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Subtraction by Addition: Do Private Scholarship Awards Lead to Financial Aid Displacement?

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Award displacement occurs when one type of financial aid award directly contributes to the change in the quantity of another award. We explore whether postsecondary institutions displaced awards in response to the Pittsburgh Promise scholarship by capitalizing on the doubling of the maximum Promise amount in 2012. We use de-identified student-level data on each Promise recipient's actual cost of attendance, grants, and scholarships, as well as demographic and academic characteristics from school district administrative files to examine whether and how components of students' financial aid packages and total costs of attendance changed after the Promise award increase. To account for overall trends in pricing and financial aid, we compare Promise recipients to the average first-time, full-time freshman entering the same institutions in the same year as reported by the Integrated Postsecondary Education Data System (IPEDS). With these two data sources, we assess differences in costs and awards between Promise students and their peers, on average, and examine whether and in what ways these differences changed after the increase in Promise funding. We refer to this strategy as a "quasi-difference-in-differences" design. We do not find evidence that institutions are responding to the Promise increase through aid reductions.

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Abstract:

Award displacement occurs when one type of financial aid award directly contributes to the change in the quantity of another award. We explore whether postsecondary institutions displaced awards in response to the Pittsburgh Promise scholarship by capitalizing on the doubling of the maximum Promise amount in 2012. We use de-identified student-level data on each Promise recipient's actual cost of attendance, grants, and scholarships, as well as demographic and academic characteristics from school district administrative files to examine whether and how components of students' financial aid packages and total costs of attendance changed after the Promise award increase. To account for overall trends in pricing and financial aid, we compare Promise recipients to the average first-time, full-time freshman entering the same institutions in the same year as reported by the Integrated Postsecondary Education Data System (IPEDS). With these two data sources, we assess differences in costs and awards between Promise students and their peers, on average, and examine whether and in what ways these differences changed after the increase in Promise funding. We refer to this strategy as a "quasi-difference-in-differences" design. We do not find evidence that institutions are responding to the Promise increase through aid reductions.

Keywords: educational finance, grants, student financial aid

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Subtraction by Addition:

Do Private Scholarship Awards Lead to Financial Aid Displacement?

I. Introduction

Private scholarships disbursed more than \$3 billion to students in the US during the 2003-2004 academic year alone, with an average award of almost \$2,000 (McSwain et al., 2005). However, students may not experience a reduction in out-of-pocket costs due to financial aid displacement, which refers to the practices of colleges reducing other forms of aid when a student receives an outside or private scholarship (Lowry, 2021). Because students must notify colleges of any outside scholarships received, colleges can engage in financial aid displacement practices when making decisions about student financial aid packages.

Financial aid displacement is perceived as unfair and has faced much criticism, particularly from private scholarship providers who found that many of the students receiving their scholarships get much less in other types of financial aid (Prudente, 2017; Elkin, 2013). Critics argue that aid displacement may discourage and penalize students applying for and receiving external grants and scholarships. They note that reductions in financial aid packages of the students who receive external scholarships are particularly inequitable if these students still have unmet financial need and/or come from low-income backgrounds.

From an economic perspective, financial aid displacement in response to external scholarships may be an important mechanism driving these scholarships' effects, given what we know about the role of funding for college (Dynarski et al., 2022; Scott-Clayton, 2011). If institutions effectively absorb some or all of the value of the grant dollars through aid displacement, this may undermine the potential for the positive effects of external financial aid on college access to translate to increases in degree attainment. Risk-averse, low-income students

may be especially sensitive to cost and pricing changes and may consider not enrolling or persisting in college if out-of-pocket costs are higher than anticipated (Dynarski, 2004, 2008). In other words, if students may not experience the reduction in out-of-pocket costs due to aid displacement, this may reverberate negatively through their college-going decisions and choices.

Recent policy initiatives have aimed to address financial aid displacement by outlawing the practice or requiring more transparency from colleges in awarding financial aid packages. Some states, such as Maryland, California, Pennsylvania, New Jersey, and Washington, have implemented restrictions on aid displacement at public institutions. The bipartisan *Helping Students Plan for College Act of 2021* has been introduced at the federal level to address this issue. These policy efforts recognize the significance of college financial aid and its displacement in the context of rising college costs, decreasing state funding, and post-pandemic inflation. However, there is limited research evidence on financial aid displacement, with most existing studies focusing on national or state-level policy changes that affect financial aid availability.

In this paper, we contribute to the literature on college financial aid and aid displacement by investigating whether the aid packaging practices of postsecondary institutions are responsive to the generosity of the Pittsburgh Promise scholarship. Our investigation capitalizes on the doubling in the Pittsburgh Promise's maximum annual award amount from \$5,000 to \$10,000 in 2012. Institutions seeking to capture some or all of this increase in Promise dollars could potentially respond by decreasing institutional aid to Promise recipients or by adjusting students' financial need by increasing miscellaneous living expenses charged to the student.² Due to the

² "Financial need" is defined as the difference between the institution's total cost of attendance and the student's estimated family contribution (a measure of a student's financial capacity to pay for college). Financial aid administrators may use professional judgment to alter Expected Family Contribution (EFC) inputs or estimated living

last-dollar design of the Pittsburgh Promise, the scholarship organization collects student-level information regarding institutional costs and financial aid awards received each semester. We use this detailed administrative data to examine aid displacement using interrupted time series and quasi-difference-in-differences estimation approaches.

