Costs and Benefits of Family Self-Sufficiency Programs Administered by Compass Working Capital in Partnership with Housing Agencies in Cambridge and Boston, MA

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Executive Summary

This report analyzes the monetary costs and benefits of Family Self-Sufficiency (FSS) programs administered by Compass Working Capital, Inc. (Compass) in partnership with two Massachusetts public housing agencies (PHAs). Compass, a national nonprofit financial services organization that is headquartered in Boston and Philadelphia, works with PHAs and private owners to administer FSS programs for households participating in U.S. Department of Housing and Urban Development (HUD) rental assistance programs. This study is a companion to a quasi-experimental study of impacts on FSS enrollees' annual earnings and public benefits receipt (Moulton et al. 2021).

What we studied

FSS is a HUD program established by Congress in 1990 that seeks to help participants in three HUD rental assistance programs (the Housing Choice Voucher, Public Housing, and project-based Section 8 programs) make progress toward economic security. FSS works to achieve these goals by combining stable affordable rental housing with (1) case management, service coordination, and / or coaching to help participants identify and achieve their goals; and (2) an escrow savings account that increases in value as participants' earnings and rent contributions rise. Compass' implementation of FSS focuses on helping families build assets and improve their financial capabilities through participant-centered financial coaching. Compass administers this FSS program work through a public-private partnership, which is funded by its partner housing agencies and private owners and grants from foundations and other philanthropic organizations.

In this report, we estimated costs and benefits from the participant perspective and from the perspective of program providers and government agencies. We estimated the impacts of the Compass FSS program on participants' total earnings and public benefits receipt over an observation period that averaged 4.25 years per household((during this period, Compass FSS participants were in the program for an average of 3.4 years). We compared the experiences of participants in Housing Choice Voucher programs in the Cambridge Housing Authority (CHA) and Metro Housing|Boston (Metro Housing) to those of matched households receiving housing assistance in other New England housing agencies without active FSS programs.[1] We used reported earnings to simulate individual-level tax liabilities and estimate impacts on these outcomes. Finally, we estimated and included changes in housing assistance payments and average disbursements from participants' FSS escrow savings accounts.

We also assessed the costs of delivering the FSS program. Cost assessments are based on Compass financial records and interviews with relevant Compass staff, and on interviews with CHA and Metro Housing leadership familiar with the organizations' inputs required to implement the FSS program.

What we found

The Compass FSS programs in Cambridge and Boston, Massachusetts, produced a net benefit of $3,885 per participant over the course of the seven-year study period. This figure represents the sum of the costs and benefits to (1) the government and other funders of the program and (2) families participating in the program.

[1] Metro Housing is a nonprofit organization that administers state and federal housing assistance in the Boston metropolitan area on behalf of the statewide public housing agency, the Massachusetts Department of Housing and Community Development.

These findings indicate that, on average, every dollar spent by the government / program produces $2.25 dollars in benefits for participants. As detailed below, in building up to these estimates, some of the total cost of delivering the program (paid by the government / Compass) is offset by tax revenue gains, decreases in payments to landlords, and decreases in public income assistance; and some of participants' earnings gains are diminished by increased tax liabilities, decreases in housing assistance levels, and decreases in public income assistance receipt. We did not attempt to quantify (i.e., monetize) the net benefits from improvements in participants' credit scores, reductions in participants' debt, the earnings impacts after the study period ends or after participants leave subsidized housing, and any effects on participants' children stemming from increased household income. We also did not attempt to quantify broader community or economy impacts, which are unclear.

Net costs and benefits of Compass FSS over seven-year study period per participant:

Costs / benefits to government/program:	-$3,114
Costs / benefits to participants:	$6,999
Total net effects:	**$3,885**

Unmeasured factors that could provide additional net benefits:

- Effects on participants' credit scores
- Effects on participants' debt profiles
- Earnings impacts after study period ends
- Effects on participants' children

This is the second cost-benefit analysis of Compass FSS programs that Abt Associates (Abt) has completed. We made several adjustments to our earlier methodology (Dastrup et al. 2017)) to account for the longer time horizon of this study and the availability of new data. The fact that this cost-benefit analysis produced similarly strong results with a different methodology speaks to the robustness of Compass' cost-benefit proposition over time.[2]

How we conducted the study

To estimate the costs of delivering the Compass FSS program, we used Compass and partner PHA expenditure reports and cost interviews to estimate per-participant program costs. To estimate costs and benefits to the government and participants of changes in income attributable to enrollment in the Compass FSS program, we used HUD administrative data and tax estimation software to estimate each cost and benefit item for each household in two groups: (1) Compass FSS participants and (2) a group of comparison households selected through two stages of statistical matching based on household characteristics. We then used a regression model to compare the average result for Compass FSS households to the average result for matched comparison households and determined the net cost or benefit associated with Compass FSS. (See Moulton et al. 2021 for more detail on the matching and comparison processes.)

Our analysis includes households that participated in Compass' FSS program at CHA and Metro Housing starting from the time Compass began delivering the program in each PHA through early 2020 (prior to the start of the COVID-19 pandemic). For CHA tenants, Compass began administering the FSS program in November 2012; and for Metro Housing tenants, Compass began administering the FSS

[2] The magnitude of the net benefit is not directly comparable between the two studies, as the present study includes several changes in methodology from the cost-benefit analysis presented in Dastrup et al. 2017.

program in June 2014.[3] As with the prior studies of Compass FSS (Dastrup et al. 2017; Geyer et al. 2017; Moulton et al. 2021), we focus solely on Compass FSS participants who had a Housing Choice Voucher. This allows us to use HUD administrative data to develop individual-level estimates for this analysis. Our analysis includes Compass FSS participants regardless of whether they have graduated, withdrawn without graduating, or remained in the program through the end of the data period.

Limitations of the study

The conclusions in this analysis rely on a non-experimental impact analysis. While we apply a sophisticated two-step (exact and propensity score) matching approach, we are only able to match households based on observable pre-enrollment characteristics (most notably earnings). The strong conclusions we find with these non-experimental matching methods suggests the program is ripe for larger-scale testing with methods that can account for unobservable factors (such as interest in enrolling in FSS, expectations of increased or improved employment, or readiness to seek or start new employment).

A key limitation of the analysis is that it does not consider changes in income that result from the program but extend beyond the time a family is in the voucher program. Once a Compass FSS participant leaves the agency's voucher program, we are no longer able to observe their income and thus do not factor subsequent changes in income (after exits from the voucher program) into the analysis. A similar limitation is that comparison group members may leave the voucher program before the Compass FSS participants to whom they are matched; in these cases, we have assumed the comparison group member's income remains at the same level last observed in the HUD data.

Another limitation relates to the fact that one of the agencies used a biannual recertification approach in which families were not required to recertify their income if they experienced an income increase. By contrast, the agencies from whom comparison group households were selected all used an annual recertification process, and some may have required interim recertifications between annual recertifications if incomes increased. This means we may have more frequent observations of income increases for comparison group members than for treatment group members, particularly when their earnings increased. Since we needed an estimate of total income over the period of observation of each household to complete the cost-benefit analysis, rather than income at a particular snapshot in time, we opted to use all of the available income data for both the Compass FSS and comparison households.

Finally, we do not consider several factors that would be useful to study in a future comprehensive analysis: (1) the benefits to participants of having higher credit scores and lower levels of credit card and derogatory debt; (2) the long-term or secondary impacts of the program, such as the effects on children of parents' increased earnings and assets or the effects of participants' use of escrow disbursements; (3) effects on people other than Compass FSS participants; (4) uncertainty (i.e., statistical significance) associated with the estimates; and (5) other technical adjustments that could be included in a comprehensive cost-benefit analysis.

