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THE EFFECTS OF NEED-BASED FINANCIAL AID ON EMPLOYMENT AND EARNINGS:
EXPERIMENTAL EVIDENCE FROM THE FUND FOR WISCONSIN SCHOLARS

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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 and earnings. 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 these students’ 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) Reduced loan debt offering greater financial flexibility when selecting among employment options, and 2) Offer-induced outstate migration. We find little evidence that the FFWS grant offer affects the labor market outcomes of students in two-year institutions, although the effects for students in technical colleges are significantly more positive than the effects for students in two-year colleges in the University of Wisconsin System.

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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. These 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. 2019; Goldrick-Rab et al. 2016; Anderson and Goldrick-Rab 2018; Anderson et al. 2019; 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’ labor market outcomes, particularly in their post-college years.

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’ labor market outcomes during both their in-college and post-college years. Specifically, we estimate the effect of the need-based aid offer on students’ in-state employment and earnings for each of the eight years following receipt of the grant offer. 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, 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 years 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. Such an interpretation is reinforced by the results of three additional analyses. First, we show that, in addition to employment reductions, the grant offer significantly reduces participation in the federal work-study program. Second, we demonstrate that, distributionally, the negative earnings effects are concentrated around the maximum grant amount, suggesting a one-to-one replacement of earnings with grant dollars for many students. Third, we provide evidence that the observed employment reductions disproportionately occur in the food service/accommodation and retail sectors, job types that typically represent substitutes rather than complements to students' academic efforts. Together, these analyses indicate that the grant offer allows students to reduce employment activities and place greater focus on their academic endeavors, behavioral patterns that perfectly align with the goals of the FFWS program.

For students' post-college years, we provide suggestive evidence that the reductions are attributable to a combination of two mechanisms: 1) Reduced loan debt offering greater financial flexibility when selecting among employment options, and 2) Offer-induced outstate migration. With respect to the first mechanism, we show that the grant offer reduces cumulative loan debt by an average of \$2,000 to \$3,000, with significant heterogeneity in offer-driven debt reduction by students' baseline level of unmet need. Indeed, individuals with high levels of unmet need exhibit average debt reductions about 2.5 times larger than that of their lower-need peers. We further demonstrate that the negative post-college employment and earnings effects are concentrated among individuals who had relatively high levels of unmet need at baseline. Together, these results are consistent with a scenario where the substantial offer-driven debt reductions for high-need students provide a degree of flexibility to work in lower-paying but more rewarding jobs. With respect to the second mechanism, we provide evidence that FFWS offerees are less likely to be confirmed Wisconsin residents, relative to their non-offered peers. Finally, we find little evidence that the FFWS grant offer affects the labor market outcomes of students in two-year institutions, although the effects for students in technical colleges are

significantly more positive than the effects for students in two-year University of Wisconsin System colleges.

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.

Turning to the labor market effects of the Pell program, 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 2019). 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. The maximum Pell award covered less than 30 percent of educational expenses at the average four-year public college in 2016-17 (Protopsaltis and Parrot 2017), 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.

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; Anderson et al. 2019; Carlson et al. 2019). 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; Carlson et al. 2019; Anderson et al. 2019) as well as the

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.

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

nationwide Dell Scholars Program (Page et al. 2017), all provide convincing evidence that need-based aid increased students' postsecondary access or attainment, or both.⁴

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 for economically disadvantaged students in Wisconsin and, ultimately, increase the number of adults in the state with a bachelor's degree. The FFWS works to achieve these goals by providing need-based grants, with the organization awarding grants to the first cohort of recipients 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 the period we study, HEAB would 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.

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).

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.

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, maintain continuous enrollment, 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 a 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]

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.

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. 2019; Anderson and Goldrick-Rab 2018; Anderson et al. 2019). 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 first, 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. However, two subsequent—and separate—evaluations provide no evidence of such increases for these cohorts (Carlson et al. 2019; Anderson et al. 2019). 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. 2019; Anderson and Goldrick-Rab 2018).

The existing evidence base surrounding the FFWS program—and need-based aid more generally—usefully informs a discussion of theoretical considerations relevant to potential labor market effects of the grant offer. We focus this discussion on two main considerations, one that points toward the FFWS grant exerting positive effects on employment and earnings and one that suggests the grant could negatively impact these outcomes. On the positive side, the grant offer has the potential to boost human capital among recipients. Although existing analyses suggest that the degree attainment effects of the FFWS program are relatively modest (Carlson et al. 2019; Anderson et al. 2019), this work also shows that the grant offer increases year-to-year persistence (Carlson et al. 2019) as well as the probability that students major in a STEM field (Anderson et al. 2019). Considering this evidence alongside the large literature demonstrating substantial labor market returns to these sorts of postsecondary attainments (see Altonji, Blom, and Meghir 2012 for a relatively recent review of this literature) suggests that the grant offer could lead to greater levels of employment and earnings in students' post-college years. Recent

empirical work produces findings consistent with such a scenario, providing evidence of increased future earnings among individuals who received the maximum Pell Grant in Texas (Denning, Marx, and Turner 2019) and among recipients of California's main merit-based scholarship (Bettinger et al. 2019).

On the other hand, the grant provides students with up to \$20,000 in additional income over a five-year period, and standard economic theory predicts that increased income will lead individuals to reallocate labor market efforts toward other activities, such as schooling or leisure. This prediction is corroborated by recent work showing Pell Grant receipt to reduce labor supply and increase enrollment intensity (Park and Scott-Clayton 2018). In addition to possibly reducing labor supply during the years of grant receipt, the FFWS program also has the potential to affect behaviors and outcomes that manifest in the labor market only in later years. For example, the FFWS grant reduces loan debt, which may provide students with financial flexibility allowing them to enter a lower-paying, but more rewarding, profession when it comes time to exit college. Similarly, the reduced undergraduate loan debt could facilitate greater levels of graduate school enrollment among FFWS offerees, which would likely depress earnings in the early postgraduate period with the promise of improved labor market outcomes down the line. More generally, it is important to recognize the potential for the income infusion accompanying FFWS grant receipt to reduce labor supply not only contemporaneously, but also in future years, although there are several reasons to expect that such reductions may not hold in the longer run (i.e. for individuals in their mid-30s to 60s).

Ultimately, the degree to which the labor market effects of the FFWS program are driven by increased human capital versus the income effect of the grant must be resolved empirically. One prior study has directly addressed this issue, with Broton, Goldrick-Rab, and Benson (2016) drawing 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. They find that the FFWS grant offer reduced the probability that a student reported working by about 6 percentage points and decreased 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 Broton, Goldrick-Rab, and Benson's (2016) work in at least three ways. First, whereas the prior 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. Most notably, our data contain information on individual's earnings as well as their employment sector. 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 even quarterly, effect of the FFWS grant offer on individuals' in-state employment and earnings 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 students to 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 by 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. For these students, HEAB provided us with 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

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,

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.

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

allowing us to estimate the effect of the FFWS grant offer on student economic outcomes up to eight years after randomization of the 2009-10 cohort of recipients. 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:

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

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 \mathbf{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 this model over all available observations from 2009-10 through 2017-18 for 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. We also estimate a specification where we omit the vector of observable student characteristics.

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.

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 we estimate equation (1) separately for each of these outcomes: 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 likely prefer need-based aid recipients remain in state and use their newly acquired human capital to contribute to the state economy. Indeed, one stated goal of the FFWS is to increase the number of college graduates in Wisconsin. 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

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.

number of supplementary analyses and robustness tests to gain as much insight as possible into the potential values of this parameter.

