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An Econometric Analysis of the Incremental Impact of SSP Plus

The Self-Sufficiency Project

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Abstract

The Self-Sufficiency Project (SSP) was a Canadian research and demonstration project that investigated how to "make work pay" by supplementing the earnings of lone parents who were long-term income assistance (IA) recipients. The goal of SSP was to help lone parents voluntarily and permanently leave IA and move into the paid labour force.

The main thrust of research on SSP has been to evaluate the impact of the earnings supplement on employment and earnings. However, a relatively small additional sub-sample of the larger SSP sample was chosen to explore the impact of an earnings supplement provided in conjunction with a set of employment services that included help with job search, resumé writing, and job retention. The supplement-plus-services program was known as SSP Plus.

The purpose of this study is to evaluate the short-term and long-term incremental impact of SSP Plus on the duration of periods of full-time employment and periods during which participants were not working full time. That is, we ask whether SSP Plus had any additional impact on these durations beyond those created by the SSP earnings supplement alone. We focus on generating estimates of the "effect of the treatment on the treated" where the "treated" are defined as those in the SSP Plus and regular SSP program groups who qualified for the earnings supplement by finding a full-time job within the first 12 months after random assignment.

Following the work of Eberwein, Ham, and LaLonde (1996), we estimate a joint model of durations of full-time employment and non-full-time employment that controls for (1) differences in observed characteristics, (2) unobserved heterogeneity, and (3) the endogeneity of choosing to become one of the "treated." The model provides consistent estimates of the incremental impact of SSP Plus on the durations. Evidence of significant short-term impacts of SSP and SSP Plus on unemployment and employment durations is found, where "short-term" means "while the take-up program group was eligible for the earnings supplement." In the long-term, however, there is no evidence of any incremental impact of the treatment on the treated. The overall experimental impact of SSP Plus was therefore generated by its success in inducing a greater proportion of its program group to qualify for the supplement and in having the incremental individuals who qualified for the supplement behave, in terms of their employment and non-employment behaviour, like other supplement recipients.

Executive Summary

The Self-Sufficiency Project (SSP) was a Canadian research and demonstration project that attempted to "make work pay" by supplementing the earnings of long-term income assistance (IA) recipients. Lone parents on IA qualified for a generous earnings supplement if they took up full-time work and left the welfare rolls within 12 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 36 months. Participation was entirely voluntary; without penalty, individuals could choose not to participate. Those who qualified for the supplement could return to IA 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.

The main SSP study focused on the effect of the supplement on employment and earnings; program group members received only minor services beyond the offer of the supplement. Anticipating that some would ask whether long-term IA recipients would need additional services in order to find and keep full-time jobs, a smaller experiment was conducted in which there were two program groups and one control group. The first program group (the "regular SSP group") was offered only the SSP earnings supplement. The second program group (the "SSP Plus group") was offered not only the SSP earnings supplement, but also a package of employment-related services that included help with job search, resumé writing, and job retention. The control group was offered neither the earnings supplement nor the employment services.

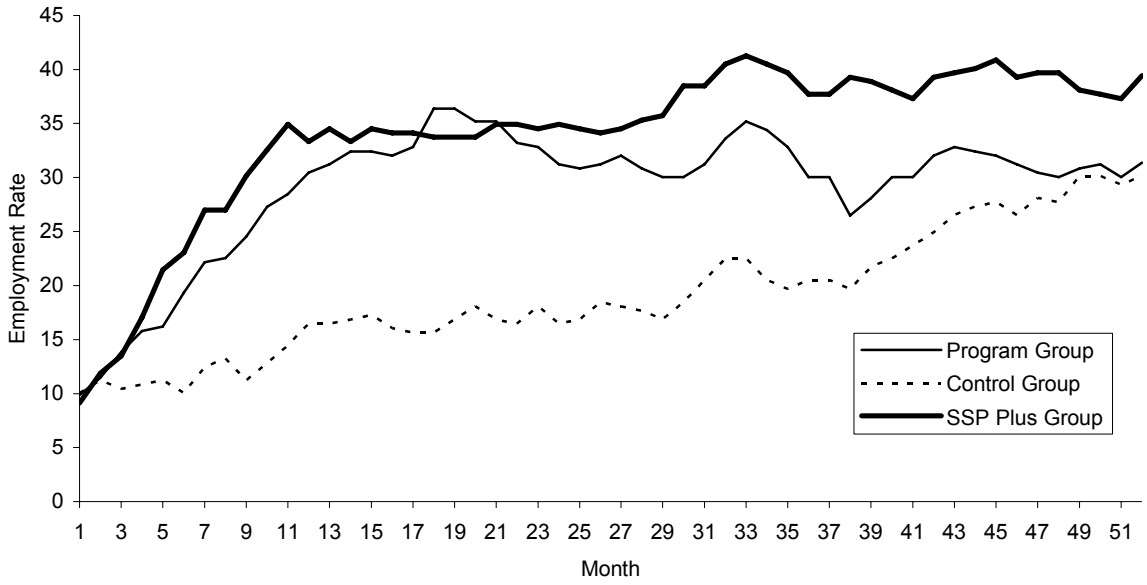
In this study, we have conducted an econometric analysis of the SSP Plus program. Our purpose was to evaluate the short-term and long-term incremental impact of SSP Plus on the duration of full-time employment and non-employment and, ultimately, on the full-time employment rate.[1] That is, we were interested in whether SSP Plus had any additional impact on employment and non-employment durations beyond those created by the SSP earnings supplement alone. We focus on generating estimates of the "effect of the treatment on the treated" where the "treated" are those who actually received an SSP supplement.

The "story" of SSP Plus has three central features. First, more than 50 per cent (131 of 252) of the SSP Plus program group qualified for the SSP earnings supplement, compared with approximately 40 per cent (99 of 253) of the regular SSP program group. Second, the full-time employment rate of the SSP Plus program group in the first year after the end of the qualifying period was about the same as the employment rate for the regular SSP group, despite the higher number of qualified individuals. For example, as can be seen in Figure ES.1, the full-time employment rates for the regular SSP and SSP Plus groups were approximately equal from the 12th to the 24th month after random assignment. Third, the

[1]Being "non-employed" in this paper means being unemployed, being out of the labour force, or working part time. "Long-term" in this context refers to the period after program group members had exhausted their eligibility for the SSP earnings supplement, an event that occurred 36 months after the participants established their eligibility for the supplement. Depending on when participants established their eligibility, the "long-term" period would have started 36 to 48 months after random assignment. Since the final survey occurred approximately 54 months after random assignment, we have between 6 and 18 months of observations on "long-term" behaviour.

full-time employment rates for the SSP Plus group exceeded those of the regular SSP group after the 24th month and soon were 9 to 10 percentage points higher, a gap that persisted until the end of the follow-up period.[2] Over the same period, the control group "caught up" to the regular SSP program group and there was no significant difference between those two groups at the end of the follow-up period. Since the SSP Plus group had a full-time employment rate that was about 10 percentage points higher than that of the regular SSP group at that point, there is a statistically significant difference between the full-time employment rates of SSP Plus group and the control group.

Figure ES.1: Full-Time Employment Rates for SSP Plus, Regular SSP, and Control Groups, by Months From Random Assignment



Our econometric model captures the short-term impacts of SSP and SSP Plus on the "interrupted" non-employment spell of most of the SSP participants. Regular SSP group members were significantly more likely than the control group to end their interrupted spell of non-employment and move to full-time employment.[3] We see this increased likelihood both in the first nine months of the 13-month qualifying period and in the last four months of the qualifying period. As predicted by theory (Card, Michalopoulos, & Robins, 2001), the incentive to find a full-time job grew as the end of the qualifying period approached — the effect of being in the SSP program group was larger in months 10 to 13 than it was in months 1 to 9. Being in the SSP Plus program group had a large and positive incremental impact on the proportion qualifying for the earnings supplement in months 1 to 9. There is no incremental impact in months 10 to 13, however, suggesting that the services provided by SSP Plus were especially effective in the first part of the qualifying period and less effective after that.

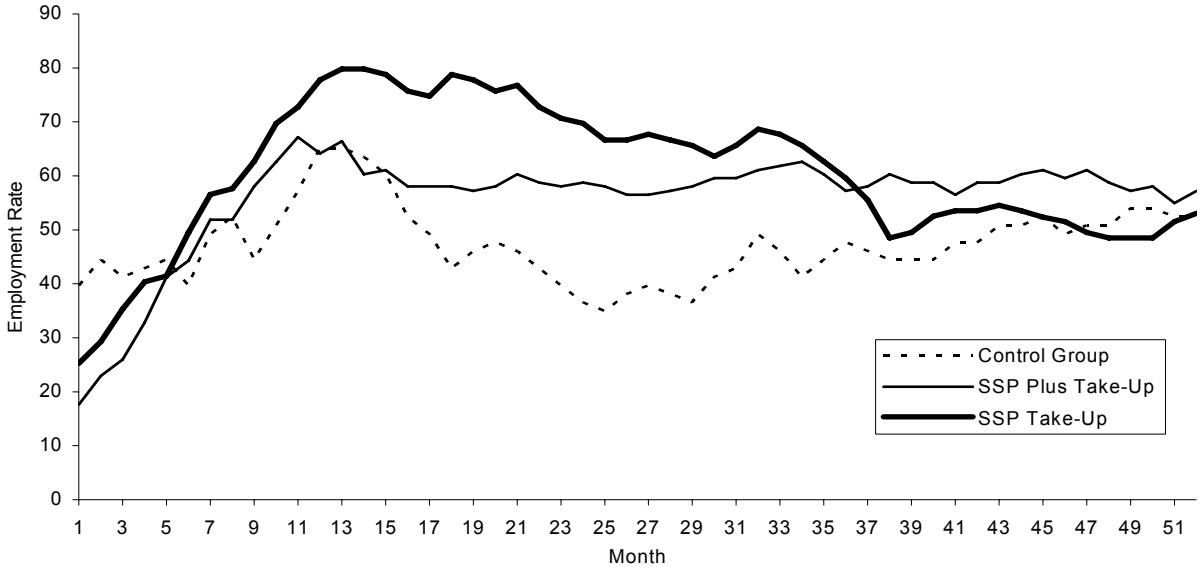
[2]The 9 to 10 percentage point impact discussed in this paragraph is for the 685 individuals who were not employed full time at baseline.

[3]At baseline, 90 per cent of SSP participants were in the midst of a spell of non-employment and the other 10 per cent were in the midst of a spell of full-time employment. Following the previous literature, we have referred to baseline spells as "interrupted" spells of non-employment and employment.

The main goal of this paper is to compare the labour force behaviour of the regular SSP and SSP Plus take-up groups over the entire follow-up period. If the two take-up groups had similar labour force behaviour — if there was no effect of the treatment on the treated — then there would be no evidence of an incremental impact of SSP Plus on the take-up groups. If so, then the overall impact of SSP Plus in Figure ES.1 must be due to the incremental impact of SSP Plus in inducing a greater proportion of its program group to take up the supplement. In effect, the impact of SSP Plus was to induce individuals who would have acted like non-take-up group members to act like take-up group members. And it is this initial impact that creates the long-run positive impact of SSP Plus.

This story is implied by Figure ES.2, which shows the proportion working full time in three groups — the regular SSP take-up group, the SSP Plus take-up group, and the subset of the control group that found work in the first 13 months after random assignment. In all three groups, the proportion working full time was similar, ranging between 50 and 60 per cent at the end of the follow-up period.

Figure ES.2: Full-Time Employment Rates for the Take-Up Groups and the Subset of the Control Group Who Found Full-Time Work Within 13 Months of Random Assignment



However, Figure ES.2 is not convincing evidence of the similarity of the three groups, because they are non-random subsets of the entire program and control groups. The simple comparison in Figure ES.2 does not adjust for any possible observable or unobservable differences between the groups that might invalidate the conclusion that the three groups were similar in their long-run employment rates.

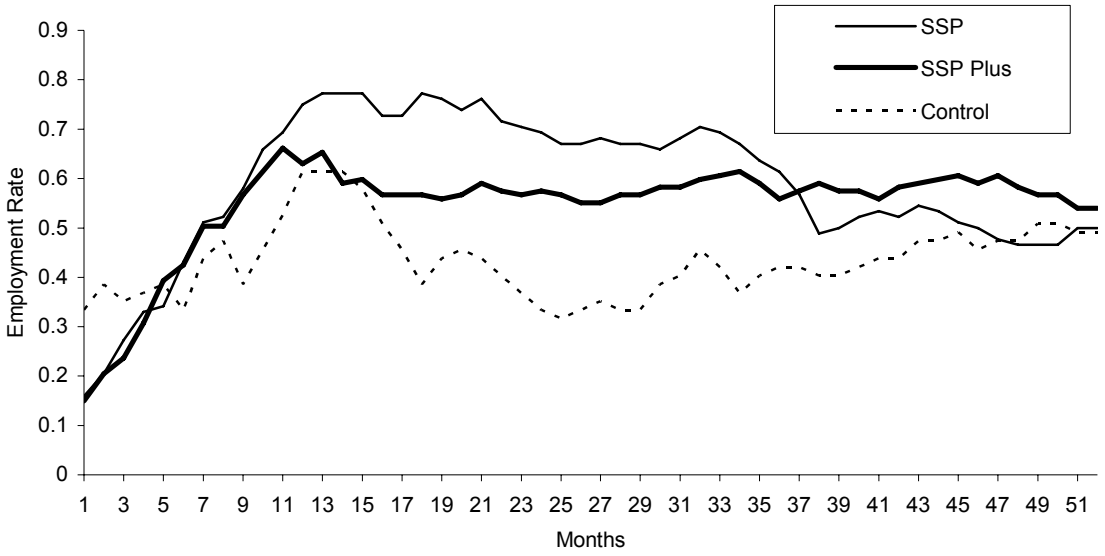
The intention behind the use of the complicated model that we estimate in this paper is to use state-of-the-art econometric techniques to adjust for the potential biases that might invalidate the comparison in Figure ES.2. Armed with the model estimates, we can produce Figure ES.3 that replicates Figure ES.2 after adjusting for the biases (and, for computational reasons, excluding those who were working full time at baseline). Two major potential biases must be addressed. First, SSP participants — in both the program groups and in the control group — non-randomly select themselves into full-time work. This self-selection is a function not only of observable differences among all participants (e.g. some have a recent work history

and some do not), but also of unobservable differences (e.g. some are strongly motivated to work for pay and others are not). Second, program group members self-select into the take-up group by choosing to take up full-time work within the qualifying period, making this decision endogenous. If take-up group membership is to be used as an independent variable in models of labour force behaviours (e.g. to answer the question of whether take-up group members had different employment durations), this endogeneity must be addressed.

Because the heterogeneity that is creating these issues is unobserved, there is no way to "adjust" for it without making a variety of assumptions about its nature. Over the years, labour economists have developed a number of techniques to address these two potential biases. Building on a model developed by Eberwein, Ham, and Lalonde (1997), we estimate a joint model of four kinds of employment and non-employment spells. Our estimator, summarized in the Appendix, has four equations representing the hazard rates for exiting out of four spell types (with each equation assuming a similar form of unobserved heterogeneity) and an equation that is used to create instruments for the endogenous variables.

The primary result of the model estimation is that there seem to be no important differences in the determinants of the employment and non-employment durations of the regular SSP and the SSP Plus take-up groups. In general, the corrections for heterogeneity and endogeneity do not lead to any important differences in the coefficient estimates. We present three versions of the model: (1) a variant with no corrections for heterogeneity or endogeneity, (2) a variant with a correction for heterogeneity but none for endogeneity, and (3) the full model with corrections for both heterogeneity and endogeneity. The parameter estimates are almost exactly the same in all three models. In all three cases, the magnitude and significance of the coefficients suggest "no difference" between the two take-up groups. Said differently, the comparison shown in Figure ES.3 correctly represents the different experiences of the three groups even though they are non-random subsets of the program and control groups.[4]

Figure ES.3: Simulated Full-Time Employment Rates for the Take-Up Groups and the Subset of the Control Group Who Found Full-Time Work Within 13 Months of Random Assignment, Excluding All Participants Working Full Time at Baseline



[4]Figure ES.3 is similar to Figure ES.2 except that those working full time at baseline have been excluded.

