985) use descriptive statistics drawn from U.S. NLRB and Canadian LRB Annual Reports to show that mandatory votes discourage unionization. Studies that use either pure time-series (Martinello (1996)) or pure cross-section data (Martinello and Meng (1992)) are not able to identify the impact of different union recognition procedures. In the context of Canadian experience it is not possible to use time-series analysis to identify the impact of specific union recognition procedures. There are three reasons for this: (1) changes in union recognition procedures are usually bundled together with other changes in labour legislation[14]; (2) there is not

[14]Cross-section time-series analysis must also confront the problem of the 'bundling' of legislative changes. Table 1 shows that the two other types of legislation considered most likely to influence certification success (first agreement arbitration and compulsory dues checkoff) are never introduced in the same 'bundle' as mandatory votes. Nevertheless mandatory vote

enough variation within one jurisdiction in the use of a specific union recognition procedure - once introduced a procedure typically remains in force[15]; (3) the analysis of a single jurisdiction means there are no 'control' groups provided by other jurisdictions. A pure cross-section analysis can examine the effect of different union recognition procedures if there is enough variation in the use of different procedures across the sample. Martinello and Meng (1992) use cross-section micro data on Canadian workers in mining and manufacturing in an attempt to identify the effect of union recognition procedures on the probability a worker is covered by a union.[16] This research does not succeed in identifying the impact of mandatory representation votes because there is not enough variation in union recognition procedures across jurisdictions in the year they study (1986). Even if there were enough variation in a cross-section to estimate the relationship between mandatory votes and certification success in such an analysis it is not

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legislation is typically introduced as part of a package of changes. In cross-section time-series analysis the introduction of mandatory votes is associated with many different packages of legislative reforms - the common feature of each package is a change in union recognition procedures. Therefore cross-section time-series analysis is more likely to identify correctly the impact of mandatory votes on certification success even when such legislation is bundled with other legislative changes than time-series analysis where typically only one bundle is observed.

[15]If recognition procedures within a jurisdiction frequently change from one recognition procedure and back it might be possible to identify the impact of a specific procedure using time-series data alone. In reality once mandatory votes are introduced they usually remain in force. In Canada, from 1978 to 1996, there is only one exception to this - British Columbia introduced mandatory votes in June, 1984 and repealed them in January, 1993.

[16]This paper also considers legislation concerning replacement workers and compulsory dues checkoff.

possible to distinguish between correlation and causation.[17] Cross-section micro data cannot control for specific year effects or for slowly changing provincial trends over time.

This paper is the first in the literature to use cross-section time-series analysis to provide direct evidence of the impact of mandatory representation votes/card check on certification success. This methodology incorporates more information than either cross-section or time-series analysis. Both province fixed effects and province-specific time trends can be used in cross-section time-series analysis. Unobserved heterogeneity and legislative endogeneity may, to some extent, be addressed through the use of these variables. As a result cross-section time-series analysis is more likely to identify correctly the impact of different union recognition procedures on certification success.

5. Cross-Section Time-Series Econometric Approach

The decentralization of Canadian labour law permits the use of cross-section time-series analysis to test for the effect of mandatory representation votes/card check on certification success. The annual data cover nine Canadian

[17]Cross-section analysis only implies causation when two conditions are met: (1) a clear structural model underlies the empirical analysis; and (2) all relevant explanatory variables can be measured and included in the estimation. In this paper neither of these conditions exists. In particular legislative endogeneity is an important empirical issue and is one reason why cross-section time-series analysis is preferred to cross-section analysis.

jurisdictions from 1978 to 1996.[18] The panel consists of observations where union recognition procedures differ across provinces and where union recognition procedures change over time within a province (as discussed earlier and described in Tables 1 and 2). All of this variation is used in the econometric analysis.

In cross-section time-series a number of possible error relationships may exist. There can be heteroscedasticity across provinces, correlation between provinces, common autocorrelation across provinces and/or province-specific autocorrelation. Specifications are first estimated using Ordinary Least Squares (OLS). Diagnostic tests are conducted to check for the presence of the error structures described above. Feasible Generalized Least Squares (FGLS) is employed when the diagnostic statistics reveal the presence of any of these error relationships.[19]

Specification

I estimate the following reduced form equation:

$$\textit{certification success}_{i,t} = \beta X_{i,t} + \varepsilon_{i,t} \qquad (1)$$

Subscript i refers to the jurisdiction, subscript t refers to the time period.

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[18]The time period is determined by data availability. Please see the Data Appendix for more detail.

[19]See Greene (1983) and LIMDEP 7.0 for good explanations of the diagnostic tests. These statistics are described in Table 3 where they are presented with the estimation results.

The specification recognizes that certification success depends on a number explanatory variables (X) that capture the legal, economic, organizational, and structural components of the environment and an error term (ε). This reduced form could be derived from a number of different structural models.[20]

Dependent Variables[21]

Two dependent variables are used as measures of certification success. The certification success rate (*certrate*) is defined as the percent of certifications disposed that are granted in the period. Certifications disposed refers to certification applications that are processed over the period.[22] Certification

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[20]Ashenfelter and Pencavel (1969) describe a very general structural model that has provided the theoretical basis for a number of empirical studies of unionization (Ashenfelter and Pencavel (1969), Kumar and Dow (1986), Riddell (1993) and Martinello (1996)). In this model unionization is the result of the interaction of demand for and supply of union services. The demand for union services is the result of cost-benefit analysis by workers. The supply of union services is the result of cost-benefit analysis by union organizers. Many factors can influence these actors' perceptions of costs and benefits including: employer tactics (themselves influenced by a similar cost-benefit analysis); legislation; and overall economic conditions. Structural changes in the overall economy may not shift the individual supply or demand curves but can affect the aggregate outcome due to the changes in the composition of the economy. Other structural models that could be described by this reduced form include Dunlop's (1958) classic industrial relations framework used by Seeber and Cooke (1983) and partial adjustment models such as those used by Lawler and Hundley (1983) and Ellwood and Fine (1988) in their empirical analyses of certification success.

[21]For specific information concerning the sources of the data and descriptive statistics for all the variables used in the paper please see the Data Appendix.

[22]Certification applications disposed is approximately equal to the certification applications filed in the period. Note that the data on the number of certifications granted and the number of certifications disposed refer to the number of bargaining units not to the number of employees that are in the bargaining unit.

applications that are disposed are either granted, withdrawn or dismissed. The certification success rate provides an intuitively appealing definition of certification success but it suffers from endogeneity because the quality of certification applications is not controlled for in the estimation. To illustrate, suppose legislation is passed that is favourable to the union movement. It is likely that attempts will be made to organize units that were previously considered too costly or difficult to organize. The number of certification applications will increase. However the marginal applications are for units that likely have a lower propensity to certify and ceteris paribus their success rate is likely to be lower. In this case the coefficient on the legislation variable is biased toward zero and the results from specifications using *certrate* as a dependent variable would underestimate the effect of the explanatory variables on certification success.[23] While it is reasonable to suppose that endogeneity biases these results towards zero from a theoretical perspective it is possible for the bias to go in the other direction.[24]

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[23]Another form of endogeneity also exists in this analysis. Rose and Chaison (1996) present empirical evidence that union density affects legislation. If legislation affects certification success and certification success affects union density and union density affects the degree of political success and political success affects legislation then the relationship is endogenous. This type of reverse causation is not likely to be important since the stock of union members affects political success and certification success is a flow that in any one period has a negligible effect on the stock.

[24]The results from regressions that use ln(certifications granted), ln(number of business establishments) and ln(certification applications processed) as the dependent variable indicate that the presence of mandatory vote legislation has a significant negative effect on both certifications granted and applications processed. The magnitude of the effect on certifications granted is much larger than on certifications processed. As expected mandatory vote legislation has no significant effect on the number of business establishments in a province.

Specifications are also estimated using another definition of certification success. The win rate (*winrate*) is defined as the percent of *all business establishments* in a province that are granted certification within the period. The number of business establishments in a jurisdiction is not influenced by the type of union recognition procedure in effect (see footnote 24). Empirical results using this dependent variable provide information on how mandatory vote/card check legislation affects the percentage of firms in a province that become newly unionized.

Explanatory Variables

The explanatory variables used in this study are similar to those used in other studies of union growth and certification success. The variables attempt to capture the effects of legislation, business conditions, organizational environment and structural factors. In addition specifications are estimated that include province fixed effects and province-specific time trends that attempt to address unobserved heterogeneity and legislative endogeneity.

The legislation variables are the three discussed earlier; mandatory representation votes (*mandvote*); compulsory dues checkoff (*checkoff*); and first agreement arbitration (*firstarb*). Each of these variables is assigned the value one in periods and jurisdictions when such legislation is in effect and zero when it is not.

Business conditions are described by the provincial unemployment rate (*uerate*) and the provincial inflation rate (*pdot*). While there is general agreement that cyclical conditions should be taken into account results of earlier studies do not present a consistent picture of how these cyclical variables affect certification success or union density. A priori it is not possible to sign the coefficients on the cyclical variables.

The organizational environment is captured by provincial union density (*density*). It is hypothesized that as union density increases certification success increases because unions become an accepted part of the employment relationship and because unions have the financial resources to expand. However as union density increases fewer workers remain to be organized and it is likely that at some point the unorganized workers who remain are those that are the most difficult and costly to organize. At this point union density becomes negatively related to certification success. Specifications are estimated with density included linearly and /or quadratically.

Finally structural factors may affect certification success. Traditionally the easiest workers to organize are full-time males in the manufacturing sector. The more difficult workers to organize are part-time women in the service sector. Three variables are included to capture structural factors: the percent of those employed that are part-time (*partime*); the percent of those employed that are female (*female*); and an industry mix variable (*mix*). The industry mix variable

for each province in a particular year is created by multiplying the employment share of each industry in that year by the national union density of that industry in 1976 and then summing over all the industries and multiplying by 100. This indicates what union density would have been in province, i, in year, t, given the current employment mix in the province and assuming that 1976 national unionization rates prevail. A priori the coefficients on the percent part-time and the percent female are expected to be negative while the coefficient on the industry mix variable is expected to be positive.

Fixed Effects and Time Trends

Cross-section time-series analysis allows the use of province fixed effects and province-specific time trends.[25] The availability of these variables provides the opportunity to address the issues of unobserved heterogeneity and legislative endogeneity.

In order to identify the impact of mandatory vote legislation on certification success the empirical analysis must take into account that different provinces in Canada likely have very different attitudes towards unions.[26]

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[25]Year dummies can also be used in cross-section time-series analysis. In the description that follows only province dummies and province-specific time trends are discussed. Specifications were estimated that included year effects. These effects were never significant either individually or as a group when the cyclical variables were included in the analysis. In the interest of efficiency the year effects were dropped from the analysis.

[26]For example, Saskatchewan was the first jurisdiction in Canada to elect a socialist government and the first jurisdiction in the world to introduce public health care. It has a long history of support for the labour movement and this is confirmed by the very high average

Provinces where public opinion is not supportive of the union movement may have low certification success rates and also enact mandatory vote legislation. If attitudes towards unions are not taken into account it will not be clear from the analysis whether mandatory vote legislation is in fact negatively related to certification success or if this relationship is spurious - reflecting only the general lack of public support for unions in provinces that enact this legislation. Data are not available that allow the measurement of social attitudes across provinces yet if this unobserved heterogeneity is not taken into account the coefficient on the mandatory vote dummy variable is likely to be biased. What can be done about this? Cross-section time-series allows province fixed effects to be included in the analysis. The inclusion of provincial dummies controls for unobserved province-specific characteristics that are constant over time such as public opinion towards unions.

It may also be the case that there are unobserved province-specific characteristics, such as social attitudes towards unions, that change over time. Provinces where mandatory votes are introduced may be those where there is declining public support for unions. In this case a reduction in certification success rates may be due to changing public opinion towards unions and not to the introduction of mandatory vote legislation. Data are not available that permit the consistent measurement of changes in public opinion toward unions over time

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certification success rates in Saskatchewan (83 percent) relative to the average of the whole sample (69 percent). Saskatchewan does not have mandatory representation votes.

and across provinces.[27] Cross-section time-series analysis allow this form of unobserved heterogeneity to be addressed through the use of province-specific time trends. Linear and quadratic province-specific time trends are used to capture unobserved province-specific factors that change smoothly over time.

The inclusion of province fixed effects and/or province-specific time trends, allowed by cross-section time-series analysis, means that the coefficient on the mandatory vote dummy variable is associated with a discrete change in the level of certification success that occurs once mandatory vote legislation is introduced. Unobserved provincial differences, such as social attitudes towards unions, that are constant over time or change smoothly over time are controlled for by province fixed effects and province-specific time trends. This means that, while there is no guarantee, we can have some level of assurance that the difficult problem of legislative endogeneity has been addressed.[28]

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[27]Information that would allow variables that measure or instrument public opinion toward unions to be included in a cross-section time-series analysis is not available in Canada. Opinion polls concerning public attitudes towards unions are available on a national basis but not provincially. The pragmatic ideology of the major political parties in Canada makes it difficult, if not impossible, to create a meaningful instrument based on public support for different political parties that would capture changes in public opinion towards unions over time and across jurisdictions in Canada. Martinello (1996, 1999) is able to use political variables in his time-series analyses of single jurisdictions. Even in this case the measurement of political factors is not straightforward.

[28] In order to provide some additional assurance that this is the case Granger/Sims causality tests were used to test directly for the exogeneity of mandatory vote legislation. These results show that mandatory vote legislation is exogenous in these specifications. A detailed description of the Granger/Sims causality tests and results can be found in Appendix One.

Endogeneity may be more widespread. The percent part-time, percent female, density and industry mix variables may also be endogenous. If specifications are estimated (using either the certification success rate or the certification success proportion as the dependent variable) that either omit or lag these variables the coefficient on the mandatory vote dummy variable is

6. Results

Certification Success Rate Results

Table 3 presents estimation results from two specifications where the certification success rate is the dependent variable. Specification #1 includes legislation variables (*mandvote, firstarb, checkoff)* , environment variables (*mix, female, partime, density, uerate, pdot*), and province dummies as explanatory variables. Specification #2 adds province-specific time trends.[29] Diagnostic tests on the error structures of both specifications show that heteroscedasticity exists across provinces; correlation exists among the provinces at a point in time; and there is province-specific first-order autocorrelation. FGLS corrects for these problems and provides more efficient estimates than OLS. The FGLS estimates are presented in columns 1 and 2 of Table 3.

Results on the legislation variables are similar across specifications. In both specifications the coefficient on the mandatory vote dummy is negative and significant at more than the 99% confidence level. The evidence suggests that

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negative and significant at greater than the 99 percent level in all specifications.

[29] The results on the mandatory vote coefficient are not very sensitive to the inclusion of covariates The coefficient on the mandatory vote dummy variable is negative and significant at the 90 percent level in a regression that includes only the legislation variables. When province fixed effects are added to this regression the mandatory vote coefficient is negative and significant at greater than the 99 percent level. Other specifications were estimated. These specifications included (national) year dummies, quadratic province-specific time trends and various forms of the environment variables (the quadratic unemployment rate, the proportionate rate of change in the unemployment rate, the rate of change in inflation, and quadratic union density). In any specification that included the legislation variables and the province dummies the coefficient on the mandatory vote dummy variable was negative and significant at at least the 90 percent level. The negative effect of mandatory votes on certification success is robust across many specifications.

mandatory representation vote legislation reduces certification success rates by approximately 9 percentage points below what they would have been under card check. Since the mean value of the certification success rate for the sample is 69 percent this represents a reduction of 13 percent in the certification success rate when mandatory vote legislation is in force. The coefficients on first agreement arbitration and compulsory dues checkoff are never significantly different from zero. Since these legislative variables are likely to be positively correlated with political support for unionization but are ambiguously related to certification success these results provide further confirmation that the negative significant coefficient on the mandatory vote dummy variable is not just reflecting legislative endogeneity.

Results on the environment variables are mixed. The coefficients on the cyclical variables are similar in both specifications: the unemployment rate is always negative and significant; the inflation rate is never significantly different from zero. Higher unemployment rates appear to reduce certification success. Coefficients that describe structural factors vary across the specifications. The industry mix coefficient is positive and significant in Specification #1. It may be that this coefficient is not significant in Specification #2 because the province-specific time trends introduced in this specification capture most of the variation in this variable. The sign on the industry mix coefficient confirms prior expectations. The coefficients on percent female, percent part-time, and

provincial union density are usually not significantly different from zero.

Win Rate Results.

The same specifications are estimated using the win rate as the dependent variable. These results are presented in columns 3 and 4 of Table 3. Diagnostic tests indicate that FGLS can improve the efficiency of Specification #3 by correcting for heteroscedasticity across provinces; correlation between provinces; and province-specific first-order autocorrelation. Diagnostic tests indicate that FGLS can improve the efficiency of Specification #4 by correcting for heteroscedasticity across provinces and correlation between provinces.

When the percentage of newly certified firms rather than the certification success rate is used as the dependent variable, the coefficient on the mandatory vote dummy continues to be negative and significant at more than the 99% level in all specifications. The coefficient on the first agreement arbitration dummy variable is never significantly different from zero. The coefficient on compulsory dues checkoff is negative and significant in the FGLS result for Specification #4. Coefficients on cyclical variables perform similarly in both specifications. The coefficient on the unemployment rate is always negative and significant. The coefficient on the inflation rate is always positive and significant. The structural variables present fairly consistent results. The percent female coefficient is always significant and negative as expected. Percent part-time and union density coefficients are never significantly different from zero. The coefficient on

industry mix is negative and significant in Specification #3 otherwise it is not significantly different from zero.

The results from the win rate specifications confirm that a significant, negative relationship exists between mandatory representation votes and certification success.

7. Conclusions

The results presented in this paper show that mandatory vote legislation reduces certification success rates approximately 9 percentage points below what they would be under card check. This result is robust across different specifications and significant at more than the 99% confidence level. The cross-section time-series approach used to obtain these results is preferred to either a pure time-series or a pure cross-section approach. First, it incorporates more variation. Second, it allows the inclusion of province dummy variables and province-specific time trends that address the problem of unobserved heterogeneity and may provide a remedy for legislative endogeneity. This means that we can have some confidence that the impact of mandatory votes on certification success has been correctly identified.

These results are relevant to policymakers who should be aware that the type of recognition procedure affects certification success and will influence the ability of unions to maintain and expand their membership. The evidence helps

us to understand why the labour movements in North America and the U.K. have supported card check recognition procedures while business has preferred mandatory votes. The results also suggest that differences in recognition procedures between the U.S. and Canada may provide a potential explanation for why Canada's unionization rate is higher than that of the U.S.

Table 1*

Mandatory Representation Votes, Compulsory Dues Checkoff and First Agreement Arbitration in Canada 1976-1997**			
Jurisdiction	**Mandatory Vote**	**Checkoff**	**First Agreement**
Federal		84:7	78:4
Newfoundland	94:2	85:6	85:6
PEI			not yet proclaimed***
Nova Scotia	77:5		
New Brunswick			
Quebec		77:12	77:12
Ontario	95:11	80:6	86:5
Manitoba	97:2	72:11	82:2
Saskatchewan		72:5	94:6
Alberta	88:11		
British Columbia	84:6 to 93:1	77:9	73:11

*Sources for Table 1 are found on the following page.

**The numbers in the cells of the table indicate the year:month the legislation is introduced. In almost all jurisdictions the legislation remains in force until the end of 1996. The one exception is mandatory vote legislation in B.C. that was repealed in January, 1993.

***Legislation to introduce First Agreement Arbitration was passed in PEI on May 19, 1994. It comes into force on proclamation. It is not yet in force.

Sources for Table 1:

Labour Legislation in Canada, 1949-50. Ottawa: Department of Supply and Services,

Labour Legislation of the Past Decade: A Review of Developments in Canadian Labour Legislation for the 1951-1960 period. Ottawa: Dept. Of Supply and Services, 1961.

Department of Labour, Legislation Research Branch, Recent Legislation and Administrative Developments. Ottawa: Department of Supply and Services, 1961, 1962, 1963, 1964, 1965, 1966.

Labour Canada, Legislative Research Branch, Developments in the Enactment and Administration of Labour Law in Canada. Ottawa: Ministry of Supply and Services, 1966-67, 1967-68, 1968-69, 1969-70, 1970-71.

Labour Canada, Legislative Review. Ottawa: Department of Supply and Services, volumes 1 through 22, covering the period from 1973 to 1989-90.

HRDC, Highlights of Major Developments in Labour Legislation. This covers the period from 1990 to 1998 and is available from the HRDC website: http://labour-travail.hrdc-drhc.gc.ca/policy

Table 2

Variation in Legislative Environments of Nine Canadian Jurisdictions from 1978 to 1996			
Legislative Environment			Number of Observations
Mandvote	Firstarb	Checkoff	
no	no	no	38
yes	no	no	28
no	yes	no	0
no	no	yes	26
yes	yes	no	0
no	yes	yes	65
yes	no	yes	0
yes	yes	yes	14
		Total	171

Table 3: Results				
Dependent Variable	**Certification Success Rate (certrate)**		**Win Rate (winrate)**	
Specification	**#1**	**#2**	**#3**	**#4**
mandvote	-9.08(.959)**	-8.88 (1.07)**	-.052 (.019)**	-.140 (.018)**
checkoff	-.55 (2.33)	-2.42 (2.35)	-.014 (.024)	-.064 (.030)
firstarb	-.28 (1.44)	-3.23 (1.69)	.028 (.015)	-.006 (.019)
mix	2.71 (0.79)**	1.05 (.837)	-.018 (.009)*	-.015 (.011)
female	-.28 (0.27)	-.09 (.042)	-.023 (.004)**	-.020 (.006)**
partime	1.18 (0.38) *	.56 (0.51)	.009 (.005)	.007 (.006)
density	0.26 (0.20)	0.08 (0.23)	.004 (.002)	-.002 (.003)
uerate	-1.21 (0.14)**	-1.22 (0.22)**	-.016 (.003)**	-.018 (.003)**
pdot	.06 (0.10)	.07 (0.12)	.006 (.002)**	.006 (.002)**
bc	3.44 (2.85)	7.67 (4.50)	.124 (.061)*	.409(.064)**
alta	-3.89 (2.98)	-5.46 (5.79)	-.064 (.043)	-.196 (.067)**
sask	25.52 (5.86)**	8.71 (8.60)	-.122 (.073)	-.058 (.113)
man	12.42 (3.33)**	5.31 (5.83)	-.103 (.041)*	-.070 (.062)
ont	-.03 (2.62)	-5.98 (4.87)	.047 (.032)	.035 (.044)
que	11.42 (2.67)**	12.37 (4.43)**	.271(.068)*	.647(.057)**
ns	19.99 (1.65)**	16.56 (3.00)**	.164 (.035)**	.168 (.041)**
nfld	7.05 (3.78)	5.06 (7.50)	.205 (.048)**	.218 (.063)**
bctime		-.23 (0.28)		-.012 (.004)**
altime		-.56 (0.34)		.011 (.004)*
satime		.61 (0.33)		.002 (.004)
matime		.45 (0.33)		.004 (.003)
ontime		.35 (0.27)		.004 (.003)
qutime		-.25 (0.26)		-.022 (.004)**
nbtime		-.28 (0.33)		-.0009 (.003)

nstime		-.045 (0.28)		.005 (.004)
nftime		.36 (0.39)		.009 (.005)*
constant	-18.73 (28.70)	42.70 (31.33)	1.56 (.339)**	1.60 (.441)**
Diagnostic Statistics (1)				
Wald (2)	136.05**	131.21**	256.57**	149.66**
Likelihood Ratio (3)	74.21**	76.68**	61.27**	52.26**
Autocorrelation Statistic (4)	.1104	.1873	2.81	.3394
Autocorrelation Statistic (5)	6.59* 5.74*	6.92*	12.82** 11.91** 10.39** 5.72*	

The numbers in brackets are standard errors.
**significant at at least the 99 per cent level
* significant at at least the 95 per cent level

(1) The FGLS specification was chosen based on a significance of at least 95%.
(2) The null hypothesis for the Wald Statistic is that of homoscedastic errors cross provinces.
(3) The null hypothesis for the Likelihood Ratio Statistic is that there is no correlation between the error terms of the provinces at a point in time.
(4) The null hypothesis for this autocorrelation statistic is that there is common first-order autocorrelation across provinces.
(5) The null hypothesis for this autocorrelation statistic is that there is province specific first-order autocorrelation. There are nine test statistics - only those that are significant at at least the 95 percent level are reported.

Data Appendix

The data are annual and cover the period from 1978 to 1996. The data set begins in 1978 because data on the number of business enterprises by province are only available from 1978. Nine Canadian provinces are represented in the data. Prince Edward Island is omitted because no certification data are readily available for this province. (P.E.I. is a very small province with a total population of approximately 100,000.) The federal jurisdiction is omitted because data on the explanatory variables for this sector are not available. Descriptive statistics for all of the variables used in the study are presented in Table A1.

Dependent Variables

The certification success rate (*certrate*) is defined as the percentage of disposed certification applications that are granted. The data on certifications granted and certifications disposed come from Martinello (1996a). This publication provides information on all jurisdictions except Prince Edward Island. Data are available from as early as 1951, for some jurisdictions, to 1993 or 1994. Professor Martinello kindly provided updated figures until 1996. The data are compiled from the Annual Reports of the private sector Labour Relations Boards (LRBs) of the various jurisdictions and include information on certifications in the public and private sector as well as the construction industry. Note that the data used for this paper do not allow us to distinguish between certifications granted to unions organizing new bargaining units and those granted to unions organizing existing bargaining units through raids or displacements. Such information is available only on a very limited basis in the Annual Reports.

Special Notes on British Columbia and Alberta[30]

In 1988 legislation was passed in British Columbia that extended bargaining rights to teachers. The teachers responded by certifying the professional association that had functioned as their union. This change in coverage accounted for 75 certifications granted and disposed in 1988. Since this paper is not addressing the impact of changes in coverage on certification success the 1988 numbers for certifications filed, granted and disposed in B.C. in 1988 have been reduced by 75 to eliminate the impact on certification success of this legislative change.

Data for certifications disposed and certifications granted in 1986 and 1987 are not available in Alberta due to computer problems at the Labour Relations Board. These numbers are created using the same procedure as Martinello (1996a). Since the average ratio of certifications filed to certifications disposed is approximately one, certifications disposed is set equal to certifications filed for these two years. Certifications granted is obtained by multiplying certifications filed in 1986 and 1987 by the average of the ratio of certifications granted to certifications filed in 1989 and 1990. This later period is used because a judicial ruling in 1984 that was later overturned meant that certification behaviour over the earlier period (1984, 1985) was highly unusual. Unfortunately it is not possible to adjust the data to eliminate the effect of the ruling. 1988 is not used because the computer problems meant that the data in 1988 only covers four

[30]All of the detailed information concerning British Columbia and Alberta comes from Martinello (1996a).

months of the year.

The win rate (*winrate*) is defined as the percentage of firms where certifications are granted. The data on number of firms are provided by the Business and Labour Market Analysis Division, Statistics Canada from its Longitudinal Employment Analysis Program (LEAP).[31] The LEAP system is a longitudinal micro-database on businesses in the Canadian economy constructed through a record linkage of administrative data from Revenue Canada and Employment and Immigration Canada and Statistics Canada survey data. Only businesses that have paid employees in Canada are considered. The term business includes all businesses or organizations which during a reference year have remitted social security and tax deductions on behalf of these employees to Revenue Canada. Establishment data are only available from 1978. Almost all the LRB Annual Reports cover a 12 month period. However occasionally a LRB Report covers as short a period as 4 months or as long a period as 15 months. This is not an issue in the construction of the certification success rate variable since both the numerator and denominator of this variable are defined for the same period of time. For the win rate variable it is necessary to annualize certifications granted using the information on the length of time (in months) the Annual Report covers. This information is available in Martinello (1996a).

Legislation Variables

Mandatory representation votes (*mandvote*), compulsory dues checkoff

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[31]I would like to thank John Baldwin and Bob Gibson at Statistics Canada for kindly providing these data.

(*checkoff*) and first agreement arbitration (*firstarb*) are captured using dummy variables. In each case the variable is equal to zero if the legislation is not in force in the period. It is equal to one when it is in force. It is equal to the fraction of the year that it is in force in the year it is introduced (months in force/12).

The data for this variable are compiled from the sources listed in Table 1. Where possible the data are cross-checked against information available in other studies (e.g. Martinello (1996a).)

Economic Environment

The unemployment rate (*uerate*) for each province is the relevant series from the Labour Force Survey, Annual Averages database on CANSIM. (Series numbers: D987851, D987569, D987287, D987005, D986723, D986441, D986159, D985877, D985313).

The inflation rate for each province (*pdot*) is calculated from the CPI- All Items for its largest city (1986=100). Again the source of this information is the CANSIM database (Series numbers: P818800, P818600, P818200, P817800, P817000, P816400, P816600, P816000)

Employment and Industry Mix

The industry mix variable (*mix*) is described in the paper. The base weights for the measure are the national unionization rates for each industry in 1976. The Corporation and Labour Unions Returns Act (CALURA) provides unionization rates for eleven industry groups in 1976. The 'employment rate' for each industry, in each year, for each province is calculated using data on

employment that correspond to each of eleven industry groups of the unionization data and data on total employment in the province. The industry groups are; agriculture; forestry; fishing and trapping; mines, quarries and oil wells; manufacturing; construction; transportation, communication and other utilities; trade; finance; service industries; and public administration. These data, as well as the data necessary to construct the percent of employment that is part-time (*partime*) and the percent of employment that is female (*female)* are from the Labour Force Survey, Annual Averages and were accessed through the CANSIM database. (Series numbers: (total employment) D987714, D987342, D987150, D986868, D986586, D986304, D986022, D985740, D985176; (employment by industry) D987751-D987765, D987469-D987583, D987469-D987483, D987187-D987201, D986905-D986919, D986624-D986637, D986341- D986355, D986059-D986073, D985777-D985791, D985213-D985227; (female employment) D987732, D987450, D987168, D986886, D986604, D986322, D986040, D985758, D985194; (part-time employment) D987797, D987515, D987233, D986951, D986669, D986387, D986105, D985823, D985259.)

Union Saturation

The union density concept used in the empirical analysis is defined as:

$$\text{density} = \frac{\text{union members}}{\text{paid labour force}} \times 100$$

The series on union membership comes from the Corporation and Labour Unions Return Act (CALURA). This was discontinued in 1992. Statistics Canada

continued to collect comparable data until 1995. The data from the period from 1993 to 1995 are available from Statistics Canada, Unionization in Canada: A Retrospective. (Catalogue No. 75001-SP) Supplement, Summer 1999. The 1996 union density data for each province is constructed by fitting a linear trend to the existing union density series for each province. The CALURA series itself is not entirely consistent because of a revision in 1983. It also does not cover all union members because only unions with 100 or more members were required to report.

I have defined potential union members as the "paid labour force". The paid labour force is equal to the total labour force minus those who are self-employed. Again the data are from the LFS. Annual Averages on the CANSIM database.(Series numbers: (labour force) D987677, D987395, D987113, D986831, D986549, D986267, D985985, D985703, D985139; (self-employment) D987769, D987487, D987205, D986923, D986641, D986359, D986077, D985795, D985231)

Table A1: Descriptive Statistics (1978-1996)					
Variable	Observations	Mean	Std. Dev.	Min	Max
certrate	171	69.04	10.84	39.53	97.65
winrate	171	.25	.15	.05	.79
mandvote	171	.23	.42	0	1
checkoff	171	.61	.49	0	1
firstarb	171	.45	.49	0	1
mix	171	28.74	2.38	22.34	33.20
female	171	42.37	2.75	34.26	46.21
partime	171	16.90	3.04	8.57	23.29
density	171	31.01	4.84	21.20	43.92
uerate	171	10.51	3.71	3.80	20.80
pdot	171	5.02	3.19	-1.46	13.26

Appendix One: Causality Tests

The empirical analysis presented in the body of the paper suggests that mandatory representation votes have a significant negative effect on certification success. This result could be spurious due to the endogeneity of legislation. If public opinion has turned against unions it may be that the introduction of mandatory vote legislation really has no effect on certification success but rather the decrease in certification success reflects declining public support of unions. It is possible to test for the exogeneity of mandatory vote legislation directly using a Granger/Sims approach. The basic idea behind this test is that if mandatory vote legislation is exogenous and has a negative effect on the level of certification success this effect should only be observed in periods after the legislation is introduced. In order to perform this test dummies are created that capture the timing of the introduction of mandatory vote legislation:

D03 : equals 1 three years before mandatory votes are introduced and zero in all other years.
D02: equals 1 two years before mandatory votes are introduced and zero in all other years.
D01: equals 1 one year before mandatory votes are introduced and zero in all other years.
D00: equals 1 in the year mandatory votes are introduced and zero in all other years.
D10: equals 1 in the first year after mandatory votes are introduced and zero in all other years.
D20: equals 1 in the second year after mandatory votes are introduced and zero in all other years
D30: equals 1 in the third year after mandatory votes are introduced and zero in all other years.

