NEED-BASED FINANCIAL AID AND COLLEGE PERSISTENCE: EXPERIMENTAL EVIDENCE FROM WISCONSIN*

Sara Goldrick-Rab (srab@education.wisc.edu)
University of Wisconsin-Madison

Robert Kelchen (kelchen@wisc.edu)
University of Wisconsin-Madison

Douglas N. Harris (dharri5@tulane.edu)
Tulane University

James Benson (jbenson@ssc.wisc.edu)
Institute for Education Sciences

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We examine the impacts of a private need-based college financial aid program distributing grants at random among first-year Pell Grant recipients at three selective public universities and ten less-selective public universities in Wisconsin. The Wisconsin Scholars Grant of $3,500 per year was subject to federal rules regarding financial aid packaging, which appears to have minimized its average impacts on college persistence. An reduction of $1,000 in a student's unmet financial need during the first year of college was associated with an approximately 3.5 percentage point increase in rates of enrollment for the second year, with effects concentrated among students at the less-selective universities.

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The United States currently provides more than $132 billion per year in grant, loan, and work-study assistance to undergraduates (Baum and Payea 2011), but there is little evidence as to whether financial aid promotes college persistence and eventual degree attainment (Bettinger 2011).[1] While there are well-established economic returns to college attendance, those returns are strongest for students who accrue at least a year or two of college credits (Kane and Rouse 1995; Heckman, Lochner, and Todd 2008). Yet as college enrollment rates swelled over the last forty years, college persistence rates did not (Bailey and Dynarski 2011). National estimates from the Beginning Postsecondary Students study suggest that 14% of federal Pell Grant recipients entering public universities fail to enroll for a second year of college, and only about 40% receive a bachelor's degree within six years.

Most financial aid research conflates effects on college attendance and effects on college persistence, even though the two represent distinct educational decisions. In this paper we capitalize on a private need-based grant delivered subsequent to college enrollment, in order to isolate impacts on persistence. Specifically, with an experimental design we estimate the impacts of the Wisconsin Scholars Grant (WSG), which is distributed at random among eligible first-year undergraduates attending Wisconsin's thirteen public universities. Drawing on longitudinal data collected for three cohorts of students eligible to participate in the WSG program (just over 10,000 people in total), we examine the impact of offering a $3,500 renewable grant on the college continuation decisions of Pell Grant recipients.

[1] This figure includes $48 billion in federal grants ($34 billion of which is the Pell Grant), $70 billion in loans, $13 billion in tax credits and deductions, and $1 billion in work-study funds. However, in comparison to the average cost of tuition and fees (currently $8,244 for in-state students at public universities), grants are fairly small; an average Pell is $3,828 per full-time-equivalent student (Baum and Payea 2011).

Since students received the WSG after they began attending college, filed for aid, and received a federal Pell Grant, the new award had to be incorporated into their financial aid package according to federal regulations. By law, a student may not receive more financial aid than their estimated need, computed according to the Federal Application for Student Financial Assistance (FAFSA). If a student is "over-awarded," displacement of existing financial aid is required, subsidized and unsubsidized loans are usually removed first, followed by work-study, and state grants.[2] For this reason, students who had more unmet need before the Wisconsin Scholars Grant was awarded had more of that need reduced by the grant.

We estimate that, on average, offering students the new grant generated small, positive impacts on their retention rates, credit completion, and grade point average. Effects varied across universities, with the positive impacts constrained to the ten less-selective universities. In addition, the more unmet need was reduced by the addition of the new grant, the larger the positive academic impacts. Estimates suggest a 3.5 percentage point increase in retention to the second year of college accruing to a $1,000 reduction in unmet financial need for students attending less-selective universities. The grant appears to have produced no benefit for students attending selective universities or those who received only a trivial reduction in unmet need from its resources. We discuss the implications for the targeting of financial grant aid and the challenge of financial aid displacement.

The paper proceeds as follows: Section I provides additional background on prior evidence of the impacts of need-based financial aid programs, Section II

[2] Institutional aid is also frequently removed, especially when government aid is available, although not in the case examined in this paper (National Scholarship Providers Association 2013; Turner 2013).

describes the Wisconsin grant program, experimental design, and data, Section III presents estimates of impacts on educational outcomes for each student cohort and across cohorts, and Section IV concludes with a discussion of implications for future research and policy.

I. IMPACTS OF NEED-BASED FINANCIAL AID

Evidence suggests that reducing the income inequality characterizing America's economy in the early decades of the 21st century may partly depend on increasing the rates of college attainment among Americans from low-income families (Goldin and Katz 2008; Long 2012). What contribution does need-based financial aid make to those efforts? Despite decades of investment in financial aid, children from low-income families face a nine percent chance of attaining a bachelor's degree. That low rate of college attainment is substantially attributable to high rates of college dropout, and is only moderately explained by lower levels of high school preparation and tested ability (Bailey and Dynarski 2011). The substantial and rising cost of college is also a likely contributor, partly given higher price elasticity among low-income families (Dynarski 2003; Goldin and Katz 2008; Bowen, Chingos, and McPherson 2009; Deming and Dynarski 2010).

Historically, need-based grants have aimed to encourage students to attend college, but there is growing interest in whether they also enable or incent them re-enroll each semester, complete credits, get good grades, and eventually earn degrees. It is difficult to assess the impacts on these outcomes because most studies of grants examine the total impact on both college enrollment and persistence (e.g., McPherson and Shapiro 1991; Kane 1994; Light and Strayer 2000; Bound and Turner 2002; DesJardins et al. 2002; Paulsen and St. John 2002; Seftor and Turner 2002; van der Klauuw 2002; Stinebrickner and Stinebrickner 2003; Bettinger 2004; Singell 2004; Singell and Stater 2006; Kane 2007; Stater

2009). The few quasi-experimental studies focusing on the persistence margin suggest that a $1,000 increase in aid improves college retention rates by two to four percentage points (Bettinger 2004; Bettinger 2010). An effect of this magnitude is also consistent with estimates of how grant aid affects initial college attendance, where a $1,000 increase in aid appears to incur a three to four percentage point increase in rates of college enrollment (Dynarski 2003). Thus, financial aid grants seem to benefit students, albeit to a limited extent. It tends to be the case that studies finding otherwise are dated (i.e. Hansen 1983; Kane 1995), analyzing the responses of students attending college many decades ago, when costs and benefits were much lower and before price discrimination was heavily utilized in higher education (there has been a distinct shift away from low-tuition models to high-tuition with discounting) (Harris & Goldrick-Rab 2012; Long 2012).

Yet given how few estimates have been generated, some people question their precision and reliability, especially since estimates for programs like those delivering grants to needy students are susceptible to bias resulting from selection (Cellini 2008). In other words, students receiving aid are different in substantial ways, both observable and not, from those students who do not, and this may provide either an over or an under-statement of grants' effects (Goldrick-Rab, Harris, and Trostel 2009). Many of the most rigorous studies of whether grants impact college persistence consider programs that are not simple or strictly need-based, but instead impose additional requirements on students in an effort to increase effectiveness (Bettinger 2011). For example, the West Virginia PROMISE program, which offered free tuition and fees to students to earning a minimum GPA and enrolling more-than-full-time (completing 30 credits per year instead of 24), boosted four-year bachelor's degree completion rates by 26% (from a base of 27 percentage points) (Scott-Clayton 2011). In contrast,

experimental evaluations of two Canadian university-based aid programs with strong academic performance requirements yielded far more modest impacts (Angrist, Lang, and Oreopoulos 2009; Angrist, Oreopoulos, and Williams 2010), and a randomized trial of a University of New Mexico program with moderate academic requirements only produced small positive short-term impacts on credit completion (Patel and Richburg-Hayes 2012). Three other experimental studies of scholarship programs targeted students in poverty (primarily mothers receiving welfare) at community colleges in Louisiana, Ohio, and New York, providing grant funds directly to students—outside the financial aid system—in exchange for achieving specific credits and grades. Those efforts produced some increases in both attempted and completed credits and modest change in re-enrollment rates (Patel and Richburg-Hayes 2012).

