

The Effects of Need-Based Financial Aid on Employment, Earnings, and Receipt of Public Benefits

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Abstract

In this paper, we leverage the random assignment of a need-based financial aid grant offer—the Fund for Wisconsin Scholars (FFWS) grant—and several sets of administrative records to provide experimental evidence on the effects of the grant offer on students’ in-state employment, earnings, and participation in public assistance programs. For students in four-year universities, our results demonstrate significant employment reductions in the two years immediately following the aid offer as well as in the sixth, seventh, and eighth after receiving the randomized grant offer. We also find the aid offer to reduce in-state earnings throughout the full eight-year period we study. However, we show that the aid offer increases student grade point average, suggesting that the employment and earnings reductions during students’ in-college years are attributable to a reallocation of time and effort away from employment and toward coursework. For students’ post-college years, we provide suggestive evidence that the reductions are attributable to a combination of two mechanisms: 1) Offer-induced outstate migration, and 2) Offer-induced employment in lower paying jobs. We find little evidence that the FFWS grant offer affects the labor market outcomes of students in two-year institutions or the receipt of means-tested benefits for students in either two- or four-year institutions.

Keywords: Financial aid; experimental design, labor market outcomes

Introduction

The ever-increasing cost of postsecondary education threatens to put a college degree out of reach for many low- and middle-income students in the United States. Indeed, gaps in college access and completion between low- and high-income students have widened in recent decades (Bailey and Dynarski 2011), a pattern that may exacerbate already high levels of social and economic inequality. Advocates and like-minded policymakers have responded to these trends with calls to increase funding for need-based financial aid programs. Such calls are driven by an expectation that such aid will increase postsecondary access and completion for low-income students, and, ultimately, facilitate their transition into the labor force. To date, a fairly substantial body of work estimates the effect of need-based aid on postsecondary access and attainment (e.g. Castleman and Long 2016; Carlson et al. 2018; Goldrick-Rab et al. 2016; Anderson and Goldrick-Rab 2018; Angrist et al. 2016; Page et al. 2017; Page et al. 2018)—much of it returning evidence of meaningful positive effects—but there has been less work examining how need-based financial aid affects students’ outcomes in their post-college years (but see Bettinger et al. 2019).

In this paper we leverage the random assignment of a need-based financial aid grant offer—the Fund for Wisconsin Scholars (FFWS) grant—and several sets of administrative records to provide among the first experimental evidence on the effect of need-based financial aid on students’ economic outcomes in their post-college years. Specifically, we estimate the effect of the need-based aid offer on students’ in-state employment, earnings, and participation in public assistance programs, namely Temporary Assistance for Needy Families (TANF), the Supplemental Nutrition Assistance Program (SNAP), and Unemployment Insurance (UI). We estimate these effects separately for students attending 4-year universities and two-year institutions, both colleges and technical schools. In addition to estimating the effect of the

financial aid offer—the intention-to-treat (ITT) parameter—we also estimate the effect of receiving need-based aid, the treatment-on-the-treated (TOT) parameter. We estimate this parameter in an instrumental variables (IV) framework, using the randomized aid offer as an instrument for receipt of need-based aid.

Our results show that, for students in four-year universities, the FFWS grant offer reduces in-state employment both during students' college years as well as during the time period where they would typically transition into the labor market. In particular, our results demonstrate significant employment reductions in the two years immediately following the aid offer as well as in the sixth, seventh, and eighth after receiving the randomized grant offer. Moreover, we find the aid offer to reduce in-state earnings throughout the full eight-year period we study—the magnitude of these reductions are approximately five percent of mean control group earnings throughout most of the time period, although they are slightly larger in some years. In further analysis, we show that the aid offer increases student grade point average (GPA), suggesting that the employment and earnings reductions during students' in-college years are attributable to a reallocation of time and effort away from employment and toward coursework. For students' post-college years, we provide suggestive evidence that the reductions are attributable to a combination of two mechanisms: 1) Offer-induced outstate migration, and 2) Offer-induced employment in lower paying jobs, which may be facilitated by our finding that the FFWS offer reduces students' cumulative loan debt by \$2,000-\$3,000. We find little evidence that the FFWS grant offer affects the labor market outcomes of students in two-year institutions or the receipt of means-tested benefits for students in either two- or four-year institutions.

We proceed by first providing context for our study, situating our work within the existing literature on the effects of need-based financial aid and outlining the conceptual

considerations relevant to our analysis. In that section we also provide an overview of FFWS and describe the eligibility criteria for the aid offer as well as the details of program administration. We then detail our data and empirical strategy, present our results, and close the paper with a discussion of the implications of our results for both need-based financial aid policy and research on the topic.

Need-Based Financial Aid: Effects of Postsecondary Outcomes and Beyond

The need-based financial aid landscape is a fragmented one, with programs administered by the federal government, state governments, philanthropic organizations, and postsecondary institutions themselves. Undoubtedly the most well-known of these initiatives is the federal Pell Grant program. First authorized under the Education Amendments of 1972 and initially referred to as Basic Educational Opportunity Grants, the federal Pell Grant program has provided need-based grants that can be used to cover educational expenses at any Title IV-eligible institution for nearly a half century. Early research on this program concluded that its introduction had little effect on individuals' postsecondary enrollment decisions (Hansen 1983; Kane 1994, 1995). Later work, however, provides evidence of nuance in programmatic effects, with Seftor and Turner (2002) showing that the initial introduction substantially increased the postsecondary enrollment rates of individuals aged 25 or older, but had only modest effects on the enrollment decisions of recent high school graduates—Carruthers and Welch's (2019) work from Tennessee also finds little effect of Pell eligibility on enrollment decisions of high school graduates. However, recent work from Texas exploits a discontinuity in the award formula to show that qualifying for the maximum Pell award at the time of initial postsecondary enrollment significantly increases students' likelihood of college graduation and their average earnings four years later, compared to students who qualified for less generous awards (Denning, Marx, and

Turner, forthcoming). Among community college students, though, Park and Scott-Clayton (2018) provide evidence that Pell receipt leads to a reduction in labor supply and a corresponding increase in effort toward coursework.

Although the evidence base surrounding Pell Grants continues to expand, the share of educational expenses covered by the aid program has steadily declined over the years. Protopsaltis and Parrot (2017) conclude that the maximum Pell award covered less than 30 percent of educational expenses at the average four-year public college in 2016-17, a stark decline from the nearly 80 percent of cost coverage in 1975-76. The declining purchasing power of the Pell Grant has contributed to the development of need-based financial aid programs by both state governments and philanthropic organizations. At the state level, the Education Commission of the States identifies 52 separate state-funded programs that award financial aid solely on the basis of financial need (Education Commission of the States 2019).¹ Despite the prevalence of state-administered need-based aid programs, there have been relatively few rigorous evaluations of their effects, with Castleman and Long's (2016) analysis of the Florida Student Access Grant (FSAG) being one of the only studies in this realm.² Analysis of the FSAG demonstrated that grant eligibility increased student postsecondary enrollment—the effects were particularly pronounced at public four-year institutions. Moreover, grant eligibility boosted the mean number of credits that students earned, as well as their likelihood of earning a bachelor's degree within six years.

¹ An additional 22 programs award aid using both need and merit criteria.

² Scott-Clayton and Schudde (2019) examine the academic and labor market effects of Satisfactory Academic Progress (SAP) requirements typically included in need-based aid programs, but does not estimate the effect of need-based aid *per se*. The authors find SAP requirements have heterogeneous short-term effects, but harm academic and labor market outcomes after six years.

Relative to state-administered need-based aid programs, rigorous evaluation of philanthropically-funded programs has been much more common (e.g. Angrist et al. 2016; Page et al. 2017; Page et al. 2018; Bartik, Hershbein, and Lachowska 2017). The design details of these programs vary, but the vast majority have a place-based component—they offer aid to students with demonstrated financial need in a defined geographical area.³ Research on philanthropically-funded programs in Pittsburgh (Page et al. 2018), Kalamazoo (Bartik, Hershbein, and Lachowska 2017), Nebraska (Angrist et al. 2016), and Wisconsin (Goldrick-Rab et al. 2016) as well as the nationwide Dell Scholars Program (Page et al. 2017), all provide convincing evidence that need-based aid increased students’ postsecondary access or attainment, or both.

Considered as a whole, the evidence base regarding the effects of need-based aid on postsecondary access and attainment is an encouraging one, with rigorous studies routinely finding meaningful positive effects.⁴ Considering this evidence alongside the empirical literature demonstrating substantial labor market returns to postsecondary attainment (see Altonji, Blom, and Meghir 2012 for a relatively recent review of this literature) gives rise to the potential for the effects of need-based financial aid to reach beyond students’ postsecondary years and also shape their labor market outcomes—recent work by Bettinger et al. (2019) in the context of California’s merit-based scholarship program provides suggestive evidence on this outcome.

We empirically assess this potential in the context of the FFWS, which operates a philanthropically-funded need-based financial aid program that randomly assigns aid offers to a subset of eligible students enrolled in public postsecondary institutions in Wisconsin. In the

³ Perna and Leigh (2018) provide a comprehensive catalog and classification of existing place-based aid programs.

⁴ A substantial literature examines the academic effects of merit aid (e.g. Bruce & Carruthers 2014; Carruthers & Ozek 2016; Cornwell, Mustard, & Sridhar 2006; Dynarski 2000, 2008; Pallais 2009; Scott-Clayton 2011; Zhang & Ness 2010; Cohodes & Goodman 2014; see Page and Scott-Clayton 2016 for a comprehensive review of this work).

following section we detail the FFWS grant program, providing an overview of eligibility criteria and a summary of prior research on the program.

The Fund for Wisconsin Scholars

The FFWS, the organization that funds and administers the FFWS grant, was established in 2007 with a founding gift of \$167 million. The goal of the FFWS is to increase postsecondary persistence and attainment access for economically disadvantaged students in Wisconsin, which the FFWS works to achieve by providing need-based grants—the first grants were awarded in the fall of 2008. Throughout the time period we study a student is eligible to receive one of these grants if she:

- Graduated from a public high school in Wisconsin;
- Was less than 21 years old;
- Was pursuing a first degree at either one of the 13 four-year universities that are part of the University of Wisconsin System (UWS), one of the 13 UWS two-year colleges, or one of the 16 technical colleges that are part of the Wisconsin Technical College System (WTCS);⁵ and
- Is eligible to receive a federal Pell Grant.

Students do not directly apply for the FFWS grant. Rather, early in the fall of each academic year, every institution with the potential to enroll eligible students uses internal data to identify all newly eligible students who meet the award criteria. The institutions then send their lists of eligible students to the Wisconsin Higher Educational Aids Board (HEAB), which randomly assigns students to receive a FFWS grant offer. During period we study, HEAB would

⁵ Beginning in fall 2016, FFWS ceased offering grants to students enrolled in Wisconsin technical colleges, although students awarded a grant in prior years could continue to receive funds if they met all other eligibility criteria. In fall 2017, FFWS ceased offering grants to students enrolled in UWS two-year colleges, but, as was the case with technical colleges, students awarded a grant in prior years could continue to receive funds.

compile all eligible four-year students into one pool and all eligible two-year students into a second. They would then perform two separate randomizations, with a target of approximately 500 award acceptances in each pool.

As a result of this design, students not selected to receive the FFWS grant offer are typically unaware they were even eligible. During the fall semester, students selected for the FFWS grant offer receive an award letter that they are instructed to sign and return to the FFWS in order to access the funds. Students who follow the instructions in the award letter have their FFWS grant automatically renewed—up to a maximum of ten semesters—as long as they meet the initial eligibility criteria and make satisfactory academic progress. This award length applies to students offered FFWS grants at both two- and four-year institutions. Students offered a FFWS grant while attending a two-year institution maintained full eligibility if they transferred to an eligible four-year institution.

Currently, the FFWS grant is worth up to \$4,000 per year for students at four-year schools, an increase from the maximum grant of \$3,500 for the 2008-09 through 2014-15 award cohorts. For students at two-year institution, the award was worth up to \$1,800 per year. Importantly, FFWS is designed as a “last-dollar” aid program, meaning that it is designed to satisfy unmet financial need and, for a given student, will only be applied after all other sources of grant aid have been exhausted. Thus, FFWS offer recipients whose financial need is covered by other forms of grant aid will ultimately realize no financial benefit from the FFWS offer.