A number of specifications are estimated that incorporate these dummies. These results are shown in Tables A2 and A3. All specifications are estimated

using OLS. In all these specifications there is no indication of declining levels of certification success in the periods prior to the introduction of mandatory vote legislation. The coefficients on the leading dummies (D03, D02 and D01) are typically not significant and if significant are positive in sign.

Table A2: Causality Tests- dependent variable is the certification success rate						
Variable	#1	#2	#3	#4	#5	#6
D03	7.49(3.2)*	4.67 (3.18)	4.77(3.12)	7.96(3.14)*	5.55 (3.24)	5.72(3.21)
D02	4.99 (3.26)	1.63 (3.23)	1.76(3.17)	5.36 (3.21)	2.30 (3.36)	2.65(3.33)
D01	1.91 (3.22)	-.92 (3.16)	-.62(3.11)	2.87 (3.18)	.02 (3.29)	.51 (3.27)
D00	-.42 (3.25)	no	5.08(3.33)	.511 (3.27)	no	3.49(3.42)
D10	.78 (3.15)	no	6.57(3.27)*	2.76 (3.18)	no	5.80(3.36)
D20	-.11 (3.18)	no	5.57(3.29)	2.07 (3.24)	no	4.97 (3.39)
D30	-1.49(3.58)	no	3.41(3.58)	1.44 (3.50)	no	3.80 (3.57)
mandvote	no	-7.05(1.99)**	-10.5(2.41)**	no	-4.34(2.57)	-7.24(2.92)*
firstarb	.14 (2.30)	.57 (2.22)	-.15(2.18)	-2.14 (2.83)	-2.78(2.82)	-2.64(2.79)
checkoff	-.47 (3.21)	-.68 (3.10)	-1.51(3.06)	1.20 (4.12)	-1.00(4.16)	-.75(4.12)
structural variables	yes	yes	yes	yes	yes	yes
cyclical variables	yes	yes	yes	yes	yes	yes
province dummies	yes	yes	yes	yes	yes	yes
province time trends	no	no	no	yes	yes	yes

Standard errors are in parentheses.
* Significant at at least the 95 percent level.
**Significant at at least the 99 percent level.

Table A3: Causality Tests - dependent variable is the winrate.						
Variable	#1	#2	#3	#4	#5	#6
D03	.08 (.04)*	.07 (.04)	.07 (.04)	.08 (.03)*	.03(.03)	.03(.03)
D02	.10 (.04)*	.08 (.04)	.08 (.04)*	.09(.04)**	.04(.04)	.04(.04)
D01	.02 (.04)	.003(.04)	.004(.04)	.006(.04)	-.04(.03)	-.04(.03)
D00	-.02(.04)	no	.004(.04)	-.03(.04)	no	.03(.04)
D10	-.06 (.04)	no	-.03(.04)	-.05(.04)	no	.01(.04)
D20	-.06 (.04)	no	-.03(.04)	-.05(.04)	no	.006(.04)
D30	-.07 (.04)	no	-.05 (.05)	-.05(.04)	no	-.007(.04)
mandvote	no	-.07(.03)*	-.05 (.03)	no	-.14(.03)**	-.15(.03)**
firstarb	.05 (.03)	.05 (.03)	.05 (.03)	.03(.03)	.01 (.03)	.02(.03)
checkoff	-.004(.04)	-.01 (.04)	-.009(.04)	-.002(.05)	-.04 (.04)	-.04(.04)
structural variables	yes	yes	yes	yes	yes	yes
cyclical variables	yes	yes	yes	yes	yes	yes
province dummies	yes	yes	yes	yes	yes	yes
province time trends	no	no	no	yes	yes	yes

Standard errors are in parentheses.
* Significant at at least the 95 percent level.
**Significant at at least the 99 percent level.

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CHAPTER TWO

Canadian Union Density 1980-1998 and Prospects for the Future: An empirical investigation[1]

1. Introduction

Union density is considered one indicator of the health of the union movement. In the 1960s and 70s Canadian union density increased. From the late 1970s through the 1980s union density was fairly stable. Since 1992 Canadian union density has declined. What explains the behaviour of Canadian union density in the 1980s and 1990s? Why has Canadian union density been falling? What could happen to union density in the future? How can the union movement respond to the challenges it faces? This paper attempts to answer these questions by providing a detailed empirical analysis of Canadian union density from 1980 to 1998 and then using this information to project union density for 1999 to 2030.

The first section describes the behaviour of Canadian union density from 1950 to 1999 and examines the behaviour of union membership growth and

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employment growth over this period. In the second section stock-flow growth accounting analysis is used to investigate union membership growth from 1980 to 1998. The stock-flow accounting identity allows union membership growth to be decomposed into two sources of growth: growth due to the net flow of newly certified members ('recognition'); and growth due to 'economic and other' factors. These sources of growth are compared and then each is examined in greater detail. Net growth due to 'recognition' is further decomposed to consider the role of a number of factors, including the organization rate and the certification success rate, in this component of growth. Net growth due to 'economic and other' factors is examined using regression analysis to test for the impact of structural and cyclical factors. The regression results concerning structural change are corroborated using shift-share analysis. The third section links the stock-flow accounting identity for union membership directly to union density. The resulting difference equation is used to project possible growth paths for Canadian union density over the next thirty years. Estimates of the magnitude of net growth due to 'recognition' necessary to sustain union density at its current levels in the future are provided.

2. Canadian Union Density 1950 to 1999

Figure 1 describes Canadian union density from 1951 to 1999. Union density in time period 't' is defined as:

$$(1) \qquad \text{density}(t) = \frac{u(t)}{e(t)} \quad X \quad 100$$

Union membership (u(t)) includes all public and private sector union and employee association members. These data are from the Workplace Information Directorate union membership series published, until 1998, in the Directory of Labour Organizations and since that time in the Workplace Gazette. Employment (e(t)) is non-agricultural paid employment. These data are from the same source as the membership data.[2] Figure 1 shows that Canadian union density increases in the 1950s, decreases in the early 1960s and then increases through the mid-60s to the mid-70s. This expansion is associated with the introduction of labour laws that allowed the unionization of the public sector. From 1975 to 1992 Canadian density is fairly stable - fluctuating countercyclically between 34 and 36 percent. From 1992 to 1999 Canadian union density declines from 36 percent to 31 percent. This is the longest period of decline in union density in the last fifty years.

Changes in union density over time (d(u/e)/(u/e)) depend positively on union membership growth (du/u) and negatively on employment growth (de/e):

$$(2) \qquad \frac{d(u/e)}{(u/e)} = \frac{du}{u} - \frac{de}{e}$$

[2]For a brief discussion of union density and more details on the data please see the Data Appendix.

Figure 2 plots union membership growth. The most striking feature of this plot is the downward trend in union membership growth. Union membership growth is high in the mid-60s and early-70s and ranges from 4 to 10 percent, through the 80s growth is slower and ranges from 1 to 3 percent, by the 90s growth rates are often negative and range from -1 to 1 percent. Figure 3 plots non-agricultural paid employment growth. The deep recessions in the early 80s and 90s as well as the slow recovery from the 90s recession are evident in the plot. Figure 4 plots both the employment growth rate and the union membership growth rate. In the 60s and 70s union membership growth is frequently higher than employment growth. In the 80s and 90s union membership growth is higher than employment growth only during recessions. Canadian union density remains relatively stable in the 80s and early 90s, despite declining union membership growth because the Canadian economy performed poorly over much of this period. Union density declines from 1992 to 1999 because union membership growth remains low while employment growth rises as the economy gradually recovers from the recession.

In summary, the stability of union density from 1975 to 1992, often considered an indicator of the health of the labour movement, masks a long run decline in union membership growth. In the 1980s and early 1990s union density only increases during recessions when employment growth is very low. From 1992 when the union membership growth rate is low and often negative the

economic recovery results in increasing employment growth and declining union density.

3. Union Membership Growth - a stock-flow accounting analysis

What accounts for the long run decline in union membership growth? In order to answer this question a stock-flow accounting analysis is used. This type of analysis has been used by Dickens and Leonard (1985), Freeman (1985, 1988) Farber and Western (2000), and Johnson (2001) to examine union membership growth in the U.S. To my knowledge this is the first attempt to apply a stock-flow growth accounting framework to examine union membership growth in Canada.

3.1 The Basic Framework

The following stock-flow accounting identity forms the basis of the analysis:

(3) u (t) - u(t-1) = newly certified union members (t)

-newly decertified union members (t) + residual (t)

The identity presents three sources of growth (or decline) in union membership: (1) flows into the stock of union members from newly certified bargaining units; (2) flows out of the stock of union members from newly decertified bargaining

units; and (3) a residual. I will label the net flow due to certifications and decertifications as 'recognition'. The residual captures factors other than recognition that affect the flow of union members. Such factors include the expansion and contraction of existing bargaining units due to layoffs, new hires, plant closures and plant expansions. These adjustments could be associated with either cyclical or structural economic change. Therefore I label the residual 'economic and other' factors. Dividing through the union membership accounting identity (3) by lagged union membership allows union membership growth to be decomposed into the percent growth due to 'recognition' and the percent growth due to 'economic and other' factors.

Data available for Canada allow the union membership accounting identity (3) to be expressed as:

$$(4) \qquad u(t) - u(t-1) = [\, orgrate(t) * certrate(t) * nu(t)] - [\, dorgrate(t) * dcertrate(t) * u(t)] + [residual(t)]$$

where:

u (t) = union members at time t

nu (non-union workers) = non-agricultural paid employees union members

$$orgrate\ (organization\ rate) = \frac{certification\ applications\ processed * certsize}{non\text{-}union\ workers}$$

certsize = mean size of bargaining unit certified

certrate (certification success rate) = $\frac{\text{certifications granted}}{\text{certification applications processed}}$

dorgrate(decertification organization rate)= $\frac{\text{decertification applications processed} * \text{dcertsize}}{\text{union members}}$

dcertsize(size of unit decertified) = mean size of bargaining unit decertified

dcertrate (decertification success rate) = $\frac{\text{decertifications granted}}{\text{decertification applications processed}}$

residual = the same variable as in (3).

When the stock-flow accounting identity is written in this manner the underlying factors that contribute to the flows of newly certified and newly decertified workers are clearly identified and can be calculated with data available for Canada. The left hand side of the expression is the change in union membership from (t-1) to (t). The first expression (in square brackets) on the right hand side is the number of newly certified employees, the second expression (in square brackets) is the number of newly decertified employees. The factors that determine newly certified and decertified workers are described below. These two expressions combined equal the net flow of newly certified members.

The last term is the residual that captures the expansion and contraction of existing bargaining units and ensures the identity holds.[3] When equation (4) is divided by lagged union membership the sources of growth can be split into 'recognition' and 'economic and other' components.

3.2 Implementation of Stock-flow accounting framework for Canada

The stock-flow accounting analysis is implemented for Canada from 1980 to 1998. The period studied is determined by data availability.[4] Union membership and non-agricultural paid employment for Canada are the same series used earlier for calculating Canadian union density. The data on certifications and decertifications are compiled from the annual reports of the private sector provincial and federal Labour Relations Boards (LRBs).[5] Most para-public and public employees are covered by the private sector LRBs (actual coverage varies by jurisdiction). There are no data available for Prince Edward Island or for union

[3]When a union is certified all employees in the bargaining unit are covered by the union whether or not they choose to become union members. The left hand side of this expression measures union members. Certification and decertification flows measure coverage. Equality is maintained through the residual. Data that would allow the identity to be defined solely in terms of union members or in terms of covered employees are not available. Using household survey data Galarneau (1996) indicates that coverage is only 4 to 5 percentage points higher than membership in Canada from 1984, and 1986 to 1990.

[4] For a detailed description of the data used in the stock flow accounting analysis for Canada please see the Data Appendix.

[5] Certification and decertification data to 1993 are from Martinello (1996) with updates to 1996 kindly provided by Professor Martinello. I added the data for 1997 and 1998. For more detail please see the Data Appendix.

members that are not under the jurisdiction of the private sector LRBs. The data on certifications do not distinguish between raids (where one union replaces another as the bargaining agent for the workers) and new certifications.

Data limitations affect the residual. The residual is higher than it should be because omitted groups are included in the union membership numbers that are not included in the certification numbers (PEI, some public and para-public employees and members of employee associations). The residual is lower than it should be because the right hand side of the identity measures coverage while the left hand side measures membership (see footnote 2) and because the certification data cannot distinguish certifications that involve raids.[6] To some extent these factors offset each other but these limitations mean that net growth due to 'economic factors and other' factors must be interpreted with care.

3.2 (a) Overview - the sources of growth

Figure 5[7] plots percent growth rates of union membership and its two

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[6]The residual is also understated when employee associations unionize. When this occurs there is no increase in the union membership number (because employee associations are already included) however there is an increase in the number of newly certified workers. Unfortunately no data are available that would allow adjustment to be made for this discrepancy.

[7]The union membership growth rate in Figure 5 is not identical to that in Figures 2 and 4. In section 2, when Canadian union density is examined, the stock data from the Workplace Information Directorate is converted to annual average union membership data so that it is comparable to the annual average non-agricultural paid employment data. Thus, in section 2, union density and the growth in employment and the growth in union membership are all based on annual average data. In section 3 of the paper, when the stock-flow accounting analysis is used, the annual flows of union members calculated from the Workplace Information Directorate data are matched as closely as possible to the time periods covered by the flows of net newly certified union members available from the Labour Relations Boards' Annual Reports. The union

components - net growth due to 'recognition'; and net growth due to 'economic and other' factors. As noted earlier, average union membership growth declines over this period: From 1980 to 1989 the mean growth rate is 1.74; From 1990 to 1998 the mean growth rate is -.05. Membership growth attributed to 'recognition' is remarkably stable over the period. It is always positive. It declines slightly over the period - it averages 2.1 percentage points in the 1980s and 1.7 percentage points in the 1990s. In contrast, net growth due to 'economic and other' factors is more volatile. In some periods the growth rate associated with the residual is positive, in others it is negative. Since 1990 union growth due to 'economic and other' factors has been negative in every year. The mean growth rate due to 'economic and other' factors falls from -.37 percentage points (1980 to 1989) to -1.72 percentage points (1990 to 1998). Since net growth due to 'recognition' is fairly stable changes in union membership growth can be traced primarily to the volatility and decline in net growth due to 'economic and other' factors.

3.2 (b) Net Growth due to 'recognition'

It is instructive to look at the underlying factors that influence net growth due to 'recognition'. These factors are explicitly included in the stock-flow identity (4). Figure 6 shows the number of workers involved in certifications and decertifications. The number of newly decertified workers is very small and

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membership growth rate in Figure 5 is the annual rate of change in union membership based on the annual flows. For more details on this issue please see the Data Appendix.

stable compared to the number of newly certified workers. Certification activity is clearly the more important factor when explaining net growth due to 'recognition'. Figure 7(a) plots the 'organization rate' (certification applications processed times average size of bargaining unit certified divided by non-union workers). This provides an estimate of the intensity of union organizing efforts.[8] The plot shows a decline in the organization rate over the period. Figures 7(b) and 7(c) plot certification applications processed and mean bargaining unit size respectively. The plots reveal a decline in the number of certification applications and an increase in average bargaining unit size. Figure 8 plots the certification success rate. This variable measures the proportion of unions that apply for certification that succeed in obtaining recognition. The plot shows a statistically significant downward trend in the certification success rate. Figures 9(a), 9(b), 9(c) and 10 plot analogous measures for decertification activity. The decertification organization rate, Figure 9(a), shows no trend over the period. Decertification applications processed (Figure 9(b)) increased to 1988 but since that time have declined. There has been no significant trend in the average size of bargaining unit decertified (Figure 9(c)). Decertification success rates also show

[8]When the average size of the bargaining unit *(certsize)* is multiplied by the total number of certification applications processed the result estimates the number of workers involved in certification attempts. When divided by the non-union labor force the quotient provides a measure of the intensity of union organizing efforts. (This is true so long as bargaining units that are successfully certified are not systematically larger or smaller than those that are not successful. This may not be the case. Farber (1999) suggests that smaller units are likely to be more successful. If so, the 'organization rate' underestimates union organization efforts.)

no significant trend over the period (Figure 10).

In summary net growth due to 'recognition' appears to be the most stable component of union growth. Certification activity is the most important component of 'recognition'. Decertification activity is not quantitatively important. Since net growth due to 'recognition' is relative to union membership it paints a rosier picture of certification activity than is warranted and conceals some important underlying trends. A careful examination of the factors that contribute to certification reveals that unions are filing fewer applications for certification and that when a union applies for certification it is less likely to succeed in obtaining bargaining rights.

3.2 (c) Net growth due to 'economic and other' factors

As noted above changes in union membership growth are largely explained by net growth due to 'economic and other' factors. Can this source of union membership growth be linked to the business cycle or to structural change? Dickens and Leonard (1985, henceforth DL) regress net growth due to 'economic and other' factors on a constant, a trend, real GDP growth and real GDP growth lagged to test for the impact of cyclical and structural factors. According to DL if the coefficient on the trend is significant this indicates that changes in economic structure play a role in the growth of union membership. DL interpret structural change as an accelerated change in union membership growth. Structural change

can also be interpreted as a constant rate change in union membership growth each year. This type of structural change is indicated by a statistically significant constant in the DL regression. In the last two decades the Canadian economy has experienced decline in sectors that are traditional union strongholds (manufacturing) and expansion of traditionally non-union sectors (services). If this has affected union membership growth the coefficients on the constant and/or trend will be negative. Statistically significant coefficients on the real GDP growth variables indicate sensitivity of net growth due to 'economic and other' factors to the business cycle. A priori the coefficients are expected to be positive since booms are likely to be associated with the expansion and recessions with the contraction of existing bargaining units. Table 1 presents the results of the DL regression for Canada from 1980 to 1998.

Let's begin by examining the evidence concerning the impact of the business cycle on net growth due to 'economic and other' factors. The coefficients on real GDP growth and lagged real GDP growth are positive but not significant. Net growth due to 'economic and other' factors does not appear to be sensitive to the business cycle. There are two reasons why this may be the case. First, the definition of union membership includes all 'dues-paying members'. This means that union members that are unemployed, laid off, on strike or retired are included. When union membership is not restricted to employed members it is expected that the residual would be less sensitive to cyclical factors. Second,

the definition of union membership includes groups that are not included in the certification and decertification data namely workers that are members of employee associations and some workers from para-public and public unions that are not covered by the private sector LRBs. These omitted groups end up in the residual. Since these groups work disproportionately in sectors of the economy (education, health, public) that are less sensitive to the business cycle it is likely that the residual will also be less sensitive to the cycle. Has structural change affected net growth due to 'economic and other' factors? The coefficients on the constant and the trend are negative but not significant. The regression provides no evidence to support the existence of structural change that results in either constant or accelerated changes in union membership over time. The regression results must be viewed with some skepticism. First, this methodology tests only indirectly for the impact of structural change using the residual from the stock-flow accounting identity. Second the residual imprecisely isolates economic factors because of data limitations. Third, the interpretation of the constant and trend terms described above is open to criticism. Therefore in order to corroborate this result I conduct a shift-share analysis. An index is created using the unionization rates in nine different industries (i) in 1983 (union (i,83)) and the employment share (emp (i,t)) in those same industries from 1980 to 1998[9]:

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[9] Data on union density by industry is from CALURA. 1983 is chosen as the base year because this is the first year in which the CALURA union membership data included employee associations. Therefore the definition of union membership is comparable to that used in the Workplace Information Directorate union membership series. For more details on industry

$$(5) \quad \text{Index}(t) = \frac{\sum_i \text{emp}(i,t) * \text{union}(i,83)}{\sum_i \text{emp}(i,83) * \text{union}(i,83)} \quad X \quad 100$$

This index shows how much union density would have changed if industry structure changed over the period and unionization rates by industry remained fixed at their 1983 values. Table 2 presents the values of this index from1980 to 1998. The index falls from 101.0 in 1980 to 98.5 in 1998. The decline in the index over the period is not monotonic - there are years where the index rises. This evidence suggests that from 1980 to 1998 economic structural change has a negligible effect on Canadian union density. The shift-share index indicates that structural change accounts for, at most, 3 percent of the decline in union density over this period. This amounts to a less than one percentage point decrease. The shift-share analysis provides support for the results of the regression analysis.

In conclusion, from 1980 to 1998 union membership growth in Canada stagnates or declines. Stock-flow accounting analysis allows union membership growth to be decomposed into two components; net growth due to 'recognition' and net growth due to 'economic and other' factors. 'Recognition' factors are fairly stable over the period and do not account for the decline in union membership growth. The apparent stability of 'recognition' conceals a significant

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classifications and the data used please see the Data Appendix.

decline in union organizing intensity and in certification success rates.

The source of the decline in union membership growth can be traced to 'economic and other' factors. Regression analysis shows that the decline cannot be linked to either cyclical factors or to structural change. Shift-share analysis supports the claim that structural change has not been important. Therefore the long run decline in union membership growth is a trend of largely unexplained origin.

4. The Future of the Union Movement in Canada

The stock-flow accounting identity for union membership can be linked explicitly to union density. This allows us to examine the direct contribution of 'recognition' and 'economic and other' factors to current union density and to consider the long run implications of recent trends for the labour movement in Canada.

The stock-flow accounting identity (4) can be written more compactly as:

$$(5) \quad u(t) = u(t-1) + recog\ (t) + econ(t)$$

where recog(t) is net new union members due to certifications and decertifications from (t-1) to (t) and econ(t) is the residual from (t-1) to (t) that reflects 'economic and other' factors. Dividing by non-agricultural paid employment at t (e (t)), multiplying by 100 and manipulating yields the following expression for union

density:

$$(6) \qquad density(t) \approx (1-g)*density(t-1) + (1-g)*\frac{recog(t) + (econ(t))}{e(t-1)} * 100$$

where g is the rate of growth of non-agricultural paid employment. The two expressions on the right hand side of the equation show that current density is determined by 'inertia' (lagged density) and the percent net flow of new union members. Inertia is based on the stock of union membership in the previous period and therefore makes the largest contribution to current union density. The percent net new union members accounts for only a very small part of current union density. Figure 11 decomposes the contribution of percent net new union members to current union density into its two components: 'recognition' and 'economic and other' factors. It is not surprising that the contributions of these two factors to current union density display identical characteristics to their contributions to union membership growth - the only change is that they are now scaled by employment rather than union membership so the levels are different.

What are the long run prospects for the Canadian union movement? Have these prospects changed in the last two decades? In order to address these questions the difference equation (6) is used to project the growth path of union density from 1999 to 2030 under three different scenarios. Each scenario makes different assumptions concerning the values of employment growth and percent

net new members. These assumptions are informed by the recent trends described earlier in the paper. In the first projection the averages of these variables over the period from 1980 to 1989 are used (2 percent employment growth; .6179 percent net new members) . The second uses the averages of these variables from 1990 to 1998 (.7 percent employment growth; -.0228 percent net new members). The third projection is more forward-looking. In the 1990s employment growth has been abnormally low (on average .7 percent) and in the future is likely to be higher. However employment growth is unlikely to be as high as it was in the 1970s and 80s when female participation increased and the baby boom generation entered the labour force. Therefore in the third scenario I assume that employment growth is 1.5 percent. In this scenario I continue to assume that percent net new union members is the average experience of the 1990s (-.0228 percent) since this experience appears to be part of the long run decline in union membership growth that began in the 1960s.

Figure 12 shows the three projections. If the experience of the 1980s characterizes employment growth and the percent net new members the union movement is able to hold its own. Union density is stable - by 2030 approximately 1 in 3 non-agricultural paid employees would be union members. In contrast to the 1980s, the changes that occurred in the 1990s, should they continue, place the union movement on a declining growth path - by 2030 only 1 in 4 non-agricultural paid employees would be union members. In the possibly

more realistic scenario where employment growth is 1.5 percent the decline in union density is even larger - by 2030 only 1 in 5 non-agricultural paid employees would be union members.[10]

These projections suggest the decrease in union density that began in 1992 is likely to continue. What can the union movement do to prevent further decline? Labour organizing activity can positively affect union density through its influence on net growth due to 'recognition'. Increases in this component of union growth can offset negative affects due to net growth due to 'economic and other' factors and employment growth. Equation (7) expresses the mathematical relationship among these three variables assuming that union density remains unchanged:[11]

$$(7) \qquad \frac{d\,recog}{u} = \frac{de}{e} - \frac{decon}{u}$$

To keep union density constant net growth due to 'recognition' (drecog/u) must

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[10] The steady state density for the 80s scenario is 30 percent. Since percent net new members is negative in the other two scenarios the steady state density in each of these cases is zero.

This analysis assumes the difference equation is linear. This may not be the case. Freeman (1998) suggests that the recognition component of percent net new members is related to union density. If union density becomes too low then organizing activity falls because the union movement has fewer resources. At the same time firms increase their resistance to unions because they perceive that unionization will place them at a competitive disadvantage in a largely non-unionized environment. If this is true then the decline in union density may be more rapid than that described by the linear model.

[11] Equation (7) is obtained by substituting the union membership growth decomposition into equation (2), setting d(u/e)/(u/e) equal to zero and solving for net growth due to 'recognition'.

exactly offset the growth in non-agricultural paid employment (de/e) net of any growth in union membership from factors other than recognition (decon/u). If net growth due to 'recognition' is larger than this union density will rise; if it is smaller density will fall.

In the 1980s employment growth averages 2 percent and net growth due to 'economic and other' factors averages -.4 percentage points. In order for union density to remain unchanged over the decade net growth due to 'recognition' must average 2.4 percentage points. In fact it averaged 2.1 percentage points and union density fell slightly. If the average conditions of the 1980s characterize the period from 2000 to 2030 to keep union density stable net growth due to 'recognition' must be 2.4 percentage points.

In the 1990s employment growth averages .7 percent and net growth due to 'economic and other' factors averages -1.7 percentage points. In order for union density to remain unchanged over this decade net growth due to 'recognition' must average 2.4 percentage points. In fact it averaged 1.7 percentage points and union density fell. If the average conditions of the 1990s persist in the period from 2000 to 2030 net growth due to 'recognition' must be 2.4 percentage points.

If, from 2000 to 2030, employment growth is 1.5 percent and net growth due to 'economic and other' factors continues to average -1.7 percentage points net growth due to 'recognition' must rise to 3.2 percentage points to keep union density stable.

If the projections provide a reasonable glimpse into the future, to maintain union density at its current level net growth due to 'recognition' would have to lie in the range of 2.4 to 3.2 percentage points. In only three of the nineteen years from 1980 to 1998 has net growth due to 'recognition' taken values over 2.4 and it has never been as high as 3.2. To maintain its presence in the economy this analysis suggests the union movement must increase net growth due to 'recognition'. Increasing the flow of newly certified members will achieve this objective. The stock-flow accounting analysis shows that two important factors that affect this flow, the 'organization rate' and the 'certification success rate', decline from 1980 to 1998. To increase net growth due to 'recognition' requires intensified effort by the union movement to organize workers in order to reverse the downward trend in the 'organization rate' and to offset the falling 'certification success rate' that has occurred in the last two decades.

5. Conclusions

The stability of union density from 1980 to 1992 conceals a long run decline in union membership growth that began in the late 1960s. By the 1980s union membership growth falls to the point where union density rises only during recessions when employment growth is low. In the 1990s union membership decreases further and is often negative. Despite the fact that over most of this decade employment growth is abnormally low, union density declines from 1992

to 1999. This is the longest period of decline in union density in the last fifty years.

The sources of union membership growth from 1980 to 1998 are examined using a stock-flow growth accounting framework. The decomposition reveals that net growth due to 'recognition' is positive and fairly stable from 1980 to 1998 while net growth due to 'economic and other' factors is more volatile and becomes increasingly negative over the period. A careful examination of the factors that affect net growth due to 'recognition' shows there has been a reduction in the intensity of union organizing activity and that when a union applies for certification it is less likely succeed. A closer look at net growth due to 'economic and other' factors using regression and shift-share analysis reveals that this component of union membership growth cannot be linked either to cyclical or structural changes in the economy.

Projections of union density based on the experience of the 1980s or the 1990s present very different pictures of the future of the union movement in Canada. Projections based on the 1980s predict that union density will be stable. Projections based on the 1990s (or for a more 'realistic' scenario where employment growth is not abnormally low) predict a decline in union density. If the experience of the 1990s persists it places the Canadian union movement on a fundamentally different growth path than would be expected had the experience of the 1980s continued. To prevent further declines in union density the union

movement can increase net growth due to 'recognition' by increasing its organizing efforts.

This research provides descriptive answers to the questions posed in the introduction to the paper. These answers allow us to see important underlying factors that have influenced Canadian union density in the last two decades and the challenges that face the union movement in the future. However this research leaves many questions unanswered such as: Why have union organization rates and certification success rates declined? What are the 'other' factors that are so important in determining union membership growth? Can these 'other' factors be linked to changes in public support for unions, employer resistance or public policy? What strategies are most likely to achieve organizing success in Canada? These questions provide the agenda for future research in this area.