Despite the relative preponderance of evaluations focused on performance-based financial aid, the vast majority of U.S. federal and state financial grant programs remain need-based and straightforward, with only modest academic requirements. The federal Pell Grant program, perhaps the best-known, only requires students to enroll in college full-time (12 credits) in order to receive the full grant, and merely demands that students make "satisfactory academic progress" each term in order to retain the aid. Since there are relatively few evaluations of such simple programs, we contribute to the literature on aid by examining the effects of a relatively simple Wisconsin program.

II. THE WISCONSIN SCHOLARS GRANT AND EXPERIMENTAL DESIGN

The Wisconsin Scholars Grant (WSG) is a privately funded program, initiated in 2008 and supported by a $168 million endowment from the Fund for Wisconsin Scholars, making it one of the largest need-based grant programs in the

state (Pope 2010).[3]. This paper describes impact estimates based on the entering cohorts of 2008, 2009, and 2010, with the most detailed estimates focusing on data from the program's first cohort.

A. *The Treatment*

The WSG program offered Pell-eligible students a $3,500 grant per year which was renewable for up to five years, with a total potential maximum award of $17,500 per student.[4,5] This amounted to 20.4% of their estimated costs of attendance, and 85% of the unmet financial need these students faced as they began college (for more on the calculation of unmet need, see below).

Students were eligible for the WSG if they are Wisconsin residents who attended and graduated from a state public high school within three years of matriculating to one of the state's 13 public universities, where they enrolled for at least 12 credits (full-time), completed the Free Application for Federal Student Aid (FAFSA) and qualified for a federal Pell Grant, while still possessing calculated unmet need (net of all grant aid) of at least $1.[6]

Students could receive the grant for up to 10 semesters or five academic years if they maintained Pell eligibility and enrolled at a Wisconsin public

[3] More information on the Fund for Wisconsin Scholars is at www.ffws.org.
[4] A student is eligible to receive the Pell Grant if his or her expected family contribution, as determined by completion of a federal aid application and a need analysis methodology, is below a certain value ($4,041 in the 2008-2009 academic year). For more details, see Dynarski and Scott-Clayton (2007).
[5] The grant was transferable among all public colleges and universities in Wisconsin. Students were still eligible if they switched to a Wisconsin public two-year college, but the grant amount declined to $1,800 per year.
[6] The WSG could not plausibly have affected college entry in the first cohort and it is very unlikely to have affected the initial enrollment decision of later cohorts. While the program was first announced about one year before the awards were made (December 2007), program details were not public until September 2008 and even then received little publicity. Because of this, we think our estimated impacts are purely on persistence and not on the initial decision to enroll in college.

university or two-year college, full-time (at least 12 credits) at the start of each term, making satisfactory academic progress.[7]

B. *Implementation*

Treatment began when students enrolled in their first semester of college when, following random selection using administrative records, students were sent an award notification letter in the mail.[8] In response, they had to affirm specific pieces of their grant eligibility that could not be checked with available administrative records, and return a form accepting the award. Financial aid administrators then took the WSG funds and integrated them into students' financial aid packages, notifying them electronically of their new award by the end of the first term.

Prior to receiving the award, these Pell Grant recipients faced unmet financial need of up to $14,400. Unmet need is calculated using a standard federal formula, which subtracts a family's expected family contribution (computed using the FAFSA) and all grants and scholarships from the institution's cost of attendance (including tuition and fees, room and board, books and supplies). The remaining amount must by covered through "self-help," which including money from student loans, work-study, gifts, or other forms of employment. Some students decline loans, leading to more unmet financial need; in this study, we estimate that 47 percent of students turned down at least part of

[7] The Pell Grant also requires that students make satisfactory academic progress (SAP), which typically means a C average or equivalent and "academic standing consistent with the requirements for graduation" from the institution. Apart from SAP, there were no stated GPA requirements for the WSG.

[8] For the cohorts we describe in this paper, the letter was sent in October. Students were also sent an e-mail from their financial aid officer verifying the legitimacy of the grant and to watch for documents in the mail.

the loans offered when they first enrolled in college (Goldrick-Rab and Kelchen 2013).

We hypothesized that the academic impact of the WSG depended on whether it reduced students' financial constraints by alleviating their unmet need. The extent to which it did that depended on laws governing aid packaging, which requires that aid awards not exceed an institution's cost of attendance. The board of the Fund for Wisconsin Scholars understood this, and the program explicitly aimed for the grant to displace student loans. To that end, the rules stipulated that institutional aid could not be supplanted by the WSG, and that it had to be awarded in its entirety (i.e., no partial awards were possible). Therefore, even though students were informed that the WSG had a total value of $3,500, when packaged that money was often used to reduce loans rather than unmet financial need (the award letter is contained in the Appendix). The displacement of grants is common to many philanthropic programs, but is often overlooked by researchers (Amos et al., 2009; National Scholarship Providers Association, 2013).[9] It is largely unknown whether or not it represents an organizational inefficiency by reducing the potential effectiveness of those grants.

It is also notable that we analyze impacts beginning with the program's inception. New programs often have growing pains as they hammer out effective ways to implement their rules, communicate with constituents, and figure out other challenges. In one sense, studying new efforts presents an opportunity to

[9] This may be because it is difficult to observe financial aid package data. For example, while Bettinger (2010) notes that students who were allocated more Pell and state grant aid from the Ohio policy he studied appeared to benefit more, the data he had made it impossible to know how much of an increase in total aid students effectively received- he did not observe aid packages and thus could not examine resulting changes in institutional aid, loans, or work-study. If his conclusion, that more grant aid lowers dropout rates, is correct, then the estimated size of the impact per $1000 may be understated.

better understand the factors moderating program effects, but it also comes with costs. This study has the most extensive data for the WSG program's first cohort, and therefore we present the most detailed analyses for that cohort, describe program implementation to the best of our ability, and include results for two later cohorts using the limited amount of administrative data we could obtain.

It is possible that implementation could affect program impacts; for example the accuracy of both institutional and student knowledge of program rules may have improved, or it may have become more trusted. We conducted interviews with financial aid officers that revealed variation in their understandings of the criteria regarding who was eligible for the grant, the conditions under which it could be renewed, and what messages they were to provide students about the award. In addition, like many government programs, the WSG's program rules were unevenly followed and in some cases misunderstood by students. Students in the first cohort were not regularly reminded about the grant's renewal criteria but the program did issue a few emailed communications containing "different messages about eligibility, transferring, good luck with classes, and other general information."[10] But surveys administered to the first cohort in the months after the program began and again a year later showed that barely half of students offered the grant knew that it was part of their financial aid package.

Some students were also confused about the grant's academic requirements, required for retention of the funds. On surveys, 83% of students

[10] This is an excerpt from a personal communication from the Fund's Executive Director to the authors.

assigned to treatment revealed that they misunderstood the grant's requirements,[11] and recipients of the federal Academic Competitiveness Grant (ACG), which required a B average, seem to have mistakenly thought that the Wisconsin grant demanded full-time enrollment and a B average. In addition, the WSG required that students continue to receive the Pell Grant each year, and some students did not understand this and were surprised when their family income changed or they did not re-file the FAFSA and thus their WSG was discontinued.

These challenges may have contributed to a decline in the fraction of treated students continuing to receive the grant after their first year of college. While 69% of students offered the grant renewed the grant for a second year, only 49% of students retained it for three years, greatly diminishing the potential for treatment impacts over time. Our data allow us to observe this decline for the first cohort of students only, but the program reports that the problem continued for the other two cohorts as well. This information is especially useful when interpreting the trends in academic impacts over time.