How then can we account for the 9 to 10 percentage point experimental impact of SSP Plus relative to regular SSP? The answer is that SSP Plus had its impact in incentivizing a greater proportion of its program group members to find full-time work and qualify for the supplement. Our results suggest that these incentivized program group members then behaved in roughly the same way as take-up group members in the regular SSP take-up group. This is surprising because one might think that the SSP Plus incentivized take-up group members would have been more similar to regular SSP non-take-up group members. Indeed, that was precisely the conjecture when it was observed that over the period 12 to 24 months after random assignment the SSP Plus program group had roughly the same full-time employment rate as the regular SSP program group, despite having a higher proportion who had qualified for the supplement. The conjecture was that the incentivized SSP Plus take-up group members had simply found a short-term full-time job in order to qualify for the supplement and had then reverted to behaving like non-take-up group members. But this was apparently not true: SSP Plus had succeeded in making them into "real" take-up group members. Exactly how SSP Plus accomplished that feat is unknown. It could be that voluntarily finding a full-time job (however short-lived) and qualifying for the supplement was enough to transform the incentivized SSP Plus take-up group members into "real" take-up group members. Or it could be that one of the services provided by the SSP Plus staff had the same effect. Given the general failure of mandatory work programs in the United States to effect major changes in the labour force behaviour of welfare recipients, we suspect that the latter explanation is more likely.

One final point: it is possible that the control group later "caught up" with the SSP Plus program group, having already "caught up" to the regular SSP program group by Month 52. However, the follow-up period was not long enough to observe this, if it in fact occurred.

I. Introduction

The Self-Sufficiency Project (SSP) was a Canadian research and demonstration project that attempted to "make work pay" by supplementing the earnings of long-term income assistance (IA) recipients.[5] Lone parents on IA qualified for a generous earnings supplement if they took up full-time work and left the welfare rolls within 12 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 36 months. Participation was entirely voluntary; without penalty, individuals could choose not to participate. Those who qualified for the supplement could return to IA 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.

The main SSP study focused on the effect of the supplement alone on employment and earnings; program group members received only minor services beyond the offer of the supplement. Anticipating that some would ask whether long-term IA recipients would need additional services in order to find and keep full-time jobs, a smaller experiment was conducted in which there were two program groups and one control group. The first program group (the "regular SSP group") was offered only the SSP earnings supplement. The second program group (the "SSP Plus group") was offered not only the SSP earnings supplement, but also a package of employment-related services that included help with job search, resumé writing, and job retention. The control group was offered neither the earnings supplement nor the employment services.

Participants in the SSP Plus experiment were surveyed four times by Statistics Canada — a baseline survey at the point of random assignment and follow-up surveys 18, 36, and 54 months after random assignment. In this paper, we use the data on participants who responded to the 54-month follow-up survey.

The long-term goal of SSP and of SSP Plus was to help lone parents to voluntarily and permanently leave IA and enter into the paid labour force. Program designers theorized that the SSP earnings supplement (and the SSP Plus services) would induce women who would otherwise have stayed on IA to enter the labour force. Once in the labour force, members of both program groups would be more likely to stay off the welfare rolls, either because they would experience large enough increases in earnings so they would be better off working (even without the supplement) or because they would come to appreciate the non-monetary benefits of work. In a previous study (Zabel, Schwartz, & Donald, 2004), we evaluated the short-term and long-term impact of SSP on the duration of full-time employment and non-employment.[6] In that paper, we focused on generating estimates of the "effect of the

[5]The project took place in two Canadian provinces (British Columbia and New Brunswick) between November 1992 and December 1999, and was funded by the Canadian federal department now known as Human Resources and Skills Development Canada (HRSDC). Operating outside the provincially run social assistance systems, SSP was managed by the Social Research and Demonstration Corporation (SRDC). Evaluations undertaken thus far have been carried out by MDRC and SRDC.

[6]For the remainder of this paper "employment" should be taken to mean "full-time employment." See Section III for the relevant definition of "full time." "Non-employment" means that the participant is not working full time; instead, she is either unemployed, working part time, or out of the labour force (and may or may not be on IA).

treatment on the treated" where the "treated" were those in the program group who actually took up the SSP supplement. Here, we focus on the incremental impact of SSP Plus, above and beyond the impact of regular SSP. To obtain unbiased estimates of the long-term incremental impact of SSP Plus, we use an econometric framework that has evolved from that developed for our earlier paper.

In the next section, we discuss some of the basic information about SSP Plus that has been released in previous analyses by Lei and Michalopoulos (2001) and in Chapter 8 of the final SSP evaluation report by Michalopoulos et al. (2002). We derive other basic results from our own calculations. In Section III, we describe the data and present a descriptive analysis of the initial employment behaviour of the SSP Plus group and of the regular SSP group. We estimate econometric models of employment and non-employment duration in the Section IV. Section V simulates the long- and short-run impacts of SSP. Section VI summarizes our sense of how SSP Plus affected the durations.

II. Basic Information About SSP and SSP Plus

One of the most important goals of the Self-Sufficiency Project (SSP) was to increase the rate at which lone parents on social assistance left their provincial welfare programs and took up full time work. It was decided early in the project to incorporate a random assignment evaluation into the project.[7] In total, 6,028 lone parents completed the baseline survey and were randomly assigned between November 1992 and March 1995. It was also decided to include a relatively small sub-experiment — known as "SSP Plus" — that would offer not only the earnings supplement, but also a range of employment services.

Between November 1994 and March 1995, long-term income assistance (IA) recipients in New Brunswick were randomly assigned to three different SSP groups. In total, 892 lone parents were randomly assigned in this time period — 293 were assigned to SSP Plus, 296 were assigned to the regular SSP program, and 303 were assigned to the control group. In this paper, we use data only from those participants who responded to the follow-up survey administered by Statistics Canada roughly 54 months after random assignment. After a handful of exclusions made necessary by missing data for important variables, we are left with a sample consisting of 252 members of the SSP Plus group, 253 members of the regular SSP group, and 249 control group members.[8]

An interesting and somewhat unexpected feature of the SSP sample is that a significant proportion of participants — just under 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 two program groups, 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 IA).

The data are organized into "relative months" or months since random assignment. The "first" month for each SSP Plus participant is the month in which they were randomly assigned, which could be in any calendar month from November 1994 to March 1995.

After random assignment, SSP Plus 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 was administered before 54 calendar months had elapsed; as a result, complete data on employment and non-employment durations is available for only 51 months after random assignment.

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[7] In each month of the enrolment period, Statistics Canada used administrative data provided by the provincial social assistance agencies in British Columbia and New Brunswick to identify all recipients who (a) were lone parents, (b) were 19 years of age or older, and (c) had received benefits in the current month as well as 11 of the 12 preceding months. A random sample of those who met these criteria was then contacted, interviewed by a Statistics Canada interviewer, and invited to participate in the project. However, "to participate in the project" meant either being in a program group that would be offered the earnings supplement or in the control group that would receive nothing. The interviewers carefully explained the project to each potential participant. Following the explanation, the person was asked to sign an "informed consent" form verifying that she understood the project and giving researchers access to administrative data. The baseline survey was completed at this time. Roughly 90 per cent of the fielding sample completed the baseline survey and signed the informed consent.

[8] The small size of these three groups has long been a problem for statistical analyses of SSP Plus and, as will become evident, implies that only very large effects will be statistically significant.

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 survey and were asked about every new job held since then.[9] The reported spells were then matched to relative months after random assignment.

Given this evaluation design, it is a simple matter to assess the impact of SSP on *some* dimensions of participants' labour force participation. From the survey information, any number of labour force outcomes can be defined. In reports published thus far, the emphasis has been on comparing the proportion working full time for various groups *at a single point in time*.

Both the SSP Plus and the regular SSP groups were eligible for the SSP earnings supplement, a supplement whose key features are presented next. Only the SSP Plus group could receive the employment services described below.

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, in one or more jobs) and who were not receiving IA.

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 IA for most recipients. During the first year of operations, the benchmark was $30,000 in New Brunswick. The benchmark was adjusted over time to reflect changes in the cost of living and in the generosity of IA. 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 (those who had been receiving IA for at least one year).

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 were permanently ineligible to 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 it was first received, as long as that person was working full time and not receiving IA.

Voluntary alternative to welfare. Participants could not receive IA payments while receiving the supplement. Participation in the supplement program was voluntary, and even after beginning supplement receipt, people could decide at any time to return to IA as long as

[9]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 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.

they gave up supplement receipt and met the eligibility requirements for IA. They could again receive the supplement by going back to work full time at any point during the three-year period in which they were eligible to receive the supplement.

KEY FEATURES OF SSP PLUS

Creation of an employment plan. A "blueprint for self-sufficiency" could be drawn up for each SSP Plus group member. It would include information on employment barriers, goals, and anticipated use of SSP Plus services.

Resumé service. SSP Plus program staff was available to draft, type, format, proofread, and print resumés.

Job coaching. SSP Plus group members were encouraged to form one-on-one relationships with SSP Plus program staff members, who offered practical advice and emotional support.

Job club. Enrolment in job clubs led by SSP Plus job coaches was encouraged. Coaches emphasized early contact with employers, consistent follow-up, and the importance of maintaining a positive attitude.

Job leads. SSP Plus program staff collected and distributed news of job openings.

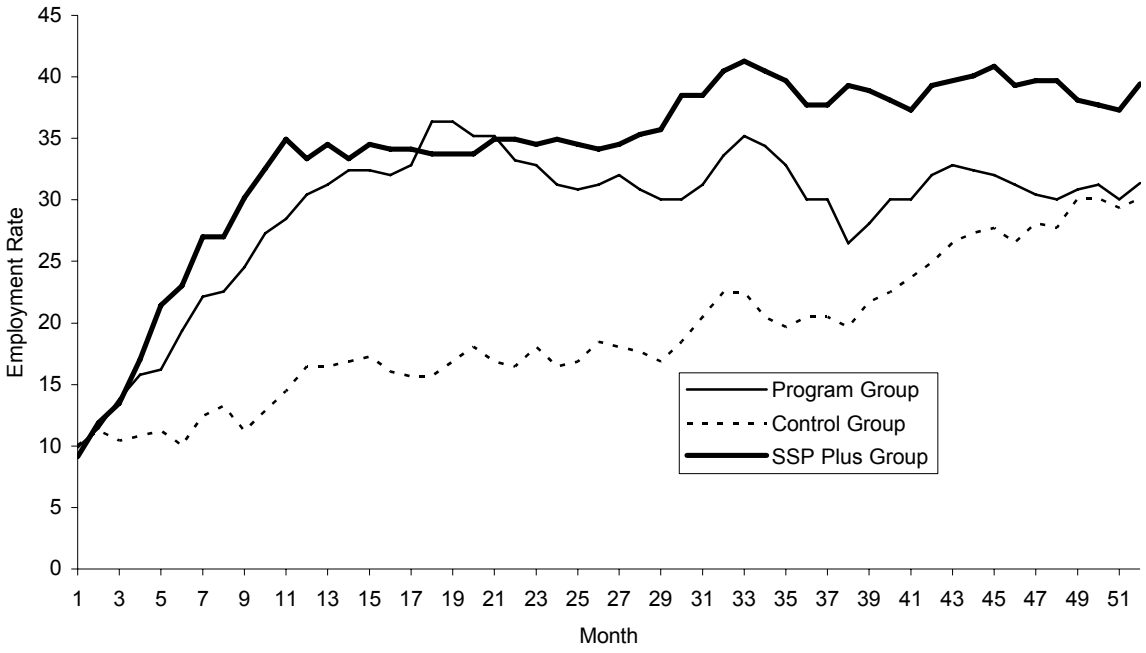
Self-esteem workshop. SSP Plus group members could participate in exercises designed to build self-esteem.

Other workshops. Other workshops targeted SSP Plus group members who were confronting job loss or looking for higher-paying positions.

III. Simple Descriptive Measures of the Duration of Employment and Non-employment

Using data from the follow-up surveys, MDRC created a series of 0-1 variables, one for every month after random assignment, that took the value "1" if the respondent typically worked 30 or more hours during the month.[10] In each month after random assignment, the proportion of the SSP Plus group who were employed full time (as just defined) could be calculated and compared with the proportion of the regular SSP group who were employed full time. Michalopoulos et al. (2002, p. 239) report that the largest incremental impact of SSP Plus on full-time employment occurred long after random assignment, in Quarter 13 after random assignment. At that point, the average quarterly proportion working full time was 39.5 per cent for the SSP Plus group and 30.0 per cent in the regular SSP group, an incremental impact of 9.5 percentage points. In the first three years after random assignment, there had been no statistically significant difference in the full-time employment rates of the SSP Plus and regular SSP groups. Figure 1 shows the experimental impacts for our sample.[11]

Figure 1: Full-Time Employment Rates for SSP Plus, Regular SSP, and Control Groups, by Months From Random Assignment



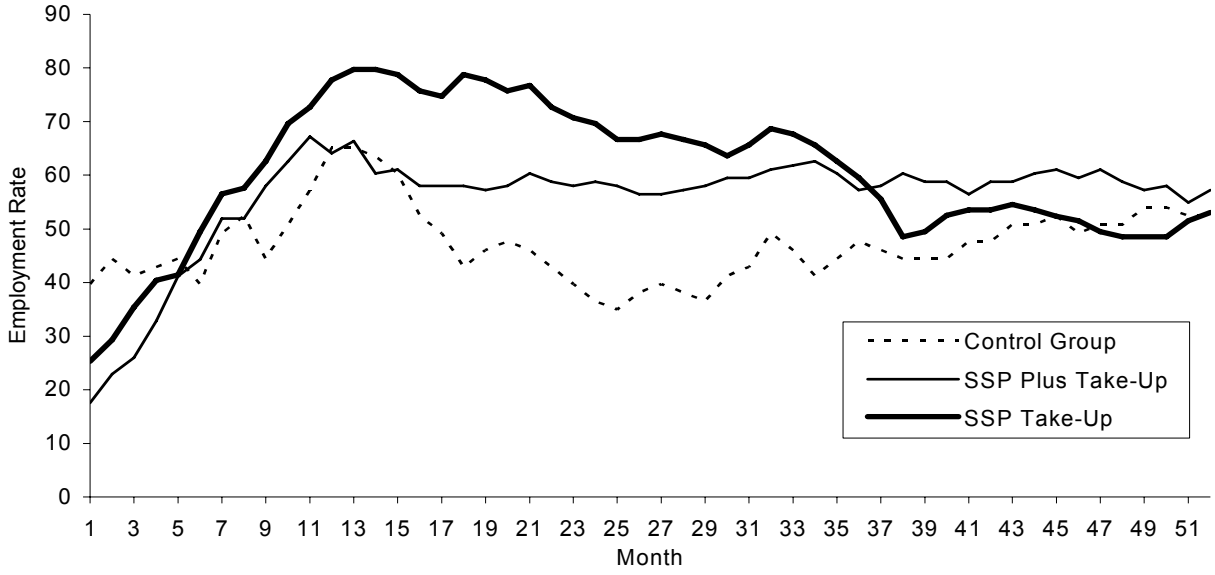
[10]Respondents were asked how many hours per week they "typically" worked on each job. If they were working on jobs whose typical weekly hours were 30 or more during a month, then they were assigned the value "1" on the full-time indicator for that month.

[11]This sample is different than that used to produce a similar figure in the SSP final report (Michalopoulos et al., 2002, p. 151) because of the exclusion of 11 participants who have missing values for covariates used later in the paper.

