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The Value of Non-market Time Lost During the Self-Sufficiency Project

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The Authors

Abstract

The Self-Sufficiency Project (SSP) was a pilot program for welfare recipients conducted in two provinces in Canada during the 1990s. SSP is generally considered to have been one of the most successful pilot programs ever evaluated through social experimentation. The cost–benefit analysis of SSP indicated that the program resulted in a substantial net gain to society. However, the cost–benefit analysis did not take into account the program's effects on participants' non-market time. The purpose of this paper is to examine whether the conclusions reached from the cost–benefit analysis of SSP would be altered if the program's effects on the non-market time of participants were taken into account. Using conservative assumptions about a number of key parameters underlying the labour supply schedule, the results indicate that the net social benefits from SSP are greatly reduced once lost non-market time is taken into account. When sensitivity tests are conducted using less conservative assumptions, the estimate of SSP's net social benefits is even further reduced, even turning negative under certain assumptions. It is important to keep in mind that this study examines only one possible limitation of the original SSP cost–benefit study. Other considerations are mentioned that could act to increase the net gains from SSP.

Executive Summary

The Self-Sufficiency Project (SSP) was a pilot program for welfare recipients conducted in two provinces in Canada (British Columbia and New Brunswick) during the 1990s. SSP is generally considered to have been one of the most successful pilot programs ever evaluated through social experimentation. The cost–benefit analysis of SSP indicated that the program resulted in a substantial net gain to society. However, the cost–benefit analysis did not take into account the program's effects on participants' non-market time. The purpose of this paper is to examine whether the conclusions reached from the cost–benefit analysis of SSP would be altered if losses in the non-market time of participants resulting from the program were taken into account.

THE FINDINGS IN BRIEF

- **The cost of the non-market time lost to persons who responded to the SSP financial incentive by working more was substantial.** Before considering the cost of lost non-market time, the net social benefit of the SSP program to society was $2,565 per program group member. Based on conservative assumptions, once the cost of lost non-market time is taken into account, the net benefit to society falls to $705, just over a quarter of its originally estimated value. Thus, nearly three quarters of the positive net social gains attributed to SSP in the original cost–benefit analysis of long-term IA recipients are eliminated, once the cost of lost non-market time is taken into account.
- **The value of lost non-market time was slightly higher in British Columbia than in New Brunswick.** Before considering the cost of lost non-market time, the net social benefit of the SSP program to society was considerably higher in New Brunswick than in British Columbia. Once the cost of lost non-market time is taken into account, the net social benefit of the SSP program remained positive in New Brunswick but became (slightly) negative in British Columbia. Although a small part of this difference between the two provinces results from the larger estimated value of the loss in non-market time in British Columbia, most is attributable to fact that government budgetary expenditures on SSP were over twice as large in British Columbia as in New Brunswick.
- **Numerous sensitivity tests were performed to determine whether the results were robust with respect to the assumptions made in generating them.** All but one of these sensitivity tests produced estimates of SSP's societal effects that are well under $1,000, and a couple suggested they are negative.
- **Other possible factors not considered in the original cost–benefit analysis of SSP nor examined in this study could result in either an increase or a decrease in the estimated net social benefit of SSP.** Two of these factors that would tend to increase the net social benefit of SSP, possibly enough to offset the value of lost non-market time, involve assigning a value to taxpayer's willingness to pay to reduce income assistance (IA) rolls through increased work effort and recognizing that a dollar gained by SSP recipients might be valued more highly than a dollar lost by taxpayers to finance the program.

THE SSP PROGRAM

SSP offered a generous monthly earnings supplement for up to three years to single-parent families who had been on income assistance (i.e. welfare) in British Columbia and New Brunswick for at least a year and who were randomly assigned to a program group. To qualify for the earnings supplement, a single parent had to leave IA, work full time (i.e. average at least 30 hours a week over the month), and take up the supplement within a year of when it was first offered. The supplement was equal to one half the difference between a "target" earnings level (initially $37,000 in British Columbia and $30,000 in New Brunswick) and an individual's earnings. Because the income individuals could receive if they worked full time was much larger under SSP than under IA, the program provided a strong monetary incentive to leave welfare and work full time.

THE ORIGINAL SSP COST–BENEFIT ANALYSIS

According to the official evaluation of SSP, one third of the sample of long-term welfare recipients in British Columbia and New Brunswick who were offered the earnings supplement worked full time and took up the supplement offer. Close to three fifths of these recipients worked full time in response to the financial incentives offered by the program, while the remainder took advantage of the offer even though they would have worked full time without it. Average earnings rose by nearly $3,400 or by more than 20 per cent of the average earnings of control group members. The cost–benefit analysis of the SSP program found that even though government agencies spent more than $4,700 per participant on administering the program and distributing transfer payments, society gained nearly $2,600 per program group member, making the program extremely cost-effective. Most of this additional net social benefit resulted from increases in participant hours at work and, hence, earnings.

LIMITATIONS OF THE ORIGINAL SSP COST–BENEFIT ANALYSIS

One potential limitation of the SSP cost–benefit analysis, as well as those of other welfare-to-work programs, is that the estimated net social benefits do not include the value of non-market time lost through increased work effort. Because SSP induced many welfare recipients to work full time, they correspondingly had less time for child-rearing and other non-market activities. Although there were some negative effects of SSP on adolescents in the early years of SSP, the program appears to have been neutral for this group in the long run. Younger children appeared to have benefited from the SSP program. However, regardless of the effects of SSP on children, the lost non-market time represents a real cost to participants, one that is potentially quite important. Indeed, not valuing this time is explicitly mentioned by the SSP evaluators as a limitation of their cost–benefit study.

METHODOLOGY OF THIS STUDY

This study uses data from the SSP Recipient experiment to estimate the value of lost non-market time. Our baseline estimate is based on conservative assumptions that are likely to understate its true size. In order to estimate the value of lost non-market time, it is necessary

to identify members of the SSP program group who would not have worked in the absence of SSP, but who worked full time in response to the financial incentive provided by SSP. Similarly, it is necessary to identify members of the program group who would have worked part time in the absence of SSP, but who worked full time under SSP. These are individuals who gave up non-market time in order to participate in the SSP program.

Not all participants receiving an SSP supplement gave up non-market time to participate in SSP. Some individuals would have chosen to work full time even in the absence of the SSP incentive. These non-responders did not lose non-market time as a result of the supplement. Instead, the supplement simply resulted in windfall gains for them, an equivalent net cost to the government and a zero net gain to society. Consequently, in order to compute lost non-market time, it is essential to separate responders from non-responders among supplement recipients during each month and, among responders, to separate those who would have worked part time in the absence of SSP from those who would not have worked at all.

Because of the randomized design of SSP, the *number* of responders and the *number* of non-responders who received supplements are both known, but it is not possible to identify who these persons are unless further assumptions are made. The key assumption made in this study that allows us to identify such individuals is that non-responders have similar observed economic and demographic characteristics as members of the control group who are working full time, even though the control group members are not eligible for SSP. A statistical technique called "propensity score stratification" is used to identify individual responders and non-responders.

The number of responders is derived from the experimental impacts on full-time employment. The impacts are derived by subtracting the control group mean full-time employment rate from the program group mean full-time employment rate. Our analysis is restricted to months in which the experimental impacts on full-time employment are statistically significant at the 10 per cent level or less (statistically insignificant impacts are assumed to be zero and not result in any lost non-market time). Statistically significant impacts on full-time employment occur in every month from Month 2 through Month 51. Therefore, we compute the surplus and lost non-market time in each of these 50 months.

ESTIMATED LOSSES IN NON-MARKET TIME

The first 10 rows in Table ES.1 present estimates of benefit and cost components taken directly from the SSP final report. These results are reported from three different perspectives: that of the program group, that of government, and that of society. Because society is comprised of the program group and taxpayers who fund the government's budget, the values for the societal perspective are computed by summing the estimates in the first two columns. The estimates consist of dollar amounts that have been aggregated over the five years after random assignment. All the values in Table 3 have been inflation-adjusted to Year 2000 Canadian dollars using GDP implicit price deflators from Statistics Canada and discounted to the Year 2000 using a five per cent discount rate. The reported benefits and costs are averages for the program group. For example, the reported benefit of $3,562 from increased earnings is an impact estimate that was obtained by first subtracting the average earnings of the control

group from the average earnings of the program group. In computing these averages, workers with positive earnings and non-workers with zero earnings were both included.

Table ES.1: Five-Year Estimates of Net Gains and Losses per Program Group Member

Financial effects ($)	Perspective		
	Program Group	Government Budget	Society
	Original estimates		
Transfer payments	$3,173	-$3,173	$0
Transfer payment administration	$0	-$232	-$232
Operating cost of SSP	$0	-$1,267	-$1,267
Program Management Information System	$0	-$37	-$37
Supports for work	$108	-$108	$0
Earnings	$3,562	$0	$3,562
Fringe benefits	$538	$0	$538
Taxes and premiums	-$1,732	$1,732	$0
Tax credits	-$394	$394	$0
Net gain or loss (net present value)	**$5,256**	**-$2,691**	**$2,565**
	Re-analysis of benefits and costs		
Lost non-market time	*-$1,860*	*$0*	*-$1,860*
Adjusted net gain or loss (net present value)	***$3,396***	***-$2,691***	***$705***

As indicated by Table ES.1, although the incomes of program group members increased by an average of $5,256 during the five years following random assignment, the increase in the government budget that resulted from the program during the same period was $2,691 per program group member, and, hence, the net social benefit of the program to society was $2,565 ($5,256 - $2,691) per program group member. However, once the cost of lost non-market time is taken into account, the net benefit to society falls to $705 ($2,565 - $1,860), just over a quarter of its originally estimated value.

CONCLUSIONS AND POLICY IMPLICATIONS

The key finding in this study is that the cost of the non-market time lost to persons who responded to the SSP financial incentive was substantial. Our baseline estimates, which are based on conservative assumptions, imply that well over a third ($1,860 out of $5,256) of the gains in income received by the program group was offset by losses in non-market time. As a consequence, about three quarters of the positive net social gains attributed to SSP in the original cost–benefit analysis of long-term IA recipients are eliminated.

By demonstrating that the SSP cost–benefit findings look very different when lost non-market time is taken into account than when it is not, this study has both an important methodological and an important policy implication. The key methodological implication is that more work is needed to overcome the limitations of cost–benefit analyses of programs targeted at the disadvantaged, such as SSP, if they are to provide a reliable indicator of program efficacy — for example, research is needed on reservation wages, program general

equilibrium effects, the relative value of dollars gained by low- and high-income persons, and the willingness of taxpayers to pay for increases in the work effort of transfer recipients.

The policy lesson follows directly from the methodological implication. Because they do not treat potentially important issues, cost–benefit studies of programs targeted at the disadvantaged produce suggestive, but not fully reliable, findings. Although the evaluators conducting cost–benefit analyses are usually careful to point out their limitations — the SSP analysts certainly were — the caveats tend to be forgotten by users of the findings, and the numbers that are actually produced are stressed in assessing whether the program was cost-effective. Thus, in determining whether the program was successful, policy-makers look at the program's *estimated* net benefit (i.e. whether *estimated* benefits exceed *estimated* costs), regardless of whether this "bottom-line" figure might be overturned if factors that were left out of the analysis — for example, the value of non-market time — were taken into account. It is important that, until cost–benefit analyses of programs targeted at the disadvantaged become more reliable, policy-makers recognize their limitations and treat their findings with great care.

I. Introduction

The Self-Sufficiency Project (SSP) was a pilot program for welfare recipients conducted in two provinces in Canada during the 1990s. SSP is generally considered to have been one of the most successful pilot programs ever evaluated through social experimentation. The cost–benefit analysis of SSP indicated that the program resulted in a substantial net gain to society. However, the cost–benefit analysis did not take into account the program's effects on participants' non-market time. The purpose of this paper is to examine whether the conclusions reached from the cost–benefit analysis of SSP would be altered if the program's effects on the non-market time of participants were taken into account.

SSP offered a generous monthly earnings supplement for up to three years to single-parent families who had been on income assistance (i.e. welfare) in British Columbia or New Brunswick for at least one year and who were randomly assigned to a program group. To qualify for the earnings supplement, a single parent had to leave the income assistance program (IA), work full time (i.e. average at least 30 hours per week over the month), and take up the supplement within one year of when it was first offered. The supplement was equal to one half of the difference between a "target" earnings level (initially $37,000 in British Columbia and $30,000 in New Brunswick) and an individual's earnings. Because the income that individuals could receive if they worked full time was much larger under SSP than under IA, the program provided a strong monetary incentive to leave IA and work full time.

According to the official evaluation of SSP (Michalopoulos et al., 2002), one third of the sample of long-term welfare recipients in British Columbia and New Brunswick who were offered the earnings supplement worked full time and took up the supplement offer. Close to three fifths of these recipients worked full time as a result of the financial incentives offered by the program, while the remainder took advantage of the offer even though they would have worked full time without it. Average earnings rose by nearly $3,400, or by more than 20 per cent of the average earnings of control group members. A cost–benefit analysis of the program found that even though government agencies spent more than $4,700 per participant on administering the program and distributing transfer payments, society gained nearly $2,600 per program group member, making the program extremely cost-effective (Michalopoulos et al., 2002). Most of this additional net social benefit resulted from increases in participant hours at work, and hence, increases in earnings.

One potential limitation of the SSP cost–benefit analysis, as well as those of other welfare-to-work programs, is that the estimated net social benefits do not include the costs of non-market time lost through the increased work effort. As emphasized by Gramlich (1990), Greenberg (1997), and Boardman, Greenberg, Vining, and Weimer (2001) as well as many others, the conceptually appropriate measure of the impact of a government program on any group of individuals is the net change in their surplus (or economic rent), rather than the net change in their income. In other words, the lost non-market time that accompanies increases in work hours has value that needs to be counted as a cost when assessing the merits of any proposed government program.

Because SSP induced many welfare recipients to work full time, they correspondingly had less time for child-rearing and other non-market activities. As indicated by Ford, Gyarmati, Foley, Tattrie, and Jimenez (2003), there were some negative effects of SSP on adolescents in the early years of SSP, although the program appears to have been neutral for this group in the long run. Younger children appeared to have benefited from the SSP program. Regardless of the effects of SSP on children, however, the lost non-market time does represent a real cost to participants, one that is potentially quite important. Indeed, the SSP evaluators explicitly mention that not placing a value on this time is a limitation of their cost–benefit study (Michalopoulos et al., 2002, p. 141).

This paper uses data from the SSP Recipient experiment to estimate the value of this lost non-market time.[1] This estimate is based on conservative assumptions that are likely to understate its true size. The estimated lost non-market time is used to re-compute the net social benefits of the SSP program. The calculations show that the net social benefits from SSP are greatly reduced once lost non-market time is taken into account, even though the estimate of the value of lost non-market time is based on highly conservative assumptions. As might be anticipated, when sensitivity tests are conducted using less conservative assumptions, the estimate of SSP's net social benefits is even further reduced, even turning negative under certain assumptions.