[3] Metro Housing self-administered an FSS program with a different model prior to when Compass began providing the FSS program in June 2014. FSS program participants and associated costs from this prior program are not included in this analysis.

1. Introduction

In a companion quasi-experimental study, Moulton et al. (2021) found that the Family Self-Sufficiency (FSS) programs Compass Working Capital, Inc. (Compass) administered, in partnership with the Cambridge Housing Authority (CHA), Metro Housing|Boston (Metro Housing), and Lynn Housing and Neighborhood Development (LHAND), had substantial impacts—an average gain of $6,032 in participants' annual household earnings between enrollment and the latest available data up to March 1, 2020.[4] That report also provided an overview of Compass' program model and documents outcomes related to FSS participants' earnings and cash benefits at specific follow-up periods where treatment and comparison households' available data were carefully aligned.

Demonstrating that the Compass FSS programs have a positive effect on key outcomes is only the first step in determining whether the programs should be recommended for continued and broader implementation. The cost of administering the Compass FSS programs is an important consideration. The changes in earnings and other outcomes will result in changes in net tax liabilities and changes in the receipt of means-tested benefits. The resulting changes in costs to the government and the effects of the Compass FSS programs on participants' overall resources are important for assessing the overall costs and benefits of these programs.

Building on the quasi-experimental framework established by Moulton et al. (2021), this analysis explores overall costs and benefits of the Compass FSS programs by creating summative measures of earnings and related outcomes for as long as we observe them in the U.S. Department of Housing and Urban Development's (HUD's) administrative data—in other words, we estimate the change in total earnings since enrollment in the FSS program that may be attributable to participation in the Compass FSS program. We do this by filling in gaps between income reports (with the most recent reported amount) and developing an estimate of the total cumulative earnings of Compass FSS participants and comparison households for as long as Compass FSS participants are observed in our dataset.[5] This allows us to compare the full estimated cost of delivering the program to the full observed earnings benefits that result from participation. Because of data availability constraints and because Compass no longer operates the LHAND FSS program, this cost-benefit analysis includes participants in CHA and Metro Housing only.

For this study:

Costs are items that contribute to the cost of the program to the government and other funders or decrease the benefit of the program to participants.

Benefits are items that offset the program's cost or increase the benefit to participants.

This cost-benefit analysis assesses **five elements** in **two perspectives**:

Government / Program Perspective

1. ***The cost of delivering the Compass FSS program.*** This category includes direct costs of operating the FSS program to Compass Working Capital (including overhead) and its partners.

[4] This is a similar level of impact on average annual household earnings as was found in the initial analysis of Compass FSS administered in CHA and LHAND (Geyer et al. 2017).

[5] Since we have on average more than four years of follow-up outcomes, we account for the time value of money by discounting later values by 5 percent annually. This values $1 at enrollment equally to $0.95 in the following year, and so forth for later years.

2. ***Any immediate savings the government realizes as a result of participants' progress toward economic security.*** This category includes estimates of changes in costs to (1) federal and state governments, from changes in means-tested program participation and benefit levels; and (2) federal and state governments, from changes in taxes owed.[6]
3. ***The net change in housing assistance expenditures related to the FSS program***. This is equal to (1) the deposits made into FSS participants' escrowed savings accounts (once disbursed) minus (2) the offsetting reduction in housing assistance payments the public housing authority (PHA) makes to participants' landlords.

Program Participant Perspective

4. ***Changes in participants' total net income.*** This category includes estimates of changes in income resulting from (1) earnings growth, (2) changes in non-housing public benefits, and (3) changes in taxes owed or received.
5. ***The net change in a participant's housing assistance benefits.*** This is (1) the growth in assets from disbursed FSS escrow savings minus (2) the reduction in Housing Assistance Payments (HAP) the PHA makes to participants' landlords.

This five-element framework allows us to understand the types of primary costs and financial benefits the program brings from the perspective of each type of stakeholder. The primary costs of the program are experienced by government entities (including PHAs) and by Compass, the provider of FSS program services (funded in part by philanthropy). The benefits attributable to participation in the Compass FSS program are experienced by program participants in the form of additional net resources and by the government in the form of reduced expenditures on benefits and increased tax revenues.

Overall Net Costs and Benefits

Exhibit 1-1 shows the average net costs and benefits per participant during the study period (late 2012 through early 2020) for each of the two perspectives (government / program and participants). In reporting these estimates, we have listed all estimates in one of two columns: "Costs"—items that contribute to the cost of the program to the government and other funders or decrease the benefit of the program to participants; and "benefits"—items that offset the program's cost or increase the benefit to participants. Placing the items in these two columns allows them to be summed across categories to produce a net average cost or benefit of the program during the time period studied. In the sections below, we provide more detail on how we calculated these costs and benefits, what the components consist of, and component-level results. We also provide assumptions about the likely direction (costs or benefits) that we might see in other items beyond the scope of this analysis, had they been included.

[6] Estimates of changes in non-housing public benefit receipt rely on amounts for TANF, unemployment benefits, and disability assistance reported in HUD administrative data. For income taxes, we estimate the tax liability for each FSS and comparison household using TAXSIM, the National Bureau of Economic Research program for calculating liabilities under U.S. federal and state income tax laws from individual data, and estimate impacts using the same regression model used for earnings comparisons.

The estimated costs and benefits reported in Exhibit 1-1 reflect an average of 4.25 years of observation for each household over the course of the approximately 7 years of available data in our dataset. On average, Compass FSS participants were in the FSS program for 3.4 years.[7]

Exhibit 1-1. Summary of estimated cost-benefit analysis findings, October 2012–March 2020

	Cost	Benefit
Government / Program Perspective (per participant)		
1. Total program costs (Compass + PHAs):	**$9,802**	
2. Net increase in tax revenue:		**$4,002**
3. Net decrease in non-housing income support and benefits paid:		**$2,580**
4. Net change in housing assistance expenditures		
a. Escrow disbursements to graduates:	**$3,649**	
b. Reduction in housing assistance payments to landlords:		**$3,755**
Net effect of program on government / program expenditures:	***$3,114***	
Participant Perspective (per participant)		
1. Increase in earnings and other income:		**$12,607**
2. Net increase in tax liability:	**$2,922**	
3. Net decrease in non-housing income support and benefits received:	**$2,580**	
4. Net change in housing assistance benefits		
a. Escrow disbursements to graduates:		**$3,649**
b. Reduction in housing assistance benefits:	**$3,755**	
Net effect of program on participants:		***$6,999***

Factors not included in this study and predicted direction of effect

Factor	Predicted effect
Improved participant credit scores	**Net benefit**
Reduced debt and high-interest debt	**Net benefit**
Additional earnings impacts after study period	**Net benefit**
Benefits to participants' children of increased family resources	**Net benefit**
Effects on the local economy	**Unclear**

[7] The first Compass FSS participants were those enrolled in FSS at CHA in September 2012, and we included enrollees until the study ended in March 2020. However, for the first six months of this period, there were relatively few FSS enrollments compared to subsequent periods during the data period. For this reason, we refer to the study period as 7 years, even though the period from the first to the last record spans 7.5 years in total. The average period of enrollment in FSS (during which costs accrue) is 3.4 years, and we follow participant earnings and related outcomes for an average of 4.25 years after enrollment.