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 1.9 to 2.4 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 magnitude¹¹. In the third post-randomization year, we estimate the grant offer to reduce employment by a marginally significant percentage point, a magnitude about half of that for the first two years. Further, we find the grant offer to have no significant effect on the probability of employment in the fourth or fifth year after randomization. In each of these years the point estimates are generally 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 eighth years after the initial grant offer. The estimated sixth and seventh year effects are in the range of 2-2.5 percentage points

¹¹ 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.

while the eighth-year effect is notably larger, approaching four percentage points. 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 little 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 eight years following randomization, the grant offer has no significant employment effects. All points estimates are less than one percentage point in magnitude and do not approach statistical significance. Taken together, the right-hand panel of Table 3 makes clear 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 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 -\$285 in the specification without covariate adjustment and -\$269 in the model containing baseline covariates. Compared against the control group mean, these estimated effects represent an earnings decline of more than 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 -\$461 to -\$483 (depending upon specification) correspond to an earnings reduction of about 8 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 marginally significant in the fourth year (p -values of about 0.07) and fully insignificant in the fifth post-randomization year (p -values of about 0.15). Still, we highlight that the point estimates for these years are in the range of -\$300 to -\$400, which corresponds to approximately 3 percent of mean control group earnings.

Significant negative effects of the FFWS grant offer re-emerge in the sixth 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 -\$775 in the sixth 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 three 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 5-8 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.

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. As stated in our registration, 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 5 about here]

We present the results of estimating equations (2) and (3) in Table 5. 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 81-85 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. To facilitate interpretation of the substantive magnitude of the effect, we present the control group mean in the first column of each panel.

The employment results demonstrate that grant receipt reduced the probability of employment in Wisconsin by 2.8 and 2.2 percentage points in the first and second years following randomization, respectively. The estimated effects of grant receipt are less than two percentage points and generally 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 2-3 percentage points. The estimate for the eighth post-randomization year is substantially larger at 4.5 percentage points.

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 sixth 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 -\$950 to nearly -\$1,900 over this period, the relative size of these effects is fairly steady at 6-8 percent of mean control group earnings. Together, the results in Table 5 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.

How Does the Grant Offer Affect the Labor-Coursework Tradeoff During Students' In-College Years?

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 6 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

[Insert Figure 1 about here]

We present the results of this analysis in Table 6. 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 0.04-0.05 points. The corresponding effect for those who receive at least one dollar of aid in their first eligible semester is an increase of 0.05-0.06 points. These first-year effects mostly persist throughout subsequent years, with the estimated effects of both the offer and aid receipt on students’ last observed GPA only slightly smaller in magnitude than the first-year effects. Figure 1 provides evidence that the GPA-increasing effect of the grant offer operates throughout all but the very top of the GPA distribution. To create Figure 1, we first estimated a

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.

series of regressions where we specified the outcome as an indicator that a student's first-year GPA exceeds x , where x ranges from 0.1 to 4.0 in increments of 0.1—this results in 40 total regressions. In each regression, we model the outcome as a function of an indicator for randomly receiving an FFWS grant offer and a cohort fixed effect. Figure 1 plots the estimated coefficient and 95% confidence intervals for the indicator of receiving an FFWS grant offer from each of these regressions. Substantively, the figure illustrates that the grant offer significantly increases the probability that students' first-year GPA exceeds x over the range of 0.4 to 3.2, with the effects largest in the range of 2.6 to 2.9 where the grant offer increases the probability that students' first-year GPA exceeds x by more than two percentage points. The grant offer has no significant effect on the probability that a student's first-year GPA exceeds 3.3.

[Insert Table 7 about here]

Having shown that the FFWS grant offer has a statistically significant, if perhaps substantively modest, effect on student GPA, we now leverage our wide-ranging data in an effort to gain greater insight into the specific employment activities displaced by the increased emphasis on coursework. First, we take advantage of the fact that our data contain information on students' financial aid packages to estimate the effect of the grant offer on participation in the federal work-study program, as well as on the dollars earned via that program. We estimate these effects using a model with the same structure as that depicted in equation (1), and present the results in Table 7. They show that the grant offer reduces work-study participation by 2-4 percentage points in each of the first four years following the grant offer. These effects correspond to 12 to 27 percent of mean participation among the control group. The right-hand column of Table 7 illustrates that the grant offer induces annual declines in work-study earnings that are proportionally similar to the reductions in participation.

Along with reducing participation in work-study, it seems likely that the offer-induced employment reductions in years one and two, which are depicted in Table 3 above, occurred primarily among students working in jobs that provide a sufficient paycheck but contribute little to students' long-term career aspirations, such as food service or the retail sector. To systematically examine this conjecture, we leverage the fact that the UI records contain the industry sector in which an individual was employed. Specifically, in addition to the dollar amount of earnings and employee and firm identifiers, the UI database contains a field specifying the firm's code under the North American Industry Classification System (NAICS).

NAICS was developed by the Office of Management and Budget in the late 1990s to systematically classify firms for purposes of data collection and reporting. Under NAICS, each firm is assigned a six-digit code, with the first two digits corresponding to the sector—there are 21 sectors in NAICS—and each additional digit building on the first two to depict subsector, industry group, NAICS industry, and detailed industry, respectively. For each of the first four years following the grant offer, we use this information to generate a series of dummies indicating whether a student was recorded as working in each of the 21 NAICS sectors.¹³ Then, separately for each year and within a Seemingly Unrelated Regression (SUR) framework, we specify each of the 21 indicators for employment in a given sector as an outcome that we model as a function of an indicator for receiving a randomized FFWS grant offer and a cohort fixed effect. We present the full SUR results in the appendix (see Table A3), and summarize the key takeaways here.

First, the grant offer reduces the probability that students are employed in the Accommodation and Food Service sector by a statistically significant 1.9 percentage points in the first post-offer year. For each of the three subsequent years, the coefficients remain negative and in excess of one percentage point—they range from -1.1 to -1.3—with *p*-values of approximately 0.10. These results suggest that a nontrivial number of students exited the Accommodations and Food Service sector in response to the grant offer. Second, the SUR results indicate that the grant offer reduced employment in the Retail sector by 0.7 to 1.2 percentage points in each of the first three years following the grant offer, although only the estimate for the second year achieves a *p*-value below 0.10. Together, these results are consistent with a scenario where the grant-induced employment reductions observed in Table 3 are primarily attributable to students exiting part-time jobs in the Food Service and Retail sectors.

[Insert Figure 2 about here]

Such an interpretation is reinforced by Figure 2, which provides evidence that the labor market effects of the FFWS grant in the second post-offer year were largest among students

¹³ The 21 NAICS sectors are Agriculture, Forestry, Fishing, and Hunting; Mining, Quarrying, and Oil and Gas Extraction; Utilities; Construction; Manufacturing; Wholesale Trade; Retail Trade; Transportation and Warehousing; Information; Finance and Insurance; Real Estate and Rental and Leasing; Professional, Scientific, and Technical Services; Management of Companies and Enterprises; Administrative and Support and Waste Management and Remediation Services; Educational Services; Health Care and Social Assistance; Arts, Entertainment, and Recreation; Accommodation and Food Services; Other Services; Public Administration; and Unclassified.

earning between \$3,000-\$6,000, which corresponds almost exactly to the maximum dollar amount of the FFWS grant. Conceptually similar to Figure 1, we created Figure 2 by first estimating a series of regressions where we specified the outcome as an indicator that a student's earnings exceeded x , where x ranges from \$1 to \$20,000 in increments of \$1,000. In each regression, we model the outcome as a function of an indicator for randomly receiving an FFWS grant offer and a cohort fixed effect. Figure 2 plots the estimated coefficient and 95% confidence intervals for the indicator of receiving an FFWS grant offer from each of these regressions. To illustrate interpretation, Figure 2 indicates that the grant reduces the probability of earning more than \$1 by 1.9 percentage points, an identical estimate to the employment effect presented in Table 3. And the figure illustrates the grant offer reduces the probability of earning more than \$4,000—the maximum value of the FFWS grant—by 4.1 percentage points. This contrasts with the estimated effects of earning more than \$15,000, which is less than one percentage point for all bins above \$15,000.