Figure 1. Canadian Union Density 1951 to 1999

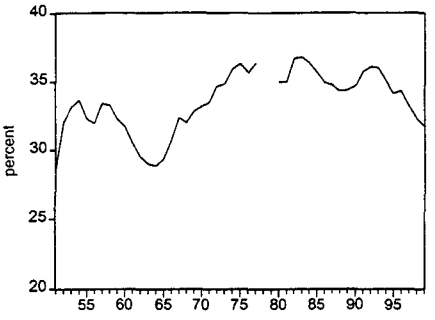

Figure 2. Union Membership Growth

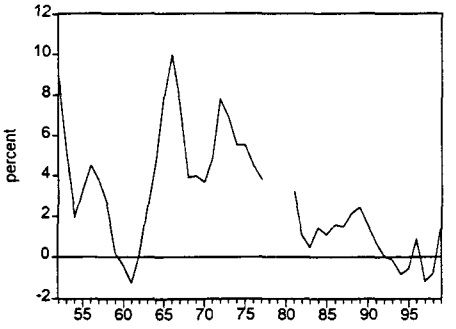

Figure 3. Non-agricultural paid employment growth

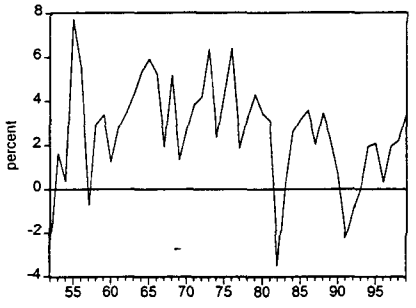

Figure 4. Union Membership and Non-agricultural Employment Growth

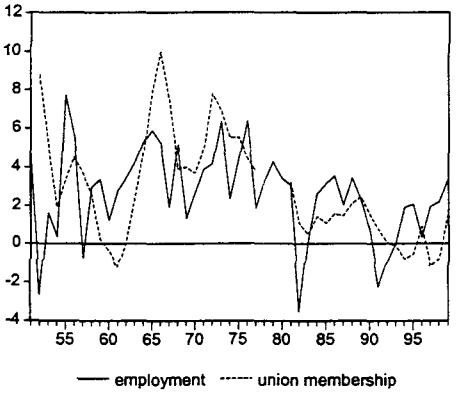

Figure 5. Sources of Union Membership Growth

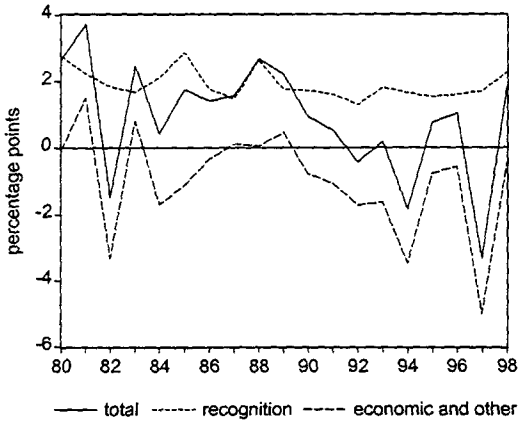

Figure 6. Flows of newly certified and newly decertified workers

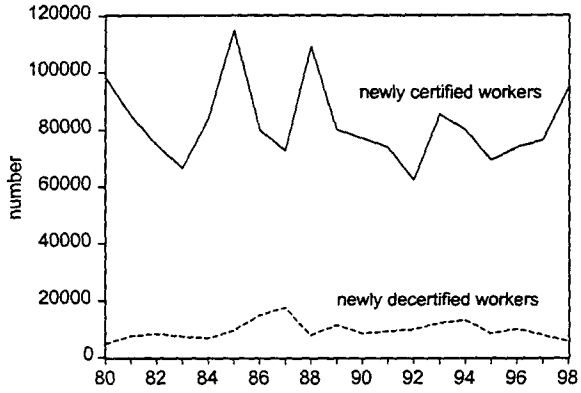

Figure 7a. Organization Rate

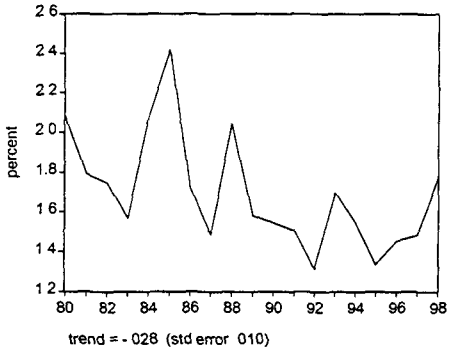

Figure 7b. Certification Applications Processed

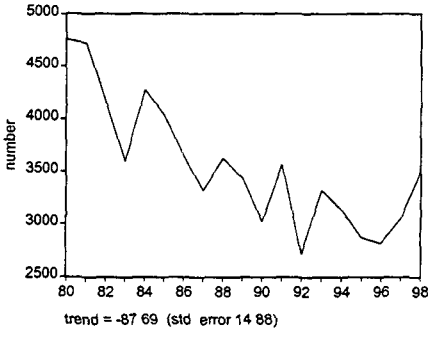

Figure 7c. Mean Size of Bargaining Unit Certified

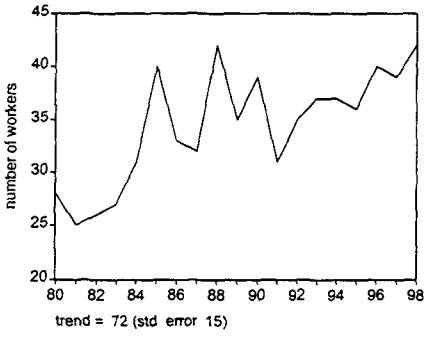

Figure 8. Certification Success Rate

Figure 9a. Decertification Organization Rate

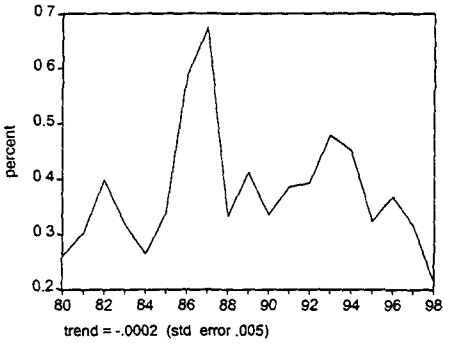

Figure 9b. Decertification Applications Processed

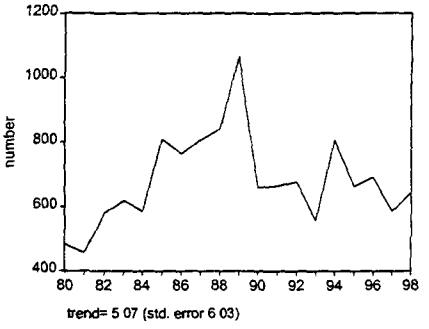

Figure 9c. Mean Size of Bargaining Unit Decertified

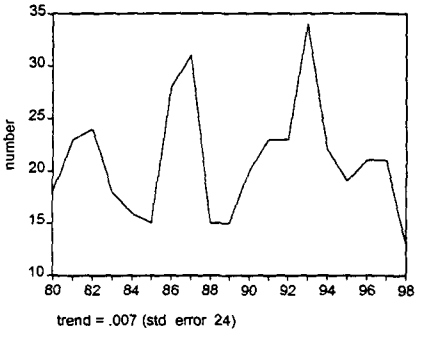

Figure 10. Decertification Success Rate

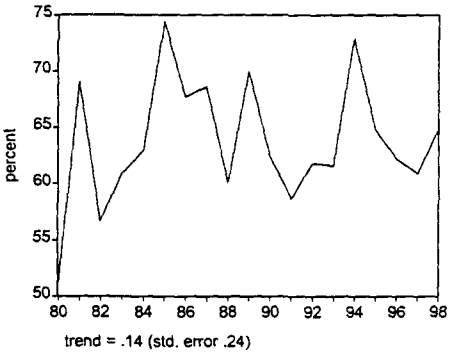

Figure 11. The contribution of 'recognition' and 'economic and other' factors to union density

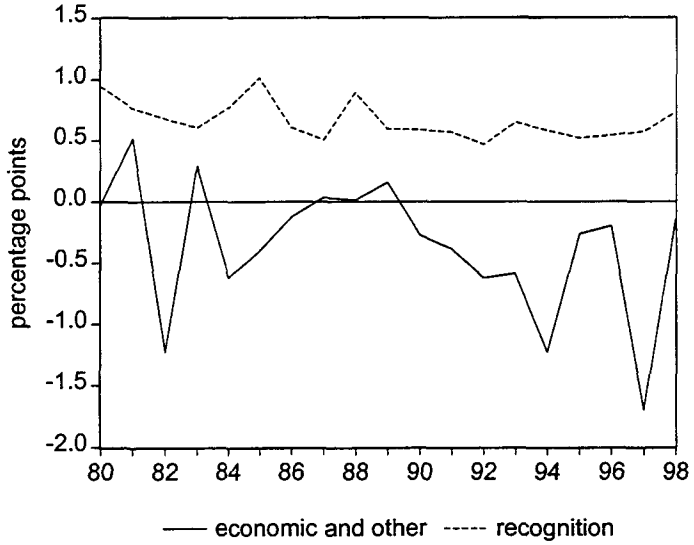

Figure 12. Projected Growth Paths of Union Density 1999-2030

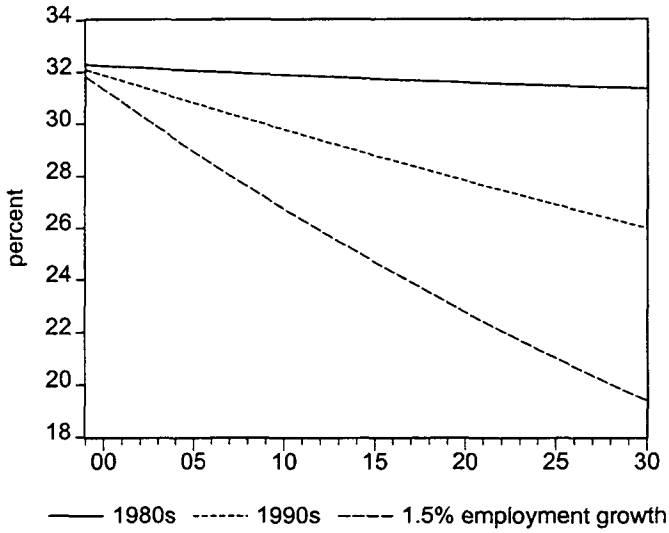

Table 1: Net Growth due to 'Economic and Other' factors Canada (1980-1998)	
Variable	Coefficient (standard error)
constant	-.09 (.90)
trend	-.11 (.07)
Real GDP growth	.05 (.17)
Lagged GDP growth	.03 (.17)
Diagnostics:	
R-squared	.17
D.W. Statistic	2.79

Table 2: Shift-Share Index for Canada 1980 to 1998	
Year	Index
1980	101.0
1981	101.1
1982	100.4
1983	100.0
1984	99.5
1985	99.5
1986	99.1
1987	99.2
1988	99.3
1989	100.0
1990	99.1
1991	98.4
1992	98.4
1993	98.4
1994	98.7
1995	98.4
1996	98.0
1997	98.3
1998	98.5

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DATA APPENDIX

Union Density

Definition

There are a number of ways that union density can be defined. Some definitions use 'union coverage' in the numerator. When a union is granted bargaining rights in Canada or the United States all members of the bargaining unit are represented (covered) by the union whether they choose to be union members or not. Data on coverage are available on a very limited basis in Canada (from the Survey of Union Membership for 1984, the Labour Market Activity Survey from 1986 to 1990, and the Labour Force Survey from 1997 to the present). Membership data are available over a longer time period. Therefore membership is used in the numerator rather than coverage. Various measures have been used as the denominator including; the civilian labor force; the non-agricultural labor force; the paid labor force; and employment. Non-agricultural paid employees is the definition used in this paper - this measure eliminates two groups that are not considered potential union members; agricultural workers and the self-employed.

Data

Aggregate Canadian union membership data from 1951 to 2000 are compiled by the Workplace Information Directorate (Human Resources Development Canada) and published in the Directory of Labour Organizations

survey that is voluntarily completed by unions or employee associations with 50 members or more. The survey asks the number of union/association dues paying members as of January 1 of the year. This series provides the only consistent data on union membership in Canada over the period from 1951 to 2000. No data are available for 1979 (no survey was conducted in this year). Union membership data for Canada are also available from the Corporations and Labour Unions Returns Act (CALURA) from 1962 to 1995.[12] Under CALURA unions (with over 100 members) were required by law to report membership and other information to Statistics Canada. Union members include those that are on strike, retired, laid-off or unemployed as of December 31 of the year. From 1983 employee association members are counted as union members. This represents a significant break in the series. CALURA is the only source for disaggregated information on union membership over time in Canada (e.g. union members by province or union members by industry etc.)[13] While CALURA is considered to provide the most reliable information on union membership in Canada, the Workplace Secretariate provides a longer, more consistent series on aggregate union membership; therefore this source is used for exploring union density over

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[12]CALURA was discontinued in 1992 but Statistics Canada continued to collect the data until 1995. The data from 1993 to 1995 are available in Statistics Canada, Unionization in Canada: A Retrospective (1999).

[13]There are a number of household surveys that provide information on aspects of union membership in particular years (Survey of Union Membership, 1984, Labour Market Activity Survey 1986-1990). Since 1997 such information is available from the new Labour Force Survey. CALURA provides disaggregated information from 1962 to 1995.

time and the stock-flow accounting analysis. Non-agricultural paid employment data are also from the series published by the Workplace Secretariate. Since 1976 this series is from the Labour Force Survey, Annual Averages.

The datum on Canadian union membership is the stock on January 1 of the year. Non-agricultural paid employment is an annual average over the year. The stock measure of union membership is converted to an annual average so measure is comparable to the denominator. (Note this measure of union membership used in Figures 1, 2 and 4.) Since no union membership data are available in 1979 this means that average annual union membership cannot be calculated for 1978 or 1979 and therefore union density is missing for these two years.

Stock-Flow Accounting Analysis

Data

Data on union membership are compiled by the Workplace Information Directorate and are described in the section on "Union Density" (above). Data on certifications and decertifications from 1980 to 1993 are from Martinello, Certification and Decertification Activity in Canadian Jurisdictions (1996) with updates to 1996 kindly provided by Professor Martinello. I added the data for 1997 and 1998. These data are compiled from the Annual Reports of the private

sector provincial and federal Labour Relations Boards (LRB).[14] All private sector and most public and para-public employees are covered by these LRBs (the actual coverage varies by jurisdiction). There are no data on certifications and decertifications for Prince Edward Island (the smallest province in Canada with a population of approximately 100,000) or for activity outside the jurisdiction of the private sector LRBs.

The LRB Annual Reports provide information on certifications disposed (processed) and certifications granted and the analogous information on decertifications. (No data on decertifications disposed is available for Saskatchewan until 1998). The data do not distinguish between certifications involving previously unorganized workers and those involving already organized workers ("raids"). Bargaining unit size (*certsize, dcertsize*) is constructed using data on the number of newly certified (covered) and newly decertified (uncovered) employees and certifications and decertifications granted. Data on the number of newly certified employees and newly decertified employees are available on a limited basis across jurisdictions. Data on newly certified employees are available from 1980 to 1998 for B.C., Alberta, Saskatchewan, Manitoba, Ontario Newfoundland and the federal jurisdictions and for 1980 to 1988 for Quebec. Data on newly decertified employees are available for 1980 to

[14]In most, but not all, Canadian jurisdictions the administrative body responsible for administering collective bargaining legislation is called the Labour Relations Board. In this paper all of these bodies will be referred to as Labour Relations Boards.

1998 for Saskatchewan and Ontario and 1980, 1981 1989 and 1990 for the federal jurisdiction. All available data are used. The average size of bargaining unit certified (decertified) in Canada is constructed by summing the number of newly certified (decertified) employees across all jurisdictions in that year where the data are available and dividing by the sum of certifications (decertifications) granted in these jurisdictions in that year. When the mean size of bargaining unit certified (decertified) is multiplied by the total number of certifications (decertifications) granted the product estimates the number of newly certified (decertified) employees in Canada .

Issues

(1) Time Period

Data on certifications and decertifications are available on a fairly consistent basis across jurisdictions from 1977 to 1998. However union membership is missing for January 1, 1979 so there are no union membership growth rates for 1978 or 1979. Therefore the time period studied for the stock-flow analysis in Canada is 1980 to 1998.

(2) Missing Data

Since no data on decertifications disposed are available for Saskatchewan the decertification organization rate and the decertification success rate are estimated by removing Saskatchewan from the numerator and denominator of these expressions. (Saskatchewan is a relatively small province that accounts for

about 3 percent of employment in Canada.). For the decertification organization rate Saskatchewan is eliminated from union membership by using the proportion of union members in Saskatchewan available from CALURA. According to this source in all years from 1978 to 1995 Saskatchewan union members accounted for 3 percent of all union members in Canada.

Missing data on newly certified workers and newly decertified workers are a concern. Fortunately quite a bit of information is available on newly certified workers. The jurisdictions for which data are available account for 70 percent of employment in Canada when Quebec data are not available and 94 percent when Quebec data are available. Much less information is available on newly decertified workers - the jurisdictions for which data are available account for slightly more than 40 percent of employment in Canada. However decertification activity in Canada is very small in magnitude in Canada and even large differences in the average size of bargaining unit decertified would not alter the substantive conclusions of this paper.

(3) Stocks and Flows

For the stock-flow accounting analysis it is important that union membership flows generated from the stock of union members match the flows from the LRB Annual Reports as closely as possible. As mentioned above the union membership numbers are the stock as of January 1 of (t). Certification and decertification data cover a 12 month period that runs either from January (t) to

December (t) or from April (t) to March (t+1). In the stock-flow accounting analysis the flow of union members from January (t) to January (t+1) is matched with the Annual Report numbers from January (t) to December (t) or April (t) to March (t+1). (Note union membership growth shown in Figure 5 is based on this measure of union membership.)

Shift-Share Analysis

The shift-share analysis uses unionization rates as percent of employed workers in the industry. Density numbers by industry in 1983 are from CALURA. 1983 is chosen as the base year because this is the first year that CALURA counted employee association members as union members and therefore beginning in this year the CALURA definition of union member is the same as that in the Workplace Information Directorate series. Employment figures from 1980 to 1997 are from the Labour Force, Annual Averages (CANSIM numbers for each employment series follow). The industries included are: agriculture (D984730); fishing, trapping, mining, quarries and oil (D984731); manufacturing (D984736); construction (D984739); transportation, communications and utilities (D984741 and D984735); trade (D984742); finance (D984745); services (D984746) and public administration (D984751). The industry classifications for both union density and employment are based on the Standard Industrial Classification, 1980 (SIC). In 1999 Statistics Canada began

using a new industrial classification system called, the North American Industrial Classification System (NAICS). The new classifications are not strictly comparable to the SIC classifications. In the process all the employment series were revised from 1987 and the CANSIM series listed above, based on the SIC classification system, are no longer available directly from the CANSIM database. The 1998 employment numbers are created using Table 18 from "Employment by Industry and Occupation Based on New Classifications, Labour Force Update. Spring 1999. Data on employment after 1998 are only available for classifications based on the NAICS.

CHAPTER THREE

Private Sector U.S. Union Density from 1983 to 1999:

An empirical investigation[1]

1. Introduction

U.S. union density falls continuously from the mid-1960s to the present. Research that examines the period from 1960 to the early 1980s provides a number of explanations to account for the decline.[2] Most of these explanations can be characterized as focusing on two sources of union membership growth: union organization activity or economic activity. Research that focuses on union organizing activity points to factors that have depressed the net flow of newly certified union members. Weiler (1983) and Freeman (1985, 1988)) argue employer resistance has made union organizing increasingly difficult. This factor is closely linked to public policy concerning unionization that: requires representation votes; imposes remedial rather than punitive damages when unfair labour practices are committed; depends on procedures that are prone to delay; and outlaws union shops (Freeman (1985, 1988), Rose and Chaison (1985,1990),

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[1]I thank John Burbidge, David Johnson, Peter Kuhn and Mike Veall for helpful comments on earlier drafts of this paper. Financial assistance from the Social Sciences and Humanities Research Council of Canada and the Canadian International Labour Network is gratefully acknowledged. This paper has been submitted to *Industrial Relations* in May 2001.

[2] For a summary of the empirical literature to 1982 see Fiorito and Greer (1982).

and Weiler (1983)). Over this same period changes in the interpretation and enforcement of the National Labor Relations Act, due to number of decisions made by the National Labor Relations Board and the courts, have also made organizing more difficult (Block, Beck and Kruger (1996)). There is some evidence that reduced union organizing efforts (1950 - 1980) also affect the flow of newly certified members (Freeman (1985)). Research that focuses on economic activity examines factors that affect the expansion or contraction of existing bargaining units. The major factor considered in this context is structural change that resulted in the contraction of sectors of the economy that are traditional union strongholds and the expansion of sectors that have low unionization rates. While most researchers agree that structural change has affected unionization there is much disagreement concerning how important it is (Farber (1985), Freeman (1988), Troy (1990,1992, 2000)).

U.S. private sector union density decreased from 15 percent to 8 percent between 1983 and 1999. This period is characterized by increased international competition, technological innovation, a very conservative political environment in the 1980s and continuously falling union density. These factors may influence union membership growth through both union organizing activity and economic activity.[3] Increased competition and a need for flexibility may cause employers

[3]Union organizing activity refers to the net flow of new members due to certification or decertification. Economic activity refers to the net flow of new members due to changes in the size of existing bargaining units. Economic factors may influence both of these flows.

to increase resistance to union organizing activity should they perceive that a unionized environment reduces their competitive advantage. The conservative political environment that existed in the 1980s included a very conservative National Labor Relations Board which may have adversely affected union organizing activity. Low union density reduces the financial resources for union organizing and may also encourage greater employer resistance. (Freeman (1998)). Globalization and technological change also may have induced structural changes that influence union membership growth through the contraction and expansion of existing bargaining units in the economy. The purpose of this paper is to explore the contribution of union organizing activity and economic activity to U.S. private sector union density in order to provide insight into why private sector union density has continued to decline in the 1980s and 1990s. A stock-flow growth accounting analysis is used to decompose total union membership growth into growth due to union activity and growth due to economic activity. This allows the contribution of each factor to union membership growth and union density to be investigated. Each factor is then examined in more detail. By providing information from 1983 to 1999 this research updates Dickens and Leonard (1983) and Freeman (1988). It complements and confirms recent research by Farber and Western (2000) who use a slightly different stock-flow accounting framework but reach similar conclusions.

The paper is organized as follows. The first section describes private sector

union density. Since density is affected by the behaviour of union membership growth and employment growth these factors are also examined. The second section presents the stock-flow growth accounting framework. The accounting identity allows union membership growth to be decomposed into two parts: net growth due to newly certified members (union activity); and net growth due to the expansion and contraction of existing bargaining units (economic activity). The size and behaviour of the two parts are described, their contributions to union membership growth and union density are examined, and the long-run implications for the union movement are discussed. The third section of the paper examines the determinants of growth due to the net flow of newly certified members. This investigation is based on a more detailed decomposition of the stock-flow accounting identity. The final section of the paper explores the role of economic factors. Regression analysis is used to examine the behaviour of the measure used to account for economic factors in the stock-flow analysis. Since this variable only indirectly measures economic factors a shift-share analysis is also used to provide direct empirical evidence concerning the impact of structural change on union density.

1. Union Density, Union Membership Growth and Employment Growth

U.S. private sector union density is shown in Figure 1. Union density is defined as:

$$(1) \qquad \text{density}(t) = \frac{u(t)}{e(t)} \times 100$$

Union membership in year t (u (t)) is private sector, non-agricultural, non-construction employed union members. These data are available from the Current Population Survey (CPS) on a consistent basis from 1983 to 1999. Employment (e) is private sector, non-agricultural, non-construction paid employment. These data are from the Economic Report of the President 2001.[4] The measure of union density is restricted to the private, non-agricultural, non-construction sector of the economy in order to be consistent with the coverage of the National Labor Relations Board data used in the stock-flow accounting analysis. Figure 1 shows the continuous decline in union density from 1983 to 1999.

Changes in union density over time (d(u/e)/(u/e)) depend positively on union membership growth (du/u) and negatively on employment growth (de/e):

$$(2) \qquad \frac{d(u/e)}{(u/e)} = \frac{du}{u} - \frac{de}{e}$$

[4]For a brief discussion of union density and more details on the data please see the Data Appendix.

Figure 2 plots the two components of the change in union density. It is clear from the plot that both factors contribute to the decline in union density. Union membership growth is negative in every period (except 1994[5]), though it becomes slightly less negative over time. Employment growth is positive in every period except 1991 and is clearly related to the business cycle. The robust performance of the U.S. economy in the 1990s prevents the increase in union membership growth from slowing the rate of decrease of union density.

2. Union membership growth: A stock-flow growth accounting framework

In order to get a more complete picture of factors that influence union membership growth in the U.S. private sector a stock-flow growth accounting framework is used. Dickens and Leonard (1985, henceforth referred to as DL) provide a detailed accounting analysis of the growth of U.S. private sector, non-agricultural, non-construction union membership from 1950 to 1980. The results presented use the same stock-flow accounting identity and update the DL results for 1981 to 1999.[6] The analysis provides insight into the sources of union

[5] A revision of the CPS occurred in 1994 that means data before and after this period are not strictly comparable. This is worrying when a spike in the union membership growth rate occurs in that same year. Examination of plots of the underlying levels data does not reveal a jump in levels after 1994 - the levels data revert to the long run growth path after 1994. A regression analysis also reveals that data after 1994 are not significantly different from data before 1994 (see the data appendix for details). 1994 has higher union membership growth than other periods.

[6] Certification and Decertification data are available from 1980 to 1998, union membership data are only available from 1983. Therefore some information is updated from 1981 and other information is updated from 1983. For more details please see the Data Appendix and

membership growth in the 1980s and 1990s and allows their influence on private sector union density to be investigated.

The following stock-flow accounting identity is the basis of the analysis:

(3) u (t) - u(t-1) = newly certified union members (t)
-newly decertified members (t) + changes in membership
due to expansion/contraction of existing bargaining units (t)

DL implement this identity using U.S. data. The stock-flow growth accounting framework that implicitly underlies their analysis is:

$$(4)\quad u(t) - u(t-1) = \left[\frac{\text{workers eligible to vote in certification elections (t)}}{\text{non-union workers(t)}} * \frac{\text{eligible voters in units that certify (t)* non-union workers (t)}}{\text{workers eligible to vote in certification elections(t)}}\right] - \left[\frac{\text{workers eligible to vote in decertification elections (t)}}{\text{union members(t)}} * \frac{\text{eligible voters in units that decertify (t)* union members (t)}}{\text{workers eligible to vote in decertification elections (t)}}\right] + \left[\text{residual (t)}\right]$$

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the Notes to Table 1.

The first two elements of (4) (in square brackets) capture the net flow of newly certified members. DL refer to this as the 'net flow due to representation elections'. Legal and institutional factors, employer resistance and union organizing activity are major influences on this flow. The last element of equation (4), the residual, captures the change in union membership associated with the expansion and contraction of existing bargaining units. Economic factors have a major influence on the residual since these changes are associated with structural or cyclical changes in the economy. DL refer to the residual as the 'net flow due to economic factors'.[7] Dividing through the union membership accounting identity (2) by lagged union membership allows union membership growth to be decomposed into the percent growth due to 'representation elections' and the percent growth due to 'economic' factors.

The stock-flow accounting identity (3) is implemented for the U.S. using data from 1981 to 1999. In order for these results to be comparable to DL I have used, where possible, the same data sources and definitions. Data on representation elections are from the Annual Report of the National Labor Relations Board. Data on employment are from the Economic Report of the

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[7]It should be noted that economic factors may also influence net growth due to representation elections. For example Blanchflower and Freeman (1992) link the rising union wage premium in the 1970s to increased employer resistance to unions and decreased organizing activity. Increased global competition and technological change may also have increased employer resistance to unions. Throughout this paper it is assumed that these effects are second order and depend on the existence of a public policy environment that does not deter employer resistance.

President. Both of these sources are the same as those used by DL. Data on union membership (total and by sector) are from the Current Population Survey (available on a consistent basis since 1983). DL's data on union membership are from the Directory of National Unions and Employee Associations published by the BLS but only available until 1979. DL use data on public sector union membership published in AFL-CIO convention proceedings.[8] A number of adjustments are made to the data in order to ensure that the flows of union membership from the NLRB data are consistent with the stock of union membership data from the CPS. These are described in the Data Appendix where they are also compared to the adjustments made by DL. None of the substantive conclusions of the paper are sensitive to reasonable adjustments made to the data.

Figure 3 plots private sector union membership growth and its two major components; net growth due to representation elections and net growth due to economic factors from 1984 to 1999. The most striking feature of this plot is the stability of net growth due to representation elections - over the entire period its value is positive and accounts for, on average, .7 of one percentage point of total union membership growth. Net growth due to economic factors mirrors the behaviour of total membership growth and is two to three times the size of net growth due to representation elections in absolute value. The stability of net growth due to representation elections indicates that changes in total union

[8]The CPS definition of union member is different from that in the BLS. The difference and the implications for the analysis are described in the Data Appendix.

membership growth in the 80s and 90s cannot be traced to this source. The small size of net growth due to representation elections relative to the large negative values of net growth due to economic factors has implications for union density and the future of the union movement to be discussed later.

DL present the results of their analysis in a table showing five-year averages for each of the relevant variables. Table 1 reports their results for 1950 to 1980 and adds five-year averages for 1981 to 1999 provided by this study. Table 1 allows us to look at trends in the sources of growth over a longer time period. Net growth due to representation elections falls from 1950 to 1974 and remains fairly stable since that time. There is no evidence of further decline in the 1980s and 1990s. From 1950 to the early 1970s net growth due to economic factors is positive in some years and negative in others. Since the mid-1970s this source is always negative and substantially larger in size in absolute terms compared to most of the earlier period. On the basis of this longer run perspective it does not appear that factors affecting union organizing activity (employer resistance, public policy , union organizing) have caused a decline in net growth due to representation elections in the 80s and 90s. The fact that, in contrast to earlier periods, net growth due to economic factors has been consistently negative throughout the late 70s, 80s and 90s (though becoming less negative in later years) suggests that structural factors may be dominating cyclical ones.

The information from the stock-flow accounting analysis(4) can be

combined with the identity (2) to provide insight into how the components of union growth affect union density:

$$(5)\quad \frac{d\,(u/e)}{(u/e)} = \frac{d\,rep}{u} + \frac{decon}{u} - \frac{de}{e}$$

where (drep/u) is net growth due to representation elections and (decon/u) is net growth due to economic factors. In the 1980s and 1990s employment growth is typically positive while net growth due to economic factors is always negative. Net growth due to representation elections, while positive, is not large enough to offset the negative influence of both employment growth and net membership growth due to economic factors and therefore union density declines throughout the period. Farber and Western (2000), using a different accounting framework , also find that changes in union organizing activity have had little effect on U.S. private sector union density from 1973 to 1998.

How large would net growth due to representation elections have had to be in the 1980s and 1990s for union density not to change?[9] On average net growth due to representation elections would have to contribute 4.8 percentage points to union growth over the period. The values in each year range from 2.1 to 7.8. Since 1950 net growth due to representation elections has never been higher than

[9]In (5) set (d(u/e)/(u/e))=0. Solve for (drep/u). This yields: (drep/u) = (de/e)-(decon/u)- how large net growth due to representation elections would need to be to keep union density constant.

2 percentage points. The union movement would have to organize at an unprecedented pace to prevent further decline in union density.[10]

The long-run prospects for union density can be described by linking the stock-flow accounting identity for union membership explicitly to union density and then solving the resulting difference equation for the steady state[11]. Equation (3) can be written more compactly as:

$$(6) \quad u(t) = u(t-1) + recog(t) + econ(t)$$

where recog(t)[12] is net new union members due to certifications and decertifications from (t-1) to (t) and econ(t) is new union members due to expansion and contraction of existing bargaining units from (t-1) to (t). Divide through by e(t) and manipulate to yield:

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[10]Union leadership recognizes the need to organize. In the 1990s the AFL-CIO have begun to devote more resources to union organizing and research has been conducted that provides information on the most effective strategies for organizing (Bronfenbrenner (1997) and Bronfenbrenner and Juravich (1998)). Freeman (1998) suggests that as union density declines in a product sector fewer resources are available for organizing and employer resistance to unionization will likely increase because they perceive unionization will substantially damage their competitive position.

[11]Freeman (1988) also linked the stock-flow membership accounting identity to density and found the steady state.

[12]The analysis assumes that the net flow of members due to representation elections is not related to union density and therefore the difference equation is linear. Freeman (1998) suggests this may not be the case. When density is low employer resistance may rise because they perceive that their competitive advantage would be adversely affected should the unionization drive succeed. When density is low the union movement may not have the resources to effectively mount organizing campaigns. Therefore as density falls the net flow of members due to representation elections also falls.

$$(7)\quad \text{density}(t) \approx (1-g)*\text{density}(t-1) + (1-g)*\frac{(\text{recog}(t) + \text{econ}(t))}{e(t-1)}$$

where g is the rate of growth in private sector, non-agriculture, non-construction paid employment. Steady state union density (density(s)) is:

$$(8)\quad \text{density}(s) \approx \frac{(1-g)}{g} * \frac{(\text{recog}(t) + \text{econ}(t))}{e(t-1)}$$

The experience of the last sixteen years, where in most periods the change in union membership (recog(t)+ econ(t)) has been negative, means that the steady state outlook for private sector union density is zero.[13]

The analysis presents a very pessimistic outlook for private sector unionism in the U.S. In the last 16 years the increase in new members due to representation elections while positive and stable has not been large enough to offset the decline of union membership in existing bargaining units or to keep pace with employment growth.

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[13]When the steady state is calculated based on the relevant data in each year and averaged across the period the steady state is -8 percent. Focusing on the last five years, where union growth is somewhat higher (though still negative) the steady state is -1 percent.

3. A closer look at the factors that influence net growth due to representation elections

The stock-flow accounting identity (4) allows net growth due to representation elections to be examined in greater detail. In particular, closer examination of the data allows us to see how underlying factors that influence the flows of newly certified and newly decertified union members have changed over time.

