# The Long-Term Effects of Income Support: Unemployment Insurance in New Brunswick and Maine, 1940-1991

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New Brunswick and Maine are an adjacent Canadian province and U.S. state with similar populations and natural resource endowments. Over the last half-century, however, their unemployment insurance (UI) systems evolved very differently, with the Canadian UI system eventually becoming much more generous. Using the five decennial censuses in both jurisdictions over this period from 1940 to 1991, we show that UI plays a key role in explaining the dramatic differences in work patterns between the jurisdictions. For example, by 1990, 6.1 percent of employed men in Maine worked fewer than 27 weeks per year; in New Brunswick that figure was 20.8 percent. According to our estimates, New Brunswick's much more generous UI policy accounts for about two thirds of this differential. Among working women, 13.8 percent worked less than half the year in Maine, compared to 26.2 percent in New Brunswick, with UI policy differences accounting for essentially all of the difference. In sum, our data show that large differences in income support generosity can cause large differences in labor supply, especially over long periods when workers have time to build a "life style" around those programs.

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## I. Introduction

Existing studies of the labor market effects of income support programs focus mainly on short-term responses to policy changes. For the most part, these studies find labor supply responses to income support that are in the expected direction, but modest in size. Not surprisingly, some critics (e.g. Murray 1984) have argued that such studies may dramatically understate the long-term work incentives of these programs. Over a longer time horizon, individuals have the ability to make larger adjustments in their behavior, and to adjust on a wider number of margins, in some cases effectively building a 'lifestyle' around the programs in question.

Of course, for a variety of reasons, the long term effects of income support programs are much harder to measure than short term effects. One reason is that large-scale changes in such programs tend only to be made at the national level.[1] As a result, a control group is typically not available to indicate what might have happened in the absence of a policy change. Identification of long-term effects in nonexperimental studies is further hampered by the greater leeway for confounding variables such as macroeconomic conditions to change over longer periods. Experimental studies, which solve the control group problem via random assignment, tend to be very limited in duration and to focus on small variations in program parameters.[2]

In this paper we attempt to measure the long-term effects of large-scale changes in income support policy by taking advantage of a dramatic natural experiment. This experiment results from the fact that a national border –between New Brunswick and Maine-

[1] Of course, a structural model could be used to extrapolate estimates derived from small program changes to larger ones, but this requires a priori knowledge of functional forms outside the range of the data.
[2] A fairly large change in income support was recently analyzed in an experiment, the Self-Sufficiency Project, which included British Columbia and New Brunswick as participating provinces. See Riddell and Riddell (2004) for further details.

- divides a region with a relatively homogenous population and resource endowment, but which experienced very different changes in income support policy. By 1940, Maine had a modest unemployment insurance (UI) system but New Brunswick had none. After that, New Brunswick's system grew much more rapidly, to the point where New Brunswick's system is now astonishingly generous, especially to workers with very short work histories. Using the five decennial censuses spanning the period 1940-1991, we use the comparison between these two jurisdictions over time to estimate the long-term effects of UI program parameters on labor market outcomes.

Our focus in this paper is on the incidence of *part-year work* among workers.[3] According to our data, despite a modest UI program in Maine versus none in New Brunswick, men in these two jurisdictions had a similar, high incidence of part-year work in 1940. However, while men's part-year work significantly declined over the next five decades in Maine, it did not in New Brunswick. Among women, part-year work was substantially less common in New Brunswick than Maine in 1940; by 1990 this pattern had been dramatically reversed as a result of growth in New Brunswick and decline in Maine. Thus, broad time trends are consistent with a scenario where a large relative increase in Canada's UI benefits caused a large, long-term increase in the share of workers working less than a full year. These crude impressions are confirmed by two types of statistical analysis, the first of which uses grouped cell-level census data for the entire 1940-91 period. The second component estimates a more disaggregated distribution of annual work weeks using

[3] Of course, UI programs also have implications for other dimensions of labor supply, including the prevalence of years without any weeks of work. Because much of the variation in UI generosity in this paper stems from industry-time interactions, these cannot be examined in this paper (nonparticipants are not usually "attached" to an industry in any obvious way). In addition, the implications of UI for labor force participation are likely to be harder to distinguish from other factors affecting time trends in nonparticipation than the very particular implications of UI programs for the prevalence of different levels of positive weeks worked.

Census microdata from the three decades, 1970-1991, for which it is available in both regions.[4]

Both our cell-level and individual-level analyses generate estimates of UI program effects that are lasting and large. For example, by 1990, 6.1 percent of employed men in Maine worked fewer than 27 weeks per year; in New Brunswick that figure was 20.8 percent. According to our estimates, New Brunswick's much more generous UI policy accounts for about two thirds of this differential. Among working women, 13.8 percent worked less than half the year in Maine, compared to 26.2 percent in New Brunswick, with UI policy differences accounting for essentially all of the difference.

In sum, our results suggest that the large expansion in income support inherent in the Canadian UI system over the latter half of the twentieth century may have preserved a seasonal 'way of life' among men that has become largely extinct in Maine. For women, Canadian UI appears to have created a new pattern of part-year labor force participation that would not otherwise have existed.

## II. Existing Literature

As noted, the vast majority of existing studies of the labor supply effects of income support programs focus on short-term responses to relatively small program changes. While it is hard to argue with the reasons for this focus, it unfortunately leaves unanswered some of the most important questions regarding the effects of income support on society.[5] The same critique applies to most existing studies of unemployment insurance specifically, including for example Meyer (1990) and Green and Riddell (1997). As one might expect, Meyer finds

[4] 2000 Canadian Census data became publicly available very late in the process of researching this paper. Since the major changes to Canadian UI occurred before this period, we decided not to add 2000 data to the analysis.

[5] One recent exception to this general trend, however, is Meyer and Rosenbaum (2001), who study the effects of reforms to the welfare system and the earned income tax credit, using women without children as a control group for those much more affected by these policy changes –women with children.

that an increase in UI generosity raises unemployment durations, and Green and Riddell find that work histories adapt to benefit eligibility rules, but the effects that are identified are strikingly small in magnitude. As noted, however, because they are based on relatively immediate observed responses to policy changes, a key limitation of these studies is that they only measure short-run responses to UI.[6] One reason why long-run responses might exceed short-run responses is that it takes time for workers to learn (new) program rules well enough to take full advantage of the UI system (see for example Lemieux and MacLeod 2000). Another is that long-run adjustment can occur on a much wider range of margins than is possible in the short run, including education and school completion decisions, choices of an industry or occupation in which to acquire specific skills, geographic mobility, and pure 'setup' time to develop job-sharing and other arrangements that maximize the benefit of the UI system to local workers.[7] By adopting a perspective that spans several decades, we hope to capture such effects in this paper. **Refer to CJE studies of the 71 reforms specifically?**

## III. Background

Maine is the northeasternmost state in the U.S.A, known for its fishing industry, coastal scenery, cold climate, rural character and relatively low incomes. New Brunswick is the Canadian province that borders directly on Maine, known for similar traits. Both regions have populations that are overwhelmingly white and native-born. In 1944, Maine and New Brunswick had total populations of 805,000 and 461,000 respectively. Over the next 50 years

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[6] The same is true of the entire literature on the effects of UI on employment durations (see for example Christofides and McKenna 1996, Green and Riddell 1997 and Baker and Rea 1998). The latter two papers exploit an 'accidental' 1989 increase in the minimum entrance requirement from between 10 and 14 weeks to 14 weeks. Both studies find that some affected individuals were able to find the additional weeks to qualify despite having less than a year to adjust to the change in the eligibility parameter. However, in quantitative terms, these effects were very modest, perhaps because of the short time horizon involved.

[7] Hearsay evidence exists that a common way to maximize the use of federal UI benefits in high-unemployment rural areas is for four people to "share" a local government job, each working 12 or 13 weeks per year. Throughout most of the 1970's, 80's and 90's, this would qualify all four for a full year of UI benefits.

they experienced similar population growth of 54 and 59 percent respectively, well behind their respective country averages of 90 and 135 percent. Both regions lagged behind national income growth rates as well. For example, New Brunswick's personal income per capita (measured in constant, Canadian dollars) **grew by X% between 19xx and 19yy, compared to Y% in Canada as a whole. Comparable numbers for Maine and the U.S. were X% and Y%. (add numbers underlying old table).**

Figure 2 provides a prelimary impression of the historical role of UI in Maine and New Brunswick's economies. Part (a) shows expenditures in UI as a share of provincial or state GDP over time. For New Brunswick, it shows large increases during the 1950s, and again in the early 1970s, suggesting major increases in program generosity at those times. Expenditures declined during the 1960s, and remained roughly stable at between 5 and 6 percent of GDP after about 1977. In contrast, UI expenditures in Maine were (a) roughly constant over the entire time period, and (b) much smaller as a share of state GDP. In fact, Maine's UI expenditures remained under one percent of its GDP over almost our entire sample period. By the end of our sample period, the UI share of GDP in New Brunswick was about *six times* the share in Maine; such high expenditures were probably sustainable only because UI is federally funded in Canada, in contrast to Maine's requirement to be self-financing within the state.

Part b of Table 1 compares spending on UI to other transfer programs in these two jurisdictions. Although the definitions of other transfers is not strictly comparable between regions, this shows that UI played a much larger role in New Brunswick's income tranfer system than in Maine's. By the end of our sample period, UI constituted over 25 percent of all transfers in New Brunswick, compared to about 5 percent in Maine. Like part a of the figure, these statistics also suggest major expansions in New Brunswick's UI program during the 1950's and early 1970s; this is confirmed by our analysis of policy in the following

section. This dominant role for UI in New Brunswick provides part of the justification for focusing on this income support program alone in our study of these two jurisdictions. Further confirmation of the dominant role of UI in the lives of New Brunswick's workers is provided by Table 1, derived from Canadian Census and U.S. March CPS data. Defining "workers" as anyone with positive weeks worked in the calendar year (a definition we shall maintain throughout the paper), about 30 percent of New Brunswick's workers received some UI benefits in 1990. This corresponds to about 6 percent for men, and about 3 percent for women in Maine. While the number of workers touched by UI is similar to the share receiving other transfer payments in Maine, it is *five to six times* the number receiving other transfers in New Brunswick.

Finally, part c of Figure 1 provides historical unemployment statistics for the two jurisdictions under study. Up to about 1953, Maine had a higher unemployment rate than New Brunswick. We then see New Brunswick's unemployment rate rising substantially above Maines in the 1950's; a gap which is closed somewhat by1970. After 1970, a large and apparently permanent gap emerges again, with New Brunswick's rate consistently above 12 percent from 1982 onwards, and Maine's consistently below 8 percent from 1984 onwards.[8]

Clearly, the trends in Figure 1 are suggestive of increases in unemployment that occur in response to major increases in New Brunswick's UI benefit generosity at two times: the 1950's and 1970s. Of course, considerable further analysis is necessary to confirm such a causal connection. We begin this analysis by describing the UI systems and their evolution in both regions in more detail.

[8] The emergence of this large gap mirrors, in a considerably magnified fashion, the well-known emergence of the Canada-US unemployment rate gap (for instance, see Ashenfelter and Card, 1986)

## IV. The Evolution of Unemployment Insurance in New Brunswick and Maine

This section traces the evolution of UI legislation in New Brunswick and Maine, focusing on the Census years to which our data applies. Since our analysis focuses on the weeks worked variables (which apply to the calendar year preceding the Census), our interest is in UI policy for 1939, 1949, 1959, 1969, 1979 and 1989 in Maine, and 1940, 1950, 1960, 1970, 1980, and 1990 in New Brunswick. In much of what follows we refer for convenience to both the 1939 and 1940 data as "1940", etc. Only the highlights of each region's are described here; further details are provided in Appendices 1and 2.

### a. Maine

As a result of the 1935 federal Social Security Act, all U.S. states including Maine had UI programs by July of 1937. While there have been a few substantive changes, including some expansion of the program to groups not covered in the original plan (such as government workers), Maine's Unemployment Insurance program has remained largely unchanged since that time. Workers are eligible for benefits if they have a minimum amount of earnings in a specific period of time (called the base period). Earnings in the base period also determine, within a minimum and maximum, workers' weekly benefit amounts (WBA) and the total benefits they are eligible to receive.

In the census years 1939, 1949 and 1959, Maine's base period was the calendar year preceding the date of the claim. If eligible, a worker was entitled to 16 weeks of benefits in 1939, 20 weeks in 1949 and 26 weeks in 1959. Eligible workers' WBA was related to base period earnings via a fixed schedule (see Appendix 1). The original federal Act excluded from coverage workers in small firms[9], as well as agricultural and government workers. Also in 1954, federal civilian employees became included in the UI system under a separate

[9] To be included, an employer needed to employ eight or more workers during at least 20 weeks of the year; this was reduced to four or more workers in 1954 and to one or more in 1970.

program created especially for them. Self-employed workers have never been covered under Maine's UI system.

Maine's UI program underwent some changes in the 1960s. The base period was now defined as the first four of the previous five calendar quarters immediately prior to an application for benefits. Workers still needed to earn a minimum amount in the base period to be eligible for benefits, but now also needed wage credits in at least two quarters of the base period. Total benefits were simply calculated as 1/3 of base period earnings, within a minimum and maximum. The specific weekly benefit amount paid was determined by a fraction of high quarter earnings with benefit durations being the residual (i.e., total benefits/WBA). The program parameters were such that benefit durations were restricted to a maximum of 26 weeks, with a minimum that ranged from 8 to 11 weeks depending on the year.[10] A dependents' allowance also became available, provided that the claimant's spouse was not employed full-time. In addition, special seasonal rules were implemented for individuals working in firms that systematically employed their work force for 40 weeks or less (for 1970 and 1980; reduced to only 26 weeks as of 1990) which restricted benefits for such workers.[11] Apart from some changes in the benefit parameters and some other minor changes, the UI program in Maine has retained these features to this day.

Two other changes that are relevant to our analysis occurred in the U.S. unemployment insurance system between 1969 and 1979. First, coverage was expanded to

[10] Another change in UI in the United States was the implementation of federal-state extended benefits. This program extends benefits to worker during a defined period of high unemployment. Essentially, extended benefits are triggered if the insured unemployment rate equals or exceeds 120 percent of the average insured unemployment rate for the corresponding period in each of the two preceding calendar years (and must also be above 5%). Extended benefits were not in effect during any of the relevant census years for Maine.

[11] Maine has had a long history of special seasonal regulations, which restrict benefits to unemployment that occurred during the seasonal operating period. For example, in 1989, an employee of a designated seasonal employer who worked 20 weeks would only be able to collect six weeks of benefits.

include all employees of state and local governments.[12] Also, agricultural employers with ten or more workers or a payroll of at least $20,000 were required to pay UI taxes. Second, benefits for high income earners became subject to federal income taxation.[13]

**b. New Brunswick**

In contrast to the U.S., the UI program in Canada is administered and financed at the federal level. Aside from the obvious effect of a common set of rules, this has the important feature of not requiring the program to be self-funding *within* New Brunswick, in sharp contrast to the situation in Maine.[14] As already noted this allows benefits to be sustained at a much higher level in New Brunswick, especially after 1970. Also, in contrast to most states in the U.S., eligibility in Canada's UI system is determined by the number of weeks worked rather than total earnings during the qualifying period. Finally, unlike Maine's, the program has gone through some fundamental changes since its inception in the 1940's.

Canada's first Unemployment Insurance Act was passed in August 1940; the system first paid benefits in 1942.[15] As a result, in the first year for which we have data (1940), no UI system existed in New Brunswick. On the other hand, UI benefits in 1950 were determined largely by the 1940 Act, which specifically excluded a long list of detailed occupations and groups from UI coverage. On this list were agriculture, forestry, fishing, logging, hunting, teachers, part-time workers, and most government workers. Eligibility required 180 days of work during a two-year qualifying period. The complex nature of

[12] In the estimates of UI benefits used in the following section, we assume that all government workers became covered in Maine between 1969 and 1979, and that agricultural workers remained uncovered during the entire period.

[13] In 1979 UI benefits in the U.S. became taxable at one-half the recipient's normal tax rate, for recipients who income exceeded $20,000 ($30,000 for married coupled, assuming joint filing). For our analysis we incorporate taxes, for both regions, by assuming that the worker's only income is from wages and salary (given data constraints, we ignore other income in the household).

[14] In fact, despite the common national system, the indexation of benefit weeks to local unemployment rates and the special treatment of seasonal workers made benefits considerably *more* generous in high-unemployment regions like New Brunswick, compared to the rest of Canada.

[15] According to Human Resources Development Canada's own summary of the history of UI, this made Canada "the last western industrialized nation to have unemployment insurance". (http://www.hrdc-drhc.ca/ae-ei/hist/chapter4.shtml.

eligibility under the 1940 Act is discussed in detail in Appendix 2 (under the rules pertaining to 1950).

For the 1950 through 1970 period, weekly benefit rates, which included a dependents' allowance, were a function of weekly earnings. Appendix 1 lists the benefit schedules applicable for each year relevant to our analysis, and provides further discussion of the qualifying and duration rules. For example, in 1950, the maximum duration of benefits was one day of benefits for each five daily contributions made in the previous five years. This formula allowed a claimant with five years of continuous employment to get one year of benefits.