It is important to stress that only one of a number of possible limitations to the SSP cost–benefit study are examined in this paper and that a consideration of all of these factors could result in either an overall increase or an overall decrease in the estimated net benefits of SSP.[2] For example, Michalopoulos et al. (2002) note that improvement or deterioration in child and parent well-being and community effects such as reduced or increased crime and drug use would need to be considered in a full assessment of the net social benefits of the SSP program. In addition, general equilibrium effects that result from SSP (e.g. displacement of persons who are not eligible for the SSP earnings supplement, effects on the wages of IA recipients and other workers, and exit and entry effects) may be important (Lise, Seitz, & Smith, 2004) but are ignored in the SSP cost–benefit analysis. The analysis also ignores any value that taxpayers may place on reductions in the IA rolls that result from SSP and the increase in work effort on the part of program participants. Moreover, the SSP earnings supplement meant that income was transferred from taxpayers to program participants. Because participants have much lower incomes than taxpayers, on average, their marginal utility of income is likely to be higher. Thus, it can be argued that a dollar gained by participants should be valued more highly than a dollar lost by taxpayers. However, like most cost–benefit studies of programs that have distributional implications, this is not done in the cost–benefit analysis of SSP. Some of these issues are discussed further in the conclusion of this paper.

The following section discusses why lost non-market time is likely to be an important cost of the SSP program, one that should be taken into account in determining the program's cost-effectiveness. The third section describes how the value of non-market time lost by SSP

[1]SSP also had an Applicant experiment for persons just entering welfare. While participants in the Recipient experiment were immediately eligible for SSP, participants in the Applicant experiment had to remain on welfare for one year before becoming eligible. The impacts and net benefits of the Applicant experiment were significantly larger than in the Recipient experiment (see Ford et al., 2003). We do not analyze data from the Applicant experiment in this paper.

[2]For a comprehensive discussion of issues involved in conducting cost–benefit analyses of government programs, see Boardman et al. (2001).

participants is estimated. Section IV notes that only those members of the program group who responded to the SSP financial incentives by working full time actually lost non-market time as a result of the program and describes the methods used to identify such persons. Once they are identified, an estimate is made of the value of the lost non-market time for each of them. Section V presents these estimates and, based on them, reassesses the original cost–benefit analysis of SSP. Section V also reassesses the separate cost–benefit findings for each of the two provinces included in the SSP experiment (British Columbia and New Brunswick). Section VI examines the sensitivity of the findings to several of the assumptions underlying the cost–benefit reassessment. Section VII summarizes the conclusions and draws some implications from them.

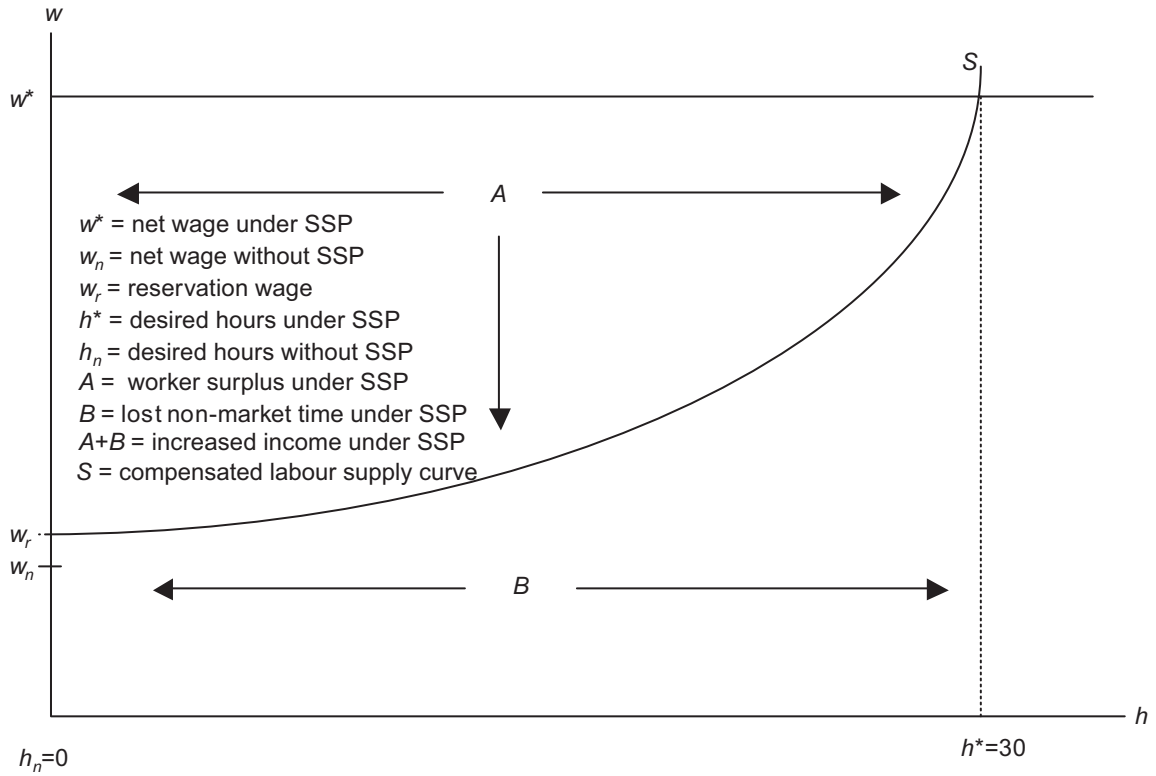
II. The Effects of SSP on the Income and Surplus of Participants

In the Self-Sufficiency Project (SSP) cost–benefit analysis, the major program benefits resulted from earnings increases attributable to inducing persons to work full time who otherwise would not have worked full time. From an analytical perspective, it is useful to examine the behaviour of two groups of individuals who responded to the SSP incentive: those who would not have worked in the absence of the SSP incentive (hereafter called "non-worker responders") and those who would have worked part time in the absence of the SSP incentive (hereafter called "part-time responders").

NON-WORKER RESPONDERS TO SSP

Figure 1 shows the response of an individual in the first group — a non-worker who is induced to work full time by the SSP offer. Initially this person is not working ($h_n = 0$), so the net hourly wage potentially available to her[3] in the market (w_n) is less than her reservation wage (w_r). In the diagram, w^* represents her net hourly wage rate under SSP, which is equal to the hourly change in income resulting from working full time (i.e. at least 30 hours per week).

Figure 1: Value of Lost Non-market Time for Non-worker Responders



[3]Feminine pronouns are sometimes used in this report because more than 90 per cent of single parents who have received income assistance for at least a year — the target group for SSP — are women.

Note that neither w_n nor w^* is the gross hourly wage she would be paid by an employer if she did go to work, but rather her hourly net return to working full time without SSP and with SSP, respectively. For example, consider a single-parent mother living in British Columbia in the early 1990s, when SSP recruitment occurred. During this time, income assistance (IA) had both a "flat" disregard and an "enhanced" disregard.[4] The flat disregard was $200 per month and the enhanced disregard was 25 per cent of earnings above $200 per month. If the gross hourly wage rate that would be paid by an employer to the individual in Figure 1 were $6,[5] then the employer would pay her $180 a week for 30 hours of work. If for simplicity we ignore taxes and government transfers other than SSP and IA,[6] ignore the flat IA disregard for the moment,[7] and assume that IA benefits are given by $225 - 0.75wh$,[8] then in the absence of SSP her income at 30 hours of work a week would be $270 [180 + 225 - 0.75(180)], just $45 more than the $225 she would receive if she did not work at all. Hence, her net wage rate (w_n), or her hourly return from working full time, would be $1.50 (45/30), which as previously indicated would not be enough to induce her to work.[9] If we assume that SSP benefits are given by $356 - 0.5wh$,[10] then at 30 hours of work a week her income under SSP would be $446 [180 + 356 - 0.5(180)], or $221 more than the $225 she would receive if she did not work at all, and her net hourly wage (w^*) would be $7.37 (221/30). To summarize, in this example the net return for working full time under SSP instead of not working at all is $7.37 per hour, which is much higher than the net return from working full time under IA ($1.50 per hour).

It is important to note that w_n and w^* are not the conventionally measured return for one additional hour of work. Rather, their relative magnitudes appropriately capture the discrete incentive a non-worker faces under SSP, because such a person must make a discrete choice between continuing to work zero hours and working a minimum of 30 hours.

In Figure 1, S is the compensated labour supply schedule of the SSP participant.[11] Her reservation wage, w_r, is the wage required before she would work at all. The area under the SSP wage line w^* (areas $A + B$) to the left of h^* represents the increase in income resulting from working 30 hours, the area between w^* and curve S (area A) represents the surplus she receives from the increase in income, and the area under the supply schedule (area B) represents the value she places on the non-market time lost as a result of working 30 hours.

According to Figure 1, with the increase in the net wage from w_n to w^* resulting from SSP, the SSP participant's desired hours of work will rise from zero to $h^* = 30$.[12] In Figure 1,

[4]The flat disregard was eliminated in April 1996 and the enhanced disregard was available for 12 out of every 36 months on IA.

[5]At the beginning of SSP the minimum wage in British Columbia was $5.50.

[6]Taxes are taken into account in Section VI.

[7]This simplifying assumption is for purposes of exposition. The flat disregard is taken into account in the empirical analysis presented below.

[8]This is the weekly equivalent of the approximate enhanced disregard annual formula used in British Columbia at the beginning of the SSP program [$(11,700 - 0.75wh_a)/52$, where h_a is annual hours].

[9]Including the flat disregard of $46 per week ($200 per month) would increase her net wage rate to $2.65 per hour.

[10]This is the weekly equivalent of the approximate annual formula used in British Columbia at the beginning of the SSP program [$0.5(37,000 - wh_a)/52$].

[11]As Greenberg (1997) indicates, the appropriate schedule for estimating lost non-market time is a compensated labour supply schedule. If income effects are zero, then this schedule represents both the uncompensated and the compensated labour supply schedules.

[12]It is possible that w^* will induce the individual to work more than 30 hours. In fact, most program group members working full time are observed to be working more than 30 hours (see Table 3.3 of Michalopoulos et al., 2002, p. 35). Our empirical work allows for this possibility.

the increased income resulting from participating in SSP is given by $30w^*$, which is represented by the area $A + B$. This corresponds to the income that was used in calculating the net benefits to program group members in SSP in Michalopoulos et al. (2002). However, of this increased income, B is the value of lost non-market time and A is the surplus, or the actual net benefit enjoyed by the participant.[13] Therefore, unless the value of lost non-market time is taken into account, the net social benefits of SSP for initial non-workers will be overstated. As Figure 1 implies, this overstatement can account for a substantial share of the total increase in income resulting from participating in SSP. However, as also suggested by the figure, the exact size of the overstatement depends on the value of the reservation wage, the shape of the labour supply schedule, and the value of w^*. As discussed below, it also depends on whether hours are in equilibrium at h^* under SSP.

To illustrate the implications of Figure 1, we begin by assuming that the SSP and IA programs are as given above, the labour supply schedule is linear, the reservation wage is \$3,[14] and the participant is in equilibrium at 30 hours per week ($h_s = 30$ in Figure 1). Given these assumptions, the surplus in Figure 1 will equal \$66 [i.e. $A = 0.5(7.37 - 3.00)(30)$] and the value of lost non-market time will equal \$155 [($B = 0.5(7.37 + 3.00)(30)$]. In this example, therefore, about 70 per cent of the participant's increased income of \$221 (\$66 + \$155) will be lost non-market time. However, as Greenberg (1997) shows, a linear labour supply schedule gives an upper bound on the size of the value of lost non-market time (and a lower bound on the size of the surplus). If we instead assume that the labour supply curve is a segment of an ellipse (as shown in Figure 1) but maintain the remaining prior assumptions, then Table 1 in Greenberg (1997) implies that approximately 55 per cent of the participant's increased income will be lost non-market time.[15] Finally, if we continue to assume the supply curve is an elliptical segment, but that the reservation wage is only \$2 rather than \$3, then only around 44 per cent of the participant's increased income will be lost non-market time.

So far we have assumed that our illustrative SSP participant works the number of hours she desires under SSP. In fact, there are two reasons to suspect that many SSP participants actually worked more than their desired hours and thus are at a point to the right of their labour supply schedules, S, in Figure 1. First, some SSP participants may have sought jobs that permitted them to work only 30 hours per week (the minimum required to receive the SSP earnings supplement) but were unsuccessful. Consequently, they accepted employment at a greater number of hours. Second, some SSP participants may have preferred to work fewer than 30 hours at a wage of w^*, but the program did not permit them to do so. Thus, the intersection of the wage line (w^*) and the labour supply curve for such persons occurs at less than 30 hours. However, given a choice between not working and receiving a net wage of w^* if they work at least 30 hours, they chose the latter. No surplus is received for hours worked in excess of desired hours. In fact, as will be demonstrated later, any income that is received

[13]Some of this gain in surplus may in fact be reductions in deadweight loss that are attributable to the positive tax system and benefit reduction rates associated with IA and other transfer programs. In other words, because labour is taxed and non-market time is not, a wedge is driven between the two causing a deadweight loss. The SSP supplement offsets the deadweight loss resulting from the wedge. However, if the supplement more than offsets disincentives resulting from the current tax/transfer system, it can cause deadweight losses of its own. Thus, some of the losses of non-market time may be deadweight losses resulting from SSP.

[14]Because the individual was unwilling to work under IA at a net wage rate of \$1.50, her reservation wage must be larger than \$1.50. Because she works full time at a wage of \$7.37, it must be less than \$7.37.

[15]In using this table, we assume that the compensated wage elasticity at zero hours equals 0.1. However, as demonstrated in Section VI, our findings are fairly insensitive to the value of the compensated wage elasticity.

in exchange for working these excessive hours is more than offset by the value of the non-market time that is lost. It is also possible, although less likely, that some responders to SSP worked at least 30 hours per week (thereby qualifying for the earnings supplement), but actually desired to work even more hours.[16] Neither surplus nor lost non-market time results from these hours of underemployment. Because SSP requires 30 hours of work in order to receive an earnings supplement, over-employment seems more likely than under-employment among those receiving the supplement. The implications of under- and over-employment for our empirical work are examined in Section VI.

PART-TIME RESPONDERS TO SSP

Figure 2 shows an individual who would work part time in the absence of SSP ($h_n = 15$), but who would work 30 hours in response to the SSP offer ($h^* = 30$). Using the example above and assuming that without SSP the individual would work 15 hours a week and receive a gross hourly wage of $6, her employer pays her $90, and her income is $247.50 [90 + 225 - 0.75(90)]. This is $22.50 less than the $270 she would receive if she worked full time instead of part time under IA. Thus, her net hourly wage from working 30 hours (rather than 15 hours) under IA (w_n) is $1.50 (22.50/15). If she worked the additional 15 hours for a total of 30 hours under SSP, her weekly income would increase to $446 [180 + 356 - 0.5 (180)], which is $198.50 more than the $247.50 she receives at 15 hours a week. Thus, her net hourly wage in working the additional 15 hours under SSP (w^*) is $13.23 (198.50/15).[17] This value appropriately represents the incentive faced by the part-time worker under SSP, because the program requires such a person to make a discrete choice between continuing to work part time (15 hours in our example) or working at least 30 hours.