Overall, the story that emerges from this series of analyses is one where the FFWS offer allows students to reduce labor market effort and reallocate that time toward their coursework, with tangible evidence of improved academic performance. And this improved 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 evidence of only small effects of the aid offer on ultimate degree completion (Carlson et al. 2019).

What is Responsible for the Negative Employment and Earnings Effects in Students' Post-College Years?

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 less desirable. In this section, we put forth multiple candidate explanations and—to the extent possible—use our data to assess their plausibility.

Reduced Loan Debt

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. Put differently, 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.¹⁴ 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, sixth, and seventh years following randomization. The estimated effects are even larger in the eighth post-randomization year, 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 this later year—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 A4), we also show that, by the time of scheduled graduation, the FFWS offer reduced the proportion of students with any loan debt by nearly three percentage points, with a much larger 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.

¹⁴ 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.

[Table 9 about here]

Table 9 presents additional evidence consistent with such a scenario. In particular, Table 9 presents the results of an analysis where we estimate the employment and earnings effects separately for students with low versus high levels of unmet need—we define students with low unmet need as those with levels below the median in the initial year (i.e. before the FFWS grant was applied to students' aid packages).¹⁵ The table generally shows no significant differences in employment or earnings between the two groups during students' in-college years, although the point estimates for students with high unmet need are generally more negative than those for their lower-need peers, especially with respect to employment. However, in students' post-college years, which we consider the sixth through eighth years after the grant offer, Table 9 provides evidence that the negative employment and earnings effects seen in Tables 3 and 4 are almost entirely driven by students with high levels of unmet need. For example, in the sixth post-offer year, we estimate the grant offer to reduce employment of students with high unmet need by 3.4 percentage points. By contrast, the offer is estimated to slightly increase employment of low unmet need students. For earnings, the estimated effects for students with high and low unmet need are -\$1,425 and \$29, respectively.

This pattern of results—where the negative labor market effects in students' post-college years are attributable to individuals with high unmet need—is consistent with a scenario where the grant-driven reduction in cumulative debt is much greater for high-need students than for their lower-need peers, thereby generating a larger relative change in debt-driven labor market decisions. Indeed, in Table A5 in the appendix, we show that the average grant-driven debt reduction for high-need students is about 2.5 times larger than the average debt reduction for lower-need students. The larger debt reductions for high-need students could provide these individuals with greater flexibility to enter a lower paying, but more rewarding, profession. It could also facilitate their exit from the labor market entirely, a possibility that, given traditional societal structure, raises questions about how the labor market effects are distributed across gender. Consequently, we conducted an analysis where we tested for differences in the effect of the grant offer by gender, finding no significant differences across any of the first eight years

¹⁵ We calculate unmet need as: $\text{unmet need} = \text{total cost of attendance} - (\text{expected family contribution} + \text{grant aid})$. We use cohort-specific measures of median unmet need when classifying a student as low or high unmet need.

following the randomized grant offer.¹⁶ We present full results of this analysis in Table A6 in the appendix.

[Insert Figure 3 about here]

Figure 3 presents a final piece of evidence consistent with the scenario depicted above. Like Figures 1 and 2, Figure 3 presents results from a series of regressions where we estimate the effect of the grant offer on the probability of earning more than x in the seventh post-offer year, where x ranges from \$1 to \$60,000 in increments of \$2,000. Figure 3 makes clear that the grant offer reduces earnings throughout all but the very upper tail of the earnings distribution. In particular, the figure illustrates that, for each bin in the range from \$1 to \$44,000, the grant offer reduces the probability of earning more than x by between 2-2.5 percentage points—this range cover approximately 90 percent of the earnings distribution. These reductions over such a broad range of the distribution is consistent with FFWS grant offerees feeling freer to take lower-paying jobs, perhaps as a consequence of their reduced loan debt.

Graduate School

The FFWS program is primarily intended to increase postsecondary persistence and, especially, degree attainment. Even though evidence indicates that the effects of the grant offer on these outcomes are relatively modest (Carlson et al. 2019), the slight increases in attainment combined with the more sizable reduction in loan debt could boost graduate school enrollment. Given that graduate students generally earn quite meager stipends, increased levels of graduate school enrollment could, in theory, be responsible for the negative labor earnings and employment effects seen in students' post-college years.

[Insert Table 10 about here]

To examine this possibility, we use our NSC records to construct multiple measures of post-baccalaureate enrollment. In particular, we construct individual-level indicators for enrolling in the following types of postsecondary institutions after earning a bachelor's degree: 1) Any institution, 2) 4-year institution, indicating a PhD or professional degree such as medical or law school, 3) 2-year institution suggesting a HVAC training or perhaps a nursing degree. We then regress each of these three measures on an indicator for receiving an FFWS offer and a cohort

¹⁶ Additionally, we examined the potential for differential effects by gender among individuals with low unmet need, again finding no significant differences among any of the eight years following the randomized grant offer.

fixed effect. In Table 10 we present both OLS (top panel) and logit (bottom panel) results. The first column indicates that the grant offer increases the probability of any post-BA enrollment by 0.7 (OLS) to 1.1 (logit) percentage points. The second and third columns illustrate that, individually, the grant offer had no significant effects on enrollment in 4-year or 2-year institutions. Thus, on the whole, here is little evidence the grant offer had any meaningful effect on graduate school enrollment, a finding consistent with Anderson et al. (2019). Still, to confirm that post-BA enrollment was not responsible for the negative labor market outcomes, we estimate a variant of the model depicted in equation (1) where we condition on post-BA enrollment in any postsecondary institution. The results, which we present in full in Table A7 in the appendix, exhibit no substantive difference from our main results in Tables 3 and 4.

Outstate Migration

It is possible 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 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.¹⁷ 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.

¹⁷ Our data on earnings and enrollment in a Wisconsin postsecondary institution extend through 2018 while our CARES records extend through 2017. In the analyses that follow, we impute individuals' 2018 CARES location on the basis of their 2017 data. However, our results are insensitive to other approaches to determining individuals' 2018 CARES location, including omitting this information entirely when determining confirmed Wisconsin residency.

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 11. 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 between two and four 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 11 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 11. 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, with the estimates for the fifth and seventh post-randomization years significant at $p < 0.10$. The fifth-year estimate is nearly identical to the main results presented in Table 4, while the estimates for years six through eight are all about one-half to three-quarters the size of their analogs in Table 4. Together, the results in Table 11 suggest that the negative effects of the FFWS offer on in-state earnings are unlikely to be entirely driven by FFWS-induced outstate migration, but they provide some evidence 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, as well as a cohort fixed effect.¹⁸

We present the estimated coefficients for the interactions in Table A8 in the appendix. 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 four (Year 7) to five (Year 8) 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.

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.¹⁹

¹⁸ We also conducted an analysis where we estimate equation (1) over a sample that excludes individuals attending institutions located near the Wisconsin border at the time of randomization. In particular, we exclude individuals attending UW Eau Claire, UW Stout, UW River Falls, UW Superior, UW Parkside, UW La Crosse, and UW Whitewater. The results of this analysis are substantively similar to our main results, and are available upon request.