A final key feature of the UI system in place in 1950 was the so-called 'ratio rule', which reduced the maximum benefit duration by one day for each three days of benefits received in the previous three years. For seasonal workers, this imposed significant limits on benefit duration. Indeed the ratio rule was, to some extent, viewed in the early years of the plan as a way of ensuring that the seasonally unemployed would not, over a number of years, draw out large amounts of benefit, thereby upsetting the actuarial basis of the plan.[16]

While not affecting benefits in that year, the year 1950 saw the introduction of Supplementary Benefits to Canada's UI system. These benefits, renamed as Seasonal Benefits in the 1955 Unemployment Insurance Act, had a major impact on the UI system prevailing in 1960.[17] By 1960, seasonal benefits were payable to people unable to qualify for regular benefits, including those whose benefit rights had been exhausted.[18] As we demonstrate quantitatively below, this constituted a significant enrichment of Canada's UI

[16] For a review of many of the key aspects of Canada's UI system over the 1942 to 1980 period see Dingledine (1981).
[17] Another interesting feature introduced in the 1950s was a requirement for married women to demonstrate that they had not willingly left the labor market as a consequence of marriage, in order to qualify for UI. This sharply reduced the number of married female claimants in the following year.
[18] Specific rules for seasonal benefits are described in the Appendix 2. Seasonal benefits are included in the estimates of benefit generosity used in all our econometric analysis.

program, and marked a clear departure from the traditional insurance principles that had been its original foundation.[19]

Major changes were made to the Canada's UI system in the 1970s, largely as a consequence of the 1971 Unemployment Insurance Act (Bill C-229), which came into effect in 1972. Benefit schedules that made the WBA a function of the weekly wage were abolished, as was the seasonal benefits system. By 1980, UI in Canada had taken on the following features. There were now 3 types of benefits available: regular benefits, labor force extended benefits and regional extended benefits. To qualify for regular benefits, workers were required to have worked only 10 to 14 weeks, depending on the regional unemployment rate, in the last 52 weeks. Once eligible, each week worked qualified the worker for one week of regular benefits, up to a maximum of 25 weeks. Workers with longer attachment to the labor force were rewarded with one extra week of labor force extended benefits for each two additional weeks worked beyond the first 26 weeks. For harder hit areas, regional extended benefits offered an additional 2 weeks of benefits for every .5% the regional rate exceeded 4%, up to a maximum of 50 weeks. As well, a new entrants/re-entrants rule was introduced in 1979, which established a 20 weeks entrance requirement for individuals who had less than 14 weeks worked in the 52 weeks prior to the start of their qualifying period.[20]

The method of determining the WBA had also changed. By 1980, the WBA was calculated as (up to a maximum) 60% of average insurable earnings in the most recent 20

[19] While seasonal benefits remained in place until the 1971 Unemployment Insurance Act, a special 'repeat-user' rule along with other reductions in the generosity of seasonal benefits were made in the 1960s in an attempt to curb the large increases in seasonal benefit payments. Further discussion is available in the Appendix 2.

[20] A repeater rule was also introduced in 1979. Coupled with the new entrants/re-entrants restriction, the repeater rule was an attempt to decrease the ease of entry for low attachment workers. Individuals with repeat claims, and whose benefits in their qualifying period exceed the variable entrance requirement needed an additional six weeks (i.e., VER became 16 to 20 weeks). However, regions with an unemployment rate over 11.5% were exempted from the repeater rule. New Brunswick's unemployment rate was above 11.5% in both 1980 and 1990, and thus the repeater rule does not enter into our analysis.

paid weeks prior to unemployment, and 67% for individuals with dependents.[21] Benefits were also, by this time, subject to taxation.[22] In contrast to the 1950s, 1960s and early 1970s, the 1980s saw little change to the UI program.

**c. Comparing the programs**

In addition to the complex nature of the programs themselves, straightforward comparison of the generosity of Maine's and New Brunswick's UI programs is made more difficult by the fact that Maine's eligibility rule depends on earnings, whereas New Brunswick's depends on weeks worked.[23] In the remainder of this section we compute a simple summary measure of benefit generosity incorporating all the above rules (plus the additional details listed in the Appendix 2) that allows us to make summary comparisons over time as well as between regions. This measure also enters into the next section's statistical formulation of workers' decision problem in a simple but natural way.

In particular, the measure of UI benefit generosity used in this paper is specific to the number of weeks a person works per year. Simply put, it summarizes the weeks worth of *income* a person would receive if he/she worked $w$ weeks per year on a regular basis and was unemployed the remainder of the year. [24] In more detail, suppose that an individual earns $\$E$ for every week worked. If working $w$ weeks qualifies the worker for $c$ weeks worth of UI benefits worth $\$B$ per week, then total weeks worth of *income* received for $w$ weeks of work

[21] All weeks were used if the period was less than 20 weeks.
[22] UI benefits first became taxable, as ordinary income, in 1972. As well, in 1979, recipients with annual net income greater than $20,670 (1.5 times maximum insurable earnings) had to reimburse 30% of the benefits that made up the excess. For example, a person who received $3000 in UI, and whose net income exceed the threshold ($20, 670 for the 1980 census year) by $3000 had to repay $900 (.3*$3000).
[23] Both regions have a waiting period (a period where no benefits are paid, but the individual is otherwise eligible); Maine has always had a one week waiting period while New Brunswick (i.e., Canada) has had a number of changes in its waiting period. For the purposes of our analysis, the relevant waiting period for New Brunswick are one week for 1970 and two weeks for 1980 and 1990.
[24] In most cases the qualifier "on a regular basis" is irrelevant. We introduce it to allow for restrictions on repeat, seasonal unemployment –such as Canada's "ratio rule" in the 1950's—to affect benefit entitlements. Also, note that to receive these UI benefits, a worker in either region could not be labelled by his/her employer as having voluntarily quit his/her job. We discuss the appropriateness of this assumption in the following section.

are $(wE + cB)/E > w$. In Figure 2 (a) we plot this measure of benefit generosity for levels of annual weeks worked between 5 and 50 for all years of our data in New Brunswick. In all cases the calculations are made for a person earning the average manufacturing weekly wage (AWW) in that year.[25]

For 1940, the benefit schedule in Figure 4(a) is a 45-degree line, reflecting the fact that New Brunswick had no UI program then. Thus, 15 weeks of work earned the worker exactly 15 weeks worth of income, and the same was true for any other level of annual labor supply. By 1950, Canada's UI program provided relatively small amounts of income support at low levels of annual weeks worked (for example 20 weeks worth of work now produced about 24 weeks of income), but the most generous UI subsidies occurred at higher levels of annual labor supply. For example, 35 weeks of work per year yielded almost 45 weeks worth of income. Of course, if a person worked all year he or she could collect no UI in that year, so the 1950 curve (like all the others) rejoins the 45-degree line at that point.

In 1960 and 1970, the Canadian UI revisions summarized earlier –in particular the increased special benefits targetted at seasonal workers-- led to greater benefit generosity at low weeks of work (20 work weeks now yielded essentially 30 weeks of income), with the greatest total subsidy at about 25 work weeks. The most dramatic change in Figure 4 (a) however, clearly took place between 1970 and 1980: *by 1980, an average worker in New Brunswick could, on a regular basis, receive 33 weeks worth of income at his/her regular rate of pay by working 10 weeks per year*. In 1990, the subsidy to (very) part-year work in New Brunswick was almost as dramatic, with the exception that –due to an 'accidental' lapse

[25] Throughout our analysis, if the data does not allow us to explicitly incorporate a given UI rule we compute UI benefits under the assumption that workers arrange any fixed number of annual work weeks in such a wasy as to maximize UI benefits. This assumption is in keeping with the available empirical literature such as Green and Riddell (1997) and Baker and Rea (1998).

in the variable entrance requirement that happens to coincide with this year of our data—14 weeks of work (rather than 10) were now required to qualify for these generous UI benefits.[26]

Figure 4(b) shows the same measure of benefit generosity for Maine in all 6 Census years in our data. Since Maine had an operating UI program in every year, there is no 45-degree line. Also, the graphs in all years look quite similar, indicating only relatively minor changes in benefit generosity over time. Finally, overall benefit generosity –especially at low levels of annual weeks worked—is much less. In most years, Maine's subsidy is biggest at around 30 weeks of work, which would yield (depending on the year) between about 36 and 39 weeks worth of income for a worker earning the average manufacturing wage.

## V. Empirical Analysis: Cell-level data, 1940-91

### a. Conceptual Framework

We use a simple voluntary labor supply model as a framework for all our emprical analysis. This framework is assumes that workers *choose* their annual weeks of work (thus all unemployment is voluntary). Of course this is an abstraction; if we find no effect of UI policy that suggests this abstraction is excessively unrealistic. Our analysis is also predicated on the notion that workers receive UI for all weeks of nonwork for which their weeks of employment qualify them. On the surface, of course, this second assumption is somewhat contradictory to the first: If unemployment is voluntary, then presumably workers enter unemployment by quitting their jobs[27], which in both jurisdictions would either disqualify the worker from benefits, or severely curtail those benefits relative to the benefit schedules we

[26] See Green and Riddell (1997) and Baker and Rea (1998) for a description and analysis of this 'accidental' change to the VER.

[27] This is of course not always necessary. Workers in a seasonal industry or in limited-term contracts could simply choose not to search for work after those jobs ended.

use in our analysis. Thus, our interpretation also requires that employers agree to relabel at least some voluntary turnover as involuntary. Interestingly, there is considerable evidence of this practice in Canada (which incidentally has no experience rating of UI; thus employers face no marginal tax cost when they relabel a separation). This abstraction may not fit Maine as well, where at least a minimal amount of experience rating does occur.

For the purposes of this section, suppose now that a worker faces only two labor supply options: to work full year or part year. Each of these options is associated with a fixed annual amount of leisure, denoted $L^F$ and $L^P$ respectively (these constants do not vary across individuals). Let the annual income received by full- versus part-year workers respectively be $Y_i^F$ and $Y_i^P$; these income levels vary across individuals for a variety of reasons, including changes in policy and the fact the UI program has differential impacts by wage rate, region, industry, etc. Next, let the utility of working full year be given by the Cobb-Douglas function:

$$U(Y_i^F, L_i^F) = \alpha \ln Y_i^F + \beta \ln L^F \equiv \alpha\, y_i^F + \beta\, l^F + \varepsilon^F \qquad (1)$$

Similarly, let the utility of working part year be given by:

$$U(Y_i^P, L_i^P) = \alpha \ln Y_i^P + \beta \ln L^P + \theta^P X_i + \varepsilon_i^P \equiv \alpha\, y_i^P + \beta\, l^P + \theta^P X_i + \varepsilon_i^P \qquad (2).$$

In equation (2), $\theta^P X_i$ represents the effects of observable personal characteristics on the *relative* utility of part-year work (as is well known in the discrete choice literature, any factors that affect the utility of all choices the same way have no effects on outcomes; thus only relative effects are identified). Combining (1) and (2), individual *i* prefers to work part year iff:

$$\varepsilon_i^F - \varepsilon_i^P < \alpha(y_i^P - y_i^F) + \beta(l^P - l^F) + \theta^P X_i. \qquad (3)$$

Given specifications for the distributions of $\varepsilon_i^F$ and $\varepsilon_i^P$, (3) can be estimated via maximum likelihood from microdata. In the microdata case, a dichotomous dependent variable (whether an individual works part year) is regressed on a vector of personal characteristics ($X$) and on $(y_i^P - y_i^F)$, i.e. on $\ln(Y_i^P / Y_i^F)$, the log of the ratio of part-year to full-year income.[28] In the case of grouped data (such as that considered in this section), (3) implies a relation between the fraction working part year in a cell and the regressors on the right-hand side, whose functional form depends on the distributions of $\varepsilon_i^F$ and $\varepsilon_i^P$.

In sum, UI policy enters our model by changing the ratio of part-year to full-year income (henceforth "relative income"). Once a specific level of work weeks is chosen to represent "part-year" work, this ratio can be computed directly from our summary benefit measures shown in Figure 2: simply divide the weeks of income associated with any given weeks-worked option by 52.[29]

**b. Data**

For every census year between 1940 and 1990 in both New Brunswick and Maine, we were able to collect information on the fraction of employed persons working between 1 and 39 weeks, versus between 40 and 52 weeks, in the census reference year.[30] For Maine in all years, and for New Brunswick beginning in 1970, this information was constructed from

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[28] Because the terms $\beta(l^P - l^F)$ are absorbed into the constant term in $\theta^P$, $\beta$ is not identified. The model is easily extended beyond Cobb-Douglas preferences by allowing the effect of $(y_i^P - y_i^F)$ to be nonlinear. Experiments with higher-order polynomial terms of this variable yielded broadly similar results.

[29] Of course, the schedules shown in Figure 2 will vary with a worker's observable characteristics, such as industry. This variation is incorporated into our measure throughout the analysis.

[30] Statistics are actually reported for the weeks-worked categories 1-13, 14-26, 27-39, 40-52 (see Appendix 3 for more details). Unfortunately, the published Canadian Census data for 1960 and earlier "adjusts" the annual weeks worked data by counting weeks worked by part-time workers as partial weeks, thus overstating the number of part-year workers. We address this problem by using the fact that in 1960, the census does report the fraction of part-time workers among those working 40-52 weeks. Assuming this fraction is the same in 1940 and 1950, we can estimate the number of workers misclassified as part-year and re-allocate them to the full year category. For men, this adjustment makes an imperceptible difference; for women it is more substantial.

public-use microdata files (see the following section for details). Because census microdata does not exist for Canada in the earlier years, we rely on published sources for New Brunswick prior to 1970. Across countries and years, the finest level of disaggregation available is by gender and broad industry group; thus industry/gender/region/year cells form the unit of observation for this exercise.[31] Appendix 3 provides further discussion of data issues related to the construction of these cells.

Sample sizes in the post-1970 microdata limit the number of industries for which we can calculate cell means with a reasonable degree of precision. Specifically, we exclude the cells for women employed in agriculture, construction and primary industries for this reason. Given the above constraints, we are left with 6 industries per year for women (trade, services, transportation/storage/communication/utilities, finance/insurance/real estate, manufacturing, and public administration) and 9 for men (the above plus agriculture, forestry/fishing/mining and construction),[32] for a total of 6 industries * 6 years * 2 regions = 72 female observations and 9 * 6 * 2 = 108 male observations, or 180 total.

For all observations, the sample – dictated by the published Canadian data – is all wage earners over the age of 15 with at least one week of work in the previous calendar year.[33] In both regions and all years, industry designations refer to the longest job held during the previous calendar year. Thus, it is important to recognize that our weeks-worked data refer to weeks worked in *all* industries by individuals who are classified according to the "main" industry to which they were attached. This may be particularly important in Maine, where workers may 'stitch' together stretches of paid work and self employment in several different industries to assemble a full year of work in the face of a less-generous

[31] For the 1940-91 analysis, we are forced to use all of Maine because the U.S. censuses did not have county information consistently available prior to 1970.

[32] There is a trivial amount of mining in both New Brunswick and Maine.

[33] We exclude the self-employed from the sample. With the exception of self-employed fishermen in Canada, the self-employed are not eligible for UI in either region.

unemployment insurance system. As we argue in a different context below, any resulting measurement error in true benefit eligibility should bias our estimates of program effects towards zero.

Table 2 shows employment-weighted means of our dependent variable by gender, region and year (all 180 observations are listed in Appendix 4). In 1940, despite a modest UI program in Maine, employed men exhibited an almost-identical propensity to work part-year: in the two jurisdictions under study: 38 percent in New Brunswick versus 36 percent in Maine. This reflects the highly seasonal nature of economic activity in this region. Over the next five decades, men's part-year work essentially continued at this high level in New Brunswick, while declining substantially (to 22 percent) in Maine. For women, the increasing divergence between New Brunswick and Maine is much more dramatic. In 1940, before the advent of UI in New Brunswick, working women in Maine were almost twice as likely to work part-year compared to women in New Brunswick, at 41 versus 21 percent of workers. Five decades later, part-year work had fallen to 32 percent in Maine, while essentially doubling to 41 percent in New Brunswick. Thus, by the end of the period the rankings of the regions had been dramatically reversed.

Part-year trends for different industries, shown in Appendix 4, show similar trends in most major industries. Of particular interest is the manufacturing industry, which is a large category (thus precisely measured) and does not strike one as an inherently seasonal activity.[34] Still, it exhibits trends very similar to those in Table 2. Appendix 4 also shows

[34] Green and Sargent (1998) do point out, however, that a significant share of New Brunswick's manufacturing involves processing the output of seasonal extractive industries, such as fish processing, fruit processing, and paper mills. To the extent this is true, and is more the case in New Brunswick than Maine, comparisons of the *level* of part-year work (as opposed to changes over time) between the two regions within manufacturing may not be wholly reflective of UI policy differences. That said, in the northern counties of Maine (except the county of Penobscot and its textile industry which we unfortunately cannot exclude from our northern counties sample), fruit, fish and wood processing is also the main manufacturing industry.

dramatically higher levels of part year work in construction and primary industries, as expected.