The following briefly summarizes the costs and benefits reflected in Exhibit 1-1:

Government / program perspective: The Compass FSS program had a **net cost to the government / program of $3,114 per participant** over the course of the seven-year study period. This reflects the net of the following costs and benefits:

1. The cost to Compass and its PHA partners of administering the Compass FSS program.
2. Increases in taxes paid by or on behalf of Compass FSS participants (due in large part to increases in the employer portion of participants' payroll taxes).
3. Decreases in non-housing public benefits paid to Compass FSS participants through such programs as Temporary Assistance for Needy Families (TANF) and Social Security.
4. The net change in housing assistance expenditures for each participant. This is equal to (1) the average escrow disbursement made to FSS participants at graduation from their escrowed savings accounts (averaging both positive disbursements to graduates and zero disbursements to the fraction that exit the program without graduating and thus receive no escrow at graduation) minus (2) the offsetting reduction in HAPs the PHA makes to participants' landlords. (This estimate includes interim disbursements of FSS escrow made to program participants before graduation for participants who ultimately graduated from the program. It does not include information on interim disbursements made to non-graduates, for which data were unavailable.)[8]

Participant perspective. The Compass FSS program produced a **net benefit of $6,999** per participant over the course of the seven-year study period. This reflects the net outcome of the following costs and benefits:

1. Increases in earnings by Compass FSS participants and other changes in income.
2. An increase in tax liability.
3. A reduction in non-housing public benefits from such programs as TANF and Social Security.
4. The net change in a participant's housing assistance benefits. This is (1) the average FSS escrow savings disbursed to participants minus (2) the offsetting reduction in HAPs the PHA makes to participants' landlords. As noted above, this estimate does not reflect interim disbursements made to non-graduates.

Other factors not included in this study. No cost-benefit analysis can include all factors affecting the community, the analysis, or the potential long-term direct or indirect impacts of an intervention.[9] The

[8] For FSS participants who had not yet graduated or left the FSS program, we estimated the likelihood of graduation by enrollment cohort and estimated escrow disbursement proportionally based on this projected outcome.

[9] In addition to the factors listed in Exhibit 1-1, a more comprehensive cost-benefit analysis would include an analysis of uncertainty—i.e., are benefits statistically significantly larger than costs—and a variety of technical adjustments. Such adjustments would include accounting for the value of time shifted to increased employment (which would decrease overall net benefit), accounting for efficiency gains to the overall economy from decreased government expenditures (known as "excess burden," and which would increase overall net benefit).

final panel of Exhibit 1-1 lists some key factors not included in this analysis and the direction (benefit, loss, or unclear) we would expect each of these key factors to have if included:

1. Anticipated positive effects on participant credit scores and debt profiles. A study of Compass FSS participant credit score and debt outcomes conducted by Geyer and colleagues suggests that the program is effective in helping increase participant credit scores and reduce participant high interest and derogatory debt (Geyer et al. 2017).

2. Potential positive effects on post-study participant earning increases. We do not have information on participant or comparison group member earnings or other income beyond the study period or beyond their time in the Housing Choice Voucher (HCV) program. It seems likely the income gains would continue, at least for some time, which would produce a net benefit.

3. Potential positive short- and long-term effects for participants' children. We did not examine effects on participants' children such as increased family economic security, increased parental well-being, or benefits from financial coaching through their parents' experiences.

4. We did not assess the potential for effects on the local community or economy or on nonparticipants. The net impact of these effects is unclear. In theory, increased incomes could lead to more spending at local businesses or a greater ability to contribute to community resources. However, such multiplier and pass-through effects may not materialize in practice, so the actual net impact to the local community is unclear.

Exhibit 1-2 displays the combined overall result. As indicated in this exhibit, the net effect of public benefits is $0 since the government savings are fully offset by a loss of income to participants. The net effects of HAP and escrow are both $0 since the cost to the government is offset by a corresponding benefit to the participant.

Exhibit 1-2. Summary of total net benefit calculation (Quarter 4 2010 through Quarter 1 2020)

Program costs		*Income gains*		*Net taxes*		*Net public benefits*		*Net HAP*		*Net escrow*
−$9,802	+	$12,607	+	$1,080	+	$0	+	$0	+	$0

$$= \$3,885 \textit{ per participant}$$

Program Context

Compass administers several FSS programs in partnership with PHAs and private owners of multifamily housing. This cost analysis focuses on Compass FSS programs currently administered by Compass in collaboration with CHA in Cambridge, Massachusetts; and Metro Housing in the Boston metropolitan area of Massachusetts.

Nationwide, more than 700 FSS programs receive HUD grants to cover the costs of FSS program coordinators and several hundred additional PHAs or owners operate an FSS program but do not receive program coordinator grants from HUD. FSS is a flexible program, and the program intensity and specific features vary substantially from one local FSS program to another. Program impacts and program costs and benefits may vary substantially depending on the program approach.

Other cost-benefit analyses of FSS programs

There have been relatively few comprehensive cost-benefit analyses of FSS programs. This analysis of the costs and benefits of delivering the Compass FSS program is a follow-up to Dastrup et al. (2017), an initial analysis of Compass FSS costs and benefits in CHA and LHAND. That analysis found an average net monetary benefit per participant in Compass FSS programs in Lynn and Cambridge of $10,069 over a five-year period—from 2010 to 2015—during which treatment group members had an average of 2.7 years since FSS enrollment. Because that study utilized a somewhat different methodology, and covered different agencies over a different time period, the size of the net benefit is not comparable across the two studies.[10] In our view, the fact that the two studies both found a strong net benefit attributable to Compass FSS is a sign of the robustness of the Compass value proposition over time and across settings.

The difference in the magnitude of the findings here and in the prior report is due primarily to a lower estimate of income gains in this study.[11] This study took a more conservative approach to estimating total income over the follow-up period in several ways. First, this study discounts earnings (and all other outcomes) by 5 percent per year after enrollment to account for the time value of money, a standard practice in cost-benefit analyses. Second, this study sums all earnings after FSS enrollment and estimates impacts directly on this outcome, whereas the last study estimated an average annual earnings impact and assumed it applied as the best estimate for the full five-year follow-up period. In addition, as noted in the Executive Summary, we did not try to account for differences in PHA policies around recertification, which may mean that there are more frequent observations of income increases among comparison households than Compass FSS participants. We did not make this adjustment because we needed to develop income estimates for each household over the entire observation period and determined it would be most appropriate to use all available income information for this purpose, rather than ignoring much of the information about comparison households in order to match against the biannual recertification process of Metro Housing. This may have depressed the finding of an income increase attributable to Compass FSS during the study observation period. This study also covers a different sample (CHA and Metro Housing vs CHA and LHAND) for a different time period (late 2012 to early 2020), matched to comparison group members in a way that allows better alignment of enrollment dates with earnings follow-up.

A different study team, Verma et al. (2017), found that an FSS program in New York City produced a net financial benefit over a 10-year time horizon of $6,200 per participant. The FSS program in that study was sufficiently different from the Compass FSS program—and the methodology for the cost-benefit sufficiently different—that we again do not think the dollar estimates are directly comparable. Nevertheless, it is useful context for this study.[12]

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[10] For the prior cost-benefit analysis and its companion impact study, which covered a shorter period of FSS enrollment, we followed all Compass FSS participant and comparison group members over the same five-year time period (regardless of enrollment timing within that window). This study covers a longer time horizon but refines the methodology to follow participants (and matched comparison households) from their individual enrollment dates through the end of when they are observed in the data. This takes full advantage of the available administrative data, while minimizing assumptions about periods when households are not observed.

[11] We have not definitively analyzed the differences in the amounts estimated.

[12] Galster and colleagues (2019) also conducted a cost-benefit analysis of a program that includes FSS participants. However, the specific program studied represents an add-on to the standard FSS program, which was focused on preparing participants for homeownership, and thus is not comparable.

