An Analysis of the Impact of SSP on Wages

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Executive Summary

The Self-Sufficiency Project (SSP) was a Canadian research and demonstration project that attempted to "make work pay" for long-term income assistance (IA) recipients by supplementing their earnings. The long-term goal of SSP was to get lone parents permanently off income assistance and into the paid labour force. In this study, we empirically examine one theoretical explanation for the existence of a long-term impact of SSP on employment – wage progression. In order to qualify for the supplement, program group members had to find full-time work within one calendar year of random assignment. Those who qualified (called the "take-up" group) received the supplement while they were working full-time during the three years following their qualification. Because of this additional incentive to work, take-up group members acquired more full-time work experience than comparable control group members. The greater full-time work experience should imply, on average, that the wages of individual take-up group members were higher than comparable control group members at the end of the follow-up period. This is what we refer to as relative wage progression. With higher wages, take-up group members should be more likely to work than comparable control group members even after the supplement period has ended. That is, relative wage progression is one avenue through which SSP might have had long-term impacts on the ability of recipients to work full-time.

We refer to the relative wage progression of the program group as a whole as the treatment effect. The relative wage progression for the take-up group, the sub-set of the program group members who found full-time work in the first year, is a measure of the effect of the treatment on the treated (TOT). We calculate TOT for two sub-groups of the take-up group; those who would have found full-time work within one year even without the incentive of receiving the SSP supplement (the non-incentivized program group) and those who would not have found full-time work in the first year if they had not had such an incentive (the incentivized program group). We are able to calculate the relative wage progression for these two groups for the 36-month supplement period and for the 12 months that follow. The latter information will provide some evidence about whether SSP continued to affect labor market behaviour after the supplement period had ended.

Using an econometric model of wage determination, we find evidence of relative wage progression of approximately 10 percentage points for the incentivized program groups in both provinces. This includes relative wage progression of 9 percentage points during the 36-month supplement period. Further, there (indirect) evidence of a sustained impact of SSP on the incentivized groups in the twelve months after the supplement period has ended in both provinces; this amounts to an additional relative wage progression of approximately 1 percentage point. For the non-incentivized groups, there is evidence of relative wage progression of 3 percentage points during the supplement period in New Brunswick but no evidence of any impact in British Columbia. In New Brunswick, there is also direct evidence of a sustained impact of SSP on the non-incentivized group during the 12 months that follow and, again, no such evidence in British Columbia.

It is encouraging to see that SSP had its biggest impact where it mattered most. That is, it was able to induce a number of individuals to take up full-time work when they would not otherwise

have done so and then to motivate them to continue working. What is surprising is that these incentivized program group workers gained as much full-time experience as their non-incentivized counterparts. That is, their labour market behaviour mimicked that of the non-incentivized program group. We construct a sub-set of the control group that is comparable to the incentivized program group which we call the incentivized control group. This group gained very little full-time experience and showed little wage progression over the follow-up period. This is why the incentivized program group members exhibited significant relative wage progression compared to the incentivized control group.

We provide two approaches to evaluating the treatment effect and the TOTs. First, we carry out a simple comparison of the median wages of program and control group members. We calculate wage progression as the difference in median wages at the beginning and end of the 52 month follow-up period. The median wages are the same at the point of random assignment and, even though the median wages of the program group were below those of the control group for most of the follow-up period, they regain equality at the end of the follow-up period. Hence there is no evidence of relative wage progression over this period. When we restrict the comparison period to begin in month 14, when all take-up group members are eligible to receive the supplement, median wages of the control group begin at higher levels than those of the program group. As the median wages of the program group catch up to those of the control group by month 52, there is evidence of relative wage progression from month 14 to month 52.

While this simple analysis has its appeal, the major drawback is that the resulting estimates of relative wage progression are sensitive to who is working in the beginning and final month of the comparison of median wages. For example, we cannot get an accurate measure of the wage progression of the incentivized program group since so few are working in the first 14 months of the follow-up period. We address this deficiency by developing a formal model of individual wages that includes experience as one of its determinants. Wage progression in that model occurs because of the increase in experience over the duration of the follow-up period. The effect of SSP operates through its differential impact on the extent of full-time work experience in the program and control groups. This structural approach is able to control for the endogeneity of experience and the non-random selection into work. It is not subject to the problem of the first procedure because we can use the results of the wage model to predict the wages for each individual in every month of the 52-month follow-up period. Further, we can calculate wages (and hence wage progression) at any month and for various sub-groups of the full-sample. This allows us to calculate wage progression over the 36-month supplement period and for the 12 months that follow.

An important part of our analysis is estimating the relative wage progression of the non-incentivized and incentivized program groups. Yet, these sub-groups are not directly observed. One of the contributions of this paper is the procedure we develop to identify these sub-groups.[1] Specifically, we use a matching procedure to link members of the take-up group with comparable members of the control group. This matching procedure not only enables us to divide the take-up group into the incentivized and non-incentivized program groups but it also defines comparable sub-sets of the control group. This means that we measure the relative wage

[1] Riddell and Riddell (2004) implement a different but related procedure for identifying the members of the non-incentivized and incentivized groups.

progression of the incentivized and non-incentivized program groups against equally sized matched sub-sets of the control group.

As mentioned above, we estimate the relative wage progression for specific sub-groups of the program group. Included are those with and without a high school degree, those with and without young children present and for the four quartiles of the IA benefits and wage distributions. The incentivized and non-incentivized program sub-groups with high school degrees exhibited more relative wage progression than those without high school degrees. This difference is greatest in New Brunswick. Further, the non-incentivized program sub-group with young children present experienced greater relative wage progression than the non-incentivized program sub-group with children. The reverse is true for the incentivized program sub-group; those program sub-group members with no young children did better than those with young children. For the sub-groups defined by the IA benefits quartiles, the largest relative wage progression occurs for the incentivized program sub-group in the lowest quartile of the benefits distribution. This sub-group has the greatest number of months of experience since baseline since there is less of an incentive to stay on IA given the lower benefits level. For the sub-groups defined by the quartiles of the distribution of wages received at the first full-time job since baseline, we find that the non-incentivized program group members in the 4^{th} quartile of the wage distribution did comparatively worse than those members in the other three quartiles. Thus, SSP had a greater impact on those who needed the most help in attaining self-sufficiency; those not at the upper end of the wage distribution.

A related analysis of the relative wage progression of the SSP program group was previously carried out by Card, Michalopoulos, and Robins (2001). They used the 36-month survey and looked at wage growth between months 12-14 and 33-35. They found little difference in the wage growth of the program and control groups over this period. Further, they found no difference in the wage growth of the incentivized program group compared to the non-incentivized program group. Our study differs from theirs in a number of important ways: 1) we use the 54-month survey rather than the 36-month survey; this allows us to estimate relative wage growth over the entire 36-month supplement period and up to 12 months after that; 2) we develop and estimate a model of wages that allows us to evaluate relative wage growth at any point in time and for various program sub-groups by calculating the difference in mean wages arising from the different levels of experience accumulated by the program and control groups; 3) while Card et al. (2001) indirectly infer the wage growth of the incentivized program group, we use a matching procedure to identify not only this group but also the non-incentivized program group; 4) we carry out separate analyses for British Columbia and New Brunswick and we find differences across the two provinces in the wage progression for the non-incentivized groups; 5) unlike Card et al, we find evidence of relative wage progression for the incentivized group, progression on the order of 10 percentage points The key to this result is choosing the relevant comparison group – those members of the control group who did not find full-time work in the first year and who best matched up with the members of the incentivized program group.

Our work directly addresses a major policy question under consideration at HRSDC: "How can low-income Canadians escape poverty?" The Self-Sufficiency Project provides evidence to answer this question. By analyzing the SSP data, we can determine if generous earning supplements can lead to relative wage progression through increased labour force participation

and then to self-sufficiency after the supplement period ended. Our results indicate that the biggest impact of SSP was on the wages of the incentivized program group. We also find evidence that this impact was sustained after the supplement period ended.

Since it is those who would not have worked full-time without the SSP supplement who benefited the most from receiving it, the most effective program is one that provides the greatest incentive for this group to leave IA. An idealized experiment might include eligibility periods of different lengths to see how this affects take-up of the supplement. To fully examine the usefulness of even having an eligibility period, one such option could include no eligibility period and hence all program group members would be given the supplement for full-time work during a fixed time period. Also, given our evidence that SSP actually continued to have an impact during the 12-month post-supplement period, our idealized experiment would continue to collect information for more than a year after the supplement ended. This data would allow one to ascertain if the benefits program truly had a long-term (more than one year post-supplement) impact on IA recipients. Further, it would be interesting to allow the length of the supplement period to vary to see how this affects the long-term impact of the SSP-style experiment.

1. Introduction

The Self-Sufficiency Project (SSP) was a Canadian research and demonstration project that attempted to "make work pay" for long-term income assistance (IA) recipients by supplementing their earnings. Lone parents on IA qualified for a generous earnings supplement if they took up full-time work and left the welfare rolls within twelve months of entering the project. Once qualified, they received a supplement that roughly doubled their pre-tax earnings during periods of full-time work in the next three years. Participation was entirely voluntary; individuals could choose not to participate without penalty. Those who qualified for the supplement could return to income assistance when they were not working; if they subsequently found full-time work within their three year eligibility period, they could again receive the earnings supplement. Participants received only minor services beyond the financial incentive provided by the earnings supplement.

The project took place in two Canadian provinces, British Columbia and New Brunswick, between November 1992 and December 1999 and was funded by Human Resources Development Canada (HRDC), the large federal government department responsible for Canadian labour market programs and policy.[2] Operating outside the provincially-run social assistance systems, SSP was managed by the Social Research and Demonstration Corporation (SRDC).

The goal of SSP was to allow lone parents on social assistance — 95 percent of whom are lone mothers — to take up paid work, if they so desired, and to increase their total income by doing so. As is well-known, the benefits paid to social assistance recipients are reduced, often dollar-for-dollar, as labour market earnings rise. Thus, work may not "pay" because increased earnings are offset by lower social assistance payments.

To evaluate whether participation in SSP resulted in increased earnings and employment, it was designed as a social experiment with potential participants randomly divided into a program group and a control group. The rigorous evaluation methods associated with social experimentation were an integral part of the project from its inception. A series of surveys — a baseline survey at the point of random assignment and follow-up surveys 18, 36 and 54 months after random assignment — was undertaken by Statistics Canada.

In this study, we empirically examine one theoretical explanation for the existence of any possible long-term impact of SSP on employment – wage progression. Program group members who qualified for the supplement (called the "take-up" group) received the supplement while they were working full-time during the three years after they established their eligibility. The supplement created an additional incentive to work and take-up group members acquired more full-time work experience than comparable control group members. The greater full-time work experience should imply, on average, that the wages of take-up group members grew more quickly than comparable control group members over the course of the follow-up period, a phenomenon we refer to as relative wage progression. With relatively higher wages, take-up

[2] HRDC has since been reorganized and the federal department responsible for the Self-Sufficiency Project is now Human Resources Social Development Canada (HRSDC).

group members should be more likely to work even after the supplement period has ended. Relative wage progression is therefore one avenue through which SSP can have a long-term impact on full-time work.

In Section 2, we survey the literature on wage progression in SSP and elsewhere. One especially relevant paper is by Card et al. (2001) who analyzed wage progression using data from the 36-month SSP follow-up survey. We summarize their work and we point out how our analysis differs, even though our work is in the same spirit as theirs. In Section 3, we describe the SSP program and discuss the data we will use for our analysis. We also present a simple comparison of median wages for the program and control groups at the beginning and end of the survey period. This allows us to arrive at one estimate of the relative wage progression of the program group.

In Section 4, we conduct a similar analysis of median wages for the take-up group, those program group members who qualified for the supplement. We decompose the take-up group into what we call the "incentivized' and "non-incentivized" groups.[3] The latter sub-group is made up of take-up group members who would have worked full time in the first year even without the SSP Supplement. For this group, the additional payments for full-time work were a windfall gain. The incentivized group, on the other hand, would not have worked full-time in the first year without the additional motivation provided by the prospect of receiving the SSP supplement in the following three years.

While the incentivized and non-incentivized program groups are subsets of the take-up group, they cannot be directly observed. Thus, we develop a means of identifying them using a technique known as propensity score matching. Specifically, we use the nearest neighbor algorthm to link members of the take-up group with comparable members of the control group.

The problem with these simple comparisons of median wages is that they do not properly control for all observable and unobservable differences in the sub-sets of program and control group members who worked at different months during the survey period. Thus, the median wages at the beginning and end periods are sensitive to who is working (and who is not working) at these times. In Section 5, we address this deficiency by developing a model of wages that includes labour market experience as one of its determinants. Wage progression in our model occurs through the increase in experience over the duration of the follow-up period. The effect of SSP in the model arises from the impact of different amounts of full-time work experience in the program and control groups. We estimate the wage model using fixed effects to control for time-invariant unobserved individual factors that affect wages. Because it is endogenous, we instrument for full-time work experience using the program/control group dummy variable. We also control for non-random selection into full-time work.

Next we use the estimates from the wage model to calculate the treatment on the treated, that is, the impact of SSP on the wage progression for the non-incentivized and incentivized program

[3] In various versions of their paper, Card et al. call these two groups the "incentivized" and "non-incentivized" groups and also the "induced" and "windfall" groups. Riddell and Riddell (2004), another paper on SSP wage progression, use the latter terminology.

groups. We do so over the 36-month supplement period and over the 12 months following the supplement period, allowing us to differentiate between the relative wage progression that occurred during and after the supplement period. The latter information will provide some evidence about whether SSP continued to affect labor market behaviour after the supplement period ended. Finally, we estimate the relative wage progression for specific sub-groups of the program group; those with and without a high school degree, those with and without young children present and for the four quartiles of the IA benefits and wage distributions.

We summarize and discuss our analysis in Section 6 and offer policy recommendations based on our findings.

2. Literature Review

Card, Michalopoulos, and Robins (2001, henceforth CMR) was the first analysis of the relative wage progression of the SSP program group that went beyond the confines of experimental comparisons. They focused on those individuals in the take-up group who would not have worked if not for the SSP supplement, a group they refer to as the "induced" sub-group (and who we refer to as the "incentivized" sub-group). CMR used the 36-month SSP follow-up survey and looked at mean wage growth between months 12-14 and 33-35. They found little difference in the wage growth of the program and control groups over this period. Further, they found no difference in the wage growth of the induced sub-group compared to the "non-induced" sub-group (those who would have worked full-time even without the SSP supplement). CMR estimate that the annual growth rate for all these groups was 2.5 to 3 percent.

One assumption that CMR rely on to obtain their results is that SSP had no impact on the wage growth of the non-induced sub-group. They test this assumption by comparing the wage growth of program and control group members who were working at baseline, either full- or part-time, and showed that there were no discernable differences between the wage growth of the two groups. Since members of the program group who were working at baseline constituted approximately 70% of the non-induced sub-group, CMR concluded that it was likely that SSP had no effect on the full non-induced sub-group. CMR also address the potential selection bias that arises from the non-random selection into work and concluded that the selection bias in observed wage growth was small and not significant.