¹⁹ 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

[Insert Table 12 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 Table 12.²⁰ 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 and the estimate for the eighth post-randomization is statistically 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 students’ post-college earnings, but we cannot 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 post-college earnings is null. Together, the results in Table 12 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:

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

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

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.

²⁰ 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.

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 13.

[Insert Table 13 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 positive across the entire time period we analyze, with the sixth-year estimate statistically significant. In contrast, the estimated effects for UWS enrollees are uniformly negative, if not consistently 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. Together, the results make clear that the earnings impact of the FFWS offer was much more positive for individuals in technical colleges than for individuals in UW System colleges.²¹

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' labor market outcomes—their in-state employment and earnings—

²¹ It would be interesting to explore if this pattern is consistent with higher GPAs for students at technical colleges, unfortunately, we do not have the necessary data.

both during the years they are enrolled in college and during the years where they presumably transition into the workforce.

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 offers decreased student employment and earnings, we also show that it significantly increases student GPA during their time in the UW System by 0.04-0.06 points. Further analysis provided clear evidence 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 less obviously explicable, and perhaps less 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. One 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. 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 to 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 among four-year university students with an FFWS offer 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 second, 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. That would be consistent with established earning growth profiles for college graduates. These age earnings profiles also differ by major with average highest salaries at ages 41-45 but for business majors, social sciences, cultural or area studies they peak later. According to the Chronical of Higher Education (2019), "Although majors in the liberal arts (language or philosophy, and social sciences or cultural or area studies) were the lowest-paid among 18- to 25-year-olds, their salaries increased at the highest rate, and those in the social sciences or cultural or area studies caught up well enough that their salaries surpassed those of health-care majors during much of the latter part of their careers." 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, and earnings 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	59.4	57.0	0.003	50.9	52.5	0.091
White	76.2	76.5	0.735	77.8	78.3	0.919
Underrepresented Race	15.7	15.1	0.337	15.9	15.1	0.670
Other Race	8.1	8.4	0.468	6.3	6.7	0.280
Ever ELL	9.0	8.7	0.607	8.4	8.1	0.810
Received SNAP	17.5	17.1	0.938	27.6	25.6	0.191
<i>N</i>	4,568	29,653		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	-0.023*** (0.006)	-0.024*** (0.006)	0.877	-0.003 (0.005)	-0.003 (0.006)
Year 2	0.828	-0.019*** (0.006)	-0.020*** (0.006)	0.892	-0.003 (0.005)	-0.003 (0.005)
Year 3	0.815	-0.011 (0.007)	-0.013* (0.007)	0.877	0.000 (0.006)	0.001 (0.006)
Year 4	0.821	-0.008 (0.007)	-0.010 (0.007)	0.863	-0.002 (0.006)	-0.001 (0.006)
Year 5	0.814	-0.004 (0.008)	-0.006 (0.008)	0.853	-0.003 (0.007)	-0.003 (0.007)
Year 6	0.779	-0.020** (0.009)	-0.020** (0.010)	0.840	0.000 (0.008)	0.000 (0.008)
Year 7	0.753	-0.022* (0.012)	-0.023* (0.012)	0.822	-0.002 (0.010)	-0.002 (0.010)
Year 8	0.731	-0.038** (0.015)	-0.039** (0.015)	0.811	-0.004 (0.013)	-0.006 (0.013)

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 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	3884.05	-284.64*** (58.63)	-269.06*** (60.16)	6655.07	-131.23 (91.94)	-157.13 (96.72)
Year 2	5896.71	-482.95*** (89.52)	-460.70*** (90.84)	9886.24	-70.17 (137.94)	-80.07 (139.28)
Year 3	7331.31	-404.16*** (124.42)	-379.96*** (126.45)	12669.79	71.54 (183.96)	56.43 (183.26)
Year 4	9095.81	-288.54* (163.84)	-297.07* (165.30)	14760.66	116.59 (226.94)	133.03 (225.45)
Year 5	13709.98	-363.53 (258.39)	-390.38 (259.78)	16904.32	262.48 (281.83)	322.36 (281.27)
Year 6	18190.94	-776.91** (362.37)	-766.267** (364.43)	19325.17	470.75 (358.52)	493.10 (357.24)
Year 7	20609.22	-1138.05** (470.84)	-1118.98** (472.73)	21090.53	-46.62 (450.90)	-6.67 (450.41)
Year 8	22037.94	-1576.17** (656.50)	-1619.62** (660.35)	22558.73	-406.74 (594.27)	-359.42 (594.22)

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 FFWS grant take-up and estimated effect of FFWS grant take-up on annual employment and earnings from two-stage least squares models, by post-randomization year

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	0.838*** (0.002)	-0.028*** (0.007)	3884.05	0.838*** (0.002)	-308.20*** (72.040)
Year 2	0.828	0.838*** (0.002)	-0.022*** (0.007)	5896.71	0.838*** (0.002)	-565.64*** (110.170)
Year 3	0.815	0.839*** (0.002)	-0.013* (0.008)	7331.31	0.839*** (0.002)	-484.97*** (148.450)
Year 4	0.821	0.839*** (0.002)	-0.010 (0.008)	9095.81	0.839*** (0.002)	-354.73* (194.070)
Year 5	0.814	0.831*** (0.003)	-0.004 (0.009)	13709.98	0.831*** (0.003)	-473.62 (314.290)
Year 6	0.779	0.828*** (0.003)	-0.023** (0.011)	18190.94	0.828*** (0.003)	-956.17** (444.490)
Year 7	0.753	0.810*** (0.004)	-0.027* (0.014)	20609.22	0.810*** (0.004)	-1405.69** (594.500)
Year 8	0.731	0.847*** (0.004)	-0.045** (0.017)	22037.94	0.847*** (0.004)	-1853.17** (777.130)

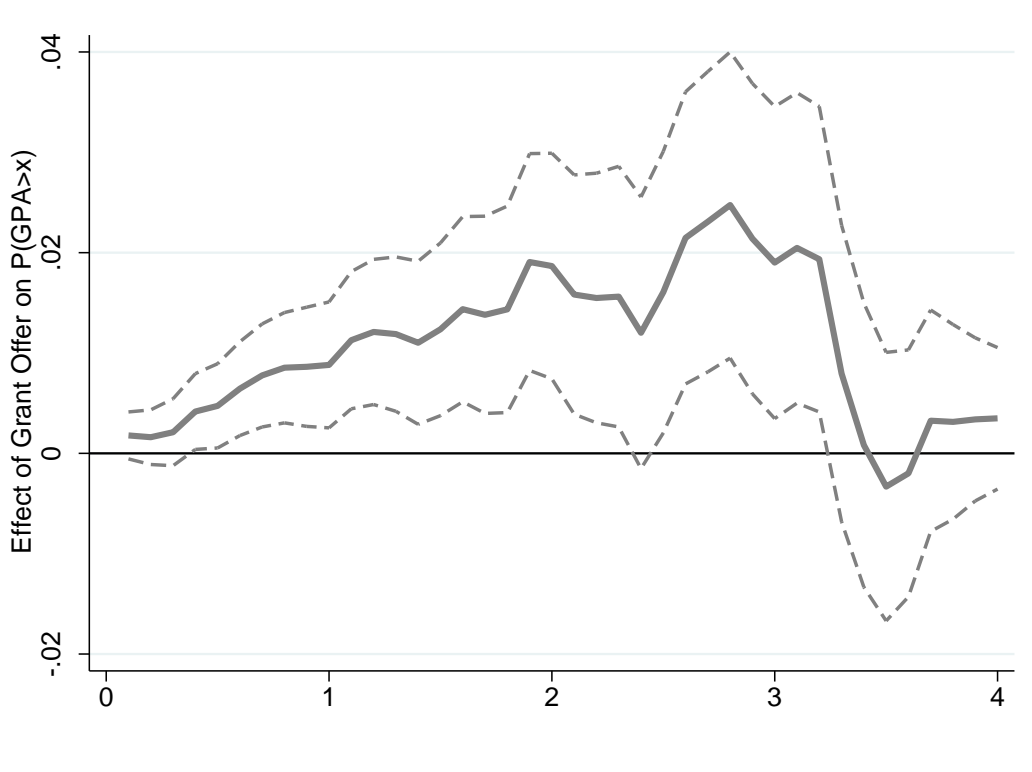
NOTE: ***p<0.10, **p<0.05, *p<0.01. Robust standard error in parentheses below coefficient estimate. For each outcome, each row presents results from a separate two-stage least squares regression. The first stage predicts FFWS grant take-up as a function of receiving an FFWS grant offer, where FFWS take-up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