Structure of this Report

The balance of this report includes the following:

- Section 2 details the estimated costs and benefits associated with the Compass FSS program.
- Section 3 concludes the analysis with detailed estimated costs and benefits of the Compass FSS programs and calculates net program costs and benefits.
- Section 4 (Conclusion) discusses the implications of the findings from this cost-benefit analysis.
- This is followed by references cited in the text and the appendix, which presents the methodological approach and framework for this interim cost-benefit analysis

2. Components of Costs and Benefits Associated with Compass FSS

The sections below describe the costs and benefits associated with Compass FSS, which feed into the analysis of total net costs and benefits.

Costs of Delivering Compass FSS

This section details the costs per participant to Compass, CHA, and Metro Housing associated with delivering Compass FSS from 2016 through 2019. We then blend these costs with those covering the period from 2012 to 2015, obtained and calculated through the earlier cost-benefit analysis (Dastrup et al. 2017). These costs are detailed in Exhibit 2-1.

Total Compass Costs per Participant per Year: $2,419

The $2,419 total cost per participant per year comprises direct and indirect program costs. Eighty percent of direct costs are program staff (the financial coaches), with the remainder of direct costs including workshops provided to FSS enrollees, materials used for outreach, and fees to credit bureaus to pull credit reports. Indirect costs are calculated as a prorated portion of organizational costs, including analysis, strategy, and innovation; organizational overhead; and fundraising. All cost estimates are based on the proportion of Compass' overall program expenditures (across the organization's various programs) that are for FSS program activities in Cambridge and metropolitan Boston.

Total PHA Costs per Participant per Year: $595

Together, the two PHAs devote an estimated $224,440 in staffing and administrative resources to the FSS program per year ($97,521 at CHA and $126,918 at Metro Housing). With an average participation of 377 households, this represents an average cost of $595 per participant per year.[13]

Exhibit 2-1. Estimated program costs to Compass and PHAs per participant per year (2016–2019 average)

	Total average annual cost	Average cost per participant per year
Average Participants Per Year		**377**
Compass Costs		
Direct (staffing, program expenses, program operations)	$546,671	
Indirect (analysis, strategy and innovation, organizational overhead, fundraising)	$365,262	
Compass Total	***$911,933***	***$2,419***
PHA Costs		
Staffing	$214,195	
Other (overhead, facilities, events)	$10,244	
PHA Total[a]	***$224,440***	***$595***
FSS Intervention Total	***$1,136,373***	***$3,014***

Sources: Abt interviews with PHA staff and Compass staff, and an analysis of annual expenditure reports. Costs are representative for the 2016 to 2019 time period. Average annual costs per participant for Compass from 2013 to 2015 were collected and assessed for the prior cost-benefit analysis (Dastrup et al. 2017), and were slightly lower, at $3,191 per participant per year.

[a] PHAs also paid Compass an average of $300,195 annually to administer the FSS programs. The balance of Compass' costs of running the program are paid through philanthropic contributions.

[13] The per-participant cost is slightly lower in CHA ($536) than in Metro Housing ($654) when these are broken out separately.

For a discussion of costs not included in this analysis, see Dastrup et al. 2017. These costs include items such as the value of participants' time, program or system start-up costs, and payments made from the partner housing agencies to Compass.

Total Cost per Participant of Delivering Compass FSS Programs

Combining Compass and PHA per-participant costs results in an estimate of $2,419 + $595 = $3,014 per participant per year in the Compass FSS program as the total cost of delivering the Compass FSS programs.[14] This amount represents the value of all resources—staff, materials, facilities, and administration—used to operate a relatively mature program on an ongoing basis. The amount averages costs across all program participants without considering differences in intensity of program resources or other participant-specific cost drivers.

Participants were enrolled in the Compass FSS program for an average of 3.4 years during the 7-year study period. About 25 percent of that enrollment occurred during the prior study period, which had an estimated cost of $3,191 per participant per year. We blend the cost estimates from the two periods based on the years in which participants are enrolled, resulting in **a blended cost of $3,058 per participant per year**.

Because the earnings that we compare to these costs are averaged over a longer follow-up period, we adjust both costs and benefits to a present value at the time participants enrolled. This adjustment accounts for the principle that a dollar today is preferred to a dollar tomorrow. After making this adjustment for each of the 3.4 years of average enrollment, the summed present value of all enrollment costs is $10,345 per participant.

The next sections provide the estimates needed to compare this average per-participant program cost to average program impacts in earnings, and related changes in government and participant tax and benefit outcomes.

Impacts on Participant Earnings

The primary benefit targeted by the Compass FSS program and measured in this analysis is the change in participant earnings. The relevant earnings measure for a comparison to program costs is the change in the total sum of earnings after enrollment that is due to participation in the program. This is because costs in initial years of the program may result in earning increases in future years.[15]

We estimate that the impact of Compass FSS on total earnings (summed over all years after enrollment—on average 4.25 years of follow-up) per person during the study period was **$12,607** ($p < 0.001$).[16] As shown in Exhibit 2-2, this estimate represents the differences between the average total cumulative gains in household earnings for Compass FSS participants and a matched comparison group during the same

[14] The blended cost per participant of CHA and Metro Housing is $595.

[15] The companion Moulton et al. (2021) study focuses on the first-stage impact question of whether earnings at specific follow-up points are higher because of FSS program participation. This analysis builds on that study by comparing cumulative earnings over the follow-up period to total program costs.

[16] Our earnings definition includes primarily wage earnings, but also includes any infrequent income sources, including self-employment earnings and other non-wage earnings sources. We also include the small amount of pension income reported with this earning estimate.

period.[17] This is determined by calculating the average total increase in earnings over the follow-up period from each individual participant's enrollment quarter (or from the same quarter for matched comparison group members) to the last quarter in which the participant is observed in the data (or the same quarter for a control group member, with extrapolation as needed). This is typically the final quarter of the study period (Quarter 1 of 2020) but is earlier (the final quarter they are observed in the data) for Compass FSS participants who exited the HCV program.

Exhibit 2-2. Compass FSS and comparison household change in total earnings since baseline

	FSS households	Comparison households	Difference between FSS and comparison households
Average cumulative total earnings since enrollment (approximately 4.25 years)	$98,954	$86,347	$12,607

To make this calculation, we observe or interpolate (by carrying forward the most recently observed value) quarterly earnings reported in HUD administrative data. For each Compass FSS participant household, we calculate the net present value of all of the quarterly amounts from the enrollment quarter through the end of the follow-up period (or the last quarter in which the household is observed in the data).[18] We then use the same linear regression model used to estimate impacts in Moulton et al. (2021) to estimate the average differences between the earning outcomes for FSS participants and the comparison group to identify changes in these outcomes that are the result of FSS participation. We also use empirical model outputs to generate overall average estimates of each variable for (1) FSS participants as a group and (2) the comparison group.

We use earnings in each year of the study period as the basis for estimating tax liabilities, public income support, and receipt of benefits in that year at the individual level for each FSS participant and comparison group member. We address income from public sources—unemployment insurance, TANF, supplemental security income (SSI), and social security—in the next section.

Impacts on Tax Liabilities and Public Income Support

This section reports estimates of changes in the use of tax revenue and expenditures and public income support that are attributable to participation in the Compass FSS programs in Cambridge and Metro Housing. We used the National Bureau of Economic Research's TAXSIM program to estimate the tax liability for each FSS and comparison household. (See Appendix for additional detail on estimating changes to tax liabilities and public income supports.)