Our work on wage progression differs from the analysis in CMR in the following ways:

- We look solely at full-time work, whereas CMR include part-time work in their analysis.

- We use the 54-month survey rather than the 36-month survey. This allows use to estimate relative wage growth over the entire 36-month supplement period and twelve months of the post-supplement period. The latter analysis provides evidence about the impact of SSP after supplement eligibility has ended.

- We estimate a model of wages that includes full-time post-baseline experience. The model assumes that the formal means by which wage progression occurs is by the accumulation of

full-time work experience. We can then evaluate relative wage growth at any point in time and for various program sub-groups by calculating the difference in mean wages that arises from the different amounts of experience accumulated by the program and control group members.

- While CMR indirectly infer the wage growth of the incentivized group, we use nearest neighbor matching to identify not only this group but also the non-incentivized group. We can then calculate separate estimates of relative wage growth for the incentivized and non-incentivized sub-groups.

- We carry out separate analyses for British Columbia and New Brunswick and we find differences across the two provinces in the wage progression for the non-incentivized groups.

- Unlike CMR, we find evidence of relative wage progression for the incentivized group, progression on the order of 10 percentage points. The key to this result is choosing the relevant comparison group – those members of the control group who did not find full-time work in the first year and who best matched up with the members of the incentivized program group.

Riddell and Riddell (2004) also studied wage progression in SSP. Using the 54-month follow-up survey, their first step was to update the CMR analysis. Their updated results are similar to those of CMR in that they show little relative wage progression for the program group.

Their next step was to decompose the program group into what they called "windfall" and "induced" subgroups, which correspond to our "non-incentivized" and the "incentivized" groups.[4] Looking at simple differences between mean wage growth for various subgroups, they decided that "in summary, those leaving welfare in the program and control groups experienced similar rates of wage growth over the period of the SSP demonstration" and that "induced participants and windfall beneficiaries experienced similar rates of wage increase" (p. 22).

Finally, Riddell and Riddell estimated a wage growth model in which the dependent variable was the difference, for each SSP participant who worked full-time in months 12 to 14, between the full-time wage reported during months 12-14 and the last reported full-time wage. Although they acknowledged the possibility that some of the right-hand side variables in their wage growth model were endogenous, Riddell and Riddell estimated only an ordinary least squares model,

[4] The authors' method of accomplishing this decomposition is somewhat different than our method. They also divide the take-up group into those who would have worked full-time in the absence of the supplement offer (our non-incentivized group) and those who would not have worked full-time in its absence (our incentivized group). Their first step, was to estimate a model whose dependent variable took the value 1 for control group members who were working full-time in two of the three months 12-14 and 0 otherwise (n=2,174). Using the coefficients from that model, they then estimated the probability of working full-time in two of months 12-14 for all program group members who actually were working full-time in those months (n=679). They defined their "non-incentivized" group as those with the highest probabilities of working full-time in two of the three months 12-14. This group had the same size as the control group that worked full-time in months 12-14. The remaining program group members who were working full-time in two of months 12-14 — those with the lowest probabilities of doing so — were defined as the induced or incentivized group.

arguing that the likelihood of substantial bias was small, that the samples sizes were too small to permit more complicated analysis, and that no obvious instruments for the endogenous variables were available.

Connolly and Gottschalk (2004) analyzed the impact of the SSP subsidy on job choice and between-job and within-job wage growth. The framework for their analysis was a job search model. Based on a comparison of the costs and benefits of search, possible wages were divided into ranges for which individuals will search full-time, search on-the-job, and not search at all. Connolly and Gottschalk then show how the SSP supplement would cause some people who were searching full-time to take a job and switch to on-the-job search and others who were working to stop looking for a new job. Overall, Connolly and Gottschalk showed that the SSP supplement would decrease job duration but they had no prediction about how the supplement would affect wage growth between jobs.

Connolly and Gottschalk used the 36-month survey for their empirical analysis. Data were restricted to months 19 to 36 since starting and ending wages for jobs were not recorded until after month 18. The results confirm the prediction of shorter job duration. To analyze between-job and within-job wage growth, Connolly and Gottschalk restricted the sample to those employed at baseline. They did this to minimize the differences in the composition of the sub-samples of program and control group members who were used to calculate wage growth. For this sub-sample, they found both higher within-job and between-job wage growth for the SSP program group as compared to the control group. This appears to conflict with CMR who found no difference in the wage growth of program and control group members who were working at baseline.

Grogger (2005) estimated the returns to experience as a means for evaluating the impact on wages in Florida's Family Transition Program (FTP), a pilot welfare reform program. Like SSP, FTP randomly assigned participants to treatment and control groups and provided the treatment group with financial incentives for working. Grogger developed a new approach to controlling for the bias that arises because of non-random selection into work. His approach involved the use of the reservation wage as reported by participants in FTP. Grogger also found that his model did a reasonable job of controlling for the endogeneity of experience. When he instrumented for experience using the FTP treatment-control indicator, he did not reject the exogeneity of experience. Grogger applied his model of wages to a cross-section of data collected four years after random assignment. He estimated that the sample of welfare recipients received a 5.6% annual return to experience. Given that the treatment group gained, on average, one more quarter of experience over this four-year period, this implies that they showed a 1.4% relative wage progression (compared to the control group).

Gladden and Taber (2000) provided an empirical analysis of the wage progression of moderate to low-skilled workers. These are defined as individuals with 12 or fewer years of schooling and with less than ten years of potential experience. Gladden and Taber were interested in finding out if wage growth differed across different groups. They found that wage growth did not differ by level of schooling and family background and they found little evidence that the returns to experience differed over the different sub-groups. Gladden and Taber used potential experience (age – education – 6) as an instrument for actual experience. They estimated that both low-

skilled and medium-skilled workers experienced rates of wage growth of 4-6% per year for full-time work in the first ten years of their workforce lifetimes.

3. The SSP Program and the SSP Data

The key features of SSP and its earnings supplement are given in Table 1. In total, 6,028 lone parents completed the baseline survey and were randomly assigned between November, 1992 and March, 1995. Of the 6,028 participants, 2,880 were assigned to the program group, 2,849 were assigned to the control group and 299 were assigned to a special program called SSP Plus. In this paper, we use the results of the follow-up survey administered by Statistics Canada roughly 54 months after each participant was randomly assigned either to the program group or to the control group. The number of 54-month survey respondents, excluding those who were assigned to SSP Plus, was 4,852; 2,460 respondents were in the program group and 2,392 were in the control group.

Participants who had missing values on one or more of the survey questions used in the multivariate models that we estimate were also excluded. The resulting sample size for our analysis is 4,769 (2,415 in the program group and 2,354 in the control group).

An interesting and somewhat unexpected feature of the SSP sample is that a significant proportion of participants — about 10 per cent — were already working full time in the month before they were randomly assigned. For those in this 10 per cent who were randomly assigned to the program group, the SSP supplement was a windfall gain since they were already working full time and could qualify for the supplement without changing their employment status (although they would have to leave income assistance).

The data are organized into "relative months" or months since random assignment. The "first" month for each SSP participant is the month in which they were randomly assigned, which could have been in any calendar month from November 1992 to March 1995. After random assignment, SSP participants were followed until the end of a follow-up period marked by the date of the 54-month survey interview. For a number of participants, however, the survey occurred before 54 calendar months had elapsed so that complete data on unemployment and employment durations are available for only 51 months after random assignment. Thus, in this paper, the follow-up period is 51 months in length. We use the employment status in month t-1 to determine the value of the employment status variable assigned in month t. Since employment status in the 51st month determines employment status in the 52nd month, there are 52 months over which employment and wages can be calculated.

Each survey asked about every job that the respondent held between the survey date and the last time the respondent had been surveyed. For example, the 18-month survey collected detailed information on every job held since the date of the baseline survey. Respondents were asked if they were still working in jobs that they held at the time of the baseline interview and were asked about every new job held since the baseline.[5] In this analysis, we focus on full-time jobs.

[5] We note that "seam effects" may exist in the SSP data. Seam effects arise because respondents tend to "move" starting and ending dates of events to the dates on which they were interviewed. SRDC has noted this seam problem

This is because SSP provided supplements for individuals who were working full-time in the 3-year supplement period. In addition, program group members had to have found a full-time job in the first year in order to be eligible to receive the supplement. Further, the means by which we capture wage progression in our wage model is through increasing experience. It is unlikely that the return to part-time experience will be equal to that for full-time experience and might well be only marginally greater than zero. For these reasons, we have excluded part-time work from our analysis.

To calculate wages, we use the monthly wage variables provided in the SSP analysis file. The variables are calculated from information collected in each of the periodic follow-up surveys. We note that, to be eligible for the earnings supplement, program group members were required to work in full-time jobs that paid at least the minimum wage. That minimum wage was different in New Brunswick and British Columbia, starting in 1992 at $5.50 per hour in British Columbia and $5.00 per hour in New Brunswick. At the end of the experiment, the minimum wage was $7.15 per hour in British Columbia and $5.50 per hour in New Brunswick. We have excluded observations for both control and program group members where a full-time wage rate below the provincial minimum wage was recorded. This resulted in the exclusion of 4,424 of a possible 50,331 monthly wage rate observations (8.8%). Because wages are measured in different time periods, we have put the wages in constant 2003 dollars using the Canadian Consumer Price Index.

We provide the definitions of a number of observable characteristics of SSP participants used in our analyses in Table 2. We give the means and standard deviations of these variables for all program and control group members in columns (1) and (5) of Table 3.

In each relative month after random assignment, a (non-random) subset of the program and control groups were working full-time. We can calculate the median wage for each sub-set in each month. We use the median rather than the mean wage because the former is more robust to outliers.[6] Note that unlike CMR and Riddell and Riddell, we analyze changes in median wages and not the means of individual-level changes in wages.

An important issue for the simple analyses of changes in median wages that are carried out in Sections 3 and 4 is that the median wages that we compare across months will involve different sets of individuals. Any change in median wages, therefore, might be due either to changes in the wages of individual workers or to changes in the composition of the group of workers for whom the median is calculated. That situation has the potential to create a "composition" bias if the groups of full-time workers in the different months are very dissimilar and hence have very different wages. One method that we employ to mitigate the potential for such a composition bias is to use three-month moving averages (the median wage listed for month t is the median of

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in the SSP data and, in work done in 2002, taken steps to mitigate the problem. We have used the adjusted data in this paper.

[6] We carried out the analysis using the mean and found that our estimates of both absolute and relative wage progression were higher than when the median is used. Note that while the results based on the mean are more comparable to the regression results in Section 5, the results based on the median are actually closer to the regression results than are those based on the mean.

the months t-1, t, and t+1). We will effectively eliminate this bias when we move to a formal model of wages in Section 5.[7]

Figure 1 shows the monthly median wages for program and control group members for months 2 through 51; data for New Brunswick and British Columbia are shown separately. It is clear from Figure 1 that program group members had lower median wages than the control group. This is the expected result since take-up group members are likely to work at jobs with lower wages given that they also receive the supplement. We also see in Figure 1 that median wages were higher in British Columbia than they were in New Brunswick.

As Table 1 makes clear, program group members can qualify for the earnings supplement if they found a full-time job within one calendar year of the point of random assignment.[8] From Figure 1, we see that the median wages of the program group actually fell during that first year as program group members found full-time jobs to qualify for the supplement. After this, there is a slow catch-up of the wages of the program group relative to the control group. Thus, between the beginning and the end of the 51-month follow-up period, Figure 1 provides no evidence of relative full-time wage progression for the program group in either British Columbia or New Brunswick.

We now take a closer look at the period starting in month 14 after random assignment since this is when the eligibility period has ended and all take-up group members now receive the SSP supplement for full-time work.[9] This is the time period when we first expect to see evidence of relative wage progression as the supplement induces eligible women to work more. The additional work experience will lead to relatively higher wages as long as there is a positive return to experience. Further, using month 14 as the baseline for comparison will help to mitigate the composition bias that is generated by comparing median wages across two time periods. Because of the structure of SSP, we expect the program group members who worked in month 51 to be more similar to those who worked in month 14 than to those who worked in month 2. This should imply that the difference in median wages between months 14 and 51 is a better measure of wage progression as it is less influenced by the composition bias relative to the same comparison of median wages in months 2 and 51. This is suggested by the fact that, in British Columbia, only 83 program group members worked in month 2 whereas 305 worked in month 14 and 271 worked in month 51. Further, a comparison of mean values of 13

[7] Note that the comparison of the wage rates for a given individual in different months (as done in CMR) also has problems since it is confined to the subset of individuals who worked in both of the different months and can generate sample selection bias.

[8] We actually define the incentive period to be the first 13 months. Each program group member had exactly twelve months to qualify for the earnings supplement by finding a full time job. The employment variable measured in the surveys, however, was based on calendar months. A participant whose twelve-month period started on January 21st, for example, would have until January 21st of the following year to qualify. However, "month 1" for that person, would be the January in which random assignment occurred. If he or she found a full-time job in the first three weeks of the *second* January, full time employment would have been coded as starting in "month 13".

[9] At month 14, all program group members who could qualify for the supplement would have qualified for it. However, only a subset of eligible program group members were typically working in any given month since take-up group members were free to leave full-time work without forfeiting their supplement eligibility.

demographic characteristics of working participants for months 14 and 51 showed that the differences in these means were smaller in all but one case than the differences in means between months 2 and 51. We conclude that program group workers are much more similar for months 14 and 51 than they are for months 2 and 51.

In British Columbia, in month 14, 305 program group members worked full-time for a median wage of $7.37.[10] In that same month, 141 control group members worked for a median wage of $8.65. In month 51, 271 program group members worked for a median wage of $9.69 while 240 control group members worked for an a median wage of $9.91. Overall, the median real wage increased by $2.32 and $1.26 for the program and control groups, respectively. The absolute relative wage progression for the program group is the difference in these values or $1.06. Between months 14 and 51, the percentage gains in median wages for the program and control groups were 31.5% and 14.6%, respectively (10.2% and 4.7% annually). The relative wage progression for the program group is the difference in these values; 16.9 percentage points. The figures in this paragraph are also presented in Table 4.

In New Brunswick in month 14, 340 program group members worked for a median wage of $5.58. During the same month, 140 control group members worked for a median wage of $6.21. In month 51, 313 program group members worked for a median wage of $6.60 while 260 control group members worked for an a median wage of $6.88. Overall, the median real wage increased by $1.02 and $0.67 for the program and control groups, respectively. The absolute relative wage progression for the program group is thus $0.35. Between months 14 and 51 the percentage gain in median wages for the program and control groups was 18.3% and 10.8%, respectively (5.8% and 3.5% annually). The relative wage progression for the program group is thus 7.5 percentage points.

Thus we find that in both British Columbia and New Brunswick, there is evidence of relative wage progression made by the program group. However, we cannot attribute this relative increase in median wages to SSP without first controlling for observable and unobservable differences in the two groups at months 14 and 51. We do this in Section 5, where we develop a formal model of wage determination.