Table 6. 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	0.047*** (0.014)	0.043*** (0.014)	0.037*** (0.013)	0.034*** (0.013)
	<i>Treatment-on-the-Treated</i>			
1st Stage-Effect of FFWS Offer on Take-Up	0.851*** (0.002)	0.855*** (0.002)	0.849*** (0.002)	0.853*** (0.002)
2nd Stage- Effect of FFWS Receipt	0.055*** (0.016)	0.051*** (0.016)	0.044*** (0.015)	0.040*** (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.

Figure 1. Estimated Effect of FFWS Offer on the Distribution of Grade Point Average



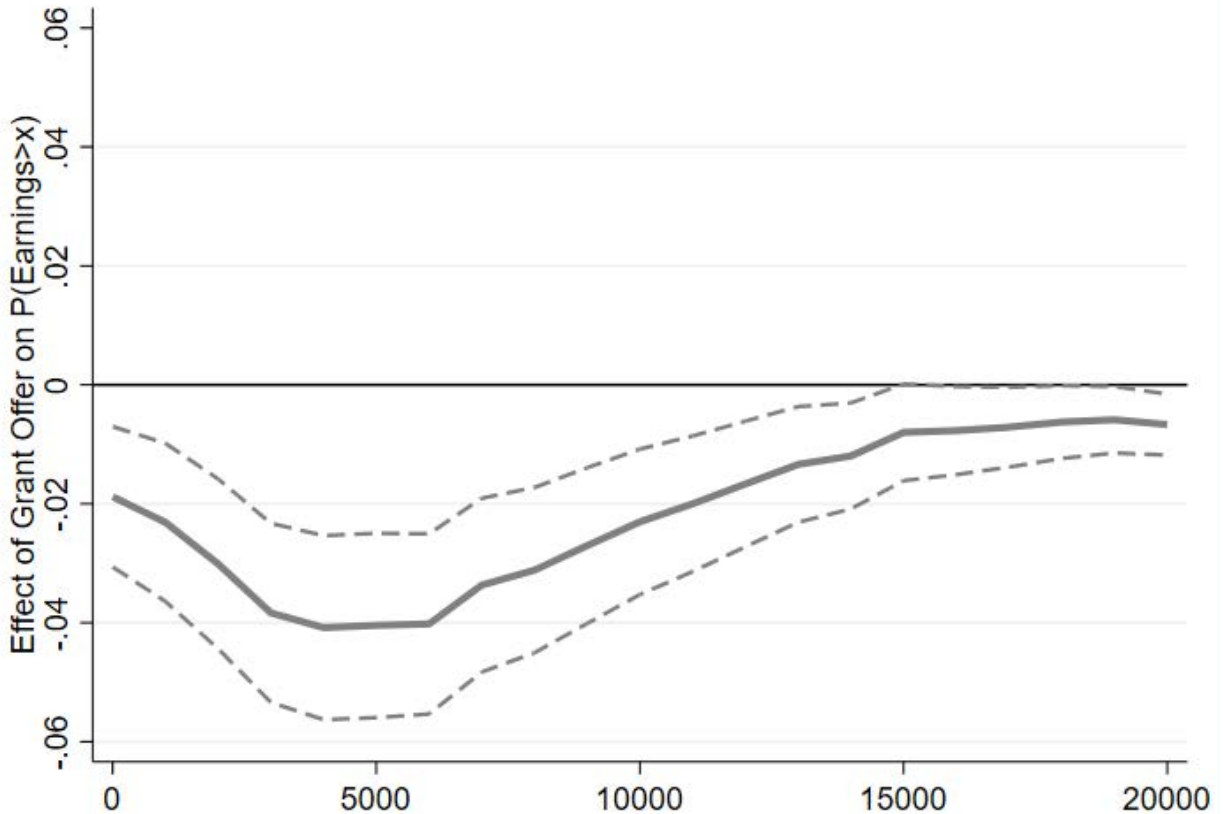
Notes: The figure plots point estimates (solid line) and 95% confidence intervals (dashed lines) of the effect of receiving an FFWS offer on the probability that that students' first-year GPA exceeds the value on the x-axis, where x ranges from 0.1 to 4.0 in increments of 0.1. This results in 40 total regressions. In each regression, we model the outcome as a function of an indicator for randomly receiving an FFWS grant offer and a cohort fixed effect.

Table 7. Effect of FFWS grant program on employment and earnings from federal work study program for students in 4-year institutions

Year	Work Study Employment		Work Study Earnings	
	Control Group Mean	Coefficient (S.E.)	Control Group Mean	Coefficient (S.E.)
Year 1	0.13	-0.016*** (0.005)	\$113.11	-\$15.43*** (5.08)
Year 2	0.13	-0.035*** (0.005)	\$170.67	-\$36.07*** (5.98)
Year 3	0.12	-0.026*** (0.005)	\$188.50	-\$30.77*** (6.63)
Year 4	0.10	-0.018*** (0.005)	\$184.72	-\$26.55*** (6.97)
Year 5	0.04	-0.007* (0.004)	\$121.24	-\$8.60* (4.81)
Year 6	0.01	0.002 (0.002)	\$69.77	4.20 (3.28)
Year 7	0.002	0.000 (0.001)	\$46.86	-\$1.10 (1.13)
Year 8	0.002	-0.001** (0.001)	\$51.53	-\$2.02*** (0.64)

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 work study employment (left column) or annual work study earnings (right column). 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.

Figure 2. Estimated Effect of FFWS Offer on the Distribution of Earnings in the Second Post-Randomization Year



Notes: The figure plots point estimates (solid line) and 95% confidence intervals (dashed lines) of the effect of receiving an FFWS offer on the probability that that students' earnings in the second post-randomization year exceeds the value on the x-axis, where x ranges from \$1 to \$20,000 in increments of \$1,000. This results in 20 total regressions. In each regression, we model the outcome as a function of an indicator for randomly receiving an FFWS grant offer and a cohort fixed effect.