Net federal income, payroll, and state income taxes

Exhibit 2-3 presents estimates of the effects of Compass FSS on tax liabilities. Over the follow-up period, increased income relative to the comparison group results in smaller federal income tax refunds (i.e., a higher net tax liability) of $1,240, larger average state income tax liabilities of $603, and increased

[17] Since participants are matched on earnings at baseline, the measured difference in earnings over the follow-up period is equal to the difference in earning gains over the follow-up period.

[18] The net present value is the sum over all quarters, where each quarterly value is discounted at a 5 percent annual rate to account for the time value of money.

payroll taxes of $2,159 (employer and participant portions combined).[19] Each of these increases is statistically significant. In total, the government has a net tax revenue gain of $4,002, while participants pay $2,922 more than they would have in the absence of the Compass program (the difference is the employer portion of payroll taxes).

Exhibit 2-3. Changes in taxes from government (revenues) and participant (liabilities) perspectives

Outcome	Government perspective impact[a] *(standard error) p-value*	Participant perspective impact[a] *(standard error) p-value*	Participant perspective expected outcome if enrolled in Compass FSS program[b]	Participant perspective expected outcome if not enrolled in Compass FSS program[b]
Taxes				
Federal Income Tax	$1,240 *($399) < 0.01****	-$1,240 *($399) < 0.01****	-$3,027	-$4,267
State Income Tax	$603 *($118) < 0.01****	-$603 *($118) < 0.01****	$1,396	$794
Federal Insurance Contributions Act (FICA) Taxes[c]	$2,159 *($388) < 0.01****	-$1,080 *($388) < 0.01****	$6,560	$5,481
Total Taxes	$4,002 *($744) < 0.01****	-$2,922 *($744) < 0.01****	$4,930	$2,008
Tax Credits ***(included in net federal)***				
EITC	$606 *($218) < 0.01****	-$606 *($218) < 0.01****	$4,001	$4,607
Additional Child Tax Credit (ACTC)	−$425 *($108) < 0.01****	$425 *($108) < 0.01****	$1,855	$1,430

p-value: * < 0.10, ** < 0.05, *** < 0.01.

[a] The impact is equal to the change in the sum of the outcome from enrollment through the last observed period that is attributable to enrolling in the Compass FSS program, estimated from participant-level data.

[b] The means presented in this table are regression-adjusted means. That is, they are estimates of the average outcome that the full sample of participants and members (Compass FSS + Comparison) would have if they were enrolled in Compass, and the average outcome that the full sample of participants and members (Compass FSS + Comparison) would have if they were *not* enrolled in Compass.

[c] FICA taxes include both the employer and employee contributions from the government perspective, but the employee contributions only from the participant perspective.

Public income support: unemployment, TANF, SSI, and Social Security

Increased incomes result in changes in participants' receipt of public income support. Exhibit 2-4 reports changes in unemployment assistance, TANF, SSI, and Social Security income received by Compass FSS participants relative to the comparison group. These programs are examples of government transfer

[19] Increases in earnings can lead to higher or lower tax liability for low-income households, depending on their particular tax situation, which depends on their marital status, the number of dependents, and the level of income. More Compass FSS participants relative to the comparison group saw increases in earnings that were likely to lower or eliminate tax refunds from programs such as the Earned Income Tax Credit (EITC) than to increase or introduce them.

payments, which is evident when viewing the government and participant perspective columns in Exhibit 2-4. Decreases in any of these income sources for participants (a cost to participants) lead to corresponding decreases in government expenditures (a benefit to the government).[20] Participation in Compass FSS is associated with a decrease in TANF of $650 (statistically significant), in social security of $1,202 (statistically significant at the 0.05 level), and in SSI of $897 (significant at the 0.1 level). A small increase in unemployment assistance ($168) is not statistically significant, but similar to all other elements of income and liability, is included within our sum across all categories at the individual level in order to estimate net costs and benefits. Altogether, Compass FSS participants received an average of $11,027 in public assistance benefits, which is $2,580 lower than would have been the case had FSS participation not increased their incomes.

Exhibit 2-4. Changes in public income support from government and participant perspectives

Outcome	Government perspective (savings)[a] *(standard error)* *p-value*	Participant perspective (loss of income support)[a] *(standard error)* *p-value*	Participant perspective income support if in Compass FSS program[b]	Participant perspective income support if not in Compass FSS program[b]
Income Support				
Unemployment	-$168 *($342)* *0.63*	$168 *($342)* *0.63*	$1,801	$1,633
TANF	$650 *($221)* *< 0.01***	-$650 *($221)* *< 0.01***	$1,518	$2,168
SSI	$897 *($474)* *0.06**	-$897 *($474)* *0.06**	$3,239	$4,136
Social Security	$1,202 *($587)* *0.04***	-$1,202 *($587)* *0.04***	$4,469	$5,671
Total Income Support	$2,580 *(717)* *< 0.01***	-$2,580 *(717)* *< 0.01***	$11,027	$13,607

p-value: * < 0.10, ** < 0.05, *** < 0.01.

[a] The impact is equal to the change in the sum of the outcome from enrollment through the last observed period that is attributable to enrolling in the Compass FSS program, estimated from participant-level data.

[b] The means presented in this table are regression-adjusted means. That is, they are estimates of the average outcome that the full sample of participants and members (Compass FSS + Comparison) would have if they were enrolled in Compass, and the average outcome that the full sample of participants and members (Compass FSS + Comparison) would have if they were *not* enrolled in Compass.

Combined net effect on taxes and non-housing benefits

Combining the changes in tax liabilities and public income support, and non-housing public benefits, we find a net decrease in government expenditures (including tax expenditures) attributable to Compass FSS of $6,582 per person over the follow-up period and a net decrease to the participant in received benefits

[20] We do not estimate and include the possible small savings in costs to the government of administering these programs.

(including net taxes) of $5,502. The difference between these two numbers, $1,079, is the employer portion of FICA taxes, which increase government revenue but do not increase participants' taxes.

Net change in housing assistance expenditures

This section describes the (1) the final disbursements of FSS escrow savings to graduating program participants and (2) the offsetting reduction in HAP the PHA makes to participants' landlords.

> ***(1) FSS Escrow.*** Compass FSS graduates have received an average of $7,047 in escrow disbursements.[21] Accounting for our estimated 63 percent graduation rate and converting to the present value at enrollment, we estimate an average of $3,650 in disbursed escrow per enrolled FSS participant at graduation and through interim disbursements provided to some graduates prior to graduation. Interim disbursements provided to those who do not ultimately graduate from the FSS program are not included here as they were not available in the data.
>
> ***(2) HAP to Participants' Landlords.*** In an HCV program, participants are responsible for paying at least 30 percent of their adjusted household income toward rent and utilities, which they pay directly to the landlord. The housing authority pays the remainder of the rent, up to a maximum known as the voucher payment standard, directly to the landlord through HAP. Based on the earnings impact estimate, we estimated there was a total decrease of $3,755 in HAP from PHAs to landlords on participants' behalf. This reduction, which is attributable to increases in participant incomes and required rent contributions, represents decreased government spending (a benefit) from the government perspective and a loss of benefits (a cost) from the household perspective. This increase in housing costs is close to the $3,650 in disbursed escrow per enrolled participant.[22]

[21] Graduates are enrolled an average of 4 years. Discounting the disbursements to the enrollment year at 5 percent results in an average present value of disbursement of $5,797.