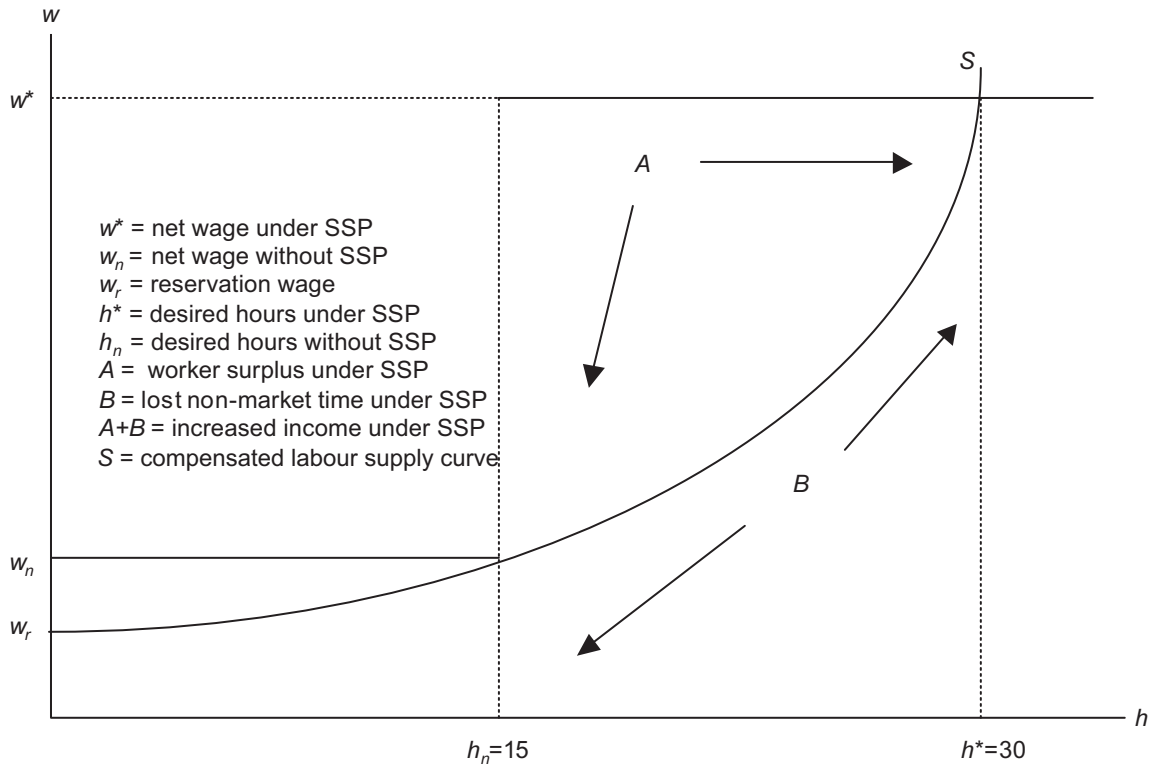
Because w^* is higher for the part-time worker in Figure 2 than for the non-worker in Figure 1, and because this individual is already working part time in exchange for a very low net wage rate (given the high implicit tax rate she faces under IA), she is probably more likely to take up the SSP offer than the non-worker.[18] As was the case for non-workers, $A + B$ represents increased income, B represents the value of lost non-market time under SSP, and A represents the surplus, or net benefit, enjoyed by the participant. Again, unless the value of non-market time is taken into account, the net social benefit of SSP will be overstated. For part-time workers, the size of this overstatement will depend on the net part-time wage-rate (w_n), the hours that would have been worked part time in the absence of SSP (h_n), the hours worked under SSP (h^*), the net wage received under SSP (w^*), the reservation wage (w_r), and the shape of the labour supply schedule.

[16]Some persons will, of course, be unable to find jobs that permit them to work at least 30 hours and thus qualify for the SSP earnings supplement. Most of these persons are irrelevant to our analysis, because the program did not cause them to alter their work behaviour (i.e. they are non-responders). Nonetheless, it is possible that a few did alter their work behaviour somewhat. Such responses are likely to be small and short-lived, however, and we ignore them for purposes of calculating the value of lost non-market time.

[17]Including the flat disregard, w^* would be $10.93.

[18]If all else is constant, the greater the desired hours of work in the absence of SSP and the higher the w^*, the more likely it is that the person will take up the program.

Figure 2: Value of Lost Non-market Time for Part-Time Worker Responders



To illustrate the magnitude of the overstatement for part-time workers, we again begin by assuming a linear supply schedule between 15 and 30 hours of work per week and equilibrium under SSP at 30 hours a week. Under these assumptions, the surplus (*A* in Figure 2) will equal \$88 [0.5(13.23 - 1.50)(15)] and the value of lost non-market time will equal \$110 [0.5(13.23 + 1.50)(15)], or about 56 per cent of the participant's \$198 increase in income. Alternatively, if we assume an elliptically shaped labour supply schedule and maintain the other prior assumptions, Table 1 in Greenberg (1997) implies that approximately 47 per cent of the participant's increased income will be lost non-market time.

III. Estimating the Value of Lost Non-market Time

The goal of this paper is to estimate the value of lost non-market time for each individual in the Self-Sufficiency Project (SSP) program group who responded to the SSP program by increasing her work effort to at least 30 hours per week. The illustrations in the previous section have several implications for meeting this goal.

First, they imply that it is necessary to identify members of the program group who would not have worked in the absence of SSP, but who worked full time in response to the financial incentive provided by SSP. Similarly, it is necessary to identify members of the program group who would have worked part time in the absence of SSP but who worked full time under SSP.

By definition, those who did not receive an earnings supplement in a given month did not respond to the SSP incentives during that month.[19] However, some of those who *did* receive an earnings supplement in a given month also did not respond. In other words, they would have chosen to work full time even in the absence of the SSP incentive. These non-responders did not lose non-market time as a result of the supplement. Instead, the supplement simply resulted in windfall gains for many of them, an equivalent net cost to the government, and a zero net gain to society.[20] Consequently, it is essential to separate responders from non-responders among supplement recipients during each month, and among responders, to separate those who would have worked part time in the absence of SSP from those who would not have worked at all. The methods we use to identify the individuals in these three groups are described in Section IV.

Second, the illustrations indicate that to compute the value of lost non-market time, the following variables are needed for each SSP responder: the hours they would have desired to work in the absence of SSP (h_n), the hours they desired to work under SSP (h^*), the net wage without SSP (w_n), and the net wage with SSP (w^*). We initially assume that hours actually worked correspond to desired hours, but later we test the sensitivity of our findings against this assumption. The value of h^* is directly observed for each responder, and h_n for each non-worker responder is, of course, equal to zero. Because we cannot directly observe the hours part-time responders would have worked in the absence of SSP, the value of h_n for these persons is set equal to the average hours worked by persons comprising a subset of part-time workers in the control group. As described in Section IV, these control group individuals were selected by statistically matching them to the part-time responders. The values of w_n and w^* are calculated in the manner illustrated in Section II. First, using the formulas for income assistance (IA) benefits in New Brunswick and British Columbia,[21] the hourly return

[19] As mentioned above, it is possible that a few program group members who did not receive the earnings supplement did alter their work behaviour somewhat in attempting to qualify, but we ignore this possibility.

[20] In fact, the additional income from SSP might have induced some of these individuals to work *less* (because of an income effect), leading to an *increase* in non-market time. However, because such persons could not reduce work hours below 30 hours and still qualify for the SSP supplement, it is unlikely that such responses were very large. We ignore the potential responses of windfall recipients in our analysis.

[21] The formulas are somewhat different for British Columbia and New Brunswick because the IA income guarantee and disregards differ in each province. They also differ for families of different sizes because the IA guarantee level increases as the number of children increases.

from working full time was computed for each responder. This yielded estimates of w_n. Next, the hourly return from working full time under SSP was calculated using the formulas for SSP benefits in each province, yielding estimates of w^*.

Third, the illustrations in the previous section also indicate that the findings might be sensitive to assumptions concerning whether responders worked the number of hours they desired under SSP, the size of the reservation wage, and the shape of the labour supply curve. As will be seen, in each case we make fairly conservative assumptions that tend to minimize the estimated value of non-market time lost by SSP responders and maximize their estimated gains in surplus. In Section VI, we test the sensitivity of our findings to alternative assumptions that are less conservative. In the case of desired hours and the shape of the labour supply curve, we also test the sensitivity of the findings against even more conservative assumptions.

As mentioned above, we assume that the observed hours of work of responders under SSP are the hours they desire to work. By definition, all responders must work at least 30 hours per week; in fact, many worked considerably longer hours. As is shown in Section VI, to the extent responders actually worked in excess of the hours they desired, the value of lost non-market time is understated. However, if they worked fewer hours than they desired, which seems less likely under SSP, the value of lost non-market time is overstated.

In addition, we base our findings on the lowest plausible values for the reservation wage (w_r). For example, as clearly shown in Figure 1, the reservation wage for non-worker responders must be above w_n but below w^*.[22] We assume that the reservation wage equals w_n for these persons (i.e. $w_r = w_n$). As indicated by Figure 2, the reservation wage for part-time responders must fall between w_n and zero. In this case, we assume that the reservation wage equals zero. As both the figures and our previous illustrations imply, the value of lost non-market time will be understated to the extent that the actual reservation wages of non-worker responders are above w_n and those of part-time responders are greater than zero.

Finally, we assume that the labour supply curves of responders are elliptical rather than linear.[23] As the figures and the numeric illustrations presented in Section II make clear, relative to assuming that labour supply curves are linear, this is also a conservative assumption.

The formulas used to compute the surplus and lost non-market time for each responder, assuming that their labour supply curve is elliptical in shape, are derived in the Appendix. As indicated in the Appendix, applying these formulas requires values for h_n, h^*, w_r, and w^* for each responder. In addition, an assumption must be made about the value of the compensated wage elasticity at post-program hours (h^*). As indicated in Greenberg (1997), as the elasticity value increases, estimates of the cost of lost non-market time also increase. A synthesis of findings from the income maintenance experiments by Burtless (1986) suggests that the value for mothers in single-parent households in the United States is approximately

[22] If w_r were below w_n, then these individuals would be observed working.

[23] Although non-linear shapes for the labour supply curves other than the elliptical one could have been assumed, the advantage of the elliptical shape is that the curve can be forced through both the point at which the line w^* intersects the hours line h^* and the point at which the wage line w_r intersects the vertical axis, regardless of the assumption made about the value of the compensated wage elasticity. Other than assuming linearity, this is not possible under most alternative plausible assumptions about the shape of the labour supply curve. For example, constant-elasticity supply curves are often assumed in cost–benefit analyses. However, given low compensated wage elasticity value assumptions, such as the 0.1 value we use, such curves would pass below the origin in figures 1 and 2.

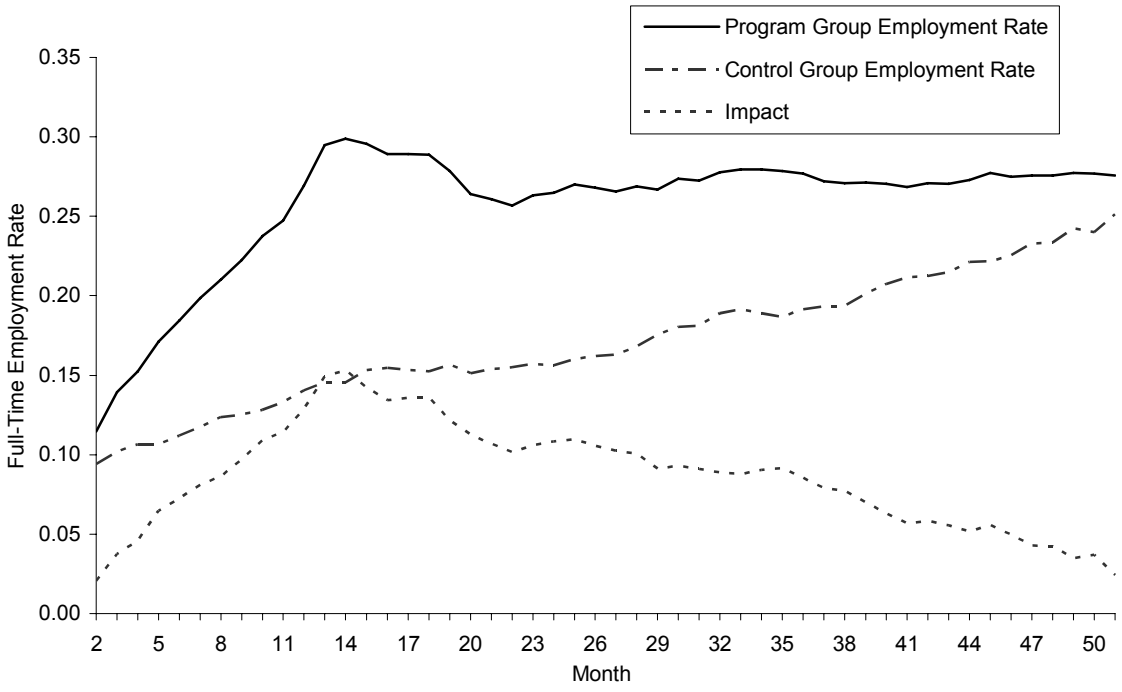
0.14. Following Burtless, we assume that the elasticity value equals 0.1. This value is relatively low in magnitude and hence is conservative, because it tends to minimize our estimate of the cost of lost non-market time. In Section VI, we test the sensitivity of our findings against both a smaller and a larger value of the compensated wage elasticity.

IV. Identifying Responders to the SSP Incentives

As indicated previously, in order to compute the surplus and lost non-market time, responders to the Self-Sufficiency Project (SSP) work incentive must be identified. Because of the randomized design of SSP, the *number* of responders is known, but identifying who these persons are is not possible unless further assumptions are made. The key assumption we make to identify these individuals is that they have observable baseline characteristics similar to certain members of the control group. The method of propensity score stratification is used to identify such individuals.

The number of responders can be derived from the experimental impacts on full-time employment. The impacts are derived by subtracting the control group's full-time employment rate from the program group's full-time employment rate. These impacts are presented in Figure 3 for months 2 through 51.

Figure 3: Program and Control Group Full-Time Employment Rates and Impacts on Full-Time Employment, by Month



Months 2 through 51 were chosen for two reasons. First, to be consistent over time, a fixed sample must be used in each month. Following Michalopoulos et al. (2002), we use the 54-month sample in the SSP Recipient experiment.[24] This sample contains 4,851 individuals, 2,392 of whom are in the control group and 2,459 of whom are in the program group. This

[24]The 54-month sample consists of persons who completed a 54-month survey (SSP surveys were also conducted in months 18 and 36 and had somewhat larger samples). Our control group sample is the same as that used by Michalopoulos et al. (2002), containing 2,392 individuals. But our program group sample excludes one individual from the 2,460 in the Michalopoulos et al. sample, resulting in a sample of 2,459 individuals.

represents about 85 per cent of the original sample enrolled in SSP (2,849 control group members and 2,880 program group members). Second, we restrict our analysis to months in which the experimental impacts on full-time employment are statistically significant at the 10 per cent level or lower (statistically insignificant impacts are assumed to be zero and do not result in any lost non-market time). Statistically significant impacts on full-time employment occur in every month from Month 2 through Month 51. Therefore, we compute the surplus and lost non-market time in each of these 50 months.