The first FFWS grants were awarded in the 2008-09 school year—about 1,200 grants were made that year—and a similar number of awards have been made each subsequent year. Table 1 presents the number of students who were eligible for the FFWS grant, the number offered the FFWS grant, and the number who accepted the award for the 2009-10 through 2016-

17 offer cohorts.⁶ In addition to the totals, it presents this information separately for technical colleges, two-year UW System colleges, and four-year UW System universities for each of the eight award cohorts. Among the cohorts we study, the table shows that nearly 9,400 students were offered an FFWS grant, out of a pool of more than 54,000 eligible students. About half of these offers have been made to students at four-year universities, with the other half made to students at two-year institutions, either technical colleges or the UW System colleges.

[Insert Table 1 about here]

Because FFWS grants are only offered to matriculated students, they are highly unlikely to affect college access outcomes. Rather, the effects of the program are designed to manifest in the form of increased persistence and attainment—these outcomes have served as the basis of previous evaluations of the program (Goldrick-Rab et al. 2016; Carlson et al. 2018; Anderson and Goldrick-Rab 2018). Focusing exclusively on students at four-year institutions, Goldrick-Rab et al. (2016) provide evidence that—for the first FFWS cohort—the aid offer increased the four-year graduation rate by nearly five percentage points. And, in an analysis that combines the second and third cohorts, the authors find that the FFWS grant offer boosted students’ cumulative GPA and credits completed. Interestingly, the increases in cumulative GPA and earned credits that the authors find for the second and third cohorts were not apparent in the first cohort.

Although time censoring prevented Goldrick-Rab et al. (2016) from examining graduation rates for the second and third cohorts, their increases in earned credits and cumulative GPA suggest that the aid offer had the potential to increase graduation rates for these students.

⁶ Our sample begins with the 2009-10 cohort—as opposed to the initial 2008-09 FFWS cohort—on the advice of FFWS personnel. They noted that institutions’ implementation and administration of the initial cohort of FFWS awards did not adhere to protocol, with one or more institutions failing to provide HEAB with the full set of students eligible to receive an award under FFWS criteria.

However, two subsequent—and separate—evaluations provide no evidence of such increases for these cohorts (Carlson et al. 2018; Anderson et al. 2018). For students at two-year institutions, prior work provides no evidence that the FFWS grant offer had any significant effect on either persistence or attainment (Carlson et al. 2018; Anderson and Goldrick-Rab 2018).

Although the bulk of prior work examining the FFWS has focused on persistence and attainment, Broton, Goldrick-Rab, and Benson (2016) drew on data from a survey administered to the first FFWS cohort in the fall of their second year in college to estimate the effect of the aid offer on employment. The authors find that being offered a FFWS grant reduced the probability that a student reported working by about 6 percentage points and reported hours worked by an average of 1.7 hours. Moreover, for employed students, the authors provide evidence that the aid offer changed qualitative aspects of students' work experiences, generally allowing them to avoid working the least desirable hours.

Our study builds on the work of Broton, Goldrick-Rab, and Benson (2016) in at least three ways. First, whereas Broton, Goldrick-Rab, and Benson's (2016) work is based on survey data, our analysis draws on administrative data maintained by Wisconsin state agencies. As such, we avoid validity issues that accompany employment self-reports (see Bound, Brown, and Mathiowetz 2001 for a review of this literature). Second, our data contain measures of economic outcomes other than employment. In particular, our data contain information on individual's earnings as well as their receipt of a wide variety of public benefits, including SNAP, TANF, and UI, among others. Finally, in contrast to prior work on the FFWS, our data are recorded at quarterly intervals over a long horizon. We are able to estimate the annual (or quarterly) effect of the FFWS grant offer on individuals' employment, earnings, and public benefit receipt up to eight years after the initial aid offer. Together, our analysis provides insight into the effects of

need-based aid on multiple economic outcomes during both individuals' years of postsecondary enrollment and their first several post-college years.

Data and Sample

Our analysis is based on a dataset containing a wide range of annual information on every student eligible to receive an FFWS grant beginning with the 2009-10 academic year. The information in this dataset is drawn from five sets of administrative records. First, we identify the annual set of FFWS grant-eligible students using records maintained by HEAB. In addition to identifying FFWS grant-eligible students, these records indicate whether the student was offered the FFWS grant (i.e., their treatment status).

Second, we obtained comprehensive postsecondary enrollment and completion information from National Student Clearinghouse (NSC) records, which were provided to us by the Wisconsin Department of Public Instruction (DPI). DPI also provided us with information on students' high school careers, including their district and school of attendance, their ACT and other standardized test scores, and their demographic characteristics, among other information. The FFWS grant eligibility criterion requiring that students graduate from a public Wisconsin high school ensured that DPI was able to provide this information for the vast majority of FFWS-eligible students. Third, the UWS provided us with records containing additional information on student postsecondary outcomes. These records contain student enrollment dates, credit completion, financial aid package, major, and grade point average, among other information. Note that UWS records do not contain information on students enrolled in WTCS schools—they only contain information on students enrolled in a two- or four-year UWS school.

Our information on individuals' employment, earnings, and participation in public assistance programs comes from the fourth and fifth sets of Wisconsin state administrative records we draw upon. We obtain quarterly measures of employment and earnings from the

Unemployment Insurance (UI) database, which is maintained by the Wisconsin Department of Workforce Development. Information on individuals' participation in various public assistance programs comes from records contained in the Client Assistance for Re-employment and Economic Support (CARES) database, which we access via the Multi-Sample Person File (MSPF) maintained the Institute for Research on Poverty (IRP) at the University of Wisconsin-Madison. The MSPF contains an anonymous, individual-level identifier for every person ever entered into any of seven databases maintained by Wisconsin state agencies.⁷

We leveraged the expertise of IRP personnel to perform the matching required to construct our dataset. This process began with HEAB providing us with the set of students, by FFWS cohort, eligible to be randomly assigned to receive an FFWS grant offer. Specifically, they provide us with student names, birth dates, and Social Security numbers (SSNs). IRP personnel then used SSNs to match FFWS-eligible students to UWS records, UI records, and the MSPF-contained CARES records. To match FFWS-eligible students to DPI records—and the attendant NSC information—IRP personnel employed a multi-faceted approach. First, they drew upon a standing, annually-updated connection that IRP maintains between DPI records and the MSPF. However, because not all FFWS-eligible students are present in the MSPF—only those ever entered into one of the seven MSPF-contributing databases are found in the file—IRP personnel also matched FFWS-eligible students to DPI records on the basis of name and birth date. These strategies resulted in near-perfect match rates across all five sets of administrative records.⁸

⁷ The seven databases are CARES, the Kids Information Data System (KIDS), the Unemployment Insurance (UI) System, the State Automated Child Welfare Information System (SACWIS), the Department of Corrections (DOC) records, the Milwaukee County Jail (MJ) records, and Court Record Data (CRD).

⁸ The expense of this near-perfect match rate was that a very small number of FFWS-eligible students were matched to more than one individual in the MSPF database. To account for these multiple matches, we randomly selected one of the matched cases when necessary.

Upon completion of this process we had a wide range of annual information for the 54,004 students eligible to be randomly assigned an FFWS grant offer in the 2009-10 through 2016-17 cohorts.⁹ This information spans the 2009-10 school year all the way through 2018, allowing us to estimate the effect of the FFWS grant offer on student economic outcomes up to four years after the first cohort’s scheduled graduation from college. Table 2 presents baseline characteristics for our analytic sample. It provides treatment and control group means separately for students in four-year universities and two-year schools. It also presents significance tests of treatment and control group differences, with the results generally consistent with a successful randomization. In line with the broader demographics of Wisconsin, Table 2 illustrates that more than three-fourths of students in our sample are white, with an additional 15 percent of the sample consisting of students from underrepresented racial/ethnic groups, specifically African American and Latinx students. For four-year students, about 17 percent of students' families received SNAP benefits in the year prior to randomization. Two-year students are slightly more disadvantaged, with about a quarter of students' families receiving SNAP in the prior year.

[Insert Table 2 about here]

Analytic Strategy

As specified in our pre-analysis plan, which we registered with the American Economic

Association RCT Registry, we estimate the effect of the FFWS offer using the following model:

$$Y_{ijt} = \alpha + \sum_{t=1}^{t=8} \gamma_t F_{ij} + \tau_j + \psi_t + \mathbf{X}_{ijt=0}\boldsymbol{\beta} + \varepsilon_{ijt} \quad (1)$$

⁹ The vast majority of students were only eligible to be randomly assigned an FFWS grant offer in a single cohort. However, a small number of individuals—approximately 500, or 2% of the total sample—were FFWS grant-eligible in multiple cohorts. To maintain the integrity of the randomization, we consider the unit of analysis to be a student-cohort observation in our analyses below. However, we cluster standard errors by student, rather than student-cohort.

where the outcome of interest, Y , for student i in cohort j in year after randomization t is a function of a constant, α , the treatment specification $\sum_{t=1}^{t=8} \gamma_t F_{ij}$, a vector of observable student characteristics X measured prior to randomization and included in the model to increase efficiency, fixed effects for cohort (τ_j) and year after randomization (ψ_t), and an error term, ε_{ijt} . We estimate over all available observations through 2018 for the 54,004 students eligible to be randomly assigned an FFWS grant offer in the 2009-10 through 2016-17 cohorts—this allows us to estimate the effect of the grant offer up to eight years after randomization. We estimate this model via ordinary least squares (OLS) with heteroskedastic-robust standard errors clustered by student. As a robustness test, we also estimate a specification where we omit the vector of observable student characteristics.

In this model, the treatment specification indicates that a student was randomly assigned to receive an FFWS grant offer. Thus, γ_t is the parameter of interest and represents the estimated effect of the FFWS grant offer on the relevant outcome of interest. Our specification estimates this parameter separately for each of the eight years following randomization. Such a specification allows for the likelihood that the grant offer will affect students' economic outcomes while they are enrolled in college differently than it would in their post-college years.

Our pre-registered analysis plan specifies two primary outcome measures and six secondary outcome measures—we estimate equation (1) separately for each of these eight outcomes. Our primary outcome measures include 1) Annual employment in the state of Wisconsin, and 2) Annual earnings in the state of Wisconsin. Our measure of employment takes on a value of one if—in a given year—an individual is recorded in Wisconsin's Unemployment Insurance (UI) database with any earnings. Our measure of annual earnings in the state of

Wisconsin also comes from the UI database and is simply measured as an individual's recorded annual earnings.¹⁰

The fact that our data contain employment and earnings records only from Wisconsin is perhaps suboptimal—the effects of the grant offer on students' post-college employment and earnings is of interest regardless of whether these individuals remain in the state or not. That said, the effect of the FFWS grant offer on students' in-state economic outcomes is undoubtedly a policy-relevant parameter. As reviewed above, a substantial number of need-based aid programs—including the FFWS grant—are place-based in nature. These programs are intended to increase the postsecondary access and attainment of students in the relevant geographic area, but they are often also designed to advance economic development efforts in that area. State legislatures and, perhaps to a lesser extent, philanthropic organizations that fund need-based aid programs would likely prefer need-based aid recipients remain in state and use their newly acquired human capital to contribute to the state economy. These realities make clear the importance of estimating the effect of the grant offer on in-state employment and earnings. However, we also recognize the importance of understanding the effect of the FFWS grant offer on students' employment and earnings outcomes regardless of their state of residence, and we conduct a number of supplementary analyses and robustness tests to gain as much insight as possible into the potential values of this parameter.

Along with our primary employment and earnings outcomes, we also estimate the effect of the FFWS grant offer on six secondary outcomes. These secondary outcomes include an indicator for annual receipt of SNAP, TANF, and UI benefits, as well as measures of the dollar

¹⁰ To best align with the timing of the randomized FFWS offer, which occurred early in the fall of each academic year, our measures of annual employment and earnings span from the third quarter of the calendar year through the end of the second quarter of the following calendar year.

amount of benefits received from each of these programs. Information on SNAP and TANF receipt is contained in the CARES database while data regarding UI benefits is recorded in that database. We again highlight that the administrative data we draw upon only record SNAP, TANF, and UI benefits received in Wisconsin—we do not observe benefits received by individuals in another state.