C. *Randomization, Sampling, and Take-Up*

Students did not have to apply for the WSG program. Rather, financial aid officers at each university identified eligible students using their administrative records, and sent their names to a state agency overseeing the distribution of several grant and loan programs. In conjunction with the research team, in 2008 the Fund used random assignment to select which eligible students received the WSG. Researchers did not oversee random assignment in the subsequent two cohorts, but the same process was reportedly used and to the

[11] Specifically, in a survey administered to the 2008 cohort, three years after they were first awarded the grant, recipients incorrectly identified either the number of credits and/or grade required to maintain the WSG.

extent possible we performed checks on baseline equivalence to verify randomization. It is notable that the program did not operate for research purposes, and student participation was not predicated on research participation. This meant that we studied the program as it operated in real life, rather than examining a trial program created for research purposes (Heckman 2005). It also means, however, that we did not determine the grant's rules or how it was targeted.

The number of eligible students fluctuated with each cohort, depending mainly on the number of Pell-eligible students in the state, and the precision with which administrators followed program rules in identifying students meeting the criteria. In 2008 the pool included 3,157 new freshmen and that number grew with each subsequent year. Estimates based on the first cohort indicate that 57% of the students were female, 25% were members of a racial/ethnic minority group, and 53% were the first in their family to attend college (Table 1).[12] In fall 2008, the average adjusted gross income of their parents was just under $30,000 and the average expected family contribution was $1,631. Thus, most students came from families living above the poverty line, yet qualifying as "working poor" because they earned less than 200% of the federal poverty threshold (Center on Wisconsin Strategy 2010).[13] Since the grant's eligibility criteria stipulated it, their mean age was just over 18, and just 2.8% were independent for tax purposes.

At the point they began college, students in the study were receiving an average of just over $7,000 in grants and scholarships (including an average Pell

[12] Racial/ethnic minority groups include African-Americans, Native Americans, Hispanics, Southeast Asians, and multiracial students who are from at least one of these groups. Information on race was obtained from a student survey, as it is not included in the FAFSA, and as such is only available for about 80% of the full sample.

[13] 27% of families in Wisconsin earned less than 200% of poverty in 2010, compared to 30% nationwide (Center on Wisconsin Strategy 2010).

of $3200), and about $3,300 in loans (80% of which were subsidized). The mean amount of unmet financial need in the sample was $4,097 but the standard deviation was substantial, at $3,582.

The number of grants the WSG offered each year (e.g. the size of the treatment group) fluctuated slightly according to the program's endowment, ranging from 550 to 600 per year. For comparison purposes, the control group includes all students not offered the grant, except for the first cohort, for which we drew a stratified random sample of 900 students (instead of the full pool) to serve as the control group.[14] In selecting that control group, we blocked the list of non-recipients by university in order to facilitate the collection of an oversample of non-white students. Thus, the size of the control group is 50% larger than the treatment group, and contains more students attending racially and ethnically diverse institutions. We employ inverse probability weights due to unequal assignment probabilities among control group students across schools.

The paper's analyses involve four samples of students, as there was some attrition in subgroups. Therefore, Table 1 provides information on each sample, and prior to each analysis, we examined main and differential attrition in the analytic sample and checked baseline characteristics for equivalence, following best practices in experimental research (WWC 2013).

D. *Data*

The State of Wisconsin lacks a student-unit record data system for higher education. In order to examine the college outcomes of students offered the Wisconsin Scholars Grant, we negotiated data agreements between the state

[14] We could not obtain the data for the entire group of non-recipients (N=2557) in the first cohort due to our initial data agreements and data collection costs, but note that there are diminishing statistical returns to control group size with a fixed treatment group (Bloom 2005).

agency that possesses financial aid information, the University of Wisconsin System, each of the 13 public universities in that system, and the Fund for Wisconsin Scholars. Over time, data agreements changed, and we did the best we could with the available data, considering effects across cohorts with varying amounts of information. Next we describe each measure, its data source, and the samples for which it is observed.

Enrollment. We measure whether and where a student is enrolled in college each semester using two data sources. For all three cohorts we rely on data from the University of Wisconsin System, which records all enrollments at the 13 universities and 13 two-year branch campuses in that system. In addition, for the first cohort we also use data from the National Student Clearinghouse (NSC), a centralized reporting system that collects publicly available directory information obtained from the colleges and universities attended by 92 percent of American undergraduates, to estimate impacts on transfer. All public universities in Wisconsin participate in the NSC.[15] Combining data from these two sources, we have enrollment information for all students in the study.

Credit completion and grade point average. For all cohorts, we observe credits and grades as measured by the University of Wisconsin System.[16] There is some attrition in these measures for the first cohort (Treatment=78.9%, Control=76.2%, p=0.252) and no attrition for the second and third cohorts. If students differentially left the UW system, these analyses might be subject to bias,

[15] Only 12 colleges in Wisconsin who participate in the IPEDS did not participate in the NSC as of 2008-2009. The largest of these is Herzing University, a for-profit institution with a student enrollment of under 1,500. Total enrollment at these 12 schools (none of which are public institutions) is just over 7,000 students.

[16] In order to observe completed credits and GPA, a student must have registered for and completed a credit and passed the class with a D or above. Credits for pass/fail classes, which are not included in GPA calculations, are not recorded with this measure. Credits derived from pre-college enrollment, including Advanced Placement tests, are also not included.

but estimates based on the first cohort suggest that there was no impact of the WSG on transfer rates outside of the System. We report grade point average for enrolled students, and for students who are not enrolled, we use the GPA from the last term enrolled, following Scott-Clayton (2011), while recognizing that estimation of causal effects on GPA is not as straightforward as with other academic outcomes.[17]

Unmet financial need: We measure pre-treatment unmet need using financial aid packages provided directly by universities. This data was difficult to obtain since it required that financial aid officers print screen-shots of each student's financial aid package before packaging the WSG. We have this data for 10 of the 13 universities and data is missing for 51% of students at those universities (Treatment=48.6%, Control=53.4%, p=0.101). This differential missingness could introduce some bias into the analysis, and thus we adjust for covariates in all analyses and urge the reader to interpret the results with caution.

E. Methods

We begin by estimating the impacts of offering the WSG to students on their academic outcomes, using OLS regression, for each cohort and then across cohorts. We test for treatment impacts on semester-to-semester retention (from the first semester in which treatment was awarded, through the third semester—one year after treatment began), credit accumulation, and GPA as well as cumulative outcomes such as the total number of credits attained, cumulative GPA, the number of semesters enrolled, and transfer. Then we extend the analysis to look at impacts over the second and third years of college, for the cohorts for

[17] Students can only have grades if they are enrolled; thus if the grant influences enrollment, then this could give the false appearance that the program influenced GPA when in fact it may be that different students were enrolled and had grades observed.

which we can observe those outcomes. We produce covariate-adjusted models for every analysis, including university fixed effects for each cohort, as well as age, race, gender, dependency status, expected family contribution, and parental education for the first cohort.

The experimental analyses are conducted in an intent-to-treat (ITT) framework. Most but not all students sent the WSG award letter responded to it; this may be due to non-receipt, misunderstanding, or knowledge that they were in fact ineligible for the award. The take-up rate was highest in the first cohort (92%) and diminished somewhat in the third cohort.[18]

At the conclusion of the analysis, we test for heterogeneous treatment effects. The WSG was distributed across all of Wisconsin's 13 public universities regardless of the evident variation in extant retention rates of Pell Grant recipients. Since it is far more difficult to improve upon retention rates of high-achieving students at well-resourced institutions, we consider whether treatment impacts varied by institutional selectivity. Then, given that the WSG was subject to financial aid packaging rules, we test for variation in impacts according to how much unmet financial need students faced before the grant was awarded.

F. *Internal Validity: Attrition and Baseline Equivalence*

The greatest threat to the internal validity of treatment impacts stems from the differential observation of outcomes. As discussed earlier, most samples have relatively low attrition, both on average and according to treatment status. Only the analysis of heterogeneous impacts according to unmet financial need suffers from significant attrition. Following recommendations of the What Works

[18] According to the program's Executive Director, this unexpected decline in take-up rates is likely due to turnover among the institutional administrators tasked with identifying eligible students, communicating with them, and distributing the award.

Clearinghouse we pay additional attention to covariate balance for that sample, conduct covariate adjustments, and caution the reader about the potential for bias in the estimates (WWC 2013).