The first expression (in square brackets) in the stock-flow accounting identity (4) is the flow of newly certified members. This flow is influenced by: (1) the intensity of organization efforts measured as the proportion of non-union workers that vote in certification elections; and (2) the success of these efforts measured by the proportion of workers eligible to vote in certification elections that win. Table 1 shows how these factors have changed over time. The certification organization rate falls almost continuously through the 1980s and 1990s. This is part of a downward trend that characterizes the entire 1950 to 1999 period. The certification success rate declines from 1950 to the late 1970s but has been quite stable in the 1980s and 1990s, and fluctuates between 39 and 41 percent.

Analogous measures of decertification organization activity and decertification success that affect the flow of newly decertified members are also presented in Table 1. At the outset it should be noted that decertification flows are very small relative to certification flows and have a negligible impact on the

net flow of newly certified members. The decertification organization rate increases from 1950 to the early 1980s. From 1980 it declines somewhat but remains higher than in the period prior to the 1980s. The decertification success rate has ranged from 40 to 46 percent in the 1980s and 1990s. There is no long run trend in this measure.

4. A closer look at net growth due to economic factors

Net growth due to economic factors is the residual in the stock-flow growth accounting identity. DL use this information to construct an indirect test of the role of structural change in union membership growth. They regress net growth due to economic factors on a constant, the growth of real GDP, lagged growth of real GDP and a time trend. The GDP variables control for the effect of the business cycle. According to DL if the coefficient on the trend is significant this indicates that changes in economic structure play a role in the growth of union membership. DL interpret structural change as an accelerated change in union membership growth. Structural change could also be interpreted as a constant rate of union membership growth each year. This type of structural change would be indicated by a statistically significant constant in the DL regression equation. Table 2 presents the results of the this regression. Neither of the cyclical variables

are significant.[14] The coefficient on the constant is negative and significant at greater than the 99 percent level. The coefficient on the trend is positive and significant at greater than the 95 percent level. The evidence suggests that structural change may be important. The results indicate that changes in the structure of the economy have reduced union membership growth by an average of 2.8 percentage points in each year. Over time the negative impact of structural change on union membership growth has diminished.

The evidence from the DL regression is open to criticism because the measure of net growth due to economic factors, used as the dependent variable, is a residual. In order to provide evidence to corroborate these results I construct a shift-share index that directly measures the impact of structural change on union density. The index is created by using the unionization rates in 8 different industries (i) in the private non-agriculture, non-construction sector of the economy in 1983 (union (i, 83)) and the employment share (emp(i.t)) in the same industries from 1983 to 1999.[15]

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[14]In a specification of the DL regression that includes a dummy for 1994 (the period with an unusually high growth rate) the coefficient on current real GDP growth is positive and significant. The coefficients on the trend and constant remain significant and are of the same magnitude.

[15]The industry classifications included are: mining; manufacturing-durable; manufacturing-non-durable; transportation and utilities; wholesale trade; retail trade; finance, insurance and real estate; and services.

$$(4) \qquad \text{Index}(t) = \frac{\sum_i \text{empt}(i,t) * \text{union}(i,83)}{\sum_i \text{emp}(i,83) * \text{union}(i,83)} \times 100$$

This index shows how much private sector union density would change if unionization rates remain at their 1983 values but industry structure changed over the period. Table 3 presents the values of the shift-share index from 1983 to 1999. Over this period the index declines by 11.9 percent. This suggests that from 1983 to 1999 the structure of the private sector of the economy did change in a manner that reduced union density: sectors with higher unionization rates in 1983 contract and sectors with lower unionization rates in 1983 expand. At 1983 unionization rates this structural change would account for 11.9 percent decline in union density, or 1.8 percentage points of the decline. The annual rate of change of the index is also included in Table 3. It appears that the rate of decline of the index slows over the period - from annual rates of decline of over 1 percent in the late 1980s to rates as low as .5 in the late 1990s. The shift-share analysis lends support to the conclusions reached in the regression analysis namely that structural change has contributed negatively to union membership growth and but this factor is becoming less important over time. This conclusion is also supported by evidence presented in Farber and Western (2000) who find that most of the decline in the private sector unionization rate is due to differential

employment growth rates in union and non-union sectors.

5. Conclusions

Union density is determined by union membership growth and employment growth. Union membership growth can be decomposed into 'net growth due to representation elections' and 'net growth due to economic factors'. An examination of these factors using a stock-flow accounting framework provides insight into why U.S. private sector union density has continued to decline in the 1980s and 1990s.

Net growth due to representation elections is positive and stable from 1983 to 1999. This suggests that, contrary to expectations, increased international competition, technological change, a conservative political environment and low union density have not had a negative impact on union organizing activity over this period. Net growth due to 'economic activity' is negative over most of the period though it becomes less negative in later years. Regression and shift-share analysis suggest that the behaviour of this component of union membership growth is linked to structural change in the economy and that the influence of structural change is less important in the 1990s than in the 1980s. Globalization and technological change may have adversely affected union membership growth by inducing structural change in the economy.

Although net growth due to representation elections is positive throughout

the 1980s and 1990s, it is not large enough to offset the negative contribution of net growth due to economic factors and therefore union membership growth is usually negative. Due to the robust performance of the U.S. economy over most of this period employment growth has been strong. Negative union membership growth combined with positive employment growth results in declining union density. Union organizing activity would have had to occur at an unprecedented pace to prevent union density from declining in the 1980s and 1990s.

Figure 1. U.S Private Sector Union Density

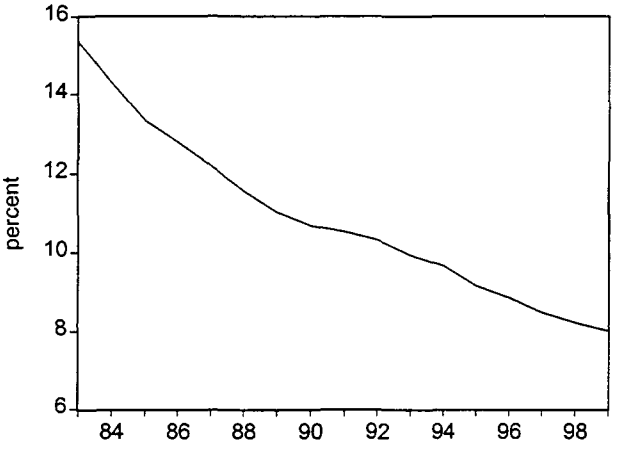

Figure 2. Union Membership and Employment Growth

Figure 3. Sources of Private Sector Union Membership Growth

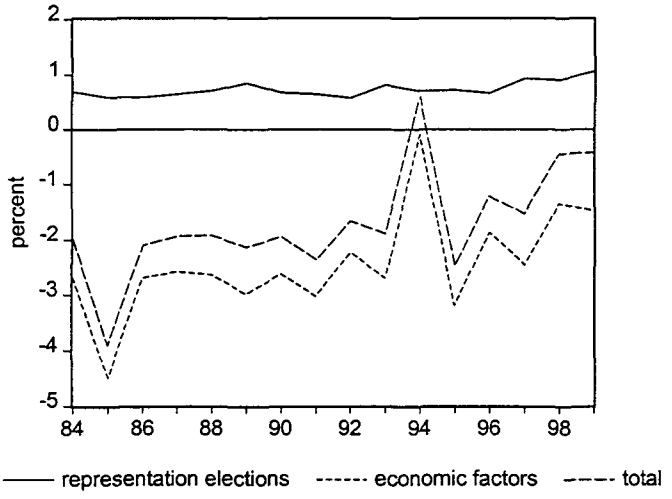

Table 1: Components of Union Growth: Five year averages, 1950 -1999

Period	Density (1)	Certification organization rate (2)	Certification Success Rate (3)	Decertificat'n Organization Rate (4)	Decertificat'n Success Rate (5)	Union Membership Growth Rate (6)	Net Growth due to "Representation Elections" (7)	Net Growth due to "Economic Causes" (8)
1950-54	34.4	2.59	76	.07	52	3.7	3.6	0.1
1955-59	34.6	1.53	62	.09	49	0.0	1.6	-1.59
1960-64	31.2	1.56	55	.12	49	-0.7	1.6	-2.3
1965-69	29.0	1.46	55	.10	42	2.2	1.8	0.4
1970-74	27.2	1.25	46	.14	48	0.6	1.3	-0.7
1975-79	23.8	.97	37	.23	54	-1.0	0.9	-1.9
1980-84	14.8	.30	39	.36	42	-2.0	0.7	-2.7
1985-89	12.2	.30	38	.34	40	-2.4	0.7	-3.1
1990-94	10.2	.24	39	.32	46	-1.4	0.7	-2.1
1995-99	8.5	.22	41	.26	46	-1.2	0.9	-2.1

1. All numbers for 1950 through to 1979 are from Dickens and Leonard (1985) Table 1, pp.326.
2. The averages for density, the certification organization rate, and the decertification organization rate for 1980 to 1984 are based on data from 1983 and 1984 only. The averages for the union membership growth rate, the net flow due to certification elections, and the net flow due to economic causes for 1980 to 1984 are the 1984 values of these series.
3. Dickens and Leonard (1985) make a number of adjustments to National Labor Relations Board data. For consistency I have made the same adjustments. The substantive conclusions of the paper are unaffected if the raw data are used. For details concerning the adjustments please see the Data Appendix.

Table 2: Net Economic Growth Regression for the U.S. (1983-1999)	
Variable	Coefficient (standard error)
constant	-3.5 ** (0.87)
trend	0.11* (.04)
Real GDP growth	0.27 (.15)
Lagged GDP growth	-0.28 (.15)
Diagnostics:	
Adjusted R-squared	0.36
D.W. Statistic	2.66

** significant at the 99 percent level
* significant at the 95 percent level

Table 3: Shift-Share Index for the U.S. Private Sector		
Year	Index	Growth
1983	100.0	
1984	99.9	-.14
1985	98.3	-1.6
1986	96.6	-1.7
1987	95.6	-1.0
1988	95.0	-.6
1989	94.2	-.8
1990	93.6	-.6
1991	92.9	-.8
1992	92.1	-.8
1993	91.4	-.8
1994	90.9	-.6
1995	90.4	-.5
1996	89.8	-.7
1997	89.3	-.5
1998	88.9	-.5
1999	88.1	-.8

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DATA APPENDIX

Union Density

Definition

There are a number of ways that union density can be defined. Most research uses union membership in the denominator. Dickens and Leonard (1985) also use union membership. Some definitions use 'union coverage' in the numerator. When a union is granted bargaining rights the United States all members of the bargaining unit are represented (covered) by the union whether they choose to be union members or not. Information based on this definition of union density is presented later in the paper. The denominator should capture total potential union members. Various measures have been used in the denominator including; the civilian labour force; the non-agricultural labour force; the paid labour force and analogous measures of employment. I use paid employment because this removes the self-employed (who are not potential union members) from the data and because this is consistent with Dickens and Leonard (1985). Union membership, coverage and paid employment are restricted to the private sector, non-agriculture, non-construction sector of the economy because this means the density, membership growth and employment growth data are consistent with those used for the stock-flow accounting analysis performed later in the paper that uses information from the National Labor Relations Board.

Data

From 1983 to 1999 data on union membership are available from the Current Population Survey(CPS). The CPS includes employed members of unions and employee associations. A redesign of the CPS in 1994 means that data after this date are not strictly comparable to the earlier CPS data. A spike in the private sector union membership growth rate occurs in 1994. Tests were performed in order to check whether this might be due to the revision and indicate this is not the case. The results of the tests are found in Appendix One. Card (1996) found evidence of misclassification of self-reported union status of private sector workers in the CPS. Based on evidence from a validation survey conducted in 1977 he finds that 2.7 percent of individuals who are, in fact, union members report that they are not, while 2.7 percent of individuals who are not, in fact, union members report that they are. I do not adjust for this misclassification error. Farber and Western (2001) adjust the CPS data for this error and find it makes no qualitative difference to their results. Data on non-agricultural employees on non-agricultural payrolls are from the Economic Report of the President, 2001 (Table B-46). Data on union membership and employment are annual averages.

Stock-Flow Accounting Analysis

Adjustments to ensure the flows from the CPS data match the flows from the NLRB data

A number of adjustments are made to the data to ensure that the flows of union members generated from the CPS data match, as closely as possible, the flows from the NLRB. These are described below and compared to the adjustments made by DL.

First, since the public sector and construction sector largely organize outside the NLRB these groups are removed from the union membership (and employment) data. DL make the same adjustment. Other factors that affect the reconciliation of union membership flows between the NLRB and CPS data are assumed to offset each other and no further adjustment is made to the total union membership data from the CPS.[16]

Second, some certification drives involve raids of active bargaining units where the employees are already union members, however other raids are of

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[16]A small portion of private sector unions are recognized outside the NLRB. Most of these are recognized by state labour boards. DL conducted a survey in 1980 and determined that less than 8 percent of new private sector union members participated in state board elections. This suggests that in order to be consistent with NLRB union membership flows that union membership data from the CPS or BLS should be reduced by 8 percent. However other factors offset this that mean no adjustment is necessary. The BLS data used by DL do not include employee association members. These members are included in the NLRB numbers. Less than 10 percent of NLRB elections involve employee associations therefore DL assumed that this factor offset the other and did not adjust the numbers. The CPS membership data used in this paper includes employee association members but does not include members that are laid off, unemployed, on strike or retired. I assume that the exclusion of these groups from the CPS union membership numbers offsets the inclusion of private sector union members that participate in non-NLRB elections and make no adjustment to the CPS union membership data.

inactive bargaining units where the employees are no longer counted as union members. The data cannot distinguish between these situations. DL assume that 5 percent of employees that are eligible to vote in representation elections are already counted as union members. I make the same adjustment.

Third, when looking at the net flow of newly certified members the following considerations are taken into account. Employees eligible to vote in a representation elections won do not all become union members. DL, based on data from an earlier study, assume that 9 percent of all workers covered by collective agreements are not union members. CPS data from 1983 to 1999 show that the percent of private sector workers covered by collective agreements that are not union members has remained steady at 9 percent union over this period. The difference between coverage and membership suggests the flow of newly certified members from the NLRB data should be reduced by 9 percent. In addition, some unions that are recognized will not succeed in negotiating a collective agreement. When this happens the bargaining unit becomes inactive or decertifies. Workers in inactive unions are not counted as union members but there is no record of them leaving the union sector. Based on empirical studies conducted in the 1970s DL calculate that 15 percent of newly certified workers fall into this category. When these two factors are taken into account 24 percent of workers eligible to vote in representation elections won in the 1970s should not be counted as union members. DL assume that an average of 12 percent of

workers in elections won from 1950 to 1980 should not be counted as union members. (They conduct sensitivity analysis where they allow the percentage to range from zero to 20 percent over the whole period or to grow from 10 percent to 40 percent and find the results are not sensitive to this assumption.) Many decertification elections involve inactive units. DL assume that 50 percent of all workers involved in decertification elections are not union members. (Sensitivity analysis on this assumption reveals that varying the percent from zero to 100 has no impact on DL's results.) I make the same assumptions as DL. I assume that 12 percent of employees eligible to vote in elections that are won should not be counted as additions to the stock of union members and that 50 percent of employees eligible to vote in successful decertification elections should not be counted as deductions from the stock of union members. The tables and figures presented in the paper are based on data that make adjustments that are the same as those made by DL. Sensitivity analysis shows that if certification flows are reduced by 0 to 40 percent and/or the decertification flows are reduced by zero to 100 percent the substantive conclusions of the paper are not affected.

APPENDIX ONE: Regressions that examine the very high U.S. union growth rate in 1994.

The plots of total private sector non-agricultural, non construction union membership growth (and the residual growth rate linked to 'economic and other' factors) reveal a very large increase in the growth rate in 1994 for that one year only. In 1994 the CPS underwent a revision and data before and after the revision are not considered to be 'strictly' comparable. A check of the series used to generate the growth rate (both to check for errors and to examine the behaviour over time) reveals that the level increases only in 1994 and then reverts to its level on the previous growth path. From the examination of the raw data 1994 appears to be an anomaly, not associated with a revision in the CPS. To test this more rigorously I estimate a number of regressions. Explanatory variables used in the regressions include: (1) a dummy that takes the value 1 in 1994 and 0 otherwise (dummy94); (2) a dummy that takes the value 1 from 1995 to 1999 and 0 otherwise (dummy9599); (3) the interaction of dummy9599 with a time trend (dummy9599*trend); and (4) the interaction of dummy9599 with real GDP growth. The results of three specifications are provided in the Table below.

TABLE A1: Regressions that examine the spike in the U.S. private sector union growth rate in 1994.			
Variable	Specification #1	Specification #2	Specification #3
constant	-2.93 ** (.50)	-3.72** (.96)	-3.51** (.94)
dummy94	2.86** (.80)	2.52 * (.85)	2.65** (.82)
dummy9599	.13 (.69)	-2.14 (1.64)	-4.72 (3.02)
trend	.11 (.07)	.14 (.08)	.12 (.096)
real GDP growth		.17 (.14)	.14 (.13)
dummy9599* growth		.48 (.48)	
dummy9599* trend			.31 (.22)

Standard Errors are in parentheses. ** Significant at at least the 99 percent level. * Significant at at least the 95 percent level.

In all the regressions the coefficient on the dummy variable for 1994 is positive and significant. It is clear that the mean of the growth of union membership rises in 1994. The coefficient on the dummy variable for 1995 to 1999 is never significant. This indicates that the mean growth rate of union membership is not affected by whatever happens in 1994 in later periods. In order to test whether the trend changes after 1994 the dummy variable for 1995 to1999 is interacted with the trend variable. The coefficient on this variable is not significant indicating that the trend in union membership growth is not affected by 1994. Finally the dummy variable for 1995 to 1999 is interacted with GDP growth to test whether or not the sensitivity of union membership growth is

affected by 1994, again, the coefficient on the interaction term is not significant. These tests suggest that whatever is happening in 1994 its influence is restricted to that year only. It is very unlikely that the revision of the CPS is causing this jump.

CHAPTER FOUR

The Canada-U.S. Union Density Gap 1980 to 1998: An empirical investigation[1]

1. Introduction and Motivation

U.S. union density decreases continuously from the 1960s to the present - falling from 30 percent to less than 15 percent. In contrast Canadian union density increased through the 1960s and 70s, remained stable at approximately 36 percent through the 1980s and early 1990s and has only recently begun to show signs of decline. By the end of the 1990s Canadian union density is approximately 19 percentage points higher than that of the U.S. The United States and Canada have very similar systems of industrial relations and close economic, political and cultural ties. Why has the gap between Canadian and U.S. union densities emerged?

Researchers have suggested many different answers to this question.[2] This paper provides empirical evidence concerning the impact of three factors on the

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[1]I thank John Burbidge, David Johnson, Peter Kuhn, Felice Martinello and Mike Veall for helpful comments on earlier drafts of this paper. Funding for this research was provided by the Social Sciences and Humanities Research Council of Canada and the Canadian International Labour Network. This paper has been submitted to *Industrial Relations*.

[2]Kumar (1993) provides a summary of this literature.

density gap in the 1980s and 1990s: the differing overall economic performance of the U.S. and Canadian economies; differences in structural change between Canada and the U.S.; and union recognition procedures. The first section describes union density in Canada and the U.S., establishes the size of the density gap and places the experience of the last twenty years in context. The second section looks at how the differing overall economic performance of the U.S. and Canadian economies, reflected in different rates of employment growth in the 80s and 90s, has affected the density gap. The third section uses a shift-share analysis to see how structural change, often associated in recent years with technological innovation and increasing international competition, has affected union density in both the U.S. and Canada. The fourth section examines the influence of mandatory vote recognition procedures on the union density gap. A number of researchers (Weiler (1983), Freeman (1985, 1988), Rose and Chaison (1985), Meltz (1985), Chaison and Rose (1994)) suggest that U.S. reliance on mandatory votes has discouraged unionization, while Canada's reliance (until recently) on the card check procedure has encouraged unionization. Building on earlier research (Johnson (2001)), I use simulation analysis to: (1) quantify the impact of mandatory votes on the union density gap; and (2) measure the contribution of the increasing use of mandatory votes in Canada to the narrowing of the gap.

2. An Overview of Union Density in Canada and the United States

Figure 1 displays Canadian and U.S. union density from 1951 to 1999 and establishes the size of the union density gap. Union density at time 't' is defined as [3]:

$$(1) \qquad \text{union density (t)} = \frac{\text{union members (t)}}{\text{non-agricultural paid employment (t)}} \times 100$$

From 1951 to 1965 Canadian and U.S. unionization patterns are roughly similar. After 1965 union densities in the two countries diverge. From 1965 to 1975 Canadian union density increases from 29 to 36 percent. Canadian density then remains fairly stable from 1975 to 1992, fluctuating between 34 and 37 percent. However, since 1992 Canadian union density declines, falling from 36 percent to 32 percent. In contrast U.S. union density declines continuously from 29 percent in 1968 to 13 percent in 1999. The gap between Canadian and U.S. union densities increases from 1968 to 1993. In 1993 the union density gap is 21 percentage points. From 1993 to 1999 the gap narrows slightly so that by 1999 U.S. union density is 19 percentage points lower than that of Canada.

[3]The Data Appendix provides a discussion of the definition of union density. It also lists the data sources and describes various problems and limitations of the data used (including why there are breaks in the series).

3. The role of differing economic performance

In the last 16 years the U.S. economy has generally outperformed the Canadian one in terms of employment growth. What impact has this had on union density gap?

The behavior of union density over time depends on the relative growth of union membership compared to the growth of non-agricultural paid employment. Figure 2 plots union membership growth rates in the U.S. and Canada from 1952 to 1999. The plot clearly shows that from the late 1960s to the late 1990s union membership growth rates in the two countries converge. Figure 3 plots the growth in non-agricultural paid employment in the U.S. and Canada over the same period. In this plot cyclical variation is evident but there is no indication of a long run trend.

If we focus attention on 1984 to 1999[4], non-agricultural paid employment growth in the U.S. has been higher than that of Canada in all but 3 of 16 years. This reflects the more robust performance of the U.S. economy. Over this same period the union membership growth rates in the two countries converge. In the last 16 years in Canada, despite stagnating or declining union membership growth, union density has remained fairly stable partly because the poorer economic performance of the Canadian economy has resulted in slower growth of non-agricultural paid employment. In the U.S., where there is no downward trend

[4]Over this period Canadian and U.S. union membership data are most comparable. Please see the Data Appendix for more details.

in union membership growth over this period, union density falls nevertheless. The decline is linked to the robust performance of the U.S. economy which has attracted many new workers and these workers disproportionately enter non-union sectors of the economy.[5] These observations suggest one contributing factor to the density gap in recent years is the differing economic performance of the U.S. and Canadian economies. If most new jobs are non-union, a high rate of employment growth tends to reduce union density. The importance of this simple mechanism has been largely ignored in most time series studies of union density trends and especially in studies of the Canada-U.S. union density gap.

In order to quantify how important the differing growth rates of non-agricultural paid employment may be in explaining the Canada-U.S. union density gap I simulate what union density in Canada would have been if Canada experienced the same rate of growth in non-agricultural paid employment as the U.S. from 1984 to 1999 and Canadian union membership levels in each year continued at their actual values. Figure 4 plots the simulation along with actual union density. Simulated Canadian union density in 1999 is 3 percentage points lower than actual Canadian density. This estimate should be viewed as placing an upper bound on the contribution of the economic performance to the gap. The simulation assumes that none of the additional workers associated with the higher

[5]Farber and Western (2000) examine the growth rates in U.S. private sector union and non-union employment from 1973 to 1998 and find that union employment shrunk by an average of 2.9 percentage points per year and non-union employment grew by an average of 2.8 percentage points per year.

employment growth rates become union members. This is unrealistic since it would be expected that during a period of more robust employment growth some workers would be absorbed into expanding bargaining units or employed in newly formed units. If a simulation were performed where the percentage of the additional workers that become union members is assumed to equal Canadian union density in each year then union density would be unchanged by the increase in non-agricultural paid employment growth. This assumption requires the experience of the marginal worker to be the same as that of the average worker. This is unlikely because the expanding sectors (services, high technology) in the Canadian economy have lower than average unionization rates. For this reason a more realistic simulation would assume that some of the additional workers join unions but the percentage that become union members is likely lower than actual union density. Simulated Canadian union density in this scenario would be lower than actual union density but higher than the simulated density in the original scenario where none of the additional workers were assumed to join unions. This discussion suggests that higher non-agricultural paid employment growth in the U.S. explains some of the Canada-U.S. union density gap. The simulation places an upper bound on the potential impact of this factor on the gap. In 1999 higher U.S. employment rates account for at most 3 percentage points of the gap.

4. The role of structural change

In the last two decades North America has experienced structural change. Most believe traditional union sectors have declined while expanding sectors have low unionization rates. This change has been linked to technological innovation and/or increased international competition. While most researchers agree that structural change has affected unionization there is much disagreement concerning how large its impact has been on the density gap (Freeman (1988), Riddell (1993), Troy(1990,1992, 2000)). I use shift-share analysis to examine the impact of changes in industry structure on union density in Canada and the U.S. from 1983 to 1998.

A shift-share index is created for each country using the unionization rates in different industries (i) in 1983 (union (i,83)) and the employment share (emp (i,t)) in those same industries from 1983 to 1998:[6]

$$(2) \quad \text{Index}(t) = \frac{\sum_i \text{emp}(i,t) * \text{union}(i,83)}{\sum_i \text{emp}(i,83) * \text{union}(i,83)} \quad X \quad 100$$

This index shows how much union density would have changed if industry structure changed over the period and unionization rates by industry remained

[6]For details on the data used to construct the index (industry classifications, data sources and time period) for the U.S. and Canada please see the Data Appendix.

fixed at their 1983 values. Table 1 presents the values of this index for each country from 1983 to 1998. The indices show that structural change has had a negative impact on union density in Canada and the U.S. but the impact is larger on U.S. union density.

The Canadian index falls from 100 in 1983 to 98.5 in 1998. The decline in the index is not monotonic - there are years when the index rises. The shift-share index indicates that structural change accounts for, at most, 1.5 percent of the decline in union density from 1983 to 1998. Canadian union density in 1983 is 37 percent therefore this amounts to approximately one-half percentage point of the decrease in Canadian union density that occurs over this period. In contrast the U.S. shift-share index falls continuously from 100 in 1983 to 91.3 in 1998. Structural change results in an 8.7 percent decline in union density over the period. U.S. union density in 1983 is 20 percent, therefore accounts for 1.7 percentage points of the decrease in U.S. union density.

The shift-share analysis suggests that from 1983 to 1998 about one percentage point of the density gap can be attributed to structural change. It makes sense that structural change explains only a very small part of the density gap since both economies have experienced similar shocks. However it also makes sense that structural change has had less impact on Canadian union density because Canada, unlike the U.S., has always been characterized as a small open economy and therefore increased international competitiveness has likely required

less adjustment in the Canadian economy compared to the U.S. economy.

5. The role of mandatory representation votes

A number of researchers suggest that mandatory representation votes have a negative effect on unionization and thus contribute to the union density gap (Weiler (1983), Freeman (1985, 1988), Rose and Chaison (1985), Meltz (1985), Chaison and Rose (1994)). In the U.S. unions obtain bargaining rights almost exclusively through a mandatory vote procedure. Historically Canadian jurisdictions relied on a card check procedure for granting certification. A mandatory vote, as the name implies, requires the union win a majority in a secret vote of the proposed bargaining unit to obtain recognition. Under card check it is possible for the union to obtain recognition on the basis of signed membership cards and no vote need be held.[7] Weiler (1983) argues mandatory votes provide the opportunity for greater employer resistance to unionization. First, the employer is officially notified when a union petitions for an election and is therefore made aware of union organizing activity. Second, the delay between petition and vote (usually two or three months in the U.S.) provides an opportunity for the employer to discourage unionization through both legal and illegal means. Third, an employer will often use illegal unfair labour practices because the penalties for doing so are neither timely nor large. In contrast, under

[7]In most jurisdictions with card check, certification is granted if more than 50 or 55 percent (depending on the jurisdiction) of the bargaining unit has signed membership cards.

card check there is much less opportunity for employer resistance. Once the union has collected sufficient membership evidence it is able to apply for certification and essentially present the employer with a *fait accompli*.[8] Prior to 1976 every Canadian jurisdiction used card check procedures. Since that time a number of provinces have adopted mandatory votes. Figure 5 shows the percent of the Canadian labour force covered by mandatory vote legislation from 1976 to 1999.[9] By 1999 57 percent of the Canadian labour force is covered by mandatory votes.[10] Johnson (2001) uses the variation over time and across provinces in the use of mandatory votes to estimate their impact on certification success and finds that mandatory votes reduce certification success rates by approximately 9 percentage points. This result is robust across specifications and is significant at greater than the 99 percent level. In this section I use the empirical results from

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[8] In reality certification through card check is not quite a *fait accompli*. At this stage the employer may file complaints about the conduct of the union during the organizing drive and/or question the composition of the bargaining unit (this affects the number of membership cards that can be used to provide evidence for certification and therefore can ultimately affect whether or not the union succeeds in obtaining bargaining rights).

[9] Mandatory vote coverage declines in 1993 because British Columbia, after using mandatory votes from June 1983 switched back to card check in January 1993. Figure 5 is created using information on the timing of the introduction of mandatory vote legislation in Canadian jurisdictions from Johnson (2001) and Labour Force data from the Labour Force Survey, Annual Averages available from the CANSIM database. For more detail please see the Data Appendix (Simulations).

[10] The analysis in this paper runs until 1999. However it is important to note that in October 2000 Manitoba repealed the mandatory vote legislation that had been introduced in 1997and replaced it with card check. Manitoba accounts for approximately 4 percent of the Canadian labour force. In August 2001 the B.C. legislature tabled a bill that would reintroduce mandatory votes in the province. B.C. accounts for approximately 13 percent of the Canadian labour force.

Johnson (2001) to perform simulations. The results from the simulations represent the first attempt in the literature to quantify the impact of mandatory votes on the density gap. The simulations answer the following questions: How important are mandatory votes in explaining the gap between U.S. and Canadian union densities? How has the increased use of mandatory votes in Canada contributed to the narrowing of the density gap in recent years?

Simulation Methodology

Canadian union density is simulated from1980 to 1998.[11] Two counterfactual experiments are performed: The first assumes mandatory votes are used in all jurisdictions over the period; The second assumes that card check procedures are used in all jurisdictions over the period. The simulation analysis is based on a union membership stock-flow growth accounting identity:

$$u(t) = u(t-1) + [\text{newly certified workers}(t)] - [\text{newly decertified workers}(t)] + [\text{residual}(t)] \quad (3)$$

Where u(t) is union members in time period t. For the simulations I implement

[11]Data availability limits the time period chosen for the simulations. Please see the Data Appendix for details.

[12]The residual ensures that the identity holds. In theory the residual captures the change in union membership associated with the expansion and contraction of existing bargaining units. In practice it also compensates for limitations of the data.

this identity using data for Canada as:

$$(4)\ u(t) = u(t\text{-}1) + [\ apprate(t) * certsize(t) * certrate(t) * firms(t)]$$
$$-[dgranted\ (t) * dcertsize(t)] + [residual(t)]$$

where:

$$apprate = \frac{\text{certification applications processed}}{\text{number of firms}}$$ [13]

certsize = mean size of bargaining unit certified

$$certrate = \frac{\text{certification applications granted}}{\text{certification applications processed}}$$

firms = number of business establishments

dgranted = decertifications granted

dcertsize = mean size of bargaining unit decertified

Data on union membership and non-agricultural paid employment are the same as those described earlier. Data on certifications and decertifications are compiled from the annual reports of the private sector provincial and federal Labour Relations Boards (LRBs).[14]

The experiments are performed by changing the certification success rate

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[13]Ideally the denominator of this expression would be non-union firms. This is not possible because data are not available.

[14] Certification and decertification data to 1993 are from Martinello (1996) with updates to 1996 kindly provided by Professor Martinello. I added the data for 1997 and 1998. For more detail please see the Data Appendix.