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 Institution		
	All Loans	Subsidized Loans	Unsubsidized Loans	All Loans	Subsidized Loans	Unsubsidized Loans
Year 1	-544.91*** (86.60)	-303.66*** (56.11)	-241.25*** (34.71)	-57.70 (89.22)	-46.69 (60.00)	-11.01 (29.97)
Year 2	-1034.88*** (175.18)	-579.60*** (117.01)	-455.28*** (64.65)	-116.50 (179.09)	-90.29 (122.48)	-26.22 (57.85)
Year 3	-1583.73*** (288.51)	-954.46*** (198.46)	-629.28*** (99.55)	-185.42 (269.68)	-134.66 (187.51)	-50.76 (83.77)
Year 4	-1968.46*** (437.63)	-1239.75*** (298.13)	-728.72*** (152.12)	-409.54 (405.10)	-309.28 (276.54)	-100.26 (131.13)
Year 5	-2157.04*** (582.12)	-1334.97*** (391.34)	-822.07*** (205.75)	-544.39 (544.89)	-427.17 (365.32)	-117.22 (183.42)
Year 6	-2122.31*** (694.08)	-1273.69*** (464.28)	-848.61*** (247.25)	-412.43 (687.00)	-328.69 (458.80)	-83.74 (233.15)
Year 7	-2178.98** (849.95)	-1338.52** (562.48)	-840.46*** (308.28)	-734.61 (903.03)	-538.39 (600.98)	-196.22 (308.13)
Year 8	-3335.34*** (971.82)	-2105.52*** (651.63)	-1229.82*** (350.99)	-384.80 (915.83)	-411.14 (622.78)	26.34 (304.80)

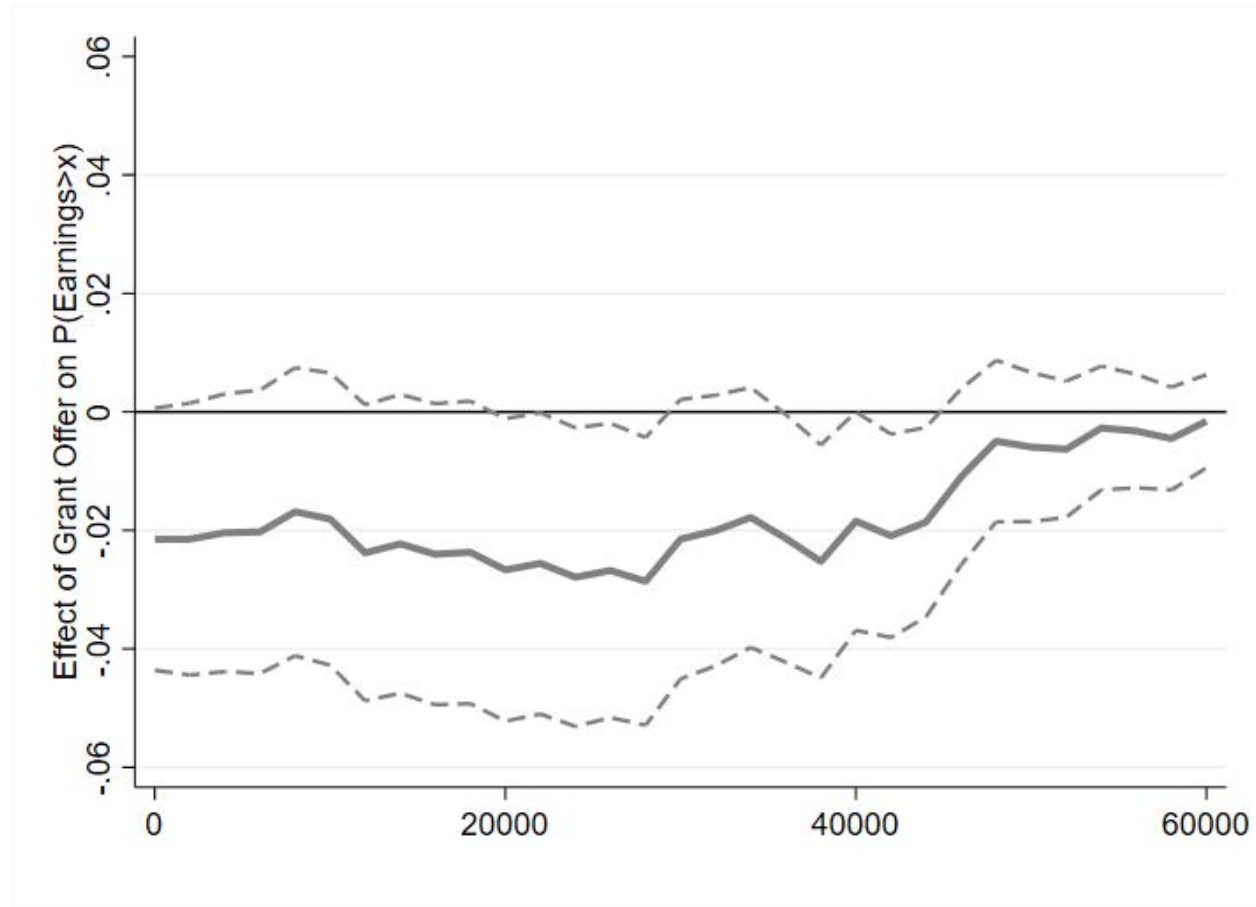
Note: ***p<0.10, **p<0.05, *p<0.01. Robust standard error in parentheses below coefficient estimate. Each coefficient is from a separate regression and is the estimate for an indicator of receiving an FFWS grant offer. All regressions contain fixed effects for cohort.

Table 9. Estimated effect of FFWS grant offer on annual employment and earnings, by year and level of unmet need

Year	Employment			Earnings		
	High Unmet Need	Low Unmet Need	Difference	High Unmet Need	Low Unmet Need	Difference
Year 1	-0.030*** (0.009)	-0.016* (0.009)	0.015 (0.012)	-299.41*** (82.494)	-224.90** (87.074)	74.51 (119.894)
Year 2	-0.023*** (0.008)	-0.013 (0.009)	0.009 (0.012)	-456.29*** (126.595)	-508.59*** (133.623)	-52.30 (183.988)
Year 3	-0.018** (0.009)	-0.001 (0.010)	0.017 (0.013)	-581.51*** (171.047)	-200.56 (181.146)	380.95 (249.058)
Year 4	-0.015 (0.010)	0.003 (0.010)	0.018 (0.014)	-392.55* (223.602)	-177.30 (237.673)	215.24 (326.200)
Year 5	-0.008 (0.011)	0.005 (0.011)	0.013 (0.016)	-553.73 (357.951)	-142.35 (382.624)	411.38 (523.721)
Year 6	-0.034*** (0.013)	0.002 (0.014)	0.036* (0.019)	-1425.05*** (506.781)	29.11 (537.147)	1454.16** (738.102)
Year 7	-0.034** (0.016)	-0.006 (0.017)	0.028 (0.023)	-1841.29*** (661.021)	-220.00 (704.621)	1621.30* (966.005)
Year 8	-0.046** (0.020)	-0.026 (0.021)	0.020 (0.029)	-1885.92** (912.273)	-1116.03 (956.056)	769.89 (1321.371)

NOTE: ***p<0.10, **p<0.05, *p<0.01. Robust standard error clustered by student in parentheses below coefficient estimate. All coefficients in each from a single OLS regression predicting annual employment (left panel) or annual earnings (right panel). All regressions contain fixed effects for cohort and post-randomization year.

Figure 3. Estimated Effect of FFWS Offer on the Distribution of Earnings in the Seventh Post-Randomization Year



Notes: The figure plots point estimates (solid line) and 95% confidence intervals (dashed lines) of the effect of receiving an FFWS offer on the probability that that students' earnings in the seventh post-randomization year exceeds the value on the x-axis, where x ranges from \$1 to \$60,000 in increments of \$2,000. This results in 30 total regressions. In each regression, we model the outcome as a function of an indicator for randomly receiving an FFWS grant offer and a cohort fixed effect.