Results

Employment and Earnings

We present the estimated effect of the FFWS grant offer on individuals' probability of employment in Wisconsin in Table 3. We present these estimates separately for students enrolled in four-year universities and two-year institutions. For each group, we present the estimates from two specifications—one with covariate adjustment and one without—for each of the first eight years following randomization. We also present the control group mean to provide a degree of context and facilitate substantive interpretation.

[Insert Table 3 about here]

The four-year results demonstrate that the FFWS grant offer reduced employment by a statistically significant 2.1 to 2.5 percentage points in each of the first two years following randomization. These results are generally consistent with the survey-based estimates presented by Broton, Goldrick-Rab, and Benson (2016), although our estimates are noticeably more modest in magnitude. Broton, Goldrick-Rab, and Benson (2016) estimate that the grant offer decreased the probability of employment in the fall of students' second year in college by more than six percentage points—our estimates are only about one-third that size. Interestingly, we find the grant offer to have no significant effect on the probability of employment in the third, fourth, or fifth year after randomization. In each of these years the point estimates are close to zero—less than one percentage point—and statistically insignificant. For context, we highlight

that the control group mean was quite steady through the first five years following randomization, with between 81.1 and 82.6 of students employed in each of these years.

Negative effects of the grant offer on in-state employment re-emerge in the sixth year following randomization—a time by which most individuals are no longer enrolled in a postsecondary institution—and persist through the seventh and, potentially, eighth year after the initial grant offer. The estimated sixth year effect is approximately -2.7 percentage points while the seventh year effect is slightly larger, ranging from -3.1 to -3.4 percentage points, depending upon specification. The point estimates for the eighth-year effects are substantively similar to those for year 7, but are estimated with less precision due to the fact that only a single FFWS cohort informs the estimate. Considered as a whole, the results in Table 3 for students enrolled in four-year universities make clear that the FFWS grant offer reduced in-state employment in the first two years following the grant offer, had no effect in the third through fifth years after randomization, and again reduced employment in the sixth through eighth years following randomization, a time period in which many individuals have exited postsecondary institutions and transitioned into the labor market.

The right-hand panel of Table 3 contains the estimated effect of the FFWS grant offer on the probability of employment for students in two-year institutions. For context, we also present the annual control group means, which range from 80 to 90 percent, depending upon the particular year. The results show that, in each of the first seven years following randomization, the grant offer has no significant effect. All points estimates are less than one percentage point in magnitude and do not approach statistical significance. The eighth-year point estimates are notably larger—approximately -3.2 percentage points—but only significant at $p < 0.10$ in a single specification. This fact, coupled with only a single cohort informing the estimates, leads us to

interpret the estimate cautiously. Taken together, we view the results in the right-hand panel of Table 4 as evidence that the FFWS grant offer had no effect on the probability of in-state employment for individuals enrolled in two-year institutions. In the appendix, we present results from a series of cross-sectional models—one regression for each year following randomization (see Table A1). The substantive results of those alternative specifications mirror those presented in Table 3.

[Insert Table 4 about here]

We present the estimated effect of the FFWS grant offer on average in-state earnings in Table 4. We again present these estimates separately for students enrolled in four-year universities and two-year institutions for each of the first eight years following randomization. We present the mean earnings of the control group to aid in interpreting the substantive magnitudes of the estimated effects. The four-year results, which are presented in the left-hand column of Table 4, demonstrate that the FFWS grant offer significantly reduces earnings in each of the first three years following randomization. For the first year, the estimated effect is -\$278 in the specification without covariate adjustment and -\$268 in the model containing baseline covariates. Compared against the control group mean, these estimated effects represent an earnings decline of about 7 percentage points. The estimated effects in the second year following randomization are even larger, both absolutely and relative to the control group mean. Indeed, the estimated effects of -\$492 to -\$524 (depending upon specification) correspond to an earnings reduction of 8-9 percentage points. Although smaller in magnitude, the negative earnings effect persists into the third year—they are about 5 percent of the control group mean—before becoming non-significant in the fourth year. We highlight that the fourth-year estimates are only

slightly smaller than those for the third year, but they are estimated with substantially less precision.

Negative effects of the FFWS grant offer re-emerge in the fifth year after randomization and persist through the eighth year, the years after most students have already left school. The absolute magnitude of the estimates consistently increased over these years from about -\$650 in the fifth year after randomization to more than -\$1,500 in the eighth year following the FFWS grant offer. However, mean control group earnings also consistently rose over this time period, resulting in the estimated negative effects of the grant offer ranging from 5-8 percent of control group earnings in each of the four years. On the whole, the results in the left-hand panel of Table 4 make clear that the FFWS grant offer reduced students' in-state earnings throughout almost all of the first eight years following randomization. Moreover, the magnitude of this reduction is substantively meaningful, consistently in the range of 5-10 percent of mean control group earnings. For students at two-year institutions (right-hand panel of Table 4), the estimated earnings effects mirror the employment results presented in Table 3, showing no consistent evidence of any significant impacts of the grant offer. In the appendix, we demonstrate that identical conclusions emerge from estimating a series of cross-sectional regressions (see Table A2). Later in the paper we discuss the normative interpretation of these results and empirically assess a series of possible explanations.

Means-tested Benefit Receipt

We present the estimated effect of the FFWS grant offer on the probability of SNAP receipt in Wisconsin in Table 5. We again present these estimates separately for students enrolled in four-year universities (left-hand panel) and two-year institutions (right-hand panel), both with and without covariate adjustment. The top panel of the table presents the estimated effect of the grant offer on the likelihood of individual receipt of SNAP benefits while the bottom panel of the table

presents the estimated effect of the grant offer on the probability of an individual being a member of a case (i.e. household) receiving SNAP benefits.

[Insert Table 5 about here]

Results for individuals attending four-year universities provide evidence that the grant offer significantly reduced the probability of individual SNAP receipt in the second and third years following randomization. The magnitude of these estimates are small from an absolute standpoint—all estimates are one percentage point or less—but they operate off a control group mean of only 3-5 percent. The low level of SNAP receipt among control group members is attributable, in part, to the fact that students enrolled at least part-time in postsecondary institutions are generally ineligible to receive SNAP benefits.¹¹ This eligibility limitation may also indirectly explain the significant negative effects of the grant offer on individual SNAP receipt in the second and third years following randomization. Carlson et al. (2018) show that the FFWS grant offer increased postsecondary persistence into the second year for individuals in four-year universities. The vast majority of students for whom the grant offer induced continued postsecondary enrollment would be ineligible for SNAP receipt, thus contributing to the estimated effects presented in Table 5. The table also presents evidence of the grant offer reducing individual SNAP receipt in the seventh year following randomization.

Although Table 5 presents evidence that the FFWS offer reduced the likelihood of individual SNAP receipt in the second and third post-randomization years, the table presents no evidence that the grant offer reduced the probability of being part of a case receiving SNAP benefits in those years. However, it does show that the grant offer decreased the probability of being a member of a case receiving SNAP benefits in the sixth and seventh years following

¹¹ There are a small number of exceptions to this eligibility limitation. See <https://www.fns.usda.gov/snap/students> for a list of current exceptions.

randomization, or after expected graduation. The estimated effects are approximately two percentage points, relative to a control group mean of 11-12 percent.

For individuals enrolled in two-year institutions, the results show that the grant offer did not significantly impact individual SNAP receipt in any of the eight years following randomization. There is some evidence that the FFWS offer increases the likelihood that an individual is a member of a case receiving SNAP benefits in the fourth and fifth years following randomization—we estimate the offer to increase the probability by 1-2 percentage points—but these estimates are not significant at $p < 0.05$. In the appendix, we present the estimated effect of the FFWS grant offer on the dollar amount of SNAP benefits received (see Table A3). Given the close relationship between the outcomes, it is unsurprising that the sign and significance levels of the results mirror those presented in Table 5.

We present estimated impacts of the grant offer on TANF receipt, the dollar amount of TANF benefits received, UI receipt, and dollar amount of UI benefits received in the appendix (Tables A4-A6). The results show no impacts on any TANF-related outcome, but some evidence that the grant offer reduces the likelihood that individuals receive UI benefits in Wisconsin in the sixth and seventh years following randomization.

Additional Analyses

Treatment-on-the-Treated Estimates for Employment and Earnings Outcomes

In Tables 3 and 4 above we present the estimated effect of the FFWS grant offer on individual employment and earnings outcomes in the years following randomization—estimates of the intention-to-treat (ITT) parameter. A meaningful proportion of students offered the grant ultimately did not receive any aid dollars, either because they did not complete the required steps to take up the offer or because their financial need had been fully met by other aid sources and the last-dollar design of the FFWS grant program resulted in no contribution to their aid package.

Thus, we employ a second strategy to estimate the effect of FFWS grant receipt—the treatment-on-the-treated (TOT) parameter—on the employment and earnings outcomes we analyzed above. In this analysis, we define FFWS grant receipt as a contribution of at least one dollar to a student’s financial aid package in the first semester following the grant offer.

We estimate this parameter using an instrumental variables (IV) approach commonly used to estimate the TOT parameter in experimental contexts, where we instrument the potentially endogenous measure of FFWS receipt with the FFWS grant offer—random assignment of the grant offer ensures that the instrument satisfies the exclusion restriction. We implement this IV strategy in a two-stage least squares (2SLS) framework, with the first stage taking the form:

$$R_{ij} = \psi + \gamma F_{ij} + \tau_j + \omega_{ij} \quad (2)$$

where receipt of FFWS grant funds, R , for student i in cohort j is modeled as a function of a constant, ψ , an indicator for receiving an FFWS grant offer, F , and a cohort fixed effect, τ_j . We denote the error term with ω .

In the second stage, the predicted values of R resulting from estimation of equation (2)—denoted as \hat{R} below—are inserted into a model predicting either individual employment or earnings, represented by Y in equation (3) below. The second-stage model also contains a constant, α , as well as a cohort fixed effect, τ_j , and an error term, ε_{ij} .

$$Y_{ij} = \alpha + \delta \hat{R}_{ij} + \tau_j + \varepsilon_{ij} \quad (3)$$

Because \hat{R} only contains the variation in FFWS grant receipt attributable to the randomized offer, it is uncorrelated with ε and the resulting estimate of δ thus represents—under plausible assumptions—the causal effect of FFWS grant receipt on the relevant employment or earnings outcome. For each outcome, we estimate this model separately for each of the eight years

following random assignment of the FFWS grant offer. We are only able to estimate the TOT parameter for students enrolled in four-year universities because our data do not contain a measure of grant receipt for all students in the two-year randomization pool—we lack the measure for students enrolled in Wisconsin technical colleges.

[Insert Table 6 about here]

We present the results of estimating equations (2) and (3) in Table 6. The left-hand panel of the table presents results when individual employment in Wisconsin is specified as the outcome while the right-hand side presents in-state earnings results. The middle column of each panel presents estimates of γ from equation (2) above—these estimates can be interpreted as the effect of the aid offer on FFWS grant receipt in the first semester. Across both outcomes, these first-stage estimates indicate that the grant offer resulted in receipt of at least one dollar in aid in the semester following randomization for 80-85 percent of offered students; the slight year-to-year variation is attributable to varying receipt rates across cohorts. The third column of each panel presents estimates of δ from equation (3), which can be interpreted as the effect of FFWS receipt on the outcome of interest—the first column of each panel presents the control group mean to facilitate interpretation of the substantive magnitude of the effect.

The employment results demonstrate that grant receipt reduced the probability of employment in Wisconsin by 2.8 and 2.5 percentage points in the second and third years following randomization, respectively. The estimated effects of grant receipt are insignificant in the third through fifth years following randomization but re-emerge in the sixth and seventh years, with grant receipt estimated to reduce in-state employment by 3-4 percentage points. The estimate for the eighth post-randomization year is comparable in magnitude but estimated with less precision.