(*certrate* = certifications granted/certifications processed) and the application rate (*apprate* = certifications processed/firms) to reflect the presence of a specific certification procedure and then simulating union membership over the period. The residual and decertification activity are assumed to be unaffected by the type of union recognition procedure in force - actual decertification activity and the actual residual are used in all the experiments. Simulated union membership is divided by non-agricultural paid employment and the results are presented in terms of union density.

Empirical results from Johnson (2001) are used to adjust the certification success rate. Johnson (2001) uses cross-section time-series analysis of nine Canadian jurisdictions from 1978 to 1996 to examine the impact of mandatory votes on certification success.[15] The results from two different specifications show that mandatory votes reduce the certification success rate by approximately 9 percentage points below what it would be under card check. The coefficient estimates are significant at greater than the 99 percent level. Since mandatory votes reduce certification success they likely discourage unions from applying for certification. To test this hypothesis the same specifications are run using the

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[15]Johnson (2001) does not include PEI or the federal sector in the analysis. There are no data on certifications and decertifications for PEI (the smallest province in Canada with a population of roughly 100,000). The federal sector is omitted because there are no data for the explanatory variables for this sector. In the simulations I assume that the coefficients from the earlier analysis fairly reflect the experience of all jurisdictions from 1980 to 1998. Relevant data on certifications and decertifications for the federal sector are included in the simulation analysis. Total union membership provides the initial value and is used to calculate the residual. This means that when the 'simulation' is performed using the actual certification success rates and application rates it produces 'actual' Canadian union density shown in Figure 1.

application rate (*apprate*) as the dependent variable. The coefficient on the mandatory vote dummy is negative and significant at greater than the 99 percent level in each specification. Table 2 presents the coefficient estimates on the mandatory vote dummy for the two specifications for each dependent variable that are used to adjust the certification success rate and the application rate in the simulations.

The certification success rate and the application rate are adjusted using the relevant coefficient estimate on the mandatory vote dummy and a set of weights. For the experiment that examines union density as if mandatory votes (card check) had been in effect in all jurisdictions, the mandatory vote coefficients from the certification success rate and application rate regressions are weighted by the percentage of the labour force that is not covered by mandatory vote legislation (card check) in each year and then added to (subtracted from) the actual certification success rate and application rate in each year. The adjusted certification success rates and application rates are then used in the union membership identity to generate simulated union membership in each year.

Experiment #1: Canadian Union Density if Mandatory Votes had prevailed in all years.

The first experiment simulates what Canadian union density would have been from 1980 to 1998 if mandatory votes had been used in all jurisdictions throughout the period. Figure 6 shows that by 1998 simulated Canadian union

density is 3.3 to 4.6 percentage points lower than its actual value. This difference provides an estimate of the portion of the Canada-U.S. density gap that can be attributed to the absence of mandatory votes in many Canadian jurisdictions. In 1998 the Canada-U.S. density gap is 19.4 percentage points. The simulations suggest that 17 to 24 percent of the gap, about 3 to 5 percentage points, can be attributed to the different recognition procedures used in the two countries.

This is a very conservative estimate of the role of mandatory votes in explaining the gap between Canadian and U.S. union densities. First, Canadian mandatory vote procedures though similar to those of the U.S. are not identical. Mandatory votes in Canada must take place a short period of time (5 to 7 days depending on the jurisdiction) after the application for certification is filed. In the U.S. there is no time limit between application and vote and usually several months elapse before the vote occurs. Thus the window of opportunity for the employer to influence the workers concerning the union, using legal or illegal means, is much longer in the U.S. Further, when unfair labor practices occur differences in procedure and the role of the courts in the two countries mean it is faster and less expensive to process complaints in Canada than in the U.S. These differences suggest that Canadian mandatory vote procedures are more conducive to certification success than U.S. procedures. The coefficient estimates based on Canadian data reflect the impact of Canadian mandatory vote procedures. These estimates likely underestimate the impact that a U.S. style mandatory vote system

would have in Canada and therefore underestimate the role of mandatory votes in explaining the density gap. Second, U.S. and Canadian union recognition procedures have differed since the 1950s. The simulation covers only the period from 1980 to 1998 so the full impact of the difference in union recognition procedures is underestimated.

Experiment #2: Canadian Union Density as if Card Check prevailed in all years.

The move from card check procedures to mandatory votes in Canada and its impact on Canadian union density is explored by simulating what Canadian union density would have been if card check existed in all years and jurisdictions from 1980 to 1998 and comparing this to actual density. The results of this experiment are presented in Figure 7 and show that by 1998 the increasing use of mandatory votes reduce union density in Canada by 1.0 to 1.4 percentage points. Put another way, the increasing use of mandatory votes in Canada has narrowed the density gap by approximately one percentage point.

Over most of the period of the simulation mandatory vote legislation applied to only a small percentage of the Canadian labor force (Figure 5). In recent years this has changed. Ontario, the most densely populated province in Canada, adopted mandatory votes in November 1995. Manitoba introduced mandatory votes in February 1997. As a result the percent of the Canadian labor force covered by mandatory votes increased dramatically from 18 percent in 1995

1995 to 57 percent in 1999.[16] In the future the negative impact of mandatory votes on Canadian union density is likely to increase.

6. Conclusions

This paper presents three pieces of evidence concerning the Canada-U.S. union density gap in the 1980s and 1990s.

First, the robust performance of the U.S. economy compared to the Canadian economy has contributed to the gap. In the last 16 years in Canada, despite stagnating or declining union membership growth, union density has remained fairly stable partly because the poorer economic performance of the Canadian economy has resulted in slower growth of non-agricultural paid employment. In the U.S., where there is no downward trend in union membership growth over this period, union density falls nevertheless. The decline can be linked to the robust performance of the U.S. economy accompanied by higher employment growth. A simulation suggests that by the end of the 1990s differing employment growth in the two countries may account for as much as 3 percentage points of the 19 percentage point gap.

Second, changes in industry structure in the 1980s and 1990s have only a

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[16]Manitoba amended its mandatory vote legislation and returned to a card check system in October 2000. Manitoba accounts for approximately 4 percent of the Canadian labour force. By 2001 approximately 53 percent of the Canadian labour force is covered by mandatory votes. In August 2001 the B.C. legislature tabled a bill that would re-introduce mandatory votes. B.C. accounts for approximately 13 percent of the Canadian labour force. Due to data availability the analysis in this paper runs to 1999.

small impact on the density gap. Shift-share analysis reveals that over the period both countries experience structural change that is expected to have a negative effect on union density but that its impact is larger for U.S. density. The analysis suggests that from 1983 to 1998 about one percentage point of the gap can be attributed to the different degree of structural change that has occurred in the two countries.

Third, simulation analysis that builds on earlier research in Johnson (2001) is used to quantify the impact of different recognition procedures used in the two countries on the union density gap. The first experiment shows that if all Canadian jurisdictions had used mandatory votes from 1980 to 1998 Canadian density would have been 3 to 5 percentage points lower in 1998. This provides a conservative estimate of the contribution of different union recognition procedures in the U.S. and Canada to the gap: the U.S. relies almost exclusively on mandatory votes while in Canada some jurisdictions use mandatory votes and others use card check. The second experiment shows that if all Canadian jurisdictions had continued to use card check from 1980 to 1998 Canadian union density would have been approximately one percentage point higher. Therefore the move away from card check toward mandatory votes has reduced the union density gap by about one percentage point. Since 1995 the percentage of the Canadian labour force covered by mandatory votes has increased from 18 to 57 percent. In the future this factor is expected to make a larger contribution to the

decline of Canadian union density and to the narrowing of the density gap.

In sum, if we assume these factors independently affect union density, differing economic performance, structural change and union recognition procedures account for between 6 and 10 percentage points (or 32 to 53 percent) of the union density gap in the late 1990s.

Table 1: Shift-Share Indices for Canada and the U.S.- 1983 to 1998

Year	U.S.	Canada
1983	100.0	100.0
1984	99.4	99.5
1985	98.4	99.5
1986	97.3	99.1
1987	96.6	99.2
1988	96.1	99.3
1989	95.5	100.0
1990	95.3	99.1
1991	94.9	98.4
1992	94.5	98.4
1993	93.9	98.4
1994	93.4	98.7
1995	92.8	98.4
1996	92.3	98.0
1997	91.7	98.3
1998	91.3	98.5

Table 2. Coefficients on the Mandatory Vote Dummy		
Dependent Variable	Application Rate	Certification Success Rate
Specification #1	-0.09 (.027)	-9.08 (0.96)
Specification #2	-0.15 (.027)	-8.88 (1.07)

Notes:

1. The number in parentheses is the standard error of the coefficient.

2. The mandatory vote variable is defined as 1 in years where mandatory vote legislation is in force and 0 when card check legislation is in force. In the year the legislation is introduced the variable is equal to the portion of the year the mandatory vote legislation is in effect. The regressions are estimated using cross-section time-series analysis. Data covers nine Canadian jurisdictions (PEI and the federal sector are the omitted jurisdictions) from 1978 to 1996.

3. Specification #1 is estimated using Feasible Generalized Least Squares. The independent variables include: industry mix; percent female employment; percent part-time employment; union density; the unemployment rate; the inflation rate; dummies to control for the effect of first agreement arbitration legislation, dues checkoff legislation and province fixed effects.

4. Specification #2 is estimated using Feasible Generalized Least Squares. The independent variables are the same as those used in Specification #1 plus province-specific linear time trends.

Figure 1. Union Density

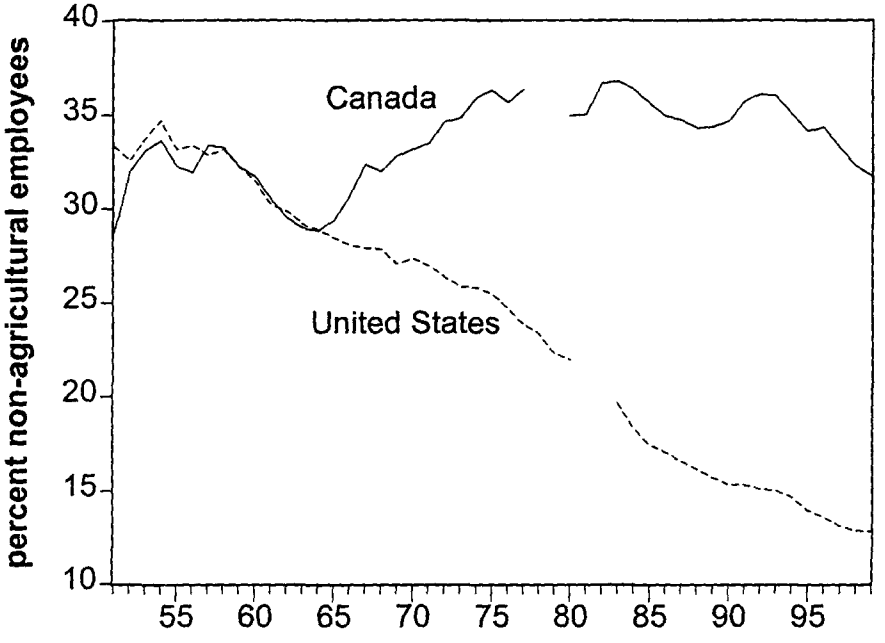


Figure 2. Union Membership Growth 1952-1999

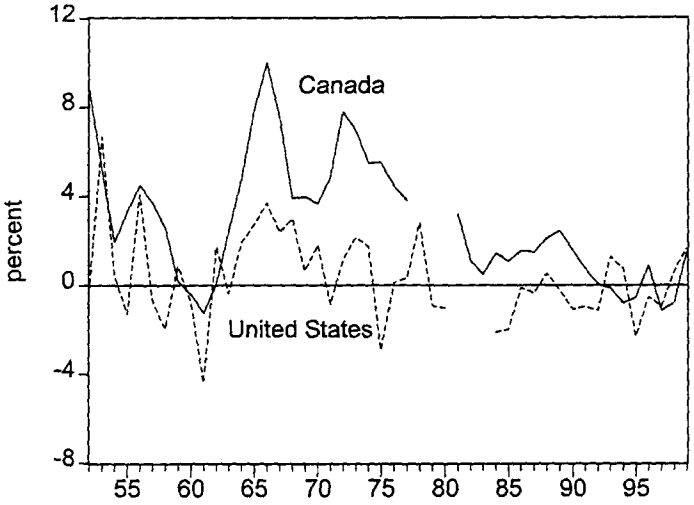


Figure 3. Non-agricultural paid employment growth 1952-1999

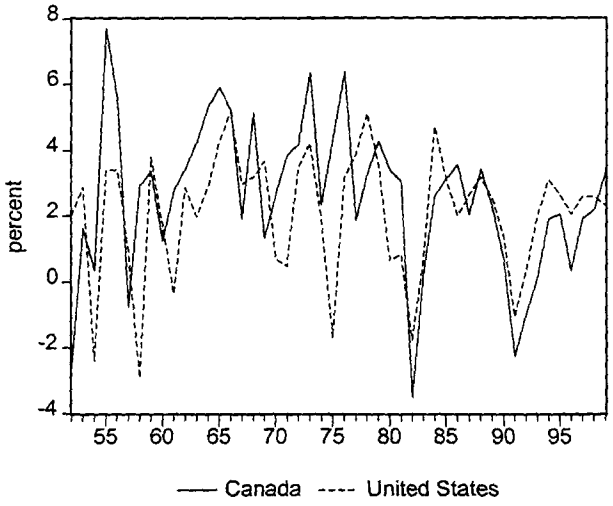


Figure 4. Canadian Union Density simulated using U.S. non-agriculutural paid employment rates

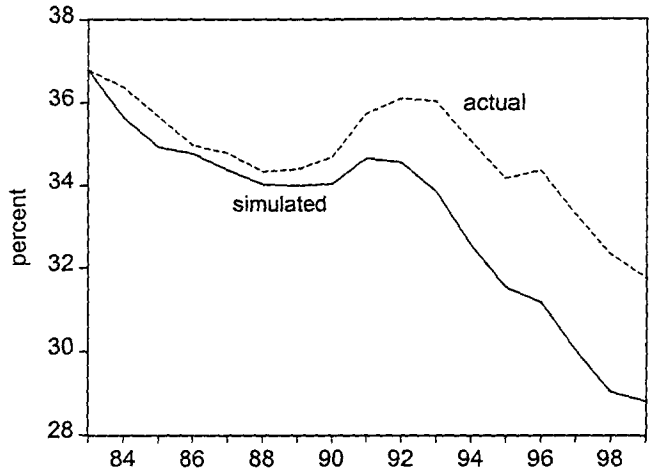


Figure 5. Percent of the Canadian Labour Force covered by Mandatory Vote legislation

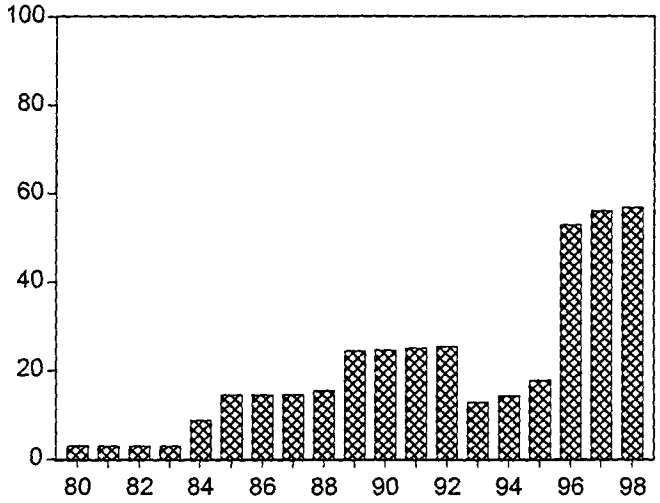


Figure 6. Experiment 1: Mandatory Votes in all years

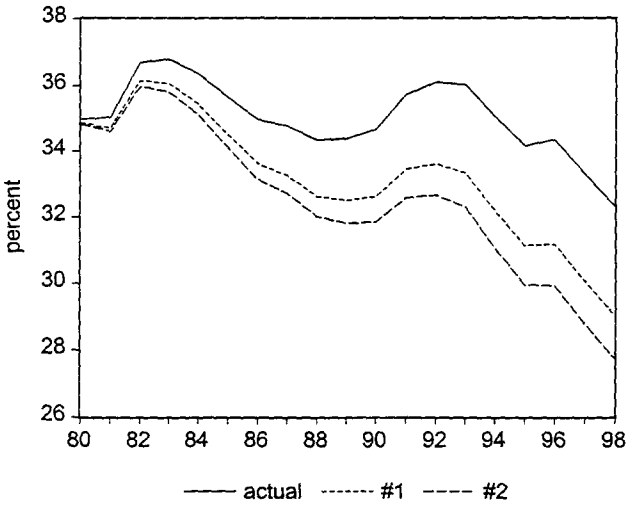
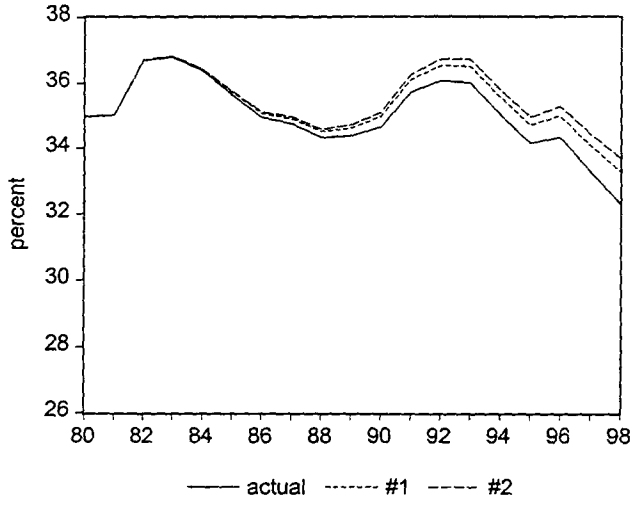


Figure 7. Experiment 2: Card check in all years



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DATA APPENDIX

Union Density

Definition

There are a number of ways that union density can be defined. The one used in this paper is:

$$\text{union density (t)} = \frac{\text{union members(t)}}{\text{non-agricultural paid employees (t)}} \times 100$$

Some definitions use 'union coverage' in the numerator. When a union is granted bargaining rights in Canada or the United States all members of the bargaining unit are represented (covered) by the union whether they choose to be union members or not. Data on coverage are available on a very limited basis in Canada (from the Survey of Union Membership for 1984, the Labour Market Activity Survey from 1986 to 1990, and the Labour Force Survey from 1998 to the present). Data on coverage are available in the U.S. from the Current Population Survey from 1978. Membership data are available over a longer time period. Therefore membership is used in the numerator rather than coverage. The denominator should capture total potential union members. Various measures have been used as the denominator including; the civilian labor force; the non-agricultural labor force; the paid labor force; and employment. Non-agricultural paid employees is the definition used in this paper. There are two reasons for this. First, from a conceptual perspective this measure eliminates two groups that are

potential union members; agricultural workers and the self-employed. Second, from a practical perspective, data on this variable are available, consistent and comparable within each country and across the two countries over time.

Data

Canadian Union Membership Data

Aggregate Canadian union membership data from 1951 to 2000 are compiled by the Workplace Information Directorate (Human Resources Development Canada) and published in the Directory of Labour Organizations (until 1998) and in the Workplace Gazette (from 1998). The data are based on a survey that is voluntarily completed by unions or employee associations with 50 members or more. The survey asks the number of dues paying members as of January 1 of the year. This series provides the only consistent data on union membership in Canada over the period from 1951 to 2000. No data are available for 1979 (no survey was conducted in this year). Union membership data for Canada are also available from the Corporations and Labour Unions Returns Act (CALURA) from 1962 to 1995.[17] Under CALURA unions (with over 100 members) were required by law to report membership and other information to Statistics Canada. Union members include those that are on strike, retired, laid-

[17]CALURA was discontinued in 1992 but Statistics Canada continued to collect the data until 1995. The data from 1993 to 1995 are available in Statistics Canada, Unionization in Canada: A Retrospective (1999).

off or unemployed as of December 31 of the year. From 1983 employee association members are counted as union members. This represents a significant break in the series. CALURA is the only source for disaggregated information on union membership over time in Canada (e.g. union members by province or union members by industry etc.)[18] While CALURA is considered to provide the most reliable information on union membership in Canada, the Workplace Information Directorate provides a longer, more consistent series on aggregate union membership therefore this source is used for exploring union density over time.

U.S. Union Membership Data

From 1951 to 1979 data on union membership are from the Directory of National Unions and Employee Associations. The data exclude employee associations. These data are based on a biennial questionnaire. The responding organization provided, through their own determination, the average number of dues paying members. The numbers may include union members who are unemployed, laid off, on strike or retired. Data for1980 and 1983 to 2000 are from the Current Population Survey (CPS). There are no data available for 1981 and 1982. The CPS includes members of unions and employee associations if they are employed. Data from 1983 to 1997 are based on annual averages and are

[18]There are a number of household surveys that provide information on aspects of union membership in particular years (Survey of Union Membership, 1984, Labour Market Activity Survey 1986-1990). Since 1997 such information is available from the new Labour Force Survey. CALURA provides disaggregated information from 1962 to 1995.

not strictly comparable to the 1980 data based on the month of May. A redesign of the CPS in 1994 means that data after this date are not strictly comparable to the earlier CPS data.

Non-agricultural paid employment

Canadian non-agricultural paid employment data from 1951 to 1999 are from the Workplace Information Directorate Directory of Labour Organizations and the Workplace Gazette. (The data are from the Labour Force Survey, Annual Averages and this source provides the information for 1978). U.S. non-agricultural paid employment data are from Table B-46 of the Economic Report of the President 2001.

Notes

Calculation of Union Density

Data on Canadian union membership is the stock on January 1 of the year. Non-agricultural paid employment is an annual average over the year. The stock measure of union membership is converted to an annual average so the time frame is comparable to the denominator. Since no union membership data are available in 1979 this means that average annual union membership cannot be calculated for 1978 or 1979 and therefore union density is missing for these two years.

Time Periods for Comparison

The first section of the paper looks at long run trends in union density in the U.S. and Canada from 1951 to 1999. The rest of the paper focuses on the period since1983. Union membership data are most consistent and comparable both within countries and across countries over the later period.

Shift-Share Analysis

Canada

The shift-share analysis uses unionization rates as percent of employed workers in the industry. Density numbers by industry in 1983 are from CALURA. 1983 is chosen as the base year so that the shift-share index is directly comparable to the U.S. shift-share index. Employment figures from 1983 to 1997 are from the Labour Force, Annual Averages (CANSIM numbers for each employment series follow). The industries included are: agriculture (D984730); fishing, trapping, mining, quarries and oil (D984731); manufacturing (D984736); construction (D984739); transportation, communications and utilities (D984741 and D984735); trade (D984742); finance (D984745); services (D984746) and public administration (D984751). The industry classifications for both union density and employment are based on the Standard Industrial Classification, 1980 (SIC). In 1999 Statistics Canada began using a new industrial classification system called, the North American Industrial Classification System (NAICS). The

new industry classifications are not strictly comparable to the SIC classifications. In the process all the employment series were revised from 1987 and as a consequence the CANSIM series listed above, based on the SIC classification system, are no longer available directly from the CANSIM database. The 1998 employment numbers are created using Table 18 from "Employment by Industry and Occupation Based on New Classifications, Labour Force Update. Spring 1999. Data on employment after 1998 are only available for classifications based on the NAICS. Therefore the shift-share index ends in 1998.

United States

Data on employment are from the Economic Report of the President (2001). Data on unionization rates are from the Current Population Survey. The industry categories are: construction; mining; manufacturing-durable; manufacturing-nondurable; transportation and utilities; wholesale trade; retail trade; finance, insurance and real estate; services; and government.

Simulations

Data

Certification and Decertifications

Data on certifications and decertifications from 1980 to 1993 are from Martinello, Certification and Decertification Activity in Canadian Jurisdictions

(1996) with updates to 1996 kindly provided by Professor Martinello. I added the data for 1997 and 1998. These data are compiled from the Annual Reports of the private sector provincial and federal Labour Relations Boards (LRBs).[19] All private sector and most public and para-public employees are covered by these LRBs (the actual coverage varies by jurisdiction). There are no data on certifications and decertifications for Prince Edward Island (the smallest province in Canada with a population of approximately 100,000) or for activity outside the jurisdiction of the private sector LRBs.

The LRB Annual Reports provide information on certifications disposed (processed) and certifications granted and decertifications granted. Bargaining unit size (*certsize, dcertsize*) is constructed using data on the number of newly certified (covered) and newly decertified (uncovered) employees and certifications and decertifications granted.[20] Data on the number of newly certified employees and newly decertified employees are available on a limited basis across jurisdictions. Data on newly certified employees are available from 1980 to 1998 for B.C., Alberta, Saskatchewan, Manitoba, Ontario Newfoundland

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[19]In most, but not all, Canadian jurisdictions the administrative body responsible for administering collective bargaining legislation is called the Labour Relations Board. In this paper all of these bodies will be referred to as Labour Relations Boards.

[20] When a union is granted bargaining rights all workers in the bargaining unit are represented (covered) by the union but they are not necessarily union members. The left-hand side of the union membership growth accounting identity measures union members. The right-hand side measures covered workers. The residual ensures the identity holds. Using household survey data Galarneau (1996) finds that coverage is only 4 to 5 percentage points higher than membership in Canada in 1984 and from 1986 to 1990.

and the federal jurisdictions and for 1980 to 1988 for Quebec. Data on newly decertified employees are available for 1980 to 1998 for Saskatchewan and Ontario and 1980, 1981 1989 and 1990 for the federal jurisdiction. All available data are used. The average size of bargaining unit certified (decertified) in Canada is constructed by summing the number of newly certified (decertified) employees across all jurisdictions in that year where the data are available and dividing by the sum of certifications (decertifications) granted in these jurisdictions in that year. When the mean size of bargaining unit certified (decertified) is multiplied by the total number of certifications (decertifications) granted the product estimates the number of newly certified (decertified) employees in Canada.

Firms

Firm data are from the Longitudinal Employment Analysis Program (LEAP) and are kindly provided by John Baldwin and Richard Dupuy of Statistics Canada. LEAP is constructed through a record linkage of administrative data from Revenue Canada and Employment and Immigration Canada and Statistics Canada survey data. Only businesses with paid employees in Canada are considered. The term business includes all businesses or organizations which during a reference year have remitted social security and tax deductions on behalf of these employees to Revenue Canada. Establishment data are only available from 1978

to 1998.

Labour Force

Labour Force data by province are from the Labour Force Survey, Annual Averages available from the CANSIM database. The relevant series numbers are: D984598(Canada), D987677 (BC), D987395 (Alberta), D987113 (Saskatchewan), D986831 (Manitoba), D986549(Ontario), D986267 (Quebec), D985985 (New Brunswick), D985703 (Nova Scotia), D985421(PEI) and D985139 (Newfoundland).

Notes

Time Period

The union density simulations cover the period from 1980 to 1998. This period is determined by data limitations. Firm data are available from 1978 to 1998. There is no union membership information available from the Workplace Information Directorate in 1979. Therefore the initial union membership data are for January 1,1980 and can be used to simulate union membership in 1981.

Stocks and Flows

It is important that union membership flows generated from the stock of union members match the flows from the LRB Annual Reports as closely as

possible. As mentioned above the union membership numbers are the stock as of January 1 of (t). Certification and decertification data cover a 12 month period that runs either from January (t) to December (t) or from April (t) to March (t+1). In the simulation analysis the flow of union members from January (t) to January (t+1) are matched with the Annual Report numbers for January (t) to December (t) or April (t) to March (t+1). Simulated union membership is converted to an annual average and combined with the annual average non-agricultural paid employment to generate simulated union density.

CHAPTER FIVE

Changes in wages and hours of workers in different skill-groups in the U.S. and Canada from 1981 to 1997[1]

1. Introduction

Many researchers assert that in the last twenty years the U.S. and Canadian labour markets experienced a similar skill-biased demand shock (OECD (1994); Card, Kramarz and Lemieux (1999); DiNardo and Lemieux (1997); Kuhn (2000)). This shock is linked to increasing earnings inequality (Levy and Murnane (1993); OECD (1994)). The OECD Jobs Study (1994) suggests that institutional differences across countries may account for different labour market responses to this shock. Canada has more generous social programs and a higher real minimum wage than the U.S. These institutional differences may mean that wages are more downward rigid in Canada. Standard supply and demand theory then predicts that the response to a similar decrease in the demand for low-skilled labour in Canada will be different from that in the U.S. In Canada a larger proportion of the reduction in earnings of low-skilled workers will occur in a reduction in hours. In the U.S. a larger proportion of the reduction in earnings of

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[1]This paper is co-authored with Peter Kuhn. The methodology and motivation are provided by Professor Kuhn. My contribution to this research paper is the literature review, computer work, interpretation of the results and write-up. Thanks to John Burbidge and Michael Veall for helpful comments and suggestions. This research is funded by the Social Sciences and Humanities Research Council of Canada and the Canadian International Labour Network.

low-skilled workers will occur in wages.

This study describes the behaviour of earnings per week, wages per hour and hours per week of prime-aged males by skill-group (identified by earnings quintile) for Canada and the U.S. from 1981 to 1997. The results are interesting for at least three reasons. First, the analysis reveals the contribution of variation in wages and hours to the increase in earnings inequality in Canada and the U.S. Second, labour market outcomes of high-skill and low-skill workers are compared within and between countries over time. Third, indirect evidence concerning relative wage flexibility in the U.S. and Canada is presented by comparing the labour market outcomes of low-skill workers across countries. The paper is organized in the following way. Section 1 provides an overview of the labour market environment in each country and its implications for labour market outcomes. Section 2 provides a review of the literature. Section 3 describes the data and discusses the measures used to describe wage and hours adjustment in the two countries. Section 4 presents the results.

2. Labour Market Environment

In this section three issues related to the labour market environment in each country are addressed. First, labour market shocks in the U.S. and Canada are discussed. Second, some of the institutional differences between the two countries that may affect downward wage rigidity are described. Third, the theoretical implications of the shocks for hours and wage adjustment of low-

skilled workers within the different institutional contexts of the two labour markets are outlined using the standard neoclassical supply and demand model.

2.1 Shocks

In order to make predictions concerning the behaviour of wages and hours for low-skilled workers in the U.S. and Canada it is necessary to describe the shocks that have affected the labour markets.

A number of researchers agree that a similar skill-biased demand shock has affected the labour markets in both countries in the last twenty years. Studies that have compared the two labour markets either present empirical evidence to support this claim (Murphy, Riddell and Romer (1998); Card, Kramarz and Lemieux (1999); OECD (1994) DiNardo and Lemieux (1997)) or assume that it is true (Kuhn and Robb (1998); Gottschalk and Joyce (1997); Kuhn (2000)). Two common explanations offered for the increase in relative demand are skill-biased technological change and globalization. Skill-biased technological change is often linked to computers and has been shown to have occurred across industries and sectors (Berman, Bound and Griliches (1994), OECD (1994), Johnson (1997), and Card, Kramarz, and Lemieux, (1999)). Increased openness to trade is also thought to have played a role (Freeman (1995); Richardson (1995); Wood (1996); Card, Kramarz and Lemieux (1999)). Both the U.S. and Canada possess a comparative advantage in the production of skill-intensive products. Increased

trade means that the North American economies increase exports of high-skill intensive goods and increase imports of low-skill intensive goods. Thus the demand for high-skilled labour by the North American traded goods sector increases while the demand for less-skilled labour decreases. No consensus has emerged on the reason for the skill-biased increase in demand. Research continues to explore this issue.[2] [3]

The supply side of the labour market must also be taken into account. Researchers agree there has been an increase in the relative supply of high-skilled labour in both countries in the last twenty years and agree that a skill-biased demand shock dominated the labour markets in both countries resulting in increased earnings inequality. (Katz and Murphy (1992) Juhn, Murphy and Pierce (1993); OECD (1994)). There is disagreement concerning whether the size of the increase in the relative supply of high-skilled labour in Canada has been the same as in the U.S. Card, Kramarz and Lemieux (1996) present direct evidence that labour supply shocks are similar across the U.S. and Canada for different skill

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[2]The assumption of a common skill-biased demand shock, while common, has been criticized. First, it has been found that a significant portion of the increase in earnings inequality both in Canada and the U.S. occurs within skill groups rather than between skill groups (Juhn, Murphy and Pierce (1993); DiNardo and Lemieux (1997)). This means that either unobserved skills play an important role or other factor(s) are affecting the wage structure. Second, researchers have failed to provide convincing empirical evidence to explain the source of this skill-biased shock. Timing is an issue with the exogenous technology shock hypothesis. Acemoglu (2001) argues that technological change may be an endogenous response to the increase in the supply of educated labour. Wasmer (2001) suggests that supply side factors explain most of the changes in wage structure in the U.S.