Table 10. Estimated effect of FFWS grant offer on enrolling in a postsecondary institution after earning a bachelor's degree

	Post-BA Enrollment	Post-BA Enrollment in 4-year institution	Post-BA Enrollment in 2-year institution
<i>OLS</i>			
Effect of FFWS Offer	0.007* (0.004)	0.004 (0.003)	-0.0003 (0.001)
<i>Logit</i>			
Effect of FFWS Offer	0.115* (0.063) [0.011]	0.105 (0.079) [0.006]	-0.048 (0.203) [-0.0006]

Notes: ***p<0.10, **p<0.05, *p<0.01. In the top panel of the table, robust standard errors clustered by student presented in parentheses below coefficient estimate. Each coefficient is from a separate OLS regression predicting any post-BA enrollment, post-BA enrollment in a 4-year institution, and post-BA enrollment in a 2-year institution, respectively. Each regression contained an indicator for receiving an FFWS offer and a cohort fixed effect. In the bottom panel of the table, we present coefficient estimates in the top row, a robust standard error clustered by student in parentheses in the second row, and the marginal effect in brackets in the third row. Each coefficient is from a separate logistic regression specified in the same manner as the OLS regressions described above.

Table 11. 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	0.001 (0.006)	-468.49* (272.19)
Year 6	-0.023*** (0.009)	-358.69 (388.79)
Year 7	-0.018* (0.011)	-871.91* (503.75)
Year 8	-0.043*** (0.014)	-442.93 (700.95)

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

Year	Earnings	
	Lower Bound	Upper Bound
Year 1	-229.58*** (58.769)	-207.11*** (59.945)
Year 2	-492.65*** (107.804)	-435.52*** (91.641)
Year 3	-531.69*** (162.899)	-375.26*** (129.425)
Year 4	-573.95*** (209.640)	-263.3173 (173.116)
Year 5	-476.1246 (446.773)	-362.7598 (288.955)
Year 6	-930.28** (455.893)	856.1224 (541.508)
Year 7	-1486.70** (626.776)	215.211 (728.968)
Year 8	-2226.52** (929.250)	1977.90** (942.578)

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 13. 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)	0.001 (0.009)	-0.006 (0.011)	102.75 (164.500)	-470.38** (236.860)	573.12** (287.620)
Year 3	-0.002 (0.007)	0.007 (0.010)	-0.010 (0.012)	93.20 (214.330)	-185.27 (326.200)	278.47 (389.260)
Year 4	-0.005 (0.007)	0.007 (0.011)	-0.012 (0.014)	162.09 (265.040)	-183.38 (405.250)	345.47 (483.460)
Year 5	-0.008 (0.008)	0.008 (0.013)	-0.016 (0.016)	446.62 (329.630)	-343.89 (514.240)	790.51 (610.700)
Year 6	0.007 (0.010)	-0.014 (0.015)	0.021 (0.018)	879.31** (421.230)	-583.95 (657.990)	1463.27* (781.090)
Year 7	0.000 (0.012)	-0.008 (0.020)	0.008 (0.023)	398.91 (528.390)	-1329.65 (871.380)	1728.56* (1019.140)
Year 8	0.000 (0.015)	-0.016 (0.026)	0.016 (0.030)	258.38 (691.010)	-2531.92** (1221.770)	2790.31** (1404.140)

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 (0.006)
Year 2	0.828	-0.019*** (0.006)	-0.020*** (0.006)	0.892	-0.002 (0.005)	-0.002 (0.005)
Year 3	0.815	-0.011* (0.006)	-0.013* (0.007)	0.877	0.001 (0.006)	0.001 (0.006)
Year 4	0.821	-0.008 (0.007)	-0.010 (0.007)	0.863	-0.001 (0.006)	-0.001 (0.006)
Year 5	0.814	-0.004 (0.008)	-0.005 (0.008)	0.853	-0.003 (0.007)	-0.003 (0.007)
Year 6	0.779	-0.019** (0.009)	-0.019** (0.009)	0.840	0.000 (0.001)	0.001 (0.008)
Year 7	0.753	-0.021* (0.011)	-0.022* (0.011)	0.822	-0.002 (0.010)	-0.002 (0.010)
Year 8	0.731	-0.038** (0.015)	-0.038** (0.015)	0.811	-0.004 (0.013)	-0.005 (0.013)

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)	-263.39*** (60.87)	6,655.07	-68.45 (89.79)	-51.04 (90.61)
Year 2	5,896.71	-474.27*** (92.42)	-471.09*** (93.13)	9,886.24	-67.46 (136.65)	-60.38 (137.44)
Year 3	7,331.31	-407.11*** (124.67)	-396.44*** (125.91)	12,669.79	35.0 (181.91)	11.9 (181.49)
Year 4	9,095.81	-297.72* (162.92)	-314.33** (164.42)	14,760.66	82.92 (224.47)	91.46 (223.59)
Year 5	13,709.98	-393.5 (261.18)	-421.69 (262.66)	16,904.32	251.26 (278.88)	314.56 (278.20)
Year 6	18,190.94	-791.74** (368.12)	-775.06** (370.63)	19,325.17	477.83 (355.56)	497.90 (354.70)
Year 7	20,609.22	-1138.43** (481.56)	-1095.09** (484.18)	21,090.53	-42.56 (452.07)	-20.43 (450.44)
Year 8	22,037.94	-1570.18** (658.55)	-1599.09** (663.03)	22,558.73	-405.64 (601.42)	-304.26 (599.33)

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 employment sector, by post-randomization year and sector

Sector	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Agriculture	-0.003** (0.002)	-0.001 (0.002)	0.002 (0.002)	0.000 (0.002)	0.000 (0.002)	0.001 (0.002)	-0.004 (0.002)	-0.005* (0.003)
Mining	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.001* (0.001)	0.001 (0.001)	0.000 (0.001)
Utilities	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.002 (0.001)	-0.002 (0.002)
Construction	-0.002 (0.002)	-0.001 (0.003)	0.002 (0.003)	0.001 (0.003)	0.003 (0.003)	0.003 (0.004)	0.003 (0.004)	0.000 (0.005)
Manufacturing	0.004 (0.004)	0.002 (0.004)	0.006 (0.005)	-0.002 (0.005)	-0.007 (0.006)	-0.011* (0.007)	-0.010 (0.008)	-0.004 (0.010)
Wholesale Goods	-0.001 (0.002)	-0.003 (0.002)	-0.005* (0.003)	-0.004 (0.003)	-0.003 (0.004)	0.000 (0.004)	0.006 (0.005)	0.003 (0.006)
Retail	-0.007 (0.007)	-0.012* (0.007)	-0.009 (0.008)	0.003 (0.008)	-0.005 (0.008)	-0.002 (0.008)	-0.007 (0.009)	-0.003 (0.010)
Transportation	-0.001 (0.002)	-0.001 (0.002)	-0.002 (0.002)	-0.006** (0.003)	-0.002 (0.003)	0.002 (0.003)	-0.006 (0.004)	-0.007 (0.005)
Information	-0.002 (0.002)	0.001 (0.002)	0.001 (0.002)	0.002 (0.002)	0.002 (0.003)	0.002 (0.004)	0.003 (0.004)	0.013*** (0.005)
Finance	-0.004** (0.002)	-0.005** (0.002)	-0.005* (0.003)	0.000 (0.004)	0.005 (0.004)	0.005 (0.005)	-0.003 (0.006)	-0.011 (0.008)
Real Estate	0.001 (0.002)	0.000 (0.002)	0.000 (0.002)	0.001 (0.002)	0.000 (0.002)	-0.004* (0.002)	0.000 (0.003)	-0.004 (0.003)
Professional	0.001 (0.002)	0.001 (0.002)	-0.001 (0.003)	0.001 (0.004)	-0.005 (0.004)	-0.001 (0.005)	-0.001 (0.006)	0.002 (0.007)
Management	0.000 (0.001)	0.000 (0.001)	-0.001 (0.002)	0.000 (0.002)	0.000 (0.002)	-0.001 (0.003)	0.003 (0.003)	-0.002 (0.004)
Waste Management	-0.008** (0.004)	-0.007 (0.005)	-0.006 (0.005)	-0.007 (0.006)	-0.008 (0.006)	-0.002 (0.007)	-0.008 (0.007)	-0.004 (0.009)
Education Services	-0.004 (0.003)	-0.001 (0.003)	0.009*** (0.003)	0.000 (0.004)	0.008 (0.005)	-0.001 (0.006)	-0.001 (0.007)	0.006 (0.010)