In addition, we check for balanced allocation of observable covariates in every sample (see Table 1). In each case, we present coefficients from OLS regressions indicating whether and by how much the treatment group differed from the control group. A simple check on the distribution of treated students across institutions (the only covariate observed for Cohorts 2 and 3 for which we have full sample outcome data) suggests that random assignment was successful (Table 1). In addition, we examine covariate balance for all Cohort 1 samples and find that with only two exceptions, samples appear balanced. We note, however, that there is some indication that the treatment group in one analytic sample is disproportionately female (the difference expressed in terms of effect sizes is 0.13) and in another sample it is somewhat financially stronger (effect size = 0.24). To remedy this, we control for college fixed effects in all models, and add the unbalanced covariates when estimating heterogeneous impacts, which involve the sample with the most differential attrition.

II. IMPACTS ON ACADEMIC OUTCOMES

A. *Average Treatment Impacts on Academic Outcomes*

Table 2 displays the WSG's short-term academic impacts (from the first semester until the third—a year after treatment was initiated) and longer-term academic impacts (for the fourth through sixth semesters, and cumulative impacts). There is some indication that the program's impact began as soon as students were notified that they were chosen for the WSG. This intervention, even prior to the actual appearance of the new financial resources, seems to have modestly boosted students' academic performance and slightly increased their

number of completed credits during the first term of college. The estimated program impacts grew stronger in the second term, after students received the grant funds. Results differ slightly according to cohort, with the pooled estimates suggesting that the offer of the WSG increased retention in Semester 2 from just over 93% to about 95%, and also increased the percent of students completing at least 12 credits from 78 to 80%. There was also a statistically significant but very small improvement in grade point average that term.

The impacts appear to persist through the following academic year, when 81.7% of the control group returned for a second year of college, compared to 84.2% of the treatment group. Treated students earned slightly more credits and got slightly better grades as well. As program implementation would predict, treatment impacts appear to fade after the second year of college as the number of students renewing the WSG declined.

B. Heterogeneous Impacts

Did the impacts of the WSG vary according to the university students attended, specifically the level of selectivity? We define selectivity according to the entering ACT scores of the institution. Three campuses have median ACT scores of 25 or higher, while the other ten campuses have median ACT scores of 23 or lower. Figure 1 illustrates this variation, showing that institutional-level Pell retention rates from the first to second year of college range from 65% to 95% across the thirteen universities in this study. We thus disaggregate the sample according to institutional selectivity and check for baseline equivalence in the pre-treatment covariates; the results in Appendix 1 suggest some imbalance (a more disadvantaged treatment group at the more selective institutions, and a more advantaged treatment group at the less selective institutions) and for that reason we included covariate adjustments in the next set of analyses.

The first panel in Table 3 shows the results of tests for variation in the impacts of the WSG according to where a student started college (a decision made well-before the WSG program began). The regression results clearly indicate that students attending the ten less selective universities were much less likely to continue for a second year of college and overall earned fewer credits when compared to students beginning at the more selective institutions, but the impact of the WSG may have been stronger for them. While there is no clear treatment impact on average after accounting for institutional selectivity, the WSG appears to have boosted retention by about six percentage points for students at less selective institutions. While the standard error in the estimation is large and the result not statistically significant, the differential effects it suggests merit additional exploration (see below).

Given the rules governing the packaging of the $3,500 grant, we next examine whether how much unmet need students faced before the WSG was distributed, and how much the WSG offset that need. Figure 2 shows that the amount of unmet financial need varied substantially among students and across universities. Unsurprisingly, there was less overall unmet financial need and less variation in that need among the Pell Grant recipients attending more selective universities, where admissions requirements limit the socioeconomic diversity of the student body and there are more institutional resources to help students apply for and receive financial aid. At less-selective universities, students' unmet need prior to treatment varied widely. A comparison to the amount of the WSG award ($3,500) is helpful, since students offered the grant could only realize a full $3,500 reduction in their need if they had at least that much need to begin with; otherwise their aid would simply be displaced. We find that 38.2% of students in the treatment group at more selective universities had more than $3,500 in unmet

need before the WSG was awarded, compared to 53.5% of treatment students at less selective universities.

The result of this variation in unmet need pre-treatment is that students received varying reductions in that need post-treatment. Figure 3 illustrates this relationship, demonstrating that the treatment impact on unmet financial need varied linearly with the amount of unmet need in a students' package pre-treatment. Only students with very substantial levels of initial unmet need saw that need decreased by the stated amount of the grant ($3,500). Instead, the grant displaced existing financial aid (loans, work-study, other state grants) for nearly all students before beginning to fill in their unmet need.

Given this variation, we then examine whether treatment impacts varied by pre-treatment unmet need, and we begin by focusing on the impacts around the $3,500 level of need, equivalent to the amount of the grant. Table 3's Panel B demonstrates that students with more unmet financial need were less likely to persist in college, and that the positive treatment impacts were much more substantial for students who began with more unmet need.

Finally, we consider whether the heterogeneity in treatment impacts based on unmet need differed for students at more and less selective institutions. The last two panels of Table 3 indicate that positive impacts of the WSG were confined to students at less selective universities facing higher levels of unmet need as they began college. Students at these universities who had initial unmet need greater than $3500 were 12.7 percentage points more likely to attend a second year of college if they were randomly assigned to receive the WSG compared to if they were assigned to the control group. In contrast, we do not detect any statistically significant impacts for comparable students at selective institutions, where having more unmet financial need bore no relationship to

retention rates. In other words, the WSG appears to have been most effective for students facing high levels of unmet need in institutions with fewer resources.

Were the impacts linear, such that students who had their unmet need reduced more by the WSG benefitted more? Figures 4a and 4b suggest that the observed null impacts for students at selective institutions hold regardless of the reduction in need students received, but that the relationship at less selective institutions may be nonlinear. While statistical power is low in the tails of the distribution, it seems that students with only a small amount of initial unmet need (e.g. less than $1000), and those with very high levels of unmet need (e.g. more than $5000) may have received fewer benefits of the WSG. Additional sensitivity analyses related to this point are located in Appendix 2.

III. CONCLUSION

Financial aid has long been evaluated for its effectiveness at promoting college attendance. But higher education's ability to affect social mobility hinges on students from low-income families completing years of college credits, and facilitating college persistence among these students may require offsetting the growing price of college attendance. Need-based financial grants are a popular mechanism with which to lower that price. In this analysis, we provide new evidence that they are modestly effective at inducing students to remain enrolled in college, earn slightly more credits, and get somewhat better grades—and that these effects may be stronger when aid is directed towards students with more unmet financial need at institutions with fewer resources. Unlike most prior studies of need-based grants, our estimates are based on a randomized experiment with three cohorts of students, and yet the estimated impacts (based on the heterogeneous effects) are quite comparable to those obtained from Bettinger's work with both the federal Pell Grant (2004) and an Ohio program (2010).

That said, we think these analyses have several evident limitations. First, there is a possibility of some bias in the analysis of heterogeneous effects since randomization was not blocked by either institutional selectivity or a student's unmet financial need, and there is some differential attrition in the sample used. Second, several of the analyses may be underpowered; while a sizable number of students were offered the WSG, only a small fraction actually appear to have received the full benefit in terms of a reduction in unmet need. Third, the results are based on a group of Wisconsin Pell Grant recipients who began college full-time despite having substantial unmet financial need. The impacts of the WSG might be stronger if delivered prior to when the college decision is made and/or if it were directed to part-time or otherwise more needy students.

Even with these limitations in mind, this evidence is timely and useful given the relative dearth of evidence on the impacts of grants and the ongoing debates in Washington about the future of Title IV financial aid programs and the upcoming reauthorization of the Higher Education Act. We believe that they hold several implications for research and policy. The first is that researchers should do more to attend to the potential differential impacts of financial aid across institutional settings and students. The findings in this paper suggest that overall larger impacts of the WSG could be achieved by focusing the program on students attending less-selective institutions. Financial aid is generally not targeted based on institution attended but rather directed at students. This requires a highly complex eligibility assessment (the FAFSA) that introduces cost, complexity, and demonstrable inefficiency (Bettinger 2011; Dynarski & Scott-Clayton 2006; Goldrick-Rab et al. 2009). Instead, it might be preferable to direct the most grant aid to where it may be most useful, in helping incentivize students with lower levels of academic achievement to focus their time on studying rather than working.