The earnings results show that grant receipt reduced in-state earnings by \$300-\$600 in each of the first four years following randomization, a time period that generally corresponds to students' in-college years. The estimated effects range from 4 to 10 percent of mean control group earnings during this time. The negative in-state earnings effects of grant receipt persist in the fifth through eighth post-randomization years, a time by which most students in our sample have exited postsecondary education. Although the absolute magnitude of these estimates increases from -\$800 to nearly -\$1,900 over this period, the relative size of these effects is fairly steady at 6-7 percent of mean control group earnings. Together, the results in Table 6 provide important evidence on the effects of actually receiving FFWS grant funds, as opposed to merely receiving a grant offer, on individuals' in-state labor market outcomes.

Further Analysis of Employment and Earnings Results for Students at Four-Year Universities

Our results provide clear evidence that the FFWS offer reduces in-state employment and, especially, earnings across the eight years following the aid offer for students at four-year universities. However, these results span two distinct periods in students' lives—their time in college and their transition into the labor market—and this fact lends nuance to their normative interpretation. As noted above, the FFWS grant program is intended to improve postsecondary success for low-income students in Wisconsin by providing aid designed to alleviate financial pressures that often inhibit student course performance and, ultimately, degree completion. One specific burden that the FFWS may alleviate is the pressure to balance employment obligations with the demands of coursework. Many low-income students cannot finance their postsecondary education without the income from a full-time or near full-time job. However, the time demands of full-time work can inhibit coursework success—students may simply lack the time necessary to excel in their classes. And subpar performance in one or more classes in a particular semester

may cascade to affect a student's persistence in postsecondary education, as well as their ultimate degree completion.

[Insert Table 7 about here]

In this scenario, the FFWS-induced decline in student employment and earnings in the first few years following the aid offer can be viewed as normatively desirable, particularly if it is accompanied by evidence of improved academic outcomes. To assess whether we observe any such evidence we estimate the effect of the FFWS grant on two measures of student grade point average (GPA) for the set of students enrolled in four-year universities: 1) First-year GPA and 2) Last observed UW System GPA. We measure the last observed UW System as a student's GPA at the time he or she leaves the UW system, either due to degree completion or to discontinuing enrollment in a UW System institution.¹²

We present the results of this analysis in Table 7. The results make clear that the FFWS offer increases student GPA, regardless of whether we measure it as first-year GPA or last observed GPA during UW System enrollment. In particular, the FFWS offer increases first-year GPA by about 0.04 points. The corresponding effect for those who receive at least one dollar of aid in their first eligible semester is an increase of 0.05 points. These first-year effects persist throughout subsequent years, with the estimated effects of both the offer and aid receipt on students' last observed GPA almost identical in magnitude to the first-year effects. Considering the results in Table 7 alongside those in Tables 3 and 4 suggests that the FFWS offer allows students to reduce their employment and associated earnings and reallocate that time toward their coursework, with tangible evidence of improved academic performance. And this improved

¹² The last observed UW System GPAs are distributed across years as follows: 7% of students have their last observed UW System GPA in Year 1; 11% in Year 2; 13% in Year 3; 27% in Year 4; 28% in Year 5; 10% in Year 6; 3% in Year 7; and 1% in Year 8.

course performance could serve as a mechanism by which the FFWS grant offer improves downstream academic outcomes. Indeed, in other work we show that the FFWS grant offer increased year-to-year persistence in postsecondary education, although we find no significant effects of the aid offer on ultimate degree completion (Carlson et al. 2018).

In addition to containing information on students' in-state employment and earnings during their postsecondary enrollment, our data also span students' transition into the labor market—we generally consider this period to be years five through eight following randomization. Compared to the period where students were enrolled in school, the negative employment and earnings effects observed during their transition into the labor market are less obviously explicable, and perhaps desirable. In this section we put forth two candidate explanations and—to the extent possible—use our data to assess their plausibility.

Above we describe how FFWS grants are designed to alleviate financial pressures that constrain students' academic options, and in Table 7 we provide evidence that the FFWS grant offer resulted in improved academic performance while students were in school. A similar dynamic may play out as students transition into the labor market. Specifically, the FFWS grant may reduce students' debt burden, which, in turn, could lead students to consider jobs that are lower-paying yet welfare enhancing—the FFWS grant may provide a degree of financial flexibility that frees students to consider a broader set of labor market options.

[Insert Table 8 about here]

We present evidence relevant to this potential explanation in Table 8. In particular, we present the estimated effect of the FFWS grant offer on cumulative loan amounts accrued during enrollment in a UW System institution. We present the results for students enrolled in four-year institutions in the left-hand panel of the table, with the results for students enrolled in two-year

UWS colleges presented in the right-hand panel as a point of comparison.¹³ In each panel, we present the estimated effect of the FFWS grant offer separately for all loans, subsidized loans, and unsubsidized loans. The results in Table 8 make clear that the FFWS offer significantly reduces cumulative loan debt for students enrolled at four-year universities, with the magnitude increasing from about \$500 in the year following randomization to approximately \$2,000 in the fourth, fifth, and sixth years following randomization. The estimated effects are even larger in the seventh and eighth post-randomization years, but these increased effects are primarily reflective of the fact that the earliest cohorts in our data—the only cohorts that inform the estimates for these later years—borrowed at higher rates than more recent cohorts, likely due to their enrollment during the height of the Great Recession. In contrast, the results for students at two-year UW System colleges reveal the grant offer to have no effect on cumulative loan debt. In the appendix (see Table A7), we also show that, by the time of scheduled graduation, the FFWS offer reduced the proportion of students with any loan debt by more than two percentage points, with a much larger the reduction—approximately five percentage points—in the fraction of students with more costly unsubsidized loans. Together, these results suggest that receiving an FFWS grant offer provides students with a degree of financial flexibility that may play into their post-college labor market decisions.

A second potential explanation for the negative in-state employment and earnings effects in students' post-college years is the possibility that the FFWS grant offer induces either outstate migration or asymmetric outstate migration for high-earning students (or both). Indeed, a limitation of our data is our inability to measure employment and earnings outside of Wisconsin. This limitation does not call into question our ability to validly estimate the effect of the FFWS

¹³ Our data do not contain loan information for students enrolled in technical colleges—these schools are part of the Wisconsin Technical Colleges System (WTCS) rather than the UW System.

offer on in-state employment or earnings, which are clearly policy-relevant parameters and the primary focus of our analysis, but it does mean that differential outmigration could contribute to the observed results.

We perform several analyses to gain insight into the role that differential outmigration might play in generating the negative in-state employment and earnings effects. First, we use all information at our disposal to construct an annual measure indicating whether an individual in our sample was confirmed as residing in Wisconsin in that year. In particular, we consider an individual a confirmed Wisconsin resident if they either: 1) Had earnings recorded in the state, 2) Were enrolled in a Wisconsin postsecondary institution, or 3) Were recorded in the CARES database as residing in Wisconsin. Of course, our measure of confirmed Wisconsin residence is an imperfect one. Most notably, individuals who reside in Wisconsin but do not participate in the formal labor market will not be captured by this measure.

With this in mind, we estimate the effect of receiving an FFWS offer on the probability of being a confirmed Wisconsin resident and present the results in the first column of Table 9. The results show that an FFWS offer has no effect on being a confirmed Wisconsin resident in the fifth post-randomization year, but a negative effect of about three percentage points in the sixth, seventh and eighth years. Again, though, this does not provide conclusive evidence that the FFWS offer induces outstate migration as these individuals could reside in Wisconsin and simply not participate in the formal labor market—our data do not allow us to distinguish between these possibilities.

[Insert Table 9 about here]

Next, we use our measure of confirmed Wisconsin residence as the basis for constructing a new measure of annual earnings. In this measure, we code cases with zero Wisconsin earnings

and who are not confirmed to be residing in the state as missing—individuals with zero earnings but who are confirmed as state residents remain coded as zero. We then regress this measure of annual earnings on an indicator for receiving an FFWS offer and a cohort fixed effect, which provides us with the average difference in annual earnings between confirmed Wisconsin residents who did and did not receive an FFWS offer. We present these results in the second column of Table 9. In each of the four years we analyze, individuals who received an FFWS grant offer earned less than their peers who received no such offer, although only the estimate for the fifth post-randomization year is statistically significant. The estimate for that year is nearly identical to the main results presented in Table 4, while the estimates for years six through eight are all about one-half the size of their analogs in Table 4. Together, the results in Table 9 suggest that the negative effect of the FFWS offer on in-state earnings is unlikely to be entirely driven by FFWS-induced outstate migration, but they leave open the possibility that it may play some role.

We next assess the degree to which an FFWS offer might induce differential outstate migration of individuals with high earning potential. Such patterns could produce the negative in-state employment and earnings effects in students' post-college years, even if there are no mean differences in outmigration. We perform this assessment by estimating a series of regressions where we predict our annual measure of confirmed Wisconsin residency with an indicator for receiving an FFWS offer, a student characteristic theoretically associated with post-college earning potential—ACT score, bachelor degree completion, postsecondary GPA, and gross family income—and the interaction of that characteristic with the FFWS offer indicator.¹⁴

[Insert Table 10 about here]

¹⁴ The regressions also contain a cohort fixed effect.

We present the estimated coefficients for the interactions in Table 10. The results show that the relationships between confirmed Wisconsin residency and composite ACT score, BA degree attainment (either from the UW System or any institution), or gross family income is not significantly different for those who received an FFWS grant offer, compared to their non-offered peers. However, the results in the final column provide evidence of a differential relationship between confirmed Wisconsin residency and college GPA for those who did and did not receive an FFWS grant offer. In particular, for each one-point increase in GPA, students who received an offer of FFWS aid are two (Year 6) to four (Year 7) percentage points less likely to be confirmed Wisconsin residents, relative to their peers who received no such offer. This suggests that the FFWS offer could spur high-performing students to migrate out of Wisconsin at higher rates, but the GPA results should be considered alongside the null relationships for all other characteristics we analyze in Table 10.

Considered together, the results presented in Tables 7-10 provide useful insight into the mechanisms potentially responsible for generating the negative in-state employment and earnings effects of the FFWS offer. During students' time in college, evidence suggests that the FFWS grant allows students to reallocate time away from employment and toward their coursework, producing tangible improvements in their academic performance. As students transition into the labor market, we provide indirect evidence in support of two mechanisms that could plausibly generate the continued negative employment and earnings effects in students' post-college years. First, we show that the FFWS offer significantly reduced students' mean debt burden, which may provide them with the flexibility to consider jobs that are lower-paying yet welfare enhancing (e.g., teaching). We provide no direct evidence on qualitative aspects of students' labor supply decisions, but plan to pursue such analysis in the future by examining

whether the FFWS offer affects sector of employment. Second, we provide suggestive evidence that the FFWS offer generates a slight increase in outstate migration, and perhaps leads to differential outstate migration among higher-performing students, at least as measured by college GPA.

Bounding the Effect of the FFWS Offer on Total Earnings

Our primary analyses focus on the effect of the FFWS offer on employment and earnings in

Wisconsin, which is the state where the FFWS program is administered. From a societal

standpoint, however, we are interested in the effects of the FFWS offer on individuals' overall

earnings, regardless of the state where they are accrued. Although data limitations prevent us

from estimating this parameter directly, at least without implausibly strong assumptions, we can

bound the effect using the approach developed by Lee (2009). This technique trims the

distribution of the outcome variable for the group with lower attrition levels and then uses this

trimmed group mean—along with the untrimmed mean of the group with higher attrition

levels—as the basis for calculating upper and lower bounds of the treatment effect.¹⁵

[Insert Table 11 about here]

Specifying the outcome as our measure of annual earnings where we code cases with zero

Wisconsin earnings and who are not confirmed to be residing in the state as missing, we present

the results of Lee's (2009) bounding technique for students enrolled in four-year universities in

¹⁵ More specifically, this technique first requires determining the quantile at which to trim the distribution of the outcome variable for the group with less attrition. This determination is made by taking the difference in the share of cases in the treatment and control groups with observed outcomes and then scaling that difference by the proportion of cases with observed outcomes in the group with less attrition. This calculation identifies the quantile at which to trim the distribution of the outcome variable for calculating the upper bound of the treatment effect. Calculating the lower bound of the treatment effect simply involves trimming the distribution of the outcome measure at one minus the quantile used for calculating the upper bound.