Employment-weighted means of our UI generosity measure are presented in Table 3. Specifically, the relative income variable summarized there is the ratio of part-year to full-year total annual income that would be received by an individual earning the average weekly wage in his/her industry/region/year/gender cell, given the rules and benefits of the prevailing UI system as discussed previously.[35] Table 3 shows two alternative versions of this relative income variable; one uses income at exactly 20 weeks of work to represent the attractiveness of part-year work, the other uses 30 weeks.[36] Under the 20 weeks worked assumption, the minimum possible value for relative income under part-year work is therefore 20/52 = .385, which would apply in years in which no UI system existed - New Brunswick in 1940 - or those industries which are not covered by UI legislation (such as the public sector in Maine). [37]

One policy change that is clearly visible in Table 3 is the introduction of UI in New Brunswick after 1940: New Brunswick shows the minimum possible value of the relative income variable (.385) in 1940, and higher levels afterwards. Maine's UI system was already in place by 1940, and according to our measures remained slightly more generous than New Brunswick's in 1950 as well. By 1960 and 1970, New Brunswick's system had become more

[35] Of course, in reality not all eligible workers actually apply for and receive UI benefits (see for example Ashenfelter and Card, 1986; Blank and Card, 1991). Since takeup is endogeneous (see, e.g. , Anderson and Meyer 1997) , we abstract from it here and simply use the legislated benefits a each worker would receive *if* he applied for them as a more exogenous measure of benefit generosity.

[36] Appendix 5 shows the distribution of weeks worked across the various categories available. Unfortunately, in the Canadian census, the weeks worked categories in the 1941 and 1951 censuses were 1-19, 20-29, 30-39 and 40-52, instead of the 1-13, 14-26, 27-39, 40-52 categories used in later years and in the U.S for all years. Nevertheless, it appears that 20 and 30 weeks worked are reasonable assumptions to adopt for our analysis, particularly for men. Results from other weeks worked assumptions (5, 10, 15, 25 and 35) are available upon request; there was little difference in the results.

[37] The relative income variable varies across industries within years for two reasons. First, higher average weekly wages in an industry reduce the relative income from part-year work due to legislated maxima for weekly UI benefit levels. Second, as discussed, some industries were explicitly excluded from UI coverage in certain years. Due to data constraints, we are unable to fully incorporate cross-sectional variation in UI coverage into our relative income variable for Maine: all we can do is set UI benefits to zero for agriculture and the public sector. This measurement error should bias our estimates of UI parameters towards zero.

generous, especially for women whose lower wages made them less affected by the maximum weekly benefit amount. The decline in generosity between 1960 and 1970 is, to a large extent, due to the restrictions on seasonal benefits that were imposed through the repeat user rule and other reductions in generosity of seasonal benefits. The other major change that is clearly visible in Table 3 is the effects of the 1972 UI reforms in Canada. These reforms dramatically increased benefit generosity in New Brunswick, so that a worker earning the average manufacturing wage could earn over 70 percent of a full year income by working only 20 weeks and collecting UI benefits for the remainder of the year. In the statistical analysis which follows we address whether this dramatic increase in benefits affected the tendency to work part year in New Brunswick.

**c. Results**

Weighted least-squares estimates of equation 3 are presented in Table 4.[38] All specifications include fixed effects for every industry, each year of data, and both regions; separate regressions are estimated for men and women. To produce estimates that are representative of the entire labor force, all regressions are weighted by year-specific industry shares in employment. The results in all columns show that part-year work is significantly more common in agriculture, construction and primary industries than it is in manufacturing (the omitted category). Compared to manufacturing, part-year work is less common in finance, government, and transportation industries, though the size and significance of these effects varies by gender. In three of four specifications, there is a statistically significant downward time trend in part-year work that is common to both jurisdictions (controlling for such a trend is an advantage of our difference-in-differences approach). Finally, note that –

[38] Results based on a logistic specification (i.e. using the log-odds ratio in the cell as the dependent variable) produced very similar results. The linear results are presented for greatest ease in interpretation, and because predictions are much more straightforward with this specification. Grouped-data logit is not feasible because, for those cells based on published data, we do not have access to the underlying number of observations on which the cell proportions were based.

while the estimates using 20- versus 30-week parameters to represent part-year work are very similar, the 20-week version of the model fits our data better, especially for women. (This could be because a larger share of part-year women than men work 20 rather than 30 weeks). In the discussion below, we will thus refer mostly to the 20-week results.

Concerning the UI policy variables, row 1 of Table 4 shows that relative income from part-year work has a significant, positive effect on the share of workers working part year in all specifications. To interpret the size of these coefficients, note from Table 3 that the largest decadal change in our policy variable actually occurred between 1950 and 1960: a rise of (.580-.441=) .139 for men, and (.614-.455=) .159 for women, both in New Brunswick.[39] Taking logs, this translates into a change into Table 4's policy variable, $\ln(Y_i^P / Y_i^F)$, of .274 for men and .300 for women. (In other words, the policy changes between 1950 and 1960 made part-year work about 30 percent more attractive, relative to full-time work, for both an average man or woman). Applying the coefficients from Table 4, this translates into a predicted change in the share working part year of .058 for men and .156 for women. Using actual 1950 shares as a base, this policy change would raise the share working part year to 34 percent for men, and 31 percent for women.

Clearly, the above effects are large and economically meaningful, especially for women. Are these large effects plausible? To put some perspective on them, consider them in the context of the largest imaginable increase in our policy variable: suppose UI policy made income from 20 weeks of work exactly equal to income from full-year work. Under this scenario, $\ln(Y_i^P / Y_i^F)$ would rise by about .8 for both men and women, causing a rise of 17 and 41 percentage points respectively in the share of men and women working part year.

[39] Coincidentally, a change of exactly the same magnitude occurred between 1970 and 1980 for women; for New Brunswick's men the 1970-1980 change was .135.

Using actual 1950 shares as a base, this extreme policy change would still leave 55 percent of men, and 44 percent of women, working full year despite an effective wage rate of zero.

In fact, viewed another (more traditional) way, the labor supply responses estimated in Table 4 are quite modest indeed. To see this, consider first the nature of the implicit wage change associated with UI policy and the choice between full- and part-year work, illustrated in Figure 3. If a person works full year, he/she will not receive any UI benefits regardless of the generosity of the UI system. Normalize his/her income in this situation to 1. An increase in the generosity of the UI system, however, raises the relative income earned from part-year work (modelled in the figure, as in Table 4, as 20 weeks). In particular, UI changes in New Brunswick between 1950 and 1960 raised the relative income from part-year work from .441 to .580, as shown. Now note two things: First, in contrast to the usual case, wage changes of the form shown in Figure 3 have *unambiguous* effects on predicted labor supply if leisure is a normal good: both income and substitution effects imply an increase in part-year work when the subsidy to part-year work rises. Second, the magnitudes of the wage changes associated with even quite dramatic UI reforms are surprisingly small. For the case in the figure (New Brunswick men between 1950 and 1960), the percentage wage change is about 28 percent ((.580-.441)/(1-.5(.580+.441)). Assigning 20 weeks of work to part-year workers and 52 to full-year workers, the predicted change of 5.8 percentage points in part-year work from the model translates into a predicted decline in 1.8 weeks of work per year, which in turn translates into a labor supply elasticity of –0.17. The same calculation yields an elasticity of -0.37 for women. While these are economically very large and meaningful estimates, they are not by any means implausible magnitudes (especially since –as noted-- we are considering a kind of wage change with unambiguous predicted effects on labor supply).

How well can the models in Table 4 account for the trends in part-year work observed in our data? This question is addressed in Figure 4 (again for the case of the 20 weeks

assumption), which calculates predicted and actual part-year shares for New Brunswick and Maine as a whole by taking employment-weighted averages of industries . As Figure 4 shows, predicted part-year shares from our model track actual shares remarkably well over the five decades of our data. Of course, the decade-to-decade changes shown in Figure 4 incorporate common year effects and changing industry mix over time as well as the effects of changing UI policy. To assess the contribution of UI policy changes alone, Figure 4 presents the predicted share working part year under the counterfactual assumption that UI policy remained unchanged in both jurisdictions over this entire 50-year period. (We set the UI policy variable to its 1950 level in both jurisdictions since that is the year in which the policy was most similar in the two regions). As Figure 4 clearly shows, holding UI policy fixed at its 1950 level has almost no effect on the predicted part-year share in Maine. This is because Maine's UI policy was very stable over our entire sample period. In New Brunswick, however, our model shows that UI policy indeed played a major role in driving the time trend in part-year work; according to our model, New Brunswick work patterns would look very different today had its UI policy not expanded so much after 1950. Importantly, much of the effects of UI policy occurred well before the highly-publicized UI reforms of 1972.

More detail on the role of policy changes in our model is provided by Figure 5, which plots actual and predicted changes in the New Brunswick-Maine *differential* in part year work. Once again, predicted changes track actual ones well: the model explains the fact that, in 1940, women in New Brunswick were 20 percentage points *less* likely to work part year than in Maine, but more likely to work part year in 1990, very well. Since the relative part-year share is predicted to remain very stable over this period in the absence of any UI policy changes, the model attributes essentially all of this divergence between the jurisdictions to New Brunswick's changes in UI policy. For men, the part-year share was

essentially the same in both jurisdictions in 1940. By 1990, New Brunswick's men were 14 percentage points more likely to work part year than Maine's. All told, our model is able to explain only about 7.5 of these 14 percentage points. Notably, however, the model also predicts that New Brunswick's *relative* part-year work would have declined –from 6 to 3 percentage points--over this period in the absence of UI policy changes (this is largely because of a greater change in industry mix out of seasonal industries). Thus, of the 7.5 increase in the predicted part-year gap, *minus* 3 percentage points are explained by New Brunswick's greater shift out of seasonal industries (New Brunswick has a much larger base from which the decline begins), with *plus* 10.5 points attributable to UI policy changes.

## VI. Empirical analysis: Microdata, 1970-91

### a. Conceptual Framework

Public-use microdata files are available for Canada only for the years 1970 and onward. Thus, for the three decades of 1970, 1980 and 1990, we have the option of exploring the determinants of part-year work at the individual worker level. To compensate for the shorter time span of the data, this has four principal advantages: (a) we can take advantage of more sources of variation across types of individuals ime in our relative income variable; (b) we can restrict our attention to a part of Maine –the "northern counties"-- which provide an even better control group for New Brunswick than Maine as a whole; (c) we are able to conduct separate analyses of population subgroups, in particular by education level, and especially (d) we can look at a more detailed distribution of weeks worked than the simple split between under and over 40 weeks. Since (as already noted) changes in UI policy over this period had distinct and dramatic implications for the relative attractiveness of different detailed weeks-worked categories, examination of the entire weeks-worked

distribution provides further insights into whether UI policy, versus some other possible influence, explains the dramatic rise in New Brunswick's relative unemployment rate over this time period. In addition, our microdata allow us to control for a larger set of covariates that may affect weeks worked, and to incorporate other UI rules in each region including dependents' benefits and taxes.

The information on weeks worked in our microdata allows us to assign every individual in each jurisdiction and year into one of four weeks worked options: 1-13, 14-26, 27-39 and 40-52 – these are the most detailed categories that are consistent across regions and time. Figure 2 has already shown that changes in UI policy over this time period affected the relative attractiveness of different amounts of part-year work very differently. Clearly, our confidence that the large increases in part-year work that are observed in New Brunswick in our data were in fact caused by changes in UI policy would be greatly increased if a model based on UI effects only predicted the exact change in the distribution of weeks worked well. Thus we require a method of estimating the distribution of workers across four weeks-worked categories.

Fortunately this is possible via a straightforward generalization of equations (1) - (3). Instead of two weeks-worked categories (*P* and *F*, for part- and full-year), let there now be four, labelled with superscripts 1, 2, 3 and 4. Let category 1 continue to represent full-year work (still defined as 40-52) weeks. Continuing to use this as the reference category, equation (1) remains unchanged except for a change of subscript. The remaining three categories each will have utility given by their own equation (2). Now, if the four $\varepsilon$'s have independent Weibull distributions, equation (3) becomes McFadden's conditional logit model, where the $X$'s represent characteristics that only vary across persons, while the

income ($Y$) variables vary across both persons and the four choice categories.[40] Finally, since an equal increase in ln($Y$) across all four categories leaves optimal choices unchanged, we can normalize ln($Y^F$) to 1 in (1), which transforms the income variables in (2) to $\alpha \ln Y_i^j - \alpha \ln Y_i^1 = \alpha \ln(y_i^j / y_i^1)$, j = 2,3,4. Thus, the correct choice-specific variable is the log of the ratio of person $i$'s income if he/she chose the relevant weeks-worked category, to his/her income if she worked full year.

Some practical issues arise in computing the relative income variables described above. A familiar one is the level of weeks to use to "represent" the entire category in computing UI benefits.[41] We use the midpoint for the 14-26 (20 weeks worked) and 27-39 (33 weeks worked) categories, and assume full-year work (52 weeks) for the final category – as in the dichotomous case. The data imposes an important constraint on our analysis with respect to the 1-13 week category. If we adopt a midpoint of 7 weeks then no individual would receive UI in any region or year. However, with 13 weeks, a substantial proportion of Maine workers are able to qualify – albeit with a relatively minor amount of UI income – while all workers in New Brunswick for 1970 and 1980 qualify.[42]

We examined the continuous distribution of weeks worked for 13 weeks and under in 1980 for New Brunswick and Maine. For New Brunswick, 50% of individuals are at 9 weeks or less (where no one can qualify for UI in either region) with 20% at 10 weeks, 5% at 11

[40] Most other specifications for the distribution of the errors are computationally impractical.

[41] Given the complexity of UI legislation in both jurisdictions, it is not practical to compute benefits for every integer level of weeks worked, then take a weighted average thereof. Weighted averages are also impossible for those region-years (New Brunswick in 1970, for example), where Census weeks-worked information is only provided in large categories. Finally, using a fixed number of weeks avoids the endogeneity associated with changing weeks distributions within a category.

[42] Further, in 1990 for New Brunswick, the unanticipated and 'accidental' suspension of the variable entrance requirement in Canada results in individuals who previously qualified with 10-13 weeks worked being ineligible for the 1990 benefit year *only* (see Green and Riddell, 1997; Baker and Rea, 1998). Given that the weeks worked variable in the 1991 Canadian census refers to the 1990 calendar year, no individual in New Brunswick in 1990 is allocated UI income for the 1-13 weeks worked category. While Green and Riddell, and Baker and Rea found that some individuals were able to find the extra weeks to qualify, this unanticipated shock to the UI system must be considered when interpreting the results.

weeks, 20% at 12 weeks, and 5% at 13 weeks. The distributions are virtually identical for men and women. As well, the above distribution is very similar for Maine – where men and women have an identical distribution (54% at 9 weeks or less, 13% at 10 weeks, 3% 11 weeks, 25% at 12 weeks, and 5% at 13 weeks). Overall, therefore, it seems appropriate to use 12 weeks as the assumption for computing UI parameters, but give only 50% total UI income for the 1-13 weeks category.

A second practical consideration in the use of microdata is the effects of measurement error in weeks worked (this is largely eliminated in the cell data by the law of large numbers). Even though weeks worked is the dependent variable in this study, measurement error in weeks worked can cause bias here because weeks worked are used to calculate the key regressor of interest, the relative income in a weeks-worked category.[43] We do two things to alleviate the 'division bias' problem. First, we eliminate outliers in the distribution of calculated weekly wages; specifically, in each region/year we drop the top 1 percent and bottom 5 percent of the calculated wage distribution on the grounds that such outliers likely reflect measurement error in weeks worked (inspection revealed a larger number of implausibly low wages). Second, in all specifications we use predicted rather than actual relative earnings, where predictions are based on the following variables in addition to the *X*'s in equation 3: New Brunswick interacted with 1980, New Brunswick interacted with 1990, all the industry dummies interacted with New Brunswick, all the industry dummies

[43] To see the point, return briefly to the two-outcome case and recall that our relative income variable is calculated, for each individual, using that individual's estimated average weekly earnings, and that average weekly earnings are computed by dividing annual earnings by annual weeks worked. Loosely speaking, our regression in the dichotomous case is thus specified as follows:

$$\text{Prob(Part-year)} = f(\beta_0 + \beta_1 R\,[\text{annual earnings/annual weeks}] + \beta_2 X + \varepsilon),$$

where the function determining relative income, *R*, is decreasing in its argument because of the maximum UI benefit level. Suppose that an individual's weeks worked were misclassified at a lower level than the true level. This then raises our computed weekly wage (the argument of *R*) and reduces the computed relative income from working part year. Since the same negative measurement error raises the dependent variable, it will appear that reducing relative income from part-year work raises the prevalence of part-year work even if no such (perverse) causal effect is present.

interacted with New Brunswick and a post-1970 dummy, and education interacted with New Brunswick and a post-1970 dummy. The idea is that UI policy changes had effects on the relative attractiveness of weeks-worked categories that varied by jurisdiction, industry and worker skill level. These policy changes are exogenous to the measurement error in individual weeks worked and can therefore be used to identify the effects of the relative income variable.[44]

**b. Data**

For New Brunswick, we use the 1%, 2%, 3% national Public Use microdata files for these three decades respectively; these are the only published Census microdata available in Canada. For Maine, we use the 1% sample in 1970 and the 5% state samples in 1980 and 1990.[45] The construction of the microdata, including issues of variable comparability across countries and across years, is discussed in Appendix 3. Further, as noted, access to microdata allows us to construct a better control group for New Brunswick by restricting attention to the northern portion of Maine, which borders on New Brunswick. Figure 6 shows a map of Maine, denoting these areas.[46] Summary statistics for the main control ($X$) variables in both all of Maine and Northern Maine are provided in Tables 5 and 6 for women and men respectively. (Weeks-worked distributions are described in Tables 8 and 9 below). Trends in industry mix are similar in both countries, though New Brunswick has a larger primary share of employment than Maine, as well as a larger public sector. Manufacturing is

[44] Another advantage of using predicted relative earnings is that it addresses estimation problems stemming from unobserved individual 'ability' as well. If unexplained individual weekly wage differences ('ability') are positively correlated with unobserved differences in tastes for work, a cross-sectional OLS coefficient on our relative income variable will overstate the causal effects of relative income on weeks worked. By removing the idiosyncratic portion of individual earnings from the calculation of an individual's relative earnings in different weeks worked categories, our procedure eliminates this form of "ability bias" as well.