[3]Aggregate demand conditions also affect the labour market. In order to control for this factor in the analysis that follows labour markets are compared at peaks in the business cycle. This is discussed later in the paper.

groups.[4] Kuhn and Robb (1998) present evidence that the aggregate labour supply curve for prime-aged males in Canada shifted left between 1973 and 1989 however in Kuhn and Robb (1997) they find the curve was stable between 1977 and 1991. Kuhn and Robb (1998) show the U.S. supply curve is stable between 1973 and 1989.[5] DiNardo and Lemieux (1997) find that the supply of workers by age and education categories change at comparable rates in the U.S. and Canada during the 1980s. However the supply of workers with more than high school education has increased faster in Canada than in the U.S. Murphy, Riddell and Romer (1998) suggest that Canada, compared to the U.S., has experienced a larger increase in the relative supply of high-skilled labour and this accounts for the smaller increase in wage inequality in Canada. Freeman and Needels (1993) and Bar-Or et al (1995) suggest that the education premium in Canada is lower than that of the U.S. because the relative supply of university educated labour in Canada was higher than the U.S. in the 1980s. The conflicting evidence concerning supply shocks suggests a need for caution when making a claim that there have been identical labour supply shocks in both the U.S. and Canadian

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[4] Card, Kramarz and Lemieux (1996) provide an overview of the relative supply of labour by skill group. They present two types of data: (1) the change fraction of the adult population that was highly educated (16 years of schooling in U.S. or a university degree in Canada), the percentage change in this group and the percentage change in the share and; (2) a skill-index that captures the change in the relative supply of different education and age groups. After examining these data they conclude that "relative supply shifts were not too dissimilar in the three countries during the 1980s"(p. 9). (The third country is France.) In addition in their regression results the supply index variable is often insignificant or of the wrong sign.

[5] Kuhn and Robb (1997, 1998) are described in more detail in section 2.

economies.[6]

2.2 Institutions

Differences in social programs and the minimum wage between Canada and the U.S. suggest there may be greater downward wage inflexibility in Canada.[7] This portion of the paper broadly reviews these differences and their implications for wage flexibility.

Unemployment insurance and social assistance programs exist in both the U.S. and Canada. Hanratty and Blank (1992) and Blank and Hanratty (1993) document the differences in social safety nets in Canada and the U.S. in the 1980s. They conclude that in terms of both coverage and level of benefits

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[6]Appendix 3 presents results for regional samples for the U.S. and Canada. The samples choose provinces and states that have a large portion of manufacturing. It is thought that similar labour market shocks will have affected the markets in these smaller more comparable samples. The results for the regional samples provide evidence that supports the conclusions based on the national samples. The results are presented in greater detail in Appendix 3.

[7]Two other institutions that may cause inflexibility in the labour market are Employment Protections Laws and unions. Neither of these institutions are considered in this analysis. Kuhn (2000) describes the differences in Employment Protection Legislation in the U.S. and Canada. It is clear that Canadian law offers much more protection than that of the U.S. by requiring that notice (or pay in lieu of notice) be given before workers are laid off. The costs (or penalities for non-compliance)of these laws are not large enough to influence employer hiring or layoff behaviour. In fact the empirical evidence available suggests that by allowing pre-displacement job search such advance notice legislation improves labour market adjustment and reduces short spell unemployment (Jones and Kuhn (1995) and Friesen (1997)). It is unlikely that this institutional difference affects wages or employment. Unions are also not considered in this analysis. DiNardo and Lemieux (1997), in a study that compares the impact of unions on the hourly wage distribution in the U.S. and Canada, show that unions raise wages of lower middle income groups but have no impact on the lower or upper tail of the wage distribution. Since workers in the bottom quintile are not protected by unions any effect of unions on this group is second order and it is not surprising that unions do not exert a major influence on this group. The focus of this study is on adjustments of wages and hours for this group therefore the impact of unions on labour market flexibility is not considered in the analysis.

Canadian social programs are more generous than those of the U.S. In the 1990s changes have been made to social programs in both countries but Canada's programs remain more generous than those of the U.S.[8] The presence of social programs changes the labour-leisure choice and makes non-market alternatives to working more attractive. The more generous programs in Canada suggest the reservation wage in Canada is higher than in the U.S. and the labour supply curve more elastic at low wages. Therefore Canadian wages are likely more downward rigid than those of the U.S.

Minimum wage laws exist in both the U.S. and Canada. Coverage of the minimum wage is similar in both countries. Figure 1 plots the average real minimum wage in Canada (provincial labour force weighted average of provincial minimum wages) and the U.S. federal real minimum wage from 1981 to 1996. From the plot it is apparent that the real minimum wage in Canada has: been higher than that of the U.S. over the last two decades; decreased in the 1980s but the decline was not as large as in the U.S.; and increased in from 1990 to 1995 while the U.S. real minimum wage declined. This evidence suggests the

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[8]Unemployment insurance is available in both countries for a limited time to those who lose their jobs and meet eligibility requirements. In Canada the eligibility requirements are less strict and the replacement rate is approximately twice that of the U.S. (OECD (1994)). Assistance is also available in both countries for non-workers. In Canada means-tested programs provide cash assistance to low income families and individuals. In the U.S. food stamps are the only form of support generally available to able-bodied workers. In the U.S. some assistance has been available on a very limited basis to single mothers below a certain income level through Aid for Families with Dependent Children (AFDC) until 1996 and more recently through Temporary Assistance for Needy Families (TANF) and there is a federal welfare program the provides minimal cash assistance to households and individuals regardless of household composition.

Canadian minimum wage possesses more 'bite' than the U.S. minimum wage and is more likely to create a binding constraint in the labour market. DiNardo and Lemieux (1997) find that minimum wages tend to prop up the lower tail of the wage distribution in Canada and that differences in real minimum wages in the U.S. and Canada account for approximately one-third of the difference in changes in the variance of log wages of males from 1981 to 1988. Minimum wages legislate downward wage rigidity. Since the Canadian real minimum wage is higher than the U.S. this legislation affects a wider range of wages and introduces a greater degree of downward wage rigidity in Canada.

2.3 Theoretical Implications

Labour markets in the U.S. and Canada are embedded in competitive market economies without centralized wage-setting institutions. They can be characterized using the standard neoclassical supply and demand model. This basic framework has been used in many other studies of the earnings distribution in these countries (see for example, Katz and Johnson (1992); Murphy, Riddell, Romer (1998); Johnson (1997); Card, Kramarz and Lemieux (1999)). Social programs and minimum wages introduce downward wage inflexibility to the labour market. Downward wage inflexibility from both these sources binds only the low-skill labour market. If Canadian wages are more rigid downward than those of the U.S. the supply and demand model predicts a similar skill-biased

demand shock will cause different adjustments in the market for low-skilled labour in each country. A decrease in demand for low-skilled labour puts downward pressure on both wages and hours of this group. However if wages are inflexible downward then market adjustment to the shock will occur primarily through hours of work rather than through wages. If institutional differences between the two economies result in greater downward wage rigidity in Canada than in the U.S. a greater portion of the adjustment to a similar adverse demand shock for low-skilled labour will occur through a reduction in hours rather than wages in Canada and the opposite will be true in the U.S.[9] The market for high-skilled labour is not affected by these institutional rigidities. The supply and demand framework predicts that an increase in demand for high-skilled labour will increase wages and hours for this group in both countries.

The supply and demand model predicts that a skill-biased demand shock will result in: (1) increased wages and hours of high-skilled workers; and (2) decreased wages and hours for low-skilled workers. In addition more rigidly-downward wages in Canada should result in a larger portion of low-skilled labour market adjustment through hours rather than wages compared to the U.S. In the empirical analysis in section 3 we present evidence concerning the differential adjustment of wages and hours in the Canadian and U.S. labour markets.

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[9]The adjustment to the skill-biased demand shock may also occur through the number of people hired or laid off. The analysis presented in this paper focuses only on those who are employed. High-skill and low-skill workers are identified by earnings quintile and such data are not directly available for those who are unemployed.

3. Earlier Studies

Two areas of earlier research are particularly relevant for this study. First, there is research that compares labour market outcomes in the U.S. and Canada asking if differences in outcomes are consistent with institutional differences across the countries. Second, there is research that looks at the contributions of hours per week and weekly wages to the earnings distributions in each country.

3.1 Labour Market Outcomes that reflect Institutional Differences in the U.S. and Canada

The research that looks for evidence that different labour market institutions in the U.S. and Canada result in different labour market outcomes presents a mixed set of results.

DiNardo and Lemieux (1997) test directly for the affect of unions and minimum wages on the hourly wage distribution in Canada and the U.S. between 1981 and 1988. They use a semi-parametric technique to simulate hourly wage distributions in each country in the absence of unions or minimum wage. Comparing these distributions to the actual wage distributions measures the impact of these institutions on the wage distribution within each country and across countries. Data are from the Current Population Survey (CPS) in the U.S. and the Survey of Work History (SWH), 1981 and the Labour Market Activity Survey(LMAS), 1988 for Canada. They find higher unionization and a higher real

minimum wage in Canada explain approximately two-thirds of the difference in wage inequality across the two countries - each institution accounts for about one-third of the difference. They show minimum wages have the largest impact on the lower tail of the distribution. They find unions have little effect on the distribution of wages either near or below the minimum wage or in the upper tail of the distribution.

Kuhn and Robb (1998) hypothesize that since Canada has a more generous social safety net if wages of low-skilled workers fall, low-skilled labour in the both the U.S .and Canada respond by supplying less labour but the response by Canadian low-skilled labour is larger. Data for males aged 25-54 who work full-time (but not necessarily full-year) from the Survey of Consumer Finances (SCF) for Canada and CPS for the U.S. are used. They split the sample into deciles using weekly earnings and compare labour supply responses across the two countries at similar points in the business cycle (the data cover the period from 1973 to 1992). They find that wage (weekly earnings) reductions are linked to declining employment (weeks worked in the year) particularly in the lowest decile and that both aggregate and within decile responses are larger in Canada than in the U.S. This provides indirect evidence that Canada's more generous social programs cause larger quantity adjustments relative to price adjustments at the bottom of the wage distribution. Kuhn and Robb (1998) note the Canadian results may confound movements along the labour supply curve with shifts in that

curve while in the U.S. the labour supply response occurs along a stable curve. However it appears that the shift occurred in the 1970s and the curve has been stable since 1977 (Kuhn and Robb (1997)).

Card, Kramarz and Lemieux (1999) compare wage and employment adjustment in Canada and the U.S. (and France). They argue that different labour market institutions (unions, minimum wages and social programs) in the three countries mean wages are more flexible downward in the U.S. Data for the U.S. are from the 1979 and 1989 CPS. Data for Canada are from the SWH, 1981 and the LMAS,1988. Samples are constructed to be as comparable as possible. A supply and demand framework that allows for the presence of downward wage rigidity is used to test for the responsiveness of wage changes and employment changes. The results are not conclusive but on balance show relatively smaller wage adjustments across skill groups in Canada compared to the U.S. but no systematic widening of employment outcomes. They conclude that there is at best weak support for the hypothesis that institutional differences in these countries account for their different labour market outcomes.

Kuhn (2000) examines data from 1981 and 1992 on prime-aged males from two comparable data sources: the SCF for Canada and; the CPS for the U.S. Log weekly earnings are split into quintiles. Mean log earnings are calculated by quintile and decomposed into mean log hours per week and mean log hourly wage. The percent change in hours and wages are compared between 1981 and

1992 for the U.S. and Canada. He finds that hourly real wage declines in the bottom quintile are approximately the same in the U.S. and Canada (about 15%) and suggests this casts doubt on the hypothesis that the different institutional environment in Canada creates downward wage rigidity.

3.2 Hours per week, the hourly wage and the weekly earnings distribution

Several studies look at the contribution of hours and hourly wages to the distribution of weekly earnings.

We are aware of only one study that compares U.S. and Canadian hours and wage adjustment. DiNardo and Lemieux (1997) show that hourly wage inequality grew more slowly than weekly earnings inequality in Canada compared to the U.S. This suggests that weekly hours of work have become more unequal over time in Canada and have played a larger role in increasing inequality.

There are a number of studies that look at Canada. Picot (1996) documents the rising inequality in weekly earnings over the 1980s and early 1990s. He uses data from a number of different surveys (SWH, 1981; Survey of Union Membership (SUM), 1984; LMAS, 1986, 1989; and the Survey of Labour Income Dynamics (SLID), 1993) and compares across years at similar points in the business cycle. By decomposing the log variance of earnings he traces the source of the rising inequality in weekly earnings of prime-aged males primarily to changes in hours per week. Changes in hourly wages play only a minor role. This

work updates an earlier paper by Morissette, Myles and Picot (1994) that reaches similar conclusions. Morissette (1996) confirms these results using a slightly different data set. In contrast U.S. studies have found that the contribution of hours per week to earnings inequality is not important (Burtless (1990); Levy and Murnane (1992)).

3.3 How the current paper fits into the earlier literature

This paper provides information on the behaviour of wages and hours for different skill groups and the contribution of these factors to earnings inequality. The results provide indirect evidence concerning the relative downward wage flexibility in the Canadian and U.S. labour markets. The paper adopts the empirical technique used in Kuhn(2000) and updates and extends these earlier results. This methodology is quite different from earlier studies that have looked at the contribution of variations in wages and hours to earnings inequality. These studies (Picot (1996); Morissette (1995); and Morissette, Myles and Picot (1994); Burtless (1990)) use log variance decompositions to measure the overall contribution of wages and hours to earnings inequality. Our approach provides more detail on how the hours and wages experience of different skill-groups contributes to earnings inequality. We also use different Canadian data than the earlier studies. This methodology is also different from most of the earlier studies that look for evidence of downward wage rigidity. Our study most closely

resembles earlier work done by Kuhn and Robb (1997, 1998). However that study, because of its different motivation, looked at weekly earnings and weeks worked per year and did not use decompositions to explore earnings inequality. Our study also uses different variables in the analysis; weekly earnings, hours per week and wages per hour.

4. Data and Methodology

A number of descriptive measures are used to summarize the behaviour of hours and wages in the U.S. and Canadian economies for different skill-groups over the period from 1981 to 1997.[10] The measures use comparable microdata from the March Current Population Survey (CPS) for the U.S. and the Survey of Consumer Finances (SCF) for Canada. All calculations use the weights from the relevant survey. This section describes the data used and the methodology adopted.

4.1 Data

The March CPS and the SCF are built on labour force surveys that ask very similar questions about individual's labour market experience. Responses to the questions in these surveys provide information on criteria for sample selection and

[10]No data are available from the SCF for 1983. The SCF for incomes in 1983 focused on assets and debts and wage data comparable to other years are not available. Therefore the SCF covers 1981-1982 and 1984-1997. The CPS covers 1981 to 1997.

data that allow the construction of measures of weekly earnings, hours worked per week, and the hourly wage.

Samples are constructed for each country so they are as similar as possible. The sample is defined as men, aged 24 to 60, who are not self-employed, have positive weeks worked in the reference year and positive hours worked in the survey week. Focusing on prime-aged males allows us to abstract from changes that have occurred in women's labour market behaviour, early retirement and time spent acquiring education that may have influenced hours or wages over the period studied. Self-employment earnings are not included because they represent a combination of returns to both human and physical capital. Annual wage and salary earnings are deflated using the Consumer Price Index (1993=100) for each country. The real hourly wage is calculated as: ((real annual wage and salary earnings in the previous year)/((weeks worked in the previous year) X (hours worked in the survey week)).[11]

Two problems exist in these data. First, in the SCF the question concerning usual hours worked per week refers to usual hours worked per week in the reference month (the month of the survey) while the earnings question refers to the previous year. This problem has led other researchers who have examined the behaviour of hours per week and hourly wages to use data from different surveys

[11]Results were also produced for a comparison of regions in the U.S. and Canada. This was done in an attempt to ensure that supply and demand shocks were as similar as possible across the two countries. These results are described in Appendix 3.

over different years (Picot (1996); Morissette (1996); Morissette, Myles and Picot (1994)). Combining data from different surveys raises issues concerning comparability and consistency over time. The SCF is the only Canadian data source to provide consistent information on earnings over a long period of time. Samples can be constructed for both the SCF and CPS that are comparable. The CPS asks questions about both the hours worked last week and the usual hours worked per week on the job last year, the earnings question refers to the previous year. The results presented in the paper use hours last week for both countries. Results were produced for the U.S. using the hours last year variable (see Appendix 1). There is no substantive difference between the two sets of U.S. results. This suggests that, at least for examining long run trends in hours and wages the SCF data are adequate.[12] The second problem is that the income variable in the CPS is topcoded and the topcoding changes over the period: 1981-1983 the topcode is $75,000; 1984 to 1987 it is $99,999; 1988 to1994 it is $199,998. From 1995 to 1997 high income individuals are grouped by age, sex, and worker status and the mean income is assigned to all members of the group. Top coding means that results for the top quintile with respect to earnings and wages do not truly reflect the experience of that group and comparison across the

[12]The results based on SCF are different from that based on combining different surveys. The SCF results show increasing inequality in hours worked per week has contributed to increasing earnings inequality but that the increasing inequality in the hourly wage has had a larger influence on earnings inequality. Earlier Canadian studies (Picot (1996), Morissette (1996) and Morrissette, Myles and Picot (1994)) find that almost all the earnings inequality is explained by increasing inequality in hours not by wages.

two countries is difficult. In most of the analysis that follows mean earnings by quintile are used for comparison because they can be decomposed, however for the top quintile comparison is done on the basis of both mean earnings and median earnings because although the median cannot be decomposed it is less sensitive to topcoding. (Appendix 2 presents the median plots for both countries.)

4.2 Methodology

The empirical work presents the facts concerning the adjustment of real hourly wages and hours per week for different skill groups in Canada and the U.S. The descriptive statistics used are: (1) plots of mean log weekly earnings, mean log hours per week and mean log wages by quintile from 1981 to 1997 for each country and; (2) a comparison of percentage changes in these same variables between years when the U.S. and Canada are at similar points in their business cycles.

First, workers are split into quintiles based on log real weekly earnings. Low-skilled workers are identified as those in the bottom quintile. Note that for each worker (i):

(1) $\ln(\text{weekly earnings}_i) = \ln(\text{hourly wage}_i) + \ln(\text{hours per week}_i)$

Taking within-(earnings)quintile (q) means of both sides of (1) preserves the relationship.

$$(2) \qquad \text{Mean}(\ln(\text{weekly earnings})_q = \text{Mean}(\ln(\text{hourly wage}))_q + \text{Mean}(\ln(\text{hours}))_q$$

The means are normalized to zero in 1981. The normalized means for each variable are then plotted by quintile from1981 to 1997 for each country.

Percent changes in earnings, hours and wages provide a more precise measurement of the changes that have occurred. Differencing equation (2) preserves the identity. This allows the growth in mean earnings to be calculated and decomposed into the growth in wages and the growth in hours by quintile. Since macroeconomic conditions affect the demand for labour it is necessary to compare periods that are at similar points in the business cycle. It is preferable to look at 'peak-to-peak' changes because at this point in the cycle labour supply constraints are likely binding. Analysts[13] identify 1981 as a peak in both countries. In 1981 both countries experienced a weak recovery only to head directly into another recession in 1982. 1988 or 1989 is considered to be a peak in

[13]Identifying business cycles is as much art as science. It requires that a large number of factors be considered. Information on business cycle peaks in the U.S. come from the NBER website (http://www.nber.org/cycles/html). Information on Canadian business cycles are from an article by Cross in the Canadian Economic Observer, February, 1996, pp. 3.1 to 3.39. (The article actually identifies recessions but the peaks can be inferred from the analysis.)

Canada. Employment indicators - the unemployment rate and the employment-to- population ratio reach minimums and maximums respectively in 1989 therefore this year will be used for the analysis. 1990 is considered to be a peak year in the U.S. In 1997 both countries had been on an expansion path for a number of years. In order to examine changes in wages and hours at similar points in the business cycle in each country the results presented in this paper focus on three comparisons : (1) 1981 to 1997 in Canada and the U.S.; (2) 1981 to 1989 in Canada and 1981 to 1990 in the U.S.; (3) 1989 to 1997 in Canada and 1990 to 1997 in the U.S. The decompositions of the growth in mean real earnings are found in Tables 1 through 3.

5. Results

4.1 The Plots of Mean Ln Weekly Earnings, Mean Ln Hours and Mean Ln Wages by Quintile from 1981 to 1997

Figures 2, 3 and 4 plot mean ln weekly earnings, mean ln hours per week and mean ln wages per hour for each country from 1981 to 1997. It is instructive to examine these figures because they provide an overview of the behaviour of these variables in each country over time. Since the sample sizes are so large statistical significance is not an issue in the analysis.

Figure 2 plots the normalized mean ln earnings by quintile from 1981 to 1997 for Canada and the U.S. In each country normalized mean ln earnings 'fans out' over time indicating that earnings inequality increased in both countries. The

bottom three quintiles in the U.S. and Canada experienced declining earnings over the entire period. The fourth quintile in both countries experienced some positive growth in earnings in the late 1980s but has not fared as well in the 1990s. Only the top quintile in Canada and the U.S. experienced increases in earnings throughout the period.[14] There is some evidence of cyclical behaviour. This is most pronounced for the bottom quintile in the U.S. and Canada and the top quintile in the U.S.[15]

Figure 3 presents the behaviour of mean ln weekly hours by quintile. From 1981 to 1997 hours dispersion increased in both the U.S. and Canada. The dispersion is larger in Canada than in the U.S. Prime-aged males in the fourth and fifth quintiles in both countries appear to be working longer hours; those in the second and third quintiles appear to work about the same hours as in 1981. In both countries the bottom quintile experienced a decline in hours. The decline is particularly striking for Canada. Again, there is evidence of cyclical behaviour that is most noticeable for the bottom quintile.

Figure 4 plots the mean ln hourly wage by quintile. In Canada and the U.S. only the top quintile experienced increases in real wages over the period. The

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[14]Growth of the top quintile in the U.S. appears to have been much higher than in Canada. Changes in the top-coding of income in the CPS, discussed earlier, mean that such comparison must be made with care. However when normalized median ln earnings are plotted a similar pattern is observed. Results that plot normalized median ln earnings, hours and hourly wages can be found in Appendix 2. It is not possible to decompose the median therefore these results are not included in the body of the paper.

[15]The plot of median ln earnings for the U.S. also shows that the top quintile is quite sensitive to the business cycle. See Appendix 2.

wage increases for this group in the U.S. are larger.[16] In the U.S. the real wage for the other quintiles falls. This is also true for Canada however the declines of the bottom two quintiles in Canada exhibit considerably more variability than in the U.S. Cyclical fluctuation is evident particularly for the bottom quintile in the U.S. and Canada and the top quintile in the U.S.[17]

A comparison of the plots of normalized mean hourly wages (Figure 4) to the plots of mean hours per week (Figure 3) shows that for both countries increases in inequality in hourly wages is the more important factor in increases in inequality of weekly earnings. However increases in inequality of hours per week has played a larger role in increasing earnings inequality in Canada than in the U.S.

Overall these figures present a rather dismal picture of labour market outcomes for prime-aged males in Canada and the U.S. from 1981 to 1997. In the context of increasing inequality, it appears that most prime-aged males in the U.S. and Canada have experienced declining earnings in the last twenty years. Changes in hours and wages across quintiles in Canada and the U.S. are roughly consistent with a skill-biased demand shock affecting the labour markets: high-skilled workers in the top quintile of the earnings distribution experienced increases in wages and hours; low-skilled workers at the bottom of the

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[16]This is also true of ln median wages in the U.S. See Appendix 2.

[17]This is also true of ln median wages in the U.S. See Appendix 2.

distribution experienced decreases in wages and hours. Workers in the top quintile in Canada have increased their earnings primarily by increasing hours worked rather than through wage increases.[18] In the U.S., workers in the top quintile are earning higher wages and working longer hours. Workers in the middle quintiles in Canada and the U.S. have seen their earnings stagnate or fall over this period even for quintiles that are working longer hours because the decline in wages has been larger than the increase in hours. Low-skilled workers in the bottom quintile in both countries have been hit hardest by changes in the labour market and are most vulnerable to swings in the business cycle. In Canada and the U.S. this group has seen both wages and hours fall throughout most of the period and as a consequence earnings have plummeted. The plots show that the decrease in hours has played a larger role in the decline in earnings of low-skilled workers in Canada and that a decrease in wages has played a larger role in the decline of earnings of low-skilled workers in the U.S. Therefore there is some evidence to support the theoretical prediction that for low-skilled labour when a negative demand shock reduces earnings a larger portion of the adjustment is through hours in Canada where institutions create downward wage rigidity and a larger portion of the adjustment is through wages in the U.S. where the wage is more flexible.

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[18]An institutional difference may account for this. In Canada payroll tax contributions by employers are capped. Therefore, in the case of high-skilled workers , an employer may choose to have the existing labour force work longer hours rather than hire more workers in order to minimize costs.

5.2 Decompositions of the Growth in Weekly Earnings

Tables 1 through 3 present the decomposition of the growth in real weekly earnings for the U.S. and Canada over peak years. Each table shows results for the U.S. and Canada for periods that are closely comparable in time frame and economic conditions. The analysis below summarizes the general trends that are present across all the tables.

First, some general observations. Widening earnings inequality is readily apparent: only the top quintile consistently shows positive growth; the other quintiles experience negative growth in earnings and the declines are larger for lower quintiles. Most workers, except the low-skilled workers in the bottom quintile, are working longer hours: the top four quintiles typically show positive growth in hours and; the bottom quintile consistently shows negative growth in hours worked per week. Real hourly wages have fallen for all workers except those in the top quintile - real wage growth for the bottom four quintiles is always negative and the decline is generally larger for lower quintiles. It is interesting that the general trends in labour market outcomes are similar across the two countries. Not surprisingly these conclusions confirm the observations based on the plots.

Is the evidence consistent with the predictions of the standard model of supply and demand? First, theory predicts that an increase in the demand for

high-skilled labour raises wages and hours (and hence earnings) for this group. The Tables show that wages, hours and earnings increase for the top quintile in each country. Second, theory predicts that a reduction in the demand for low-skilled workers causes wages and hours (and hence earnings) to fall for this group of workers. The Tables show that growth in real wages, hours and earnings is typically negative for the bottom quintile in both the U.S. and Canada. Third, theory suggests that institutional differences between Canada and the U.S. mean that adjustment in the market for low-skilled workers will occur differently in each country. In Canada a larger portion of the decline in earnings will occur through hours while in the U.S. a larger portion will occur through wages. Each table shows the percent of the decline in earnings of the bottom quintile due to wage and hours adjustment. In Canada changes in wages account for between 18 and 70 percent of the total change in earnings of low-skilled workers. In contrast in the U.S. changes in wages account for 89 to 122 percent[19] of the total change in earnings of low-skilled workers. This evidence suggests that wages are more flexible downward in the U.S. and that a larger portion of the change in earnings of low-skilled workers in Canada occurs through hours. In sum, it appears that the evidence from the decompositions generally are consistent with the

[19]In the U.S. in the 1990s the wage decrease is larger than the hours increase.

predictions of the theory.[20]

6. Conclusions

The empirical evidence presented in this paper shows that earnings inequality has increased from 1981 to 1997 in the U.S. and Canada. The analysis reveals that increases in hourly wage inequality are primarily responsible for the increases in earnings inequality. Increases in hours inequality have not been as important but have been larger in Canada than in the U.S.

The labour market experience of high-skilled and low-skilled workers in both countries has been very different in the last twenty years. High-skilled workers have experienced earnings growth combined with increases in hours and, at least in the U.S., wages. In contrast low-skilled workers have experienced dramatic declines in earnings growth and decreases in wages and hours. These changes are consistent with a skill-biased demand shock in the context of neoclassical labour market theory.

In Canada a larger percentage of the reduction in the earnings of low-skilled workers in Canada is accounted for by declining hours while in the U.S. a larger

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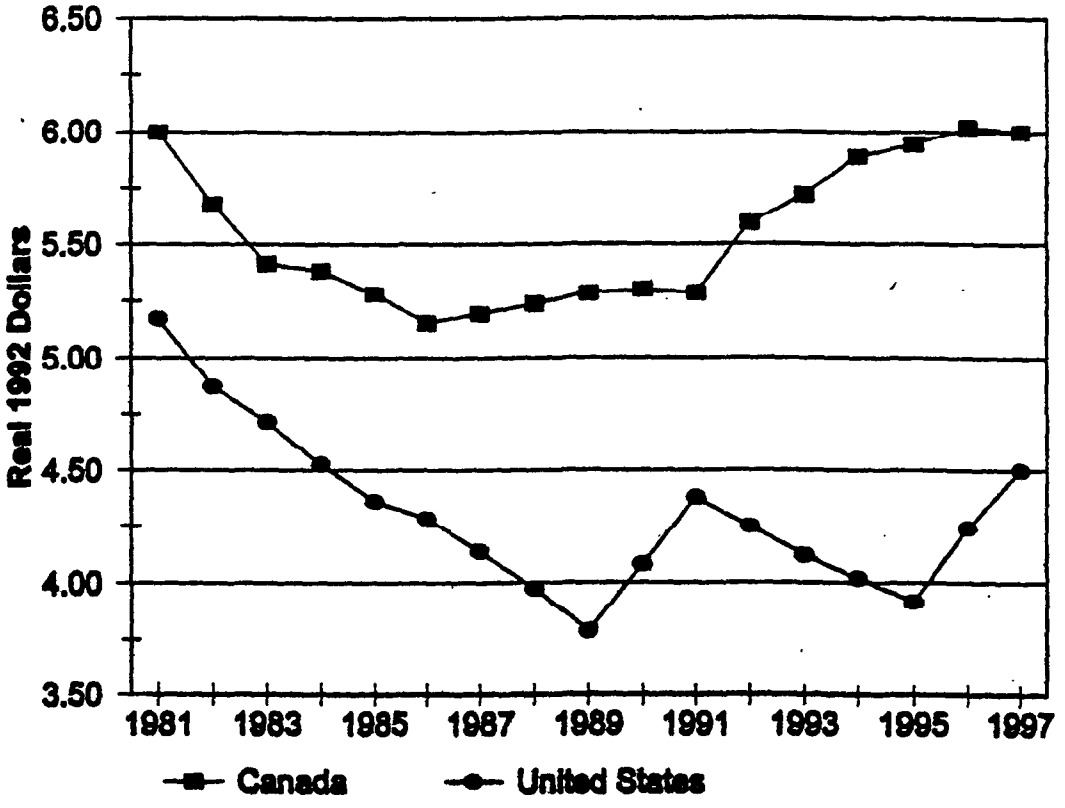
[20] The descriptive analysis presented in this section assumes that a similar skill-biased demand shock has dominated the labour market in each country and that supply side factors have not been very important. This assumption has been made by a number of other researchers (for example Card, Kramarz and Lemieux (1999) and Kuhn (2000)). In which case wage inflexibility is consistent with larger hours adjustments in Canada. However the results are also consistent with an explanation where a similar skill-biased demand shock has affected the labour markets in both countries and the supply of low-skilled labour has fallen in Canada relative to the U.S. and there is no difference in wage flexibility between the two countries.

percentage of the reduction in the earnings of low-skilled workers is accounted for by declining wages. In the context of the neoclassical theory of the labour market this evidence is consistent with a higher degree of downward wage rigidity in Canada than in the U.S.