Finally, we can compare the full distribution of wages for the program and control groups. Using methodology suggested in Barrett and Donald (2003) we tested for the stochastic dominance of the wages of one group versus the other. The result is that for both British Columbia and New Brunswick the distribution of wages for the control group stochastically dominates (to all orders) the distribution for the program group starting at around month 4 and continuing until about month 48. This is not surprising since it is likely that some program members were induced to find work at lower-paying jobs than they would have been willing to take without the supplement.

[10] The median wage in "Month 14" is actually the median of months 13, 14 and 15. The number of workers is the average of those working in these three months.

4. A Simple Estimate of the Effect of the Treatment on the Treated: Identifying the "Incentivized" and "Non-Incentivized" Groups

In Section 3, we looked at the change, over time, in the median wages of all program and control group members who worked full-time. This allowed us to get a measure of the treatment effect of SSP and, like previous analyses, we found that the effect on median wages was essentially zero over the full 52-month follow-up period. When we confined the analysis to the months between the beginning of the SSP supplement period and the end of the 52-month follow-up period, we did find some evidence of relative wage progression by the program group. Another interesting measure of the effectiveness of SSP is its impact on those who were treated — the TOT or the impact of SSP on those who took up the program and received the SSP supplement. Of the 2,415 program group members, 849 (35%) found a full-time job in the first 13 months with a reported wage that was at least the minimum wage and hence constitute the take-up group.[11] Note that this includes 159 individuals who were working full-time at baseline and who automatically qualified for the SSP supplement. Estimating the TOT is complicated by the fact that the take-up group represents a non-random sub-sample of the program group. Thus any unbiased estimate of TOT must control for this non-random selection into the take-up group.

As a comparison to the take-up group, we might consider the sub-set of the control group who found full-time work in the first 13 months with a reported wage that was at least the minimum wage. We denote this group the **non-incentivized control group** since they found work in the first 13 months without the SSP incentive. Of the 2,354 control group members, 465 (20%) are in this group. The take-up group is larger than the non-incentivized control group, however, because SSP induced some members of the program group to find a full-time job when they would not otherwise have done so. On average, the take-up group members received significantly higher IA benefits at baseline and spent more months on IA in the three years prior to baseline than did the members of the non-incentivized control group. Thus a direct comparison of the wages of the take-up and the non-incentivized control group groups will not provide an accurate estimate of TOT because these groups differ in observable and unobservable ways.

We therefore seek to construct a subset of the take-up group that is comparable to the non-incentivized control group. Note that even in the absence of any program such as SSP, some members of the program group would leave IA and work full-time. We denote this group the **non-incentivized program group**. One immediate effect of the offer of the SSP earnings supplement, however, might be to induce some individuals who would not otherwise have worked full-time to take-up full-time work within the 12-month SSP eligibility window. We denote this group the **incentivized program group**.[12] The comparison of the non-incentivized program group and the non-incentivized control group will give an estimate of TOT for the non-incentivized program group. We will also compare the incentivized program group to a similar

[11] There are several ways to define a "take-up group." Administrative data from the demonstration identify those who actually received supplement payments. Comparisons of program and control groups cannot use this information, however, because no similar information is available for the control group. We therefore define the "take-up group" as any program group members who reported working full-time in the first 13 months after random assignment.

[12] As noted above, Card et al. (2001) refer to these individuals as the "induced" program group.

sub-set of control group members (to be discussed later in this section) to get a separate estimate of TOT for that sub-group. Note that the fact that we have two estimates of TOT for the two different sub-groups means that we are allowing for heterogeneity in the response to SSP across these sub-groups.

While the incentivized and non-incentivized program groups are subsets of the take-up group, they cannot be directly identified. Thus, we must develop a means of indirectly identifying them. One way of doing this is to use propensity score matching. Specifically, we use nearest neighbor (NN) matching to link members of the take-up group with the members of the non-incentivized control group. The first step is to estimate an equation, using the entire control group, in which the dependent variable indicates whether or not the individual found a full-time job in the first thirteen months after random assignment. Full-time work is assumed to be determined by a latent variable, WFT13*

$$\mathrm{WFT13}_i^* = \mathrm{X}_{ic}\pi_c + \varepsilon_{ic} \tag{1}$$

where X_{ic} is a vector of demographic and IA variables measured at baseline (including the constant term) and ε_{ic} is a standard normal random variable. If WFT13* is positive, we assume the individual chose to work full-time within 13 months of random assignment ; if it is less than zero, the person decided not to work full-time in that period. We actually observe:

$$\mathrm{WFT13}_\mathrm{i} = \begin{cases} 0; \text{ not employed full - time in the first 13 months if } \mathrm{WFT13}_\mathrm{i}^* \le 0 \\ 1; \text{ employed full - time in the first 13 months if } \mathrm{WFT13}_\mathrm{i}^* > 0 \end{cases} \tag{2}$$

We estimate equations (1) and (2) separately for British Columbia and New Brunswick using probit. Using the resulting coefficient estimates for British Columbia, we calculate predicted probabilities of working full-time within the first 13 months after random assignment, $\mathrm{P}\left(\mathrm{X}_{\mathrm{ic}}\hat{\pi}_c^{BC}\right)$ for the 209 members of the non-incentivized control group (where $\hat{\pi}_c^{BC}$ is the vector of coefficient estimates from equation (1) obtained from the British Columbia sub-sample). We do the same thing for the 256 members of the non-incentivized control group from New Brunswick to generate $\mathrm{P}\left(\mathrm{X}_{\mathrm{ic}}\hat{\pi}_c^{NB}\right)$. We then use $\hat{\pi}_c^{BC}$ ($\hat{\pi}_c^{NB}$), and the relevant values of the independent variables, to obtain (out-of-sample) predicted probabilities for all 415 (434) members of the take-up group from British Columbia (New Brunswick).

The propensity score method uses these probabilities to pair each member of the non-incentivized control group with a member of the take-up group. Both groups are sorted, in descending order, by their predicted probabilities. Then, starting with the first (and highest) value for the control group, we find the closest probability among the take-up group members. We do the same for each of the remaining members of the control group that worked full-time in the first 13 months, following this procedure separately for the 209 BC pairs and the 256 NB pairs. The resulting matched set of 465 take-up group members constitutes the non-incentivized program group; the remaining 384 members of the take-up group constitute the incentivized program group.

Caliendo and Kopeinig (2005) recommend a number of different methods for assessing the quality of the NN match. The simplest is a visual comparison of the density distributions of the propensity scores (i.e., the predicted probabilities) for the 465 non-incentivized program group members and the corresponding 465 control group members. Looking at Figures A1-A4 in the Appendix, we see that the densities look quite similar for both 209 British Columbia pairs and the 256 New Brunswick pairs. A second method is a comparison of the maxima and minima of the two supports. These values along with the mean and standard deviation of the propensity scores are given for the non-incentivized program and control groups by province in Table 5. Generally, the program and control sub-groups match up well according to these statistics. In British Columbia, the mean is slightly larger for control group but the difference is not significant at the 10% level. Finally, one can test for the difference in population means for the observable variables included in the propensity score regression (the means are given in columns 3 and 6 of Table 3). None of these means are significantly different, at the 5% level, when comparing the non-incentivized control group to the proposed non-incentivized program group, suggesting that the propensity score matching "worked" by this criterion.

Turning to the incentivized program group members, we see that they tended to have significantly fewer high school degrees, more months on IA prior to baseline, more emotional problems, and a higher benefit amount than either the non-incentivized program or control group members (see Table 3). Thus, the matching produced the expected results, at least in terms of observables, for the non-incentivized and incentivized groups.

We need a separate subset of the control group to match with the incentivized program group that we have just identified. Since, by definition, the incentivized program group would not have found a full-time job in the first thirteen months in the absence of the SSP supplement, we need to match them with members of the control group who did not find full-time work in the same time period. We again employ NN matching to generate the subset of the control group that matches the incentivized program group. We denote this group the **incentivized control group**.

We then carry out the same three tests for the quality of match that we applied to the non-incnetivized groups. Once again, visual inspection of the distribution of the probabilities suggests a good match (see Figures A5-A8 in the Appendix). The summary statistics for the propensity scores are given in Table 5. These statistics are very similar for the incentivized program and control groups in both provinces. Finally, when we test for the difference in population means for the observable variables included in the propensity score regression (given in columns 4 and 7 of Table 3), the only variable where the means are significantly different (at the 5% level) is the proportion of individuals aged 30 to 34 in New Brunswick. None of the means for the other age categories are significantly different at the 5% level. We therefore conclude that the matching was successful.

Having identified the non-incentivized program and control groups, we can compare their median wages to get an estimate of TOT for this group. The median wages for these two groups by province are given in Figure 2 for months 14 to 51. In British Columbia, there is a consistent gap over the 38-month period. In New Brunswick, the gap initially widens and then narrows to almost zero by month 51.

In New Brunswick, in month 14 the median wages for the 193 non-incentivized program group workers and the 136 non-incentivized control group workers were $5.66 and $6.21, respectively. In month 51 the median wages for the 137 non-incentivized program group workers and the 116 non-incentivized control group workers were $7.04 and $7.16, respectively. Overall, the median real wage increased by $1.38 and $0.95 for the non-incentivized program and control groups, respectively. The absolute relative wage progression for the non-incentivized program group is the difference in these values or $0.43. Between months 14 and 51 the percent gain in median real wages for the non-incentivized program and control groups was 24.4% and 15.3%, respectively (7.9% and 5.0% annually). The relative wage progression for the non-incentivized program group is the difference in these values; 9.1 percentage points (this information is also presented in Table 4). It is important to note that while the non-incentivized program and control groups are the same size, the sub-sets of each group that work in a given month can differ. Typically, as in the case in both months 14 and 51 above, there are more non-incentivized program group members working than there are non-incentivized control group members working in a given month. This is expected since for a given wage offer, the effective wage is higher for a member of the program group than for a member of the control group because the former also receives the SSP supplement. It is thus not surprising that the median wage for the non-incentivized program group is lower than the median wage for the non-incentivized control group.

In British Columbia, in month 14, the median wages for the 154 non-incentivized program group workers and the 140 non-incentivized control group workers were $7.51 and $8.63, respectively. In month 51 the median wages for the 81 non-incentivized program group workers and the 91 non-incentivized control group workers were $9.69 and $10.59, respectively. Overall, the median real wage had increased by $2.18 and $1.96 for the non-incentivized program and control groups, respectively. The absolute relative wage progression for the non-incentivized program group is thus $0.22. Between months 14 and 51 the percent gain in median real wages for the non-incentivized program and control groups was 29.0% and 22.7%, respectively (9.4% and 7.4% annually). The relative wage progression for the non-incentivized program group is thus 6.3 percentage points.

A simple comparison of the median wages of the incentivized program and control sub-groups is not very meaningful since the latter group did not work during the first 13 months. For that reason, there are only a small number of incentivized control group members who worked in the first few months after that. We therefore postpone this comparison of the relative wage progression of the incentivized groups until the next section where we develop and estimate a model of wage behavior that enables us to predict the wages of workers and non-workers and hence allows a comparison of the full sets of incentivized program and control group members.

In the context of this simple comparison of means, we can do the best job of controlling for observable (including wages) *and unobservable characteristics* by focusing the analysis on those who were working full-time at baseline since they were randomly assigned to the program and control groups and thus do not systematically differ in their observable and unobservable characteristics. Note that, by definition, those working at baseline are sub-groups of the non-incentivized program and control groups. There are 150 control group members and 122 program group members who were working full-time at baseline with a wage greater than or

equal to the minimum wage. A comparison of their observed characteristics shows that none of the mean values are significantly different at the 5% level. The baseline median wages for these program and control group members were 6.53 and 6.51, respectively so the median wages were essentially the same for both groups to start. This is also true when the same calculations are made in each province.

Figure 3 presents the median wages, over the life of the demonstration, for the program and control group members in British Columbia and New Brunswick who were employed at baseline. What is interesting is that these program group members actually had lower median wages than the comparable control group members over the 36 months when the former group members were receiving SSP supplements. After the supplement period, the program group then caught up to the control group and their median wage actually ended at a higher level than that for the control group in British Columbia. One explanation for this is that program group members were willing to work for lower wages given that they also received the supplement. In fact, in both provinces, there were a higher percentage of these program group members working during the supplement period than control group members. Overall, there does not appear to be much evidence of relative wage progression for the program group members who were working full-time at baseline. This result is similar to Card et al (2001) who found no difference in the wage growth between program and control group members who were employed either full-time or part-time at baseline. On the other hand, Connolly and Gottschalk (2004) find both higher within-job and between-job wage growth for the program group as compared to the control group for individuals who were employed at baseline.

5. Measuring the Impact of SSP on Wages

In this section we provide a framework for calculating a consistent estimate of the impact of being in the SSP program group on wage progression. Our strategy is to begin by estimating an equation whose dependent variable is the individual-level observed wages of SSP participants who worked full-time during the 52-month follow-up period. One of the right-hand side variables in this equation is the number of months of full-time work experience accumulated to date during the 52-month follow-up period. Estimating this wage model will provide a measure of the return to experience. To estimate the treatment effect we first calculate individual wage progression as the return to accumulated full-time experience in month 52. The mean returns for the program and control groups are measures of absolute wage progression for each group. The difference in these mean returns will then give a measure of relative wage progression for the program group. This is what we refer to as the treatment effect of SSP. We can apply the same procedure to the non-incentivized and incentivized program groups to estimate the TOTs for these two groups. We will also apply this procedure to sub-groups such as those women who do and do not have a high school degree and those women who do and do not have young children present to see if there are some sub-groups that showed comparatively greater relative wage progression.

The advantage of this approach over the simple comparison of median wages that was used in the previous two sections is that the results are not a function of who is working in a given month (i.e. there is no composition bias). Once we have estimated the wage equation, we can predict a

person's wage in each month regardless of whether or not they actually worked in that month. Thus our measures of relative wage progression are based on the full sample of program and control group members. This is highlighted by the analysis of the incentivized group. As we mentioned in the previous section, there are so few members of the incentivized control group who were working at the beginning of the follow-up period that it is not possible to get a reliable estimate of the median monthly wages for this group using the simpler method.

There are at least two complications in implementing this strategy. One is the standard problem that arises in estimating wage equations — individuals select themselves into work non-randomly so we must control for observable and unobservable differences of workers. The other is that the labour market experience variable on the right hand side of the wage equation is likely to be endogenous and estimates of the return to experience will be biased unless we account for this endogeneity.