[45] We use Stata's p-weight option to adjust our estimates for these differences in sampling rates across countries and years. Thus our estimates are representative of a worker drawn at random from the combined populations of Maine and New Brunswick over all three years of our data.

[46] This particular mix of counties is dictated by our data.

more important in Maine than New Brunswick, but also declined much more precipitously as a share of employment over the sample period. For women, industry mix is more comparable when focusing on the northern counties of Maine: in particular, manufacturing is substantially less important in northern Maine relative southern Maine, and the service sector is substantially more important in northern Maine relative to the south. For men, the industry mix is also more comparable when focusing on the northern counties where the primary sector is much larger and the manufacturing sector smaller. As well, for men, workers in the northern counties are less education than those in the southern counties and thus more comparable to New Brunswick. [47]

**c. Results**

The coefficients from conditional logit estimation of equation 3 are reported in Table 7. Clearly, the results provide strong evidence that, *ceteris paribus*, an increase in the relative income in a weeks-worked category makes it more likely to be chosen. Recall that the only source of variation in the relative income variables across observations in our data is UI legislation: if there were no UI program, relative income in all four weeks-worked categories would be constant across persons and $\alpha$ would not be identified. That said, conditional logit coefficients do not provide useful measures of the predicted effects of a regressor on the expected distribution of outcomes. To that end, Tables 8 through 11 display various actual and predicted weeks-worked distributions calculated from the coefficients in Table 7.

The purpose of Tables 8 and 9 is simply to assess how well our conditional logit model fits the actual weeks-worked distribution across time and space. Several features

[47] Restricting attention to Maine's two most northerly counties --Aroostook and Washington – in 1980 and 1990 yields descriptive statistics that are very similar to New Brunswick's. Unfortunately these counties are not separately identified in the 1970 US census.

emerge very clearly. First, our model clearly fits the observed distribution of work weeks very well across both regions and all years; in most cases the predicted shares are within a single percentage point of the actual  Second, as already noted, full-year work is much more common among men in Maine than in New Brunswick, and in all years. By 1990, only about 72 percent of men in New Brunswick worked full year, compared to about 88 percent of men in Maine. In addition, while full-year work declined over time in both regions between 1970 and 1990, it declined to a greater extent in New Brunswick than Maine (about 7 versus 3 percentage points) despite starting at a lower base. Further, part-year work grew among men in both countries over the sample period, but the magnitude of the change was much smaller in Maine (in fact part-year work declined slightly in all weeks-worked categories in Maine between 1980 and 1990). In New Brunswick, the change was biggest in the 14 to 26-week category, and in the 1-13 week category between 1970 and 1980. These facts, combined with the decline in the fraction of New Brunswick men working 27 to 39 weeks, are strongly suggestive of a UI policy effect.

Actual versus predicted values for women are shown in Table 11. Similar patterns are evident, but against the background of an overall increase in labor force participation and full-year work. Again, of note is the large increase in the fraction of the New Brunswick women working 1-13 weeks (particularly between 1970 and 1980), and 14 to 26 weeks per year; an amount of work that entitles one to a full year of UI benefits in New Brunswick, but with which it is difficult to qualify for UI in Maine. Overall, for both women and men, the model performs quite well: it is rare to see more than a one percentage point difference for any weeks worked bin other than in a few 1970 cases, and there is almost never a two percentage point difference.

To examine the role of UI policy, we conduct two thought experiments by computing predicted weeks-worked distributions for alternative hypothetical values of the UI

parameters. Table 10 asks the following policy question: what would have happened in New Brunswick if the 1971 UI Act had not been implemented? Our answers to this question are striking. For men, the simulation indicates that, instead of declining by 7 percentage points as it did, full-year work would have remained relatively constant at around 80 percentage points over the next two decades. Since full-year work remained essentially constant over this entire period, the 1971 UI Act explains essentially all of New Brunswick's (absolute and relative) decline in full-year work among men. Moreover, absent the 1971 UI Act, the large increases in the 1-13 weeks worked (from 1.3 to 4.5 percentage points) and 14-26 weeks worked (9.3 to 15.6) categories would not have occurred.

For women, a similar story emerges. Instead of a relatively minor increase in full-year work, the fraction of women working full-year would have *increased* by 14 percentage points – the same increase experienced by Maine—if New Brunswick's 1971 had not occurred. Of course, even absent this Act the part-year weeks worked distribution in New Brunswick is still skewed towards 14-26 weeks, but the previous section suggests that this is due to the incentives put in place by the 1955 UI Act. In sum, according to our estimates, the 1972 UI reforms dramatically increased the incidence of part-year work in New Brunswick. Especially for women, these effects that would not be apparent in a single-country study that did not have access to Maine's women as a control group.

Table 11 considers a second policy experiment: what would happen if New Brunswick adopted Maine's UI system? According to our estimates, 80 percent of New Brunswick's working men would be working full year in 1990 (compared with 72 percent who actually did so, and compared with 88 percent of Maine men who did so). Thus, UI policy alone explains half of men's 16 percentage point cross-sectional gap in full-year work between these two jurisdictions in 1990. If New Brunswick had Maine's UI system, 75 percent of its working women would have worked full year in 1990 (compared with 65

percent who actually did so, and compared with 76 percent of Maine women who did so). Thus, UI policy explains *all* of women's 16 percentage point cross-sectional gap in full-year work between these two jurisdictions in 1990.

Focusing on the share of workers who put in less than a half year of work, Table 11's predictions are even more dramatic. For example, according to Table 8, in 1990, (2.2+3.9=) 6.1 percent of Maine's working men worked fewer than 27 weeks; in New Brunswick that figure was 20.8 percent. According to Table 11 only (1.0+10.4=) 11.4 percent of New Brunswick's working men would work less than half year if New Brunswick had Maine's UI system. Thus, according to our estimates, UI policy differences explain about two thirds ((20.8-11.4)/(20.8-6.1) of this differential. Among working women in 1990, 13.8 percent worked less than half year in Maine, compared to 26.2 percent in New Brunswick. Similar calculations imply that UI policy differences can account for essentially all of this difference.

## VII. Conclusions

Most previous studies of the labor market effects of income support programs focus on short-run responses to policy changes. Given that individuals can make many more adjustments over the long run, such studies may understate the ultimate impact of these programs. Unfortunately, identifying long-term effects is difficult given that large-scale changes in such programs are typically made at the national level; thus no control group is typically available. Moreover, confounding variables such as economic conditions are more likely to contaminate results when taking a longer-run approach.

This paper utilizes a unique and dramatic natural experiment to evaluate the long-run impact of unemployment insurance on work incentives. Maine and New Brunswick are an adjacent Canadian province and U.S. state with similar populations, climates and natural

resource endowments. Over the 50 year time period covered by our study, however, New Brunswick experienced large changes in UI generosity: a shift from no UI program at all in 1940 to a modest one in 1950, large increases in benefit generosity between 1950 and 1960 and again between 1970 and 1980, benefit reductions between 1960 and 1970, and stability between 1980 and 1990. Over the same period, Maine's UI system was remarkably stable. Our analysis shows a close link between the jurisdictions' relative weeks-worked distributions and New Brunswick's policy changes.

Compared to most studies of the work incentives of income support programs, we identify incentive effects that are large, but not at all implausible when the extreme magnitude of New Brunswick's UI policy changes are taken into account: in 1980, for example, an average New Brunswick worker could generate a total of 38 weeks worth of income (at his/her regular weekly rate of pay) by working only 14 weeks per year. This could be done year after year, indefinitely, without penalty. Thus, if enough time elapse for workers to build a "lifestyle" around a very generous income support policy, our results suggest that very generous policies can have large effects on labor supply.

We also generate larger estimates of the effects of UI on work incentives than earlier studies of Canada's UI system, even those which focus on seasonal work and the Atlantic Provinces. We attribute this difference to three main factors: First, like other studies the Canadian UI studies tend to examine only short-run responses. Second, our use of Maine as a control group allows us to control for a secular downward trend in part-year work in both jurisdictions, associated no doubt with rising education levels and a shift into less-seasonal occupations. In a study focused on New Brunswick only, such time trends would lead to an underestimate of true UI policy effects. And finally, existing Canadian studies have paid relatively little attention to the dramatic increases in seasonal UI benefits that occurred *before* the well-known 1971 Act: in fact, by our calculations the largest increases in Canada's UI

subsidy to part-year work occurred between 1950 and 1960. Not accounting for the earlier subsidies tends to overstate the magnitude of the 1971 reforms, which (in addition to the short vs. long term distinction) partially explains why large changes were not observed immediately after they were introduced.

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**Table 1**
**Government transfer payments to workers[1] in Maine and New Brunswick, 1990**

| | Men | Women |
|---|---|---|
| **Fraction receiving unemployment insurance** | | |
| New Brunswick | .295 | .297 |
| Maine | .057 | .033 |
| **Fraction receiving other transfer payments[2]** | | |
| New Brunswick | .054 | .058 |
| Maine | .039 | .040 |

1. 'Workers' includes all ndividuals with positive weeks worked in the reference calendar year.

2. In Maine, "other transfer payments" include public assistance, veterans' benefits and food stamps (all from state and local governments). In New Brunswick, it includes social assistance, veterans pensions, workers compensation, disability benefits, mothers' allowances, Canada manpower training and mobility allowances. and provincial income supplements.

Standard errors are in parentheses. Age is restricted to 25 to 59 years. (see Data Appendix).

Sources: Authors' calculations from 1991 Census of Canada and March 1990 Current Population Survey. CPS figures are weighted by CPS final weight.

**Table 2**
**Percent of workers working part year, Census data 1940-91**

| | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 |
|---|---|---|---|---|---|---|
| | | | | | | |
| **A. MEN** | | | | | | |
| New Brunswick | .38 | .28 | .33 | .35 | .35 | .37 |
| Maine | .36 | .25 | .25 | .24 | .24 | .22 |
| | | | | | | |
| | | | | | | |
| **B. WOMEN** | | | | | | |
| New Brunswick | .21 | .15 | .31 | .46 | .48 | .41 |
| Maine | .41 | .37 | .52 | .49 | .41 | .32 |

NOTES: Part-year work is defined as working less than 40 weeks. The sources are the 1940/50/60/70/80/90 U.S. censuses for Maine and the 1941/51/61/71/81/91 Canadian censuses for New Brunswick. See text for further discussion of the computation of part-year work, and discussion of the data.

**Table 3**
**Estimated total annual income from part-year work, as a fraction of income earned from full-year work, Cell-level census data 1940-91**

| | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 |
|---|---|---|---|---|---|---|
| | **Part-year = 20 weeks** | | | | | |
| a) Men | | | | | | |
| New Brunswick | .385 | .441 | .580 | .545 | .680 | .713 |
| Maine | .454 | .456 | .479 | .495 | .509 | .509 |
| b) Women | | | | | | |
| New Brunswick | .385 | .455 | .614 | .572 | .731 | .731 |
| Maine | .474 | .478 | .511 | .509 | .513 | .513 |
| | **Part-year = 30 weeks** | | | | | |
| a) Men | | | | | | |
| New Brunswick | .577 | .688 | .761 | .734 | .774 | .796 |
| Maine | .673 | .672 | .680 | .702 | .718 | .720 |
| b) Women | | | | | | |
| New Brunswick | .577 | .716 | .793 | .760 | .808 | .808 |
| Maine | .697 | .693 | .709 | .763 | .769 | .769 |

NOTES: Standard errors are in parentheses. All means are based on 9 industries for men and 6 industries for women, and are weighted by the underlying number of observations. The sources are the 1940/50/60/70/80/90 U.S. censuses for Maine and the 1941/51/61/71/81/91 Canadian censuses for New Brunswick. See text for discussion of the computation of the relative income variable, and further discussion of the data.

**Table 4**
**Regression estimates of the incidence of part year work, Cell data 1940-91**

| Variable | 20-week UI parameters | | 30-week UI parameters | |
|---|---|---|---|---|
| | **MEN** | **WOMEN** | **MEN** | **WOMEN** |
| | **(1)** | **(2)** | **(3)** | **(4)** |
| Relative income | .210 | .519 | .289 | .421 |
| | (2.73) | (6.05) | (2.16) | (2.02) |
| New Brunswick | .031 | -.146 | .046 | -.083 |
| | (1.70) | (6.68) | (2.82) | (3.58) |
| Agriculture | .276 | | .281 | |
| | (6.61) | | (6.40) | |
| Construction | .224 | | .223 | |
| | (7.92) | | (7.76) | |
| Finance | -.111 | -.209 | -.105 | -.217 |
| | (2.02) | (4.33) | (1.88) | (3.65) |
| Government | -.056 | -.038 | -.053 | -.053 |
| | (1.95) | (0.89) | (1.76) | (0.97) |
| Primary | .333 | | .330 | |
| | (10.70) | | (10.48) | |
| Services | .033 | -.011 | .032 | -.020 |
| | (0.25) | (0.42) | (1.22) | (0.64) |
| Trade | -.012 | -.015 | -.016 | -.023 |
| | (0.25) | (0.52) | (0.65) | (0.64) |
| Transportation | -.034 | -.148 | -.034 | -.153 |
| | (1.27) | (2.81) | (1.23) | (2.36) |
| | | | | |
| 1950 | -.095 | -.089 | -.105 | -.089 |
| | (3.56) | (2.73) | (3.66) | (1.98) |
| 1960 | -.075 | -.030 | -.068 | .040 |
| | (2.36) | (0.76) | (2.07) | (0.75) |
| 1970 | -.064 | .043 | -.059 | .087 |
| | (2.07) | (1.14) | (1.83) | (1.58) |
| 1980 | -.092 | -.044 | -.072 | .052 |
| | (2.51) | (0.98) | (2.04) | (0.86) |
| 1990 | -.103 | -.125 | -.083 | -.029 |
| | (2.71) | (2.80) | (2.24) | (0.48) |
| | | | | |
| Adjusted $R^2$ | .732 | .665 | .724 | .492 |
| N | 108 | 72 | 108 | 72 |

**NOTES: Coefficients are derived from a WLS regression of the fraction of workers working fewer than 40 weeks per year on the independent variables shown. Marginal effects –i.e. the predicted change in the part-year share at the means of the data—are reported. T-statistics are in parentheses (in absolute value). The 'relative income' variable is defined as the log of (part-year income / full-year income). Manufacturing is the omitted industry group and 1940 is the omitted year. All regressions include a constant term, and are weighted by annual industry shares in employment.**