[22] With Cambridge's escrow formula setting aside 50 percent of HAP decreases into escrow, one might expect the HAP impact to be greater in magnitude than the average dispersed escrow. One explanation is that escrow is calculated from participant income increases, whether or not they are due to the FSS program. The HAP impact is based on income changes for program participants *relative to the comparison group.* Because comparison group income may also increase (but to a lesser extent than program participants), we would expect that HAP impact (which is in comparison to comparison group members' experiences) would be lower in magnitude than the decrease in cumulative HAP amount for Compass FSS participants alone (which is used to calculate escrow). For example, consider a hypothetical FSS participant in Cambridge with an increase in annual income from $10,000 to $15,000. This would result in a decrease in a HAP of $1,500, which is 30 percent of the $5,000 income gain, and a $750 escrow accrual. Suppose the matched comparison household had a smaller income gain, of $2,500 (from $10,000 to $12,500). This would result in a decrease in a HAP of $750. For this pair of households, the impact estimate would be $2,500 for earnings ($5,000–$2,500), $750 for HAP ($1,500–$750), and $750 for escrow ($750–0).

3. Net Costs and Benefits of the Compass FSS Program

In this section, we sum our estimated costs and benefits from the prior sections into our bottom-line measures of costs and benefits of the Compass FSS program over the observed follow-up period.

Government / Program Perspective

The estimated net cost to the government / program of the Compass FSS program over the observed period was **$3,657 per participant**. This is the sum of the following costs and savings:

1. Compass FSS program delivery cost of **$10,345** per participating household (participant).
2. Compass FSS led to an increase of **$4,002** in tax revenue per participant, mostly due to increases in the employer portion of participants' payroll taxes.
3. Increases in participant earnings and other income led to an estimated savings of **$2,580** in public income support and means-tested benefits.
4. Compass FSS led to an estimated savings of **$106** per participant in housing assistance expenditures. This is the net of (a) deposits to escrow accounts that averaged **$3,649** per participant and (b) reductions in HAPs that averaged **$3,755** per participant.

Program Participant Perspective

The net benefit to participants was **$6,999 per participant** over the study period. This is the sum of the following:

1. Participation in FSS led to an average increase of **$12,607** in earnings and other income per participant.
2. Participation in FSS led to an average increase of **$2,922** in tax liability per participant.
3. Participation in FSS led to an average decrease of **$2,580** per participant in public benefits received.
4. FSS led to an estimated reduction of **$106** in housing assistance benefits per participant. This is the net of (a) deposits to escrow accounts that averaged **$3,649** per participant and (b) reductions in HAPs that averaged **$3,755** per participant.

Exhibit 3-1. Summary of average individual costs and benefits over the late 2012 to early 2020 observation period

Outcome (per-participant over the follow-up period)	Cost / benefit[a]	Expected cost / benefit if enrolled in Compass FSS program[b]	Expected cost / benefit if not enrolled in Compass FSS program[b]
Government / program perspective			
Per-participant cost of administering Compass FSS program[c]			
Compass total cost	-$7,866	-$7,866	$0
PHA total cost	-$1,936	-$1,936	$0
Total program cost	***-$9,802***	***-$9,802***	***$0***
Changes in tax revenue			
Total taxes (federal and state income, FICA)	***$4,002****	***$11,490***	***$7,489***
Changes in public income support and benefits (excluding housing assistance)			
Unemployment	-$168	-$1,801	-$1,633
TANF	$650***	-$1,518	-$2,168
SSI	$897*	-$3,239	-$4,136
Social Security	$1,202**	-$4,469	-$5,671
Total income support (excluding housing assistance)	***$2,580****	***-$11,027***	***-$13,607***
Housing assistance expenditures			
Change in HAP	$3,755	$3,755	$0
Average escrow disbursements [d]	-$3,649	-$3,649	$0
Total housing assistance plus escrow	***$106***	***$106***	***$0***
Participant perspective			
Income from nongovernment sources (annual per-household)			
Total increase in income from nongovernment sources	***$12,607****	***$98,954***	***$86,347***
Changes in taxes			
Total taxes (federal and state income, ½ FICA)	***-$2,922***	***-$4,930***	***-$2,008***
Changes in public income support and benefits (excluding housing assistance)			
Total income support (excluding housing assistance)	***-$2,580****	***$11,027***	***$13,607***
Housing assistance benefits			
Change in housing assistance payments[c]	-$3,755	-$3,755	$0
Average escrow disbursements[d]	$3,649	$3,649	$0
Total housing assistance plus escrow	***-$106***	***-$106***	***$0***

p-value: * < 0.10, ** < 0.05, *** < 0.01.

[a] The cost or benefit is equal to the change in outcome measure summed over the follow-up period that is attributable to enrolling in the Compass FSS program, estimated from participant-level data. In most cases, these impact estimates compare outcomes for participants and comparison households using a regression model that controls for baseline characteristics. The cost of administering the program is estimated at the program level.

[b] The means presented in this table are regression-adjusted means. That is, they are estimates of the average outcome that the full sample of participants and members (Compass FSS + Comparison) would have if they were enrolled in Compass, and the average outcome that the full sample of participants and members (Compass FSS + Comparison) would have if they were *not* enrolled in Compass.

[c] Changes in HAPs are assumed to be 30 percent of the estimated earnings impact. Program costs are estimated at the program and PHA levels. As such, these estimates cannot be incorporated into statistical tests.

[d] Average escrow dispersed is the expected amount (accounting for participants who do not graduate), estimated for the treatment group only.

In sum, over the 2012–2020 study period (average of 4.25 years of follow-up per participant and 3.4 years of exposure to Compass FSS for participants), estimated benefits of the program substantially outweigh estimated costs (see Exhibits 3-2 and 3-3).

Exhibit 3-2. Summary of cost-benefit analysis findings, October 2012–March 2020

	Cost	Benefit
Government / Program Perspective (per participant)		
1. Total program costs (Compass + PHAs):	**$9,802**	
2. Net increase in tax revenue:		**$4,002**
3. Net decrease in non-housing income support and benefits paid:		**$2,580**
4. Net change in housing assistance expenditures		
a. Escrow disbursements at graduation:	**$3,649**	
b. Reduction in HAPs to landlords:		**$3,755**
Net effect of program on government / program expenditures:	***$3,114***	
Participant Perspective (per participant):		
1. Increase in earnings and other income:		**$12,607**
2. Net increase in tax liability:	**$2,922**	
3. Net decrease in non-housing income support and benefits received:	**$2,580**	
4. Net change in housing assistance benefits		
a. Escrow disbursements at graduation:		**$3,649**
b. Reduction in housing assistance benefits:	**$3,755**	
Net effect of program on participants:		***$6,999***

Total program cost is estimated at the program level. The remaining values are averages per participant of the change in outcome measures in each period starting with enrollment summed over the participant's available follow-up data that are attributable to the participant enrolling in the Compass FSS program. Those impacts are estimated from participant-level data using a linear regression model that compares Compass FSS participants to a comparison group of similar households in nearby PHAs that do not have an FSS program. Except for estimates of program costs, and changes in housing assistance (for which statistical tests are not applicable), all of these values are statistically significant at the 0.01, 0.05 or 0.10 levels. See the earlier sections of this report for the significance levels of each estimate.

Exhibit 3-3. Summary of total net benefit calculation

$$\underset{-\$9{,}802}{Program\ cost} + \underset{\$12{,}607}{Income\ gains} + \underset{\$1{,}080}{Net\ taxes} + \underset{\$0}{Net\ public\ benefits} + \underset{\$0}{Net\ HAP} + \underset{\$0}{Net\ escrow}$$

$$= \$3{,}885\ \boldsymbol{per\ participant}$$

4. Conclusion

Our analysis of the costs and benefits of the Compass FSS program for government sources, program providers, and participants suggests that the Compass FSS program is cost-effective. We estimate the program produced a **net benefit of $3,885 per person over the late 2012 to early 2020 time period** studied across an average of 4.25 years of follow-up per household and 3.4 years of exposure to the FSS program for participants. **For every net dollar spent by the government / program, the program generated a net benefit of $2.25 to program participants.**

While this is a lower net benefit than found in the original analysis (Dastrup et al. 2017), the few methodological factors described in the introduction may explain this difference. Simultaneously, the findings of this study indicate a strong benefit / cost ratio, and the fact that we were able to replicate a finding of substantial positive net benefits for all program enrollees (regardless of whether they graduated or persisted in the program) is encouraging with regard to the program's net benefit.