The number of responders in each month is derived as follows. First, n_c and n_p are defined as the number of persons in the control group and program group respectively. Next, ft_c and ft_p are defined as the fraction of the control and program groups who are employed full time (30 hours or more per week) in a particular month. The number of responders is given by $n_p(ft_p - ft_c)$ and the number of non-responders is given by $n_p ft_c$. Thus, for example, in Month 13, $n_p = 2{,}459$, $ft_p = 0.294835$ and $ft_c = 0.145485$. The number of program group members employed full time is 725, the number of responders is 367, and the number of non-responders is 358.

Not all of the program group members working full time in any given month were eligible to receive the SSP supplement. Only those who found full-time employment within one year after being enrolled were eligible. Thus, non-responders consist of two groups: those eligible for the SSP supplement and those not eligible. For purposes of our calculations, we consider only persons eligible for the SSP supplement to be potential responders. Thus, the number of *eligible* non-responders consists of the number of persons eligible for the supplement minus the number of responders. In the example above, 645 of the 725 full-time workers in the program group were eligible for the supplement. Thus, the number of eligible non-responders is 278 (358 - 80).

Given the sample of eligibles (645 in our Month 13 example), we know that 367 (or 57 per cent) are responders and 278 (or 43 per cent) are eligible non-responders. In order to identify members of each group, we adopt the method of propensity score stratification. Using the sample of program group eligibles and all control group members working full time, a propensity score is estimated for each program group member. The propensity score equation is a logit equation in which the dependent variable is one if the observation is in the control group and zero if the observation is in the program group.[25] Corresponding to the number of responders derived from the estimated experimental impacts, individuals with the lowest propensity scores in the program group are assigned as responders. In the example

[25]The explanatory variables in this equation are measured at the beginning of the experiment (at the baseline period) and consist of dummy variables for living in New Brunswick; being a male; living with both parents until 16 years of age; living in a household that received welfare before the respondent was 16 years of age; not working; looking for work; being enrolled in an education or training program; owning a home; living in subsidized housing; having a physical problem that limited activity at home, work, or school; having any emotional problems; being born in Canada; speaking English; speaking French; the respondent's mother not having a high school diploma; the respondent having a high school diploma but no further education; needing child care; being able to borrow money in an emergency from friends or family; having the blues for three or more days in the week prior to the baseline survey; having no physical disability; being an immigrant to Canada in the past five years; the respondent's age; the number of other adults in the household; the number of children in the household; the age of the oldest child in the household; the age of the youngest child in the household; total number of years employed; total hours worked and earnings in the year prior to the baseline survey; the number of months in the baseline year that the respondent worked; and the number of months in the baseline year that the respondent worked full time. For a few of these variables, the required information was missing for some observations. In these cases, we used the mean and left the observation in the estimation sample. Results of this equation for a typical month (Month 13) are presented in Table A.1 of the Appendix. Results for the other months are available from the authors on request.

above, for Month 13, the 367 lowest propensity scores are assigned to the responder group. These lowest propensity scores are least similar to the full-time workers in the control group — that is, individuals who were working full time in the absence of SSP incentives — and hence are most likely to be responders. These 367 lowest propensity scores constitute the sample for which the surplus and lost non-market time are calculated. The remaining 278 full-time workers in the program group are most likely to be non-responders. We repeated this exercise for each month of the experiment, from Month 2 through Month 51.

Table 1 compares mean baseline characteristics among full-time workers in the control group, the derived sample of program group non-responders, and the derived sample of program group responders in Month 13. If the propensity score stratification worked reasonably well, the control group sample should be similar to the derived sample of program group non-responders and different from the derived sample of program group responders. To examine this, we follow Dehejia and Wahba (2002) and Smith and Todd (2005) and perform a "balancing test"

The first three columns of Table 1 present the mean baseline characteristics in the three samples. The fourth and fifth columns give the difference in means and the standard error of the difference in means between the control group and the program group non-responders. The sixth and seventh columns give the difference in means and the standard error of the difference in means between the control group and the program group responders.

In the case of the control group versus program group non-responders, mean baseline characteristics are significantly different for 7 of the 31 characteristics, and three of these differences are only marginally significant at the 10 per cent level.[26] In the case of the control group versus program group responders, mean baseline characteristics are significantly different for 19 of the 31 variables, and 16 of these differences are significant at the five per cent level or higher. This suggests that the control group exhibits greater similarity to the program group non-responders than to the program group responders. Thus, we can conclude from these balancing tests that the propensity score stratification did a reasonable job of selecting an appropriate group of responders from among the sample of program group members working full time in Month 13.

Figure 4 shows the proportion of full-time workers in each month who had ever qualified for SSP payments who were SSP responders in each month. The figure indicates that the fraction of those working full time who were doing so in response to the program's financial incentives increased quickly during the first half year after random assignment, reaching a peak at Month 14 and slowly declining thereafter. This fraction became quite small by Month 48, when virtually no one in the program group remained eligible for the earnings supplement. However, the fraction did remain above zero, indicating that SSP continued to have some effect on full-time employment even after the financial incentive to work full time no longer existed.

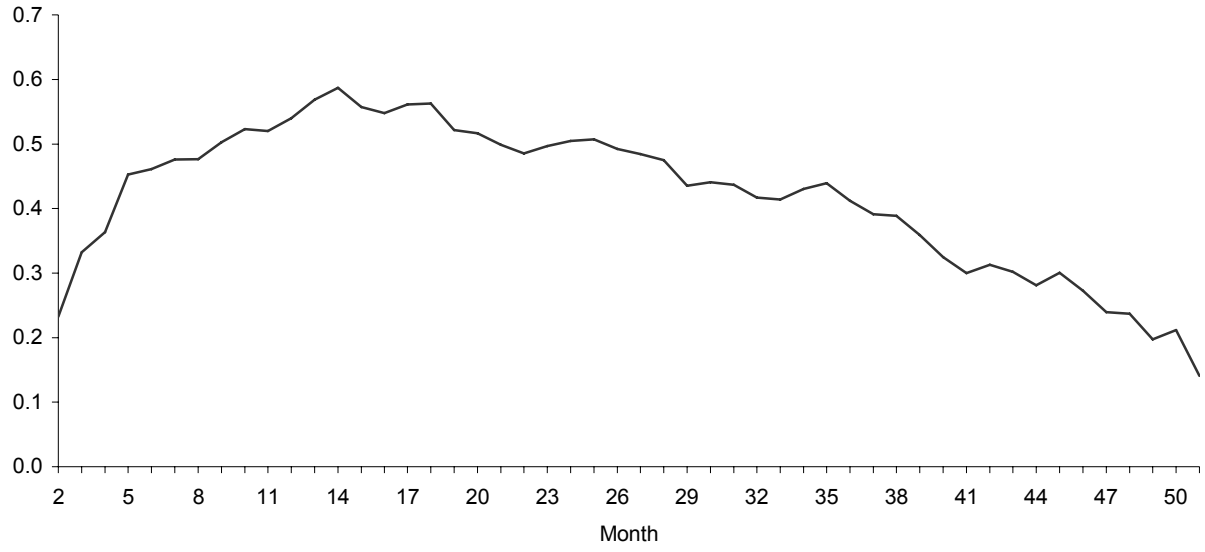
[26]However, the four highly significant coefficients indicate that propensity score matching did not work perfectly. For example, program group non-responders are significantly more likely to have worked and looked for work at baseline than the control group, perhaps indicating a greater attachment to the workforce. However, they were also less likely to have needed child care at baseline, possibly implying the opposite. We later test the sensitivity of our findings to the use of propensity score stratification.

Table 1: Comparison of Mean Baseline Characteristics in Three Samples of Full-Time Workers

	Mean						
Baseline Characteristic	**(1) Control Group**	**(2) Program Group Non-responders**	**(3) Program Group Responders**	**(1) - (2)**	**Standard Error**	**(1) - (3)**	**Standard Error**
1 = Lives in New Brunswick	0.506	0.496	0.520	0.009	0.040	-0.015	0.037
1 = Male	0.040	0.050	0.027	-0.010	0.017	0.013	0.014
Age	31.649	32.273	30.193	-0.624	0.661	1.456**	0.564
Number of other adults in household	0.221	0.299	0.087	-0.077	0.052	0.134***	0.035
Age of oldest child	8.695	8.992	8.038	-0.298	0.472	0.657	0.422
Age of youngest child	6.666	7.426	5.480	-0.760*	0.427	1.187***	0.366
Number of children	1.537	1.421	1.728	0.116**	0.059	-0.190***	0.058
1 = Living with both parents until age 16	0.609	0.583	0.678	0.026	0.040	-0.069*	0.036
1 = Lived in welfare household before age 16	0.223	0.254	0.209	-0.031	0.034	0.014	0.030
Number of years employed	9.253	10.112	7.596	-0.859	0.574	1.657***	0.463
1 = Working	0.474	0.601	0.142	-0.127***	0.040	0.332***	0.032
1 = Looking for work	0.375	0.499	0.217	-0.124***	0.029	0.158***	0.028
1 = Enrolled in school	0.178	0.158	0.191	0.020	0.030	-0.013	0.029
1 = Own home	0.078	0.076	0.060	0.002	0.021	0.018	0.019
1 = Live in subsidized housing	0.205	0.171	0.276	0.034	0.031	-0.070**	0.031
1 = Physical problem limiting work activity	0.162	0.127	0.240	0.035	0.028	-0.079**	0.030
1 = Emotional problems	0.040	0.029	0.082	0.012	0.015	-0.042**	0.018
1 = Born in Canada	0.902	0.910	0.869	-0.007	0.023	0.033	0.024
1 = Speaks English	0.986	0.978	0.997	0.007	0.011	-0.012*	0.007
1 = Speaks French	0.138	0.119	0.188	0.019	0.027	-0.050*	0.028
1 = Mother not a high school graduate	0.587	0.575	0.612	0.013	0.038	-0.024	0.036
1 = High school diploma but no college	0.434	0.439	0.447	-0.005	0.040	-0.013	0.037
1 = Needs child care	0.733	0.647	0.899	0.085**	0.037	-0.166***	0.028
1 = Able to borrow money in an emergency	0.721	0.717	0.714	0.004	0.036	0.007	0.034
1 = Has blues three or more days in past week	0.125	0.108	0.145	0.016	0.026	-0.020	0.025
1 = No physical disability	0.838	0.873	0.760	-0.035	0.028	0.079***	0.030
1 = Immigrated to Canada in last five years	0.017	0.015	0.022	0.003	0.010	-0.005	0.010
Hours worked in previous year	489.998	558.356	193.745	-68.358	51.828	296.253***	41.677
Earnings in previous year	3207.782	3762.408	953.976	-554.626	377.910	2253.806***	284.336
Number of months employed in previous year	4.571	5.240	2.252	-0.669*	0.381	2.320***	0.333
Number of months employed full time in previous year	2.480	3.045	0.376	-0.565*	0.333	2.104***	0.228
Sample size	348	278	367				

Note: Statistical significance levels are indicated as * = 10 per cent; ** = 5 per cent; *** = 1 per cent.

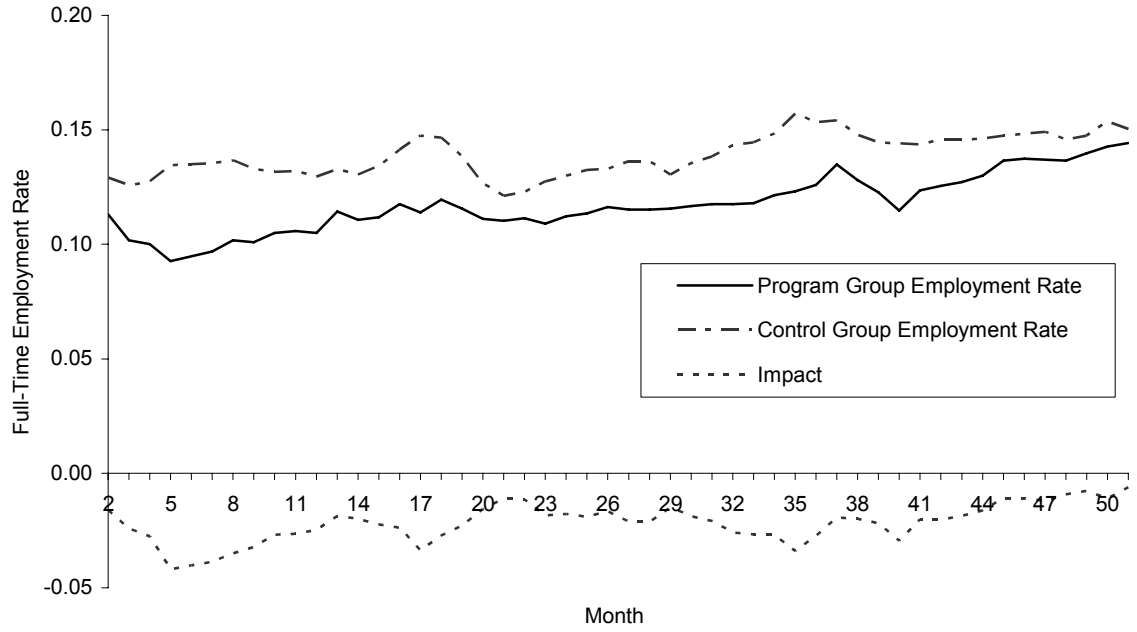
Figure 4: Responders as a Fraction of Eligible Full-Time Workers, by Month



Some of the responders would have worked part time in the absence of SSP and some would not have worked at all. Again, the experimental impacts can identify the *number* of individuals in each group but cannot identify who the actual individuals are unless further assumptions are made. The number of part-time responders can be derived from the impacts of the SSP experiment on the probability of working part time. These impacts are expected to be negative, because some of the program group members switch from part-time to full-time work in order to become eligible for the SSP supplement.

The impacts of SSP on part-time employment are given in Figure 5. As the figure indicates, the impacts are negative in almost every month. With a couple of exceptions, the impacts are statistically significant in every month up to Month 43 and then become smaller and statistically insignificant. If we define pt_p and pt_c as the part-time employment rate of the program and control groups in a particular month, the fraction of the responders who would have worked part time in the absence of the SSP program is given by $-(pt_p - pt_c)/(ft_p - ft_c)$ or the negative of the ratio of the experimental impact on part-time employment to the experimental impact on full-time employment. In Month 13, $pt_p = 0.114274$, $pt_c = 0.132943$, $ft_p = 0.294835$, and $ft_c = 0.145485$. Therefore, the fraction of responders who would have worked part time in the absence of the SSP program is 0.125 (0.018669/0.14935). The remaining fraction of responders (0.875) would not have worked in the absence of SSP.