**Table 5**
**Summary statistics for Census micro-data: Men**

| Variable | New Brunswick | | | Maine | | | Maine – Northern counties | | |
|---|---|---|---|---|---|---|---|---|---|
| | **1970** | **1980** | **1990** | **1970** | **1980** | **1990** | **1970** | **1980** | **1990** |
| Age | 40.96 | 38.24 | 39.22 | 40.97 | 39.15 | 38.99 | 41.09 | 39.23 | 38.92 |
| | (.362) | (.214) | (.149) | (.258) | (.107) | (.089) | (.462) | (.187) | (.154) |
| | | | | | | | | | |
| Agriculture | .010 | .009 | .016 | .029 | .019 | .020 | .031 | .031 | .032 |
| | (.003) | (.002) | (.002) | (.004) | (.001) | (.001) | (.009) | (.003) | (.003) |
| Primary | .079 | .085 | .081 | .022 | .023 | .029 | .044 | .037 | .043 |
| | (.009) | (.006) | (.004) | (.004) | (.002) | (.002) | (.009) | (.003) | (.003) |
| Construction | .084 | .115 | .115 | .091 | .091 | .126 | .108 | .091 | .120 |
| | (.009) | (.007) | (.005) | (.007) | (.003) | (.003) | (.014) | (.005) | (.005) |
| Transportation | .171 | .156 | .133 | .082 | .084 | .073 | .101 | .096 | .070 |
| | (.013) | (.008) | (.006) | (.007) | (.003) | (.003) | (.014) | (.005) | (.004) |
| Trade | .126 | .126 | .127 | .163 | .143 | .157 | .142 | .132 | .152 |
| | (.011) | (.007) | (.005) | (.010) | (.004) | (.004) | (.016) | (.006) | (.006) |
| Finance | .018 | .025 | .029 | .025 | .029 | .025 | .021 | .023 | .015 |
| | (.005) | (.003) | (.003) | (.004) | (.002) | (.001) | (.007) | (.003) | (.002) |
| Services | .134 | .155 | .174 | .129 | .168 | .183 | .145 | .170 | .178 |
| | (.012) | (.008) | (.006) | (.009) | (.004) | (.004) | (.016) | (.007) | (.006) |
| Manufacturing | .209 | .204 | .197 | .369 | .334 | .284 | .296 | .298 | .253 |
| | (.014) | (.009) | (.006) | (.012) | (.005) | (.004) | (.021) | (.008) | (.007) |
| Public | .167 | .126 | .127 | .089 | .109 | .102 | .108 | .122 | .137 |
| | (.013) | (.007) | (.005) | (.007) | (.003) | (.003) | (.014) | (.006) | (.006) |
| | | | | | | | | | |
| Married | .856 | .828 | .810 | .863 | .804 | .742 | .902 | .812 | .751 |
| | (.012) | (.008) | (.006) | (.009) | (.004) | (.004) | (.014) | (.007) | (.007) |
| Children | .710 | .714 | .692 | .686 | .620 | .562 | .699 | .630 | .564 |
| | (.016) | (.009) | (.007) | (.012) | (.005) | (.005) | (.021) | (.009) | (.008) |
| Attending school | .056 | .069 | .072 | .026 | .038 | .052 | .009 | .033 | .058 |
| | (.008) | (.006) | (.004) | (.004) | (.002) | (.002) | (.004) | (.003) | (.004) |
| | | | | | | | | | |
| High school or less | .882 | .575 | .524 | .799 | .642 | .550 | .835 | .670 | .584 |
| | (.011) | (.011) | (.008) | (.010) | (.005) | (.005) | (.017) | (.009) | (.008) |
| Some post-secondary | .049 | .311 | .340 | .100 | .172 | .253 | .086 | .156 | .250 |
| | (.008) | (.010) | (.008) | (.008) | (.004) | (.004) | (.013) | (.007) | (.007) |
| Four-year degree | .069 | .114 | .135 | .101 | .186 | .198 | .077 | .174 | .166 |
| | (.009) | (.007) | (.006) | (.008) | (.004) | (.004) | (.012) | (.007) | (.006) |
| | | | | | | | | | |
| Part-time (under 30 hours/week) | .031 | .061 | .043 | .023 | .023 | .024 | .032 | .023 | .029 |
| | (.006) | (.005) | (.003) | (.004) | (.002) | (.001) | (.008) | (.003) | (.003) |
| | | | | | | | | | |
| Sample size | 832 | 2111 | 3811 | 1499 | 8891 | 10813 | 462 | 2922 | 3681 |

NOTES: Standard errors are in parentheses. The sample is restricted to individuals of age 25 to 59.

**Table 6**
**Summary statistics for Census micro-data: Women**

| Variable | New Brunswick | | | Maine | | | Maine – Northern counties | | |
|---|---|---|---|---|---|---|---|---|---|
| | **1970** | **1980** | **1990** | **1970** | **1980** | **1990** | **1970** | **1980** | **1990** |
| Age | 40.48 | 37.59 | 38.46 | 42.05 | 39.30 | 38.97 | 42.41 | 39.27 | 39.15 |
| | (.497) | (.263) | (.160) | (.312) | (.122) | (.090) | (.573) | (.214) | (.162) |
| | | | | | | | | | |
| Agriculture | .007 | .010 | .018 | .021 | .012 | .013 | .020 | .021 | .020 |
| | (.004) | (.003) | (.002) | (.005) | (.001) | (.001) | (.008) | (.003) | (.002) |
| Primary | .005 | .017 | .014 | .004 | .003 | .004 | .000 | .007 | .007 |
| | (.003) | (.004) | (.002) | (.002) | (.001) | (.001) | (.000) | (.002) | (.002) |
| Construction | .007 | .017 | .011 | .009 | .006 | .013 | .007 | .007 | .010 |
| | (.004) | (.004) | (.002) | (.003) | (.001) | (.001) | (.005) | (.002) | (.002) |
| Transportation | .043 | .038 | .039 | .023 | .026 | .026 | .020 | .022 | .023 |
| | (.010) | (.005) | (.003) | (.005) | (.002) | (.002) | (.008) | (.003) | (.003) |
| Trade | .204 | .158 | .157 | .207 | .166 | .197 | .215 | .170 | .201 |
| | (.020) | (.010) | (.006) | (.013) | (.004) | (.004) | (.024) | (.008) | (.007) |
| Finance | .048 | .064 | .066 | .050 | .060 | .070 | .027 | .047 | .052 |
| | (.011) | (.007) | (.004) | (.007) | (.003) | (.003) | (.009) | (.004) | (.004) |
| Services | .468 | .487 | .489 | .323 | .410 | .463 | .414 | .448 | .487 |
| | (.024) | (.013) | (.009) | (.015) | (.006) | (.005) | (.029) | (.011) | (.009) |
| Manufacturing | .127 | .132 | .096 | .323 | .250 | .154 | .269 | .210 | .128 |
| | (.016) | (.009) | (.005) | (.015) | (.005) | (.004) | (.026) | (.009) | (.006) |
| Public | .089 | .077 | .108 | .040 | .067 | .061 | .027 | .069 | .072 |
| | (.014) | (.007) | (.006) | (.006) | (.003) | (.002) | (.009) | (.005) | (.005) |
| | | | | | | | | | |
| Married | .731 | .770 | .783 | .767 | .727 | .716 | .778 | .743 | .737 |
| | (.022) | (.011) | (.007) | (.013) | (.005) | (.004) | (.024) | (.009) | (.008) |
| Children | .728 | .625 | .691 | .626 | .631 | .609 | .596 | .638 | .622 |
| | (.022) | (.013) | (.008) | (.015) | (.006) | (.005) | (.029) | (.010) | (.009) |
| In school | .058 | .077 | .078 | .019 | .044 | .078 | .020 | .044 | .086 |
| | (.011) | (.007) | (.005) | (.004) | (.002) | (.003) | (.008) | (.004) | (.005) |
| | | | | | | | | | |
| High school or less | .870 | .531 | .485 | .786 | .654 | .506 | .788 | .636 | .539 |
| | (.016) | (.013) | (.009) | (.013) | (.006) | (.005) | (.024) | (.010) | (.009) |
| Some post-secondary | .077 | .352 | .375 | .139 | .185 | .279 | .138 | .191 | .273 |
| | (.013) | (.013) | (.009) | (.011) | (.005) | (.004) | (.020) | (.008) | (.008) |
| Four-year degree | .053 | .117 | .140 | .076 | .161 | .215 | .074 | .173 | .187 |
| | (.011) | (.009) | (.006) | (.008) | (.004) | (.004) | (.015) | (.008) | (.007) |
| | | | | | | | | | |
| Part-time (under 30 hours/week) | .226 | .276 | .233 | .173 | .184 | .175 | .200 | .185 | .172 |
| | (.021) | (.012) | (.007) | (.012) | (.005) | (.004) | (.023) | (.008) | (.007) |
| | | | | | | | | | |
| Sample size | 416 | 1384 | 3147 | 1031 | 7018 | 10098 | 297 | 2210 | 3229 |

NOTES: Standard errors are in parentheses. The sample is restricted to individuals of age 25 to 59.

**Table 7**
**Estimated Coefficients from McFadden choice model among weeks-worked categories: Using Northern Maine counties only**

| Variable | Men | | Women | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Relative income | 5.791 | 1.775 | 2.155 | 1.424 |
| | (9.08) | (2.78) | (6.32) | (4.10) |
| New Brunswick * | -1.632 | .146 | -.683 | -.469 |
| 12 weeks | (5.50) | (0.50) | (4.05) | (2.74) |
| New Brunswick * | -.458 | .830 | -.079 | .102 |
| 20 weeks | (2.24) | (3.94) | (0.59) | (0.75) |
| New Brunswick * | .349 | .384 | -.233 | -.256 |
| 33 weeks | (5.14) | (5.50) | (3.65) | (3.93) |
| 1980 * 12 weeks | -.498 | .326 | -.621 | -.427 |
| | (1.92) | (0.97) | (3.99) | (2.50) |
| 1980 * 20 weeks | -.637 | .102 | -.365 | -.232 |
| | (4.07) | (0.59) | (2.85) | (1.76) |
| 1980 * 33 weeks | -.096 | .052 | -.262 | -.284 |
| | (0.79) | (0.42) | (2.16) | (2.30) |
| 1990 * 12 weeks | -.584 | .368 | -1.311 | -1.049 |
| | (2.25) | (1.07) | (8.26) | (6.00) |
| 1990 * 20 weeks | -.524 | .356 | -.556 | -.366 |
| | (3.24) | (2.00) | (4.44) | (2.83) |
| 1990 * 33 weeks | -.293 | -.089 | -.662 | -.667 |
| | (2.46) | (0.73) | (5.62) | (5.52) |
| Socio-economic controls | No | Yes | No | Yes |
| Pseudo $R^2$ | .539 | .560 | .285 | .313 |
| $\chi^2$ | 20634.5 | 21422.5 | 8450.9 | 9249.9 |

NOTES: t-statistics are in parentheses (in absolute value). The dependent variable equals one for the weeks worked category realized, zero for each other weeks worked category. Estimation is by conditional logit. The number of individuals in the sample is 13819 for men and 10683 for women. The 'relative income' variable is defined as the log of (part-year income / full-year income). In all cases, we use the predicted values of relative income, where the predictors include the following variables in addition to the regressors in the table: New Brunswick interacted with 1980, New Brunswick interacted with 1990, all the industry dummies interacted with New Brunswick, all the industry dummies interacted with New Brunswick and a post-1970 dummy, and education interacted with New Brunswick and a post-1970 dummy. Manufacturing is the omitted industry group, high school diploma or less is the omitted education group, and 1970 is the omitted year. The sample is restricted to individuals of age 25 to 59. All equations include the socio-economic controls outlined previously, a set of weeks worked dummies, and a full set of industry dummies. Standard errors are corrected for clustering on (year * region * industry * education) cells.

**Table 8**
**Actual versus Predicted Weeks-Worked Distributions, Men**

| | New Brunswick | | Maine | |
|---|---|---|---|---|
| | Actual | Predicted | Actual | Predicted |
| **1970:** | | | | |
| 1-13 weeks | 1.7 | 1.3 | 1.1 | 1.7 |
| 14-26 weeks | 10.0 | 9.3 | 2.2 | 3.6 |
| 27-39 weeks | 10.0 | 8.6 | 5.1 | 6.5 |
| 40-52 weeks | 78.4 | 80.8 | 91.5 | 88.2 |
| **1980:** | | | | |
| 1-13 weeks | 4.5 | 4.5 | 2.0 | 2.2 |
| 14-26 weeks | 11.2 | 12.5 | 3.8 | 3.8 |
| 27-39 weeks | 8.2 | 8.9 | 6.7 | 7.2 |
| 40-52 weeks | 76.1 | 74.1 | 87.6 | 86.9 |
| **1990:** | | | | |
| 1-13 weeks | 4.5 | 4.5 | 2.2 | 2.5 |
| 14-26 weeks | 16.3 | 15.6 | 3.9 | 5.0 |
| 27-39 weeks | 7.6 | 7.5 | 5.5 | 6.5 |
| 40-52 weeks | 71.7 | 72.4 | 88.4 | 86.0 |

**Table 9**
**Actual versus Predicted Weeks-Worked Distributions, Women**

| | New Brunswick | | Maine | |
|---|---|---|---|---|
| | Actual | Predicted | Actual | Predicted |
| **1970:** | | | | |
| 1-13 weeks | 10.1 | 8.8 | 11.6 | 12.3 |
| 14-26 weeks | 16.6 | 18.0 | 11.4 | 12.4 |
| 27-39 weeks | 11.5 | 14.1 | 13.6 | 14.8 |
| 40-52 weeks | 61.8 | 59.1 | 63.3 | 60.5 |
| **1980:** | | | | |
| 1-13 weeks | 14.7 | 13.6 | 8.4 | 8.5 |
| 14-26 weeks | 16.2 | 18.0 | 10.1 | 10.8 |
| 27-39 weeks | 11.3 | 11.3 | 12.8 | 12.8 |
| 40-52 weeks | 57.8 | 57.1 | 68.8 | 67.9 |
| **1990:** | | | | |
| 1-13 weeks | 7.5 | 8.2 | 6.0 | 6.8 |
| 14-26 weeks | 18.7 | 17.7 | 7.8 | 8.9 |
| 27-39 weeks | 9.1 | 8.8 | 9.7 | 10.1 |
| 40-52 weeks | 64.7 | 65.4 | 76.4 | 74.2 |

**Table 10**
**Predicted Effects of Hypothetical Changes to New Brunswick's UI System: Simulation with 1971 UI Act Removed**

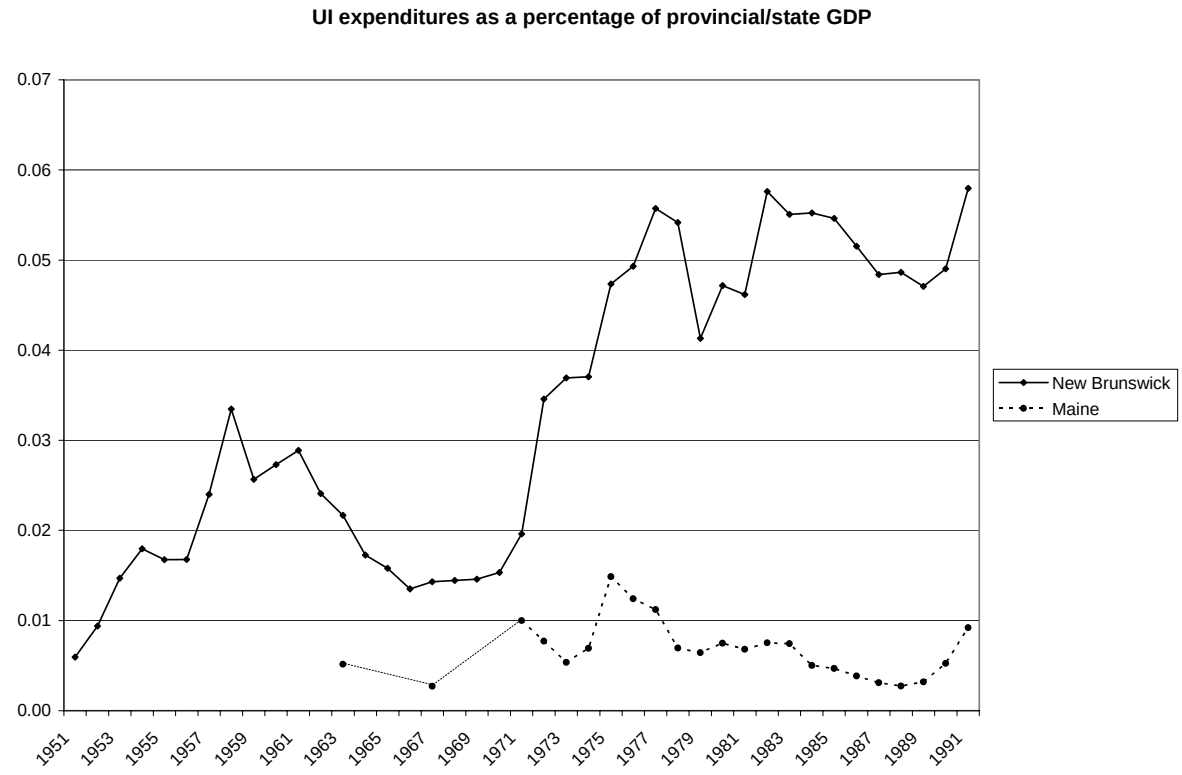
| | Men | | Women | |
|---|---|---|---|---|
| | NB Baseline | Without the 1971 UI Act | NB Baseline | Without the 1971 UI Act |
| **1970:** | | | | |
| 1-13 weeks | 1.3 | 1.3 | 8.8 | 8.8 |
| 14-26 weeks | 9.3 | 9.3 | 18.0 | 18.0 |
| 27-39 weeks | 8.6 | 8.6 | 14.1 | 14.1 |
| 40-52 weeks | 80.8 | 80.8 | 59.1 | 59.1 |
| **1980:** | | | | |
| 1-13 weeks | 4.5 | 2.0 | 13.6 | 6.7 |
| 14-26 weeks | 12.5 | 8.7 | 18.0 | 14.2 |
| 27-39 weeks | 8.9 | 8.1 | 11.3 | 11.8 |
| 40-52 weeks | 74.1 | 81.2 | 57.1 | 67.3 |
| **1990:** | | | | |
| 1-13 weeks | 4.5 | 1.9 | 8.2 | 3.8 |
| 14-26 weeks | 15.6 | 10.4 | 17.7 | 13.6 |
| 27-39 weeks | 7.5 | 7.3 | 8.8 | 8.9 |
| 40-52 weeks | 72.4 | 80.4 | 65.4 | 73.7 |

**Table 11**
**Predicted Effects of Hypothetical Changes to New Brunswick's UI System: Simulation with Maine's UI Rules Imposed on New Brunswick**