The figure shows that those randomly assigned to the SSP Plus group had employment rates that were greater (though not significantly greater) than those randomly assigned to regular SSP group during the first three years following random assignment. Both program groups had employment rates that were significantly higher than those of the control group. After the third year, however, the control group "caught up" to the regular SSP program group and those two groups had equal employment rates at the end of the follow-up period. By contrast, the SSP Plus group kept its relatively high full-time employment rate, creating significant incremental impacts in the later months of the follow-up period. It is this pattern of experimental impacts that suggests the "story" that SSP Plus had a permanent and positive impact on full-time employment, whereas the impact of the supplement alone vanished by the end of the follow-up period.

Figure 2 shows the full-time employment rates for regular SSP group members and for SSP Plus group members *who qualified for the supplement*. We will call these non-random subsets of the two program groups the "take-up" groups. The appropriate comparison group for the regular SSP and SSP Plus take-up groups consists of those members of the control group who found full-time employment in the first 13 months.

Figure 2: Full-Time Employment Rates for the Take-Up Groups and the Subset of the Control Group Who Found Full-Time Work Within 13 Months of Random Assignment



Therefore, Figure 2 compares the employment rates of that subset of the control group with the employment rates of take-up groups in the two program groups. The differences between the groups are non-experimental impact estimates of the effect of the treatment on the treated. They are non-experimental estimates because they may be the result not only of the fact that the two take-up groups received different "treatments" (either the supplement alone or the supplement plus services), but also because of observable and unobservable differences between the take-up groups and their counterparts in the control group — those who worked within 13 months of random assignment. The purpose of studies such as this one is to estimate the impact of being in the take-up groups relative to being in the control group,

holding constant the observable and unobservable differences between the groups. That is, we are estimating the "effect of the treatment on the treated."

Figure 2 shows that at the end of the follow-up period the take-up groups have slightly higher employment rates than the relevant subset of the control group. The employment rate of the regular SSP take-up group was higher than that of the SSP Plus take-up group until the end of the third year. At that point, the regular SSP employment rate, which had started to decline after about two years, fell below the SSP Plus employment rate, which stayed relatively constant.

Figures 1 and 2 describe the basic patterns that we are trying to explain in this paper. We attempt that explanation by analyzing models of the duration of the employment and non-employment spells that control for observable and unobservable differences across the three groups. We then use these results in Section VI to simulate employment rate effects comparable to those presented in Figure 2.

We now describe the duration of employment and non-employment spells with only minimal modeling of the processes that determine the durations. Where possible, we present experimental contrasts, involving all members of the regular SSP group, the SSP Plus group, and the control group. When this is not possible — for example, when we describe the non-random subsets of the two groups who worked full time during the follow-up period — we describe the durations without accounting for any self-selection or unobserved heterogeneity. Our description includes estimates of survivor functions. Econometric models that account more formally for self-selection, unobserved heterogeneity, and duration dependence appear in Section V.

It bears repeating that in this paper "employment" means working in a job that typically involved 30 or more hours per week; that is, "employment" is really "full-time employment." Furthermore, "non-employment" implies that individuals are either unemployed, out of the labour force, or working part time.

In Table 1, we provide the definitions of a number of observable characteristics used as covariates in our analyses. Columns 1 to 6 of Table 2 then give the means and standard deviations of these variables for those in the SSP Plus group, the regular SSP group, and the control group. One can see that the mean values are very similar across the three groups. For each variable, we conducted t-tests for the equality of the SSP Plus and regular SSP population means. Only for BAGEGE40 — the proportion of respondents 40 years of age or older — do we reject the null hypothesis of equal means at the five per cent significance level (p-value = 0.0454). These results suggest that random assignment "worked" and that the two groups are similar in terms of their observable characteristics.[12]

[12]See Lei and Michalopoulos (2001, p. 12) for a similar analysis that also suggests that random assignment "worked." We note, however, that both the greater age of the SSP Plus sample and the smaller proportion who had "less than high school" would typically increase full-time employment rates. At a minimum, these observable differences should be taken into account when estimating impacts. The econometric models estimated in Section IV account for both observable and unobservable differences.

Table 1: Variable Descriptions

Variable	Description
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 of age; 0 otherwise
BLTHS	1 if respondent has less than a high school education at baseline; 0 otherwise
NVRMAR	1 if respondent is single and has never been married at baseline; 0 otherwise
MONTHIA	Number of months on IA in the three 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 the four quarters prior to baseline interview (in hundreds of dollars)
BAGE1922	1 if respondent's age is 19 to 22 at baseline; 0 otherwise (omitted)
BAGE2325	1 if respondent's age is 23 to 25 at baseline; 0 otherwise
BAGE2629	1 if respondent's age is 26 to 29 at baseline; 0 otherwise
BAGE3034	1 if respondent's age is 30 to 34 at baseline; 0 otherwise
BAGE3539	1 if respondent's age is 35 to 39 at baseline; 0 otherwise
BAGEGE40	1 if respondent's age is more than 40 at baseline; 0 otherwise

Table 2: Variable Means and Standard Deviations

	SSP Plus Group (n = 252)		Regular SSP Group (n = 253)		Control Group (n = 249)	
	(1)	(2)	(3)	(4)	(5)	(6)
Variable	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
NKIDS	1.60	0.78	1.51	0.69	1.57	0.78
YGCHLE4	0.50	0.50	0.45	0.50	0.45	0.50
BLTHS	0.48	0.50	0.55	0.50	0.52	0.50
NVRMAR	0.58	0.49	0.57	0.50	0.57	0.50
MONTHIA	30.20	7.77	30.45	7.49	30.37	7.96
EMOPROB	0.067	0.25	0.091	0.29	0.064	0.25
BENEFIT ($00)	6.83	1.31	6.81	1.36	6.66	1.72
BAGE2325	0.13	0.34	0.13	0.33	0.11	0.32
BAGE2629	0.20	0.40	0.15	0.35	0.16	0.37
BAGE3034	0.18	0.38	0.23	0.42	0.18	0.39
BAGE3539	0.17	0.38	0.15	0.35	0.17	0.38
BAGEGE40	0.12	0.32	0.18	0.38	0.22	0.42

THE DURATION OF NON-EMPLOYMENT SPELLS FOLLOWING RANDOM ASSIGNMENT

Columns 1 and 2 in Table 3 show the percentages of the SSP Plus and regular SSP groups in each of a series of categories measuring the duration of time during which the group members were not employed full time (i.e. they were either employed part time, unemployed, or out of the labour force). The relevant spell here is the "interrupted" spell, one that is measured from the date of random assignment and which was "interrupted" by random assignment; for sample members who were working full time at baseline, the spell length is zero.[13] Column 4 in the table shows the incremental impact of the program, measured as the

[13]We chose to begin the spell of non-employment on the date of random assignment, thus "left censoring" the data.

difference between the two program groups. Column 4 contains experimental estimates of the incremental impact of SSP Plus as compared with regular SSP. This is an experimental impact because all those assigned to SSP Plus and all those assigned to the regular SSP group are included.

Table 3: Length of Time From Random Assignment to First Full-Time Job

Category	(1) SSP Plus Group (n = 252)	(2) Regular SSP Group (n = 253)	(3) Control Group (n = 249)	(4) SSP Plus vs. Regular SSP Impact
Duration = 0	8.73	9.49	9.24	-0.76
1 < duration < 6 months	19.05	10.67	7.63	8.38
6 ≤ duration ≤ 13 months	24.21	18.97	8.43	5.23
14 ≤ duration ≤ 24 months	6.75	8.70	10.04	-1.95
25 ≤ duration ≤ 36 months	6.35	5.14	8.43	1.21
37 ≤ duration ≤ 51 months	4.37	7.11	8.84	-2.75
No full-time work after random assignment	30.56	39.92	47.39	-9.37
Total	100.00	100.00	100.00	0.00

Before looking at the numbers in Table 3, it is worthwhile to describe the categories that appear in that table. As described above, those randomly assigned to regular SSP or to SSP Plus had exactly 12 months to qualify for the earnings supplement by finding a full-time job. The employment variable measured in the surveys, however, is based on calendar months. Participants whose 12-month qualifying period started on January 21, for example, would qualify for the supplement if they left IA and found a full-time job by January 21 of the following year. However, in the survey data, "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 following January, full-time employment would have been coded as starting in "Month 13." For that reason, we actually define the incentive period to be the first 13 months after random assignment, and that definition suggests that one of the categories in Table 3 should be 6 to 13 months, inclusive.

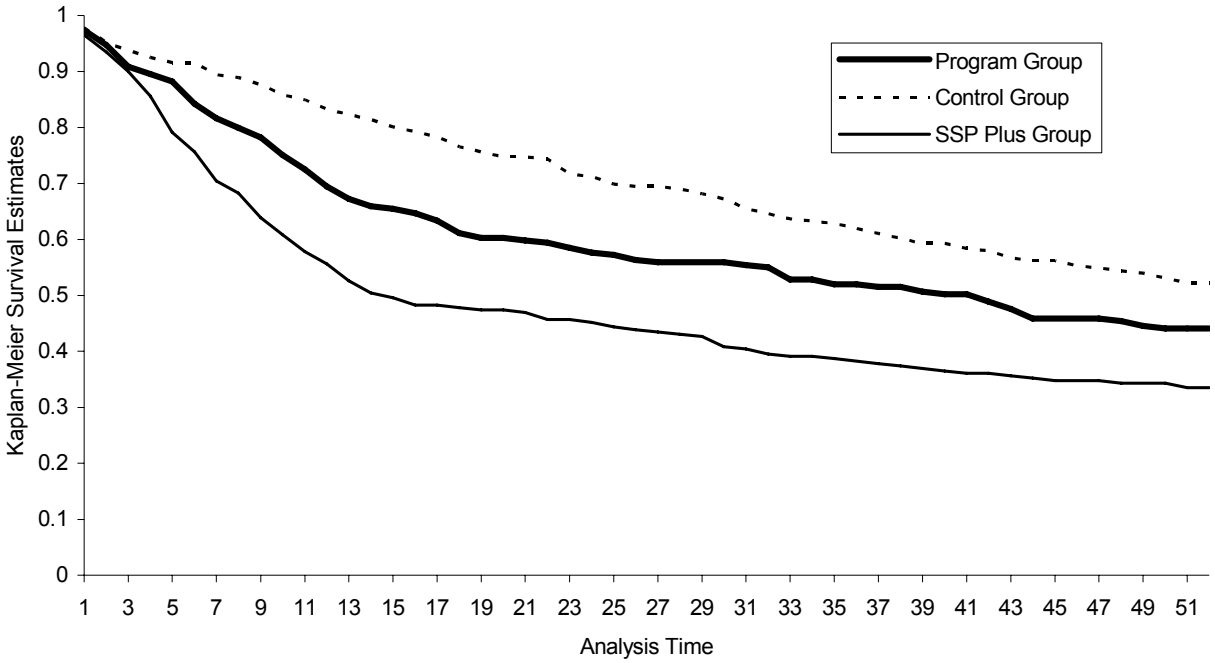
The most important point in Table 3 is that a higher percentage of the SSP Plus group members found full-time employment within the 13-month window for supplement eligibility. Among those randomly assigned to SSP Plus, 51.99 per cent (8.73 + 19.05 + 24.21) worked full time within the first 13 months after random assignment; the comparable percentage among those in the regular SSP group is 39.13 per cent. There is a gap of about 10 percentage points between the SSP Plus group and the regular SSP group in the percentage who had worked full time at some point during the follow-up period (69.44 per cent versus 60.08 per cent in the regular SSP group, as calculated from the last line of Table 3).

Given the fairly large gap between the proportions of the two program groups that qualified for the supplement, it is worth returning for a moment to Figure 1. There we see that even though the rate of supplement qualification for the SSP Plus group was roughly 13 percentage points higher for the SSP group, there is a much smaller gap in the proportions of the two groups working at any one point in time. That is because individuals who qualified

for the supplement did not have to remain in full-time employment. They could qualify by working full time for the required time and then leave their jobs. Said differently, during the first three years after random assignment there was no significant difference in the full-time employment rates of the SSP Plus and regular SSP program groups *even though* there was a 13 percentage point difference in the proportions that had qualified for the supplement. An implication of this pattern is that the first employment spell should be shorter, on average, for the SSP Plus group.[14]

Another way of viewing the difference between the SSP Plus and regular SSP groups in the duration of their interrupted spell of non-employment is to calculate empirical survivor functions using the Kaplan–Meier product-limit estimator. Figure 3 presents the survivor functions for the two program groups and for the control group.

Figure 3: Kaplan–Meier Survivor Functions — First Non-employment Spell



The height of the function represents the probability of remaining without full-time employment until the time period on the horizontal axis. In the first 12 months after random assignment, the survivor function for the SSP Plus group falls much more quickly than the regular SSP function, reflecting the greater likelihood of finding a full-time job in the first 12 months after random assignment (see Table 3). After the eligibility period ends, however, the two functions remain the same distance apart, implying that the likelihood of leaving the interrupted spell is about the same after the eligibility period ends. The survivor function for the control group members lies everywhere above that of the two program groups, indicating their lower probability of ending their interrupted spell.

[14]This does not mean that SSP Plus participants always had relatively short spells of employment, only that they might have taken a short-term job after random assignment in order to qualify for the supplement.

The fact that SSP Plus group members were more likely to find a full-time job within the eligibility period presumably reflects the services they received during that period and has been noted in previous evaluations.

THE DURATION OF THE FIRST FRESH EMPLOYMENT SPELL

We now describe the first "fresh" spell of full-time employment for SSP Plus and regular SSP participants, where "fresh" means that the spell began after random assignment. Unlike the first spell during which respondents were not working full time, which began at baseline for most respondents, the first fresh spell of full-time employment (if any) could have begun at any point between random assignment and the end of the 51st month after random assignment.

Table 4 contains an experimental analysis of the duration of the first fresh full-time employment spell, showing the proportion of the SSP Plus, regular SSP, and control groups in each of several duration categories.[15] No distinction is made in Table 4 between those who did and did not qualify for the supplement. If SSP Plus encouraged only short-term jobs taken for the purpose of qualifying for the supplement, most of the 10 percentage point difference in the fractions that had ever worked full time would be concentrated in the shortest duration categories. The table shows (Column 4) that most of that 10 percentage point difference is in the shortest duration category (less than six months), with the remainder spread across the longer categories. These results support an interpretation that the initial effect of SSP Plus was to encourage full-time work that lasted for a relatively short period of time; that is, the SSP Plus group may have worked full time only to qualify for the supplement and then left their first job quite quickly. However, it is worth noting that a slightly smaller proportion of the SSP Plus group had a first full-time employment spell that lasted 6 to 12 months.

Within the framework of social experimentation, researchers cannot go much further in analyzing the duration of full-time employment. This is because the sub-sample of individuals who ever found full-time work is not random. To illustrate this point, Table 5 compares the mean values of observable characteristics for SSP Plus, regular SSP, and control group members who had *ever* worked full time in the follow-up period with the means for those who had *never* worked full time in the follow-up period. When we conduct tests of the equality of the population means for the "ever" and "never" full-time employed groups, we reject the null hypothesis at the five per cent significance level for many of the variables. Those who worked full time were younger, more likely to have graduated from high school, less likely to have emotional problems, and more likely to have worked full time prior to random assignment. These results indicate that the two groups were significantly different in terms of their observable characteristics.

[15]These spells are right-censored at the date of the 54-month interview. That is, they are not completed spells and may have continued for longer than the number of months shown. The same is true in Table 7.