Table 11.¹⁶ For each of the first three years, both the lower and upper bound estimates are negative and significant, making clear that the FFWS offer almost certainly reduces total earnings—not just in-state earnings—during this time period. Over the subsequent five years, the lower bound estimates remain negative, relatively large, and statistically significant. The upper bounds, however, are generally null, although the point estimates for the final three years are positive, with the estimate for the sixth post-randomization year even marginally significant.

Considered as a whole, the results of this exercise produce two main takeaways. First, the effects of the FFWS offer on overall earnings are almost certainly negative during students’ in-college years. Second, we can likely rule out the FFWS offer generating large increases in earnings, but we cannot completely eliminate the possibility of significant earnings reductions. However, given the range and significance levels of the two bounds, it seems most likely that the effect of the FFWS offer on overall early post-college earnings is null. Together, the results in Table 11 provide a useful complement to our main in-state results.

Heterogeneity by Two-Year Institution Type

Our final analysis turns attention to FFWS-eligible students enrolled in two-year institutions. In particular, we examine whether the effects of the FFWS offer on in-state employment and earnings differ for students enrolled in Wisconsin technical colleges versus their peers in two-year UWS colleges. We perform this analysis by estimating a series of regressions—one for each post-randomization year—that take the form:

$$Y_{ij} = \alpha + \varphi F_{ij} + \zeta T_{ij} + \gamma(F_{ij} * T_{ij}) + \tau_j + \varepsilon_{ij} \quad (4)$$

¹⁶ We also applied this bounding technique to the sample of students enrolled in two-year institutions. Neither the lower nor upper bound estimates were statistically significant across any of the eight years, a result perhaps unsurprising given the estimates in Table 4.

where the outcome of interest, Y , for student i in cohort j is a function of a constant, α , and indicator for receiving an FFWS grant offer F_{ij} , an indicator for technical college enrollment at the time of the offer T_{ij} , the interaction of those two terms, fixed effects for cohort (τ_j), and an error term, ε_{ijt} . We estimate this model over the full sample of FFWS-eligible students enrolled in two-year institutions and use the results to construct estimates of the effect of the FFWS offer separately for technical college enrollees, two-year UWS college enrollees, as well as an estimate of the difference between those two estimates. We present these results in Table 12.

[Insert Table 12 about here]

The employment results, which we present in the left-hand panel of the table, demonstrate no significant effect of the FFWS offer for either technical college or two-year UWS college enrollees. Additionally, the differences between the two sets of estimates are insignificant as well. In short, there is no evidence of heterogeneity in the effect of the FFWS offer on employment by institution type.

The earnings results—presented in the right-hand panel of the table—do provide some evidence of heterogeneity in the effect of the FFWS offer. For technical college enrollees, the estimated effects of the FFWS offer are generally positive across the entire time period we analyze, although none of the estimates are statistically significant. In contrast, the estimated effects for UWS enrollees are negative, with the estimates for the seventh and eighth post-randomization years being both substantively and statistically significant. These divergent patterns contribute to a number of the differences between the estimated effects for the two sets of students achieving statistical significance, as indicated in the final column of the table.

Discussion and Conclusion

As ever-increasing college costs threaten to put postsecondary education beyond the reach of many low- and middle-income U.S. students, need-based aid programs can represent a lifeline

that prevents a college degree from slipping away. Indeed, a large literature provides strong evidence that need-based aid can increase college access, persistence, and completion (e.g. Castleman and Long 2016; Goldrick-Rab et al. 2016; Angrist et al. 2016; Page et al. 2017; Page et al. 2018). This paper complements that literature by experimentally estimating the effects of need-based aid on students' economic outcomes—their in-state employment, earnings, and means-tested benefit receipt—both during the years they are enrolled in college and during the years where they presumably transition into the labor market.

Our results show that, for students in four-year universities, the FFWS grant offer reduces in-state employment in the two years immediately following the offer as well as in the sixth, seventh, and eighth years following the offer—the estimated effects are null in the three interim years. Moreover, we find the aid offer to reduce in-state earnings throughout the full eight-year period we study, with the magnitude of these reductions typically in the range of five percent of mean control group earnings. Although the aid offer decreased student employment and earnings, we also show that it increases student GPA during their time in the UW System. This suggests that students are reallocating time and effort away from employment and toward education, a reallocation perfectly aligned with the goals of the FFWS program.

The negative in-state employment and earnings effects in students' post-college years are both less obviously explicable and desirable. Although our experimental design is ideal for validly estimating the causal effects of the FFWS grant offer, it is less suited to identifying the specific mechanisms that generated the effects. Still, we propose multiple candidate mechanisms and conduct a series of analyses that shed light on their plausibility. The first candidate mechanism we examine is offer-induced outstate migration, and the evidence suggests that this phenomenon could be responsible for some portion of the effect as we show that students offered

the FFWS grant are less likely to be confirmed Wisconsin residents. However, we cannot rule out the possibility that the FFWS offer simply results in individuals being less likely to participate in the Wisconsin labor market, thus limiting our ability to confirm their Wisconsin residency.

A second potential mechanism we explore is the possibility that the FFWS grant may provide a degree of financial flexibility that frees students to consider a broader set of labor market options, including positions with lower pay that may be more desirable on other dimensions. We show that the FFWS offer reduces students' mean cumulative loan debt by \$2,000-\$3,000, which provides students with at least some greater degree of financial flexibility in their post-college endeavors. Further, we show that, conditional on being employed in Wisconsin, students offered the FFWS grant exhibit lower earnings in their post-college years than control group students, although the estimates are not always statistically significant. Together, though, these results are consistent with the FFWS grant offer freeing students to take lower paying, yet potentially welfare-enhancing, jobs.

The effects of need-based aid on in-state employment and earnings are undoubtedly relevant to policymakers deciding how allocate limited public dollars, but from a societal standpoint we are also interested in the effects of the FFWS offer on individuals' overall earnings, regardless of where they are accrued. Because data limitations prevent us from estimating this parameter directly, we apply Lee's (2009) bounding technique that provides lower and upper bounds for the overall effect, based on the observed data. These results provide evidence that we can rule out the FFWS offer generating large increases in overall earnings, and that the effect on overall earnings is either negative or null.

The difference between the clearly negative effects on in-state employment and earnings and the potential null effects on overall student employment and earnings highlights a tension that policymakers must navigate when designing need-based aid programs funded with public dollars. In particular, our results show that policymakers are often tasked with striking a balance in designing an aid program that maximizes the welfare of the aid recipients versus one that maximizes the welfare of the state and its taxpayers. Policymakers across the country have taken a wide variety of approaches in striking this balance. On one end of the spectrum, aid programs in New York and Rhode Island require aid recipients to maintain residence in the state for a specified number of years following their postsecondary completion or exit. On the other end, a large number of programs have no residency or employment conditions attached to aid receipt. Our work does not identify the optimal response to this tension, but it does provide information that may be useful to policymakers trying to navigate it.

This paper focuses primarily on the in-state employment and earnings effects of the FFWS grant offer for students enrolled in four-year universities, but our results for students in two-year institutions also have important implications. Although we show the aid offer to have no effects on in-state employment and earnings for two-year students, these overall results mask noticeable heterogeneity by institutional type, namely UWS colleges and technical colleges. In particular, we estimate the effects of the FFWS offer on in-state earnings to be more positive for students in technical college than for students in UW System colleges, with these differences significant at $p < 0.10$ in the sixth, seventh, and eighth years following the aid offer.

Our paper is unique in its ability to experimentally estimate the effects of need-based aid on employment and earnings outcomes up to eight years after the initial aid offer, which covers the period when many individuals transition into the labor market. However, even these

estimates capture only the very early portion of students' careers, and the longer-run dynamics could play out very differently. For example, it is possible that the FFWS grant offer induces individuals to take jobs with lower initial pay, but much greater room for future salary growth. Or perhaps the FFWS grant offer induces individuals to go on to graduate education, thus delaying their entry into the labor market. With the necessary passage of time, we plan to incorporate future educational, employment, earnings, and means-tested benefit data to assess whether the medium- and longer-term effects of the FFWS offer differ from those we present here.

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Tables and Figures

Table 1. Number of students receiving FFWS grant offer and number of eligible students not receiving FFWS grant offer, by cohort

Cohort	4-Year University		2-Year Institution	
	FFWS Offer	No FFWS Offer	FFWS Offer	No FFWS Offer
2009-10	500	3,635	544	2,188
2010-11	550	4,521	600	2,489
2011-12	621	4,204	649	2,308
2012-13	625	3,499	675	2,178
2013-14	600	3,718	700	2,430
2014-15	557	3,588	750	1,686
2015-16	540	3,387	700	1,365
2016-17	575	3,101	200	321
<i>Total</i>	<i>4,568</i>	<i>29,653</i>	<i>4,818</i>	<i>14,965</i>

Notes: The sample sizes for two-year students in the 2016-17 cohort are smaller because Wisconsin Technical College students were ineligible beginning in that year.

Table 2. Balance between the treatment and control groups on pre-randomization characteristics

Characteristics (%)	4-Year University			2-Year Institution		
	FFWS Offer	No FFWS Offer	<i>P</i> -Value	FFWS Offer	No FFWS Offer	<i>P</i> -Value
Female	59.3	56.6	0.002	50.7	52.5	0.072
White	76.7	76.7	0.964	77.9	78.3	0.693
Underrepresented Race	15.2	14.8	0.596	15.9	15.1	0.67
Other Race	8.1	8.4	0.455	6.2	6.6	0.204
Ever ELL	8.8	8.6	0.748	8.2	8	0.763
Received SNAP	17.1	16.8	0.938	27.8	25.5	0.141
<i>N</i>	3,993	26,552		4,618	14,644	

Notes: The table shows the characteristics of the full sample of students (2009-10 through 2016-17 cohorts) with available data on a given variable of interest in the year prior to randomization. "Ever ELL" indicates a student was labeled as an English language learner at some point during his/her time in a Wisconsin public school. "Received SNAP" indicates a student's family received Supplementary Nutrition Assistance Program benefits in the year prior to randomization. The "P-Value" column provides the p-value from a regression of FFWS offer receipt on the characteristic of interest. These regressions also included cohort fixed effects.

Table 3. Estimated effect of FFWS grant offer on annual employment, by institution type and inclusion of baseline characteristics

Year	4-Year University			2-Year Institution		
	Control Group Mean	No Covariate Adjustment	Covariate Adjusted	Control Group Mean	No Covariate Adjustment	Covariate Adjusted
Year 1	0.812	-0.0230*** (0.0064)	-0.0247*** (0.0064)	0.877	-0.0036 (0.0055)	-0.0040 (0.0055)
Year 2	0.826	-0.0205*** (0.0067)	-0.0223*** (0.0067)	0.892	-0.0034 (0.0053)	-0.0033 (0.0053)
Year 3	0.811	-0.0071 (0.0072)	-0.0090 (0.0078)	0.876	0.0006 (0.0060)	0.0011 (0.0060)
Year 4	0.819	-0.0035 (0.0077)	-0.0056 (0.0078)	0.862	0.0019 (0.0069)	0.0016 (0.0070)
Year 5	0.812	-0.0071 (0.0088)	-0.0085 (0.0089)	0.854	-0.0037 (0.0081)	-0.0051 (0.0082)
Year 6	0.778	-0.0266** (0.0112)	-0.0269** (0.0114)	0.841	-0.0005 (0.00970)	-0.0031 (0.0098)
Year 7	0.750	-0.0311** (0.0147)	-0.0340** (0.0149)	0.823	0.0017 (0.0125)	-0.0020 (0.0127)
Year 8	0.729	-0.0287 (0.0218)	-0.0382* (0.0221)	0.816	-0.0327* (0.0195)	-0.0319 (0.0199)

NOTE: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Robust standard error clustered by student in parentheses below coefficient estimate. All coefficients in a column from a single OLS regression predicting annual employment in the state of Wisconsin. Each coefficient is an estimate from an interaction between the indicator for receiving an FFWS grant offer and an indicator for the respective post-randomization year. All regressions contain fixed effects for cohort and post-randomization year. Regressions in covariate adjusted columns also contain measures of student gender, race/ethnicity, and English learner status in high school. Covariate-adjusted regression for students in 2-year institution also contains an indicator for technical college enrollment.