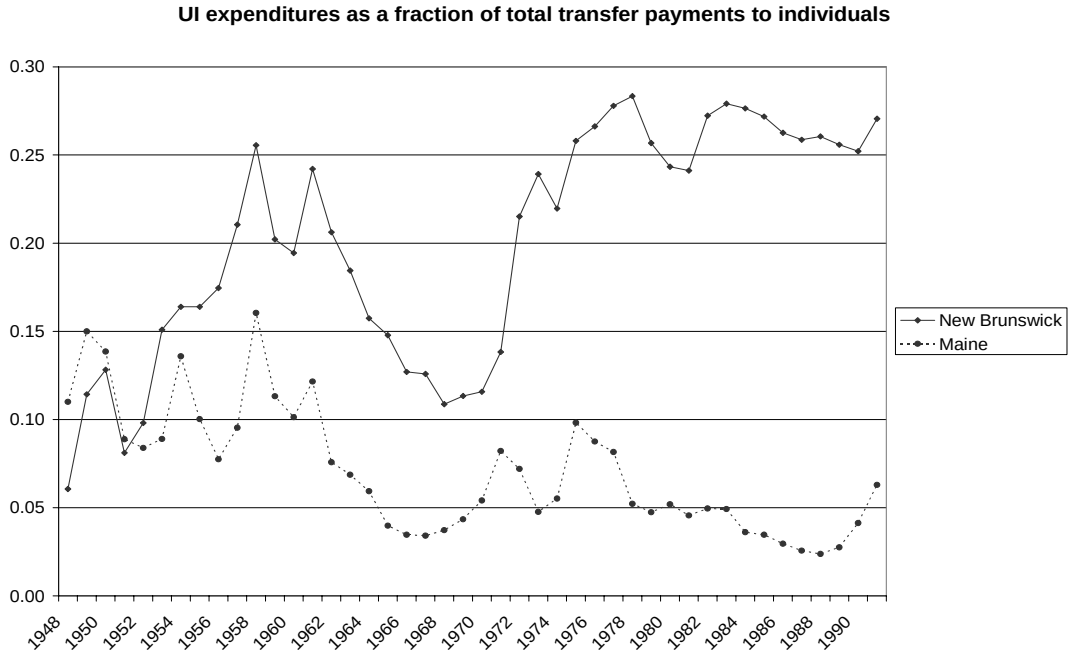
| | Men | | Women | |
|---|---|---|---|---|
| | NB Baseline | With Maine's UI system | NB Baseline | With Maine's UI system |
| **1970:** | | | | |
| 1-13 weeks | 1.3 | 1.0 | 8.8 | 6.0 |
| 14-26 weeks | 9.3 | 8.0 | 18.0 | 16.2 |
| 27-39 weeks | 8.6 | 9.5 | 14.1 | 15.8 |
| 40-52 weeks | 80.8 | 81.9 | 59.1 | 62.0 |
| **1980:** | | | | |
| 1-13 weeks | 4.5 | 1.0 | 13.6 | 3.8 |
| 14-26 weeks | 12.5 | 8.8 | 18.0 | 13.8 |
| 27-39 weeks | 8.9 | 10.2 | 11.3 | 13.9 |
| 40-52 weeks | 74.1 | 80.1 | 57.1 | 68.5 |
| **1990:** | | | | |
| 1-13 weeks | 4.5 | 1.0 | 8.2 | 2.2 |
| 14-26 weeks | 15.6 | 10.4 | 17.7 | 12.3 |
| 27-39 weeks | 7.5 | 8.3 | 8.8 | 10.1 |
| 40-52 weeks | 72.4 | 80.3 | 65.4 | 75.4 |

**Figure 1: UI and Unemployment in the Maine and New Brunswick Economies**

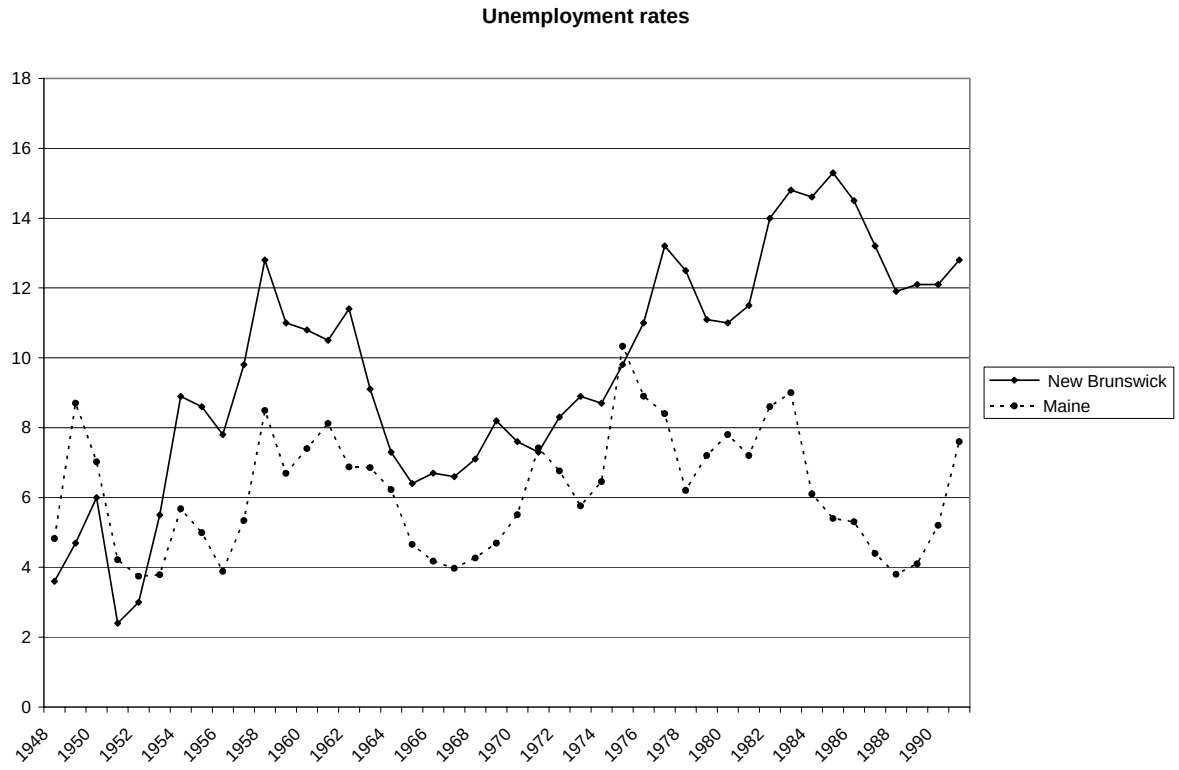
a)




b)



c)

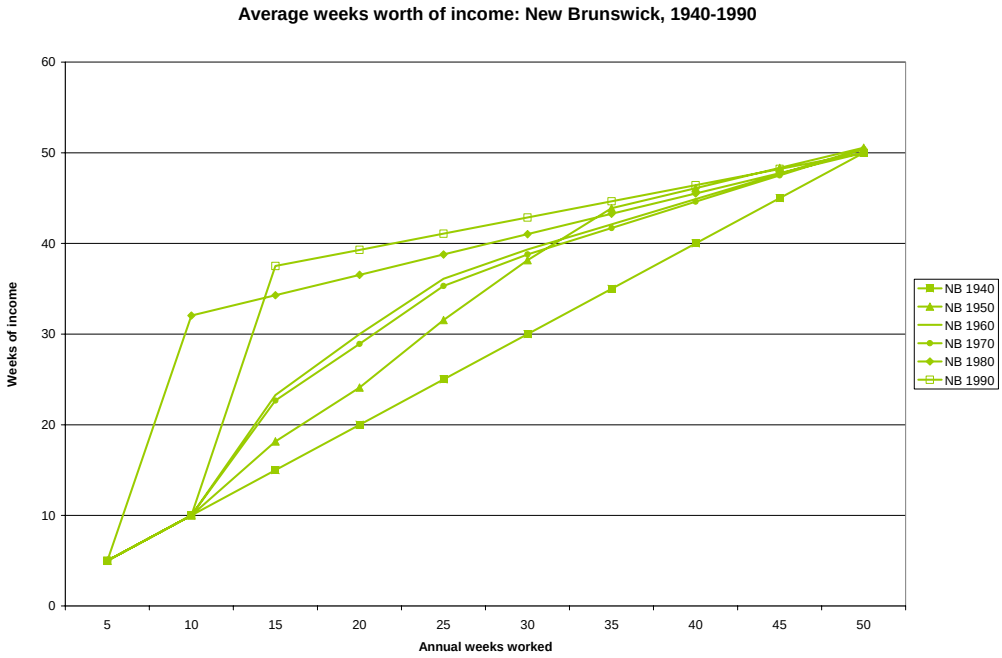



Notes to Figure 1

"Total transfer payments to individuals" consist of: a) for New Brunswick, family and youth allowances; veterans' allowances, unemployment insurance benefits; scholarships and research grants; old age security; pensions to government employees (federal and provincial); adult education and training payments; provincial transfers such as direct relief, workers compensations, disability-related payments and grants to post-secondary institutions; CPP/QPP and miscellaneous federal/provincial/municipal transfer payments and b) for Maine, all forms of retirement & disability insurance benefit payments; worker's compensation payments; medical payments; income maintenance benefit payments; all UI-related benefit payments; all veteran-related payments; federal education and training payments; and miscellaneous federal/state/local transfers payments. For consistency between the jurisdictions, we include federal UI payments to individuals in Maine, which includes (depending on the year) payments for federal civilian government employees (after they became covered), railroad employees, and 'other' federal UI payments. These federal payments are a small fraction (typically ~10%) of state payments.

**Figure 2: Weeks of Income Received versus Weeks Worked**

a) New Brunswick




b) Maine

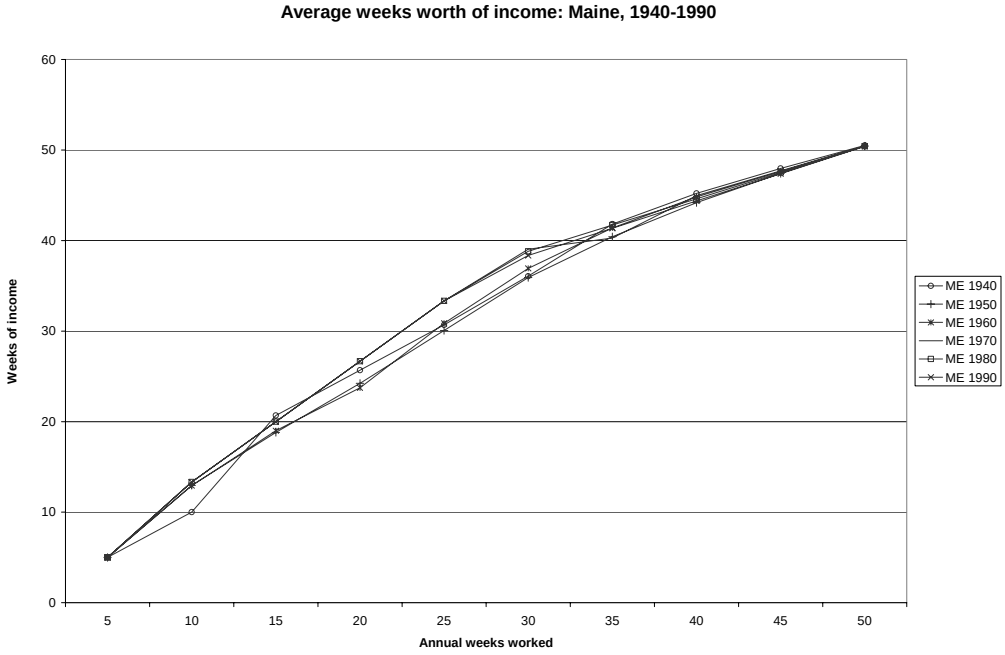


**Figure 3: Implicit Wage Changes in UI Policy Changes**

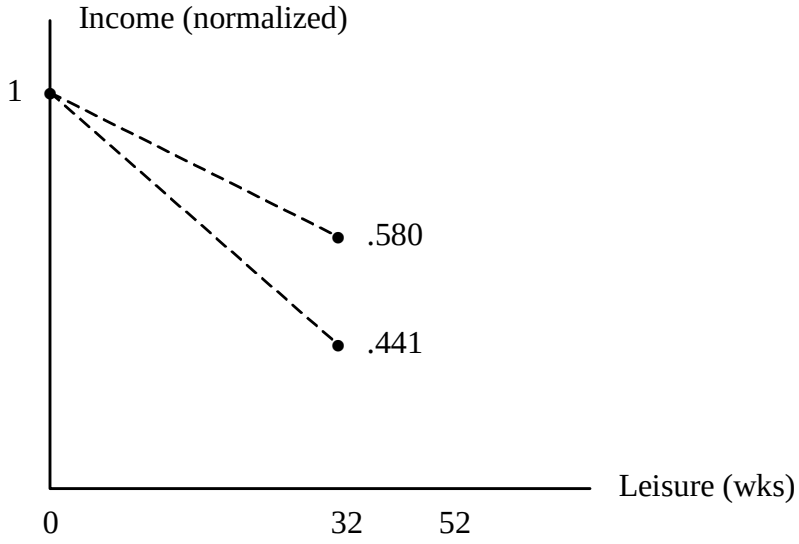
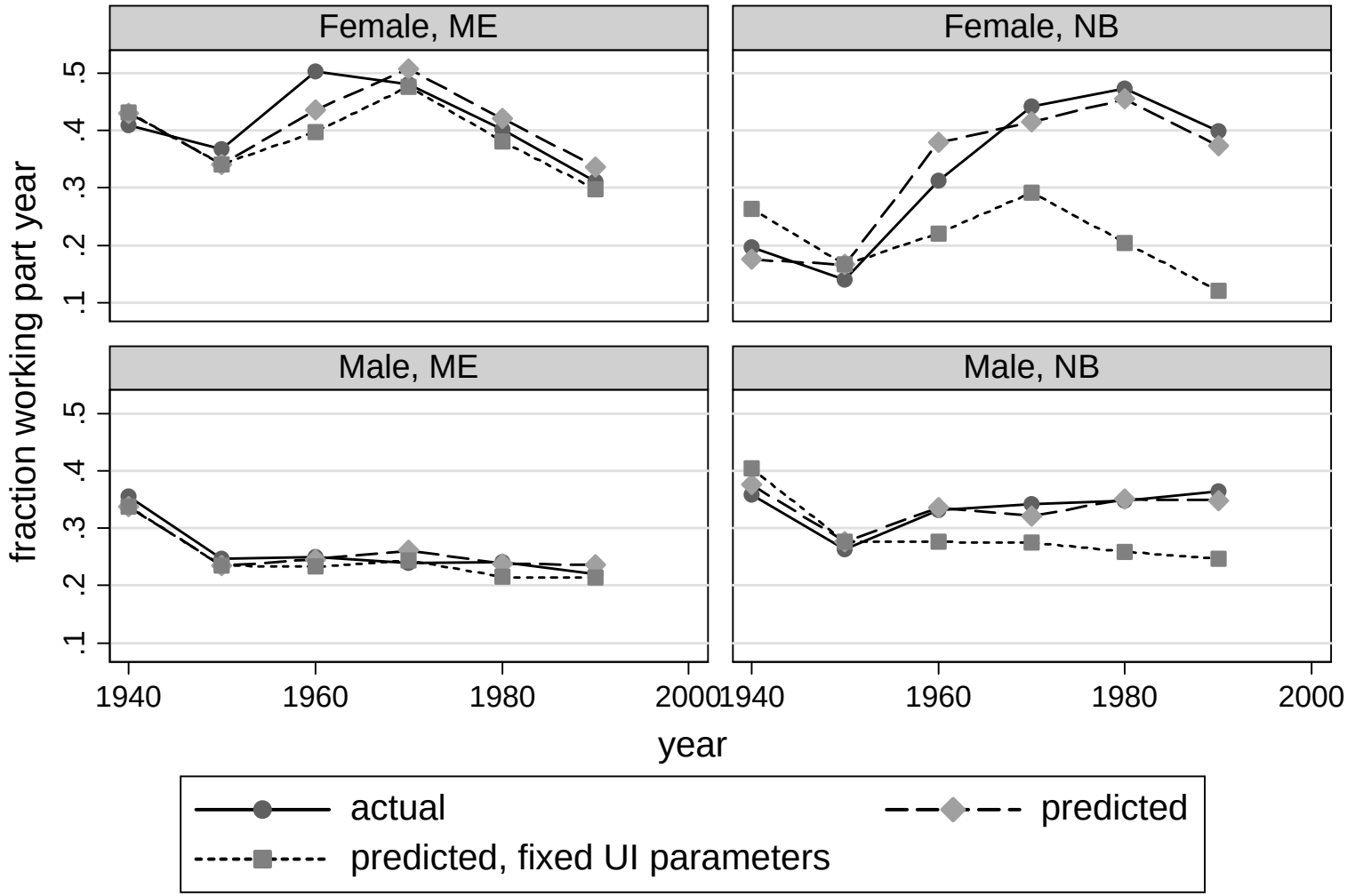