Table 4: Duration of First Spell of Full-Time Employment (All Participants)

Category	(1) SSP Plus (n = 252)	(2) Regular SSP (n = 253)	(3) Control Group (n = 249)	(4) SSP Plus vs. Regular SSP Impact
1 ≤ duration < 6 months	26.59	17.79	22.09	8.80
6 ≤ duration < 12 months	13.10	15.81	15.66	-2.72
12 ≤ duration < 18 months	6.75	3.56	5.22	3.19
18 ≤ duration < 24 months	4.76	5.14	2.01	-0.38
24 ≤ duration < 30 months	3.97	3.95	2.01	0.02
30 ≤ duration < 36 months	2.78	3.56	2.41	-0.78
36 ≤ duration < 42 months	3.57	4.35	0.00	-0.78
42 ≤ duration < 48 months	3.57	3.16	1.20	0.41
Duration of 48 months or longer	4.37	2.77	2.01	1.60
No full-time work after random assignment	30.56	39.92	47.39	-9.37
Total	100.00	100.00	100.00	0.00

Table 5: Variable Means and Standard Deviations for Those Who Worked Full Time After Random Assignment and Those Who Never Worked Full Time After Random Assignment

	All Those Who Worked Full Time After Random Assignment (n = 458)		All Those Who Never Worked Full Time After Random Assignment (n = 296)	
Variable	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**
NKIDS**	1.48	0.69	1.69	0.82
YGCHLE4	0.48	0.50	0.44	0.50
BLTHS**	0.41	0.49	0.68	0.47
NVRMAR	0.59	0.49	0.55	0.50
MONTHIA**	29.70	7.83	31.33	7.49
EMOPROB**	0.04	0.19	0.13	0.36
BENEFIT ($00) **	6.51	1.51	7.16	1.32
BAGE2325**	0.15	0.36	0.09	0.28
BAGE2629	0.17	0.38	0.17	0.38
BAGE3034	0.19	0.40	0.20	0.41
BAGE3539	0.17	0.37	0.16	0.37
BAGEGE40**	0.12	0.32	0.25	0.44

Note: ** indicates that there is a statistically significant difference in means at the 0.05 level.

Members of both program groups who took up full-time employment may also differ systematically, in unobservable ways, from each other and from control group members who found full-time employment. In general, any comparison of means or proportions that is limited to program and control group members who worked full time will not be "comparing comparables." The analysis of the impact of SSP and SSP Plus on those who qualified for the supplement (or received job-search services) — the "effect of the treatment on the treated" — must therefore account non-experimentally for the differences between the two groups.

For descriptive purposes, however, we begin with several analyses that do not account for any potential systematic differences between the two groups. All of these analyses are non-

experimental, and thus it is possible that the results are as much a function of the techniques employed as they are of the underlying economic behaviour.

We first distinguish among four different program groups. One subset of the 252 SSP Plus program group qualified for the supplement (giving them a financial incentive to be employed full time during the subsequent 36 months); we will call these participants the "SSP Plus take-up group." This group not only received the SSP supplement when they were working full time, but also received a variety of job-related services when they were non-employed or looking for a different job. Another subset of the SSP Plus program group did not qualify for the supplement and received no further job-related services after the 12-month eligibility period ended; this group will be called the "SSP Plus non-take-up group." The 253-member "regular SSP group" can be divided similarly. One subgroup — the "regular SSP take-up group" — consists of all regular SSP program group members who qualified for the SSP supplement. This group received the supplement when they were working full time but received nothing else. Finally, the regular SSP program group members who did not qualify for the supplement received neither the supplement nor any job-related services (the "regular SSP non-take-up group").

A difficult issue in any SSP analysis of the "effect of the treatment on the treated" is defining the group that was actually "treated" in the sense of receiving an SSP supplement. Supplement receipt was carefully documented in the SSP's Program Management Information System (PMIS); that database was used to document supplement eligibility, to record hours and weeks worked, and to determine the amount of the supplement paid to eligible members of both program groups. Using the PMIS data, we can easily define the SSP Plus and regular SSP take-up groups. The first row of Table 6 shows that according to the PMIS, 135 of the 252 SSP Plus group members had ever received the supplement; similarly, 92 of the 253 regular SSP group members had ever received the supplement.

The PMIS, however, contains no information about the SSP control group. In order to analyze the effect of the treatment on the treated, information on the employment of both program and control groups is required, and the only source of such information is the follow-up surveys. Not surprisingly, the survey data (reported by participants) are not the same as the PMIS data (compiled by program administrators). The second row of Table 6 shows that according to survey data, 131 of the 252 SSP Plus group members worked full time in the first 13 months after random assignment as did 99 of the regular SSP group members.

There is good reason to believe that the PMIS data are the best source of information about who actually received an SSP supplement. Even if the person accurately reported working full time in the first 13 months after random assignment, they may not have applied for the supplement, or the job they held might not have been eligible (e.g. jobs in family businesses were not eligible).

However, using the PMIS definition of "take-up" creates several important problems. In the survey data, a number of those who received the supplement according to the PMIS reported that they had never worked full time during the qualifying period. As a consequence, if we use the PMIS definition we will have take-up group members who never ended their first spell of unemployment. And we will have non-take-up group members who found full-time work in the first 13 months after random assignment. To be precise, of the

135 SSP Plus group members who received a supplement according to the PMIS, 18 did not report working full time in the first 13 months after random assignment. Of the 117 SSP Plus group members who did *not* receive a supplement according to the PMIS, 14 reported working full time in the first 13 months. The comparable numbers of the regular SSP group are 11 and 18; said differently, about seven per cent (11/154) of the regular SSP group who did not report working during the qualifying period received a supplement. The implication for our analysis is that there would be take-up group members who have long first non-employment spells and non-take-up group members who have short non-employment spells. The relevant numbers are large enough to create differences in coefficient estimates.

Table 6: Different Definitions of SSP Supplement "Take-Up"

Definition	SSP Plus (n = 252)	Regular SSP (n = 253)
Number who ever received an SSP supplement according to PMIS	135	92
Number who reported, on the follow-up surveys, that they had working full time in the first 13 months after random assignment	131	99

In the remainder of this paper, we use a definition of "take-up" drawn from the survey data. That is, we include in the "take-up" group all program group members who reported working full time in any of the first 13 months after random assignment. With that definition, the 252-member SSP Plus program group can be divided into 131 take-up group members and 121 non-take-up group members; the regular SSP program group consists of 99 take-up group members and 154 non-take-up group members.

Returning to the descriptive analysis of employment spells, consider all program group members who worked full time at any point during the follow-up period — 175 members of the SSP Plus program group and 152 members of the regular SSP program group. This group will include all of the take-up group members and any non-take-up group members who found full-time work after the qualifying period ended. If the force of SSP Plus was simply to induce participants to qualify for the supplement, the SSP Plus take-up group members might have considerably shorter employment durations than the SSP Plus non-take-up group (who did not qualify for the supplement). This is because those who did not qualify for the supplement might have taken full-time jobs (at whatever point that occurred) for reasons other than simply qualifying for a supplement, and were thus likely to have longer first employment spells than the SSP Plus take-up group.

Table 7 shows the duration of the first fresh employment spell for those who ever worked.[16] Columns 1 and 2 of Table 7 show no pattern of shorter durations for the SSP Plus take-up group. The two SSP Plus groups have virtually the same proportions in the two shortest duration categories (just under 60 per cent in both groups). The SSP Plus take-up group had a greater proportion with long first employment spells (longer than 36 months), but that is to be expected, because by definition they began their first full-time jobs earlier in the follow-up period.

[16]Table 7 distinguishes among take-up and non-take-up groups among those who worked full-time in the follow-up period. There are also program group members who never worked full time and who are therefore also in the overall "non-take-up" group (and who are not included in Table 7).

Table 7: Duration of First Spell of Full-Time Employment

Category	(1) SSP Plus Take-Up Group	(2) SSP Plus Non-Take-Up Group	(3) SSP Plus Group	(4) Regular SSP Take-Up Group	(5) Regular SSP Non-Take-Up Group	(6) Regular SSP Group
1 ≤ duration ≤ 6 months	43.51	43.18	43.43	29.29	47.17	35.53
7 ≤ duration ≤ 12 months	14.50	15.91	14.86	15.15	32.08	21.05
13 ≤ duration ≤ 24 months	12.21	27.27	16.00	19.19	9.43	15.79
25 ≤ duration ≤ 36 months	8.40	13.64	9.71	14.14	9.43	12.50
Duration > 36 months	21.37	0.00	16.00	22.22	1.89	15.13
Total	100.00	100.00	100.00	100.00	100.00	100.00
Sample size	131	44	175	99	53	152

When we consider all SSP Plus group members and regular SSP group members together (columns 3 and 6 of Table 7), we see that the SSP Plus group was considerably more likely to have a first fresh spell of full-time employment that was relatively short (less than six months), but the regular SSP group were more likely to have a first fresh spell in the 6 to 12 month range. This is again consistent with the idea that SSP Plus induced some of its participants to find short-lived full-time jobs in order to qualify for the supplement.

We estimated (but do not show) the empirical survivor functions for the first employment spell of the five groups: the SSP Plus take-up group, the SSP Plus non-take-up group, the regular SSP take-up group, the regular SSP non-take-up group, and the control group. The two take-up groups "survived" in their first full-time job for longer than the three groups that were not eligible for the supplement. The SSP Plus non-take-up group and the regular SSP non-take-up groups are those who found full-time work at some point in the follow-up period (most of those who were not eligible for the supplement did not find such work). They also tended to lose their jobs more quickly than the take-up groups and at about the same rate as the control group.

MULTIPLE SPELLS OF NON-EMPLOYMENT AND EMPLOYMENT

Over the course of the follow-up period, many SSP Plus participants had more than one spell when they were or were not working full time. It is important to include this information when evaluating the overall effects of the SSP program, because one of the long-term goals of SSP Plus was to increase the likelihood that the take-up groups would work full time. In order to assess whether this goal was, met we need to analyze the labour market behaviour of the take-up groups after their 36-month supplement eligibility period ended. The first employment spell lasted less than 36 months for almost 85 per cent (236 of 281) of SSP Plus and regular SSP group members who ever worked full time, so spells beyond the first must be considered.

Table 8 shows the number of spells of not working full time for each person, and Table 9 shows the number of full-time employment spells. Tables 8 and 9 include all members of all groups rather than only those who had ever worked full time. About 80 per cent of the SSP Plus take-up group, and 70 per cent of the regular SSP take-up group had more than one spell of not working full time, meaning that they found a full-time job after random assignment

and then stopped working full time within the follow-up period. A much smaller percentage of those who were not eligible for the supplement had more than one such spell.

Table 8: Number of Spells of Non-employment

Number of Spells	(1) SSP Plus Take-Up Group	(2) SSP Plus Non-Take-Up Group	(3) Regular SSP Take-Up Group	(4) Regular SSP Non-Take-Up Group	(5) Control Group
0	1.53	0.00	2.02	0.00	1.20
1	20.61	77.69	29.29	77.92	62.65
2	36.64	14.88	35.35	12.99	21.69
3	28.24	4.13	23.23	5.19	10.84
4+	12.98	3.31	10.10	3.90	3.61
Total	100.00	100.00	100.00	100.00	100.00
Sample size	131	121	99	154	249

Table 9: Number of Employment Spells

Number of Spells	(1) SSP Plus Take-Up Group	(2) SSP Plus Non-Take-Up Group	(3) Regular SSP Take-Up Group	(4) Regular SSP Non-Take-Up Group	(5) Control Group
0	0.00	63.64	0.00	65.58	47.39
1	31.30	26.45	43.43	22.73	26.10
2	39.69	5.79	33.33	7.14	17.27
3	19.08	3.31	17.17	3.90	6.43
4+	9.92	0.83	6.06	0.65	2.81
Total	100.00	100.00	100.00	100.00	100.00
Sample size	131	121	99	154	249

Table 9 shows that most take-up group members had more than one full-time job in the follow-up period and that almost 20 per cent of both take-up groups had more than two jobs. Since most of those who did not qualify for the supplement never held a full-time job in the follow-up period, only small proportions had more than two jobs.

As noted above, we determine the eligibility of each member of both program groups for the SSP supplement by the month after random assignment (when their first full-time employment spell began). Those who were eligible for the supplement should have had second and higher non-employment spells that were shorter than those of either the control group or the non-take-up group. A complicating factor here is that even short spells of employment or non-employment may "cross" the point in time when the take-up group members lost their eligibility for the supplement. For example, a supplement recipient might hold their first full-time job for 30 months, stop working for three months, and then find a new second full-time job. After three months on the second job, their eligibility for the supplement would end. Accounting for this phenomenon requires the more detailed econometric analysis that follows.

The two take-up groups are of particular interest here because the SSP Plus take-up group had access to job-search and job-retention services even after the 12-month qualifying period had ended. We estimated (but again do not show) Kaplan–Meier survival functions for all

spells of non-employment and employment beyond the first. For example, if an individual had three non-employment spells, we would treat the two spells that follow the first as if they were the second spells of two different individuals. That is, we do not run separate models of the duration of the second, third, and higher non-employment spells. We do this because there is no pressing reason to expect differences in the determinants of the durations of any higher order spells, and treating them separately would complicate an already complex modelling process. Similarly, all spells of employment after the first are combined.

In the end, however, there was no difference between the survival functions of the SSP Plus take-up group and the regular SSP take-up groups. Using the log-rank test for the equality of survivor functions, we could not reject the hypothesis of equality for either the employment or unemployment functions.

IV. Econometric Model

In this section, we develop a model of hazard rates out of employment and non-employment as a function of the Self-Sufficiency Project (SSP) and SSP Plus program incentives.

A MODEL OF EMPLOYMENT AND NON-EMPLOYMENT DURATIONS

The econometric model set out here allows us to obtain estimates of the impacts of the SSP and SSP Plus incentives that are not subject to the biases discussed earlier. We can estimate the impact prior to take-up, during the incentive period, and after the incentive period is over. The latter estimates are particularly important since they are measures of the long-term impact of SSP and the long-term incremental impact of SSP Plus.[17] Generating such estimates allows us to evaluate whether SSP and SSP Plus achieved their long-term goals of encouraging lone parents on welfare to leave income assistance (IA) permanently and move into the labour force.

The econometric analysis of SSP and SSP Plus is an important advance over the analysis of the previous section for at least two reasons. First, an important assumption in estimating empirical survival functions such as that appearing in Figure 3 is that the population at risk is homogeneous. One kind of participant is no more likely to "fail" than any other participant. This is clearly not true for SSP participants. For example, IA recipients who worked in the recent past were more likely to be able to find employment in the future than those who had no recent work history. The econometric analysis allows us to estimate their labour market behaviour conditional on observable characteristics that affected this behaviour. Second, any analysis based on non-random sub-samples of the program and control groups is non-experimental in nature and hence requires a framework that controls for non-random selection, unobserved heterogeneity, and duration dependence. Our econometric analysis provides such a framework.