We deal with the self-selection issue by estimating a wage equation that not only includes the observable characteristics of workers but also accounts for the difference in unobservable variables using a framework based on the standard sample selection model. The standard labour supply framework specifies both a reservation wage equation (in logs)

$$\ln\text{WAGE}^{*}_{\text{it}} = \beta_0 + \text{V}_{it}\beta_1 + \text{f}\left(\text{EXP}_{it};\beta_2\right) + \beta_{3t}\text{PROGRAM}_i + \theta^{*}_{1i} + \varepsilon^{*}_{1it} \qquad (3)$$

and a market wage equation (in logs)

$$\ln\text{WAGE}_{\text{it}} = \alpha_0 + \text{Z}_{it}\alpha_1 + \text{f}\left(\text{EXP}_{it};\alpha_2\right) + \theta_{2i} + \varepsilon_{2it} \qquad (4)$$

where V_{it} and Z_{it} are vectors of observable covariates, $\text{f}(\cdot)$ is a general function of experience (EXP_{it}), θ^{*}_{1i} and $\theta_{2\text{i}}$ represent unobserved heterogeneity and ε^{*}_{1it} and $\varepsilon_{2\text{it}}$ are unobserved error terms.

The reservation wage is the minimum wage offer that an individual would accept to work. The specification of equation (3) reflects one of the ideas underlying the design of SSP, that the offer of an earnings supplement would lower the reservation wages of those in the program group. The variable PROGRAM is 1 if the individual is a program group member and 0 if a control group member. Note that the coefficient on $\text{PROGRAM}_{\text{i}}$ is time-varying since the incentives of the SSP program change over time.

In the market wage equation (4), we do not include PROGRAM as a regressor. That is, in this specification, we have allowed program participation to affect the reservation wage, but not the market wage faced by the individual. While program members knew that they are eligible for the SSP supplement, their employers knew about supplement eligibility only if their employees told them. In general, therefore, we expect that actual wages should not be affected by SSP.

Our specification reflects the assumption that the SSP program directly affects the decision about whether or not to work full-time (see equation 5 below) but that its effect on wages works only through the greater experience that program group members acquire. Since experience plays an

important role in our model, we consider two specifications. First, Gladden and Taber (2000) point out that during the first ten years of participation in the labor force, log-wages are approximately a linear function of experience. This scenario is true for many of the individuals in our sample. Second, most models of market wages assume that the return to experience is nonlinear so we also consider a model that includes the square of experience. In the linear specification, EXP_{it} in equations (3) and (4) represents the months of full-time work experience, measured from baseline, in month t. In the quadratic specification, it is important to also account for pre-baseline experience since the monthly return depends on the total amount of full-time experience at that point in time. The available data include whether or not each individual was working full-time in the twelve months prior to baseline so we can add this to experience since baseline.[13]

Note that we assume that the return to experience is the same for all individuals. Thus relative wage progression can only occur via a differential in work experience. One might allow the return to experience to vary by type of job, level of education, or other observable factors but the evidence in Gladden and Taber (2000) indicates that there is little such variation across sub-groups of low- and medium-skilled workers that make up the bulk of this sample. One might also be inclined to allow the return to experience to vary for the incentivized and non-incentivized groups but this is not an exogenous variation since membership in these two groups is not random.

An individual will work full-time if

$$\ln WAGE_{it} \geq \ln WAGE^{*}_{it}$$

Letting WFT^{*}_{it} be a continuous latent indicator of an individual's propensity to enter the full-time labour force and WFT_{it} be an observed 0-1 indicator of whether or not the individual works full-time in period t, we have that

$$WFT^{*}_{it} = \gamma_0 + X_{it}\gamma_1 + \gamma_{2t}PROGRAM_i + \theta_{1i} + \varepsilon_{1it} \qquad (5)$$

where: individual i is observed to work full-time in period t ($WFT_{it} = 1$) if $WFT^{*}_{it} \geq 0$
individual i is observed to not work full-time in period t ($WFT_{it} = 0$) if $WFT^{*}_{it} < 0$

and where $X_{it} = (V_{it}, Z_{it})$, $\theta_{1i} = \theta_{2i} - \theta^{*}_{1i}$ and $\varepsilon_{1it} = \varepsilon_{2it} - \varepsilon^{*}_{1it}$. Observed wages are given by

[13] The data also include a variable that measures years of experience since baseline. At least three problems exist with this variable that can lead to measurement error bias. First, the unit of observation is months, not years, so there is likely to be a measurement error problem if we include it in the wage model. Second, this variable does not distinguish between full-time and part-time experience. Third, individuals are asked how many years they had worked at a paid job or business since age 16. There will undoubtedly be some recall bias in the responses. Note that, since we use the fixed effects estimator to estimate the wage model, if we were to add this as a separate explanatory variable it would be subsumed into the fixed effect since it is time-invariant. Hence, we use the first option were we add the number of months of full-time experience in the twelve months prior to baseline to post-baseline experience.

$$\ln\text{WAGE}_{it} = \begin{cases} \alpha_0 + Z_{it}\alpha_1 + f(\text{EXP}_{it};\alpha_2) + \theta_{2i} + \varepsilon_{2it} \text{ if } \text{WFT}_{it} = 1 \\ \text{unobserved otherwise} \end{cases} \quad (6)$$

The two complications mentioned above can now be explained in the context of the model summarized in equations (3-6). First, experience is likely to be endogenous in both equations (5) and (6). Experience reflects previous labor market choices and thus is likely to be correlated with the individual-specific effects θ_{1i} and θ_{2i} that represent unobserved time-invariant factors that affect those previous choices. We propose to deal with the issues of endogeneity using instrumental variables type procedures.[14] Given the experimental nature of the data, we will use the variable PROGRAM_i to instrument for EXP_{it}. Note that we do not include experience in equation (5) because of its endogeneity. For this analysis, we will only need a consistent estimate of the probability that $\text{WFT}_{it} = 1$ so we can estimate a reduced form version of the WFT equation and thus avoid endogeneity bias.

Second, since the wage equation (6) can only include observations for individuals who have self-selected themselves into full-time work, estimation by OLS is not consistent. This is the standard self-selection issue that any model of wages must address. We assume that $\theta_{1i} + \varepsilon_{1it}$ and $\theta_{2i} + \varepsilon_{2it}$ are bivariate normal. Then

$$E[\theta_{2i} + \varepsilon_{2it} \mid \theta_{1i} + \varepsilon_{1it} > -Y_{it}\gamma] = \alpha_3 \frac{\phi(Y_{it}\gamma)}{\Phi(Y_{it}\gamma)} = \alpha_3 \lambda(Y_{it}\gamma) \quad (7)$$

where $$Y_{it}\gamma = \gamma_0 + X_{it}\gamma_1 + \gamma_{2t}\text{PROGRAM}_i$$

and $\lambda(Y_{it}\gamma)$ is known as the inverse Mills ratio. It follows that

$$\begin{aligned} E[\ln\text{WAGE}_{it} \mid \text{LFP}_{it} = 1] &= E[\ln\text{WAGE}_{it} \mid \theta_{1i} + \varepsilon_{1it} > -Y_{it}\gamma] \\ &= \alpha_0 + Z_{it}\alpha_1 + f(\text{EXP}_{it};\alpha_2) + E[\theta_{2i} + \varepsilon_{2it} \mid \theta_{1i} + \varepsilon_{1it} > -Y_{it}\gamma] \\ &= \alpha_0 + Z_{it}\alpha_1 + f(\text{EXP}_{it};\alpha_2) + \alpha_3 \lambda(Y_{it}\gamma) \end{aligned} \quad (8)$$

Hence, a consistent estimator of the wage equation can be obtained by estimating the model with only the observed wage data and including the inverse Mills ratio on the right hand side of the equation.

Note that $\lambda(Y_{it}\gamma)$ must be estimated since it is not directly observed. It is therefore necessary to first estimate the WFT equation (5) and then use the results to calculate $\lambda(Y_{it}\hat{\gamma})$ as an estimate of the inverse Mills ratio. We include a set of exogenous explanatory variables, measured in the

[14] See Grogger (2005) and Gladden and Taber (2000) for examples of papers that instrument for endogenous experience.

baseline survey, in the WFT equation.[15] We estimate the WFT equation separately for British Columbia and New Brunswick using random effects probit (results available from the authors upon request). One variable that is left out of the wage equation that is included in the WFT equation is the level of benefits received. This is because we assume that employers do not observe the benefits level of the individuals when hiring and offering wages to the individuals in the sample. The exclusion of the benefits variable identifies the augmented wage equation.

The second step is to estimate the wage equation including $\lambda\left(\mathrm{Y}_{it}\hat{\gamma}\right)$ as a regressor and instrumenting for EXP_{it} and EXP_{it}^2. Note that even though we include both EXP_{it} and EXP_{it}^2 in the quadratic specification of the wage equation, we only need one instrument; the variable $\mathrm{PROGRAM}_i$. The reason that this is the case is that $\mathrm{E}(\mathrm{EXP}_{it}^2|\mathrm{Z}_{it}, \mathrm{PROGRAM}_i)$ is not linear in Z_{it} and $\mathrm{PROGRAM}_i$ and hence other functions of Z_{it} and $\mathrm{PROGRAM}_i$ will appear in the first-step instrument equation for EXP_{it}^2 (and EXP_{it} as well). This means that we can include $\mathrm{PROGRAM}_i \cdot \mathrm{Z}_{it}$ and Z_{it}^2 as instruments (see Wooldridge (2002) for a discussion of this point). Hence the first-stage equation for EXP_{it} is

$$\begin{aligned}\mathrm{EXP}_{it} &= \delta_0 + \mathrm{Z}_{it}\delta_1 + \delta_{2t}\mathrm{PROGRAM}_i + \delta_3\mathrm{MONTH}_t + \delta_4\lambda\left(\mathrm{Y}_{it}\hat{\gamma}\right) \\ &\quad + \mathrm{Z}_{it}^2\delta_5 + \mathrm{Z}_{it}\cdot\mathrm{PROGRAM}_i\delta_{6t} + \cdots + \nu_{it}\end{aligned} \tag{9}$$

The same regressors are in the 1st-stage equation for EXP_{it}^2. We include month since baseline (MONTH_t) since we expect experience to increase with time since baseline. We also allow the coefficient for $\mathrm{PROGRAM}_i$ to vary over time since the experience differential between program and control group members should increase over time and because the incentive structure of SSP changes over time. The program variable is highly significant in the 1st-stage experience regressions, validating it as an instrument for experience (results available from the authors on request).

Note that the wage equation (8) includes the unobserved individual effect θ_{2i}. This will likely include unobserved, time-invariant, individual factors (such as ability) that affect wages and that are correlated with the regressors. If such correlated effects exist, the fixed effects estimator is required to obtain consistent parameter estimates. We test for correlated effects in the wage equation using the Hausman test and reject the null hypothesis of uncorrelated effects. Thus, we estimate the wage equation (8) using fixed effects. We estimate separate wage equations for the two provinces. The results are given in Table 6. For the linear specification, the monthly return to experience is roughly half a percentage point per month (0.515% and 0.439% in British Columbia and New Brunswick, respectively). For the quadratic specification, EXP_{it}^2 is positive

[15] We include dummy variables that indicate if the individual was single and not previously married (NVRMAR), did not have at least a high school degree (BLTHS), had limited activity due to a long term emotional, psychological, nervous or mental health condition or problem (EMOPROB), had a child at baseline who was less than or equal to 4 years old (YGCHLE4), if age was between 23 and 25, 26 and 29, 30 and 34, 35 and 39, or 40 and older (BAGE2325, …), the number of children (NKIDS), the number of months on IA in the 3 years prior to the baseline interview (MONTHIA), the average monthly IA amount received in 4 quarters prior to baseline interview (BENEFIT) and the monthly unemployment rate (UNRATE). See Table 1 for complete definitions.

and highly significant in both regressions. The positive sign indicates that the wage function exhibits increasing returns to experience. This result is somewhat counter-intuitive since most evidence indicates that wages exhibit decreasing returns to experience over the life-cycle. Recall that our measure of experience only includes full-time experience gained since one year prior to baseline. Hence this under-estimates total full-time experience since first entering the labour market. The positive sign for the coefficient on EXP_{it}^2 means that the quadratic specification will under-estimate the returns to experience. Generally, the estimated returns to experience from the linear specification are greater than those from the quadratic specification. For these reasons, we follow Gladden and Taber (2000) and use the linear specification to estimate wage progression. The unemployment rate is positive and significant in three of the four regressions. This result is opposite to expectations. The sample selection bias correction term, λ, is only significant in the linear specification for British Columbia.

The impact of SSP on wage progression manifests itself through the difference in the months of experience accumulated by the program and control group members over the course of the follow-up period. In British Columbia, by month 52, program group members had accumulated an average of 11.6 months of experience while control group members had gained an average of 8.2 months of experience. To calculate relative wage progression, we first determine each individual's percentage increase in wages based on her accumulated full-time experience at month 52, using the coefficient estimates from Table 6. The mean percentage wage increase for the program and control group members is the (absolute) wage progression for each group. The difference in these wage progressions, measured in percentage points, is our estimate of relative wage progression. The estimated absolute wage progression for the British Columbia program group was 6.4 percent; for the British Columbia control group, the estimated absolute wage progression was 4.5 percent (Table 7). Thus the British Columbia program group experienced a relative wage progression of 1.9 percentage points.

In New Brunswick, by month 52, program group members had accumulated an average of 14.2 months of experience while control group members had gained 8.9 months. Using the same procedure as we used for British Columbia, we calculate that the program group exhibited a relative wage progression of 2.5 percentage points compared to the control group (the above estimates and their standard errors are included in Table 7). In both provinces, the estimates of the relative wage progression for the program groups are smaller than those obtained from the simple comparison of median wages for months 14 to 51 in Section 3. This implies that not controlling for observable and unobservable differences between the program and control group members who work — which is not done in the simple comparison of median wages — leads to an upward bias in the impact of SSP on wages.

Next we estimate TOTs for the non-incentivized and incentivized program groups. We do this both over the 36-month supplement period and over the 12 months following the supplement period. This will allow us to differentiate between the relative wage progression that occurred during the period of supplement eligibility and any additional wage progression that occurred after the supplement eligibility of the take-up group members had ended. The latter information will provide some evidence about whether SSP continued to affect labor market behaviour after the supplement period ended and thus whether one of the long-term goals of SSP was met.

To distinguish between the supplement eligibility period and the period after eligibility had ended, we must have starting and ending dates for supplement eligibility for all individuals. The eligibility of all take-up group members starts in the month in which they first found a full-time job after baseline. Following the same logic, we define the supplement period for the non-incentivized control group to be the 36-month period starting when they find their first full-time job. Defining the supplement period for the incentivized control group is more complicated since they did not find a full-time job in the first 13 months. For them, we define the 36-month supplement period to start in month 13 and run until month 48. Thus, to estimate wage progression during the supplement period, we will determine the experience gained for all incentivized control group members at month 48. If anything, this will overstate the experience gained since some members of this group would have found a full-time job prior to month 13 given that they were eligible to receive the SSP supplement.

With these decisions in place, we begin with the calculation of the TOT using the 256 non-incentivized program and control group members in New Brunswick. Their mean months of experience were 23.9 and 17.7, respectively, at the end of the supplement period. Using the coefficients from the wage model, we estimate that the non-incentivized program group experienced a mean return to experience of 11.2% over 3 years or an annual increase of 3.8%. This is slightly higher than the 2.5 to 3% annual increase found by Card et al. (2001). The analogous absolute wage progression for the non-incentivized control group was 8.2%. We therefore estimate that the relative wage progression for the non-incentivized program group was 3.0 percentage points over the 3 years. This value is significantly greater than zero. Table 7 shows these estimates and their standard errors.