Figure 5: Program and Control Group Part-Time Employment Rates and Impacts on Part-Time Employment, by Month



Given the fraction of responders who would have worked part time in the absence of SSP, the next step was to select the appropriate number from the sample of responders. This was again done using the method of propensity score stratification. Using the samples of program group responders and control group members not working full time (i.e. those not working and those working part time), a logit regression was run in which the dependent variable was one if the person was in the program group.[27] A predicted propensity score is obtained for each control group member and those with the highest propensity scores are matched to the sample of program group responders. This yields a sample of control group "responders." Then, using this sample of control group responders, some of whom were not working and some of whom were working part time, a logit regression is run to predict the probability of working part time.[28] Next, the results from this estimated equation are used to predict the probability of working part time among the sample of program group responders had SSP not existed. The individuals in this group who have the highest predicted probabilities are selected until the appropriate number of part-timer responders is reached (based on the fraction of the responders who would have worked part time in the absence of SSP). Finally, the number of part-time hours is assigned to these program group members using the mean part-time hours of the subset of the control group sample of responders who were working part time. Thus, for example, in Month 13 there were 46 part-time responders in the program group (0.125 x 367), and their predicted part-time hours during Month 13 in the absence of SSP are 63.39.[29]

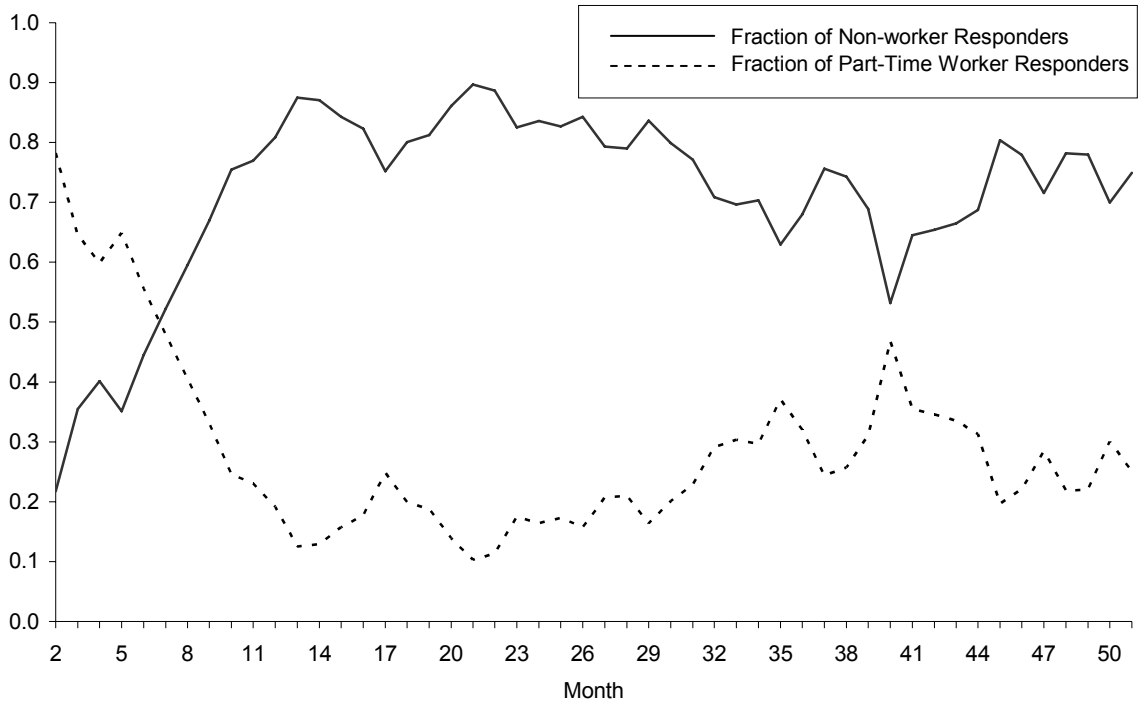
[27]Results of this equation for Month 13 are presented in the Appendix, Table A.2.

[28]Results of this equation for Month 13 are presented in the Appendix, Table A.3.

[29]Instead of using the mean part-time hours for each assumed part-time responder, a part-time hours equation could have been estimated to allow part-time hours to vary across the sample. Doing this, however, would have had little effect on the results because they are driven by the non-worker responders, not the part-time responders.

Figure 6 shows non-worker responders and part-time responders as a proportion of all responders. During the first half year after random assignment, most responders were persons who would have worked part time in the absence of SSP. Presumably, these persons had a closer attachment to the workforce than non-workers and consequently were able to respond to the program's financial incentives more quickly. After the first six months, non-worker responders became more important than part-time responders. In fact, except for the first year after random assignment, they accounted for between 70 and 80 per cent of all responders during most of the months.

Figure 6: Assumed Prior Employment Status of Responders, by Month



V. Findings

ESTIMATES OF LOSSES OF NON-MARKET TIME

Using the derived samples of non-worker and part-time responders and the income assistance (IA) and Self-Sufficiency Project (SSP) formulas in British Columbia and New Brunswick at the time SSP operated, we calculated w_n and w^* for each person in every month. In doing this, we ignored taxes. In Section VI, we examine the sensitivity of the results to allow for federal and provincial taxes in the calculation of w_n and w^*.

Table 2 shows the number of responders and their average net wage each month without SSP (w_n) and with SSP (w^*). Table 2 also divides the net income gains of responders between those gains that can be counted as surplus and those gains that were offset by lost non-market time, using the formulas given in the Appendix.[30] The table presents monthly values and (in the bottom row) weighted averages of these monthly values, with the number of responders in each month used as the weights.

Table 2: Decomposition of Net Income Gains From the SSP Recipient Study

Month	Net Wage on IA	Net Wage on SSP	Adjusted Value A/(A + B)	Net Income Gain A + B	Value of Surplus A	Value of Lost Non-market Time B	Number of Responders
2	$1.50	$9.00	0.57	$819	$466	$353	51
3	$1.88	$8.14	0.57	$859	$483	$375	92
4	$1.94	$8.22	0.55	$898	$487	$411	113
5	$1.98	$8.33	0.56	$902	$492	$410	159
6	$1.90	$8.19	0.54	$923	$486	$437	178
7	$2.10	$7.77	0.54	$954	$505	$449	199
8	$2.16	$7.61	0.54	$969	$517	$452	213
9	$2.23	$7.40	0.53	$988	$517	$470	239
10	$2.42	$7.71	0.51	$1,000	$501	$499	268
11	$2.28	$7.12	0.52	$1,005	$510	$495	281
12	$2.31	$7.05	0.51	$998	$499	$499	317
13	$2.32	$6.93	0.50	$1,003	$494	$509	367
14	$2.34	$7.10	0.50	$1,009	$496	$513	377
15	$2.26	$7.21	0.50	$1,004	$491	$513	350
16	$2.25	$7.30	0.50	$995	$490	$506	331
17	$2.25	$7.80	0.52	$1,026	$524	$503	334
18	$2.30	$7.42	0.51	$997	$499	$498	335
19	$2.24	$7.15	0.51	$980	$489	$491	299
20	$2.34	$7.11	0.50	$1,017	$498	$519	277
21	$2.39	$6.96	0.50	$1,021	$500	$521	263
22	$2.41	$7.09	0.50	$1,037	$503	$534	250
23	$2.47	$7.30	0.51	$1,037	$518	$519	260
24	$2.50	$7.11	0.51	$1,045	$513	$531	267

(continued)

[30]These values are in current Canadian dollars. As indicated earlier, the SSP experiment took place during the 1990s.

Table 2: Decomposition of Net Income Gains From the SSP Recipient Study (Cont'd)

Month	Net Wage on IA	Net Wage on SSP	Adjusted Value A/(A + B)	Net Income Gain A + B	Value of Surplus A	Value of Lost Non-market Time B	Number of Responders
25	$2.47	$7.18	0.51	$1,037	$512	$524	270
26	$2.39	$7.16	0.50	$1,031	$505	$526	260
27	$2.50	$7.55	0.50	$1,042	$511	$531	252
28	$2.48	$7.55	0.50	$1,036	$503	$533	248
29	$2.44	$7.10	0.49	$1,053	$506	$547	224
30	$2.50	$7.24	0.50	$1,063	$511	$552	229
31	$2.49	$7.32	0.50	$1,090	$526	$564	224
32	$2.54	$7.82	0.50	$1,095	$530	$565	218
33	$2.53	$7.74	0.51	$1,067	$522	$545	216
34	$2.51	$7.58	0.51	$1,072	$528	$545	222
35	$2.44	$7.97	0.53	$1,029	$526	$503	225
36	$2.40	$7.84	0.52	$1,043	$524	$519	210
37	$2.48	$7.71	0.51	$1,063	$525	$538	194
38	$2.71	$7.76	0.51	$1,082	$534	$548	190
39	$2.48	$7.90	0.52	$1,047	$518	$530	173
40	$2.55	$8.59	0.54	$1,005	$529	$476	155
41	$2.73	$8.45	0.51	$1,032	$510	$522	140
42	$2.67	$8.21	0.51	$1,070	$532	$538	144
43	$3.02	$8.04	0.50	$1,098	$533	$565	137
44	$3.29	$8.61	0.49	$1,144	$543	$601	127
45	$3.56	$7.52	0.61	$1,107	$662	$446	137
46	$3.13	$7.86	0.61	$1,113	$680	$433	122
47	$3.21	$8.19	0.50	$1,186	$568	$618	105
48	$3.07	$8.15	0.47	$1,195	$535	$660	104
49	$4.45	$7.99	0.57	$1,202	$681	$521	86
50	$3.59	$8.79	0.48	$1,203	$551	$651	91
51	$3.59	$7.81	0.53	$1,147	$596	$551	60
Weighted averages	$2.46	$7.54	0.51	$1,030	$516	$514	

The first two columns of the table indicate that in most months the net wage with SSP was approximately three times larger than the net wage without the program, suggesting that SSP created very substantial incentives to work full time. During the first months after random assignment, when part-time responders were proportionately more important, the differences between w_n and w^* were even larger.

The net increases in income per responder and the proportion of these increases that result in gains in surplus (i.e. the "adjustment value") appear in the middle two columns of Table 2. The average net income increases were just over one thousand dollars each month. However, there was no month in which more than 61 per cent of these gains could be counted as surplus, and in a few months this percentage fell to less than 50 per cent. Viewed somewhat differently, around 40 to 50 per cent of the net income gains of SSP responders were offset by losses in non-market time. The weighted average for the adjustment value (the percentage of the net income gain that is surplus), which is shown at the bottom of the table, is 51 per cent. In assessing this 51 per cent figure, the reader should keep in mind that it is

based on conservative assumptions. As will be seen in Section VI, its true value is probably smaller and hence the value of lost non-market time is probably larger.

REASSESSMENT OF THE SSP COST–BENEFIT ANALYSIS

We can use our results to reassess the original cost–benefit analysis of SSP presented in Michalopoulos et al. (2002). The first 10 rows in Table 3 present estimates of benefit and cost components taken directly from Table 7.6 of Michalopoulos et al. (2002). These results are reported from three different perspectives: that of the program group, that of government, and that of society. Because society is comprised of the program group and taxpayers who fund the government's budget, the values for the societal perspective are computed by summing the estimates in the first two columns. The estimates consist of dollar amounts that have been aggregated over the five years after random assignment. All the values in Table 3 have been inflation-adjusted to Year 2000 Canadian dollars using Gross Domestic Product (GDP) implicit price deflators from Statistics Canada and discounted to the Year 2000 using a five per cent discount rate. The reported benefits and costs are averages for the program group. For example, the reported benefit of $3,562 from increased earnings is an impact estimate that was obtained by first subtracting the average earnings of control group members from the average earnings of the program group. In computing these averages, workers with positive earnings and non-workers with zero earnings were both included.

Table 3: Five-Year Estimates of Net Gains and Losses per Program Group Member

	Perspective		
Financial effects ($)	**Program Group**	**Government Budget**	**Society**
	Original estimates		
Transfer payments	$3,173	-$3,173	$0
Transfer payment administration	$0	-$232	-$232
Operating cost of SSP	$0	-$1,267	-$1,267
Program management information system	$0	-$37	-$37
Supports for work	$108	-$108	$0
Earnings	$3,562	$0	$3,562
Fringe benefits	$538	$0	$538
Taxes and premiums	-$1,732	$1,732	$0
Tax credits	-$394	$394	$0
Net gain or loss (net present value)			
Including windfalls	**$5,256**	**-$2,691**	**$2,565**
Excluding windfalls	**$3,796**	**-$1,231**	**$2,565**
	Re-analysis of benefits and costs		
Lost non-market time	*-$1,860*	*$0*	*-$1,860*
Adjusted net gain or loss (net present value)	***$3,396***	***-$2,691***	***$705***

The $3,173 net benefit the program group received from increased transfer payments, which resulted because the SSP earnings supplement more than offset the loss in IA payments for these who found full-time employment, was similarly estimated. Unlike the gain in earnings, which accrued only to individuals who responded to the financial incentives

offered by SSP, part of the increased transfer payments are windfall gains enjoyed by persons in the program group who would have found full-time jobs in the absence of the SSP program. Based on receipt of an SSP earnings supplement over the 50 months examined in Table 2, we estimate that 54 per cent of the persons receiving an SSP supplement were responders and the remaining 46 per cent were windfall recipients.[31] Windfall recipients did not lose any non-market time *as a result of SSP* because they behaved in the same manner they would have if the program did not exist. Thus, in determining the net gain to responders, we excluded 46 per cent of the increased transfer benefits received by the SSP program group. Total net gains (or losses) that include these windfall gains appear in the 10th row of Table 3 and total net gains or losses that exclude them appear in the 11th row.

The last two rows of Table 3 (shown in italics) present our reassessment of the original cost–benefit findings once the cost of lost non-market time is taken into account. Once the adjustment value is used to take account of the cost of non-market time, the benefits of SSP to program group members are measured in terms of increased surplus, rather than increased income. The $1,860 estimate of the cost of lost non-market time, which appears in the first column of the second from the last row in Table 3, was derived by multiplying the program group's total unadjusted net gain of $3,796 in income, excluding windfall gains, by one minus the adjustment value of 0.51, which appears in the bottom row of Table 2 (i.e. by 0.49). The $3,396 estimate of the adjusted net income gain of the average program group member, which appears in the first column of the last row of the table, was obtained by subtracting the cost of lost non-market time ($1,860) from the program group's total unadjusted net gain in income ($5,256). This latter figure includes windfall gains, because although they do not reflect losses in non-market time by SSP responders, they should be counted as part of the gain from SSP enjoyed by the program group.