Our model is in the spirit of the training model presented in Eberwein, Ham, and Lalonde (1997, p. 666). Following this model, we estimate equations for the interrupted spells that are distinct from the equations for subsequent fresh spells. As discussed in Eberwein, Ham, and Lalonde, the interrupted spells are different from fresh spells because part of their duration occurred prior to random assignment. Define y^*_{u1idt} and y^*_{e1idt} as latent measures of the propensities to exit non-employment and employment, respectively, for person *i*, spell duration *d*, and in (relative) month *t.* We specify the equation for the interrupted spells as:

[17] Recall that "long-term" in the context of this paper refers to the period between the end of supplement eligibility for the take-up groups and the last survey interview. Thus the "long-term" is relatively short.

$$
\begin{aligned}
y^{*}_{u1idt} &= \alpha_{0u} + \mathrm{X}_{it}\alpha_{1u} + \alpha_{2u}\mathrm{PRE\text{-}INCENTIVE}_{it} + \alpha_{3u}\mathrm{NO\text{-}INCENTIVE}_{it} \\
&\quad + \alpha_{4u}\mathrm{PRE\text{-}INCENTIVE\text{-}PLUS}_{it} + \alpha_{5u}\mathrm{NO\text{-}INCENTIVE\text{-}PLUS}_{it} \\
&\quad + h_u(d, \alpha_{6u}) + \theta_{u1i} + \varepsilon_{u1it}
\end{aligned} \tag{1}
$$

and

$$
\begin{aligned}
y^{*}_{e1idt} &= \alpha_{0e} + \mathrm{X}_{it}\alpha_{1e} + \alpha_{2e}\mathrm{INCENTIVE}_{it} + \alpha_{3e}\mathrm{POST\text{-}INCENTIVE}_{it} \\
&\quad + \alpha_{4e}\mathrm{INCENTIVE\text{-}PLUS}_{it} + \alpha_{5e}\mathrm{POST\text{-}INCENTIVE\text{-}PLUS}_{it} \\
&\quad + h_e(d, \alpha_{6e}) + \theta_{e1i} + \varepsilon_{e1it}
\end{aligned} \tag{2}
$$

We observe

$$
y_{u1idt} = \begin{cases} 0; \text{remain non-employed if } y^{*}_{uidt} \le 0 \\ 1; \text{exit non-employment if } y^{*}_{uidt} > 0 \end{cases}
$$

and

$$
y_{e1idt} = \begin{cases} 0; \text{remain employed if } y^{*}_{eidt} \le 0 \\ 1; \text{exit employment if } y^{*}_{eidt} > 0 \end{cases}
$$

Where X_{it} is a vector of observable covariates, the $h(.)$ functions are general functions that capture duration dependence, and ε_{j1it} ($j = u, e$) are unobserved i.i.d. error terms.

Two of the key program variables in Equation (1) are the time-varying binary indicators PRE-INCENTIVE and NO-INCENTIVE. PRE-INCENTIVE is a 0-1 indicator that takes the value 1 for regular SSP and SSP Plus group members during the first 12 months after random assignment, when they could have become eligible for the supplement by finding a full-time job. NO-INCENTIVE is a 0-1 indicator that takes the value 1 for regular SSP and SSP Plus group members after the 12-month "window" to qualify for supplement eligibility had closed. PRE-INCENTIVE and NO-INCENTIVE are included to measure the impact of being in the regular SSP and SSP Plus groups during and after the 12-month qualifying period, respectively. They are defined for all SSP participants who were not working full time at baseline and hence are exogenous; they are always zero for control group members. During the first 12 months of their interrupted non-employment spell, members of the regular SSP and SSP Plus groups had a substantial financial incentive to find employment. The coefficient for PRE-INCENTIVE will capture the effect of this incentive on the exit propensity from the interrupted non-employment spell. The coefficient for NO-INCENTIVE will capture the effect of SSP on those who did not qualify for the supplement. The other two program variables in Equation (1) — PRE-INCENTIVE-PLUS and NO-INCENTIVE-PLUS — represent the analogous program variables for the SSP Plus group only. Hence the corresponding coefficients measure the incremental impact of being in the SSP Plus group as compared with the regular SSP group.

Equation (2) applies only to SSP participants who were employed full time at baseline (and who thus had an interrupted employment spell). The key program variables in Equation (2) are the time-varying binary indicators INCENTIVE, INCENTIVE-PLUS, POST-INCENTIVE, and POST-INCENTIVE-PLUS. INCENTIVE is a 0-1 indicator that takes the value 1 for regular SSP and SSP Plus group members during the first 36 months during which they were eligible for the SSP supplement; POST-INCENTIVE takes the value 1 for regular SSP and SSP Plus group members during months after their eligibility for the supplement had ended. These variables are always zero for control group members. INCENTIVE-PLUS and POST-INCENTIVE-PLUS are defined analogously for the SSP Plus group only. We use separate indicators for the periods before and after supplement eligibility ends because we believe that the impact of supplement eligibility on employment durations will differ during the incentive and post-incentive periods. In Equation (2), these four program indicators are exogenous because all program group members who were working full time at baseline immediately qualified for the supplement; no self-selection was involved.

Next, we specify the hazard rate equations for fresh non-employment and employment spells:

$$\begin{aligned} y^{*}_{u2idt} &= \beta_{0u} + \mathrm{X}_{it}\beta_{1u} + \beta_{2u}\mathrm{INCENTIVE}_{it} + \beta_{3u}\mathrm{POST\text{-}INCENTIVE}_{it} \\ &\quad + \beta_{4u}\mathrm{INCENTIVE\text{-}PLUS}_{it} + \beta_{5u}\mathrm{POST\text{-}INCENTIVE\text{-}PLUS}_{it} \\ &\quad + h_u(d, \beta_{6u}) + \theta_{u2i} + \varepsilon_{u2it} \end{aligned} \tag{3}$$

and

$$\begin{aligned} y^{*}_{e2idt} &= \beta_{0e} + \mathrm{X}_{it}\beta_{1e} + \beta_{2e}\mathrm{INCENTIVE}_{it} + \beta_{3e}\mathrm{POST\text{-}INCENTIVE}_{it} \\ &\quad + \beta_{4e}\mathrm{INCENTIVE\text{-}PLUS}_{it} + \beta_{5e}\mathrm{POST\text{-}INCENTIVE\text{-}PLUS}_{it} \\ &\quad + h_e(d, \beta_{6e}) + \theta_{e2i} + \varepsilon_{eit} \end{aligned} \tag{4}$$

The key program variables in equations (3) and (4) are again the time-varying binary indicators INCENTIVE, INCENTIVE-PLUS, POST-INCENTIVE, and POST-INCENTIVE-PLUS. These variables are similar to those in Equation (2), with one crucial difference — they only take on the value 1 for the take-up groups (the program group members who had qualified for the supplement). Since these program group members must *choose* to take up the 36-month SSP incentive program, the four program variables in equations (3) and (4) are endogenous. In the next section, we discuss how we control for this endogeneity in the estimation process.

For the later specification of a fifth equation of the model, it is important to realize that the program variables in equations (1) to (4) are all constructed using only the 0-1 variables indicating random assignment to the regular SSP and SSP Plus groups, defined in different months of the follow-up period.

Note also that the coefficients in equations (1) to (4) measure the change in the probability of exiting non-employment and employment. For example, positive values for

the α's and β's associated with X_{it} and the program variables will increase the probability of exit and hence *decrease* the duration of non-employment and employment.

In equations (1) and (3), θ_{u1i} and θ_{u2i} represent unobserved heterogeneity in individual propensities to exit non-employment. In equations (2) and (4), θ_{e1i} and θ_{e2i} represent unobserved heterogeneity in individual propensities to exit employment. Conditional on the observables, individuals with relatively large values of θ_{u1i} and θ_{u2i} will be more likely to exit non-employment, leaving those who remain with relatively low values of θ_{u1i} and θ_{u2i}. Again conditional on the observables, individuals in the latter group will have a lower average probability of exiting non-employment. If we do not account for θ_{u1i} and θ_{u2i}, this decline in the exit probability over the duration of the spell will be erroneously identified as negative duration dependence. We will control sample selection bias by allowing the unobserved heterogeneity terms to be correlated when the equations of the model are jointly estimated.

EXPECTED SIGNS OF THE COEFFICIENTS OF THE PROGRAM VARIABLES IN EQUATIONS (1) TO (4)

In general, we think that eligibility for SSP Plus services should have accentuated the impact of the SSP supplement, relative to receiving the supplement alone. That is, incentives to leave non-employment or to stay in full-time employment should have been even stronger for the SSP Plus group than they were for the regular SSP group.

Interrupted spell of non-employment: First, we expect that the coefficient for PRE-INCENTIVE in Equation (1) will be positive since the regular SSP and SSP Plus groups had an incentive to find a full-time job in the first 13 months after random assignment. The coefficient for PRE-INCENTIVE-PLUS — representing the incremental impact of SSP Plus — should also be positive, because SSP Plus group members would have been participating in activities that were thought to make them more likely than regular SSP group members to leave non-employment. Second, all take-up group members would have exited their initial non-employment spell by Month 13, so NO-INCENTIVE and NO-INCENTIVE-PLUS will capture the impact of SSP and SSP Plus on remaining program group members after the pre-incentive period has ended. Since all members of the program groups had a greater incentive than control group members to look for work during the qualifying period, that experience may have made program group members generally more able to find work than those in the control group, even after the end of the qualifying period. Under this scenario, the coefficient for NO-INCENTIVE will be positive. The coefficient for NO-INCENTIVE-PLUS might be positive if the services that all SSP Plus group members received had continuing effects even after the qualifying period had ended.

In an alternative scenario, the most job-ready program group members might have found jobs in the first 13 months, leaving only less job-ready program group members still in the sample after Month 13. Under this alternative scenario, the coefficient for NO-INCENTIVE would be negative. The coefficient for NO-INCENTIVE-PLUS might be positive if the SSP Plus services had continuing effects under this alternative scenario.

Interrupted spell of employment: For those who were working full time at baseline, we expect that the coefficients on INCENTIVE and INCENTIVE-PLUS in Equation (2) will be negative since those who were eligible for the supplement had a stronger incentive to remain in a full-time job (i.e. less likely to exit full-time employment) than those who were ineligible. Those in SSP Plus might have received services that further helped them stay employed full time. The coefficients on POST-INCENTIVE and POST-INCENTIVE-PLUS will be negative if SSP and SSP Plus had a long-lasting impact on those who were employed at baseline. This can happen if, for example, program group members worked more than control group members (due to the incentive of receiving the supplement) and received higher wages in the post-supplement period as a result.

Fresh spells of non-employment: We estimate all subsequent (and therefore fresh) spells of non-employment together (though we note that there is a common unobserved heterogeneity term for the spells for each person). We expect that the coefficient for INCENTIVE will be positive since regular SSP and SSP Plus group members had an incentive to regain full-time employment as long as they were eligible for the earnings supplement. Once again, the coefficient on INCENTIVE-PLUS might also be positive if the SSP Plus services were effective. Finally, the coefficients on the instrument for POST-INCENTIVE and POST-INCENTIVE-PLUS will be positive if SSP and SSP Plus had a long-run impact on the labour force behaviour of the two program groups.

Fresh spells of employment: During fresh employment spells, the SSP incentive was in place for the two take-up groups (at least for the first 36 months after their first month of full-time employment) and irrelevant for the non-take-up groups. We expect that the coefficients on INCENTIVE and POST-INCENTIVE will be negative since take-up group members should have been less likely to leave employment (i.e. to have longer employment spells) due to the program incentive (and to the SSP Plus services where relevant). The coefficients on POST-INCENTIVE and POST-INCENTIVE-PLUS capture the long-term impacts of SSP since they measure the differential behaviour of the take-up groups after they stop receiving the SSP benefits. If the coefficient for POST-INCENTIVE is less than zero, then this is evidence that SSP had a long-term impact on the regular SSP and SSP Plus group, lengthening the employment durations of the take-up groups. The coefficient for POST-INCENTIVE-PLUS measures the long-term incremental impact of SSP Plus.

The most important results in this paper are the coefficients on POST-INCENTIVE and POST-INCENTIVE-PLUS. If SSP had a long-term effect on the likelihood of non-employment or employment, then the coefficient for POST-INCENTIVE should be positive or zero for the non-employment hazards and negative or zero for the full-time employment hazards. The additional services received by the SSP Plus program group should make durations of non-employment shorter and durations of full-time employment longer.

V. Empirical Results

In this section we present the empirical results for the econometric model provided in Section IV. The data are monthly observations on the employment status (working full time or not) of the 253 regular SSP group members, 252 SSP Plus group members, and 249 control group members. The data capture up to six non-employment and six employment spells for each individual. In the first sub-section, we present the model estimator and discuss some special issues that arise in its development. In the second sub-section we present the estimation results.

MODEL ESTIMATOR

Two important features of the model presented in the previous section must be reflected in our estimator if it is to provide consistent coefficient estimates. First, the variables INCENTIVE, INCENTIVE-PLUS, POST-INCENTIVE, and POST-INCENTIVE-PLUS in the fresh unemployment and employment spell equations (i.e. in equations 3 and 4) are endogenous. Second, whereas the interrupted unemployment and employment spell equations (equations 1 and 2) are experimental due to the randomized nature of SSP, this is not the case for the fresh spells because individuals non-randomly chose to exit the interrupted spells for the fresh spells. While they may seem similar, these two issues are actually quite different. The first results from program group members who chose to take-up the supplement by becoming employed full time during the 13 month qualifying period. The second results from all SSP participants — in both program and control groups — who chose to enter fresh spells of employment or non-employment. Our estimator controls for the first problem by creating instruments for the program participation variables and controls for the second problem by allowing the unobserved heterogeneity terms in equations (1) to (4) to be correlated. Our estimator is developed formally in the Appendix. Here we describe, in a less formal way, how we handled each problem.

Endogeneity of SSP Program Variables

Since SSP and SSP Plus program group members non-randomly chose to take up the SSP and SSP Plus incentives, the take-up variables that define these sub-groups are endogenous. In order to account for this endogeneity, we specify another equation for whether or not an individual found full-time employment in the first 13 months after random assignment, using PROGRAM and SSPLUS — the 0-1 indicators of whether or not the person was randomly assigned to the regular SSP group and the SSP Plus group — as instruments:

$$\mathrm{WFT13}_i^* = \pi_0 + \mathrm{X}_i\pi_1 + \pi_2\mathrm{PROGRAM}_i + \pi_3\mathrm{SSPLUS}_i + \varepsilon_i \qquad (5)$$

For all participants, we observe

$$\text{WFT13}_i = \begin{cases} 0; \text{ remain non-employed for first 13 months if WFT13}_i^* \leq 0 \\ 1; \text{ full-time employed in first 13 months if WFT13}_i^* > 0 \end{cases}$$

One can view Equation (5) as the instrumenting equation for the endogenous take-up variables in equations (3) and (4). The consistent estimator involves the joint estimation of equations (1) to (4) and Equation (5). Details are provided in the Appendix. Note that INCENTIVE and POST-INCENTIVE in equations (3) and (4) represent the subsets of the regular SSP and SSP Plus groups who took up the SSP earnings supplement, defined in different periods after random assignment, and hence represent only one endogenous variable. That is, only the 0-1 PROGRAM and SSPLUS variables are used in their construction. For INCENTIVE_PLUS and POST-INCENTIVE_PLUS, only the 0-1 SSPLUS variable is used. Hence the two instruments PROGRAM and SSPLUS are enough to identify the model.

Non-random Selection Into Full-Time Work

In order to control for the non-random selection into subsequent employment and unemployment spells, Ham and LaLonde (1996) allow the individual-specific error terms (i.e. the θ's representing unobserved heterogeneity) to be correlated across the non-employment and employment duration equations. Whereas standard selection models include a selection and a behavioural equation that occur contemporaneously, in this case the non-employment and employment equations occur sequentially (i.e. dynamically). Eberwein, Ham, and Lalonde (1997) call the bias that can arise in this framework "dynamic selection bias."

Following Ham and LaLonde, we model the unobserved heterogeneity terms as

$$\begin{aligned} \theta_{uj} &= \alpha_{1uj} + \alpha_{2u}\theta^* \\ \text{and} \qquad & \qquad \text{j= 1, 2} \qquad (6) \\ \theta_{ej} &= \alpha_{1ej} + \alpha_{2e}\theta^* \end{aligned}$$

where θ^* is drawn from a two point distribution. Normalizing $\alpha_{1u1} = 0$ and $\alpha_{2u} = 1$ reduces the number of parameters to estimate by two. The main reason that we allow for only two points of support is due to the computational complexity of the model.[18] While the fact that we only allow for two types of unobserved heterogeneity might seem limiting, increasing the number of points of support usually has little impact on the results.

COEFFICIENT ESTIMATES

We include the following covariates, measured in the baseline survey and summarized in Table 1, in the employment and non-employment equations: dummy variables that

[18]Ondrich and Rhody (1999) provide a method for organizing the data that simplifies the maximum likelihood estimation of the multiple-spell model with unobserved heterogeneity.