The results also reinforce prior studies indicating that different types of aid have different impacts on students. When the WSG reduced students' loans rather than reducing their unmet financial aid by a meaningful amount, its impacts on academic outcomes were much smaller. This does not necessarily mean that loans are less effective than grants, since the impacts are estimated in terms of a reduction in loans among students who are demonstrably willing to take loans. But it suggests the need for greater attention to treatment heterogeneity in the study of financial aid. Moreover, we intend to continue tracking the impacts of that experimentally-induced decrease in loans in order to assess its effects on their later life choices.

The main effects of the grant appear to arise from the reduction in unmet need students face. It is worth considering alternative ways to reduce students' financial need for college, for example by lowering the cost of attendance (tuition and fees, room and board, and related costs). It is unclear whether students would respond similarly if their need were reduced in this way, and this is fertile ground for future research.

Finally, there is some evidence that the displacement of private grants during the financial aid packaging process observed in this study is widespread (National Scholarship Providers Association, 2013). If this is the case, researchers should continue to examine this issue and policymakers should consider reforms. For example, the Higher Education Act could be amended to expand the definition of cost of attendance to include other common living expenses, such as the cost of a computer and student health insurance. In addition, the overaward tolerance could be increased from $300 to something more significant.

Furthermore, references to scholarships and fellowships could be struck from the definition of estimated financial assistance.[19]

Overall, the Wisconsin Scholars Grant appears to have helped hundreds of students from low-income families obtain at least one additional year of a college education, and with some straightforward tweaks, this evidence suggests that impact might be increased. Additional assessments of financial aid programs are needed to identify similar inexpensive solutions to increase the efficacy of grant aid.

Author Affiliations

Sara Goldrick-Rab is Associate Professor of Educational Policy Studies and Sociology at the University of Wisconsin-Madison.

Robert Kelchen is a doctoral candidate in Educational Policy Studies at the University of Wisconsin-Madison.

Douglas Harris is Associate Professor of Economics and University Endowed Chair in Public Education at Tulane University.

James Benson is a program officer at the Institute for Education Sciences.

[19] More details on these proposals are available in a forthcoming white paper from the National Scholarship Providers Association, to be released soon. Details can be obtained from NSPA executive director Amy Weinstein, at aweinstein@scholarshipproviders.org

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Table 1: Impact of pre-treatment characteristics on assignment to treatment.

Characteristic	Cohort 1-- control group	Cohort 1 (full)	Cohort 1 (admin data)	p-value (full vs. admin)	Cohort 1 (unmet need)	p-value (full vs. unmet)	Cohorts 2-3
Median ACT (college-level)	22.6	0.0	0.0	0.416	0.0	0.125	-0.0
		(0.1)	(0.1)		(0.1)		(0.1)
Pct admitted (college-level)	84.4	-0.0	-0.2	0.969	-0.4	0.467	0.3
		(0.5)	(0.6)		(0.9)		(0.4)
Gender (percent female)	56.7	1.6	5.2*	0.386	3.5	0.030	--
		(2.7)	(3.1)		(4.1)		
Targeted minority (pct, self-report)	25.2	0.2	1.6	0.012	0.8	0.943	--
		(2.6)	(2.9)		(3.4)		
Average age (years)	18.25	0.00	0.01	0.743	-0.01	0.357	--
		(0.03)	(0.03)		(0.05)		
First in family to attend college (pct)	53.6	-0.6	-2.4	0.447	0.8	0.721	--
		(2.9)	(3.2)		(4.4)		
Father has an AA or higher (pct)	28.3	1.8	2.4	0.502	-4.1	0.388	--
		(2.7)	(3.1)		(4.2)		
Mother has an AA or higher (pct)	35.9	1.9	4.4	0.191	4.2	0.248	--
		(2.9)	(3.2)		(4.3)		
Financially dependent on parents (pct)	97.0	0.4	0.6	0.922	1.4	0.569	--
		(0.9)	(1.0)		(1.3)		
Expected family contribution ($)	1607	58	38	0.933	-136	0.242	--
		(127)	(146)		(170)		
Zero expected family contribution (pct)	31.7	-2.7	-3.1	0.314	-6.9*	0.263	--
		(2.5)	(2.9)		(3.7)		
Parent(s)' adjusted gross income ($)	29,437	1184	1332	0.216	1471	0.241	--
		(1000)	(1127)		(1543)		
Parent(s)' investment net worth ($)	5644	-1056	-900	0.128	-65	0.725	--
		(736)	(819)		(1170)		
Sample Size		1500	1167		639		8897
Percent of sample represented		100.0	77.2		39.8		100.0
Treatment differential (pct)		--	2.7		4.0		--
		--	(2.3)		(2.7)		--

Table 1 notes:

SOURCES: Fall 2008 WSLS survey (race), UW System (prior enrollment), IPEDS (college-level measures), FAFSA (all other measures).

Notes:
(1)Standard errors from the regression are listed below the regression coefficients. All regressions include institutional fixed effects except for college-level ACT and admit rates.

(2)Targeted minority groups include: African-Americans, Latinos, Southeast Asians, Native Americans, and multiracial. "Targeted" refers to a policy of the University of Wisconsin System, in which all sample participants began college.

(3) Parent investments (dependents only) had few extreme values with undue influences and were Winsorized at the 95th percentile (Tukey, 1962).

(4) * represents p<.10, ** represents p<.05, and *** represents p<.01.

(5) When considering only the ten campuses with unmet need data, 48.6% of the sample is represented, with a 4.9 ppt treatment differential in missing data rates (p=0.101).

(6) The p-values compare the full sample in cohort 1 to the administrative data and unmet need samples within cohort 1.

Table 2. Academic Impacts on Three Cohorts (2008-2011).
Panel 2A: Short-Term Impacts.

	Cohorts 1-3		Cohort 1-admin sample		Cohorts 2-3	
	Control Mean	Treatment Impact	Control Mean	Treatment Impact	Control Mean	Treatment Impact
Semester 1 (treatment began)						
Credits earned	13.7	0.14*	13.9	0.2	13.7	0.1
		(0.07)		(0.2)		(0.1)
Earned 12+ credits (pct)	88.0	0.7	87.9	0.3	88.0	1.1
		(0.8)		(1.8)		(1.0)
Cumulative GPA	2.64	0.07***	2.52	0.08	2.67	0.09***
		(0.03)		(0.06)		(0.03)
Semester 2						
Enrollment (pct)	93.4	1.9***	93.4	1.5	93.3	2.2***
		(0.6)		(1.4)		(0.7)
Credits earned	12.5	0.3**	12.0	0.3	12.6	0.3***
		(0.1)		(0.3)		(0.1)
Earned 12+ credits (pct)	78.1	2.0*	73.5	0.8	79.2	3.4***
		(1.1)		(2.7)		(1.2)
Cumulative GPA	2.60	0.06**	2.48	0.07	2.63	0.07***
		(0.02)		(0.05)		(0.03)
Semester 3						
Enrollment (pct)	81.7	2.7***	80.4	2.5	82.1	3.0**
		(1.0)		(2.4)		(1.2)
Credits earned	11.0	0.4**	10.6	0.3	11.1	0.5**
		(0.2)		(0.4)		(0.2)
Earned 12+ credits (pct)	67.9	2.6**	65.2	2.7	68.6	3.0**
		(1.3)		(2.9)		(1.5)
Cumulative GPA	2.59	0.06**	2.46	0.06	2.62	0.08***
		(0.02)		(0.05)		(0.03)
Sample Size	8554	1510	692	475	7862	1035

continued on next page

Table 2. Academic Impacts on Three Cohorts (2008-2011).
Panel 2B: Longer-Term Impacts.