While our analysis has several limitations noted in the introduction of this report, we believe it provides a clear account of the observable monetary costs and benefits of the program and encompasses many of the factors of interest to policymakers and philanthropic investors as they consider investing in a program similar to Compass FSS. It also provides a solid foundation for future efforts to broaden the cost-benefit analysis to address some or all of the factors excluded from this analysis, and calls for a full randomized controlled trial study design that would allow researchers to definitively assess benefits for all participants and comparison members regardless of whether they remain in the HCV program.

A more complete analysis would also include other factors, ideally after a longer period of time has elapsed to observe program effects and using earnings and benefit data observable beyond the period that FSS and comparison households received public housing assistance, where applicable.[23] On the whole, these factors and time spans, if considered, would be most likely to result in additional net increases in benefits to both participants and government entities. For example, our analysis does not directly incorporate program impacts on participant progress toward establishing and increasing credit scores or paying down high-interest debt (initially detailed in Geyer et al. 2017); and does not include long-term, potential impacts on children in households.

In addition, some benefits may persist or increase following program participation, including increased future earnings (and associated cost savings to the government), which (after program participation ends) would not lead to any new or ongoing costs to the program or government. Because this cost-benefit analysis only assesses observable and shorter-term costs and benefits, we do not consider secondary benefits to participants or the government over the long term, including likely increases in eventual Social Security retirement and survivor benefits as FSS participants with increased earnings contribute more into these systems.

The per participant costs to administer Compass FSS have also declined somewhat over time. As Compass continues to grow, agency overhead may split further over a larger number of programs,

[23] An external source of administrative earnings data would be required to account for exit from the HCV program, since this could be due to either increased earnings or to life challenges that are accompanied by earning declines.

lowering the amount allocated to any one Compass FSS program and thus contributing to additional lowering of its per-participant costs.

Taken together with the earlier Compass FSS program impact analysis that shows promising positive results of the program along multiple dimensions, the net positive benefits in this analysis suggest the program is a cost-effective investment of resources with costs to the government / program that are offset to a significant extent by lower public benefit payments and outweighed by substantial benefits to participants.

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Appendix: Methodology and Framework

In this appendix we provide an overview of our approach to measuring the costs of implementing the Compass FSS program for Compass and its partner PHAs. We then review our approach to estimating how earnings changes associated with Compass FSS program participation affect tax liabilities and receipt of means-tested income support and benefits, including the HCV program and the escrow account associated with FSS. The appendix concludes with our approach to estimating net costs and benefits of the Compass FSS program. Additional detail on our approach can be found in the original Compass FSS cost-benefit analysis (Dastrup et al. 2017) and the updated impact report (Moulton et al. 2021), which provides detail on participant matching and the regression models used.

Analyzing Program Delivery Costs

The per-participant, per-year cost of the Compass FSS program is a key element of the cost-benefit analysis. We include costs for both Compass, the nonprofit that implements the program, and partner housing agencies. Costs are comprehensive in that we include all resources used to implement the program: staffing, supplies, facilities, administration, and fundraising. We identified all of the resources used for the program through interviews, during which we reviewed expenditure reports with Compass staff who manage the program and through interviews with housing agency staff who track FSS program finances for PHA's program-related activities. We assigned monetary values to each resource used, typically based on detailed expenditure reports from Compass and reports of estimated actual spending by housing agencies, along with value estimates (for in-kind services) provided by Compass, CHA, and Metro Housing. The Abt team reviewed these reports during interviews with Compass FSS, CHA, and Metro Housing program and financial staff to ensure that all resources used to provide the FSS program were included in the resulting cost estimates. For the study period (2013–2015), we included Compass and CHA costs per participants calculated in the original cost-benefit analysis (Dastrup et al. 2017).

To arrive at a per-participant annual cost for years newly included in this study that were not included in the original Compass FSS cost-benefit analysis, we summed costs across all categories for each fiscal year (FY; Compass' FY runs from September through August; we used data for FY 2016, 2017, 2018, and 2019) and divided by the number of participants in the program for each year. We include all participants in each year that had previously enrolled but not officially left the program through graduation or termination, based on program administrative records.[24]

Finally, we determine the full cost of enrollment per participant by multiplying the average enrollment length (3.4 years) by the per-participant annual cost.

[24] This approach may somewhat overstate participation if some participants were de facto no longer participating but had not yet formally graduated or been terminated. This would lead to an underestimate of per-participant costs (by elevating somewhat the denominator in the calculation). However, since individuals who had de facto left the program are also included in the estimation of program benefits, this approach is necessary to compare benefits and costs.

Estimating Changes to Tax Liabilities and Public Income Supports

This component of the analysis focuses on average per-participant costs and benefits over the study period from increased earnings and resulting changes in tax liabilities and public income support. We observe or interpolate (by carrying forward the most recently observed value) quarterly earnings and public income support, as reported in HUD administrative data. For each treatment household, we calculate the net present value of all quarterly amounts from the enrollment quarter through the end of the follow-up period (or the last quarter in which the household is observed in the data). The net present value is the sum over all quarters, where each quarterly value is discounted at a 5 percent annual rate to account for the time value of money. We use earnings in each year of the study period as the basis for estimating tax liabilities, public income support, and receipt of benefits in that year at the individual level for each FSS participant and comparison group member. We then use the same linear regression model used to estimate impacts in Moulton et al. (2021) to estimate average differences between outcomes for FSS participants and the comparison group to identify changes in these outcomes that are the result of FSS participation. We also use outputs of the empirical model to generate overall average estimates of each variable for (1) FSS participants as a group and (2) the comparison group.

Changes to net tax liabilities. The changes in earnings associated with participation in the Compass FSS program will result in changes in income and payroll taxes paid by program participants. These changes are important to include in considering both the benefits of the program to participants and the program's net costs to the government.[25]

To empirically assess changes in Compass FSS participants' tax liabilities that result from FSS participation, we follow a similar methodology to that used by Moulton et al. (2021) to estimate the impact of FSS on earnings (i.e., the same empirical model applied to a different outcome). We then compare the simulated tax liability of FSS participants to that of comparison households identified in the earlier analysis, using the same regression model.[26] This includes estimates of tax liabilities for each Compass FSS participant and comparison group member, including federal and state income tax liability, payroll taxes, and EITC and ACTC amounts. We then apply the regression model that was used by Moulton et al. (2021) to model earnings outcomes to estimate the impact of Compass FSS participation on tax liabilities for FSS participants and the comparison group in federal and state income taxes, payroll taxes, EITC and ACTC amounts, and the combined net total tax liability.

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[25] For example, increases in participants' tax liability constitute lower net benefits for participants but additional revenue to the government. Predictions of how increased earnings affect a participant's net tax liability must take into account that many FSS program participants have a net negative tax liability (receive a net refund) and also may have negative marginal income tax rates. This means that, for many participants, instead of creating additional income tax liability, increased earnings may generate increases in after-tax income because of refundable tax credits such as the EITC and the ACTC. Simultaneously, increases in earnings will result in increased payroll taxes, with 7.65 percent of earnings going to fund the employee portion of Social Security and Medicare taxes.