As indicated by Table 3, although the incomes of program group members increased by an average of $5,256 during the five years following random assignment, the increase in the government budget that resulted from the program during the same period was $2,691 per program group member and hence the unadjusted net social benefit of the program to society as a whole was $2,565 ($5,256 - $2,691) per program group member. However, once the cost of lost non-market time is taken into account, the net benefit to society falls to $705 ($2,565 - $1,860), less than a quarter of its originally estimated value.

REASSESSMENT OF COST–BENEFIT ANALYSIS BY PROVINCE

The re-analysis of the original SSP cost–benefit analysis presented in the previous section focuses on findings that combined benefits and costs for New Brunswick and British Columbia. However, the original SSP cost–benefit analysis also computed separate estimates for each province. Hence, we present the results of a re-analysis of these separate cost–benefit estimates. This is important because the original findings were considerably more favourable for New Brunswick than for British Columbia, although positive for both provinces. Thus, taking account of non-market time could overturn the latter findings but not the former.

[31]The fraction of supplement recipients in each month who are windfall recipients is estimated as one minus the ratio of the impact on full-time employment in the month to the fraction of the program group who received a supplement payment.

Both the original findings for each province (taken from Table 7.7 of Michalopoulos et al., 2002) and our re-analysis of these findings, after taking account of the value of non-market time, are presented in Table 4. As indicated in the table, the original findings imply that, on average, members of the program group made slightly larger net gains in British Columbia than in New Brunswick, but government budgetary expenditures per program group member were over twice as large in British Columbia as in New Brunswick. As a result, the net gains to society as a whole that resulted from SSP were considerably higher in New Brunswick.

Table 4: Separate Estimates by Province

	Adjustment Value (Weighted Average of All Months)	Lost Non-market Time	Adjusted Net Gain or Loss (Net Present Value) From the Perspective of		
			Program Group	Government Budget	Society
New Brunswick					
Original estimates					
Including windfalls	1.00	$0	$5,035	-$1,660	$3,375
Excluding windfalls	1.00	$0	$3,879	-$504	$3,375
Estimates from re-analysis	0.55	-$1,745	$3,290	-$1,660	$1,630
British Columbia					
Original estimates					
Including windfalls	1.00	$0	$5,294	-$3,493	$1,801
Excluding windfalls	1.00	$0	$3,584	-$1,783	$1,801
Estimates from re-analysis	0.47	-$1,900	$3,394	-$3,493	-$99

Notes: The original estimates are from Table 7.7 of Michalopoulos et al. (2002). The net gain to the program group that excludes windfalls is computed by subtracting the windfall percentage (43 per cent for New Brunswick and 49 per cent for British Columbia) of the transfer payments from the total net gain that includes windfalls. Lost non-market time is computed as the product of one minus the weighted adjustment value and the unadjusted net gain of the program group that excludes windfalls. The adjusted net gain for the program group is computed by subtracting lost non-market time from the unadjusted net gain of the program group that includes windfalls. The adjusted net gain or loss for society is computed by subtracting lost non-market time from the unadjusted net gain for society.

The re-analysis indicates that the value of lost non-market time was slightly greater in British Columbia. This occurs because the share of the income gain that can be attributed to a gain in surplus (i.e. the adjustment value) is smaller in British Columbia, even though the estimated gain in net income per program group member that resulted from SSP is somewhat smaller in British Columbia once windfall gains are excluded. A more important implication of the re-analysis is that the net gains to society from SSP were positive in New Brunswick but (slightly) negative in British Columbia. Although a small part of this difference between the two provinces results from the larger estimated value of the loss in non-market time in British Columbia, most is attributable to fact that the government budgetary expenditures on SSP were over twice as large in British Columbia as in New Brunswick.

VI. Sensitivity Tests

As indicated earlier, our findings are based on a number of assumptions regarding the value of the reservation wage, the shape of the labour supply curve, the equilibrium status of responders, the compensated wage elasticity, and the method of selecting the group of responders. In addition, our findings do not take account of the federal and provincial tax systems in Canada and hence we are implicitly assuming zero taxes. In this section, we examine the sensitivity of our findings to these assumptions.

Table 5 presents the results of sensitivity tests of the key assumptions upon which our findings are based. The sensitivity tests are performed for the combined samples in British Columbia and New Brunswick. Rows 1, 2, and 3 are taken directly from tables 2 and 3. The remaining rows in Table 5 should be compared with the baseline estimates appearing in row 3.

Table 5: Sensitivity Tests

		Adjustment Value			Adjusted Net Gain or Loss (Net Present Value) From the Perspective of	
Row	Assumption	Month 13	Weighted Average of All Months	Lost Non-market Time	Program Group	Society
1	Original estimates including windfalls	1.00	1.00	$0	$5,256	$2,565
2	Original estimates excluding windfalls				$3,796	$2,565
3	Baseline (Table 3)	0.50	0.51	-$1,860	$3,396	$705
4	Reservation wage at mid-point of upper and lower bounds	0.28	0.29	-$2,696	$2,560	-$131
5	Backward “L” labour supply curve	0.68	0.70	-$1,139	$4,117	$1,426
6	Linear labour supply curve	0.34	0.35	-$2,468	$2,788	$97
7	Rows 4 and 5 combined	0.39	0.40	-$2,278	$2,978	$287
8	Rows 4 and 6 combined	0.20	0.21	-$3,000	$2,256	-$435
9	Over-employed if hours > 30	0.48	0.49	-$1,936	$3,320	$629
10	Under-employed if hours < 40	0.51	0.52	-$1,823	$3,433	$742
11	Substitution elasticity = 0.05	0.51	0.52	-$1,823	$3,433	$742
12	Substitution elasticity = 1.60	0.42	0.43	-$2,165	$3,001	$400
13	Incorporating federal and provincial income taxes	0.49	0.50	-$2,387	$2,869	$178
14	Random matching	0.49	0.5	-$1,899	$3,388	$666

Notes: The net gain to the program group that excludes windfalls is computed by subtracting the windfall percentage (46 per cent) of transfer payments from the total net gain that includes windfalls. The net gain to the program group that excludes windfalls that is used in calculating row 13 subtracts taxes and tax credits from transfer payments (see the text for an explanation). Lost non-market time is computed as the product of one minus the weighted adjustment value and the unadjusted net gain of the program group that includes windfalls. The adjusted net gain for the program group is computed by subtracting lost non-market time from the unadjusted net gain of the program group that includes windfalls. The adjusted net gain or loss for society is computed by subtracting lost non-market time from the unadjusted net gain for society.

The estimates appearing in rows 4 through 14 follow the procedures described earlier, with one important exception: to reduce the enormous amount of computations required to estimate adjustment values for 50 separate months, the adjustment value was only directly re-estimated for Month 13, a month in which the number of responders was close to its peak. The method used to obtain adjustment values for remaining months presumes that the differences between the baseline and the re-estimated adjustment values for each month remain roughly proportional to the differences between the baseline and the re-estimated adjustment values for Month 13. For example, as indicated in Table 5, the Month 13 adjustment value for the sensitivity test shown in row 4 is 0.28. The comparable adjustment value for Month 8 was obtained by multiplying 0.28 by the ratio of the baseline adjustment value for Month 8 (0.54) to the baseline adjustment value for Month 13 (0.52). These values were taken from Table 2. Multiplication by the ratio is intended to account for the fact that the adjustment values vary somewhat from month-to-month. Thus, the Month 8 adjustment value that was used in computing the row 4 dollar amounts is 0.291, or (0.54/0.52)0.28. The same procedure is followed for each of the remaining months. Because, as shown in Table 2, the adjustment values do not vary by very much across months, the weighted average adjustment values that result from this process (shown in Table 5) are very similar to the Month 13 adjustment values. This suggests that the procedure should result in estimates of lost leisure time that are close to what would be obtained if adjustment values were directly computed for each month.

SENSITIVITY TO ASSUMPTIONS ABOUT THE RESERVATION WAGE

As can be seen from figures 1 and 2, and as previously discussed, the reservation wage for non-worker responders must be above w_n but below w^* and for part-time responders must fall between w_n and zero. The baseline estimates in row 3 of Table 5 are based on the assumption that the reservation wages for both groups are at the bottoms of these ranges. While conservative, this assumption is also not plausible. The actual reservation wage for most responders is almost certainly above its lowest feasible value. Hence, in making the calculations in row 4, we assume instead that the reservation wage for each group is at the mid-point of each feasible range.

As a comparison of rows 3 and 4 indicates, this alternative assumption causes the share of the increase in income that results in an increase in surplus to fall by nearly half (from 51 to 29 per cent) and the estimated value of lost non-market time to rise by over $800 (from $1,860 to $2,696). As a consequence, the estimated net benefit of Self-Sufficiency Project (SSP) to society becomes negative. Thus, it appears that the findings are quite sensitive to assumptions about the reservation wage.

SENSITIVITY TO ASSUMPTIONS ABOUT THE SHAPE OF THE LABOUR SUPPLY CURVE

The baseline estimates in row 3 are based on the assumption that, as shown in figures 1 and 2, the labour supply curves of those who responded to the program's incentives are elliptical in shape. To test the sensitivity of the findings to this assumption, we make two

alternative assumptions. One is that the labour supply schedule is linear between the point at which the wage line w_r intersects the vertical axis and the point at which the line w^* intersects the hours line h^*. Inspection of figures 1 and 2 suggests that this assumption provides a lower bound on the percentage of the SSP-induced increase in income that results in an increase in surplus. The other alternative assumption is that the supply curve follows the horizontal wage line w_r until h^* hours and then it turns vertical. This labour supply curve resembles a backward letter "L," and although it is somewhat peculiar in shape and not very plausible, it is useful because it places an upper bound on the proportion of the income increases resulting from SSP that increases surplus.

The estimates that are based on these two alternative labour supply curves appear in rows 5 and 6 of Table 5. These estimates are directly comparable to the baseline estimates that appear in row 3, because we once again assume the lowest feasible value for the reservation wage. They differ greatly from one another and, while bracketing the baseline estimates, each is substantially different from the baseline estimates. Most importantly, while the linear labour supply curve implies that the net benefit of SSP to society is near zero, the backward "L" curve suggests that it is positive, though not much more than half as large as the original estimate in Michalopoulos et al. (2002).

The estimates reported in row 7 are based on two assumptions that differ from those used in computing the baseline estimates: that the reservation wage is at the mid-point of the feasible range and that the labour supply curve is a backward "L." Similarly, in computing the estimates shown in row 8, it was assumed that the reservation wage is at the mid-point of the feasible range and that the labour supply curve is linear.

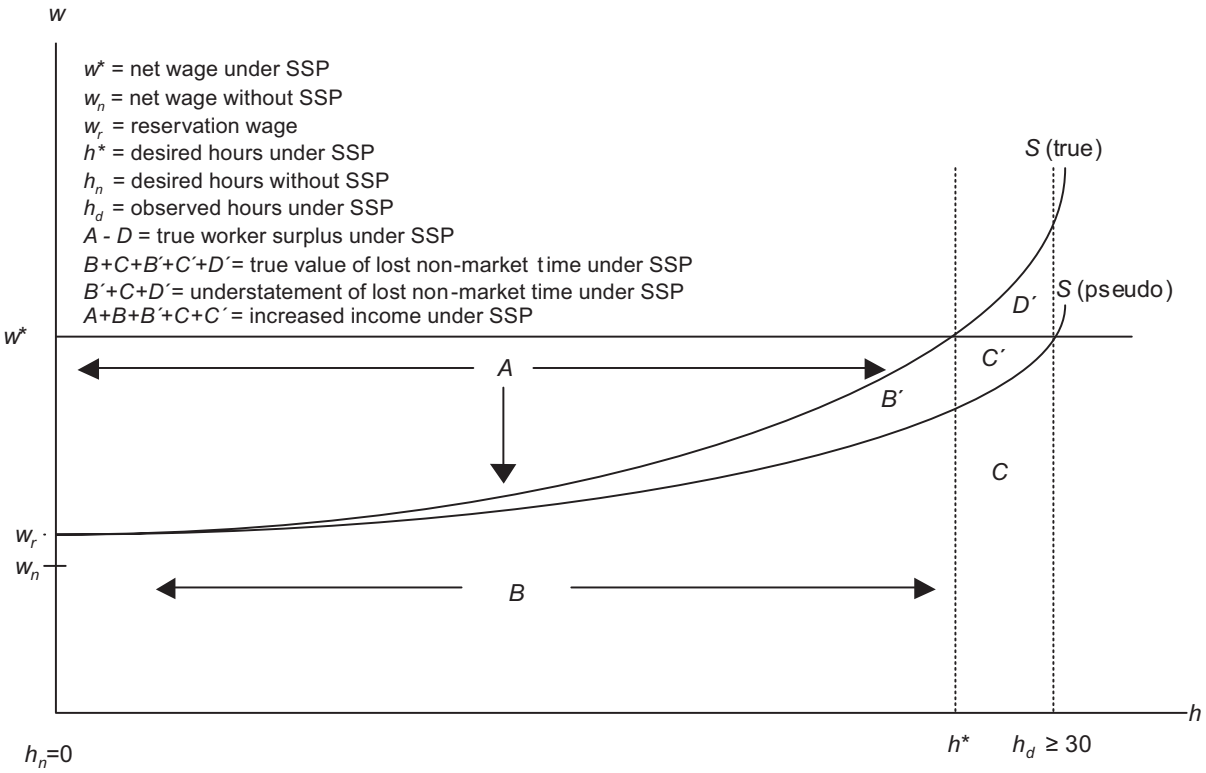
These estimates differ much less from one another than do those reported in rows 5 and 6 and, while bracketing the estimates appearing in row 4, they do not differ greatly from them. Overall, this suggests that the findings are highly sensitive to assumptions about the shape of the labour supply curve only if it is also assumed that the reservation wage is near the bottom of its plausible range. It should also be noted that the estimate in row 7 implies that the net benefit to society is negligible and the estimate in row 8 implies that it is negative.

SENSITIVITY TO ASSUMPTIONS ABOUT MARKET DISEQUILIBRIUM

In computing the baseline estimates we assumed that after adjusting to SSP, responders were all working the number of hours they desired. Of course, this may not be the case. As discussed in Section II, they may instead be working more or fewer hours than they want.

Figure 7 depicts "over-employment" for a non-worker responder, a situation in which the hours she actually worked (h_d) exceed the hours she desired to work, h^*. Thus, although in making our baseline calculations we assumed that the compensated labour supply schedule for the SSP responder represented in the figure was S (pseudo), it actually corresponded to S (true). Consequently, we counted areas $A + B' + C'$ as surplus resulting from SSP but should have only counted area A.