	Control Mean	Treatment Impact	Control Mean	Treatment Impact	Control Mean	Treatment Impact
Semester 4						
Enrollment (pct)	77.3	1.9*	75.6	1.8	77.7	2.2*
		(1.2)		(2.6)		(1.3)
Credits earned	10.2	0.3	9.9	-0.1	10.2	0.5**
		(0.2)		(0.4)		(0.2)
Earned 12+ credits (pct)	63.1	1.2	62.5	-4.1	63.2	3.5**
		(1.3)		(3.0)		(1.5)
Cumulative GPA	2.59	0.06**	2.46	0.06	2.62	0.08***
		(0.02)		(0.05)		(0.03)
Semester 5						
Enrollment (pct)	72.5	0.7	71.2	-0.0	73.2	1.9
		(1.6)		(2.8)		(2.1)
Credits earned	9.4	0.3	9.0	0.3	9.6	0.4
		(0.2)		(0.4)		(0.3)
Earned 12+ credits (pct)	57.1	2.5	53.3	2.6	59.2	3.7
		(1.8)		(3.0)		(2.3)
Cumulative GPA	2.57	0.04	2.47	0.06	2.63	0.06
		(0.03)		(0.05)		(0.04)
Semester 6						
Enrollment (pct)	70.4	0.0	69.3	-1.4	71.0	1.7
		(1.7)		(2.9)		(2.1)
Credits earned	9.1	-0.1	8.8	-0.2	9.3	0.1
		(0.2)		(0.4)		(0.3)
Earned 12+ credits (pct)	57.1	-1.0	55.9	-2.4	57.8	0.6
		(1.8)		(3.1)		(2.4)
Cumulative GPA	2.58	0.04	2.48	0.07	2.64	0.05
		(0.03)		(0.05)		(0.04)
Cumulative Outcomes						
Credits completed	58.8	2.7***	65.6	0.9	57.1	2.1***
		(0.7)		(1.7)		(0.7)
Cumulative GPA	2.60	0.06**	2.48	0.07	2.63	0.08***
		(0.02)		(0.05)		(0.03)
Sample Size	8554	1510	692	475	7862	1035

SOURCE: University of Wisconsin System.

Notes:

(1) Standard errors from the regression are listed below the regression coefficients.

(2) Retention includes any of the 13 four-year University of Wisconsin System universities, as well as the 13 two-year University of Wisconsin Colleges.

(3) If a student was not enrolled in a given semester, the cumulative GPA from the previous semester is reported.

(4) We only have four semesters of data for cohort 3.

(5) * represents p<.10, ** represents p<.05, and *** represents p<.01.

(6) All estimates include university fixed effects.

(7) Sample sizes vary--the maximum sample size is presented.

(8) Cohorts 2 and 3 are pooled with the administrative data sample from Cohort 1.

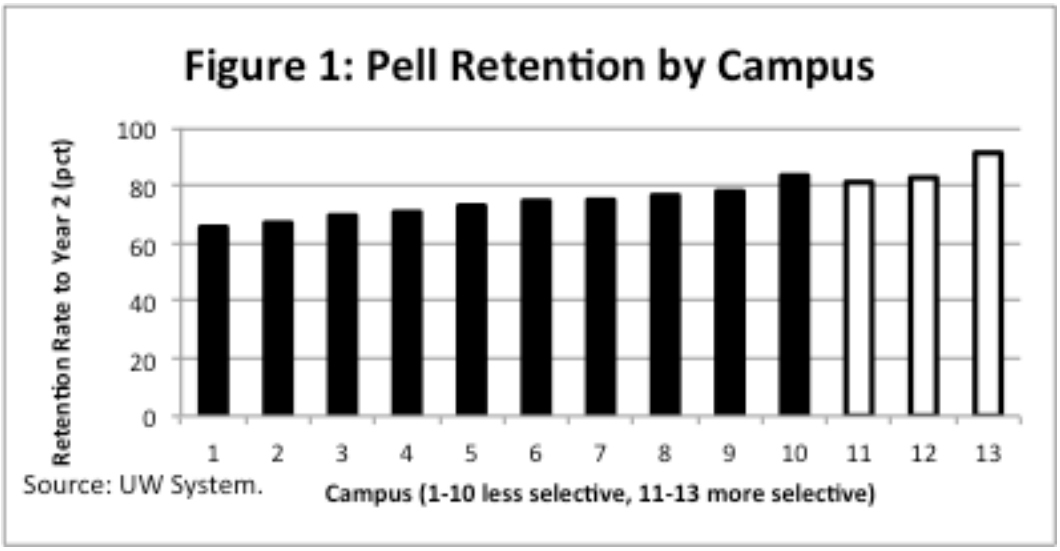
Figure 1: Pell Retention by Campus
Retention Rate to Year 2 (pct)
100
80
60
40
20
0
1
2
3
4
5
6
7
8
9
10
11
12
13
Source: UW System.
Campus (1-10 less selective, 11-13 more selective)

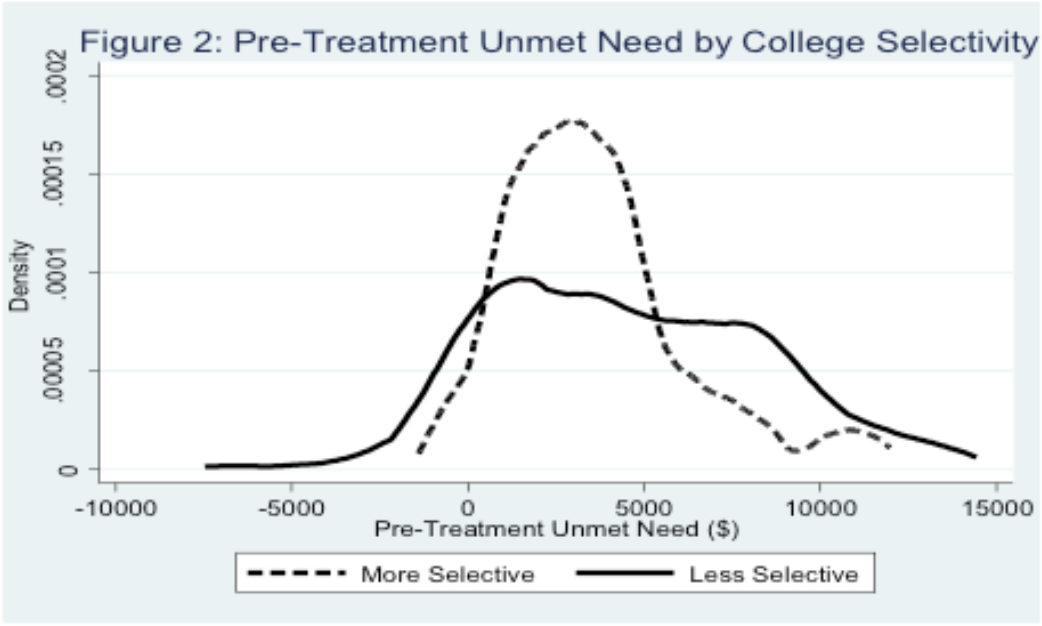
Figure 2: Pre-Treatment Unmet Need by College Selectivity
Density
0
.00005
.0001
.00015
.0002
-10000
-5000
0
5000
10000
15000
Pre-Treatment Unmet Need ($)
More Selective
Less Selective