Table 4. Estimated effect of FFWS grant offer on annual earnings, by institution type and inclusion of baseline characteristics

Year	4-Year University			2-Year Institution		
	Control Group Mean	No Covariate Adjustment	Covariate Adjusted	Control Group Mean	No Covariate Adjustment	Covariate Adjusted
Year 1	3,884.05	-278.4*** (58.54)	-268.23*** (59.79)	6,655.07	-123.0 (91.57)	-160.16* (95.92)
Year 2	5,797.77	-524.2*** (93.92)	-492.93*** (95.38)	9,883.32	-53.47 (140.60)	-77.09 (140.37)
Year 3	7,170.68	-376.8** (131.80)	-349.05*** (134.03)	12,463.26	89.30 (193.70)	72.18 (191.36)
Year 4	8,907.78	-284.8 (174.80)	-293.34* (176.27)	14,437.73	253.1 (246.30)	249.34 (243.96)
Year 5	13,471.99	-651.4** (282.70)	-665.04** (285.03)	16,788.21	339.4 (316.90)	346.25 (315.57)
Year 6	18,007.83	-868.9** (421.70)	-908.02** (424.19)	19,261.88	166.3 (413.40)	121.43 (412.61)
Year 7	20,405.92	-1145* (595.90)	-1273.09** (595.96)	21,147.75	-268.9 (550.70)	-363.85 (549.60)
Year 8	21,433.85	-1646* (941.90)	-2036.38** (944.28)	22,052.07	-995.1 (859.40)	-1105.21 (861.96)

NOTE: *** $p < 0.10$, ** $p < 0.05$, * $p < 0.01$. Robust standard error clustered by student in parentheses below coefficient estimate. All coefficients in a column from a single OLS regression predicting annual employment in the state of Wisconsin. Each coefficient is an estimate from an interaction between the indicator for receiving an FFWS grant offer and an indicator for the respective post-randomization year. All regressions contain fixed effects for cohort and post-randomization year. Regressions in covariate adjusted columns also contain measures of student gender, race/ethnicity, and English learner status in high school. Covariate-adjusted regression for students in 2-year institution also contains an indicator for technical college enrollment.

Table 5. Estimated effect of FFWS grant offer on SNAP receipt, by institution type, inclusion of baseline characteristics, and individual vs. case receipt

Year	4-Year University			2-Year Institution		
	Control Group Mean	No Covariate Adjustment	Covariate Adjusted	Control Group Mean	No Covariate Adjustment	Covariate Adjusted
<i>Individual Receipt</i>						
Year 1	0.009	0.001 (0.001)	-0.001 (0.002)	0.062	0.002 (0.004)	0.003 (0.004)
Year 2	0.029	-0.004* (0.003)	-0.006** (0.003)	0.091	0.001 (0.005)	0.002 (0.005)
Year 3	0.053	-0.008** (0.004)	-0.010*** (0.004)	0.098	0.006 (0.005)	0.006 (0.005)
Year 4	0.061	-0.007 (0.005)	-0.009* (0.004)	0.102	0.008 (0.006)	0.008 (0.006)
Year 5	0.062	-0.006 (0.005)	-0.008 (0.005)	0.099	0.005 (0.007)	0.005 (0.007)
Year 6	0.055	-0.006 (0.006)	-0.006 (0.006)	0.094	0.002 (0.008)	0.002 (0.008)
Year 7	0.047	-0.012** (0.006)	-0.011* (0.006)	0.084	0.012 (0.010)	0.012 (0.009)
Year 8	0.043	-0.009 (0.009)	-0.009 (0.009)	0.086	0.002 (0.014)	0.006 (0.013)
<i>Case Receipt</i>						
Year 1	0.167	0.000 (0.006)	-0.002 (0.006)	0.276	0.008 (0.007)	0.009 (0.007)
Year 2	0.156	-0.003 (0.006)	-0.004 (0.006)	0.266	0.001 (0.007)	0.002 (0.007)
Year 3	0.155	-0.003 (0.007)	-0.005 (0.006)	0.252	0.012 (0.008)	0.011 (0.008)
Year 4	0.149	-0.004 (0.007)	-0.004 (0.007)	0.237	0.015* (0.009)	0.012 (0.008)
Year 5	0.139	-0.008 (0.008)	-0.008 (0.007)	0.212	0.018* (0.010)	0.017* (0.009)
Year 6	0.123	-0.016** (0.008)	-0.016** (0.008)	0.204	0.009 (0.011)	0.008 (0.011)
Year 7	0.112	-0.020**	-0.016*	0.183	0.017	0.016

		(0.010)	(0.009)		(0.013)	(0.013)
Year 8	0.104	-0.006	-0.007	0.178	-0.002	0.005
		(0.014)	(0.014)		(0.018)	(0.018)

NOTE: ***p<0.10, **p<0.05, *p<0.01. Robust standard error clustered by student in parentheses below coefficient estimate. Outcome in top panel is specified as individual receiving SNAP benefits as casehead. Outcome in bottom panel is specified as individual being member of a case receiving SNAP benefits. For each panel, all coefficients in a column from a single OLS regression predicting annual SNAP receipt in the state of Wisconsin. Each coefficient is an estimate from an interaction between the indicator for receiving an FFWS grant offer and an indicator for the respective post-randomization year. All regressions contain fixed effects for cohort and post-randomization year. Regressions in covariate adjusted columns also contain measures of student gender, race/ethnicity, and English learner status in high school. Covariate-adjusted regression for students in 2-year institution also contains an indicator for technical college enrollment.

Table 6. Estimated effect of FFWS grant offer on FFWS grant receipt and estimated effect of FFWS grant receipt on annual employment and earnings from two-stage least squares models, by post-randomization year (four-year college students)

Year	Employment			Earnings		
	Control Group Mean	1st Stage-Effect of Offer on Take-Up	2nd Stage-Effect of FFWS Receipt	Control Group Mean	1st Stage-Effect of Offer on Take-Up	2nd Stage-Effect of FFWS Receipt
Year 1	0.812 0.000	0.833*** (0.002)	-0.028*** (0.007)	3884.05	0.833*** (0.002)	-310.14*** (72.490)
Year 2	0.826 0.000	0.834*** (0.003)	-0.025*** (0.008)	5797.77	0.834*** (0.003)	-618.41*** (116.846)
Year 3	0.811 0.000	0.833*** (0.003)	-0.008 (0.009)	7170.68	0.833*** (0.003)	-460.66*** (157.281)
Year 4	0.819 0.000	0.825*** (0.003)	-0.004 (0.009)	8907.78	0.825*** (0.003)	-361.96* (212.134)
Year 5	0.812 0.000	0.821*** (0.003)	-0.008 (0.011)	13471.99	0.821*** (0.003)	-829.13** (352.662)
Year 6	0.778 0.000	0.801*** (0.004)	-0.033** (0.014)	18007.83	0.801*** (0.004)	-1081.89** (533.540)
Year 7	0.750 0.000	0.834*** (0.005)	-0.037** (0.017)	20405.92	0.834*** (0.005)	-1369.85* (726.092)
Year 8	0.729 0.000	0.882*** (0.007)	-0.033 (0.024)	21433.85	0.882*** (0.007)	-1867.30* (1075.947)

NOTE: ***p<0.10, **p<0.05, *p<0.01. Robust standard error in parentheses below coefficient estimate. For each outcome, each row presents results from a separate two-stage least squares regression. The first stage predicts FFWS grant receipt as a function of receiving an FFWS grant offer, where FFWS receipt is defined as receiving FFWS grant funds in the first eligible semester. The second stage predicts the respective outcome (employment or earnings) as a function of the predicted value of FFWS grant receipt. All regressions contain cohort fixed effects.

Table 7. Effect of FFWS grant program on student GPA, by inclusion of covariates

Parameter	First-Year GPA		Last Observed GPA	
	No Covariate Adjustment	Covariate Adjusted	No Covariate Adjustment	Covariate Adjusted
	<i>Intention-to-Treat</i>			
Effect of FFWS Offer	0.043*** (0.013)	0.039*** (0.013)	0.042*** (0.013)	0.038*** (0.013)
	<i>Treatment-on-the-Treated</i>			
1st Stage-Effect of FFWS Offer on Take-Up	0.843*** (0.002)	0.847*** (0.002)	0.842*** (0.002)	0.847*** (0.002)
2nd Stage- Effect of FFWS Receipt	0.051*** (0.015)	0.046*** (0.015)	0.050*** (0.015)	0.045*** (0.015)

Note: *** $p < 0.10$, ** $p < 0.05$, * $p < 0.01$. Robust standard error in parentheses below coefficient estimate. Top panel of the table presents estimated coefficients for an indicator for receiving an FFWS grant offer. All regressions contain fixed effects for cohort. Regressions in covariate adjusted columns also contain measures of student gender, race/ethnicity, and English learner status in high school. Bottom panel of the table presents results from a two-stage least squares regression. The first stage predicts FFWS grant take-up as a function of receiving an FFWS grant offer, where FFWS take-up is defined as receiving FFWS grant funds in the first eligible semester. The second stage predicts the respective outcome (first-year or last observed GPA) as a function of the predicted value of FFWS grant take up. Regressions contain same covariates as listed for results in the top panel.

Table 8. Effect of FFWS grant offer on cumulative loan debt, by institution type, loan type, and year after randomization

Year	4-Year University			2-Year UW System College		
	All Loans	Subsidized Loans	Unsubsidized Loans	All Loans	Subsidized Loans	Unsubsidized Loans
Year 1	-536.95*** (85.97)	-297.97*** (55.58)	-238.97*** (34.60)	-61.70 (88.69)	-49.92 (59.55)	-11.78 (29.86)
Year 2	-1,075.21*** (194.11)	-601.91*** (129.83)	-473.30*** (71.20)	-129.31 (182.85)	-102.60 (125.02)	-26.72 (58.96)
Year 3	-1,480.81*** (320.90)	-859.15*** (220.59)	621.65*** (110.41)	-272.27 (298.03)	-206.71 (207.07)	-65.56 (92.28)
Year 4	-1,976.96*** (500.77)	-1,194.15*** (339.19)	-782.80*** (174.83)	-491.83 (464.09)	-390.41 (315.13)	-101.43 (151.02)
Year 5	-2,039.93*** (660.42)	-1,228.54*** (441.33)	-811.39*** (235.80)	-454.96 (649.31)	-393.91 (433.64)	-61.05 (219.05)
Year 6	-2,164.56*** (818.90)	-1,311.36** (541.70)	-853.20*** (297.22)	-752.87 (860.21)	-584.58 (574.34)	-168.30 (289.63)
Year 7	-3,288.90*** (951.54)	-2,062.40*** (630.32)	-1,226.50*** (350.56)	-478.79 (881.23)	-457.12 (595.27)	-21.67 (292.29)
Year 8	-4,314.08** (1815.36)	-2,769.68** (1182.19)	-1,544.41** (662.55)	-103.89 (1608.10)	-215.58 (1051.08)	111.68 (561.67)

Note: ***p<0.10, **p<0.05, *p<0.01. Robust standard error in parentheses below coefficient estimate. Each coefficient is from a separate regression and is the estimate for an indicator of receiving an FFWS grant offer. All regressions contain fixed effects for cohort.

Table 9. Effect of FFWS grant offer on confirmed residence in Wisconsin and annual earnings with unconfirmed residents coded as missing, by year after randomization

Year	4-Year University	
	Confirmed in Wisconsin	Earnings-Unconfirmed Coded as Missing
Year 5	-0.004 (0.007)	-697.52** (303.08)
Year 6	-0.028*** (0.010)	-336.17 (453.40)
Year 7	-0.027* (0.014)	-579.10 (639.65)
Year 8	-0.038* (0.021)	-807.91 (1,016.61)

Note: ***p<0.10, **p<0.05, *p<0.01. Robust standard error in parentheses below coefficient estimate. Each coefficient is from a separate regression and is the estimate for an indicator of receiving an FFWS grant offer. All regressions contain fixed effects for cohort.