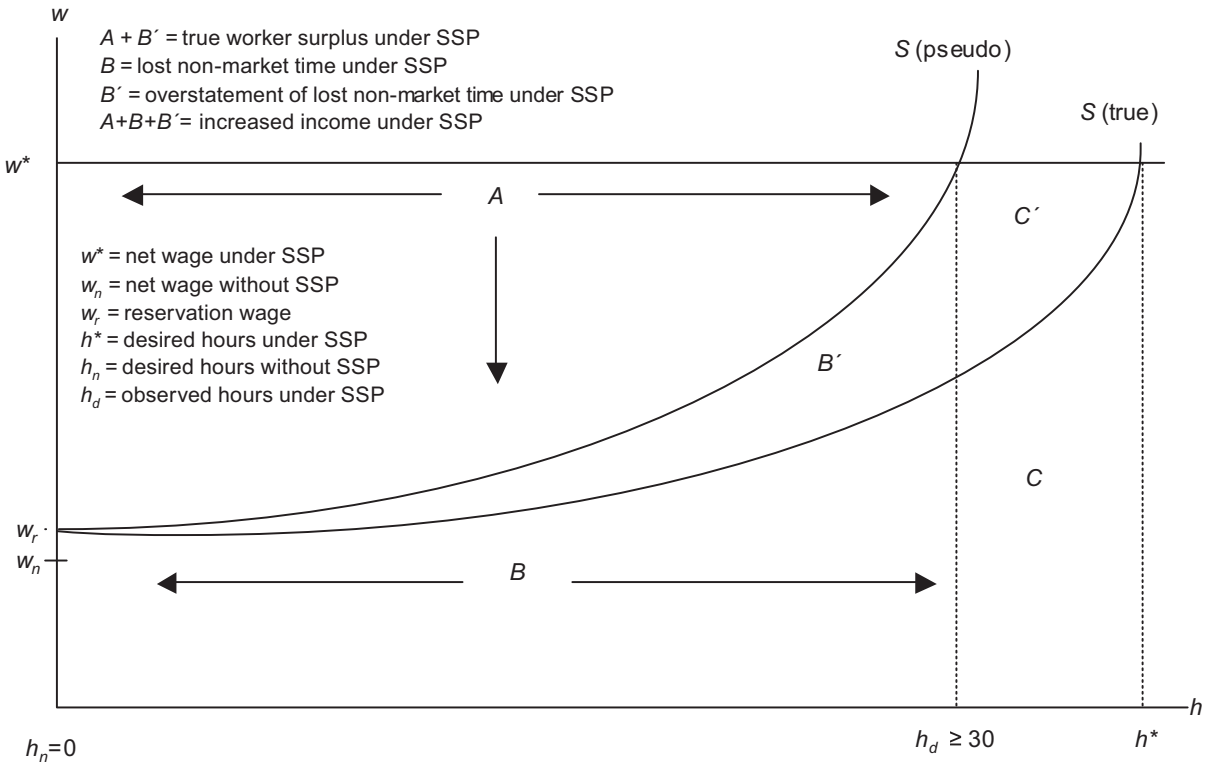
Figure 7: Value of Lost Non-market Time for Over-Employed Non-worker Responders



In addition, because the individual worked more hours than desired, a deadweight loss occurs. This deadweight loss, which is represented in Figure 7 by area D', must be subtracted from area A to compute the surplus resulting from SSP. The deadweight loss occurs because the worker is forced to work h_d hours at a wage (w*) below the wage that would induce her to voluntarily work h_d hours. Put another way, for any hour worked beyond h*, the value of the worker's time (as represented by the vertical height of her supply curve) exceeds the return she receives (w*), for working that hour. On the other hand, the value of lost non-market time should have been measured as areas $B' + C' + D' + B + C$, but was instead was estimated as areas $B + C$. Hence, surplus was overstated and the value of lost non-market time understated by areas $B' + C' + D'$.

Figure 8, which is analogous to Figure 7, depicts "underemployment" for a non-worker responder. In this case, desired hours (h*) exceeds actual hours (h_d). In our baseline estimates, therefore, surplus for the responder in the figure is measured as area A but actually equals areas $A + B'$, and the value of lost non-market time is measured as areas $B + B'$ but the true value of the loss is only B. Thus, the resulting error corresponds to area B'. Note that because only h_d hours were actually worked, areas to the right of h_d are not and should not be counted in computing the baseline estimates of either surplus or the value of lost non-market time. Lost non-market time cannot result from hours not worked.

Figure 8: Value of Lost Non-market Time for Under-Employed Non-worker Responders



Of course, we have no way of detecting whether individual SSP responders were under-employed, over-employed, or working their desired number of hours. We know only the number of hours they actually worked under SSP. However, it is possible to test the sensitivity of our findings to the baseline assumption that all responders were able to work their desired hours by making alternative assumptions. For the purpose of testing the sensitivity of the baseline findings to the possibility of over-employment, we assume that all responders desired only 30 hours of work. Thus, any responders who worked more than 30 hours are assumed to have been over-employed. For the purpose of testing the sensitivity of the baseline findings to the possibility of under-employment, we assume that all responders desired 40 hours of work. Hence, responders who worked fewer than 40 hours are assumed to have been under-employed.

The estimates that are based on these assumptions appear in rows 9 and 10 of Table 5 and differ little from the baseline estimates shown in row 3. Therefore, it seems safe to conclude that our findings are insensitive to the existence of over-employment and under-employment.

SENSITIVITY TO ASSUMPTIONS ABOUT THE COMPENSATED WAGE ELASTICITY

As mentioned in Section III, in order to use the elliptical labour supply curve, it is necessary to make an assumption about the value of the compensated wage elasticity at the desired hours of work under SSP. In making our baseline estimates, we assumed an elasticity value of 0.1, which is similar to the value suggested by findings from the income maintenance experiments.

The estimates shown in rows 11 and 12 of Table 5 are respectively based on a considerably smaller value (0.05) and a much larger and not very realistic value (1.6). It seems apparent that unless extreme and highly implausible assumptions are made about the value of the compensated wage elasticity, the baseline findings will not be strongly affected.

SENSITIVITY TO TAKING ACCOUNT OF INCOME TAXES

In computing the adjustment values in rows 3 through 12 of Table 5, we ignored various work-related costs and benefits such as taxes, tax credits, supports for work (child-care and transportation subsidies), and fringe benefits. As indicated by Table 3, the largest of these items by far is taxes. Thus, for purposes of our sensitivity tests, we took account of federal income taxes and provincial income taxes in British Columbia and New Brunswick, as well as tax credits, in calculating the adjustment values that appear in row 13 of Table 5.[32] In doing this, we use a somewhat different value for windfall gains than we used in making the other computations in Table 5.[33] Specifically, we compute windfall gains as 46 per cent of transfer payments *less* taxes and tax credits (i.e. 0.46(3,173 - $1,732 - $394) = $482). Thus, the net gain for the program group excluding windfalls equals $4,774. Primarily because of the way windfall gains are computed, the value of lost non-market time increases somewhat when taxes and tax credits are taken into account as compared with the baseline and hence the gains to society, while remaining positive, become negligible.[34]

SENSITIVITY TO AN ALTERNATIVE MATCHING SCHEME

As discussed in Section IV, two separate groups of individuals received SSP earnings supplements — those who received SSP earnings supplements by responding to the program's incentives (responders) and those who enjoyed windfall gains because they

[32] Although we have not taken account of supports for work and fringe benefits, the sum of these items is only about one third the size of the sum of taxes and tax credits. Hence, incorporating these items should have little effect on the results.

[33] As previously indicated, in ignoring taxes and tax credits, we compute windfall gains as 46 per cent of transfer payments only.

[34] The adjustment values fall only slightly as a result of taking account of taxes and tax credit. This change occurs because the values of the net wage rates with and without SSP (w^* and w_n, respectively) both fall. The reduction in the value of w_n, in turn, causes the value of the reservation wage of non-worker responders also to fall, because in computing the baseline estimates we assumed that $w_n = w_r$ for this group. And the reduction in the values of w^* and w_r shifts the labour supply curve downward. However, because both w^* and w_r decline for most responders, the changes in the adjustment values are small. Although the estimated adjustment values are barely affected by the incorporation of taxes, the net return for working full time (the values of w_n and w^*) is affected substantially. For example, in Month 13, w_n falls from $2.32 to $1.39 and w^* falls from $6.93 to $4.28 when taxes are taken into account.

worked a sufficient number of hours to qualify for SSP earnings supplements but would have also done so in the absence of the incentives (non-responders). Propensity score stratification is used to identify the members of each group, and the balancing test described in Section IV suggests that the propensity score stratification is reasonably successful. Nonetheless, we performed an alternative sample selection procedure to discover whether our findings are sensitive to the method used to identify responders. As an extreme alternative, we simply chose the responder and non-responder samples randomly.

We performed this exercise a total of six times. Three of the Month 13 adjustment values equalled 0.48, two equalled 0.49, and one equalled 0.50. We used the 0.49 figure to compute the sensitivity estimates reported in row 14 of Table 5. Because the adjustment values used to compute the estimates in rows 3 and 14 are so similar to one another, it is not surprising that the estimated values of surplus and lost non-market time in the two rows are also similar.

There are two reasons why using propensity score stratification and random assignment to select responders and non-responders, as well as six separate random assignment trials, produces such similar adjustment values. First, as indicated by figures 1 and 2, adjustment values vary for individuals with different wage rates and hours. However, most recipients of the SSP supplement were disadvantaged single-parent workers who received similarly low wages and worked between 30 and 40 hours a week. In Month 13, for example, the average net wage under SSP was $6.93 with a standard deviation of $1.67, and average hours were 36.9 with a standard deviation of 8.05. Because the variation in wages and hours was relatively small, assigning different individuals to the responder group has little effect on the estimated adjustment values. Second, as indicated by Figure 4, the fraction of responders among full-time workers who were eligible for SSP was between 40 per cent and 60 per cent during most of the months included in our analysis. In Month 13, for example, it was 57 per cent. Thus, many of the same individuals were assigned to the responder group regardless of whether propensity score stratification or random assignment was used. For example, in Month 13 there was approximately a 57 per cent overlap in individuals assigned to the responder group. This obviously muted the difference in the adjustment values computed using each method.

VII. Conclusions

The key finding in this paper is that the cost of the non-market time lost to persons who responded to the SSP financial incentive was substantial. For example, our baseline estimates, which are based on fairly conservative assumptions, imply that well over one third ($1,860 out of $5,256) of the gains in income received by the program group was offset by losses in non-market time. As a consequence, approximately three quarters of the positive net social gains attributed to the Self-Sufficiency Project (SSP) in the original cost–benefit analysis of long-term IA recipients are eliminated.

This baseline finding was subjected to numerous sensitivity tests. All but one of these sensitivity tests produced estimates of SSP's societal effects that are well under $1,000, and a few suggest they are negative. The one exception occurs when it is assumed that the labour supply curve has the shape of a backward "L" *and* that the reservation wage is at its lower boundary. Even in this case, however, SSP's social benefits are estimated to be much lower than those that appear in Michalopoulos et al. (2002). In our view, the backward "L" labour supply curve is implausible because of its highly discontinuous nature. Thus, we believe that the "true" value of lost non-market time is likely to fall somewhere between the estimates based on the elliptical labour supply curve and the estimates based on the linear labour supply curve. The value of the reservation wage is highly uncertain, suggesting that it would be useful in future evaluations of welfare-to-work programs to attempt to obtain its value through carefully conducted surveys. Currently, however, we are able to determine only its lower and upper bounds (respectively, w_n and w^* for non-worker responders and zero and w_n for part-time responders) and conjecture about where in this range it falls. The reservation wage is almost certainly higher than its lower bound value, but it could be even higher than the value at the mid-point of the upper and lower bounds, suggesting that the baseline estimate of $1,860 for the cost of lost non-market time is probably substantially understated. Thus, we conclude that the cost of the non-market time lost to persons who responded to the financial incentives offered by SSP was probably large enough to nearly offset, or even more than offset, the positive net social gains of $2,565 that the original cost–benefit analysis attributed to SSP.

In assessing this finding, it is very important to keep in mind that we have focussed on only one possible limitation to the original SSP cost–benefit study. There are two important additional considerations not taken into account in either the original SSP cost–benefit analysis or our re-analysis that would act to increase the net gains from SSP. These are the value that taxpayers place on reductions in the income assistance (IA) benefit rolls and the effects of SSP on the income distribution.

Many taxpayers who pay for IA benefits may feel that recipients of these transfers *should* be working. SSP did, of course, increase the work effort of IA participants. To the extent taxpayers are willing to pay for such an outcome, this is a benefit of the program that could, *perhaps*, offset the loss of non-market time among those who responded to SSP. No attempt, however, has ever been made to elicit taxpayers' willingness to pay for the substitution of work for transfer payments. Thus, one can currently do little more than conjecture about the size of this benefit. One approach that could be used to obtain information on this topic is

contingent valuation, which utilizes surveys to attempt to measure willingness to pay for goods not exchanged in markets.[35]

As shown in tables 3 and 4, SSP resulted in net gains for the program group but net losses to the government budget. In other words, there was a transfer of income between program participants and taxpayers. However, in the SSP cost–benefit analysis, the dollars gained by participants were valued as the same as those lost by taxpayers. Because participants in SSP had much lower incomes than taxpayers (on average), their marginal utility of income was likely to have been higher. A considerable literature exists suggesting that this difference in marginal utility should be dealt with in cost–benefit analyses by giving each dollar of gain by relatively low-income persons greater weight than each dollar of losses by relatively high-income persons (see Chapter 18 of Boardman et al., 2001). If such adjustments were made, then the estimated social net gains from SSP would obviously increase. However, the appropriate weights are unknown. Although contingent valuation might be one way of estimating the weights, it has never been used for this purpose.

By demonstrating that the SSP cost–benefit findings look very different when lost non-market time is taken into account than when it is not, this paper has both an important methodological and an important policy implication. The key methodological implication is that more work is needed to overcome the limitations of cost–benefit analyses of programs targeted at the disadvantaged (such as SSP) if they are to provide a reliable indicator of program efficacy. Some of these are mentioned above — for example, research on reservation wages, program general equilibrium effects, the relative value of dollars gained (or lost) by low- and high-income persons, and the willingness of taxpayers to pay for increases in the work effort of transfer recipients.