To see if this relative wage progression continued after supplement eligibility ended, we look at the evidence at 6 and 12 months after the supplement period ended. To have data for six months after the end of the supplement period, it must have ended in month 46 or earlier. There are 208 non-incentivized program group members and 222 non-incentivized control group members in New Brunswick for whom this is the case. With these sub-groups, we can make the same calculations as in the last paragraph both at the end of the supplement period and six months later. The difference in those calculations will tell us if the impact of SSP persisted after the supplement period had ended. These results show that the non-incentivized program group members whose eligibility ended in month 46 or before gained, on average, 0.6 months of experience relative to the comparable non-incentivized control group members over the subsequent 6 months. The relative wage progression is estimated to have been 0.3 percentage points over these 6 months.

We make the same calculations for the twelve months after the supplement period ended. There are 128 non-incentivized program group members and 156 non-incentivized control group members in New Brunswick for whom this calculation can be made.[16] The results in Table 7 show a net increase of 1.6 months of experience and a relative wage progression of 0.9 percentage points for the non-incentivized program group as compared to the non-incentivized

[16] To make sure that these two sub-groups are comparable, we tested whether there were any differences in the mean values of the demographic characteristics. In every case, we did not reject the equality of means at the 5% significance level (this was true for British Columbia as well).

control group in the 12 months after the supplement ended. The latter value is significant at the 10% level.

For the 209 non-incentivized program and control group members in British Columbia, the mean months of experience were 21.9 and 20.9, respectively, at the end of the supplement period. This implies a 12.2% wage progression over 3 years or an annual increase of 4.1% for the non-incentivized program group and an 11.6% 3-year wage progression for the non-incentivized control group. As is evident from the relatively small 1 month differential in mean experience between the two groups, the relative wage progression for the non-incentivized program group is minimal; 0.6 percentage points for three years or 0.2 percentage points annually. Further, over the 12-month post-supplement period, the relative wage progression experienced by the non-incentivized program group was only 0.02 percentage points. Overall, there is not much evidence of relative wage progression for the non-incentivized program group in British Columbia either during the supplement period or in the twelve months after the supplement period had ended.

We now turn to the incentivized groups. For the 178 incentivized program and control group members in New Brunswick, the mean months of experience were 23.2 and 4.2, respectively, at the end of the supplement period. For the incentivized program group, there was a 10.8% wage progression over 3 years or an annual increase of 3.6% and a 1.9% 3-year wage progression for the incentivized control group. As evident from the relatively large 19.0 month differential in mean experience for the two groups, the relative wage progression for the incentivized program group is substantial; 8.9 percentage points over the 36-month supplement period.

It is not possible to determine the impact of SSP on the incentivized program group after the end of the supplement period. Because we defined the supplement period for the incentivized control group so that it ended in month 48 and hence their post-supplement period could last only for 4 months. We therefore have no control group comparison for 6 and 12 months after the end of the eligibility period. Looking only at the incentivized program group, we find that they increased their mean months of experience by 6.5 and their mean wages by 3.3% in the12 months after the supplement period ended. These are similar to the corresponding increases for the non-incentivized program group (6.7 months and 3.5%). Further, recall that the relative wage progression of the incentivized program group during the 36-month supplement period was significantly greater than that for the non-incentivized program group (8.9 versus 3.0 percentage points). Thus it seems likely that relative wage progression for the incentivized program group during the 12 months after the supplement period would be at least as large as that for the non-incentivized program group; 0.9 percentage points. Hence a conservative estimate of the relative wage progression during the 12-month post-supplement period for the incentivized program group would be 0.9 percentage points. This implies that the overall relative wage progression was 9.8 percentage points for the incentivized program group over the 48-month period that includes both the 36-month supplement period and the 12 months that follow.

For the 206 incentivized program and control group members in British Columbia, the mean months of experience were 20.9 and 4.0, respectively, at the end of the supplement period. There was an 11.5% wage progression over 3 years or an annual increase of 3.8% for the incentivized program group and a 2.2% 3-year wage progression for the incentivized control

group. As evident from the relatively large 16.9 month differential in mean experience between the two groups, the relative wage progression for the incentivized program group over the 36-month supplement period is a significant 9.3 percentage points. The incentivized program group increased its mean months of experience by 5.4 and its mean wages by 3.3 percentage points in the12 months after the supplement period ended. The increase in wages is the same as for the incentivized program group in New Brunswick to whom we attributed a relative wage progression of 0.9 percentage points. Thus we speculate that the relative wage progression during this period for the incentivized program group in British Columbia was approximately 0.9 percentage points. This implies an overall relative wage progression of 10.2 percentage points for this group.

To sum up the calculations from the last few paragraphs, we find evidence of relative wage progression of approximately 9 percentage points during the supplement period for the incentivized program groups in both provinces. Further, there is (indirect) evidence of a sustained impact of SSP on the incentivized program groups in the twelve months after the supplement period had ended in both provinces. For the non-incentivized program groups, there is evidence of relative wage progression of 3 percentage points during the supplement period in New Brunswick but no evidence of such an impact in British Columbia. In New Brunswick, there is also direct evidence of a sustained impact of SSP during the 12 months that follow and, again, no such evidence in British Columbia.

We also look at wage progression for a number of sub-groups; those with and without a high school degree, those with and without young children and for the four quartiles of the IA benefits and wage distributions. Table 8 gives the differences in average months of experience and relative wage progression at the end of the supplement period and the additional relative wage progression for 12 months after the supplement period had ended for the non-incentivized and incentivized program sub-groups compared to the non-incentivized and incentivized control sub-groups. The incentivized and non-incentivized program sub-groups with high school degrees exhibited greater relative wage progression than those without high school degrees. Further, the non-incentivized program sub-group with young children present experienced greater relative wage progression than the non-incentivized program sub-group with children. The reverse is true for the incentivized program sub-group; those program sub-group members with no young children did better than those with young children. For the sub-groups defined by the benefits quartiles, the largest relative wage progression occurred for the incentivized program sub-group in the lowest quartile of the benefits distribution. This sub-group tended to have the greatest number of months of experience since baseline since there was less of an incentive to stay on IA given the lower benefits level. To determine if there was any difference in relative wage progression across the wage distribution, we divided the distribution of the wages obtained in the month of first full-time employment into the four quartiles for both the non-incentivized program and control groups in both provinces. We then compared the wage progression of the members of the non-incentivized program group in the first quartile of their own wage distribution with the members of the non-incentivized control group in the first quartile of their own wage distribution. We made the same comparison for the other three quartiles. One result is that the non-incentivized program group members in the 4^{th} quartile of the wage distribution did comparatively worse than those members in the other three quartiles. Thus, SSP had a bigger

impact on those who needed the most help in attaining self-sufficiency; those not at the upper end of the wage distribution.

6. Conclusion

In this study, we empirically examined one theoretical explanation for the existence of a long-term impact of SSP on employment – relative wage progression. We calculated the relative wage progression for the program group as a whole, a quantity we call the treatment effect. We also calculated the relative wage progression for two sub-groups of the take-up group: those who would have found full-time work within one year since baseline even without the incentive of qualifying for the SSP supplement and those who would not have found full-time in the first year without such an incentive; these are the non-incentivized and incentivized program groups, respectively. We are able to calculate the relative wage progression for these two groups for the 36-month supplement period and for the 12 months that followed.

We found evidence of relative wage progression of approximately 10 percentage points for the incentivized program groups in both provinces. This includes relative wage progression of 9 percentage points during the 36-month supplement period. Further, there (indirect) evidence of a sustained impact of SSP on the incentivized groups in the twelve months after the supplement period has ended in both provinces; this amounts to an additional relative wage progression of approximately 1 percentage point. For the non-incentivized program groups, there is evidence of relative wage progression of 3 percentage points during the supplement period in New Brunswick but no evidence of such an impact in British Columbia. In New Brunswick, there is also direct evidence of a sustained impact of SSP during the 12 months that follow (approximately 1 percentage point) and, again, no such evidence in British Columbia.

It is encouraging to see that SSP had its biggest impact where it mattered most. That is, it was able to induce a number of individuals who otherwise would not have done so to take up full-time work and then to motivate them to continue working. What is surprising is that these incentivized program group workers gained as much full-time experience as their non-incentivized counterparts. Hence, their labour market behaviour mimicked that of the non-incentivized program group. Further, the comparable set of incentivized control group individuals gained very little full-time experience and hence showed little wage progression over the follow-up period. This is why the incentivized program group members exhibited significant relative wage progression compared to the incentivized control group.

We provided two approaches to evaluating the treatment effect and the treatment on the treated. First, we carried out a simple comparison of the median wages of program and control group members. We calculated wage progression as the difference in median wages at the beginning and end of the 52 month follow-up period. This analysis showed little difference in median wages of the program and control groups at the beginning and end of the follow-up period. Hence there was no evidence of relative wage progression over this period. When we restricted the comparison period to begin in month 14, the median wage of the control group begins at a higher level than that of the program group. Hence there is evidence of relative wage progression as the median wages of the program group caught up to those of the control group by

month 52. While this simple analysis has its appeal, the major drawback is that the estimates of relative wage progression are sensitive to who is working in the beginning and final month of the comparison of median wages.

We addressed this deficiency by developing a formal model of wages that includes experience as one of its determinants. Wage progression in that model occurs because of the increase in experience over the duration of the follow-up period. The effect of SSP operates through the differential impact on the extent of full-time work experience in the program and control groups. This structural approach is able to control for the endogeneity of experience and the non-random selection into work. It is not subject to the problem of the first procedure because we can use the results of the wage model to predict the wages for each individual in every month of the 52-month follow-up period. Using this approach, we found little evidence of relative wage progression over the follow-up period for the non-incentivized program groups (3 percentage points in New Brunswick and 0 percentage points in British Columbia) and 10 percentage points of relative wage progression for the incentivized program groups.

Our work directly addresses a major policy question under consideration at HRSDC: "How can low-income Canadians escape poverty?" The Self-Sufficiency Project provides evidence to answer this question. By analyzing the SSP data, we can determine if generous earning supplements can lead to relative wage progression through increased labour force participation and then to self-sufficiency after the supplement period ended. Our results indicate that the biggest impact of SSP was on the wages of the incentivized program group. We also find evidence that this impact was sustained after the supplement period ended.

Since it is those who would not have worked full-time without the SSP supplement who benefited the most from receiving it, the most effective program is one that provides the greatest incentive for this group to leave IA. An idealized experiment might include eligibility periods of different length to see how this affects take-up of the supplement. To fully examine the usefulness of even having an eligibility period, one such option could include no eligibility period and hence all program group members would be given the supplement for full-time work during a fixed time period. Also, given our evidence that SSP actually continued to have an impact during the 12-month post-supplement period, our idealized experiment would continue to collect information for more than a year after the supplement ended. This data would allow one to ascertain if the benefits program truly had a long-term (more than one year post-supplement) impact on IA recipients. Further, it would be interesting to allow the length of the supplement period to vary to see how this affects the long-term impact of the SSP-style experiment.

We believe that our analysis of relative wage progression in SSP has made substantial contributions not only to the specific study of SSP but to the analysis of relative wage progression in general. The SSP-specific contributions include

1. We calculate wage progression over the 36-month supplement period and for the 12 months that follow.

2. We estimate both the treatment effect for the full program group and the treatment on the treated for the non-incentivized and incentivized program sub-groups.

3. We carry out separate analyses for British Columbia and New Brunswick.

4. We estimate the relative wage progression for specific sub-groups of the program group. Included are those with and without a high school degree, those with and without young children present and for the four quartiles of the IA benefits and wage distributions. The latter allows us to look at relative wage progression at points of the wage distribution other than just the mean.

With regard to wage progression in general:

1. We developed a formal model of wages that includes experience as one of its determinants. Wage progression in our model occurs because of the increase in experience over the duration of the follow-up period. The treatment effect operates through the differential impact on the extent of full-time work experience in the treatment and control groups. This structural approach is able to control for the endogeneity of experience and the non-random selection into work. Further, we can easily calculate estimated wages (and hence wage progression) at any month and for various sub-groups of the full-sample using all members of these groups and hence avoid the composition bias the plagues other methods.

2. We implement a procedure to identify directly the incentivized and non-incentivized program group members. Specifically, we use the nearest neighbor algorithm of the propensity score matching procedure to link members of the take-up group with comparable members of the control group. This not only enables us to divide the take-up group into the incentivized and non-incentivized program groups but it also results in comparable sub-sets of the control group. This means that we measure relative wage progression of the incentivized and non-incentivized program groups against equally sized matched sub-sets of the control group.