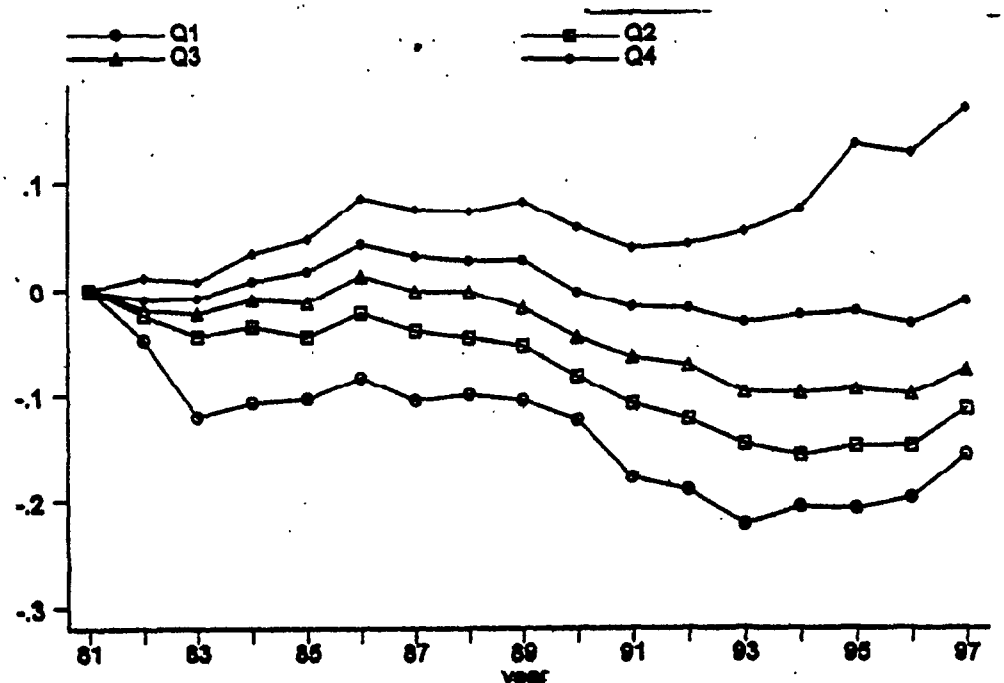
Figure 1. Real Minimum Wage



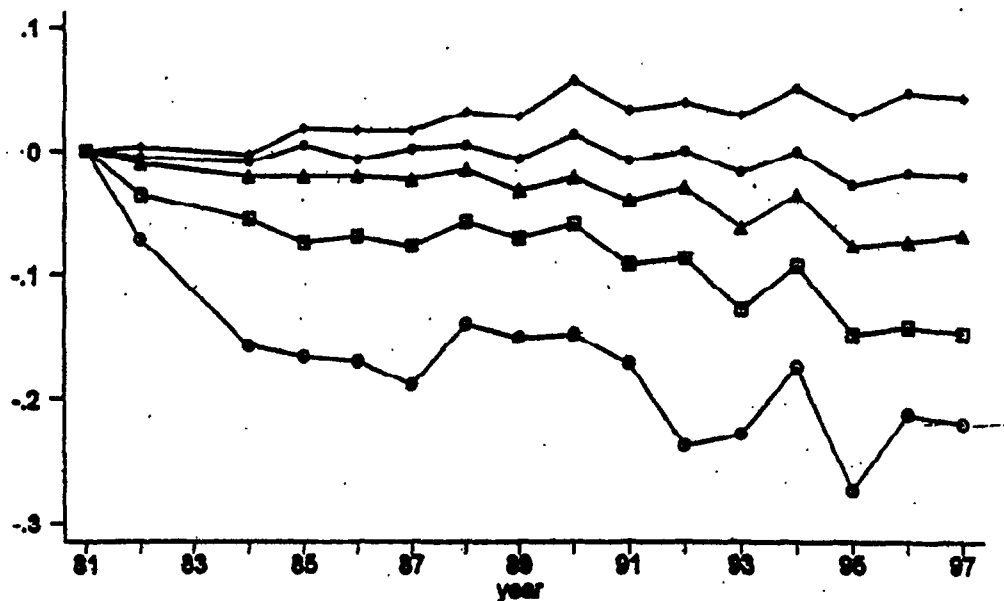
Notes

1. The U.S. minimum wage is the federal minimum.
2. The Canadian minimum wage is a labour force weighted average of the provincial minimum wages.
3. The nominal minimum is deflated by the Consumer Price Index - All Items, 1992=100.

Figure 2. Normalized Mean Ln Weekly Earnings 1981 - 1997

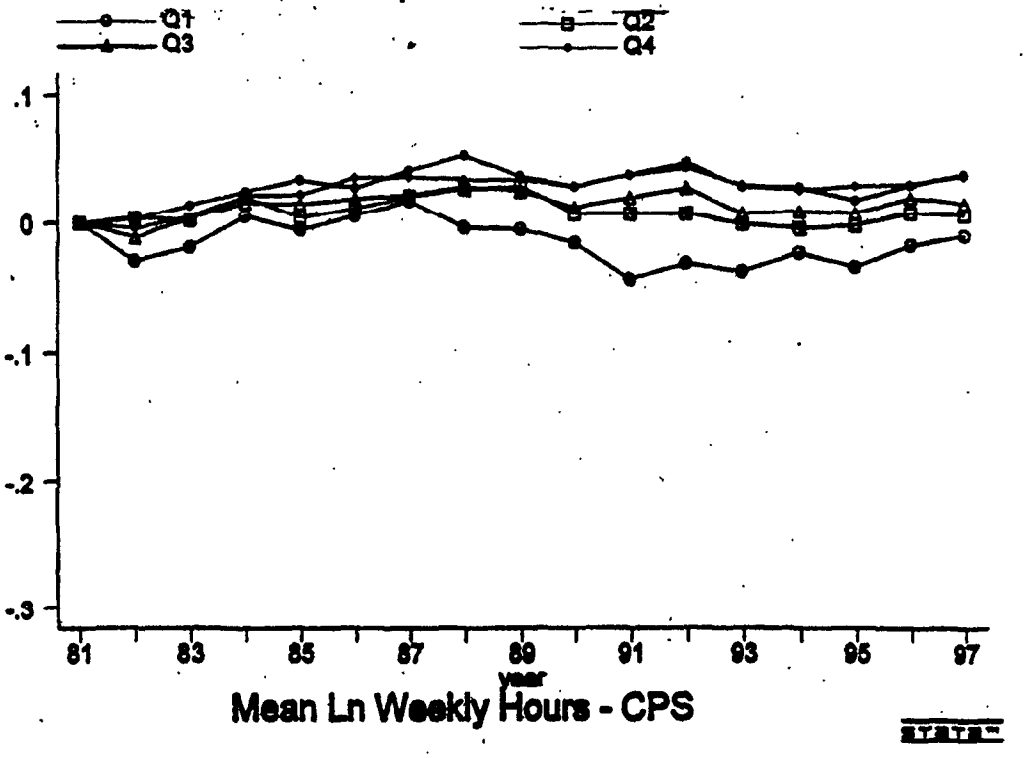


Mean Ln Weekly Earnings - CPS



Mean Ln Weekly Earnings - SCF

Figure 3. Normalized Mean Ln Hours per Week 1981 - 1997



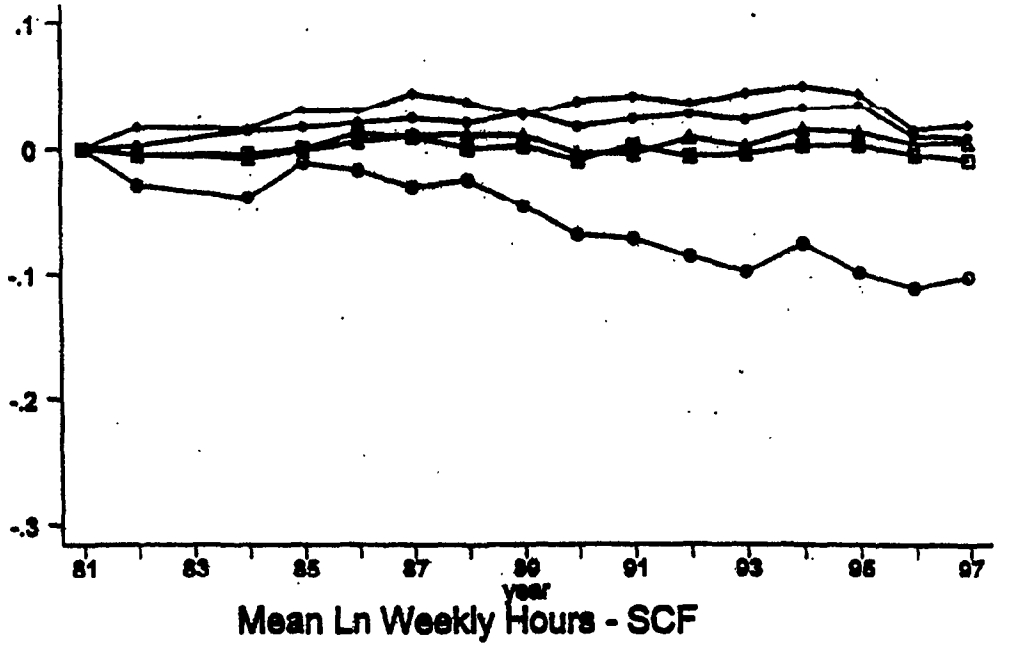
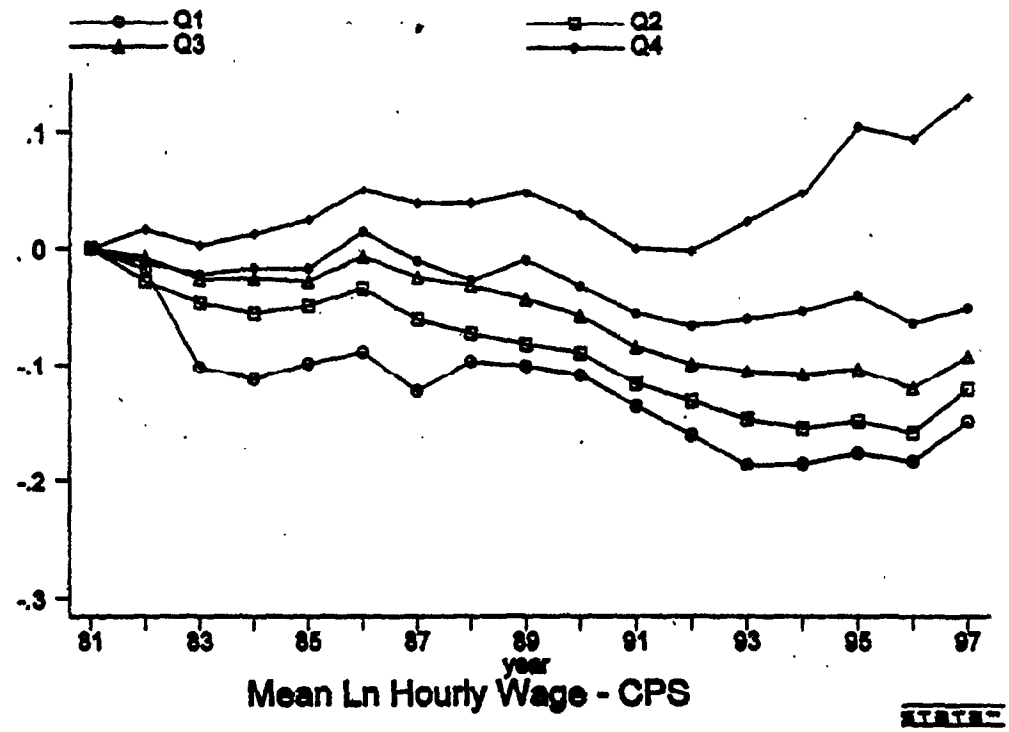


Figure 4. Normalized Mean Ln Hourly Wage 1981 - 1997



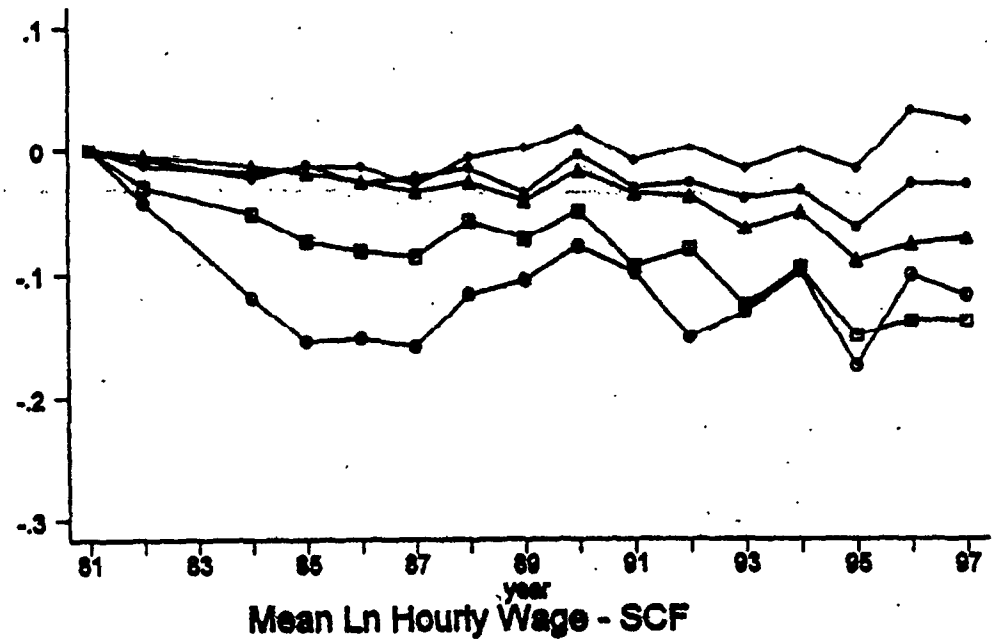


TABLE 1: Decomposition of the Growth in Mean Weekly Earnings
United States and Canada 1981 to 1997

Table 1(a) United States 1981 to 1997			
Quintile	Change in Ln Weekly Earnings	Change in Ln Hours per Week	Change in Ln Hourly Wage
1	-.155	-.007 (5%)	-.148 (95%)
2	-.111	.009	-.120
3	-.073	.018	-.091
4	-.009	.041	-.049
5	.172	.039	.133
All Workers	-.035	.020	-.055

Table 1(b) Canada 1981 to 1997			
Quintile	Change in Ln Weekly Earnings	Change in Ln Hours per Week	Change in Ln Hourly Wage
1	-.220	-.102 (46%)	-.117 (53%)
2	-.147	-.008	-.138
3	-.068	.005	-.073
4	-.021	.009	-.030
5	.043	.020	.024
All Workers	-.083	-.015	-.067

*The numbers in brackets provide information on the percentage of the change in earnings of the bottom quintile that is due to hours per week or hourly wages.

TABLE 2: Decomposition of the Growth in Mean Weekly Earnings
United States: 1981 to 1990
Canada: 1981 to 1989

Table 2(a) United States 1981 to 1990			
Quintile	Change in Ln Weekly Earnings	Change in Ln Hours per Week	Change in Ln Hourly Wage
1	-.123	-.014 (11%)	-.109 (89%)
2	-.080	.009	-.089
3	-.043	.014	-.057
4	-.001	.030	-.031
5	.059	.030	.029
All Workers	-.038	.014	-.051

Table 2(b) Canada 1981 to 1989			
Quintile	Change in Ln Weekly Earnings	Change in Ln Hours per Week	Change in Ln Hourly Wage
1	-.151	-.046 (30%)	-.105 (70%)
2	-.070	.003	-.073
3	-.031	.010	-.042
4	-.007	.029	-.036
5	.028	.027	.001
All Workers	-.046	.005	-.051

*The numbers in brackets provide information on the percentage of the change in earnings of the bottom quintile that is due to hours per week or hourly wages.

TABLE 3: Decomposition of the Growth in Mean Weekly Earnings
United States: 1990 to 1997
Canada: 1989 to 1997

Table 3(a) United States 1990 to 1997			
Quintile	Change in Ln Weekly Earnings	Change in Ln Hours per Week	Change in Ln Hourly Wage
1	-.032	.007 (+ 22%)	-.039 (-122%)
2	-.031	.000	-.031
3	-.029	.005	-.034
4	-.008	.011	-.018
5	.113	.009	.105
All Workers	.003	.006	-.004

Table 3(b) Canada 1989 to 1997			
Quintile	Change in Ln Weekly Earnings	Change in Ln Hours per Week	Change in Ln Hourly Wage
1	-.069	-.057 (83%)	-.013 (18%)
2	-.077	-.011	-.066
3	-.036	-.005	-.031
4	-.013	-.02	.007
5	.015	-.007	.022
All Workers	-.037	-.020	-.018

*The numbers in brackets provide information on the percentage of the change in earnings of the bottom quintile that is due to hours per week or hourly wages.

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APPENDIX ONE: "Hours Last Year" rather than "Hours Last Week" CPS Results

Canadian results, based on the SCF, measure usual weekly hours using a variable that records the usual hours worked per week in the reference month of the survey. This is not ideal because the earnings variable refers to earnings last year. Hours worked in the reference week is used for the Canadian results because it is the only variable that measures usual weekly hours available from the SCF. In order for the U.S. results to be as comparable as possible with the Canadian ones the analogous measure of usual weekly hours from the CPS is used in the paper. The CPS also provides information on the usual hours worked per week in the reference year. The results presented in this Appendix use this measure of hours per week The Figures and Tables demonstrate that the U.S. results are not sensitive to the choice of hours variable - the same trends are evident and the same conclusions can be drawn whether the hours last year, or the hours last week variable is used to measure usual weekly hours.

Figure A1-1. Normalized Mean Ln Weekly Earnings 1981-1997
United States: Hours = usual hours worked per week last year

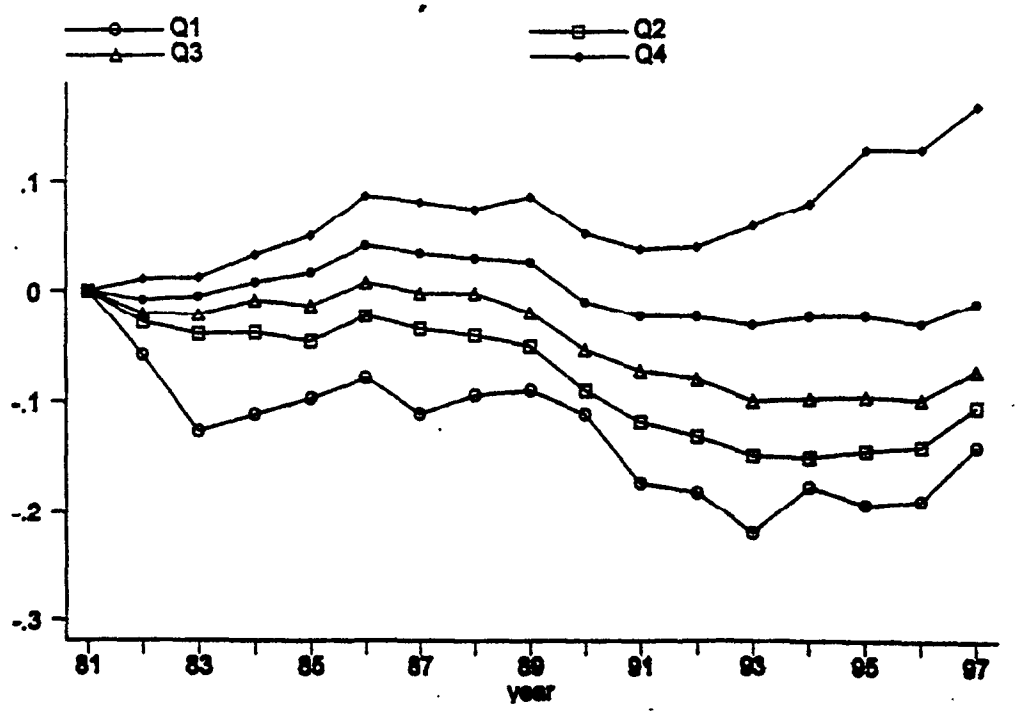


Figure A1-2. Normalized Mean Ln Weekly Hours 1981-1997
United States: Hours = usual hours worked per week last year

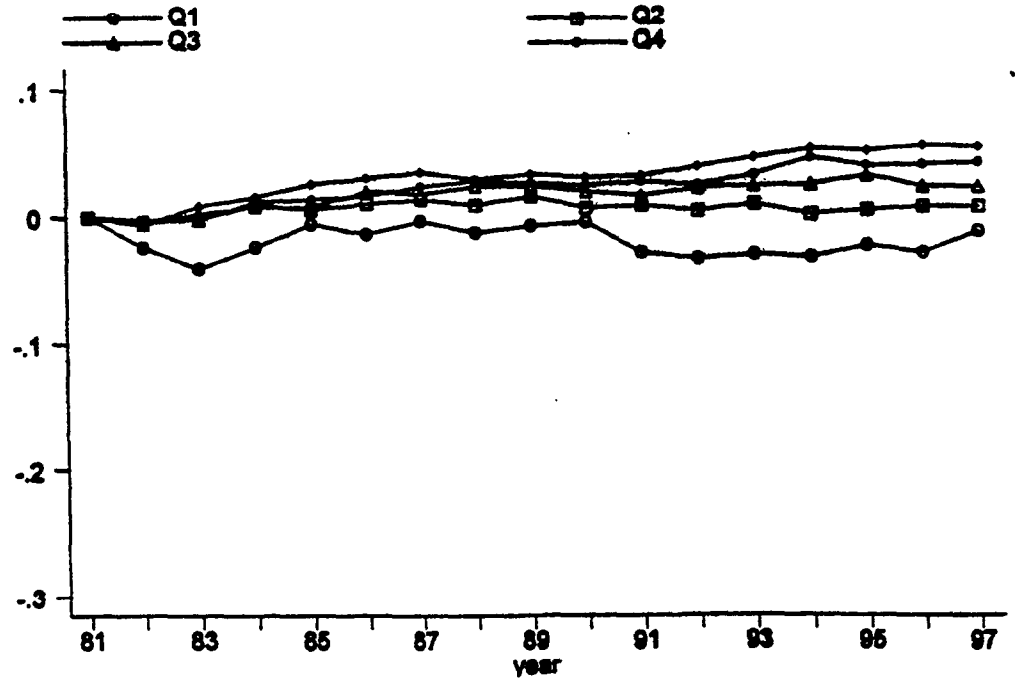


Figure A1-3. Normalized Mean Ln Hourly Wage 1981- 1997
United States: Hours = usual hours worked per week last year

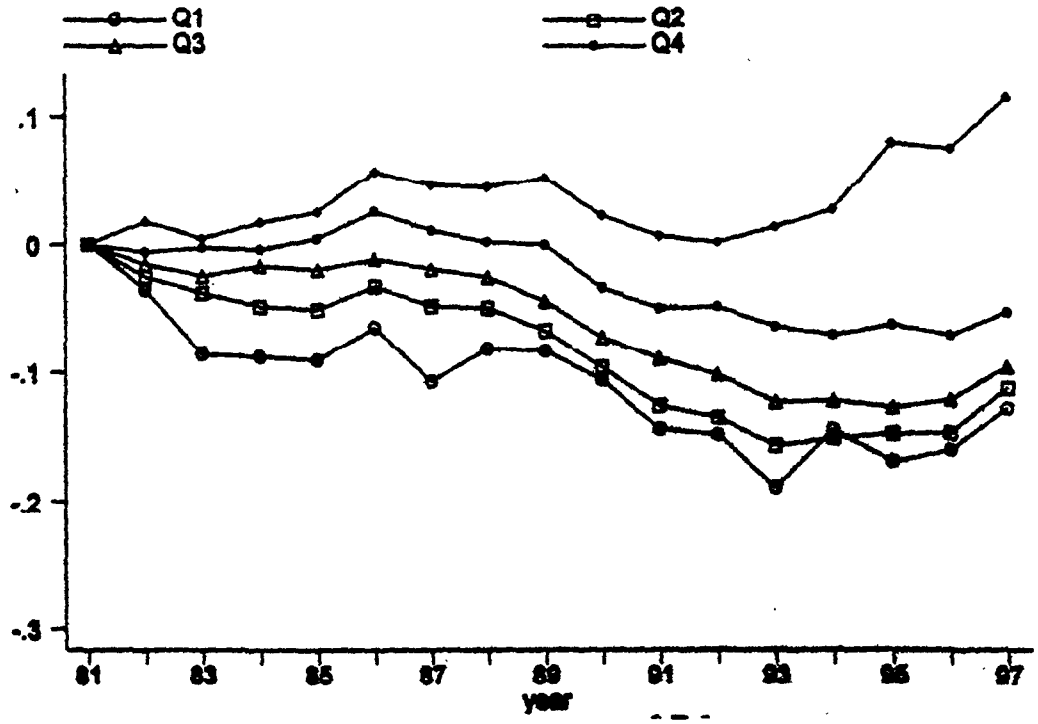


Table A1-1. Decomposition of the Growth of Mean Weekly Earnings
United States: Hours = usual hours worked per week last year
1981-1997

Quintile	Change in Ln Weekly Earnings	Change in Ln Hour per Week	Change in Ln Hourly Wage
1	-.139	-.011 (8%)	-.127 (91%)
2	-.104	.008	-.112
3	-.072	.024	-.095
4	-.009	.043	-.052
5	.171	.055	.115
All Workers	-.031	.024	-.055

Table A1-2. Decomposition of the Growth of Mean Weekly Earnings
United States: Hours = usual hours worked per week last year
1981-1990

Quintile	Change in Ln Weekly Earnings	Change in Ln Hour per Week	Change in Ln Hourly Wage
1	-.110	-.004 (4%)	-.106 (96%)
2	-.089	.007	-.096
3	-.052	.020	-.072
4	-.009	.025	-.034
5	.054	.031	.023
All Workers	-.041	.016	-.057

Table A1-3. Decomposition of the Growth of Mean Weekly Earnings
United States: Hours = usual hours worked per week last year
1990-1997

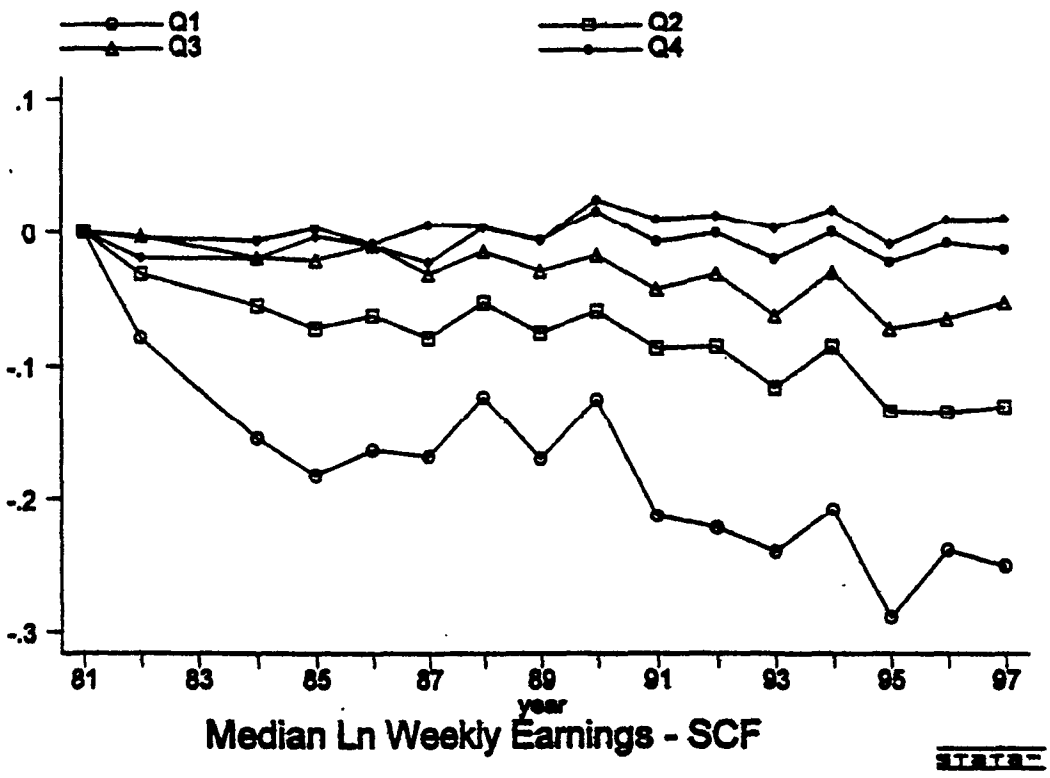
Quintile	Change in Ln Weekly Earnings	Change in Ln Hour per Week	Change in Ln Hourly Wage
1	-.029	-.007 (24%)	-.022 (76%)
2	-.014	.001	-.016
3	-.019	.004	-.023
4	-.001	.016	-.015
5	.116	.024	.092
All Workers	.011	.008	.002

APPENDIX TWO: Median Plots

Topcodes and changes in topcodes of the CPS earnings variable mean that the data on earnings of the top quintile does not truly reflect the experience of this group. The results presented in the paper summarize the experience of this group using the mean. This measure is used because it can be decomposed however it is likely to be sensitive to topcoding. The median, while is cannot be decomposed, is not as sensitive to topcoding as the mean. The Figures presented in this Appendix use medians. When the results concerning median earnings of the top quintile are compared to the results using mean earnings the trends are the same.