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 four years of age or younger (YGCHLE4), if age was between 23 and 25, 26 and 29; 30 and 34, 35 and 39; or 40 and older (BAGE2325, BAGE2629, BAGE3034, BAGE3539, and BAGEGT40, with BAGE1923 the omitted category), the number of children (NKIDS), the number of months on IA in the three years prior to the baseline survey (MONTHIA), and the average monthly IA benefit received in the four quarters prior to the baseline survey (BENEFIT).

We allow for duration dependence by including the log of the relative month, its square, and its cube (LNDURATION, $\text{LNDURATION}^{2,}$ and LNDURATION^{3}). We estimate the model using one common baseline hazard and the program variables defined in the previous section. Thus, the program variables pick up the "average" difference in the baseline hazards between the program and control groups. Ham and LaLonde (1996) recommend controlling for pre-baseline duration in the interrupted spells, claiming that this better identifies these equations. Thus, in the interrupted non-employment equation, we include TOTU, a variable measuring the number of months of non-employment in the 12 pre-baseline months. In the employment equations, we also include TOTE, defined as the number of months of full-time employment in the 12 pre-baseline months.

One issue is whether or not to update the covariates at the beginning of each fresh spell. We can (and do) update age at the beginning of such spells because we know how many months were spent in previous spells and because age is clearly exogenous. It might also be useful to update variables such as the number of children in the household, whether or not the person had a high school degree, and the person's marital status, but two complications arise. First, at the 18-, 36-, and 54-month interviews, we only know whether there has been a change in the covariates since the last interview. Thus, at best we can only update at these points and not necessarily at the month when the change occurred, or even at the beginning of each spell. Second, it may well be that fertility, educational attainment, and marital status are endogenous and affected by program take-up. In order to obtain the full program effect, these impacts would need to be taken into account. In the end, we did not attempt to update these control variables in order that any impact of SSP and SSP Plus on these variables will be reflected in the overall program effects (as measured by the coefficients on the program variables).

In the tables below, we present three different sets of results: (1) the four equations (interrupted non-employment in Table 11, fresh non-employment in Table 12, interrupted employment in Table 13, and fresh employment in Table 14) estimated separately with no individual heterogeneity and without accounting for the endogeneity of the take-up variables; (2) the same four equations estimated jointly with correlated individual heterogeneity but without accounting for the endogeneity of the take-up variables; and (3) the four equations estimated jointly allowing for correlated individual heterogeneity and accounting for the endogeneity of the take-up variables. It is somewhat surprising that with few exceptions the three sets of results are very similar. Apparently, including individual heterogeneity and accounting for the endogeneity of taking up the SSP supplement has little impact on the parameter estimates. Given such similar estimates, we focus our discussion on the third set of results for the estimator that includes correlated

individual heterogeneity and accounts for the endogenous take-up variables. We will mention the few cases where the results differ across estimators.

The variables in the model are of two types. The first is the set of demographic characteristics that we use as covariates (described above).[19] The second is the set of program variables (or their instruments) described in the previous section, which capture the effects of random assignment to either SSP Plus or to regular SSP at different points in the follow-up period.

Apart from the coefficient estimates, the model produces several other parameter estimates that relate to the importance of unobserved heterogeneity and on the possible cross-equation correlation of the heterogeneity terms. These parameter estimates are given in Table 10. The parameters μ_1 and μ_2 are the two points of support for the unobserved heterogeneity. The estimates are -0.716 and -0.519. These estimates are relatively close in magnitude and are not significantly different from each other. $p = e^{\gamma}/(1+e^{\gamma})$ is the probability that μ_1 will occur (if $\gamma = 0$, then the probability is 0.5). With γ = -0.0124, p = 0.497 so there is equal probability that each point of support will be realized. Overall, there is little evidence of substantial heterogeneity in the model. The parameters α_{1u2}, α_{1e1}, α_{1e2}, and α_{2e} determine θ_{u2}, θ_{e1}, and θ_{e2} in Equation (6). Note that none of these parameters is significantly different from zero.

Table 10: Model Parameters

Parameter	Parameter Estimate (Standard Error)
μ_1	-0.716* (0.307)
μ_2	-0.519 (0.352)
γ	-0.0124 (0.866)
α_{1u2}	-0.382 (0.127)
α_{1e1}	0.127 (2.06)
α_{1e2}	-0.688 (1.963)
α_{2e}	2.794 (2.490)

Note: * indicates significant at the 5 per cent level

Interrupted Spells of Non-employment

As discussed above, we follow Ham and Lalonde (1996) and estimate a separate equation for the interrupted spell of non-employment and show the results in Table 11.

[19]The coefficient estimates for the demographic variables (not shown) are available from the authors on request.

Table 11: Equation for the Hazard of Exiting the Interrupted Non-employment Spell

	Single Equation Estimation (No Correction for Heterogeneity, no Correction for Endogeneity)		Joint Estimation (Correction for Heterogeneity, no Correction for Endogeneity)		Joint Estimation (Correction for Heterogeneity, Correction for Endogeneity	
	Coefficient (Standard Error) (1)	**Partial Derivative (2)**	**Coefficient (Standard Error) (3)**	**Partial Derivative (4)**	**Coefficient (Standard Error) (5)**	**Partial Derivative (6)**
PRE-INCENTIVE (months 1 to 9)	0.2424	0.0100	0.2395	0.0110	0.25	0 .0126
	(0.0936)		(0.0942)		(0.4137)	
PRE-INCENTIVE-PLUS (months 1 to 9)	0.2486	0.0104	0.256	0.0120	0.2554	0.0129
	(0.0881)		(0.0895)		(0.196)	
PRE-INCENTIVE (months 10 to 13)	0.4052	0.0200	0.4087	0.0224	0.4137	0.0246
	(0.1065)		(0.1078)		(0.203)	
PRE-INCENTIVE-PLUS (months 10 to 13)	0.099	0.0035	0.1106	0.0044	0.1116	0.0049
	(0.1406)		(0.1408)		(0.292)	
NO-INCENTIVE	-0.0149	-0.0005	-0.012	-0.0004	-0.0088	-0.00034
	(0.0703)		(0.0718)		(0.075)	
NO-INCENTIVE -PLUS	0.053	0.0018	0.0605	0.0023	0.0612	0.0025
	(0.0799)		(0.0809)		(0.084)	
LNDURATION	0.0285	0.0000564	0.027	0.0000651	0.0157	0.0000819
	(0.2143)		(0.2166)		(0.231)	
$LNDURATION^2$	0.0156		0.0151		0.0246	
	(0.1272)		(0.1285)		(0.139)	
$LNDURATION^3$	-0.068		-0.064		-0.0797	
	(0.2038)		(0.2056)		(0.22)	
Number of spells	685		685		685	
Likelihood function	-5344.1855		-5339.9090		-5774.022	

In the first nine months of the eligibility period, regular SSP and SSP Plus group members had a probability of leaving their first non-employment spell for full-time work that was significantly higher than that of the control group (holding all observable characteristics constant), as shown by the positive coefficient for PRE-INCENTIVE (months 1 to 9) in Table 11. The positive and significant coefficient for PRE-INCENTIVE-PLUS (months 1 to 9) implies that members of the SSP Plus group had an even higher probability of exiting non-employment in those first nine months than the regular SSP group. These coefficients are statistically significant in the first two models (columns 1 and 3 of Table 11) but lose that statistical significance when we account for endogeneity (Column 5). In the four months leading up to the end of the qualifying period, regular SSP and SSP Plus group members once again had a higher probability of finding full-time employment when compared with the control group. As before, the coefficient for PRE-INCENTIVE (months 10 to 13) is positive. Members of the SSP Plus group again had an even greater likelihood of leaving non-employment in those four months, but the coefficient is not significant, even in the first two models. These results are broadly consistent with the survivor functions for the three groups shown in Figure 3. Overall, the SSP Plus group was more likely to find a full-time job in the qualifying period, thus becoming eligible for the SSP supplement and the additional post-take-up SSP Plus services.

Once the qualifying window was closed and those assigned to regular SSP and SSP Plus could no longer become eligible to receive the supplement, there is no difference among the three groups (given that the respondents had remained in their first non-employment spell). This is shown by the statistically insignificant coefficients on NO-INCENTIVE and NO-INCENTIVE-PLUS. That is, even though every member of the SSP Plus group was eligible to receive services — and thus all SSP Plus group members are among the "treated" — these services had no effect after the qualifying period.[20]

Many of the other covariates in the models of the interrupted non-employment spell are significantly different from zero (not shown) in the first two models. Participants who graduated from high school and who had emotional problems at the time of the baseline survey were less likely to end their interrupted non-employment spell (holding constant the program indicators). The results also imply that older women were less likely to exit non-employment. Higher levels of income assistance (IA) benefits at baseline decreased the likelihood of exiting non-employment. There is no evidence of duration dependence since neither the log of duration, its square, nor its cube is individually significant, nor are the three jointly significant at the five per cent level.

[20]The insignificance of the NO-INCENTIVE variables justifies our definition of "treated" as qualifying for the SSP supplement.

Fresh Non-employment Spells

The incentives to exit non-employment by finding full-time work change for the SSP Plus and regular SSP group members during any fresh non-employment spells. The incentive created by supplement eligibility is in effect for those who qualified for it by ending their interrupted non-employment spell within 13 months of random assignment. This incentive is not in effect for those who did not qualify for the supplement (i.e. the non-take-up groups).

The relatively small sample sizes analyzed here should be carefully considered. Only 349 individuals experienced fresh non-employment spells. This may explain (at least in part) why none of the coefficients on the program variables is statistically significant in Table 12. Hence, we focus on the derivatives and signs of the coefficients.

The coefficient for INCENTIVE is positive (0.1342) and implies a derivative of 0.0127. The magnitude of the derivative can be assessed by comparing it with that on INCENTIVE (months 1 to 9) in the interrupted non-employment equation (0.0100). The latter derivative is economically important, representing the impact of SSP on exit from the baseline non-employment spell. The coefficient for INCENTIVE implies that those in the regular SSP and SSP Plus take-up groups had a probability of exiting their fresh non-employment spells that was higher than that of the control group *while they were eligible for the supplement*. The incremental impact of being in SSP Plus (measured by the coefficient for INCENTIVE-PLUS) was positive but small, so that SSP Plus take-up group members were no more likely than the regular SSP take-up group members to exit a fresh spell of non-employment during the supplement eligibility period.

Counter to our expectations, the coefficient for POST-INCENTIVE is negative but the derivative is small. This indicates that once the incentive created by supplement eligibility had ended, the members of the regular SSP group who took up the SSP supplement were no longer more likely than the control group to end a fresh non-employment spell. That is, the shortening of the non-employment spells induced by supplement eligibility seemed to vanish after supplement eligibility ended. The coefficient for POST-INCENTIVE-PLUS is positive and economically important — its derivative is comparable to that for INCENTIVE. This is suggestive evidence that the SSP Plus take-up group members were more likely than the control group to end fresh spells of non-employment, even after the end of the eligibility period.

In contrast to the estimates of the interrupted non-employment equation, few of the coefficients on the other covariates are statistically or economically significant. One exception is that the number of months on IA in the three years prior to baseline has a significantly negative impact on exiting non-employment. There is also evidence of significant negative duration dependence. That is, the longer the participants were non-employed, the less likely it was that they left non-employment.

Table 12: Equation for the Hazard of Exiting Fresh Non-employment Spells

	Single Equation Estimation (No Correction for Heterogeneity, No Correction for Endogeneity)		Joint Estimation (Correction for Heterogeneity, No Correction for Endogeneity)		Joint Estimation (Correction for Heterogeneity, Correction for Endogeneity)	
	(1) Coefficient (Standard Error)	(2) Partial Derivative	(3) Coefficient (Standard Error)	(4) Partial Derivative	(5) Coefficient (Standard Error)	(6) Partial Derivative
INCENTIVE	0.1183	0.0127	0.1127	0.0124	0.1342	0.0158
	(0.0804)		(0.0833)		(0.148)	
INCENTIVE-PLUS	0.0221	0.0022	0.0252	0.0026	0.0203	0.0022
	(0.086)		(0.0885)		(0.093)	
POST-INCENTIVE	-0.0351	-0.0033	-0.03	-0.0029	-0.009	-0.00095
	(0.1184)		(0.122)		(0.172)	
POST-INCENTIVE-PLUS	0.149	0.0164	0.1377	0.0154	0.1323	0.0156
	(0.1465)		(0.1487)		(0.155)	
LNDURATION	-0.1631	-0.0030	-0.164	-0.0030	-0.1568	-0.0032
	(0.2097)		(0.2135		(0.219)	
$LNDURATION^2$	0.057		0.0581		0.052	
	(0.1451)		(0.1476)		(0.152)	
$LNDURATION^3$	-0.1592		-0.157		-0.1442	
	(0.2698)		(0.2742)		(0.284)	
Number of spells	588		588		588	
Likelihood function	-5344.1855		-5339.9090		-5774.022	

Interrupted Spells of Employment

We noted above that there were only 69 individuals who were working full time at baseline. Furthermore, only nine of these individuals remained in this interrupted employment spell until the beginning of the post-supplement period (i.e. longer than 36 months after random assignment). Given these small numbers, the estimates for the interrupted employment spell shown in Table 13 are not very reliable. The negative (but insignificant) coefficients on INCENTIVE and POST-INCENTIVE suggest that during and after the supplement period, regular SSP group members who were employed at baseline were less likely to exit their baseline employment spell than the comparable control group members. On the other hand, and counter to our expectations, the positive coefficients on INCENTIVE-PLUS and POST-INCENTIVE-PLUS suggests that both during and after the supplement period, members of the SSP Plus group were *more* likely to exit their interrupted employment spell than the comparable regular SSP group members. Summing the coefficients on INCENTIVE and INCENTIVE-PLUS yields the impact of SSP Plus, relative to the control group, during the supplement period. Similarly, the sum of the coefficients on POST-INCENTIVE and POST-INCENTIVE-PLUS yields the impact of SSP Plus, relative to the control group, on exit from the interrupted employment spell after supplement eligibility ended. These sums suggest that compared with the control group, members of the SSP Plus group were less likely to exit employment during the supplement period (i.e. the sum of INCENTIVE and INCENTIVE-PLUS is negative), but had the same exit rate after the supplement period ended (i.e. the sum of POST-INCENTIVE and POST-INCENTIVE-PLUS is essentially zero).

Table 13: Equation for the Hazard of Exiting the Interrupted Employment Spell

	Single Equation Estimation (No Correction for Heterogeneity, No Correction for Endogeneity)		Joint Estimation (Correction for Heterogeneity, No Correction for Endogeneity)		Joint Estimation (Correction for Heterogeneity, Correction for Endogeneity)	
	Coefficient (Standard Error) (1)	Partial Derivative (2)	Coefficient (Standard Error) (3)	Partial Derivative (4)	Coefficient (Standard Error) (5)	Partial Derivative (6)
INCENTIVE	-0.3477	-0.0486	-0.367	-0.0590	-0.3731	-0.0689
	(0.2931)		(0.3122)		(0.357)	
INCENTIVE-PLUS	0.196	0.0371	0.1494	0.0313	0.1374	0.0322
	(0.2759)		(0.3122)		(0.345)	
POST-INCENTIVE	-0.0807	-0.0132	-0.024	-0.0047	-0.0677	-0.0145
	(0.6067)		(0.6214		(0.634)	
POST-INCENTIVE –PLUS	0.0486	0.0085	-0.00005	-0.000097	0.0135	0.0030
	(0.6942)		(0.7337)		(0.77)	
LNDURATION	-0.2141	-0.0099	-0.163	-0.0078	-0.1668	-0.0086
	(0.5443)		(0.572)		(0.61)	
$LNDURATION^2$	-0.0602		-0.051		-0.0523	
	(0.4137)		(0.4247)		(0.451)	
$LNDURATION^3$	0.1088		0.0816		0.0917	
	(0.8031)		(0.8179)		(0.866)	
Number of spells	69		69		69	
Likelihood function	-5344.1855		-5339.9090		-5774.022	

Fresh Employment Spells

The incentives facing participants in fresh employment spells are broadly similar to those facing participants in the fresh non-employment spells. During the 36 months following becoming eligible for the supplement, those who are in the regular SSP or SSP Plus take-up groups have an incentive to remain in full-time employment in order receive the supplement. Those in the control group or in the non-take-up groups do not have this incentive. After the 36-month eligibility period ends for the take-up groups, the supplement will no longer provide any financial incentive to stay employed. If we see a significant impact to being in the take-up groups after supplement eligibility ends, this will be evidence of a long-term impact of SSP and SSP Plus. The program variables in the employment models are the same as those used in the above models of fresh non-employment spells.