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Figure 1

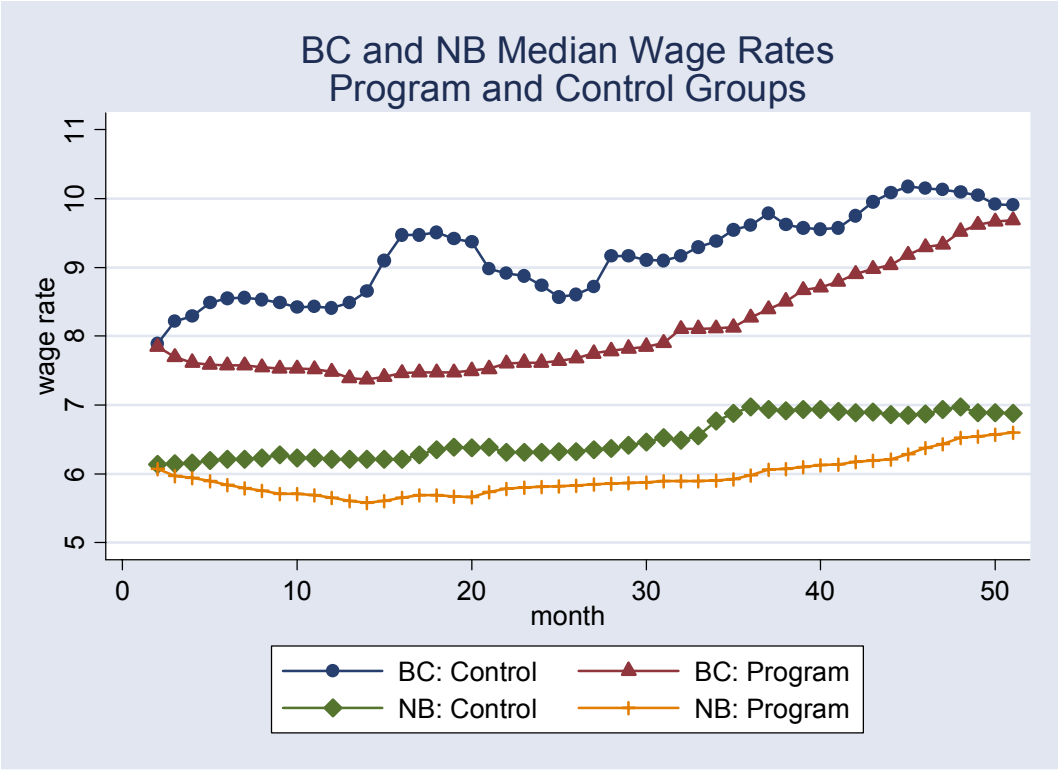

Figure 2

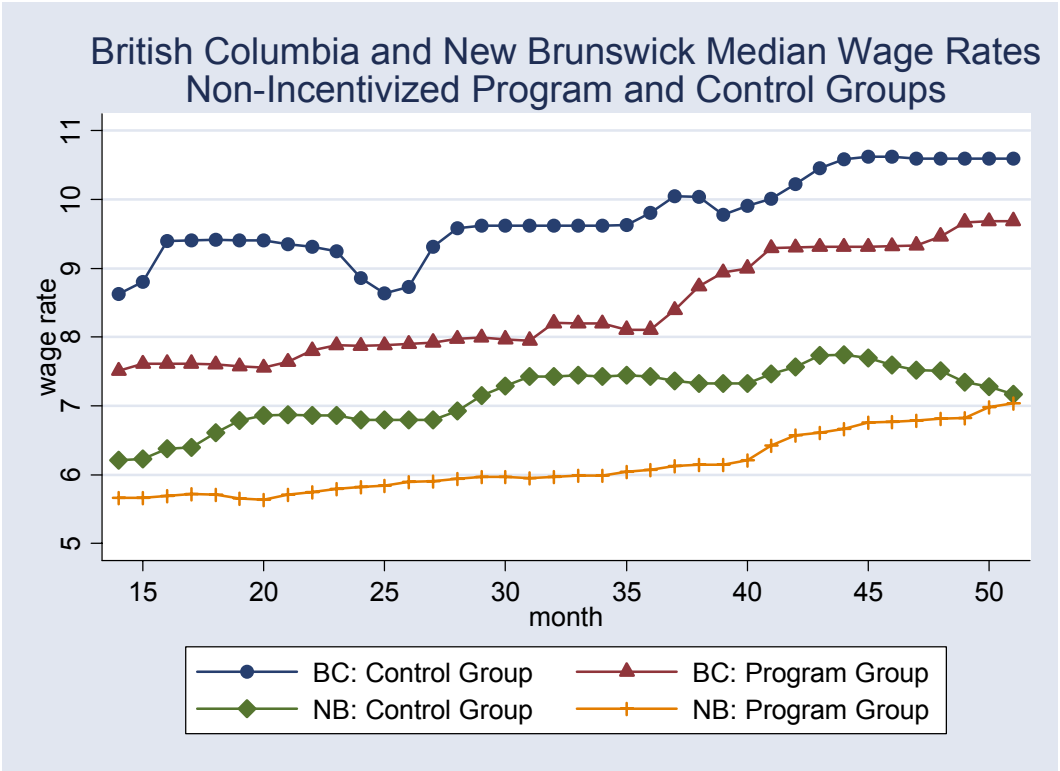

Figure 3

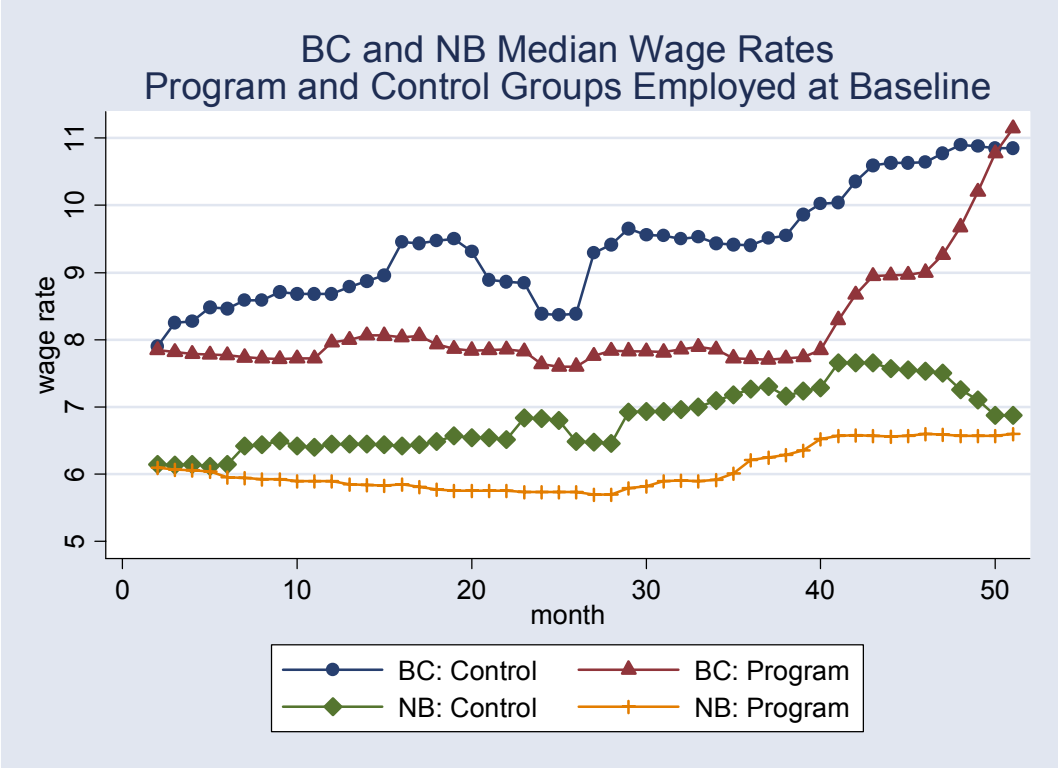
BC and NB Median Wage Rates
Program and Control Groups Employed at Baseline
wage rate
5
6
7
8
9
10
11
0
10
20
30
40
50
month
BC: Control
BC: Program
NB: Control
NB: Program

Table 1

Key Features of the SSP Earnings Supplement

- **Full-time work requirement.** Supplement payments were made only to eligible single parents who worked full time (an average of at least 30 hours per week over a four-week or monthly accounting period, whether in one or more jobs) and who were not receiving Income Assistance.
- **Substantial financial incentive.** The supplement was calculated as half the difference between a participant's earnings from employment and an "earnings benchmark" set by the program for each province. The benchmark was set at a level that would make full-time work pay better than Income Assistance for most recipients. During the first year of operations, the benchmark was $37,000 in British Columbia. The benchmark was adjusted over time to reflect changes in the cost of living and in the generosity of Income Assistance. The supplement was reduced by 50 cents for every dollar of increased earnings. Unearned income (such as child support), earnings of other family members, and number of children did not affect the amount of the supplement.
- **Targeted at long-term recipients.** Eligibility for the supplement was limited to long-term welfare recipients (with at least one year of IA receipt).
- **One year to take advantage of the offer.** Eligible IA recipients were informed that they could sign up for the supplement if they found full-time work within the 12 months following random assignment. If they did not sign up within 12 months, they could never receive the supplement.
- **Three-year time limit on supplement receipt.** A person could collect the supplement for up to three calendar years from the time she began receiving it, as long as she was working full time and not receiving Income Assistance.
- **Voluntary alternative to welfare.** Participants could not receive IA payments while receiving the supplement. No one was required to participate in the supplement program; however, after beginning supplement receipt, people could decide at any time to return to Income Assistance, as long as they gave up supplement receipt and met the eligibility requirements for Income Assistance. They could also renew their supplement receipt by going back to work full time at any point during the three-year period in which they were eligible to receive the supplement.
- **Eligible jobs.** Only jobs paying at least the provincial minimum wage were eligible for supplementation. Jobs working for family members were not eligible for supplementation. Jobs also had to be eligible for Employment Inusrance.

Table 2 – Descriptions of Explanatory Variables

PROGRAM	1 if program group member; 0 if control group member
TAKE-UP	1 if program group member who found work in qualifying period (13 months following baseline interview; 0 otherwise
NKIDS	Number of children in respondent's household at baseline
YGCHLE4	1 if a child in the household is less than or equal to 4 years; 0 otherwise
BLTHS	1 if respondent has less than a high school education at baseline; 0 otherwise
NVRMAR	1 if respondent is single, never married at baseline; 0 otherwise
MONTHIA	Number of months on IA in the 3 years prior to the baseline interview
EMOPROB	1 if respondent had limited activity due to a long term emotional, psychological, nervous or mental health condition or problem at baseline; 0 otherwise
BENEFIT	Average monthly IA amount received in 4 quarters prior to baseline interview (in hundreds)
BAGE1922	1 if respondent's age is 19-22 at baseline; 0 otherwise (omitted)
BAGE2325	1 if respondent's age is 23-25 at baseline; 0 otherwise
BAGE2629	1 if respondent's age is 26-29 at baseline; 0 otherwise
BAGE3034	1 if respondent's age is 30-34 at baseline; 0 otherwise
BAGE3539	1 if respondent's age is 35-39 at baseline; 0 otherwise
BAGEGE40	1 if respondent's age is more than 40 at baseline; 0 otherwise
UNRATE	The unemployment rate for women, 15+, in the respondent's province, for each calendar month corresponding to each month after random assignment for the respondent

Table 3 - Means and Standard Deviations of Baseline Variables
(Standard deviations in parentheses)

British Columbia

	Program Group				Control Group		
Name	All	Take-up	Non-Incentivized	Incentivized	All	Non-Incentivized	Incentivized
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
NKIDS	1.785	1.728	1.722	1.733	1.774	1.627	1.738
	(0.891)	(0.843)	(0.882)	(0.803)	(0.91)	(0.805)	(0.832)
YCHLE4	0.477	0.451	0.411	0.490	0.506	0.435	0.485
	(0.5)	(0.498)	(0.493)	(0.501)	(0.5)	(0.497)	(0.501)
NO HS DEGREE	0.527	0.460	0.416	0.505[6]	0.549	0.392	0.563
	(0.499)	(0.499)	(0.494)	(0.501)	(0.498)	(0.489)	(0.497)
NEVER MARRIED	0.438	0.441	0.455	0.427	0.445	0.478	0.432
	(0.496)	(0.497)	(0.499)	(0.496)	(0.497)	(0.501)	(0.497)
MONTHS ON IA	29.293	28.701	28.038	29.374	28.437	27.345	28.534
	(7.962)	(8.015)	(8.495)	(7.456)	(8.323)	(8.37)	(8.085)
EMOTIONAL PROBLEMS	0.088	0.058	0.038	0.078	0.080	0.038	0.087
	(0.284)	(0.234)	(0.192)	(0.268)	(0.272)	(0.192)	(0.283)
BENEFIT	967.49	922.79	854.79	991.78[3,6]	959.79	839.25	974.48
	(217.79)	(218.42)	(232.30)	(179.15)	(233.98)	(261.75)	(191.54)
AGE: 23-25	0.116	0.133	0.096	0.170[6]	0.134	0.124	0.126
	(0.32)	(0.339)	(0.295)	(0.376)	(0.341)	(0.331)	(0.333)
AGE: 26-29	0.186	0.178	0.172	0.184	0.161	0.158	0.136
	(0.389)	(0.383)	(0.379)	(0.389)	(0.368)	(0.366)	(0.344)
AGE: 30-34	0.232	0.217	0.239	0.194	0.239	0.230	0.223
	(0.422)	(0.413)	(0.428)	(0.397)	(0.426)	(0.422)	(0.417)
AGE: 35-39	0.182	0.183	0.182	0.184	0.177	0.191	0.218
	(0.386)	(0.387)	(0.387)	(0.389)	(0.382)	(0.394)	(0.414)
AGE: 40 OR OLDER	0.186	0.178	0.172	0.184	0.182	0.163	0.180
	(0.389)	(0.383)	(0.379)	(0.389)	(0.386)	(0.37)	(0.385)
Number of Observations	1,268	415	209	206	1,223	209	206

The 3 and 6 superscripts in column (4) indicate that the mean for the incentivized group is significantly different from the mean in column 3 and/or 6 at the 5% level.

Table 3 (Continued) Means and Standard Deviations of Baseline Variables (Standard deviations in parentheses)

New Brunswick

	Program Group				Control Group		
Name	All	Take-up	Non-Incentivized	Incentivized	All	Non-Incentivized	Incentivized
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
NKIDS	1.609	1.567	1.539	1.607	1.637	1.594	1.753
	(0.764)	(0.733)	(0.679)	(0.804)	(0.865)	(0.816)	(0.977)
YCHLE4	0.457	0.502	0.488	0.522	0.478	0.477	0.472
	(0.498)	(0.501)	(0.501)	(0.501)	(0.5)	(0.5)	(0.501)
NO HS DEGREE	0.527	0.396	0.332	0.489[3,6]	0.529	0.363	0.461
	(0.499)	(0.49)	(0.472)	(0.501)	(0.499)	(0.482)	(0.5)
NEVER MARRIED	0.548	0.551	0.539	0.567	0.546	0.520	0.528
	(0.498)	(0.498)	(0.499)	(0.497)	(0.498)	(0.501)	(0.501)
MONTHS ON IA	31.092	30.304	29.594	31.326[3,6]	30.650	28.785	30.927
	(7.339)	(7.671)	(7.877)	(7.265)	(7.506)	(8.009)	(7.43)
EMOTIONAL PROBLEMS	0.073	0.048	0.027	0.079[3,6]	0.065	0.027	0.084
	(0.261)	(0.215)	(0.163)	(0.27)	(0.246)	(0.163)	(0.279)
BENEFIT	652.85	614.99	578.01	668.18[3,6]	652.75	577.19	685.84
	(143.58)	(158.96)	(172.92)	(117.95)	(148.61)	(175.45)	(122.95)
AGE: 23-25	0.130	0.145	0.168	0.112	0.147	0.172	0.152
	(0.336)	(0.353)	(0.375)	(0.317)	(0.354)	(0.378)	(0.36)
AGE: 26-29	0.156	0.168	0.184	0.146	0.179	0.215	0.202
	(0.363)	(0.374)	(0.388)	(0.354)	(0.383)	(0.412)	(0.403)
AGE: 30-34	0.221	0.244	0.207	0.298[3,6,7]	0.200	0.184	0.140
	(0.415)	(0.43)	(0.406)	(0.459)	(0.4)	(0.388)	(0.348)
AGE: 35-39	0.160	0.134	0.156	0.101	0.154	0.160	0.157
	(0.366)	(0.341)	(0.364)	(0.302)	(0.361)	(0.367)	(0.365)
AGE: 40 OR OLDER	0.153	0.127	0.121	0.135	0.166	0.121	0.197
	(0.36)	(0.333)	(0.327)	(0.343)	(0.372)	(0.327)	(0.399)
Number of Observations	1,147	434	256	178	1,131	256	178

The 3, 6 and 7 superscripts in column (4) indicate that the mean for the incentivized group is significantly different from the mean in column 3, 6 and/or 7 at the 5% level.