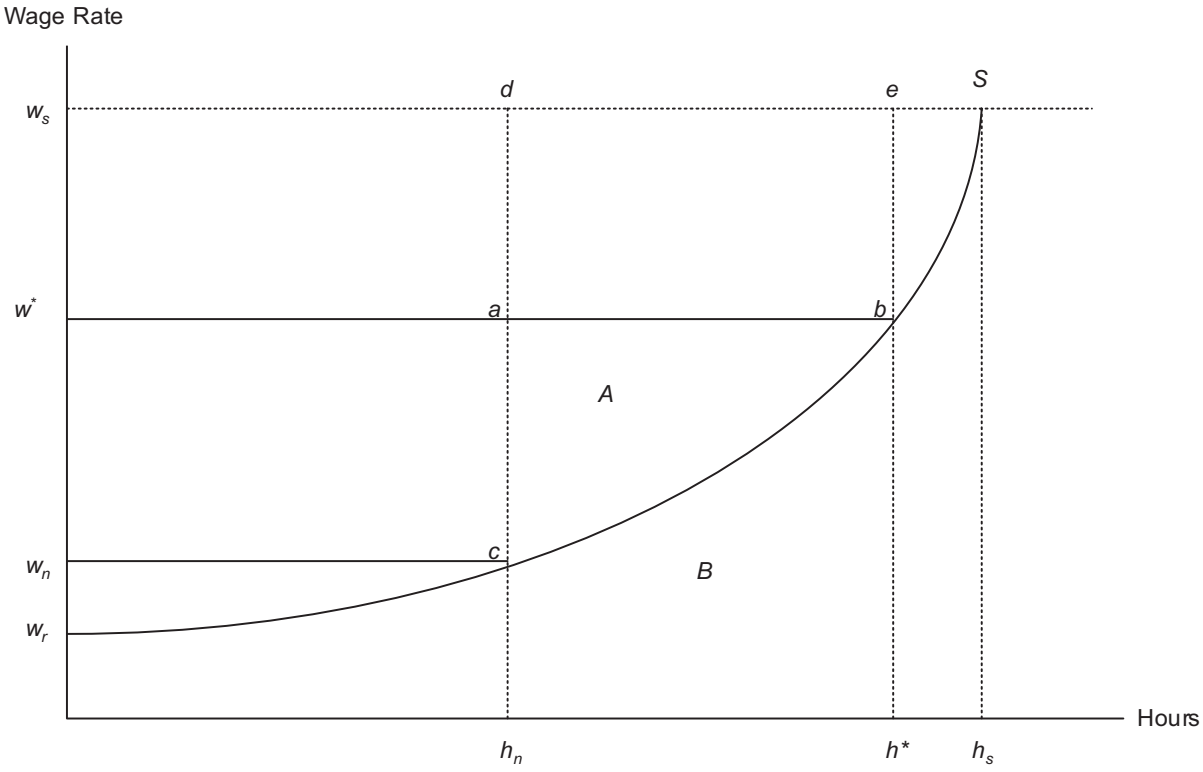
The policy lesson follows directly from the methodological implication. Because they do not treat potentially important issues, cost–benefit studies of programs targeted at the disadvantaged produce suggestive but not fully reliable findings. Although the evaluators conducting cost–benefit analyses are usually careful to point out at least some of their limitations — the SSP analysts certainly were (see Michalopoulos et al., 2002) — the caveats tend to be forgotten by users of the findings, and the numbers that are actually produced are stressed in assessing whether the program was cost-effective. Thus, in determining whether the program was successful, policy-makers look at whether the program's *estimated* net benefit (i.e. whether estimated benefits exceed estimated costs), regardless of whether this "bottom-line" figure might be overturned if factors that were left out of the analysis (e.g. the value of non-market time) were taken into account. It is important that policy-makers recognize their limitations and treat their findings with great care until cost–benefit analyses of programs targeted at the disadvantaged become more reliable.

[35]See Chapter 14 of Boardman et al. (2001) for an overview of contingent valuation and a discussion of the controversies over its usefulness.

Appendix

This appendix derives the formulas used to compute the adjustment value for each SSP responder in each month — that is, the proportion of each responder's monthly net income gain that results in an increase in surplus. The formulas are derived with reference to Figure A.1. The supply curve shown in this diagram is a segment of an ellipse. The lowest point on this ellipse occurs at w_r, while point S is located one quarter of the way around the circumference of the ellipse.

Figure A.1: Deriving the Adjustment Value



In terms of Figure A.1, the percentage adjustment value equals

(A-1) [area A/(area A + area B)]
= [(area dcS - area beS - area adeb)/area h_nabh^*].

Area h_nabh^* and area $adeb$ can be computed as follows:

(A-2) area $h_nabh^* = (h^* - h_n)(w^*)$

(A-3) area $adeb = (h^* - h_n)(w_S - w^*)$

Because the supply curve in Figure A-1 is one quarter of an ellipse, area *dcS* and area *beS* can be computed by using the formula for the area of an elliptical segment (Tuma, 1975, p. 276):

(A-4) area $dcS = \frac{1}{2}\{(h_S)(w_S - w_r)[\cos^{-1}(h_n/h_S)] - h_n(d - c)\}$

(A-5) area $beS = \frac{1}{2}\{(h_S)(w_S - w_r)[\cos^{-1}(h^*/h_S)] - h^*(e - b)\}$

Area *dcS* and area *beS* can be valued entirely in terms of wages and hours by using the standard equation for an ellipse:

(A-6) $(h_n)^2/(h_S)^2 + (d - c)^2/(w_S - w_r)^2 = 1$ or

(A-7) $(h^*)^2/(h_S)^2 + (e - b)^2/(w_S - w_r)^2 = 1$

Thus,

(A-8) $(d - c) = (w_S - w_r)[1 - (h_n/h_S)^2]^{1/2}$ and

(A-9) $(e - b) = (w_S - w_r)[1 - (h^*/h_S)^2]^{1/2}$.

By substituting (A-8) into (A-4) and (A-9) into (A-5), one obtains

(A-4') area $dcS = \frac{1}{2}(w_S - w_r)\{(h_S)[\cos^{-1}(h_n/h_S)] - h_n[1 - (h_n/h_S)^2]^{1/2}\}$

(A-5') area $beS = \frac{1}{2}(w_S - w_r)\{(h_S)[\cos^{-1}(h^*/h_S)] - h^*[1 - (h^*/h_S)^2]^{1/2}\}$.

Substituting (A-2), (A-3), (A-4'), and (A-5') into (A-1), one obtains

$$\text{adjustment value} = \frac{2(h^* - h_n)(w_S - w^*) - (w_S - w_r)h_S\{\cos^{-1}(h_n/h_S) - \cos^{-1}(h^*/h_S)\}}{2(h^* - h_n)(w^*)} \quad \text{(A-10)}$$

$$- \frac{(w_S - w_r)\{h_n[1 - (h_n/h_S)^2]^{1/2} - h^*[1 - (h^*/h_S)^2]^{1/2}\}}{2(h^* - h_n)(w^*)}.$$

By dividing both the numerator and denominator of (A-10) by w^* and by h^*, one obtains

$$\text{adjustment value} = \frac{(w_S/w^* - w_r/w^*)(h_S/h^*)\{\cos^{-1}[(h_n/h^*)/(h_S/h^*)] - \cos^{-1}[1/(h_S/h^*)]\}}{2[1 - (h_n/h^*)]} \quad \text{(A-11)}$$

$$- \frac{(w_S/w^* - w_r/w^*)[(h_n/h^*)\{1 - [(h_n/h^*)/(h_S/h^*)]^2\}^{1/2} - \{1 - [1/(h_S/h^*)]^2\}^{1/2}] - [(w_S/w^*) - 1]}{2[1 - (h_n/h^*)]}.$$

Equation (A-11) was used to compute the adjustment values for each responder for each month. To make these computations, which are summarized in Table 2 of the main text, values were needed for h_n/h^* and w_r/w^*. The source of these values is described in the main text. In addition, it was necessary to obtain values for h_S/h^* and w_S/w^* before making these computations. Approximate values for these variables were obtained by using the formula for the arc approximation of elasticity:

(A-12) $(\epsilon^S + \epsilon^b)/2 \approx [(h_S - h^*)/(h_S + h^*)] \bullet [(w_S + w^*)/(w_S - w^*)]$,

where ϵ^S is the compensated substitution elasticity at point *S* in figure *A* and ϵ^b is the compensated substitution elasticity at point *b*.

Since the ellipse is vertical at point *S*, $\epsilon^S = 0$. Thus, by dividing both the numerator and denominator of (A-12) by w^* and by h^*, one obtains

(A-13) $\epsilon^b \approx 2 \bullet \{[(h_S/h^*) - 1]/[(h_S/\text{h}^*) + 1]\} \bullet \{[(w_S/w^*) + 1]/[(w_S/w^*) - 1]\}$.

The value of h_S/h^* was obtained by using the equation for an ellipse:

(A-14) $(h^*)^2/(h_S)^2 + (w_S - w^*)^2/(w_S - w_r)^2 = 1$

By dividing both the numerator and denominator of (A-14) by w^* and rearranging terms, one obtains

(A-15) $$\frac{h_S}{h^*} = \frac{[(w_S/w^*) - (w_r/w^*)]}{\{[(w_S/w^*) - (w_r/w^*)]^2 - [(w_S/w^*) - 1]^2\}^{1/2}}.$$

By substituting (A-15) into (A-13) and rearranging terms, one obtains

(A-16) $$\epsilon^b \approx 2 \cdot \frac{\{[(w_S/w^*) - (w_r/w^*)] - \{\bullet\}^{1/2}\}}{\{[(w_S/w^*) - (w_r/w^*)] + \{\bullet\}^{1/2}\}} \cdot \frac{[(w_S/w^*) + 1]}{[(w_S/w^*) - 1]}$$

where $\{\bullet\} = \{[(w_S/w^*) - (w_r/w^*)]^2 - [(w_S/w^*) - 1]^2\}$.

Once values for ϵ^b and w_r were assumed and values for h_n, h^*, and w^* were computed, (A-16) was then solved numerically for (w_S/w^*). This value was then substituted into (A-15) to obtain a value for h_S/h^*.

Table A.1: Propensity Score Logit Regression, Non-workers, Month 13 Sample of Program Group "Eligibles" Working Full Time and Control Group Members Working Full Time

Variable	Coefficient	Standard Error
1 = Lives in New Brunswick	0.007	0.156
1 = Male	0.018	0.360
Age	0.011	0.018
Number of other adults in household	0.103	0.123
Number of children	-0.212	0.136
Age of oldest child	0.014	0.035
Age of youngest child	-0.040	0.037
1 = Living with both parents until age 16	-0.164	0.151
1 = Lived in welfare household before age 16	-0.047	0.182
Number of years employed	-0.002	0.016
1 = Working	0.593***	0.193
1 = Looking for work	0.360*	0.187
1 = Enrolled in school	0.164	0.183
1 = Own home	0.038	0.268
1 = Live in subsidized housing	-0.059	0.174
1 = Physical problem limiting work activity	-0.099	0.187
1 = Emotional problems	-0.169	0.350
1 = Born in Canada	0.188	0.250
1 = Speaks English	-0.150	0.616
1 = Speaks French	-0.202	0.201
1 = Mother not a high school graduate	-0.017	0.150
1 = High school diploma but no college	0.014	0.140
1 = Needs child care	-0.409*	0.225
1 = Able to borrow money in an emergency	0.023	0.157
1 = Has blues three or more days in past week	0.089	0.216

(continued)

Table A.1: Propensity Score Logit Regression, Non-workers, Month 13 Sample of Program Group "Eligibles" Working Full Time and Control Group Members Working Full Time (Cont'd)

Variable	Coefficient	Standard Error
1 = Immigrated to Canada in last five years	0.170	0.566
Hours worked in previous year	-0.0004	0.0003
Earnings in previous year	0.00005*	0.00003
Number of months employed in previous year	-0.025	0.031
Number of months employed full time in previous year	0.065*	0.035
Constant	-0.581	0.860
Mean of dependent variable	0.350	—
Log likelihood	-654.448	—
Pseudo R-square	0.032	—
Chi-square for significance of covariates (df = 30)	43.270*	—
Sample size	1,073	—

Notes: The dependent variable is a dummy for being a control group member. All variables are measured at the time of random assignment or before as indicated.

Statistical significance levels are indicated as * = 10 per cent; ** = 5 per cent; *** = 1 per cent.

Table A.2: Propensity Score Logit Regression, Part-Time Workers, Month 13 Sample of Program Group Responders and Control Group Members Not Working Full Time

Variable	Coefficient	Standard Error
1 = Lives in New Brunswick	0.001	0.001
1 = Male	-0.187	0.369
Age	-0.073***	0.015
Number of other adults in household	-0.699***	0.174
Number of children	0.054	0.092
Age of oldest child	0.022	0.021
Age of youngest child	0.036	0.026
1 = Living with both parents until age 16	0.359***	0.137
1 = Lived in welfare household before age 16	-0.183	0.159
Number of years employed	0.062***	0.014
1 = Working at random assignment	-0.009***	0.003
1 = Looking for work at random assignment	-0.506***	0.161
1 = Enrolled in school at random assignment	0.004**	0.002
1 = Live in subsidized housing	0.215	0.140
1 = Physical problem limiting work activity	-0.174	0.145
1 = Emotional problems	0.288	0.233
1 = Born in Canada	-0.048	0.188
1 = Speaks French	0.414**	0.164
1 = Mother not a high school graduate	0.054	0.135
1 = High school diploma but no college	0.423***	0.124
1 = Needs child care	0.925***	0.250
1 = Able to borrow money in an emergency	0.009	0.139
1 = Has blues three or more days in past week	0.021	0.175
Hours worked in previous year	0.002***	0.0005
Earnings in previous year	-0.0002***	0.0001
Number of months employed in previous year	0.046	0.037

(continued)

Table A.2: Propensity Score Logit Regression, Part-Time Workers, Month 13 Sample of Program Group Responders and Control Group Members Not Working Full Time (Cont'd)

Variable	Coefficient	Standard Error
Number of months employed full time in previous year	-0.296***	0.060
Constant	-1.487***	0.518
Mean of dependent variable	0.152	—
Log likelihood	-935.906	—
Pseudo R-square	0.090	—
Chi-square for significance of covariates (df = 30)	184.960***	—
Sample size	2,411	—

Notes: The dependent variable is a dummy for being a program group member. All variables are measured at the time of random assignment or before as indicated.

Statistical significance levels are indicated as * = 10 per cent; ** = 5 per cent; *** = 1 per cent.

Table A.3: Propensity Score Logit Regression, Part-Time Work Probability, Month 13 Sample of Control Group "Responders"

Variable	Coefficient	Standard Error
1 = Lives in New Brunswick	-0.001	0.004
Age	-0.022	0.045
Number of other adults in household	0.266	1.037
Number of children	-0.335	0.225
Age of oldest child	0.048	0.030
Age of youngest child	-0.044	0.051
1 = Living with both parents until age 16	0.105	0.410
1 = Lived in welfare household before age 16	0.054	0.469
Number of years employed	0.049	0.043
1 = Enrolled in school at random assignment	0.007*	0.004
1 = Live in subsidized housing	-0.014	0.373
1 = Physical problem limiting work activity	0.091	0.434
1 = Emotional problems	-0.437	0.766
1 = Born in Canada	-0.402	0.535
1 = Speaks French	0.094	0.416
1 = Mother not a high school graduate	-0.070	0.360
1 = High school diploma but no college	0.914**	0.384
1 = Needs child care	0.401	0.812
1 = Able to borrow money in an emergency	-0.727*	0.381
1 = Has blues three or more days in past week	-0.614	0.594
Hours worked in previous year	-0.001	0.001
Earnings in previous year	0.0001	0.0001
Number of months employed in previous year	0.325***	0.054
Constant	-2.182	1.464
Mean of dependent variable	0.199	—
Log likelihood	-130.624	—
Pseudo R-square	0.287	—
Chi-square for significance of covariates (df = 30)	104.940***	—
Sample size	367	—

Notes: The dependent variable is a dummy for being a part-time worker. All variables are measured at the time of random assignment or before as indicated.

Statistical significance levels are indicated as * = 10 per cent; ** = 5 per cent; *** = 1 per cent.

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