Table 10. Coefficients and standard errors for interaction between FFWS offer indicator and student characteristic from OLS model predicting confirmed Wisconsin residency, by student characteristic and year

	FFWS X ACT Composite Score	FFWS X BA Degree- UW System	FFWS X BA Degree- Any Institution	FFWS X Gross Family Income/ \$10,000	FFWS X UW System GPA
Year 5	-0.002 (0.002)	0.025 (0.016)	-0.005 (0.014)	0.000 (0.002)	-0.008 (0.010)
Year 6	-0.001 (0.003)	-0.012 (0.021)	-0.002 (0.020)	0.000 (0.003)	-0.024* (0.013)
Year 7	-0.002 (0.003)	-0.018 (0.029)	-0.008 (0.027)	-0.001 (0.005)	-0.043** (0.017)
Year 8	-0.001 (0.005)	0.002 (0.042)	-0.022 (0.041)	-0.004 (0.007)	-0.027 (0.025)

Note: ***p<0.10, **p<0.05, *p<0.01. Robust standard error in parentheses below coefficient estimate. Each coefficient is from a separate regression and is the estimated coefficient for an interaction between an indicator for receiving an FFWS grant offer and the student characteristic listed in each column header from an OLS model predicting confirmed Wisconsin residency. All regressions contain fixed effects for cohort.

Table 11. Lower and upper bounds for effect of FFWS offer on overall earnings four students enrolled in four-year universities, by year

Year	Earnings	
	Lower Bound	Upper Bound
Year 1	-229.53*** (58.756)	-212.41*** (59.819)
Year 2	-517.23*** (118.523)	-495.26*** (96.027)
Year 3	-541.84*** (166.024)	-355.45** (137.218)
Year 4	-540.48** (230.498)	-264.8618 (184.802)
Year 5	-701.84** (319.611)	-374.4 (463.874)
Year 6	-1091.04** (537.598)	1089.52* (626.226)
Year 7	-1558.18* (808.300)	953.1615 (897.606)
Year 8	-2284.61* (1338.436)	1434.428 (1385.296)

Note: ***p<0.10, **p<0.05, *p<0.01. Robust standard error in parentheses below coefficient estimate. Each row presents results from a separate application of the bounding technique proposed by Lee (2009).

Table 12. Estimated effect of FFWS offer on employment and earnings for technical college enrollees and two-year UW System College enrollees, by year

Year	Employment			Earnings		
	Technical College	UW System College	Difference	Technical College	UW System College	Difference
Year 1	-0.004 (0.007)	-0.008 (0.010)	0.004 (0.012)	10.33 (108.856)	-246.70 (156.736)	257.04 (190.332)
Year 2	-0.005 (0.006)	0.002 (0.010)	-0.007 (0.011)	102.56 (164.766)	-519.01** (250.762)	621.57** (299.239)
Year 3	-0.005 (0.007)	0.016 (0.011)	-0.021 (0.013)	97.60 (225.552)	-108.56 (344.866)	206.16 (411.428)
Year 4	-0.002 (0.008)	0.013 (0.013)	-0.015 (0.015)	334.92 (284.948)	-142.71 (444.526)	477.63 (527.909)
Year 5	-0.004 (0.010)	-0.002 (0.015)	-0.002 (0.018)	559.07 (370.139)	-371.59 (578.193)	930.67 (686.362)
Year 6	0.007 (0.011)	-0.021 (0.019)	0.028 (0.022)	591.76 (482.936)	-1102.16 (796.419)	1693.92* (931.464)
Year 7	0.005 (0.014)	-0.008 (0.026)	0.013 (0.029)	239.34 (645.640)	-1956.22* (1141.553)	2195.55* (1311.944)
Year 8	-0.030 (0.021)	-0.038 (0.041)	0.008 (0.046)	-257.17 (970.208)	-3869.96** (1845.953)	3612.79* (2085.389)

Note: ***p<0.10, **p<0.05, *p<0.01. Robust standard error in parentheses below coefficient estimate. In each panel of the table, each row presents results from a separate regression containing an indicator for receiving an FFWS offer, an indicator of technical college enrollment at the time of the offer, the interaction of those two terms, and a cohort fixed effect.

Appendix Tables and Figures

Table A1. Estimated effect of FFWS grant offer on annual employment, by institution type and inclusion of baseline characteristics

Year	4-Year University			2-Year Institution		
	Control Group Mean	No Covariate Adjustment	Covariate Adjusted	Control Group Mean	No Covariate Adjustment	Covariate Adjusted
Year 1	0.812	-0.024*** (0.006)	-0.026*** (0.006)	0.877	-0.005 (0.005)	-0.005 (0.005)
Year 2	0.826	-0.021*** (0.006)	-0.023*** (0.006)	0.892	-0.003 (0.005)	-0.003 (0.005)
Year 3	0.811	-0.007 (0.007)	-0.009 (0.007)	0.876	0.001 (0.006)	0.001 (0.006)
Year 4	0.819	-0.003 (0.008)	-0.005 (0.008)	0.862	0.002 (0.007)	0.002 (0.007)
Year 5	0.812	-0.006 (0.009)	-0.007 (0.009)	0.854	-0.004 (0.008)	-0.005 (0.008)
Year 6	0.778	-0.026** (0.011)	-0.026** (0.011)	0.841	0.000 (0.010)	-0.003 (0.010)
Year 7	0.750	-0.031** (0.014)	-0.032** (0.014)	0.823	0.002 (0.013)	-0.001 (0.013)
Year 8	0.729	-0.029 (0.021)	-0.037* (0.022)	0.816	-0.033* (0.019)	-0.032* (0.019)

NOTE: ***p<0.10, **p<0.05, *p<0.01. Robust standard error in parentheses below coefficient estimate. Each coefficient is from a separate regression and is the estimate for an indicator of receiving an FFWS grant offer. All regressions contain fixed effects for cohort and post-randomization year. Regressions in covariate adjusted columns also contain measures of student gender, race/ethnicity, and English learner status in high school. Covariate-adjusted regression for students in 2-year institution also contains an indicator for technical college enrollment.

Table A2. Estimated effect of FFWS grant offer on annual earnings, by institution type and inclusion of baseline characteristics

Year	4-Year University			2-Year Institution		
	Control Group Mean	No Covariate Adjustment	Covariate Adjusted	Control Group Mean	No Covariate Adjustment	Covariate Adjusted
Year 1	3,884.05	-258.42*** (60.43)	-263.72*** (60.96)	6655.07	-68.45 (89.79)	-51.91 (90.71)
Year 2	5,797.77	-515.53*** (97.46)	-497.00*** (98.43)	9883.322	-67.87 (139.31)	-66.09 (140.08)
Year 3	7,170.68	-383.54*** (131.01)	-363.94*** (132.45)	12463.26	58.3 (191.38)	39.77 (191.19)
Year 4	8,907.78	-298.75* (175.14)	-309.95* (176.86)	14437.73	239.69 (242.35)	261.20 (241.68)
Year 5	13,471.99	-680.89** (289.67)	-704.68** (291.95)	16788.21	324.07 (313.59)	343.61 (312.77)
Year 6	18,007.83	-866.38** (427.35)	-901.29** (430.62)	19261.88	173.57 (413.78)	149.48 (412.54)
Year 7	20,405.92	-1143.09* (605.89)	-1,271.46** (610.18)	21147.75	-268.91 (562.22)	-293.06 (561.27)
Year 8	21,433.85	-1646.39* (948.50)	-2002.91** (954.73)	22052.07	-995.09 (857.74)	-998.06 (857.64)

NOTE: ***p<0.10, **p<0.05, *p<0.01. Robust standard error in parentheses below coefficient estimate. Each coefficient is from a separate regression and is the estimate for an indicator of receiving an FFWS grant offer. All regressions contain fixed effects for cohort. Regressions in covariate adjusted columns also contain measures of student gender, race/ethnicity, and English learner status in high school. Covariate-adjusted regression for students in 2-year institution also contains an indicator for technical college enrollment.

Table A3. Estimated effect of FFWS grant offer on amount of SNAP benefits received, by institution type, inclusion of baseline characteristics, and individual vs. case receipt

Year	4-Year University			2-Year Institution		
	Control Group Mean	No Covariate Adjustment	Covariate Adjusted	Control Group Mean	No Covariate Adjustment	Covariate Adjusted
<i>Individual Amount</i>						
Year 1	\$13.05	1.08 (2.59)	-2.27 (2.71)	\$125.78	16.49 (10.11)	20.23** (9.90)
Year 2	\$47.46	-8.15 (5.16)	-12.03** (5.08)	\$180.50	16.60 (12.36)	18.81 (11.94)
Year 3	\$86.12	-12.41* (7.39)	-16.89** (7.24)	\$200.62	17.56 (14.42)	21.86 (14.04)
Year 4	\$103.94	-12.86 (9.25)	-16.51* (9.16)	\$215.20	18.24 (16.53)	20.16 (16.07)
Year 5	\$106.46	-6.79 (11.11)	-10.06 (11.00)	\$217.08	8.25 (19.16)	8.66 (18.84)
Year 6	\$94.70	-10.37 (12.28)	-11.43 (12.18)	\$213.69	33.42 (25.05)	38.55 (24.74)
Year 7	\$85.16	-16.84 (15.72)	-12.97 (15.59)	\$202.71	22.37 (29.99)	24.22 (29.52)
Year 8	\$77.75	-1.05 (25.28)	-1.94 (25.12)	\$225.40	-13.27 (40.94)	-0.16 (39.88)
<i>Case Amount</i>						
Year 1	\$589.44	9.38 (26.96)	5.06 (26.78)	\$1,009.64	38.04 (35.99)	45.44 (35.28)
Year 2	\$493.49	-7.69 (24.93)	-9.14 (24.79)	\$881.74	35.41 (33.39)	45.27 (32.65)
Year 3	\$453.35	-22.96 (24.53)	-23.63 (24.21)	\$784.52	32.32 (33.60)	37.77 (32.91)
Year 4	\$408.92	-33.22 (24.21)	-32.45 (23.94)	\$699.22	49.58 (34.85)	46.35 (34.12)
Year 5	\$365.35	-32.10 (25.23)	-28.15 (24.95)	\$605.91	47.51 (36.39)	46.78 (36.11)
Year 6	\$297.36	-49.24* (25.29)	-44.58* (25.13)	\$549.25	43.27 (40.08)	48.08 (39.60)

Year 7	\$269.13	-61.29* (31.59)	-42.73 (31.32)	\$471.03	62.70 (47.47)	78.04* (47.07)
Year 8	\$228.07	6.38 (45.17)	9.94 (44.60)	\$463.28	19.38 (66.85)	53.11 (66.59)

NOTE: ***p<0.10, **p<0.05, *p<0.01. Robust standard error clustered by student in parentheses below coefficient estimate. Outcome in top panel is specified as dollar amount of SNAP benefits received as casehead. Outcome in bottom panel is specified as amount of SNAP benefits received by a case in which individual has membership. For each panel, all coefficients in a column from a single OLS regression predicting amount of annual SNAP benefits in the state of Wisconsin. Each coefficient is an estimate from an interaction between the indicator for receiving an FFWS grant offer and an indicator for the respective post-randomization year. All regressions contain fixed effects for cohort and post-randomization year. Regressions in covariate adjusted columns also contain measures of student gender, race/ethnicity, and English learner status in high school. Covariate-adjusted regression for students in 2-year institution also contains an indicator for technical college enrollment.