Table 4 – Results from a Simple Comparison of Wages at Months 14 and 51 for Program and Control Groups

	British Columbia		New Brunswick	
	All	Non-Incentivized	All	Non-Incentivized
	Month 14			
Program Group: Number	305	154	340	193
Median Wage	$7.37	$7.51	$5.58	$5.66
Control Group: Number	141	140	140	136
Median Wage	$8.65	$8.63	$6.21	$6.21
	Month 51			
Program Group: Number	271	81	313	137
Median Wage	$9.69	$9.69	$6.60	$7.04
Control Group: Number	240	91	260	116
Median Wage	$9.91	$10.59	$6.88	$7.16
	Absolute Increase in Median Wages Between Months 14 and 51			
Program Group	$2.32	$2.18	$1.02	$1.38
Control Group	$1.26	$1.96	$0.67	$0.95
Difference between Program and Control Groups (Absolute Wage Progression)	$1.06	$0.22	$0.35	$0.43
	Percent Increase in Median Wages Between Months 14 and 51			
Program Group	31.5%	29.0%	18.3%	24.4%
Control Group	14.6%	22.7%	10.8%	15.3%
Difference between Program and Control Groups (Relative Wage Progression (measured in percentage points)	16.9	6.3	7.5	9.1

Table 5 - Summary Statistics for the Propensity Scores

			British Columbia		
Non-Incentivized Group	Number	Mean	Std Dev	Minimum	Maximum
Program	209	0.240	0.135	0.022	0.651
Control	209	0.251	0.151	0.003	0.700
Incentivized Group					
Program	206	0.151	0.067	0.020	0.292
Control	206	0.152	0.067	0.021	0.292
			New Brunswick		
Non-Incentivized Group					
Program	256	0.310	0.163	0.042	0.744
Control	256	0.317	0.172	0.038	0.818
Incentivized Group					
Program	178	0.204	0.103	0.033	0.650
Control	178	0.205	0.105	0.036	0.656

Table 6 - Fixed Effects Regression Results for Wage Equation
Dependent Variable: ln(Wage)

	British Columbia		New Brunswick	
EXP	0.005153**	-0.00036	0.004391**	0.001862**
	(0.000107)	(0.000683)	(0.000096)	(0.000552)
EXP^2		0.000124**		0.000055**
		(0.000015)		(0.000012)
UNRATE	0.006630**	0.003315**	0.019279**	-0.000787
	(0.001155)	(0.001234)	(0.006199)	(0.000830)
λ	0.042388**	0.009532	0.000789	0.00421
	(0.007196)	(0.008297)	(0.000756)	(0.006916)
Observations	21755	21755	24152	24152
Number of individuals	1103	1103	1200	1200
(Standard errors in parentheses)				
* Significant at 5%; ** Significant at 1%				

Table 7 - Estimates of Relative Wage Progression Based on Linear Wage Model

	British Columbia		New Brunswick	
	All		All	
	(1)	(2)	(3)	(4)
	52-month Follow-up Period			
Mean Experience – Program Group (months)	11.589		14.163	
	(15.091)		(16.293)	
Mean Experience – Control Group (months)	8.157		8.897	
	(13.164)		(12.862)	
Difference in Mean Experience (months)	3.432		5.266	
	(0.568)		(0.616)	
Mean Return to Wages – Program Group (percent) (Absolute Wage Progression)	6.484		6.694	
	(0.145)		(0.157)	
Mean Return to Wages – Control Group (percent) (Absolute Wage Progression)	4,542		4.155	
	(0.101)		(0.096)	
Difference in Mean Return to Wages (Relative Wage Progression) (percentage points)	1.942		2.539	
	(0.177)		(0.184)	
	Non-Incentivized	Incentivized	Non-Incentivized	Incentivized
	36-month Supplement Period			
Mean Experience – Program Group (months)	21.947	20.879	23.918	23.174
	(11.268)	(11.108)	(10.57)	(10.746)
Mean Experience – Control Group (months)	20.943	4.015	17.672	4.208
	(11.086)	(9.184)	(11.291)	(7.535)
Difference in Mean Experience (months)	1.005	16.864	6.246	18.966
	(1.093)	(1.004)	(0.967)	(0.984)
Mean Return to Wages – Program Group (percent) (Absolute Wage Progression)	12.161	11.540	11.191	10.833
	(0.270)	(0.256)	(0.260)	(0.251)
Mean Return to Wages – Control Group (percent) (Absolute Wage Progression)	11.576	2.209	8.201	1.922
	(0.256)	(0.043)	(0.189)	(0.0440)
Difference in Mean Return to Wages (Relative Wage Progression) (percentage points)	0.585	9.331	2.990	8.911
	(0.372)	(0.260)	(0.321)	(0.255)
	6th Month of Post-Supplement Period			
Number with 6 Months of Post-Supplement Data – Program Group	166	153	208	141
Number with 6 Months of Post-Supplement Data – Control Group	178		222	
Net Change in Mean Experience* (months)	-0.013	2.817	0.557	3.206
	(0.300)		(0.261)	
Net Change in Mean Return to Wages* (percent) (Change in Relative Wage Progression)	0.006	1.693	0.315	1.619
	(0.576)		(0.500)	
	12th Month of Post-Supplement Period			
Number with 12 Months of Post-Supplement Data – Program Group	95	82	128	86
Number with 12 Months of Post-Supplement Data – Control Group	130		156	
Net Change in Mean Experience* (months)	-0.038	5.402	1.627	6.547
	(0.725)		(0.604)	
Net Change in Mean Return to Wages* (percent) (Change in Relative Wage Progression)	0.019	3.301	0.900	3.320
	(0.656)		(0.500)	

Numbers in parentheses are standard deviations for mean experience and are standard errors for mean returns.
* For the non-incentivized groups, rows give the change in mean experience/return since the end of the supplement period for the program group minus this value for the control group. For the incentivized groups, rows give the increase in mean experience/return since the end of the supplement period for the program group only.

Table 8 - Estimates of Relative Wage Progression for Different Sub-Groups Based on Linear Wage Model

	British Columbia		New Brunswick	
	Non-Incentivized	Incentivized	Non-Incentivized	Incentivized
	(1)	(2)	(3)	(4)
		No High School Degree		
Difference in Mean Experience – Supplement Period	0.827	15.764	5.386	17.416
	(1.387)	(1.638)	(1.153)	(1.460)
Relative Wage Progression – Supplement Period	0.483	8.696	2.589	8.201
	(0.382)	(0.275)	(0.340)	(0.257)
Net Change in Relative Wage Progression – 12 months after end of Supplement Period*	-0.163	3.007	0.610	3.576
	(0.617)		(0.528)	
		High School Degree		
Difference in Mean Experience – Supplement Period	1.347	17.479	7.536	20.805
	(1.775)	(1.225)	(1.698)	(1.285)
Relative Wage Progression – Supplement Period	0.780	9.689	3.590	9.754
	(0.358)	(0.248)	(0.287)	(0.253)
Net Change in Relative Wage Progression – 12 months after end of Supplement Period*	0.399	3.568	1.336	3.026
	(0.625)		(0.488)	
		No Young Children Present		
Difference in Mean Experience – Supplement Period	-0.432	18.429	5.966	19.897
	(1.414)	(1.292)	(1.330)	(1.278)
Relative Wage Progression – Supplement Period	-0.217	10.228	2.856	9.345
	(0.386)	(0.273)	(0.337)	(0.256)
Net Change in Relative Wage Progression – 12 months after end of Supplement Period*	-0.618	3.396	0.817	2.948
	(0.662)		(0.518)	
		Young Children Present		
Difference in Mean Experience – Supplement Period	2.862	15.217	6.599	17.958
	(1.710)	(1.547)	(1.398)	(1.508)
Relative Wage Progression – Supplement Period	1.621	8.386	3.159	8.444
	(0.355)	(0.248)	(0.304)	(0.254)
Net Change in Relative Wage Progression – 12 months after end of Supplement Period*	0.972	3.185	1.024	3.676
	(0.654)		(0.478)	
		Benefits - 1st Quartile		
Difference in Mean Experience – Supplement Period	1.868	17.105	6.259	19.679
	(1.571)	(2.312)	(1.348)	(2.332)
Relative Wage Progression – Supplement Period	1.084	9.480	2.998	9.256
	(0.379)	(0.293)	(0.350)	(0.259)
Net Change in Relative Wage Progression – 12 months after end of Supplement Period*	0.118	3.543	1.378	3.751
	(0.663)		(0.551)	
		Benefits - 2nd Quartile		
Difference in Mean Experience – Supplement Period	2.671	18.094	5.688	18.919
	(2.231)	(1.656)	(1.955)	(1.541)
Relative Wage Progression – Supplement Period	1.523	8.783	2.742	8.872
	(0.359)	(0.214)	(0.294)	(0.257)
Net Change in Relative Wage Progression – 12 months after end of Supplement Period*	1.394	2.887	0.675	4.126
	(0.615)		(0.425)	

Table 8 (continued)

		Benefits - 3rd Quartile		
Difference in Mean Experience – Supplement Period	-3.589	15.921	7.738	18.475
	(2.470)	(1.760)	(2.434)	(2.218)
Relative Wage Progression – Supplement Period	-2.050	10.059	3.678	8.698
	(0.393)	(0.283)	(0.296)	(0.258)
Net Change in Relative Wage Progression – 12 months after end of Supplement Period*	-0.445	2.836	0.472	0.255
	(0.713)		(0.425)	
		Benefits - 4th Quartile		
Difference in Mean Experience – Supplement Period	3.071	16.773	6.307	18.412
	(3.757)	(2.350)	(2.867)	(2.277)
Relative Wage Progression – Supplement Period	1.810	9.223	2.997	8.653
	(0.317)	(0.249)	(0.304)	(0.237)
Net Change in Relative Wage Progression – 12 months after end of Supplement Period*	1.164	4.226	(0.020)	5.337
	(0.604)		(0.500)	
		Wages - 1st Quartile		
Difference in Mean Experience – Supplement Period	1.887		5.743	
	(2.213)		(1.979)	
Relative Wage Progression – Supplement Period	1.132		2.752	
	(0.334)		(0.314)	
Net Change in Relative Wage Progression – 12 months after end of Supplement Period*	-1.136		0.606	
	(0.617)		(0.54)	
		Wages - 2nd Quartile		
Difference in Mean Experience – Supplement Period	0.011		8.260	
	(2.289)		(1.76)	
Relative Wage Progression – Supplement Period	0.005		3.952	
	(0.358)		(0.326)	
Net Change in Relative Wage Progression – 12 months after end of Supplement Period*	-0.316		1.252	
	(0.629)		(0.565)	
		Wages - 3rd Quartile		
Difference in Mean Experience – Supplement Period	4.596		10.466	
	(1.993)		(1.868)	
Relative Wage Progression – Supplement Period	2.620		4.996	
	(0.417)		(0.266)	
Net Change in Relative Wage Progression – 12 months after end of Supplement Period*	0.722		1.703	
	(0.739)		(0.445)	
		Wages - 4th Quartile		
Difference in Mean Experience – Supplement Period	-2.462		1.094	
	(2.148)		(1.826)	
Relative Wage Progression – Supplement Period	-1.414		0.535	
	(0.385)		(0.38)	
Net Change in Relative Wage Progression – 12 months after end of Supplement Period*	0.495		0.062	
	(0.627)		(0.681)	

Numbers in parentheses are standard deviations for mean experience and are standard errors for mean returns.
* For the non-incentivized groups, rows give the change in mean experience/return since the end of the supplement period for the program group minus this value for the control group. For the incentivized groups, rows give the increase in mean experience/return since the end of the supplement period for the program group only.