**Figure 4: Actual and Predicted Part-Year Work: Cell-Level Analysis**




Graphs by gender and country

50

**Figure 5: Actual and Predicted Relative Fraction Working Part Year: Cell-Level Analysis**

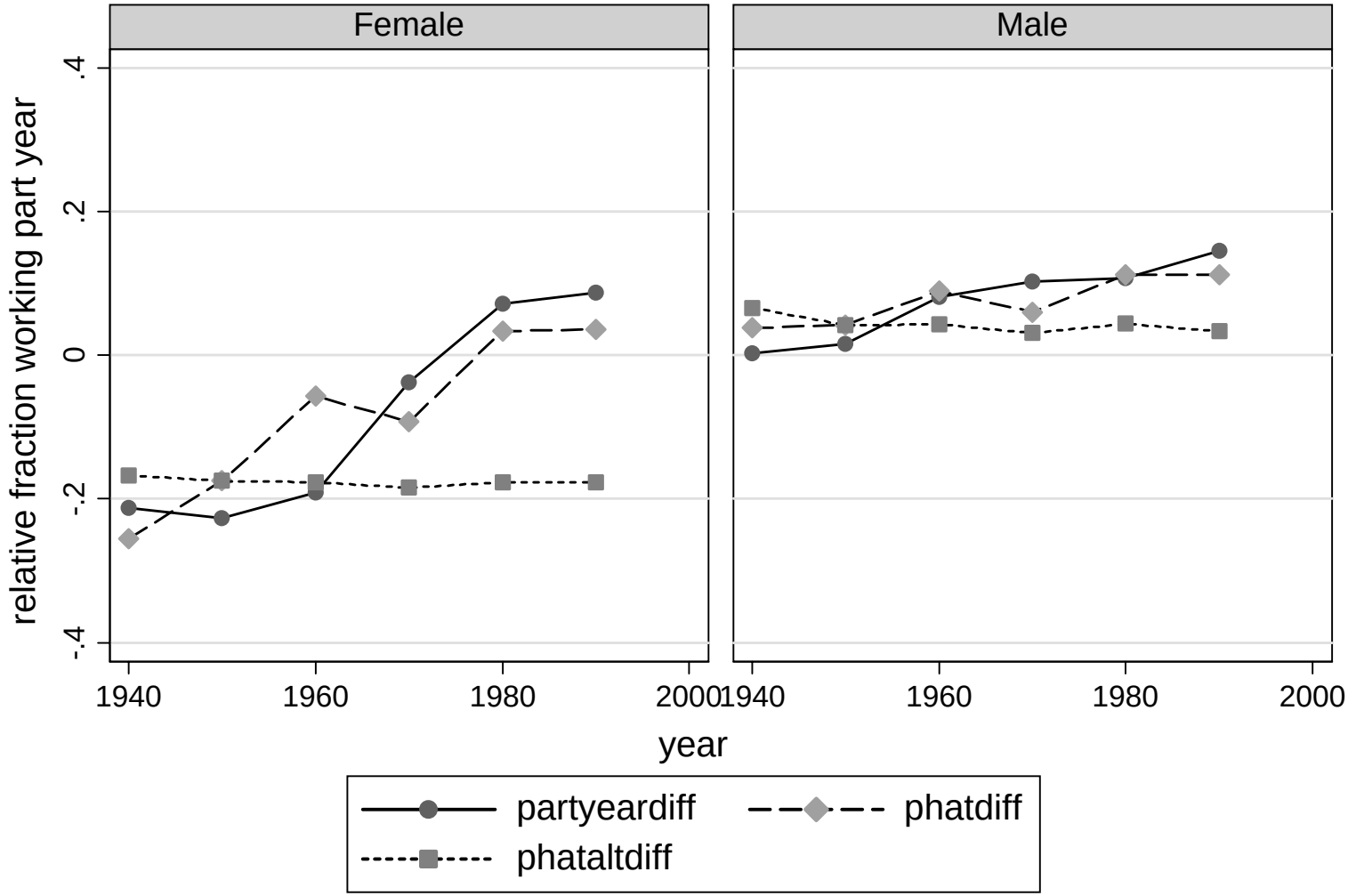


**Figure 6: Maine and its Northern Counties**


N: Denotes Northern County Sample

# Appendix 1:
# Weekly UI Benefit Schedules

## a) Maine, 1939 to 1959

| 1939 | | 1949 | | 1959 | |
|---|---|---|---|---|---|
| **Weekly benefit amount ($)** | **Base period earnings ($)** | **Weekly benefit amount ($)** | **Base period earnings ($)** | **Weekly benefit amount ($)** | **Base period earnings ($)** |
| 0 | 0 - 143.99 | 0 | 0 - 299.99 | 0 | 0 - 299.99 |
| 3 | 144.00 - 185.41 | 6 | 300.00 - 432.50 | 7 | 300.00 - 399.99 |
| 3.50 | 185.42 - 228.24 | 7 | 432.51 - 565.00 | 8 | 400.00 - 499.99 |
| 4 | 228.25 - 272.63 | 8 | 565.01 - 697.50 | 9 | 500.00 - 599.99 |
| 4.50 | 272.64 - 318.58 | 9 | 697.51 - 830.00 | 10 | 600.00 - 699.99 |
| 5 | 318.59 - 366.09 | 10 | 830.01 - 962.50 | 11 | 700.00 - 799.99 |
| 5.50 | 366.10 - 415.16 | 11 | 962.51 - 1095.00 | 12 | 800.00 - 899.99 |
| 6 | 415.17 - 465.78 | 12 | 1095.01 - 1227.50 | 13 | 900.00 - 999.99 |
| 6.50 | 465.79 - 517.82 | 13 | 1227.51 - 1360.00 | 14 | 1000.00 - 1099.99 |
| 7 | 517.83 - 571.42 | 14 | 1360.01 - 1492.50 | 15 | 1100.00 - 1199.99 |
| 7.50 | 571.43 - 626.57 | 15 | 1492.51 - 1625.00 | 16 | 1200.00 - 1299.99 |
| 8 | 626.58 - 683.28 | 16 | 1625.01 - 1757.50 | 17 | 1300.00 - 1399.99 |
| 8.50 | 683.29 - 741.54 | 17 | 1757.51 - 1890.00 | 18 | 1400.00 - 1499.99 |
| 9 | 741.55 - 801.37 | 18 | 1890.01 - 2022.50 | 19 | 1500.00 - 1599.99 |
| 9.50 | 801.38 - 862.61 | 19 | 2022.51 - 2155.00 | 20 | 1600.00 - 1699.99 |
| 10 | 862.62 - 925.41 | 20 | 2155.01 - 2287.50 | 21 | 1700.00 - 1799.99 |
| 10.50 | 925.42 - 989.77 | 21 | 2287.51 - 2420.00 | 22 | 1800.00 - 1899.99 |
| 11 | 989.78 - 1055.69 | 22 | 2420.01 - 2552.50 | 23 | 1900.00 - 1999.99 |
| 11.50 | 1055.70 - 1123.16 | 23 | 2552.51 - 2685.00 | 24 | 2000.00 - 2099.99 |
| 12 | 1123.17 - 1192.19 | 24 | 2685.01 - 2817.50 | 25 | 2100.00 - 2199.99 |
| 12.50 | 1192.20 - 1262.64 | 25 | 2817.51 - 2950.00 | 26 | 2200.00 - 2299.99 |
| 13 | 1262.65 - 1334.64 | 26 | 2950.01 + | 27 | 2300.00 - 2399.99 |
| 13.50 | 1334.65 - 1408.20 | | | 28 | 2400.00 - 2499.99 |
| 14 | 1408.21 - 1483.32 | | | 29 | 2500.00 - 2599.99 |
| 14.50 | 1483.33 - 1559.99 | | | 30 | 2600.00 - 2699.99 |
| 15 | 1560.00 + | | | 31 | 2700.00 - 2799.99 |
| | | | | 32 | 2800.00 - 2899.99 |
| | | | | 33 | 2900.00 + |

NOTES: See text for discussion of the base period.

**b) Maine, 1969 to 1989**

| Year | Method of computing weekly benefit amount | Minimum weekly benefit amount | Maximum weekly benefit amount | Minimum wage credits in base period required for: | |
|---|---|---|---|---|---|
| | | | | Minimum wba | Maximum wba |
| 1969 | 1/25 of high quarter earnings | $10 | $52 | $600 | $1,331 |
| 1979 | 1/22 of high quarter earnings | $12 without dependents $17 with dependents | $96 without dependents $144 with dependents | $900 | $2,101 |
| 1989 | 1/22 of high quarter earnings | $31 without dependents $46 with dependents | $180 without dependents $270 with dependents | $2,081 | $6,041 |

**c) New Brunswick, 1950 to 1970**

| 1950 | | | 1960 | | | 1970 | | |
|---|---|---|---|---|---|---|---|---|
| Weekly earnings | Weekly benefit, single | Weekly benefit, dependent | Weekly earnings | Weekly benefit, single | Weekly benefit, dependent | Weekly earnings | Weekly benefit, single | Weekly benefit, dependent |
| 0 - $8.99 | $4.20 | $4.80 | 0 - $8.99 | NA | NA | 0 - $20 | NA | NA |
| $9 - $14.99 | $6 | $7.50 | $9 - $14.99 | $6 | $8 | $20 - $29 | $13 | $17 |
| $15 - $20.99 | $8.10 | $10.20 | $15 - $20.99 | $9 | $12 | $30 - $39 | $16 | $21 |
| $21 - $26.99 | $10.20 | $12.90 | $21 - $26.99 | $11 | $15 | $40 - $49 | $19 | $25 |
| $27 - $33.99 | $12.30 | $15.60 | $27 - $32.99 | $13 | $18 | $50 - $59 | $22 | $29 |
| $34 - $47.99 | $14.40 | $18.30 | $33 - $38.99 | $15 | $21 | $60 - $69 | $26 | $33 |
| $48 + | $16.20 | $21 | $39 - $44.99 | $17 | $24 | $70 - $79 | $30 | $38 |
| | | | $45 - $50.99 | $19 | $26 | $80 - $89 | $34 | $43 |
| | | | $51 - $56.99 | $21 | $28 | $90 - $99 | $38 | $48 |
| | | | $57 - $62.99 | $23 | $30 | $100 + | $42 | $53 |
| | | | $63 - $68.99 | $25 | $33 | | | |
| | | | $69 + | $27 | $36 | | | |

Note: New Brunswick's benefit formula for 1980 and 1990 is described in the text.

**Appendix 2:**
**Additional UI rules in New Brunswick**

## a) 1950

**Qualifying**

Regular benefits: Under the 1940 Act a claimant was required to prove 180 contribution days within the preceding two years, and 60 of these days must have occurred within the year (or 45 days within the 6 months) prior to the current claim.

Supplementary benefits: Supplementary benefits were introduced in February of 1950 These benefits allowed payment of benefit during the winter months to certain classes of claimants unable to qualify under the minimum contribution requirements of the Act. The following classes of persons are eligible:

(a) Those whose benefit rights have terminated since the preceding March 31 and who are unable to re-qualify (class 1).
(b) Those who failed to qualify on a claim filed since the preceding March 31, provided that not less than 90 days contributions have been made on their behalf since that date (class 2).

NOTE: These supplementary benefits only existed from 1950-54, but were introduced mid-way through 1950 in an unannounced amendment. The 1955 UI Act renamed them seasonal benefits, and some important changes were made. Supplementary benefits were payable at 80% the regular rate, but this increased to 100% for seasonal benefits. The key change made in 1955 was the introduction of restrictions on benefit for "repeat claimers" (see below).

**Duration of benefit**

Under the 1940 Act, the ratio rule apply where an individual was able to collect one day of benefits for each 5 contribution days made over the previous 5 years minus one day for each 3 days of benefits collected over the previous 3 years.

## b) 1960

### *Qualifying*

Regular benefit: Claimants must have made at least 30 weekly contributions in the two years preceding the date of the claim; 8 of these must have occurred since the start of the last preceding regular benefit period or within the year preceding the claim, whichever is the shorter period; and 24 of these since the start of the last preceding benefit period, either regular or seasonal, or in the year preceding the claim, whichever is the longer period.

Seasonal benefit: Claimants in class A must have failed regular benefit requirements, and have made 15 contributions since the Saturday preceding the 31$^{st}$ of March immediately prior to the date of the claim. Claimants in class B must have failed regular and seasonal class A requirements, and have had a regular benefit terminate since the Saturday following the 15$^{th}$ of May immediately prior to the claim. [Only established Dec.1 to mid-May]

**Duration of benefit**

A claimant is entitled to receive one week's regular benefit for every two contribution weeks in the two year period prior to the claim. However, if there was a regular or seasonal benefit period within this period of two years, only contribution weeks in the last year, or in the period since the start of the last benefit period, whichever is longer, can be used for computing benefit. The minimum duration of benefit is 12 weeks. The duration of seasonal benefit A is determined by either five benefit weeks for every 6 contribution weeks made since the last March 31st or the number of possible benefit weeks from the claim to May 15, whichever is less. The duration of season B is the number of weeks in the immediately previous regular benefit period, or the number of possible benefit weeks from the claim to May 15, whichever is less. The minimum duration for seasonal A is 13 weeks and for seasonal B 12 weeks unless the number of possible weeks from the claim to May 15 is less.

**Repeat-user rule**

For persons classed as "repeat claimants" section 45(2) restricts the degree to which contributions may be used a second time as qualifying credits. Section 45(2) of the Act applies to all persons for whom a previous benefit period (either regular or seasonal) was established within the two year period preceding the current claim. Some examples will illustrate the operation of this section:

Claimant A had no previous benefit period within the last two years. To qualify for regular benefit he is required to prove 30 contribution weeks in two years, if which eight must be shown in the year immediately preceding the claim.

Claimant B had a previous benefit period 18 months ago. He also must prove the 30 and 8 weeks requirement. However, 24 of the 30 contribution weeks must occur since the commencement date of that previous benefit period 18 months ago. In addition, only the 24 weeks count in calculating the duration formula, the remaining contribution weeks within the two years having been used to calculate the previous benefit rights may not be used a second time.

Claimant C had a previous benefit period 10 months ago. He must prove the 30 week requirement, but in this case, the 24 weeks must have been accumulated within the last year. The eight week test is automatic upon the fulfillment of the 24 week test.

Failures resulting from these tests during December to mid-May are considered for seasonal benefit. The contribution record since the preceding March 31 will be examined first and if at least 15 contribution weeks are shown, a seasonal benefit period class A will be established. Failing this, the benefit record will be examined and if a regular benefit period is shown as terminated since the previous mid-May, then eligibility will be established under class B.

If it is assumed that all three examples cited above were failures for regular benefit and that this occurred during the months when seasonal benefit was operative, the following adjudication are possible:

Claimant A could qualify under class A provided he had at least 15 contribution weeks since the preceding March 31. He would not be eligible under class B.

Claimant B and C would be tested first for the 15 contribution weeks since the preceding March 31 and failing that, they could qualify under class B provided the termination date of their previous benefit periods was subsequent to the preceding May 15. In

the case of claimant C there is a very strong probability that the termination date would be within the required interval, but for B the probability is less.

From these examples it will be seen that ability to qualify on a subsequent claim within a two year period is affected by the previous claim, either regular or seasonal. Thus, in December 1958 the proportion of initial claims considered under the seasonal benefit provisions reached an all-time high of 56%. This can be attributed, in the first instance, to the generally lower level of employment during the previous months. It is associated also with the high claim level during the previous winter and the temporary extension of the seasonal benefit period to June 28, 1958. Under the impact of this combination of circumstances, a proportionately higher number of claimants was unable to fulfill the contribution requirements under section 45(2).

December 1955 also showed a very high proportion of claims considered under the seasonal benefit terms. This represented inability on the part of repeater-claimants to meet the requirements under section 45(2) of the Act as effective on October 2, 1955. When the 1955 Act was first in operation, section 45(2) stipulated that for subsequent claims filed within a two year period, the whole 30 weeks were required within the months elapsing between the commencement date of the previous benefit period and the following claim, or within the preceding 12 months, whichever was the longer period. The application of this section of the Act resulted in a sharp rise in the failures, as shown on Table 6. On September 30 of the following year this requirement was reduced to 24 weeks. As well, the minimum 15 weeks rule was changed for subsequent claims, where the minimum was reduced to 12 weeks.

### c) 1970

#### Qualifying

Regular benefit:

(1) Where there has been no previous benefit year established within the prior 104 weeks, a claimant is required to prove 30 weeks of insurable employment within that interval and at least 8 of these weeks must fall within the year prior to the current claim.

(2) Where benefit entitlement has been established within the prior 104 weeks, the 30 week requirement remains, but additional tests are applied as in (a) and (b).

(a) The cycle to which the 8 week test applies may be less than one year. If, for example, a regular benefit period was established at any date within the year prior, then the 8 weeks must have occurred since that date.

(b) Where entitlement to either regular or seasonal benefit has been established within the prior 104 week interval, then 24 of the 30 contribution weeks must have been recorded either since the date the previous claim was established or within the most recent 52 weeks whichever is the longer interval.

Seasonal benefit:

In order to qualify for class A, a claimant must prove at least 15 contribution weeks since the prior March 31. It follows, then, that entitlement under class A can only be set up between the weeks of December 1 and March 31. To be eligible for class B, a regular benefit period must have terminated since the previous mid May.