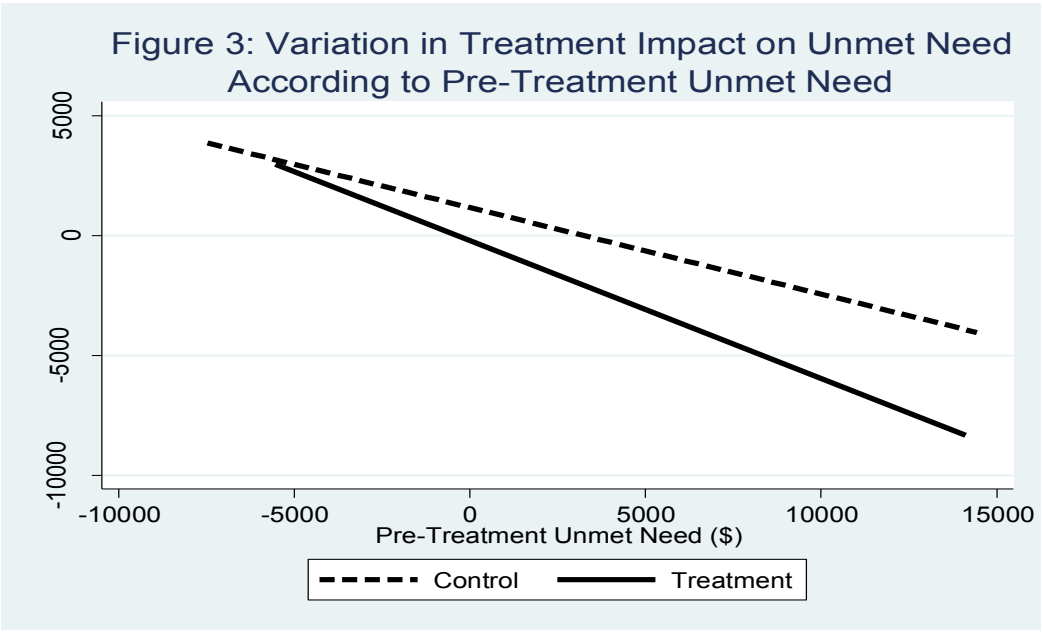
Figure 3: Variation in Treatment Impact on Unmet Need According to Pre-Treatment Unmet Need
5000
0
-5000
-10000
-10000
-5000
0
5000
10000
15000
Pre-Treatment Unmet Need ($)
Control
Treatment

Figure 4a: Variations in WSG Impact on Retention by Unmet Need (More Selective Institutions)

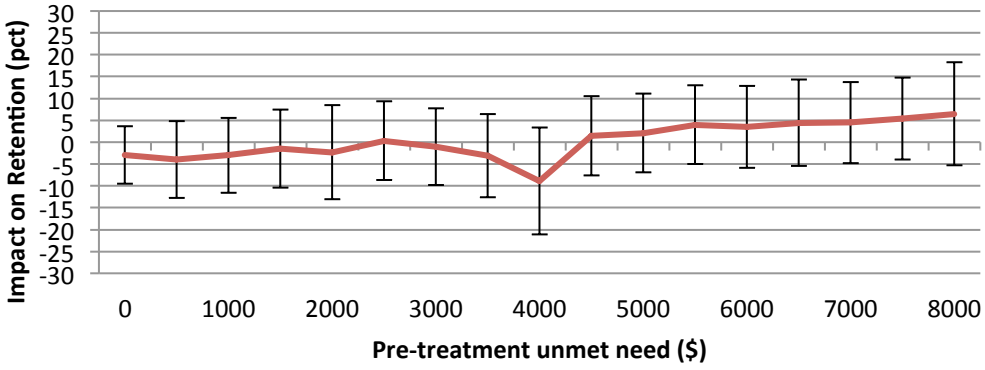

Figure 4b: Variations in WSG Impact on Retention by Unmet Need (Less Selective Institutions)

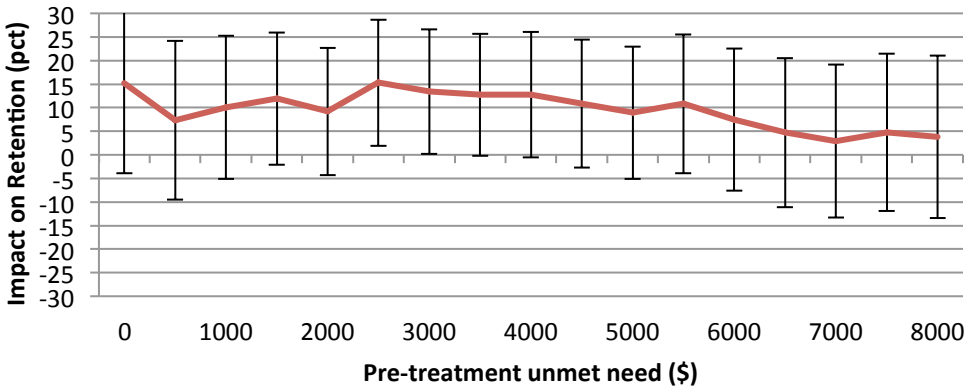

Table 3: Heterogeneous Impacts on Year 2 Outcomes.

Panel 3A: Impacts by institutional selectivity.

	2nd year retention		Credits in 2 years	
Assigned to treatment	--	-1.5	--	3.4*
		(3.4)		(1.9)
Less-selective college	-13.0***	-15.7***	-5.9***	-4.4***
	(2.5)	(3.1)	(1.2)	(1.5)
Treatment*selectivity	--	6.3	--	-3.3
		(4.8)		(2.4)
Sample Size	634	634	634	634

Panel 3B: Impacts by pre-treatment unmet need.

	2nd year retention		Credits in 2 years	
Assigned to treatment	--	-1.9	--	-0.9
		(3.6)		(1.6)
Pre-T unmet need >$3500	-7.8**	-12.3***	-2.0	-3.3*
	(3.5)	(4.5)	(1.4)	(1.8)
Treatment*unmet need	--	10.6*	--	2.9
		(5.6)		(2.4)
Sample Size	634	634	634	634

Panel 3C: Impacts by unmet need (more selective colleges).

	2nd year retention		Credits in 2 years	
Assigned to treatment	--	-0.3	--	4.7**
		(3.8)		(2.0)
Pre-T unmet need >$3500	0.9	2.2	-1.3	0.5
	(4.5)	(4.9)	(2.1)	(2.6)
Treatment*unmet need	--	-3.0	--	-3.4
		(4.8)		(3.4)
Sample Size	118	118	118	118

Panel 3D: Impacts by unmet need (less selective colleges).

	2nd year retention		Credits in 2 years	
Assigned to treatment	--	-2.1	--	-2.0
		(4.3)		(2.0)
Pre-T unmet need >$3500	-9.4**	-14.8***	-2.3	-4.0*
	(4.3)	(5.4)	(1.7)	(2.1)
Treatment*unmet need	--	12.7*	--	4.0
		(6.6)		(2.8)
Sample Size	516	516	516	516

SOURCE: University of Wisconsin System.

Notes:

(1) Standard errors from the regression are listed below the regression coefficients.

(2) Outcomes cover any of the 13 four-year University of Wisconsin System universities, as well as the 13 two-year University of Wisconsin Colleges.

(3) * represents p<.10, ** represents p<.05, and *** represents p<.01.

(4) All models include college fixed effects and covariates for race, gender, parental education, age, and EFC.

(5) More selective colleges are the two colleges with unmet need data and median ACT scores of 25 or higher. The other eight colleges with unmet need data are

(6) Unmet need is defined as the cost of attendance less total pre-treatment aid and EFC.

(7) The p-value testing for differences between the treatment*unmet need impacts between more and less selective colleges (panels C and D) is 0.055 for retention and 0.096 for credit attainment.

Appendix. Award Letter

October 22, 2008

Dear Student,

Congratulations! We are delighted that you were selected to receive a grant from the Fund for Wisconsin Scholars, Inc. (FFWS) for the 2008-2009 academic year. The FFWS was established by John P. and Tashia F. Morgridge to provide grants to graduates of Wisconsin public high schools to attend colleges and universities of the University of Wisconsin and Wisconsin Technical College Systems. You can view more information about the FFWS at www.ffws.org . The recipients of the FFWS grants were chosen from a group of eligible students through a random selection process completed at the office of the Wisconsin Higher Educational Aids Board (HEAB). The amount of your grant is $3500/year if you are a four year student and $1800/year if you are a two year student; you will receive half of the grant in the fall semester and half in the spring semester. The grant is available to you for up to ten semesters, if you continue to meet the eligibility criteria.We hope to maintain active communication with you throughout your college experience and beyond. Our dream for you is that you will successfully complete a degree and leave college with less debt than you might have otherwise had and with the skills, knowledge and willingness to contribute to our society.