In Table 14, the coefficient for INCENTIVE is negative but not statistically significant. However, the magnitude of the derivative is economically important (i.e. similar in size to that of the derivatives of the PRE-INCENTIVE variables in the interrupted non-employment equation). The sign (positive or negative) and magnitude of the coefficient implies that while they were eligible for the supplement, regular SSP group members had a probability of exiting fresh employment spells that was higher than that of control group members. The incremental impact of being in SSP Plus (measured by the coefficient for INCENTIVE-PLUS) was positive, so that SSP Plus program group members were more likely than the regular SSP group members to exit a fresh spell of employment. Further, the sum of the coefficients for INCENTIVE and INCENTIVE-PLUS is close to zero, implying that SSP Plus program group members were no more likely than control group members to exit a fresh spell of employment.

The coefficients for POST-INCENTIVE and POST-INCENTIVE-PLUS are small in magnitude. This indicates that once the incentive created by supplement eligibility had ended, the members of the regular SSP and SSP Plus groups who took up the SSP supplement were no more likely than the control group to end a fresh employment spell.

Few of the coefficients for the other covariates are significantly different from zero. Older participants were less likely to leave fresh spells of full-time employment, and individuals with baseline emotional problems were more likely to exit employment. There is evidence of significant negative duration dependence after the first few months of employment have passed, lasting until roughly Month 30. After this, there is a slight increase in the probability of exiting employment.

Table 14: Equation for the Hazard of Exiting Fresh Employment Spells

	Single Equation Estimation (No Correction for Heterogeneity, No Correction for Endogeneity)		Joint Estimation (Correction for Heterogeneity, No Correction for Endogeneity)		Joint Estimation (Correction for Heterogeneity, Correction for Endogeneity)	
	Coefficient (Standard Error) (1)	Partial Derivative (2)	Coefficient (Standard Error) (3)	Partial Derivative (4)	Coefficient (Standard Error) (5)	Partial Derivative (6)
INCENTIVE	-0.1894	-0.0194	-0.246	-0.0299	-0.1546	-0.0226
	(0.0665)		(0.0856)		(0.166)	
INCENTIVE-PLUS	0.0718	0.0089	0.115	0.0179	0.1042	0.0180
	(0.0731)		(0.0925)		(0.099)	
POST-INCENTIVE	-0.0296	-0.0034	-0.103	-0.0138	-0.0203	-0.0032
	(0.1367)		(0.1572)		(0.208)	
POST-INCENTIVE-PLUS	0.0087	0.0010	0.0213	0.0031	0.0105	0.0017
	(0.1569)		(0.1721)		(0.176)	
LNDURATION	1.7606	0.0045	1.8087	0.0057	1.8086	0.0071
	(0.2595)		(0.2714		(0.275)	
$LNDURATION^2$	-0.8689		-0.88		-0.8848	
	(0.1514)		(0.1574)		(0.16)	
$LNDURATION^3$	1.1426		1.1955		1.212	
	(0.2595)		(0.2732)		(0.278)	
Number of spells	763		763		763	
Likelihood function	-5344.1855		-5339.9090		-5774.022	

VI. Simulation

Using the econometric model estimated in the last section, we can now simulate the employment rates for the take-up and control groups, adjusting for differences in observable characteristics and for differences in unobserved characteristics (i.e. unobserved heterogeneity) and thus isolate the effects of the treatment on the treated for the SSP and SSP Plus take-up groups. We can also simulate the employment rates for the full treatment and control groups — all those randomly assigned either to the group that is offered the SSP earnings supplement, the group offered SSP Plus or the control group — thus simulating the experimental impacts. This will allow us to see how chance differences in observable characteristics affected the actual impact estimates.

HOW THE SIMULATION WORKS

For each of the 685 regular SSP, SSP Plus, and control group members who were not employed full time at baseline, we generate random error terms, drawn from the normal distribution, for each of the 52 months of the follow-up period.[21] Having generated these error terms, we combine them with the coefficient estimates from the joint model presented in the last section and generate a prediction of whether or not each individual was employed or non-employed full time in any month.[22] These predictions incorporate the two-point heterogeneity assumed in the specification of equations (1) to (4). That is, in addition to the coefficients, the covariates and the randomly generated normal errors, each of the individuals is given, for each of the θ's shown in Table 10, one of the two possible values of each θ.

To see how the simulation works, consider the initial situation. All 685 individuals start out in the first month of an interrupted spell of non-employment. Using the random error term and the estimated coefficients (shown in Table 11) from the hazard model of exit from the interrupted spell of non-employment (including the estimates of the two components of unobserved heterogeneity), we can predict, for each of the 685 individuals, whether they exit the first month of their interrupted spell and enter a fresh employment spell. If they do not exit, we again use the model of the interrupted non-employment spell to predict whether they exit non-employment in the second month. If they are predicted to exit the interrupted spell in the first month, the relevant equation for the second month becomes the fresh employment spell equation. In this way, we generate a simulated employment history, covering the 52 months of the follow-up period, for each of the 685 individuals. We carry out this exercise 10 times for each individual in order to limit the risk of unusual error terms. With 10 simulated employment histories, we have 6,850 observations in the simulation.

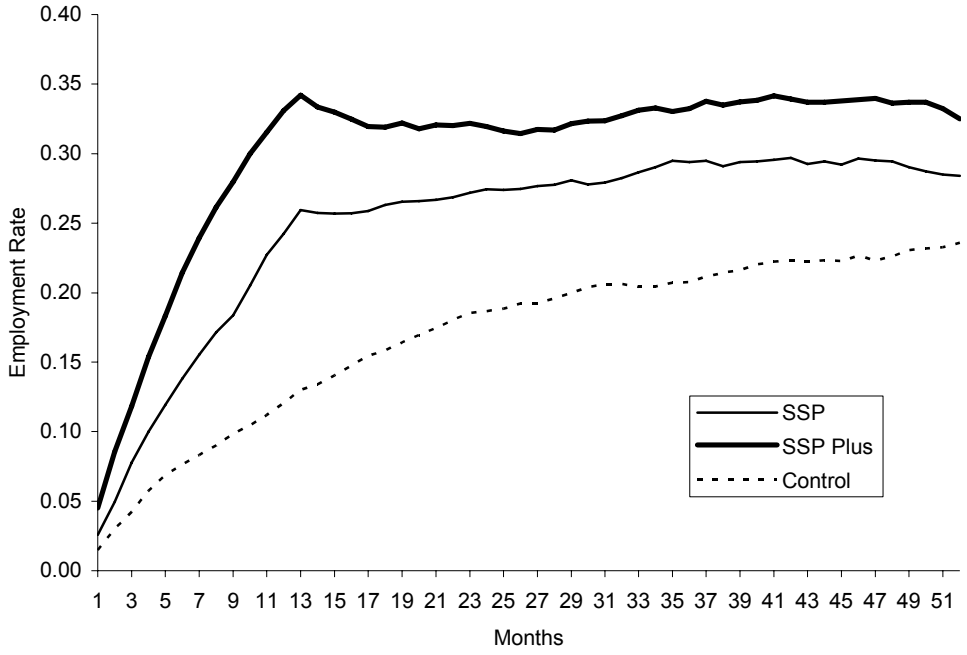
[21] Because of the unreliability of the results for the interrupted employment spell, we carry out the simulation using only the individuals who were not employed full time at baseline.

[22] The simulation also adjusts for duration dependence depending on the number of months in a given state.

Controlling for Observable Characteristics in the Experimental Impacts

Whenever random assignment is used, significant differences in observable characteristics may appear by chance. We saw in Section II that there was one significant difference between the two program groups and the control group. The SSP Plus program had significantly fewer individuals who were 40 years of age or older; that is, the SSP Plus group was on average younger than the other two groups. Since younger individuals are more likely to leave non-employment for full-time work, this apparently random element favoured the SSP Plus group. Using the simulation, we can produce impact estimates similar to those in Figure 1 that control for differences in observable characteristics.[23] The observed characteristics do not affect the simulation because all 6,850 "individuals" are used to generate all three lines in Figure 1.[24] For example, to generate the employment rates underlying the control "line," the 6,850 individuals are given the values of the program variables that the control group would have. Similarly, to generate the regular SSP and SSP Plus "lines," the 6,850 individuals are given values of the program variables that the regular SSP group and SSP Plus would have. The resulting employment rates for all 52 months are given in Figure 4. In Month 52, the employment rates for the SSP Plus, regular SSP, and control groups are 32.5 per cent, 28.4 per cent, and 23.6 per cent. This implies that the incremental treatment effect of SSP Plus is 4.1 percentage points (32.5 - 28.4) and the full treatment effect of SSP Plus is 8.9 percentage points (32.5 - 23.6).

Figure 4: Simulation of Figure 1 Using Estimated Model



[23] A more common way to hold observable characteristics constant is to estimate an ordinary least squares regression of the employment rate, including baseline covariates (e.g. age, gender, and marital status) along with the 0-1 treatment variables. When this is done here, the SSP Plus experimental impact is essentially unchanged.

[24] Since we have excluded those who were working full time at baseline, we do not actually use Figure 1, which also reflects the experience of those who were working full time at baseline.

To measure the impact that observable differences across the samples of regular SSP, SSP Plus, and control groups has on the employment rates for these three groups, we simulate the employment rates using only the members from each group. That is, we calculate the employment rate for the SSP Plus group using only the 2,300 simulation observations that correspond to SSP Plus members. We do the same for the regular SSP and control groups. The resulting employment rates in Month 52 for the SSP Plus and regular SSP groups are exactly the same as above (32.5 per cent and 28.4 per cent, respectively). The only difference is in the control group, where the employment rate is now 22.1 per cent. Thus, even though the three groups were randomly assigned, the particular random draw that occurred resulted in the control group having a 1.5 per cent lower employment rate in Month 52, all else equal. The observed employment rates in Month 52 for the 230 SSP Plus group members, the 229 regular SSP group members, and the 226 control group members were 37.6 per cent, 27.5 per cent, and 26.1 per cent, respectively. The actual incremental impact of SSP Plus among those who were non-employed at baseline is thus 10.1 percentage points (37.6 - 27.5). The full impact of SSP Plus is 11.5 percentage points. The above results indicate that while none of the 10.1 percentage point incremental treatment effect is due to observable differences, 1.5 percentage points of the 11.5 percentage point full treatment effect is due to random assignment itself. This result means, for example, that having a smaller proportion of individuals 40 years of age and older does not much affect the impact estimates.

Comparing Estimates of the Effect of the Treatment on the Treated

In Figure 2, we generated simple estimates of the effect of the treatment on the treated by comparing the SSP Plus take-up group, the regular SSP take-up group, and the members of the control group who found full-time employment in the first 13 months. Figure 5 shows the actual employment rates for these three groups, excluding those who worked full time at baseline.

Figure 5: Full-Time Employment Rates for the Take-Up Groups and the Subset of the Control Group Who Found Full-Time Work Within 13 Months of Random Assignment, Excluding All Participants Working Full Time at Baseline

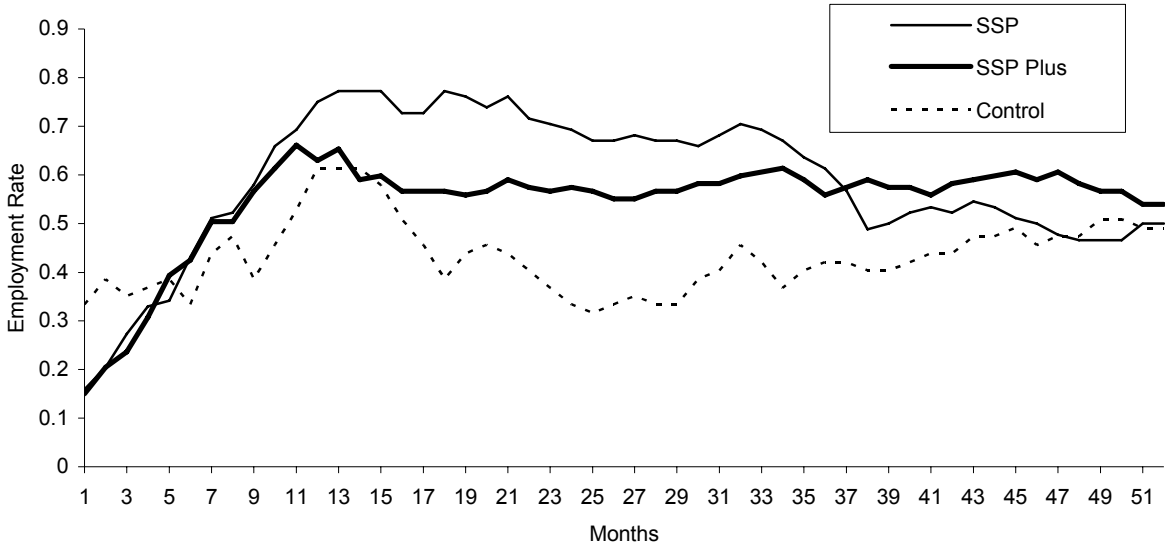
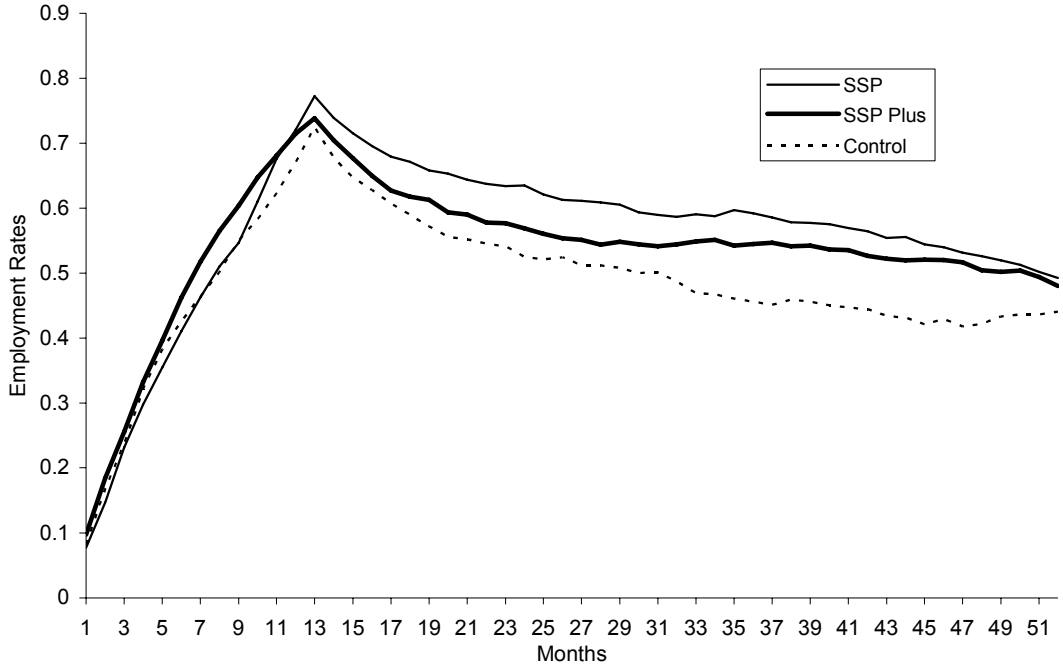


Figure 5 differs from Figure 2 only because of the exclusion of those who worked full time at baseline. In Month 52, the actual full-time employment rate for the SSP Plus take-up group was 4.0 percentage points higher than the regular SSP take-up group rate and 4.8 percentage points higher the control take-up group rate. As discussed in the context of Figure 2, this unadjusted "treatment" effect may be biased by differences in observed and unobserved characteristics and by the endogeneity of the take-up decision. By using the model estimates, we can eliminate those biases, allowing us to illustrate how the magnitude of the "effect of the treatment on the treated" changes when heterogeneity and the endogeneity of take-up are taken into account.