[26] In our prior report (Dastrup et al. 2017), data privacy considerations dictated that we match households to groups with the same rounded earnings. In the interim, National Bureau of Economic Research researchers have made available a local simulator that we were able to deploy within our secure environment. Estimates in this report are based on tax liabilities simulated directly from values reported in the HUD administrative data. See http://www.nber.org/taxsim/ and Feenberg et al. (1993) for complete documentation and detail of this tax simulator.

Changes in public income support. Changes in employment and earnings that result from participation in Compass FSS will potentially affect participants' receipt of unemployment benefits, TANF, SSI, and Social Security benefits. We anticipate seeing the largest changes for unemployment and TANF benefits, as FSS participation encourages employment and earnings that directly influence eligibility for these income support programs. SSI and Social Security eligibility is less likely to change, but gains in income may affect benefit amounts for these programs.

Information on income that participants and comparison group members receive from each of these programs is collected by PHAs to determine HCV subsidy amounts and reported to HUD using HUD's Public and Indian Housing Information Center (PIC) data system. We use the same regression model approach used by Moulton et al. (2021) to estimate the impact of FSS participation on income received from these income support programs.

Changes in receipt of other means-tested benefits. In the original cost-benefit analysis (Dastrup et al. 2017), we found that means-tested, non-housing benefits, including the Supplemental Nutrition Assistance Program, the Nutrition Program for Women, Infants, and Children, the Childcare Voucher, and public health insurance had differences between treatment and comparison groups that were small and not statistically significant. An initial exploration for the current study showed similar results for this set of benefits (i.e., small and statistically nonsignificant impact), so we have not included them in this analysis.

Changes in cost of rental assistance. Participation in the FSS program can also affect the value of the rental assistance families receive through the HCV program. Similar to families that are not enrolled in the FSS program, Compass FSS participants pay approximately 30 percent of their income for housing, with the HCV providing a housing assistance payment that covers the remaining housing costs, up to a locally determined maximum. As Compass FSS participants' incomes increase, they pay more in rent, leading to a reduction in the HAP paid to landlords by the PHA on behalf of the household. For participants in FSS, the PHA also makes an escrow contribution on behalf of the family, discussed in greater detail below.

For both Compass FSS participants and comparison group households, increases in incomes result in higher-required payments by the household for rent and utilities, and a reduction in the amount of HAPs.

For this analysis, we determined that HUD's PIC data were missing housing assistance and tenant rent payment data for a non-trivial fraction of comparison group members matched in Moulton et al. (2021). So, rather than estimating changes in housing assistance from the individual-level data, we estimate that 30 percent of increased incomes is in fact redirected to rental payments, lowering HAP by an equivalent amount. We note that lower assistance is a benefit to the government perspective that is directly offset as a cost to participants, so this estimation approach does not affect the total bottom-line result.

Participant escrow

To estimate escrow disbursals, we used escrow accumulation per FSS participant household at program exit or the most recent record (for those who were still in the FSS program). These data were provided by CHA and Metro Housing and linked to HUD's PIC data. We assumed that, for those who had graduated from the FSS program, the full accumulated amount was disbursed; and for those who had exited without graduating, no escrow had been disbursed. To account for participants still in the program, we assumed that participants still enrolled would graduate at rates observed in prior years (on average, 63 percent). The final escrow estimate is the average dispersed escrow amount of graduating participants multiplied by

the share of participants who have or are expected to graduate. Note that this approach does not take into account interim disbursements to non-graduates, which FSS participants may receive whether or not they ultimately graduate from the program. The administrative data source we used pooled interim disbursement amounts with last recorded escrow balance, so we were not able to extract information about interim disbursements (which non-graduates could receive) from final disbursement of the full balance of the escrow savings (which participants only receive if and when they graduate). Any additional interim disbursements would accrue as a benefit to participants and a cost to the government / program, which would offset each other and not affect the combined cost / benefit calculation.

Escrow accounts accrue and are dispersed as follows. When a Compass FSS participant experiences an increase in earnings that increases their adjusted household income, three things happen. First, their required contribution to rent increases, as they are generally required to spend at least 30 percent of their income on rent and utilities. Second, the HAP made by the housing authority to the landlord decreases by the same amount since the payment covers the difference between what the family pays and the gross rent (rent plus utilities) of the unit, up to a locally determined maximum. Third, a deposit is made on behalf of the family into the FSS escrow account. In the Metro Housing program, escrow deposits equal the full amount of increased rent due to increased earnings. For a household that experiences an increase in earnings and no decrease in other income, the escrow will be 30 percent of the household's increased earnings. In Cambridge, where the PHA had adopted a special escrow formula, the FSS escrow was equal to about half of the increased rent due to increased earnings.[27] FSS participants who graduate successfully from the FSS program receive the full amount accumulated in their escrow accounts.[28]

Net changes in participant tax liability and benefit receipt, and associated costs to the government

To calculate net changes in combined earnings and income, benefit receipt, and escrow savings, we sum the elements described above for each individual at multiple levels. First, we sum outcome measures within relevant categories: earnings, public income support, means-tested program benefits, and taxes. We then sum all relevant outcomes to produce grand totals. We produce separate totals with elements that are relevant from the FSS participant's perspective (e.g., only half of FICA taxes are included) and from the government's perspective (e.g., earnings and the tenant portion of rent and utilities are not included). We then calculate differences between the FSS participant and comparison group outcomes for the totals using the same regression model used in the earnings impact analysis (Moulton et al. 2021) and in the estimates of impacts on each element of public income support, means-tested benefit programs, and taxes.

Note on statistical significance

For each element of our analysis that is estimated from individual-level data, we examine whether the estimated impact associated with Compass FSS participation is statistically significant. This provides insight into whether the FSS program is associated with a significant change in the relevant tax liability or expenditure (e.g., the EITC) or public benefit (e.g., TANF). However, we sum the elements at the participant level without regard to whether a statistically significant impact is measured for the element in

[27] Following the study period, CHA has reverted to an escrow savings formula similar to that of Metro Housing. Both escrow formulas vary from the standard FSS escrow formula. Each of the two agencies used flexibility from their status as Moving to Work agencies to adjust the escrow formula.

[28] Participants may also request partial withdrawals (known as "interim disbursements") before graduation, if needed, to help them achieve their goals. Any escrow funds not disbursed to residents are returned to the program.

question, when considered in the model individually. We then assess the statistical significance of the aggregate changes.

We take this approach to ensure that our model can account for the combined effect of each element of cost and benefit. The sum of multiple elements, which individually do not exhibit statistically significant impacts, may well itself have a statistically significant impact.[29] Because we test for statistical significance of aggregate impacts, we have confidence in the statistical significance of those aggregate estimates, even if we do not find that a specific component element's impact is significant on its own.

Other elements of the cost-benefit analysis rely on program-level costs or elements that are not relevant to the comparison group (e.g., escrow). Statistical significance tests are not applicable to these types of data. Since these elements are combined in the final net benefit calculation, statistical significance can also not be assessed for this final amount using conventional statistical methods.[30]

Estimating the net costs or benefits associated with Compass FSS

We produce net cost and benefit results across the entire data period by summing individual cost and benefit elements. This allows us to compare program delivery costs, which are experienced only while participants are enrolled in the Compass FSS program, over an average of 3.4 years, with estimates of per-participant costs and benefits, which are calculated over the full analysis period (an average of 4.25 quarters per participant).

[29] The sum of multiple elements with statistically significant impacts may be insignificant (e.g., an element with a positive impact may be offset by an element with a negative impact).

[30] Methods such as obtaining confidence intervals from Monte Carlo or Bayesian analyses are beyond the scope of this analysis.