Health Care	0.004 (0.003)	0.009* (0.003)	0.002 (0.003)	-0.005 (0.004)	0.005 (0.005)	0.000 (0.006)	0.005 (0.007)	-0.011 (0.010)
Arts & Recreation	0.000 (0.004)	0.000 (0.004)	0.003 (0.004)	0.006 (0.004)	0.004 (0.004)	-0.005 (0.004)	0.002 (0.005)	-0.002 (0.006)
Food Service/Accommodations	-0.019*** (0.007)	-0.012 (0.007)	-0.011 (0.007)	-0.013 (0.008)	-0.005 (0.008)	-0.010 (0.008)	-0.007 (0.009)	-0.019** (0.010)
Other	0.001 (0.003)	-0.005 (0.004)	-0.004 (0.004)	-0.005 (0.004)	-0.002 (0.004)	-0.004 (0.004)	-0.006 (0.005)	-0.008 (0.006)
Public Administration	-0.005 (0.003)	-0.004 (0.003)	-0.002 (0.003)	-0.001 (0.004)	-0.003 (0.004)	-0.005 (0.005)	-0.003 (0.006)	-0.001 (0.007)
Unclassified	-0.001 (0.001)	-0.001** (0.001)	-0.001 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.001 (0.001)	0.000 (0.001)

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 for a given year estimated in a Seemingly Unrelated Regression framework. All regressions contain fixed effects for cohort.

Table A4. 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	-0.038*** (0.006)	-0.044*** (0.006)	-0.071*** (0.008)
Year 2	-0.029*** (0.006)	-0.033*** (0.006)	-0.063*** (0.008)
Year 3	-0.030*** (0.006)	-0.032*** (0.006)	-0.061*** (0.008)
Year 4	-0.025*** (0.006)	-0.025*** (0.006)	-0.052*** (0.008)
Year 5	-0.024*** (0.006)	-0.025*** (0.006)	-0.052*** (0.009)
Year 6	-0.023*** (0.007)	-0.024*** (0.007)	-0.050*** (0.010)
Year 7	-0.030*** (0.008)	-0.032*** (0.008)	-0.044*** (0.012)
Year 8	-0.028*** (0.010)	-0.030*** (0.010)	-0.042*** (0.015)

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 A5. Effect of FFWS grant offer on cumulative loan debt, by unmet need level and year after randomization

Year	Cumulative Loan Debt		
	High Unmet Need	Low Unmet Need	Difference
Year 1	-688.61*** 54.77	-313.78*** 57.81	374.83*** 79.59
Year 2	-1356.29*** 104.27	-526.919*** 110.06	829.37*** 151.55
Year 3	-2027.61*** 169.54	-835.11*** 179.55	1192.50*** 246.87
Year 4	-2547.12*** 247.29	-939.03*** 262.86	1608.09*** 360.76
Year 5	-2737.23*** 308.28	-1007.22*** 329.53	1730.01*** 451.05
Year 6	-2671.08*** 361.44	-1020.81*** 383.10	1650.27*** 526.43
Year 7	-2565.88*** 432.92	-1074.33** 461.48	1491.55** 632.67
Year 8	-2780.59*** 563.63	-1419.28** 590.68	1361.31* 816.39

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 regression containing an indicator for receiving an FFWS offer, an indicator for low unmet need, the interaction of those two terms, and a cohort fixed effect.

Table A6. Effect of FFWS grant offer on employment and earnings, by gender and year after randomization

Year	Employment			Earnings		
	Male	Female	Difference	Male	Female	Difference
Year 1	-0.036*** (0.010)	-0.018** (0.008)	0.017 (0.013)	-159.01* (95.338)	-331.13*** (79.271)	-172.13 (123.934)
Year 2	-0.026*** (0.009)	-0.016** (0.008)	0.010 (0.012)	-450.28*** (146.022)	-477.38*** (121.413)	-27.10 (189.821)
Year 3	-0.018* (0.010)	-0.009 (0.009)	0.009 (0.014)	-220.09 (196.951)	-510.00*** (164.303)	-290.91 (256.396)
Year 4	-0.016 (0.011)	-0.005 (0.009)	0.011 (0.014)	-135.44 (256.720)	-415.81* (214.833)	-280.38 (334.620)
Year 5	-0.001 (0.012)	-0.008 (0.010)	-0.007 (0.016)	-443.56 (411.947)	-372.77 (343.187)	70.79 (535.920)
Year 6	-0.013 (0.015)	-0.023* (0.012)	-0.010 (0.019)	-427.81 (575.809)	-951.33* (486.428)	-523.53 (753.370)
Year 7	-0.020 (0.018)	-0.023 (0.015)	-0.003 (0.023)	-1170.33 (753.227)	-967.41 (635.208)	202.92 (985.145)
Year 8	-0.033 (0.023)	-0.042** (0.019)	-0.009 (0.030)	-1870.71* (1034.842)	-1239.65 (867.978)	631.06 (1350.510)

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

Table A7. Coefficient on indicator for receiving an FFWS grant offer after conditioning on postsecondary enrollment, by post-randomization year

Year	Employment		Earnings	
	Condition on Enrollment	No Condition on Enrollment (Main Results)	Condition on Enrollment	No Condition on Enrollment (Main Results)
Year 1	-0.022*** (0.006)	-0.023*** (0.006)	-228.40*** (59.14)	-284.64*** (58.63)
Year 2	-0.019*** (0.006)	-0.019*** (0.006)	-365.19*** (85.33)	-482.95*** (89.52)
Year 3	-0.012* (0.007)	-0.011 (0.007)	-293.73** (116.53)	-404.16*** (124.42)
Year 4	-0.008 (0.007)	-0.008 (0.007)	-176.57 (155.15)	-288.54* (163.84)
Year 5	-0.004 (0.008)	-0.004 (0.008)	-286.71 (248.57)	-363.53 (258.39)
Year 6	-0.019** (0.009)	-0.020** (0.009)	-809.50** (357.07)	-776.91** (362.37)
Year 7	-0.022* (0.011)	-0.022* (0.012)	-1103.00** (469.45)	-1138.05** (470.84)
Year 8	-0.038** (0.015)	-0.038** (0.015)	-1586.65** (656.00)	-1576.17** (656.50)

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 (left panel) or earnings (right 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 condition on enrollment columns also contain an indicator for enrollment in a UW System institution.

Table A8. 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)	-0.003 (0.012)	-0.009 (0.012)	0.003 (0.003)	-0.009 (0.008)
Year 6	-0.002 (0.002)	-0.008 (0.018)	-0.005 (0.017)	0.004 (0.004)	-0.016 (0.011)
Year 7	-0.003 (0.003)	-0.014 (0.022)	-0.024 (0.022)	0.003 (0.005)	-0.040*** (0.014)
Year 8	-0.002 (0.004)	-0.023 (0.029)	-0.037 (0.028)	0.004 (0.007)	-0.054*** (0.017)

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.