Appendix 1 – Propensity Score Distributions

Figure A1

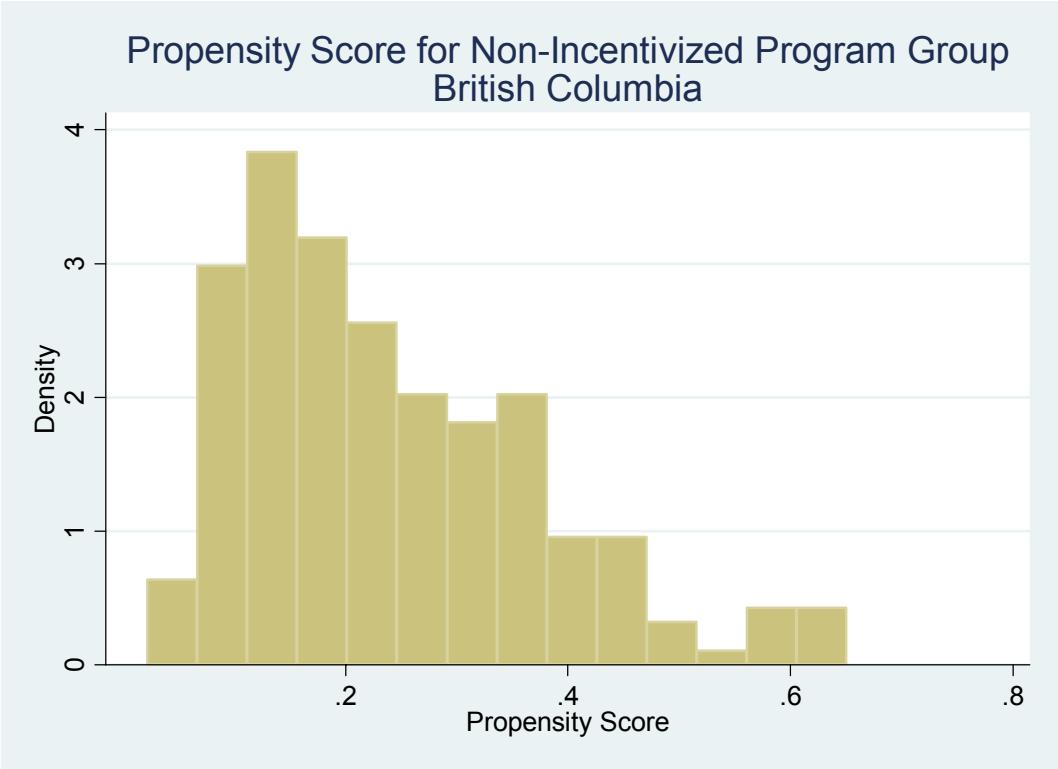

Figure A2

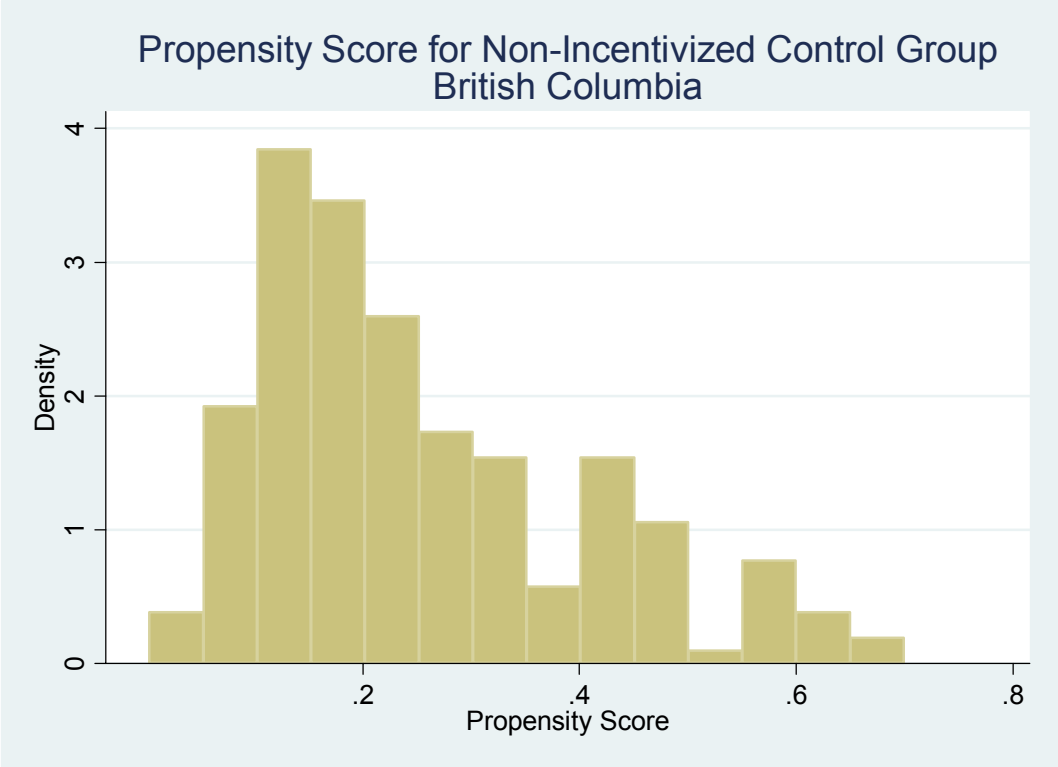

Figure A3

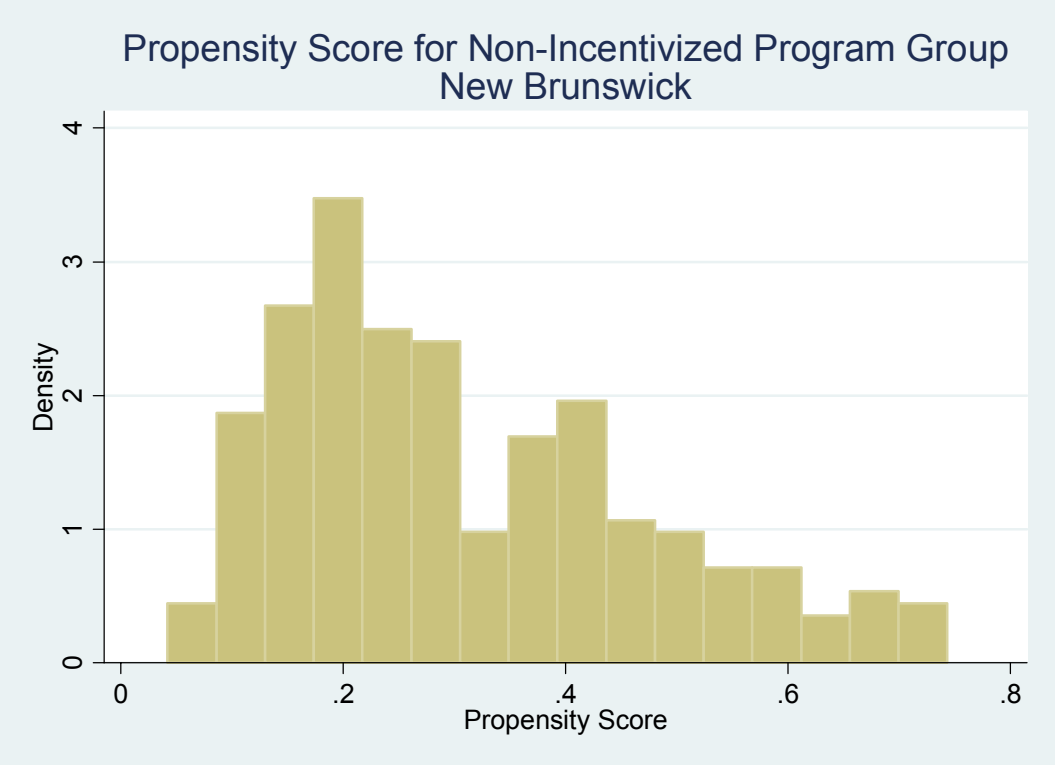

Figure A4

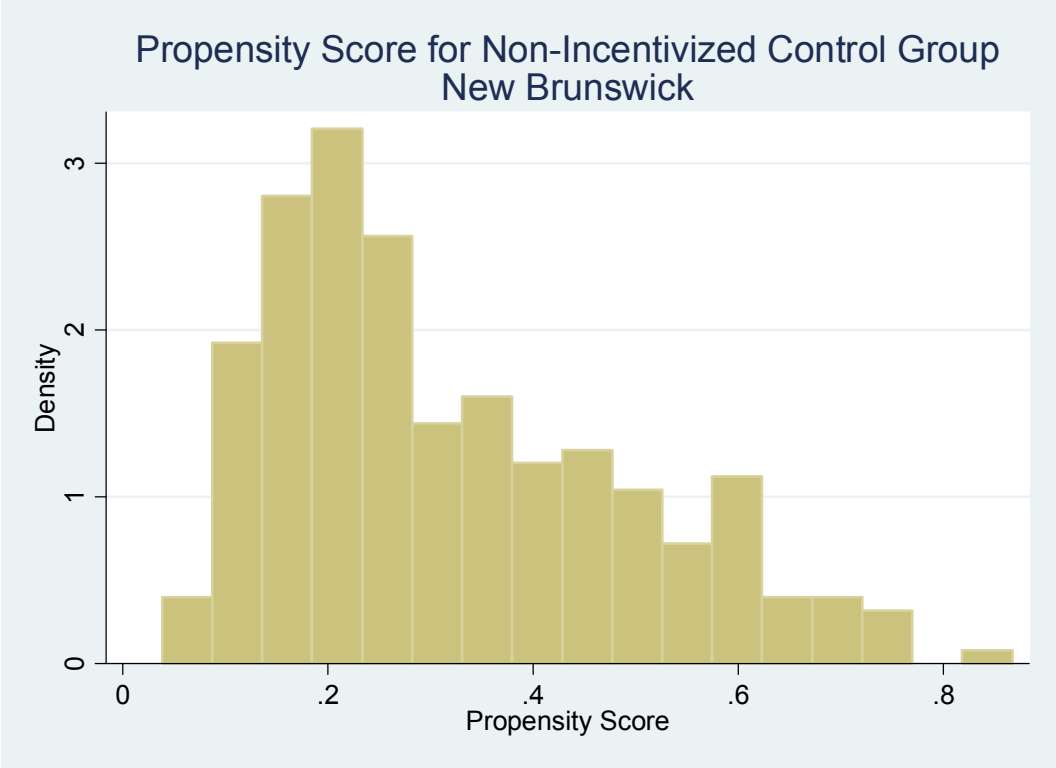

Figure A5

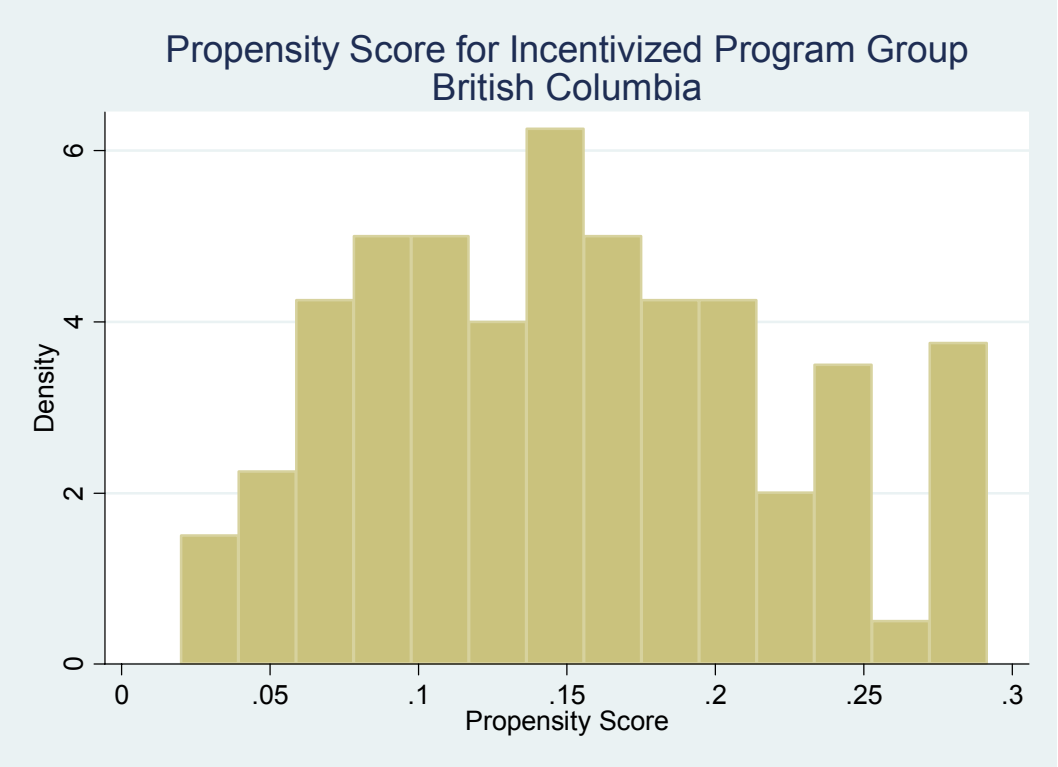

Figure A6

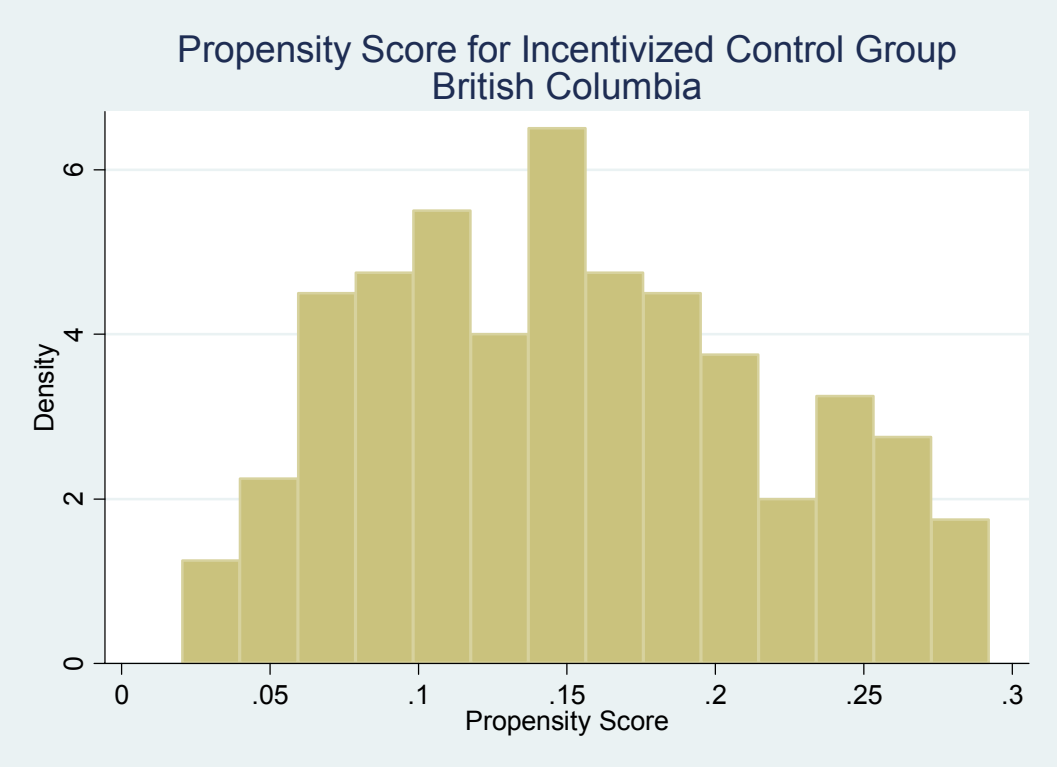

Figure A7

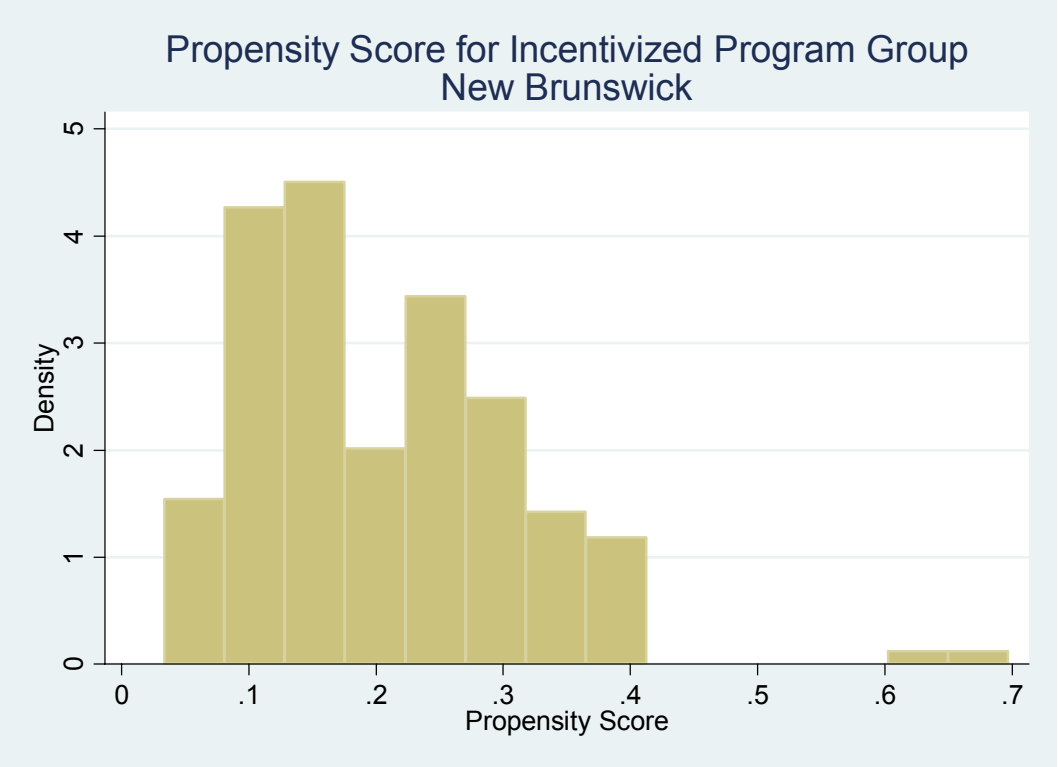

Figure A8