There are a few steps that you need to take to accept and receive this grant.

1. Complete and sign the attached Student Response Form in which you:
   - verify your eligibility
   - acknowledge and accept the grant and
   - consent to the release of your high school and college academic and financial information to the FFWS from:
     i. your current school,
     ii. the Department of Public Instruction (DPI) and
     iii. the HEAB.
2. Return the completed Form in the envelope provided.

Once I receive your completed and signed document, I will send you instructions to enroll in our ***secure***, recipient information system on the web. This will be the means by which I communicate with you most often and by which you can communicate with other recipients. It will also be the system where your academic and financial data will be stored. Once you are enrolled, your school will be notified of your receipt of the FFWS grant and the money will be sent to your school for distribution to you. We wish you the best in your college endeavors and look forward to meeting you.

Appendix 1: Covariate balance by treatment status and institutional selectivity.

	More selective colleges			Less selective colleges		
Characteristic	Cohort 1 (full)	Cohort 1 (admin data)	Cohort 1 (unmet need)	Cohort 1 (full)	Cohort 1 (admin data)	Cohort 1 (unmet need)
Median ACT (college-level)	-0.0	0.0	-0.2	0.0	0.0	0.1
	(0.2)	(0.3)	(0.3)	(0.1)	(0.1)	(0.1)
Pct admitted (college-level)	0.0	-0.0	0.2	-0.0	-0.2	-0.4
	(0.2)	(0.2)	(0.2)	(0.4)	(0.5)	(0.6)
Gender (percent female)	-5.0	3.3	1.1	3.4	5.6	4.1
	(7.1)	(7.9)	(9.3)	(3.2)	(3.6)	(4.6)
Targeted minority (pct, self-report)	-3.2	-0.6	-3.1	-0.2	-0.9	1.6
	(5.2)	(5.1)	(5.2)	(3.3)	(3.8)	(4.0)
Average age (years)	0.00	-0.01	-0.01	-0.02	-0.00	-0.01
	(0.06)	(0.07)	(0.08)	(0.04)	(0.04)	(0.05)
First in family to attend college (pct)	7.3	14.0*	13.0	-3.0	-5.8	-1.9
	(7.2)	(8.1)	(9.8)	(3.4)	(3.8)	(4.9)
Father has an AA or higher (pct)	-2.8	-9.0	-15.1	1.3	3.0	-1.7
	(7.4)	(8.3)	(9.9)	(3.2)	(3.6)	(4.6)
Mother has an AA or higher (pct)	-12.5*	-13.8*	-13.2	5.7*	8.9**	8.1*
	(7.4)	(8.1)	(9.7)	(3.3)	(3.7)	(4.8)
Financially dependent on parents (pct)	0.0	0.0	0.0	0.4	1.0	1.7
	(0.0)	(0.0)	(0.0)	(1.1)	(1.2)	(1.6)
Expected family contribution ($)	-293	-317	-390	50	7	-82
	(242)	(284)	(355)	(142)	(156)	(191)
Zero expected family contribution (pct)	6.2	4.6	2.3	-3.3	-5.2	-8.9**
	(5.2)	(6.0)	(5.8)	(3.0)	(3.4)	(4.3)
Parent(s)' adjusted gross income ($)	-2041	-3616	-3794	499	1227	2628
	(2414)	(2765)	(3261)	(1189)	(1336)	(1735)
Parent(s)' investment net worth ($)	2358	4030	656	-1627*	-1491	-224
	(2279)	(2634)	(3229)	(837)	(911)	(1239)
Sample Size	215	167	119	1101	858	520
Percent of sample represented	100.0	77.8	54.0	100.0	77.3	47.6
Treatment differential (pct)	--	4.2	6.9	--	2.0	4.5
	--	(5.8)	(7.1)	--	(2.7)	(3.3)

SOURCES: Fall 2008 WSLS survey (race), UW System (prior enrollment), IPEDS (college-level measures), FAFSA (all other measures).

Notes:

(1) Standard errors from the regression are listed below the regression coefficients. All regressions include institutional fixed effects except for college-level ACT and admit rates.

(2) Prior enrollment measures any enrollment history in the University of Wisconsin System prior to the beginning of the first semester of college.

(3) Targeted minority groups include: African-Americans, Latinos, Southeast Asians, Native Americans, and multiracial. "Targeted" refers to a policy of the University of Wisconsin System, in which all sample participants began college.

(4) Parent investments (dependents only) had few extreme values with undue influences and were Winsorized at the 95th percentile (Tukey, 1962).

(5) * represents p<.10, ** represents p<.05, and *** represents p<.01.

(6) More selective colleges are the two colleges with median ACT scores of 25 or higher. The other eight colleges are classified as less selective.

(7) This is limited to the ten campuses in cohort 1 with unmet need data.

Appendix 2: Falsification tests on retention impacts by unmet need cutoff.

	$500 unmet need cutoff			$1,500 unmet need cutoff		
	More Selective	Less Selective	p-value	More Selective	Less Selective	p-value
Assigned to treatment	2.0	-1.4		-0.0	-3.8	
	(2.9)	(7.6)		(2.1)	(5.9)	
Pre-T unmet need >$X	0.7	-5.3		-2.0	-6.8	
	(2.1)	(6.5)		(2.1)	(5.4)	
Treatment*unmet need	-4.0	7.3	0.243	-1.5	11.9*	0.116
	(4.5)	(8.6)		(4.5)	(7.2)	
Sample Size	118	516		118	516	
T pct with >$X unmet need	90.4	82.6		86.6	72.1	
C pct with >$X unmet need	90.2	83		80.1	70.4	

	$2,500 unmet need cutoff			$3,500 unmet need cutoff		
	More Selective	Less Selective	p-value	More Selective	Less Selective	p-value
Assigned to treatment	-1.8	-4.8		-0.3	-2.1	
	(4.9)	(5.2)		(3.8)	(4.3)	
Pre-T unmet need >$X	3.1	-9.6*		2.2	-14.8***	
	(4.8)	(5.3)		(4.9)	(5.4)	
Treatment*unmet need	0.3	15.3**	0.070	-3.0	12.7*	0.055
	(4.6)	(6.9)		(4.8)	(6.6)	
Sample Size	118	516		118	516	
T pct with >$X unmet need	54.6	63.7		38.2	53.5	
C pct with >$X unmet need	57.0	60.3		45.9	51.6	

	$4,500 unmet need cutoff			$5,500 unmet need cutoff		
	More Selective	Less Selective	p-value	More Selective	Less Selective	p-value
Assigned to treatment	-1.7	-0.5		-1.9	0.7	
	(4.3)	(4.3)		(3.9)	(3.9)	
Pre-T unmet need >$X	4.6	-12.0**		3.4	-14.6**	
	(3.0)	(5.7)		(2.3)	(6.5)	
Treatment*unmet need	1.5	10.9	0.264	4.0	10.8	0.440
	(4.6)	(7.0)		(4.6)	(7.5)	
Sample Size	118	516		118	516	
T pct with >$X unmet need	18.3	42.5		12.2	33.4	
C pct with >$X unmet need	23.6	46.2		17.9	35.3	

Appendix Table 2 notes

SOURCE: University of Wisconsin System.
Notes:
(1) Standard errors from the regression are listed below the regression coefficients.
(2) Retention includes any of the 13 four-year University of Wisconsin System universities, as well as the 13 two-year University of Wisconsin Colleges.

(3) * represents p<.10, ** represents p<.05, and *** represents p<.01.
(4) All estimates include college fixed effects and covariates for race, gender, parental education, age, and EFC.

(5) More selective colleges are the two colleges with unmet need data and median ACT scores of 25 or higher. The other eight colleges with unmet need data are classified as less selective.

(6) Unmet need is defined as the cost of attendance less total pre-treatment aid and EFC.
(7) The p-value tests for differences between the treatment*unmet need impacts between more and less selective colleges.