Table A4. Estimated effect of FFWS grant offer on W2 (TANF) receipt, by institution type, inclusion of baseline characteristics, and individual vs. case receipt

Year	4-Year University			2-Year Institution		
	Control Group Mean	No Covariate Adjustment	Covariate Adjusted	Control Group Mean	No Covariate Adjustment	Covariate Adjusted
<i>Individual Receipt</i>						
Year 1	0.0003	-0.0001 (0.0002)	-0.0002 (0.0003)	0.0044	0.0010 (0.0012)	0.0011 (0.0012)
Year 2	0.0011	-0.0001 (0.0005)	-0.0001 (0.0006)	0.0051	0.0008 (0.0013)	0.0010 (0.0013)
Year 3	0.0018	0.0006 (0.0009)	0.0005 (0.0009)	0.0069	-0.0007 (0.0014)	-0.0010 (0.0014)
Year 4	0.0018	0.0007 (0.0010)	0.0006 (0.0010)	0.0072	0.0000 (0.0017)	0.0000 (0.0017)
Year 5	0.0023	0.0000 (0.0010)	0.0000 (0.0011)	0.0057	0.0024 (0.0020)	0.0024 (0.0020)
Year 6	0.0028	-0.0009 (0.0011)	-0.0008 (0.0012)	0.0050	0.0022 (0.0022)	0.0022 (0.0022)
Year 7	0.0018	0.0020 (0.0020)	0.0021 (0.0020)	0.0026	0.0018 (0.0021)	0.0016 (0.0021)
Year 8	0.0017	0.0023 (0.0029)	0.0023 (0.0030)	0.0032	0.0005 (0.0029)	0.0005 (0.0029)
<i>Case Receipt</i>						
Year 1	0.0003	-0.0001 (0.0002)	-0.0002 (0.0003)	0.0045	0.0009 (0.0012)	0.0010 (0.0012)
Year 2	0.0012	-0.0001 (0.0005)	-0.0002 (0.0006)	0.0053	0.0009 (0.0013)	0.0010 (0.0013)
Year 3	0.0019	0.0005 (0.0009)	0.0005 (0.0009)	0.0072	-0.0008 (0.0015)	-0.0010 (0.0015)
Year 4	0.0018	0.0007 (0.0010)	0.0006 (0.0010)	0.0076	-0.0004 (0.0017)	-0.0004 (0.0017)
Year 5	0.0024	0.0003 (0.0011)	0.0004 (0.0012)	0.0059	0.0022 (0.0020)	0.0022 (0.0020)
Year 6	0.0029	-0.0011 (0.0011)	-0.0010 (0.0012)	0.0050	0.0022 (0.0022)	0.0021 (0.0022)

Year 7	0.0018	0.0020 (0.0020)	0.0021 (0.0020)	0.0028	0.0016 (0.0021)	0.0014 (0.0021)
Year 8	0.0017	0.0023 (0.0029)	0.0023 (0.0030)	0.0032	0.0005 (0.0029)	0.0005 (0.0029)

NOTE: ***p<0.10, **p<0.05, *p<0.01. Robust standard error clustered by student in parentheses below coefficient estimate. Outcome in top panel is specified as individual receiving W2 (TANF) benefits as casehead. Outcome in bottom panel is specified as individual being member of a case receiving W2 (TANF) benefits. For each panel, all coefficients in a column from a single OLS regression predicting annual TANF receipt in the state of Wisconsin. Each coefficient is an estimate from an interaction between the indicator for receiving an FFWS grant offer and an indicator for the respective post-randomization year. All regressions contain fixed effects for cohort and post-randomization year. Regressions in covariate adjusted columns also contain measures of student gender, race/ethnicity, and English learner status in high school. Covariate-adjusted regression for students in 2-year institution also contains an indicator for technical college enrollment.

Table A5. Estimated effect of FFWS grant offer on amount of W2 (TANF) benefits received, by institution type, inclusion of baseline characteristics, and individual vs. case receipt

Year	4-Year University			2-Year Institution		
	Control Group Mean	No Covariate Adjustment	Covariate Adjusted	Control Group Mean	No Covariate Adjustment	Covariate Adjusted
<i>Individual Amount</i>						
Year 1	\$1.40	-\$0.36 (0.948)	-\$0.63 (0.975)	\$15.68	\$4.39 (5.106)	\$4.80 (5.196)
Year 2	\$2.95	\$0.03 (1.909)	-\$0.11 (1.947)	\$17.51	-\$0.96 (4.613)	-\$0.69 (4.695)
Year 3	\$3.87	\$1.06 (2.105)	\$0.92 (2.148)	\$18.52	-\$1.32 (4.669)	-\$2.06 (4.677)
Year 4	\$4.10	\$6.52 (4.353)	\$6.70 (4.441)	\$19.01	\$3.85 (6.340)	\$4.42 (6.430)
Year 5	\$6.08	\$2.66 (4.409)	\$2.91 (4.506)	\$19.40	\$1.15 (6.278)	\$1.26 (6.384)
Year 6	\$6.82	-\$3.55 (2.437)	-\$3.59 (2.495)	\$11.59	\$2.12 (5.449)	\$1.80 (5.577)
Year 7	\$3.88	\$2.15 (4.034)	\$2.41 (4.121)	\$6.69	-\$0.28 (4.204)	-\$1.05 (4.373)
Year 8	\$6.11	\$10.25 (15.222)	\$10.22 (15.546)	\$3.37	\$5.55 (6.489)	\$5.86 (6.629)
<i>Case Amount</i>						
Year 1	\$1.40	-\$0.37 (0.948)	-\$0.63 (0.976)	\$16.28	\$5.68 (5.426)	\$6.09 (5.520)
Year 2	\$3.13	-\$0.15 (1.919)	-\$0.29 (1.956)	\$18.20	-\$1.36 (4.637)	-\$1.13 (4.719)
Year 3	\$3.96	\$0.96 (2.108)	\$0.82 (2.151)	\$19.54	-\$1.43 (4.786)	-\$2.19 (4.798)
Year 4	\$4.10	\$6.51 (4.353)	\$6.70 (4.441)	\$20.62	\$2.21 (6.407)	\$2.66 (6.501)
Year 5	\$6.50	\$4.73 (4.353)	\$5.06 (4.441)	\$19.75	\$0.77 (6.407)	\$0.80 (6.501)
Year 6	\$7.16	-\$3.88 (2.450)	-\$3.90 (2.508)	\$11.59	\$2.07 (5.450)	\$1.70 (5.578)
Year 7	\$3.88	\$2.15	\$2.44	\$7.07	-\$0.66	-\$1.45

		(4.034)	(4.120)		(4.221)	(4.397)
Year 8	\$6.11	\$10.25	\$10.23	\$3.37	\$5.55	\$5.85
		(15.222)	(15.545)		(6.489)	(6.629)

NOTE: ***p<0.10, **p<0.05, *p<0.01. Robust standard error clustered by student in parentheses below coefficient estimate. Outcome in top panel is specified as dollar amount of W2 benefits received as casehead. Outcome in bottom panel is specified as amount of W2 benefits received by a case in which individual has membership. For each panel, all coefficients in a column from a single OLS regression predicting amount of annual W2 benefits in the state of Wisconsin. Each coefficient is an estimate from an interaction between the indicator for receiving an FFWS grant offer and an indicator for the respective post-randomization year. All regressions contain fixed effects for cohort and post-randomization year. Regressions in covariate adjusted columns also contain measures of student gender, race/ethnicity, and English learner status in high school. Covariate-adjusted regression for students in 2-year institution also contains an indicator for technical college enrollment.

Table A6. Estimated effect of FFWS grant offer on receipt of UI benefits and amount of UI benefits received, by institution type and inclusion of baseline characteristics

Year	4-Year University			2-Year Institution		
	Control Group Mean	No Covariate Adjustment	Covariate Adjusted	Control Group Mean	No Covariate Adjustment	Covariate Adjusted
<i>Individual Receipt</i>						
Year 1	0.0013	-0.0003 (0.0005)	-0.0002 (0.0005)	0.0079	0.0005 (0.0014)	0.0007 (0.0014)
Year 2	0.0031	-0.0009 (0.0008)	-0.0008 (0.0008)	0.0118	0.0013 (0.0018)	0.0012 (0.0018)
Year 3	0.0045	-0.0005 (0.0011)	-0.0001 (0.0012)	0.0179	0.0033 (0.0025)	0.0030 (0.0025)
Year 4	0.0061	-0.0003 (0.0015)	0.0003 (0.0015)	0.0188	0.007** (0.0030)	0.006** (0.0030)
Year 5	0.0070	-0.0011 (0.0017)	-0.0003 (0.0017)	3.0000 0.0220	-0.0029 (0.0031)	-0.0017 (0.0031)
Year 6	0.0091	-0.004** (0.0019)	-0.004* (0.0019)	0.0203	-0.0011 (0.0036)	0.0005 (0.0037)
Year 7	0.0112	-0.006** (0.0026)	-0.005* (0.0027)	0.0182	-0.0016 (0.0043)	-0.0006 (0.0043)
Year 8	0.0091	0.0009 (0.0047)	0.0012 (0.0048)	0.0174	0.0029 (0.0067)	0.0031 (0.0068)
<i>Individual Amount</i>						
Year 1	\$5.59	-\$1.70 (1.985)	-\$1.40 (2.022)	\$39.80	-\$8.87 (7.034)	-\$8.10 (7.156)
Year 2	\$8.79	-\$3.21 (2.415)	-\$3.05 (2.466)	\$34.71	\$5.34 (7.050)	\$5.01 (7.167)
Year 3	\$17.36	-\$2.88 (5.081)	-\$1.25 (5.167)	\$59.68	\$8.27 (10.752)	\$8.01 (10.798)
Year 4	\$21.44	-\$0.77 (6.338)	\$1.64 (6.447)	\$64.14	\$29.46** (13.642)	\$27.24** (13.565)
Year 5	\$22.86	-\$5.96 (6.659)	-\$3.17 (6.782)	\$74.14	-\$11.10 (12.250)	-\$7.68 (12.460)
Year 6	\$35.28	-\$19.54*** (7.377)	-\$16.43** (7.492)	\$67.26	-\$9.26 (14.607)	-\$4.28 (14.832)
Year 7	\$41.31	-\$13.89	-\$11.71	\$73.38	-\$12.35	-\$9.69

		(14.220)	(14.557)		(19.985)	(20.442)
Year 8	\$37.57	-\$15.27	-\$15.30	\$52.45	\$46.63	\$49.50
		(16.784)	(17.224)		(37.865)	(38.983)

NOTE: ***p<0.10, **p<0.05, *p<0.01. Robust standard error clustered by student in parentheses below coefficient estimate. Outcome in top panel is specified as individual receiving UI benefits. Outcome in bottom panel is specified as dollar amount of UI benefits received by individual. For each panel, all coefficients in a column from a single OLS regression predicting annual UI receipt (top panel) or amount of UI benefits (bottom panel) in the state of Wisconsin. Each coefficient is an estimate from an interaction between the indicator for receiving an FFWS grant offer and an indicator for the respective post-randomization year. All regressions contain fixed effects for cohort and post-randomization year. Regressions in covariate adjusted columns also contain measures of student gender, race/ethnicity, and English learner status in high school. Covariate-adjusted regression for students in 2-year institution also contains an indicator for technical college enrollment.

Table A7. Effect of FFWS grant offer on any loan debt, by loan type and year after randomization

Year	4-Year University		
	Any Loans	Any Subsidized Loans	Any Unsubsidized Loans
Year 1	-0.037*** (0.006)	-0.043*** (0.006)	-0.070*** (0.008)
Year 2	-0.028*** (0.006)	-0.032*** (0.006)	-0.063*** (0.008)
Year 3	-0.020*** (0.006)	-0.022*** (0.006)	-0.056*** (0.008)
Year 4	-0.022*** (0.006)	-0.023*** (0.006)	-0.055*** (0.009)
Year 5	-0.023*** (0.007)	-0.025*** (0.007)	-0.052*** (0.010)
Year 6	-0.026*** (0.008)	-0.029*** (0.008)	-0.047*** (0.012)
Year 7	-0.022** (0.010)	-0.026** (0.010)	-0.045*** (0.015)
Year 8	-0.021 (0.016)	-0.027* (0.016)	-0.049** (0.022)

Note: ***p<0.10, **p<0.05, *p<0.01. Robust standard error in parentheses below coefficient estimate. Each coefficient is from a separate regression and is the estimate for an indicator of receiving an FFWS grant offer. All regressions contain fixed effects for cohort.