Claimants are tested first under class A, only those failing the 15 week requirement being eligible for class B. Seasonal benefit periods established subsequent to the end of March are exclusively class B. During the 5.5 month seasonal period, a claimant is eligible only once.

**Duration of benefit**

For regular benefit, one week of benefit for every two weeks of contribution within the prior 104 weeks. However, in circumstances such as paragraph 2(b) above, “qualifying conditions” regular benefit, only the contribution acquired in the interval over which the 24 week requirement applies are considered for application to the formula. Hence, the minimum, while 15 weeks for those with bare requirements, may be as low as 12 weeks where the 24 week provision applies.

For seasonal benefit class A, the formula allows 5 weeks of benefit for every 6 contribution weeks in the qualifying interval. The duration for class B claims if the number of regular benefit authorized on the period terminating since the previous mid May, subject to the seasonal benefit cut-off.

## Appendix 3:
## Data Appendix

Weeks worked and part-year work: In both countries, in all years, the weeks worked variables refer to annual weeks worked in the year prior to the census year, and are used to compute the part-year work variables. Prior to 1980, the U.S. census coverage was individuals14+, which changed to 16+ in 1980; in the Canadian census, coverage changed from 14+ to 15+ in 1971. In addition, prior to 1971 only wage-earners were asked their weeks worked in Canada (i.e., self-employed and unpaid family workers were excluded). In the aggregate analysis this variable is the proportion of individuals in the gender/industry/region/year cell that work less than 40 weeks; and in the micro-data analysis, this variable is dichotomous equaling one is the individual works less than 40 weeks. Weeks worked are only available as continuous variables in the 1980/81 and 1990/91 U.S. and Canadian censuses. In previous years, in each country, weeks worked were categorized as follows: U.S. (all years) 1-13, 14-26, 27-39, 40-47, 48-49, 50-52; Canada (1961, 1971) 1-13, 14-26, 27-39, 40-48, 49-52; Canada (1941, 1951) 1-19, 20-29, 30-39, 40-49, 50-52. In the 1940 U.S. census and the 1941 and 1951 Canadian censuses, individuals who worked part-time had their weeks worked converted into full-time equivalent weeks worked (i.e., an individual working 40 weeks at 20 hours per week would appear in the data as 20 weeks worked). We convert weeks worked for the 1941 and 1951 census years back into *actual* weeks worked by exploiting the fact that the 1961 census asked about the full versus part-time status of the weeks worked in the prior year – although the published statistics only make this available for 40 to 52 weeks worked. We must assume that the propensity to work part-time was the same in 1940 and 1950 as it was in 1960. We then adjust the proportion of individuals working 40 to 52 weeks in 1940 and 1950 upwards based on the 1960 fraction working 40 to 52 weeks part-time. For the U.S., we make a similar adjustment to the 1940 cell, but we use the hours worked in reference week variable (available in the 1940 census) since no question was asked about full-time vs. part-time status in the previous year until the 1980 census.

Relative income: Computation of relative income begins with deriving weekly wages. For Maine, weekly wages are based entirely on census micro-data. For 1940, 1950, 1980 and 1990 the weekly wage is annual income from wages and salary divided by the number of weeks worked. For 1960 and 1970 a continuous weeks worked variable was not available in the public use micro-data files, and thus .the weekly wage is wages divided by the midpoint of the weeks worked category. The categories available in the 1960 and 1970 censuses (and midpoint value adopted) are 1-13 (6), 14-26 (20), 27-39 (33), 40-47 (43), 48-49 (49), and 50-52 (51). For New Brunswick, weekly wages are based on published census data for 1941 and 1961, and census micro-data for 1971, 1981 and 1991 (a categorical weeks worked variable is available in the 1971 census – see section above – and a continuous weeks worked variable is available in both 1981 and 1991; weekly wages are calculated in the same manner as above for Maine). No weekly wage data is available for 1951, and thus a value is imputed using an industry-gender specific weighted average of the 1941 and 1961 values. As discussed in the text, we drop the top 1% and bottom 5% of calculated weekly wages in each country/year. For the cell-level analysis relative income for the 20 weeks worked assumption is then

calculated as: relative income = [(weekly wages{*g,y,i,c*}*20) + UI{*y,c*}] / (weekly wages{*g,y,i,c*}*52) where *g* is gender, *y* is census year, *i* is industry and *c* is country. UI is income from unemployment insurance, and equals the weekly benefit amount * benefit duration. UI for Maine is calculated based on the weekly wage (either the individual's or the cell value) and prevailing UI rules (see text and benefit schedules in Appendix 1). Benefit durations in Maine are discussed in the text. For New Brunswick, UI is calculated based on the prevailing UI rules for a given weeks worked assumption (20 or 30 weeks) with the weekly benefit amount computed based on the schedules in Appendix 1, or as 60%/67% (without/with dependents) for post-1971 UI Act census years. For benefit durations for New Brunswick, Appendices 3a and 3b illustrate the computation for 1950 to 1970 cells. After the 1971 UI Act, individuals in New Brunswick could collect 30 weeks of benefits for 20 weeks worked due to the 2 week waiting period and 20 weeks of benefit for 30 weeks worked (see text for further discussion).

Education: For education, the Canadian censuses are the richer source and thus the U.S. variable is used as the base. In general, prior to 1990, the U.S. census tends to have year of education while the Canadian census has a combination of years of education and credential information. The only education variable available in the 1970 and 1980 U.S. censuses used in the micro-data analysis is the 'highest grade of school' variable, which has the following categories: a category for each grade from kindergarten through grade 12 where grade 12 includes both individuals who graduated with a high school diploma and those who did not; categories for each year of university completed (to a maximum of eight). The 1990 U.S. census changed the education question to a highest level of attainment (i.e., credential). As such, education in the 1990 census is not comparable to previous census years. IPUMS provides a recoded variable, which we use, where they place grade 12 (with and without high school diploma) in a single category, equate 1 to 3 years of college with all post-secondary categories under a Bachelor's, and then equate 4+ plus years of college with a Bachelor's or greater. In the Canadian census, we set grade 11 and under as "less than high school" and grade 12 as "high school", keeping in mind that this includes some individuals without a high school diploma. We set 1 through 3 years of post-secondary schooling as "some post-secondary" and 4+ years as "degree". Creating education variables from the Canadian census that are as consistent as possible with the U.S. is done as follows. For 1971, we use grade 11 and under for "less than high school" and grade 12 plus grade 13 as "high school" (includes those with and without a high school diploma); university 1 to 2 years plus university 3 to 4 years, no degree as "some post-secondary"; university 3 to 4 years with degree, and university 5+ years (with and without degree categories) as "degree". For 1981 and 1991, we use two education variables -'highest level of school' and 'highest level of elementary and secondary' - in order to create a "high school" variable that includes both high school graduates and grade 12/13 non-graduates. "Some-post secondary" includes all non-university groups (trades certificates, etc.) as well as some university without a degree and university with certificate/diploma while "degree" includes any university graduate. The only difference in the 'highest level of schooling' variable between the 1981 and 1991 Canadian censuses is that university graduates are separated into BAs, masters and doctorates in the 1991 census.

Basic demographics: Age, gender, marital status and school enrollment are virtually all consistent across years within country and across country. Common-law couples are considered as married in both countries for the 1970 to 1990 census years. For our children in household variable, we use the 'number of children in household' variable for the U.S. A 'number of children in household' variable does exist in the Canadian census, but was only asked of women (and only married or once married women prior to the 1991 census). Thus, for the 1981 and 1991 Canadian censuses we use household type, which indicates the presence of never married children in the household, and should yield a variable that is consistent with the U.S. variable. For 1971, we are forced to use a combination of marital status, size of census family, and – for women only – the children in household variable. For men, we define children as equaling one if family size is greater than two and the individual is married.

Part-time work: In the Canadian census, a question is asked, from 1981 through 1991, about whether the weeks worked in the previous year were full-time weeks or part-time weeks. In 1971 'usual hours worked' is available, which asks the individual their usual hours worked from the previous year and should be fairly comparable to the full-time/part-time weeks worked variables in 1981 and 1991. One issue, however, is that the part-time weeks worked question in 1981 did not specifically attach a number of hours to part-time status whereas the 1991 census attached a less than 30 hours per week value. For the U.S. census, 'usual hours worked' – based on the previous year – was first asked in the 1980 census, while 'hours worked last week' (i.e., hours worked in the census reference week) is consistently available. We use usual hours worked for the 1980 and 1990 U.S. census, but are forced to use hours worked in reference week (and thus does not refer to the previous year) for the 1970 U.S. census. Regardless of which hours variable is used, part-time work is defined as less than 30 hours per week in all cases.

Industry: For micro-data, the U.S. census is the richer source with respect to industry and thus we use Canada as the base. In addition, the published Canadian census data that we use for 1941 through 1961 in the aggregate analysis are the overall richest source. Thus, we are forced to use the 1971, 1981, and 1991 Canadian census industry variables as the base. Some improvements were made to the industry variables in 1981 and 1991, but for consistency across time we must use the 1971 industry definition which was made available in all three Canadian micro-data censuses, except that forestry, fishing, and mining were collapsed into a single category. In both countries, industry refers to the individual's main job (based on hours worked) and is only asked of those working since January 1 of the year previous to the census year (e.g., January 1 1980 in the case of the 1981 Canadian census data). In both countries, for individuals not working during the census reference week, industry refers to the job of longest duration. The 1971 industry variable has 12 categories available: agriculture, forestry, fishing, mining, manufacturing, construction, transportation/storage/communication/utilities, wholesale/retail trade, finance/insurance/real estate, community/business/personal/recreational services, and public administration in addition to a 'not specified' (or not classifiable) category. Given the merging of forestry/fishing/mining (the latter being negligible in both New Brunswick and Maine) we are left with eight categories for both the aggregate data and micro-data analyses. For the aggregate analysis, we drop the 'not specified' (since there are insufficient observations to

generate cell means), but we include them in the micro-data analysis. For the U.S., we use the IPUMS 'Industry, 1950 basis' recode, which is a highly consistent across-year industry variable for the U.S (based on the 1950 Census Bureau industrial classification system). The only across-time inconsistency in this variable was following the 1970 census where coverage was changed from individuals 14+ who had worked in the previous ten years to individuals 16+ who had worked in the previous five years. A total of 148 categories are available. Given the rich nature of the U.S. data we are able to create comparable industries across countries after re-coding 'logging' from manufacturing (in the U.S.) into primary (for Canada).

Wages and salary income: Wages are highly consistent across time-within country and across country although, in any given year, each country has used different ceilings on their income variables for the public-use files (including after converting into a common currency). In both countries, wages refers to gross wages and salaries, before deductions (for items such as income tax, pensions, union dues, unemployment insurance), for the previous calendar year (i.e., the year that the weeks worked variables refers to). Payments-in-kind or reimbursements for business expenses are excluded in both countries. Commissions, tips, bonuses, piece-rate payments are included in both countries (as well as military pay although military bonuses, not regular pay, were excluded for the U.S. for 1950 – 1970 censuses).

## Appendix 4: Percent of workers working part year, Cell-level census data 1940-91

| | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 |
|---|---|---|---|---|---|---|
| | **Men** | | | | | |
| **Manufacturing** | | | | | | |
| New Brunswick | .29 | .26 | .31 | .37 | .32 | .34 |
| Maine | .30 | .21 | .16 | .19 | .16 | .14 |
| **Agriculture** | | | | | | |
| New Brunswick | .46 | .47 | .65 | .67 | .63 | .55 |
| Maine | .37 | .43 | .56 | .50 | .54 | .49 |
| **Construction** | | | | | | |
| New Brunswick | .58 | .45 | .56 | .55 | .55 | .62 |
| Maine | .67 | .41 | .37 | .26 | .36 | .30 |
| **Finance, etc.** | | | | | | |
| New Brunswick | .06 | .03 | .07 | .18 | .23 | .17 |
| Maine | .11 | .06 | .14 | .16 | .13 | .16 |
| **Government** | | | | | | |
| New Brunswick | .14 | .10 | .10 | .17 | .22 | .24 |
| Maine | .33 | .23 | .17 | .16 | .15 | .11 |
| **Primary** | | | | | | |
| New Brunswick | .62 | .59 | .75 | .61 | .69 | .70 |
| Maine | .48 | .49 | .41 | .31 | .37 | .25 |
| **Services** | | | | | | |
| New Brunswick | .09 | .04 | .22 | .34 | .33 | .33 |
| Maine | .42 | .27 | .38 | .35 | .30 | .26 |
| **Trade** | | | | | | |
| New Brunswick | .17 | .13 | .21 | .29 | .28 | .27 |
| Maine | .22 | .12 | .28 | .26 | .29 | .26 |
| **Transportation, etc.** | | | | | | |
| New Brunswick | .29 | .20 | .28 | .24 | .18 | .24 |
| Maine | .23 | .15 | .18 | .14 | .18 | .19 |
| | **Women** | | | | | |
| **Manufacturing** | | | | | | |
| New Brunswick | .26 | .36 | .51 | .54 | .60 | .59 |
| Maine | .48 | .36 | .40 | .41 | .35 | .23 |
| **Finance, etc.** | | | | | | |
| New Brunswick | .08 | .08 | .15 | .26 | .26 | .19 |
| Maine | .09 | .22 | .20 | .33 | .24 | .15 |
| **Government** | | | | | | |
| New Brunswick | .12 | .06 | .22 | .43 | .44 | .38 |
| Maine | .17 | .30 | .51 | .38 | .31 | .23 |
| **Services** | | | | | | |
| New Brunswick | .20 | .09 | .32 | .45 | .49 | .40 |
| Maine | .46 | .40 | .59 | .53 | .44 | .33 |
| **Trade** | | | | | | |
| New Brunswick | .18 | .15 | .27 | .44 | .45 | .39 |
| Maine | .30 | .39 | .57 | .57 | .47 | .39 |
| **Transportation, etc.** | | | | | | |
| New Brunswick | .11 | .09 | .18 | .29 | .33 | .28 |
| Maine | .13 | .31 | .35 | .33 | .24 | .24 |

**NOTES: Part-year work is defined as working less than 40 weeks. The sources are the 1940/50/60/70/80/90 U.S. censuses for Maine and the 1941/51/61/71/81/91 Canadian censuses for New Brunswick. See text for further discussion of the computation of part-year work, and discussion of the data.**

## Appendix 5: Percent of workers by annual weeks worked, 1940-91

a) Men

| | 1 to 13 | 14 to 26 | 27 to 39 | 40 to 52 |
|---|---|---|---|---|
| New Brunswick: | | | | |
| *1940** | *0.13* | *0.15* | *0.13* | *0.59* |
| *1950** | *0.09* | *0.11* | *0.12* | *0.68* |
| 1960 | 0.08 | 0.14 | 0.12 | 0.67 |
| 1970 | 0.10 | 0.12 | 0.12 | 0.65 |
| 1980 | 0.12 | 0.14 | 0.09 | 0.65 |
| 1990 | 0.10 | 0.18 | 0.08 | 0.63 |
| | | | | |
| Maine: | | | | |
| *1940** | *0.07* | *0.14* | *0.15* | *0.64* |
| 1950 | 0.05 | 0.09 | 0.11 | 0.75 |
| 1960 | 0.10 | 0.07 | 0.08 | 0.75 |
| 1970 | 0.10 | 0.07 | 0.07 | 0.76 |
| 1980 | 0.08 | 0.08 | 0.07 | 0.77 |
| 1990 | 0.07 | 0.08 | 0.07 | 0.78 |

b) Women

| | 1 to 13 | 14 to 26 | 27 to 39 | 40 to 52 |
|---|---|---|---|---|
| New Brunswick: | | | | |
| *1940** | *0.16* | *0.10* | *0.08* | *0.66* |
| *1950** | *0.14* | *0.08* | *0.07* | *0.71* |
| 1960 | 0.11 | 0.10 | 0.10 | 0.69 |
| 1970 | 0.17 | 0.17 | 0.11 | 0.54 |
| 1980 | 0.20 | 0.19 | 0.11 | 0.50 |
| 1990 | 0.13 | 0.20 | 0.10 | 0.57 |
| | | | | |
| Maine: | | | | |
| *1940** | *0.07* | *0.14* | *0.15* | *0.64* |
| 1950 | 0.05 | 0.09 | 0.11 | 0.75 |
| 1960 | 0.10 | 0.07 | 0.08 | 0.74 |
| 1970 | 0.20 | 0.14 | 0.13 | 0.53 |
| 1980 | 0.15 | 0.13 | 0.13 | 0.59 |
| 1990 | 0.11 | 0.11 | 0.10 | 0.68 |

NOTES: *The weeks worked categories for New Brunswick, for 1940 and 1950, are 1-19 weeks (categorized as 1-13), 20-29 weeks (categorized as 14-26 weeks), 30-39 weeks (categorized as 27-39 weeks), and 40-52 weeks. The numbers in Appendix 5 – for 1940 and 1950 New Brunswick and 1940 Maine – are not adjusted for the 1941/1951 Canadian census part-time worker adjustment, which was applied to weeks worked (see Data Appendix for further details). The sources are the 1940/50/60/70/80/90 U.S. censuses for Maine and the 1941/51/61/71/81/91 Canadian censuses for New Brunswick.