The simulated employment rates for the three take-up groups when the three sources of bias — observable differences, unobserved heterogeneity, and the endogeneity of the take-up variables — are removed are shown in Figure 6. The simulated full-time employment rates in Month 52 for the SSP Plus and regular SSP take-up groups and for the control group members who were non-employed at baseline are now 48.0 per cent, 49.3 per cent, and 44.1 per cent, respectively. In Month 52, the simulated employment rate for the SSP Plus take-up group is actually *lower* than the employment rate for the regular SSP take-up group and only 4.0 percentage points above the control group members who found work within the first 13 months. The simulated impact of regular SSP, relative to the control group, is only 5.2 percentage points. The force of Figure 6 is to illustrate that correcting for the various potential biases does not change the impression created by Figure 5 — the effect of the treatment on the treated was quite small.

Figure 6: Simulation of Figure 2 Using Estimated Model



This result, that the incremental treatment effect of SSP Plus on the treated is essentially zero, leads us to believe that the observed experimental impact of SSP Plus is due to the success of SSP Plus in inducing SSP participants to qualify for the supplement. Recall from the discussion of Figure 6 above that the simulated incremental treatment effect of SSP Plus is 4.0 percentage points and, from the discussion of Figure 4, the full treatment effect of SSP Plus is 8.9 percentage points. Also note that the simulated percentages of individuals who found a full-time job within 13 months are 46.3 per cent, 33.6 per cent, and 17.9 per cent for the SSP Plus, regular SSP, and control groups, respectively. Further, the employment rates in Month 52 for these groups are 48.0 per cent, 49.3 per cent, and 44.1 per cent, respectively. Finally, the employment rates in Month 52 for those SSP Plus, regular SSP, and control groups members who did not find full-time work in the first 13 months are 18.2 per cent, 16.2 per cent, and 21.5 per cent, respectively. Thus the incremental treatment effect is mainly due to the higher percentage of SSP Plus individuals who found full-time work in the first 13 months, relative to the two other groups. We discuss this issue further in the conclusion.

VII. Conclusion

We have conducted an econometric analysis of the SSP Plus program. The purpose of this study was to evaluate the short-term and long-term *incremental* impact of SSP Plus on the duration of full-time employment, non-employment, and, ultimately, on the full-time employment rate.[25] That is, we were interested in whether SSP Plus had any additional impact on employment and non-employment durations beyond those created by the SSP earnings supplement alone. We focus on generating estimates of the "effect of the treatment on the treated" where the "treated" are those who actually received an SSP supplement.[26]

The "story" of SSP Plus has three central features. First, more than 50 per cent (131 of 252) of the SSP Plus program group qualified for the SSP earnings supplement as compared with about 40 per cent (99 of 253) of the regular SSP program group. Second, the full-time employment rate of the SSP Plus program group in the first year after the end of the qualifying period was about the same as the employment rate for the regular SSP group, despite the higher number of qualified individuals. For example, as can be seen in Figure 1, the full-time employment rates for the regular SSP and SSP Plus groups were approximately equal from the 12th to the 24th month after random assignment. Third, the full-time employment rates for the SSP Plus group exceeded those of the regular SSP group after the 24th month and soon were 9 to 10 percentage points higher, a gap that persisted until the end of the follow-up period.[27] Over the same period, the control group "caught up" to the regular SSP program group, and there was no significant difference between those two groups at the end of the follow-up period. Since the SSP Plus group had a full-time employment rate that was about 10 percentage points higher than that of the regular SSP group at that point, there is a statistically significant difference between the full-time employment rates of the SSP Plus group and the control group.

Our econometric model captures the short-term impacts of SSP and SSP Plus on the "interrupted" non-employment spell of most of the SSP participants. As Table 11 shows, regular SSP group members were significantly more likely than the control group to end their interrupted spell of non-employment and move to full-time employment.[28] We see this increased likelihood both in the first nine months of the 13-month qualifying period and in the last four months of the qualifying period. As predicted by theory (Card et al., 2001), the incentive to find a full-time job grew as the end of the qualifying period approached — the

[25]Being "non-employed" in this paper means being unemployed, being out of the labour force, or working part-time. "Long-term" in this context refers to the period after which program group members had exhausted their eligibility for the SSP earnings supplement, an event that occurred 36 months after the participants established their eligibility for the supplement. Depending on when participants established their eligibility, the "long-term" period would have started 36 to 48 months after random assignment. Since the final survey occurred approximately 54 months after random assignment, we have between 6 and 18 months of observations on "long-term" behaviour.

[26]All SSP Plus program group members were also eligible to receive a package of services (including job-search assistance and help with resumé writing) even if they never qualified for the earnings supplement.

[27]The 9 to 10 percentage point impact discussed in this paragraph is for the 685 individuals who were not employed full time at baseline.

[28]At baseline, 90 percent of SSP participants were in the midst of a spell of non-employment and the other 10 per cent were in the midst of a spell of full-time employment. Following the previous literature, we have referred to baseline spells as "interrupted" spells of non-employment and employment.

coefficient for PRE-INCENTIVE is larger for months 10 to 13 than it is for months 1 to 9. The large, positive, and statistically significant coefficient for PRE-INCENTIVE-PLUS in months 1 to 9 in Table 11 reflects the positive incremental impact of SSP Plus on the proportion of individuals qualifying for the earnings supplement. That incremental impact goes to zero in Months 10 to 13, however, suggesting that the services provided by SSP Plus were especially effective in the first part of the qualifying period and less effective after that.

The key goal of this paper is to compare the labour force behaviour of the regular SSP and SSP Plus take-up groups over the entire follow-up period. The two "treatments" were different because the regular SSP take-up group received only the earnings supplement while the SSP Plus take-up group was eligible for additional services, both before and after they qualified for the supplement. If the two take-up groups had similar labour force behaviours — if there was no effect of the treatment on the treated — then there would be no evidence of an incremental impact of SSP Plus on the take-up groups. If so, then the overall impact of SSP Plus in Figure 1 must be due to the incremental impact of SSP Plus in inducing a greater proportion of its program group to take up the supplement. In effect, the impact of SSP Plus was to induce individuals who would have acted like non-take-up group members to act like take-up group members. And it is this initial impact that creates the long-run positive impact of SSP Plus.

This "story" is implied by Figure 2, which shows the proportion working full time in three groups — the regular SSP take-up group, the SSP Plus take-up group, and the subset of the control group who found work in the first 13 months after random assignment. In all three groups, the proportion working full time was similar, ranging between 50 and 60 per cent at the end of the follow-up period. However, Figure 2 is not convincing evidence of the similarity between the three groups, because they are non-random subsets of the entire program and control groups. The simple comparison in Figure 2 does not adjust for any possible observable or unobservable differences between the groups that might invalidate the conclusion that the three groups were similar in their long-run employment rates.

The intention behind the use of the complicated model that we estimate in this paper is to use state-of-the-art econometric techniques to adjust for the potential biases that might invalidate the comparison in Figure 2. Armed with the model estimates, we can produce a simulation that replicates Figure 2 after adjusting for the biases (and excluding those who were working full time at baseline). Two major potential biases must be addressed. First, SSP participants — in both the program groups and in the control group — non-randomly select themselves into full-time work. This self-selection is a function not only of observable differences among all participants (e.g. some have a recent work history and some do not), but also of unobservable differences (e.g. some are strongly motivated to work for pay and others are not). Second, program group members self-select into the take-up group by choosing to take up full-time work within the qualifying period, making this decision endogenous. If take-up group membership is to be used as an independent variable in models of labour force behaviours (e.g. to answer the question of whether take-up group members had different employment durations), this endogeneity must be addressed.

Because the heterogeneity that is creating these issues is unobserved, there is no way to "adjust" for it without making a variety of assumptions about its nature. Over the years, labour economists have developed a number of techniques to address these two potential biases. Building on a model developed by Eberwein, Ham and Lalonde (1997), we estimate a

joint model of four kinds of employment and non-employment spells. Our estimator, summarized in the Appendix, has four equations representing the hazard rates out of the four spell types (with each equation assuming a similar form of unobserved heterogeneity) and a equation that is used to create instruments for the endogenous variables.

The primary result of the model estimation is that there seem to be no important differences in the determinants of the employment and non-employment durations of the regular SSP and the SSP Plus take-up groups. In general, the corrections for heterogeneity and endogeneity do not lead to any important differences in the coefficient estimates. We present three versions of the model: (1) a variant with no corrections for heterogeneity or endogeneity; (2) a variant with a correction for heterogeneity but none for endogeneity; and (3) the full model with corrections for both heterogeneity and endogeneity. The parameter estimates are almost exactly the same in all three models. In all three cases, the magnitude and significance of the coefficients suggest "no difference" between the two take-up groups. Said differently, the comparison shown in Figure 5 correctly represents the different experiences of the three groups even though they are non-random subsets of the program and control groups.[29]

How then can we account for the 9 to 10 percentage point experimental impact of SSP Plus relative to regular SSP? The answer is that SSP Plus had its impact in incentivizing a greater proportion of its program group members to find full-time work and qualify for the supplement. Our results suggests that these incentivized program group members then behaved in roughly the same way as take-up group members in the regular SSP take-up group. This is surprising because one might think that the SSP Plus incentivized take-up group members would have been more similar to regular SSP non-take-up group members. Indeed, that was precisely the conjecture when it was observed that over the period 12 to 24 months after random assignment the SSP Plus program group had roughly the same full-time employment rate as the regular SSP program group, despite having a higher proportion who had qualified for the supplement. The conjecture was that the incentivized SSP Plus take-up group members had simply found a short-term full-time job in order to qualify for the supplement and had then reverted to behaving like non-take-up group members. But this was apparently not true: SSP Plus had succeeded in making them into "real" take-up group members. Exactly how SSP Plus accomplished that feat is unknown. It could be that voluntarily finding a full-time job (however short-lived) and qualifying for the supplement was enough to transform the incentivized SSP Plus take-up group members into "real" take-up group members. Or it could be that one of the services provided by the SSP Plus staff had the same effect. Given the general failure of mandatory work programs in the United States to effect major changes in the labour force behaviour of welfare recipients, we suspect that the latter explanation is more likely.

One final point: it is possible, given the absence of any continuing impact of SSP Plus on its take-up group, that the control group later "caught up" with the SSP Plus program group, having already "caught up" to the regular SSP program group by Month 52. However, the follow-up period was not long enough to observe this, if it in fact occurred.

[29]Figure 5 is similar to Figure 2 except that those working full time at baseline have been excluded.

Appendix:
Method for Dealing With Endogenous Incentive Variables

In this Appendix, we develop the maximum likelihood estimator of the model of employment and non-employment durations as given by equations (1) to (5) in the paper. This method is an extension of the method for dealing with an endogenous dummy variable in a Probit model of discrete choice, as discussed by Wooldridge (2002, Section 15.7.3). As in that model we want to allow for possible correlation between the residual in Equation (5), relating to unobserved factors that determine WFT13_i^*, and the residuals in equations (3) and (4) — note that in those equations the incentive variables for both the SSP and the SSP Plus groups are endogenous since they are formed using interactions of the variable WFT13_i and other variables. To deal with endogeneity we derive the likelihood conditional on ε, which means that equations (3) and (4) become respectively,

$$\begin{aligned} y^*_{u2idt} &= \beta_{0u} + \text{X}_{it}\beta_{1u} + \beta_{2u}\text{INCENTIVE}_{it} + \beta_{3u}\text{POST - INCENTIVE}_{it} \\ &\quad + \beta_{4u}\text{INCENTIVE - PLUS}_{it} + \beta_{5u}\text{POST - INCENTIVE - PLUS}_{it} \\ &\quad + h_u(d,\beta_{6u}) + \theta_{u2i} + \rho_{u2}(\text{PROGRAM}_\text{i} + \text{SSPLUS}_\text{i})\varepsilon_i + \varepsilon^*_{u2it} \end{aligned}$$

and

$$\begin{aligned} y^*_{e2idt} &= \beta_{0e} + \text{X}_{it}\beta_{1e} + \beta_{2e}\text{INCENTIVE}_{it} + \beta_{3e}\text{POST - INCENTIVE}_{it} \\ &\quad + \beta_{4e}\text{INCENTIVE - PLUS}_{it} + \beta_{5e}\text{POST - INCENTIVE - PLUS}_{it} \\ &\quad + h_e(d,\beta_{6e}) + \theta_{e2i} + \rho_{e2}(\text{PROGRAM}_\text{i} + \text{SSPLUS}_\text{i})\varepsilon_i + \varepsilon^*_{e2it} \end{aligned}$$

Note that the residual only enters for individuals who have either PROGRAM or SSPLUS equal to one. For those observations ε^*_{u2it} (respectively ε^*_{e2it}) is normally distributed with mean zero and variance $1-\rho^2_{u2}$ (respectively $1-\rho^2_{e2}$). Thus, for instance, for completed fresh unemployment spells of duration t_u the contribution to the likelihood will be,

$$(1-\Phi(\mu^*_{u2it_{u2}}))\prod_{t=1}^{t_{u2}-1}\Phi(\mu^*_{u2it})$$

where,

$$\begin{aligned} \mu^*_{u2it} &= (1-\rho^2_{u2}(\text{PROGRAM}_\text{i} + \text{SSPLUS}_\text{i}))^{-1} \\ &\times(\beta_{0u} + \text{X}_{it}\beta_{1u} + \beta_{2u}\text{INCENTIVE}_{it} + \beta_{3u}\text{POST-INCENTIVE}_{it} \\ &\quad + \beta_{4u}\text{INCENTIVE-PLUS}_{it} + \beta_{5u}\text{POST-INCENTIVE-PLUS}_{it} \\ &\quad + h_u(d,\beta_{6u}) + \theta_{u2i} + \rho_{u2}(\text{PROGRAM}_\text{i} + \text{SSPLUS}_\text{i})\varepsilon_i) \end{aligned}$$

The contribution for a censored spell will be,

$$\prod_{t=1}^{t_{u2}}\Phi(\mu^*_{u2it})$$

Similar contributions can be found for fresh employment spells. This then gives a complete likelihood function conditional on the individual heterogeneity terms as well as the residual ε_i. The heterogeneity terms are integrated out by summing across the two points of support and then integrating the resulting likelihood over the distribution of ε_i — this is only done for observations where $\text{PROGRAM}_i + \text{SSPLUS}_i = 1$. For observations where $\text{WFT13}_i = 1$, we integrate over the normal density truncated to the region where $\text{WFT13}_i^* > 0$, which is the interval $[\pi_0 + \text{X}_i\pi_1 + \pi_2\text{PROGRAM}_i + \pi_3\text{SSPLUS}_i, \infty)$. Similarly, we integrate over the complement of this interval for observations for which $\text{WFT13}_i = 0$. Since these integrals are one-dimensional they can be computed accurately using quadrature. We then combine the likelihood so constructed with the likelihood function for the variable WFT13_i, and our estimates that take account of both heterogeneity and endogeneity are obtained by maximizing this complete likelihood function over all parameters. Identification is achieved provided that the coefficients for PROGRAM and SSPLUS in the model for WFT13_i are not zero. This holds, because although these variables also appear to enter the equations determining the fresh unemployment and employment spells, they only do so through their interaction with WFT13_i (and other variables relating to when the incentive is still in place and when it no longer applies).

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