Appendix 2: Median Plots

Figure A2-1. Normalized Median Ln Weekly Earnings 1981 - 1997



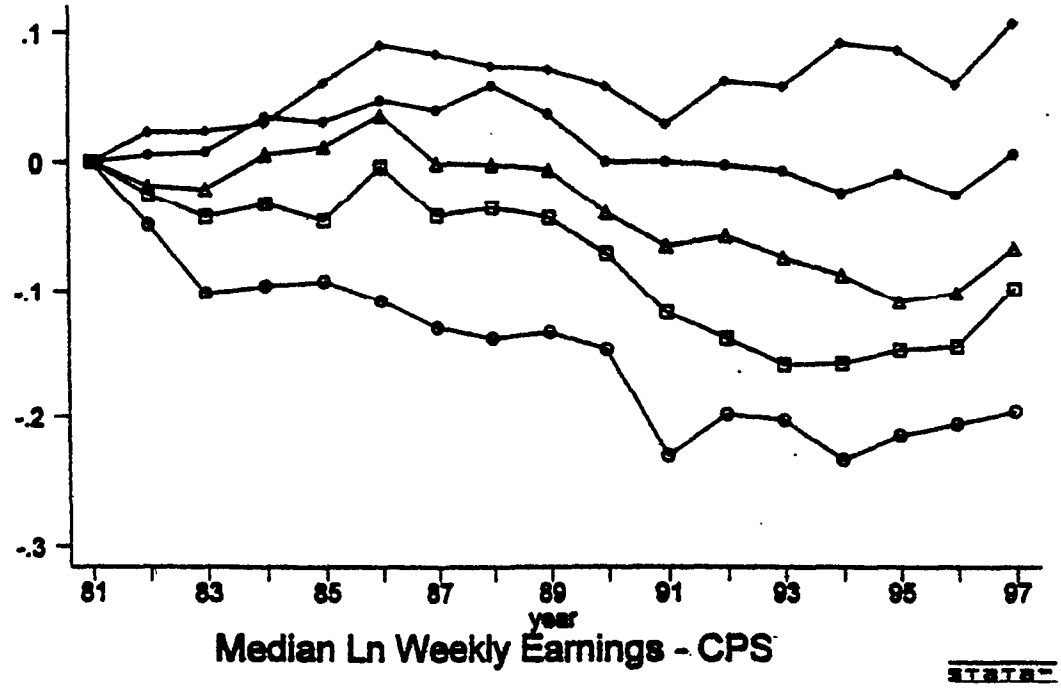
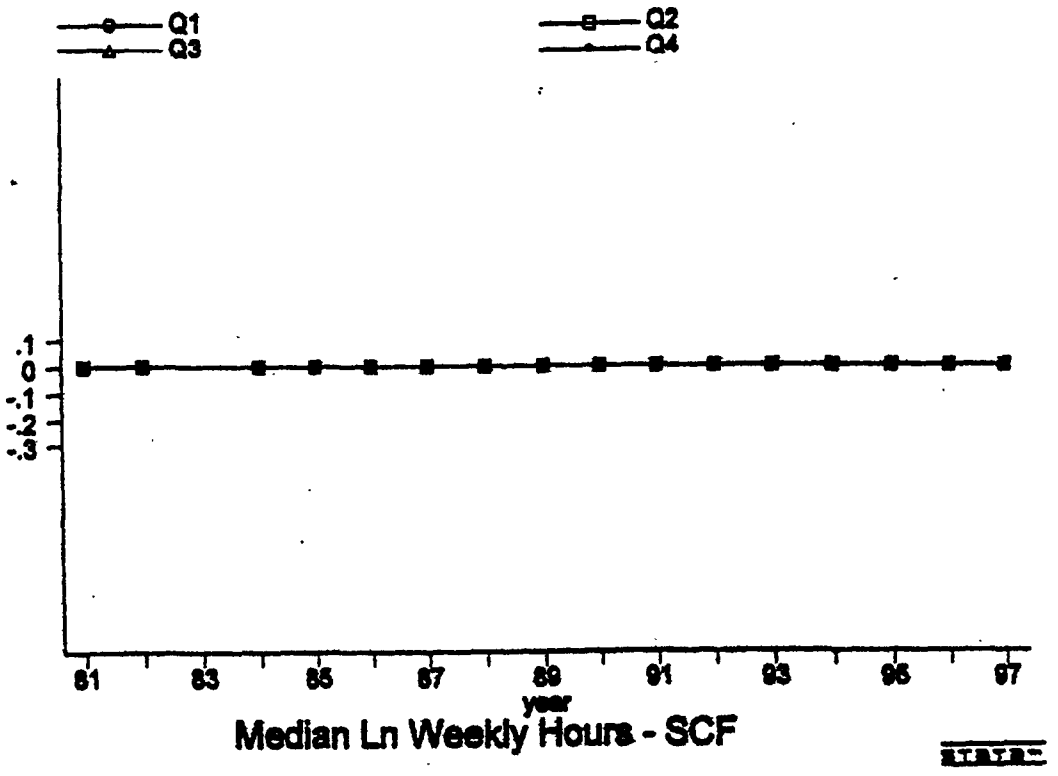


Figure A2-2. Normalized Median Ln Hours per Week 1981- 1997



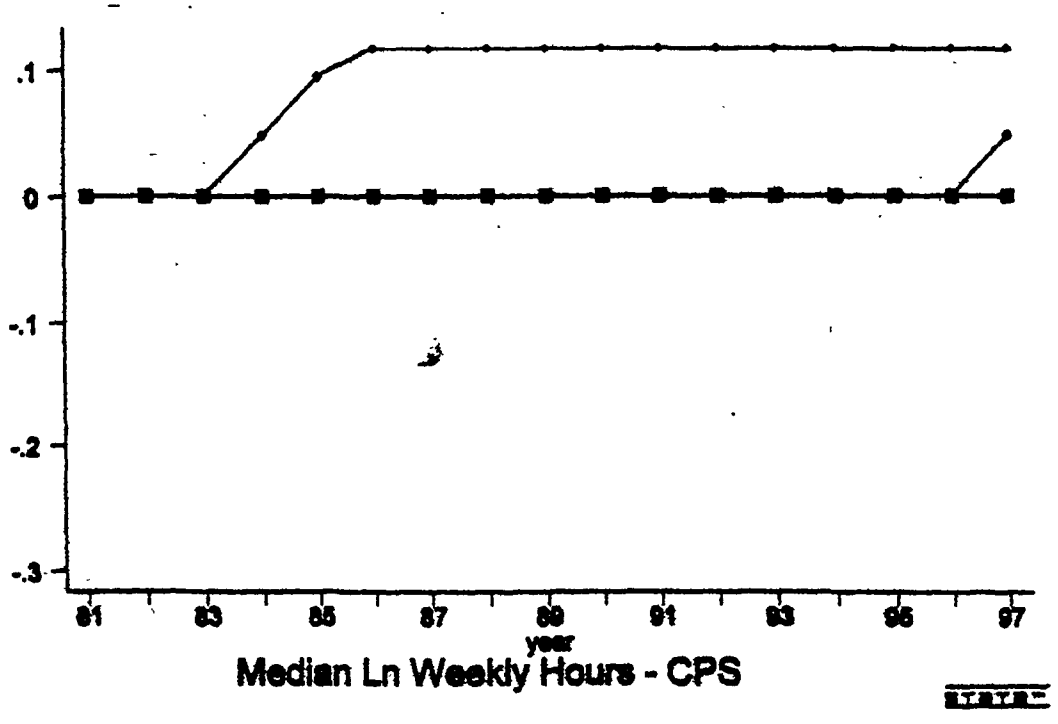
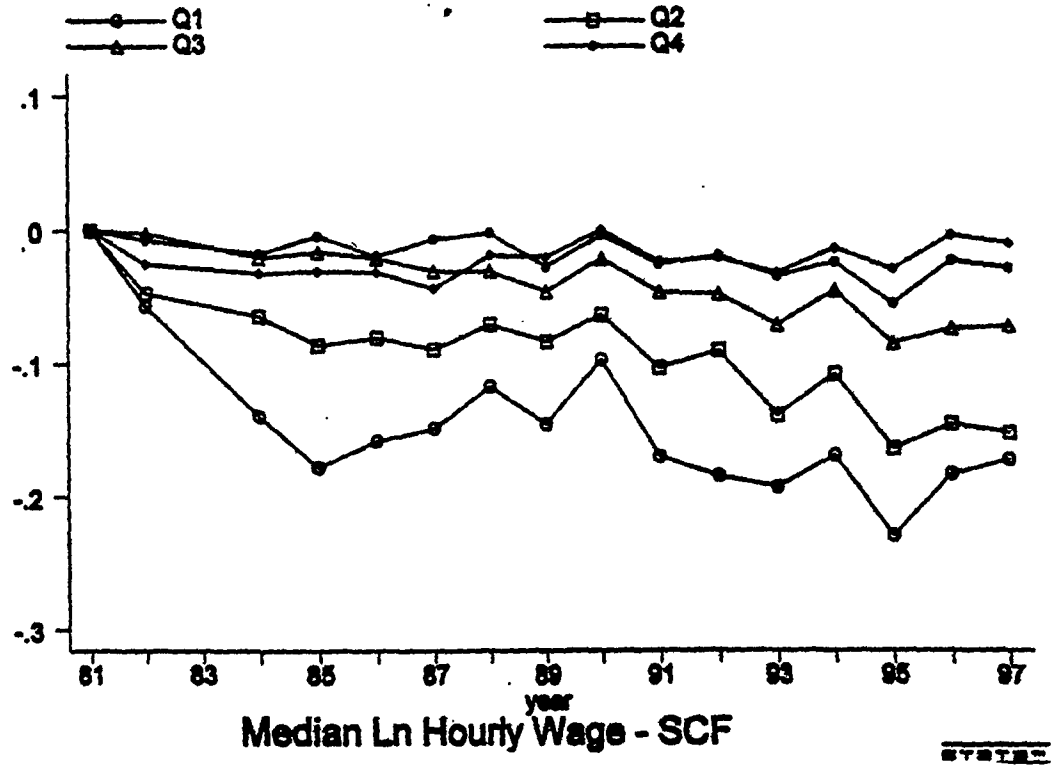
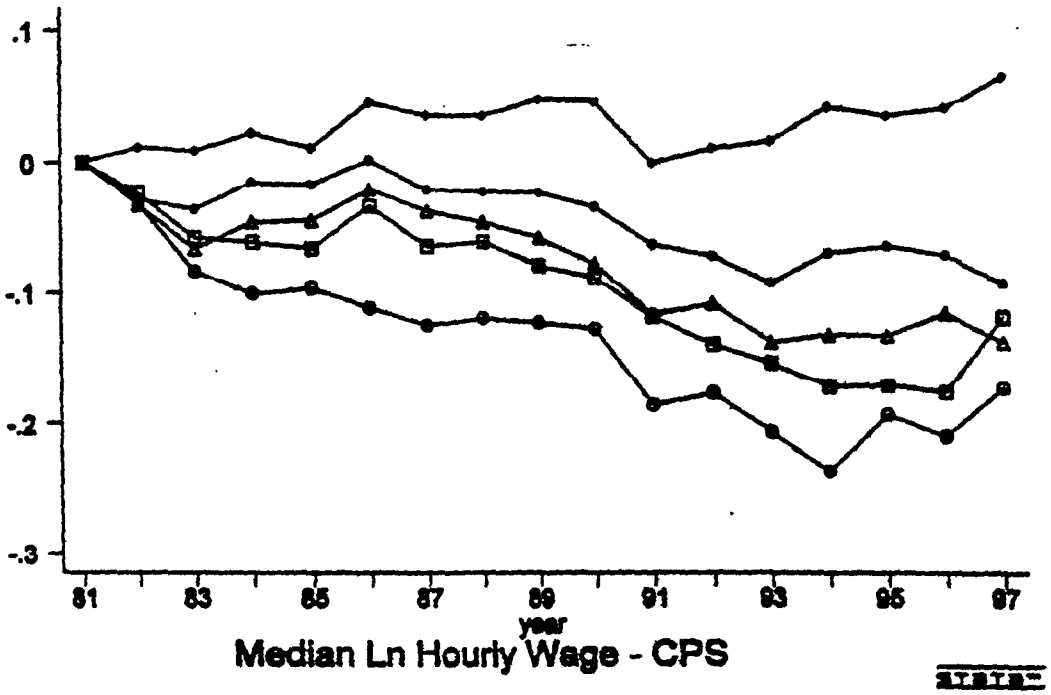


Figure A2-3. Normalized Median Ln Hourly Wage 1981- 1997



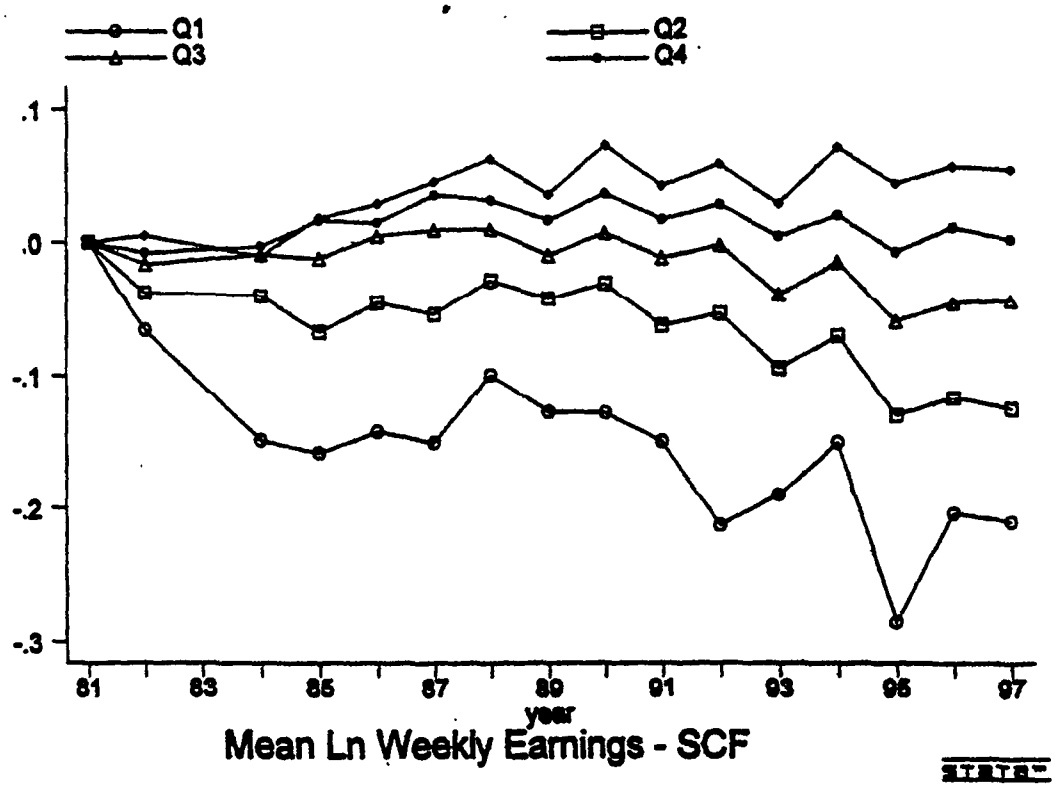


APPENDIX THREE: Results based on regional samples

Results presented in this appendix are for smaller samples for the U.S. and Canada. The samples chosen represent parts of the two economies that are most similar and therefore are more likely to have experienced similar labour market shocks. The sample definitions are based on an article that appeared in Labour Force Update (1998)[21] The samples include states and provinces that have a high proportion of employment in manufacturing. Quebec and Ontario are chosen for the Canadian region sample. The U.S. region sample includes; Maine, Connecticut, Massachusetts, New Hampshire, Rhode Island, Vermont, Georgia, Illinois, Indiana, Michigan, Missouri, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, and Tennessee.

[21]Statistics Canada, "The Canadian and U.S. labour markets: a regional perspective." Labour Force Update Autumn 1998, p. 24-29.(Catalogue no. 71-005-XPB)

Figure A3-1. Normalized Mean Ln Weekly Earnings 1981-1997



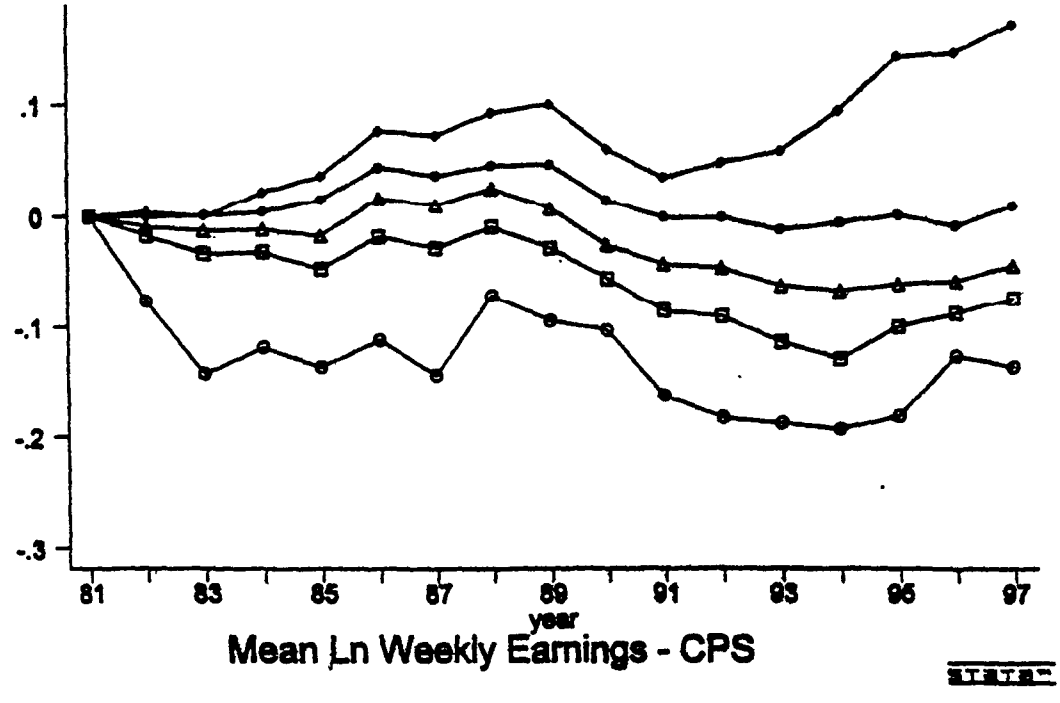
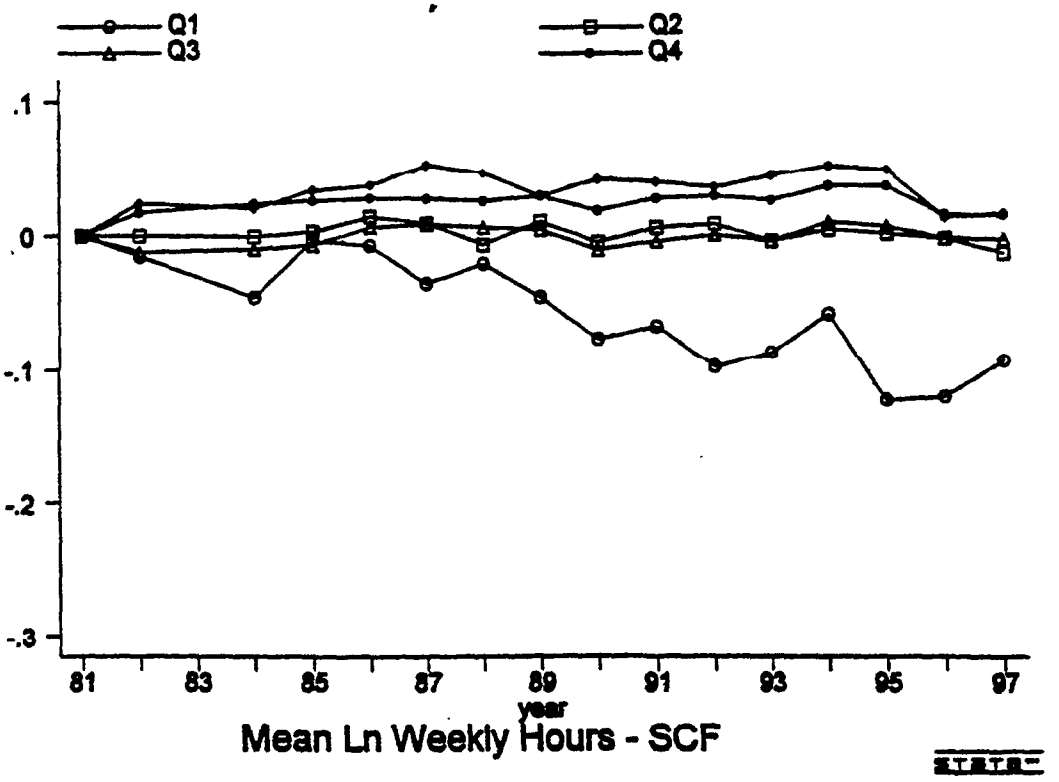


Figure A3-2. Normalized Mean Ln Hours per Week 1981-1997



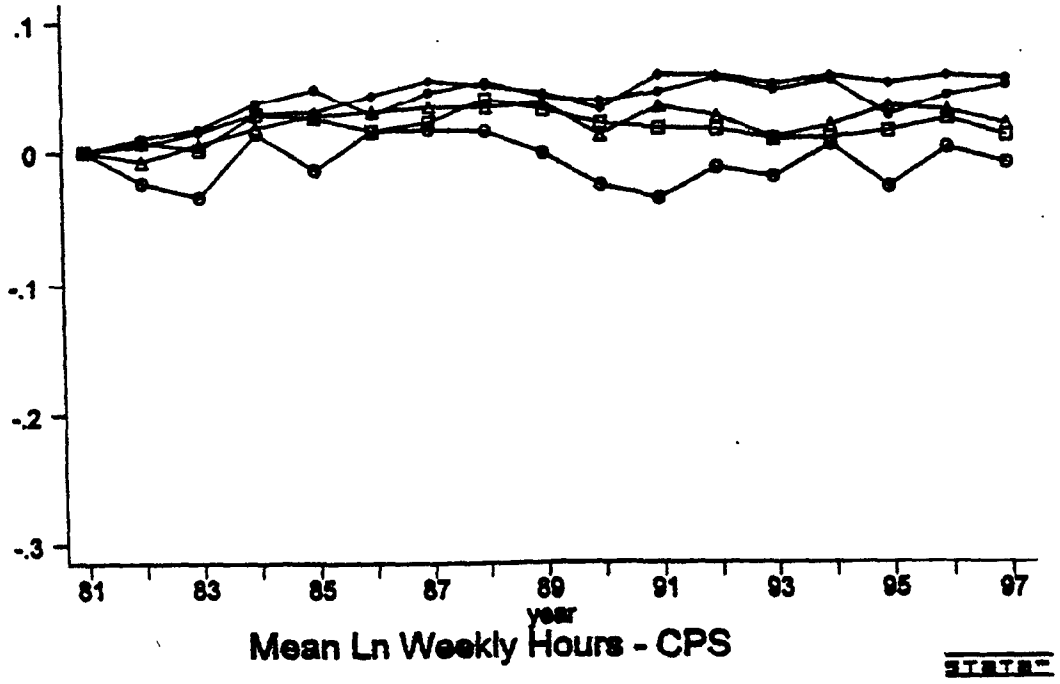
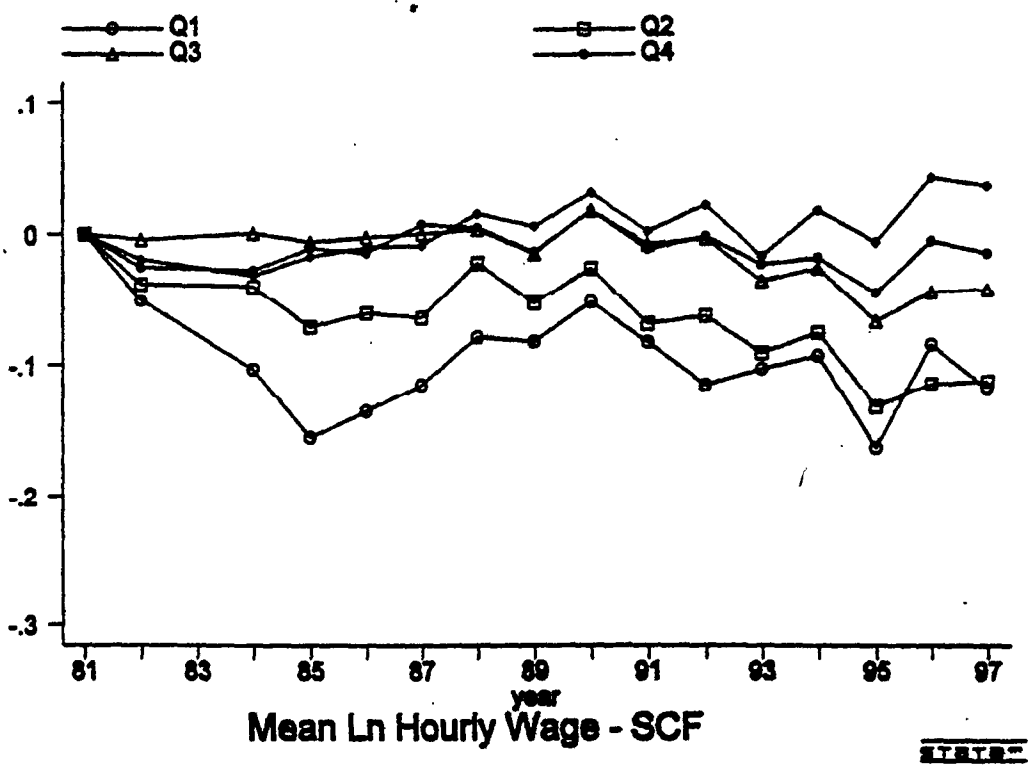


Figure A3-3. Normalized Mean Ln Hourly Wage 1981-1997



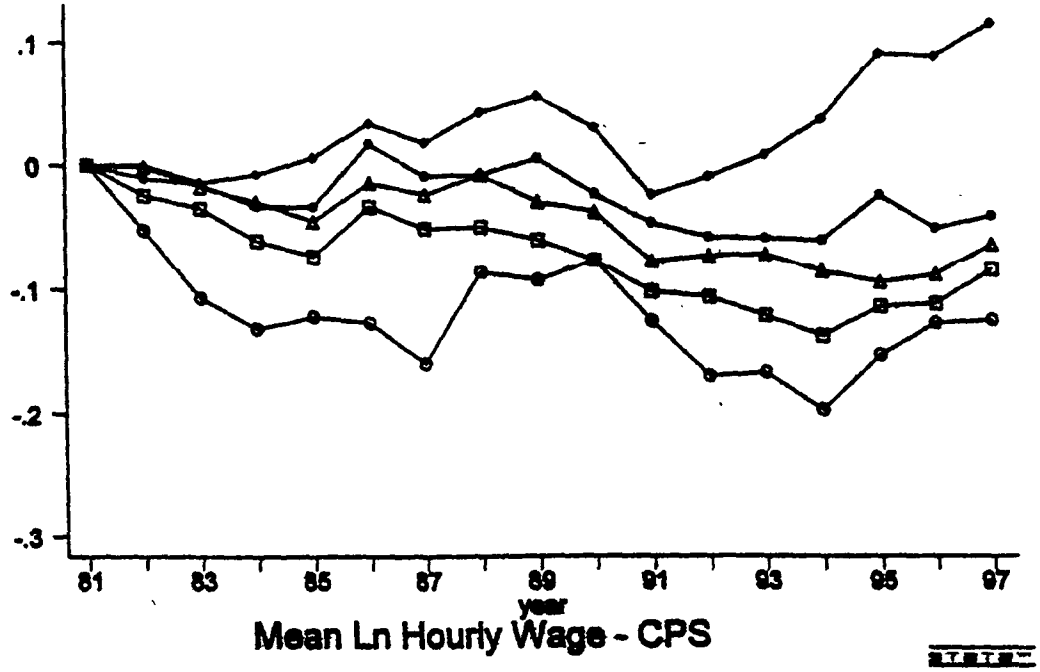


Table A3-1. Decomposition of the Growth of Mean Weekly Earnings
Canada and the U.S. 1981-1997
Subsample of Canadian provinces and U.S. states.

Table A3-1(a) Ontario and Quebec 1981 to 1997			
Quintile	Change in Ln Weekly Earnings	Change in Ln Hours per Week	Change in Ln Hourly Wage
1	-.210	-.092 (44%)	-.118 (56%)
2	-.125	-.012	-.113
3	-.044	-.002	-.042
4	.002	.016	-.014
5	.055	.018	.037
All Workers	-.064	-.014	-.050

Table A3-1(b) Subsample of U.S. states 1981 to 1997			
Quintile	Change in Ln Weekly Earnings	Change in Ln Hours per Week	Change in Ln Hourly Wage
1	-.137	-.010 (7%)	-.126 (92%)
2	-.074	.011	-.085
3	-.045	.020	-.065
4	.009	.051	-.042
5	.170	.056	.114
All workers	-.015	.025	-.041

Table A3-2. Decomposition of the Growth of Mean Weekly Earnings
Ontario and Quebec 1981-1989
Subsample of U.S. states 1981-1990

Table A3-2(a) Ontario and Quebec 1981-1989			
Quintile	Change in Ln Weekly Earnings	Change in Ln Hours per Week	Change in Ln Hourly Wage
1	-.128	-.046 (36%)	-.082 (64%)
2	-.042	.010	-.053
3	-.010	.005	-.015
4	.016	.030	-.014
5	.035	.030	.006
All Workers	-.026	.006	-.032

Table A3-2(b) Subsample of U.S. states 1981 to 1990			
Quintile	Change in Ln Weekly Earnings	Change in Ln Hours per Week	Change in Ln Hourly Wage
1	-.104	-.027 (26%)	-.077 (74%)
2	-.056	.021	-.077
3	-.026	.012	-.038
4	.014	.038	-.024
5	.060	.032	.029
All workers	-.022	.015	-.037

Table A3-3. Decomposition of the Growth of Mean Weekly Earnings
Ontario and Quebec 1989-1997
Subsample of U.S. 1990-1997

Table A3-3(a) Ontario and Quebec 1989 to 1997			
Quintile	Change in Ln Weekly Earnings	Change in Ln Hours per Week	Change in Ln Hourly Wage
1	-.082	-.047 (57%)	-.036 (43%)
2	-.082	-.023	-.060
3	-.034	-.007	-.027
4	-.014	-.013	.000
5	.019	-.012	.031
All Workers	-.038	-.02	-.018

Table A3-3(b) Subsample of U.S. states 1990 to 1997			
Quintile	Change in Ln Weekly Earnings	Change in Ln Hours per Week	Change in Ln Hourly Wage
1	-.033	.017 (+52%)	-.050 (-152%)
2	-.018	-.010	-.008
3	-.018	.009	-.027
4	-.005	.013	-.018
5	.110	.024	.084
All workers	.007	.011	-.003

CONCLUSION

The research presented in this thesis has made a number of contributions to the field of labour economics.

The first essay concerns the impact of two different union recognition procedures, mandatory vote and card check, on certification success. While a number of researchers have argued that mandatory votes discourage unionization this essay presents the first empirical evidence concerning the size of the influence of mandatory votes. The results confirm prior intuition that mandatory votes negatively affect certification success and also show that the magnitude of the impact is both statistically and economically significant: the presence of mandatory votes reduces union certification success by approximately nine percentage points.

The second essay describes Canadian union density from 1980-1998 and makes some projections for the future. My examination of the factors that influence union density reveals that the Canadian labour movement is not as healthy as it may appear. Union membership growth exhibits a long run downward trend: the only reason that union density has remained relatively stable over most of the period is that employment growth has been low. When union membership growth is decomposed using stock-flow growth accounting analysis

'recognition' factors appear to be fairly stable. Nevertheless, this apparent stability conceals a significant decline in union organizing intensity and certification success rates. The source of decline in union membership growth can be traced to 'economic and other' factors. Regression analysis shows that the decline cannot be linked either to cyclical factors or to structural change. Shift-share analysis supports the claim that structural change has not been important. Therefore the long run decline in union membership growth is a trend of largely unexplained origin. Projections of Canadian union density show that if these trends continue as few as one in five non-agricultural paid employees will be union members by 2030. The results presented in this paper provide new insights into the behaviour of Canadian union density. To my knowledge this is the first paper to recognize the role of slow employment growth in maintaining fairly stable union density in the 1980s and early 1990s in Canada. It is also the first paper to perform a detailed stock-flow accounting analysis of Canadian union membership and use this framework to project union density.

The third essay investigates U.S. private sector union density from 1983 to 1999. The paper uses a stock-flow accounting framework to examine the behaviour of union membership growth. The research finds that net growth due to representation elections has been positive and stable from 1983 to 1999. However this factor is not large enough to offset the large negative contribution of net growth due to economic factors and therefore union membership growth is

usually negative. Shift-share and regression analysis suggest that net growth due to economic factors can be linked to structural change but that the influence of structural change is less important in the 1990s than in the 1980s. This research updates earlier work by Dickens and Leonard (1982) and Freeman (1988).

The fourth essay examines three factors that contribute to the Canada-U.S. union density gap. First, a simulation suggests that by the end of the 1990s differing employment growth may account for as much as 3 percentage points of the gap. Second, shift-share analysis reveals that changes in industry structure have contributed about one percentage point to the gap. Finally two counterfactual experiments that use the results from the first paper show that by the end of the 1990s differences in union recognition procedures between the two countries may account for between 3 to 5 percentage points of the gap. If we assume these factors independently affect union density, differing economic performance, structural change and union recognition procedures account for between six to ten percentage points (or 32 to 53 percent) of the union density gap in the late 1990s. This paper recognizes the importance of the differing economic performance of the U.S. and Canadian economies to the density gap. This factor has been largely ignored in other studies of the Canada-U.S. union density gap. This is also the first study that attempts to quantify the impact of different union recognition procedures on the union density gap.

The last essay looks at changes in wages and hours of workers in different

skill-groups in the U.S. and Canada from 1981 to 1997. The analysis reveals that increases in hourly wage inequality are primarily responsible for the increases in earnings inequality in both countries over this period. The labour market experience of high-skilled and low-skilled workers in both countries has been very different. High-skilled workers have experienced earnings growth combined with increases in hours and, at least for the U.S., wages. In contrast, low-skilled workers have experienced dramatic declines in earnings growth and decreases in wages and hours. These changes are consistent with a skill-biased demand shock. In Canada a larger percentage of the reduction in the earnings of low-skilled workers is accounted for by declining wages. This evidence is consistent with higher degree of downward wage flexibility in Canada than in the U.S. This paper adopts and extends earlier work by Kuhn (2000).