To preview our results, we do not find conclusive evidence that institutions allocate less in institutional aid in response to the Promise increase. However, across institutional sectors, students receive significantly less in other private and government sources of aid. These impacts are especially substantial for Pell-eligible students. Although we are not able to disaggregate this category further to investigate why students are receiving less in private and government sources of aid, we discuss potential mechanisms driving this result.

In the next section, we describe the Pittsburgh Promise and Pennsylvania's higher education market and discuss mechanisms through which we might expect institutions to respond to the Promise award. Then, in section III, we detail our data sources and research design. We present results in section IV and conclude with a discussion and the implications of our findings in section V.

II. Background and Potential Institutional Responses to the Promise Doubling

Pittsburgh Public Schools and the Pittsburgh Promise

Following a period of decline and population reduction after the steel industry's collapse in the 1980s, Pittsburgh experienced an economic revival, primarily attributed to targeted investments in higher education and healthcare sectors (Krugman, 2013). However, while this economic resurgence brought positive changes to the city, its impact on the Pittsburgh Public Schools (PPS)

expenses, which may change a student's financial need. The FAFSA Simplification Act adopted in 2021 replaces EFC with the Student Aid Index (Lieber, 2021).

system was not equally transformative. If in 1968, PPS served approximately 68,000 students, the current enrollment stands at a mere 20,000 (Pittsburgh Public Schools, 2022). The academic performance among PPS students continues to lag behind their counterparts in other districts in Pennsylvania. Further, the racial composition within PPS also exhibits an inverse relationship compared to the overall population of Pittsburgh, with black students comprising over 53% of the student body (Pittsburgh Public Schools, 2022), more than double the proportion of black residents in the city.

Situated within this context, the Pittsburgh Promise emerges as a prominent and transformative educational reform. Announced in December 2006 by then PPS Superintendent Mark Roosevelt and Mayor Luke Ravenstahl, the Promise aimed to alleviate financial barriers for Pittsburgh Public Schools graduates pursuing postsecondary education (Lord, 2006). The program commenced with the PPS class of 2008, backed by substantial support from local industries and philanthropic organizations, including notable contributions from the University of Pittsburgh Medical Center, the Grable Foundation, the Heinz Endowments, and The Pittsburgh Foundation (Niederberger, 2019).

The goals of the Pittsburgh Promise are to bolster PPS student achievement, catalyze educational system reforms, stabilize city and school populations, and invigorate the local workforce and volunteerism. It has the distinctive traits of place-based promise programs and aims to address local educational and developmental objectives by supporting residents in pursuing higher education (Gndara & Li, 2020; Miller-Adams, 2021).

PPS students who meet Promise's eligibility criteria receive financial aid for up to four years to attend any Pennsylvania-based postsecondary institution. Diverging from the universal eligibility approach of the pioneering Kalamazoo Promise, the Pittsburgh Promise opted for a

merit-based design, incorporating GPA and high school attendance as eligibility criteria in addition to the residency requirement (Miller-Adams, 2015; Miller-Adams et al., 2022). Moreover, the Pittsburgh Promise offers relative geographic flexibility, allowing recipients to choose from a range of colleges within Pennsylvania, unlike some Promise programs with fund usage restricted to one or a few specific institutions (Miller-Adams, 2015).

Like most place-based financial aid programs, The Pittsburgh Promise operates as a last-dollar scholarship, necessitating students first to explore federal, state, and institutional aid options³ (Billings, 2018). At the same time, unlike most place-based scholarships, The Pittsburgh Promise allows recipients to allocate their Promise funds towards all aspects of college attendance, encompassing room and board expenses.

The Pittsburgh Promise annual awards were set at a maximum of \$5,000 when the program was first established, and in 2012, the maximum award amount was raised to \$10,000 per year. The program relies on continued fundraising and is expected to continue at least until 2028, as stated by The Pittsburgh Promise Foundation (2023).

Previous studies have shown that the Pittsburgh Promise introduction is associated with stabilized district enrollment and is an important factor behind parents' decisions to enroll their children in PPS (Gonzalez et al., 2011). Educators reported perceiving the Promise as a motivator for students to pursue postsecondary education, and schools provided additional support to help students navigate the college application process (Iriti et al., 2009). Students perceived Promise's GPA requirement as an incentive for better academic achievement (Gonzalez et al., 2011; Iriti et al., 2009). In an early evaluation, Gonzalez et al. (2011) found a positive but not statistically significant effect on timely college enrollment and a five-percentage point increase in second-year

³ Colleges submit an invoice detailing the student's financial aid package to the Promise, and funds are disbursed directly from the Promise to colleges.

college persistence for Promise-eligible students. Bozick, Gonzalez, and Engberg (2015) found that the Pittsburgh Promise increased enrollment in four-year colleges. Page et al. (2019) estimated that the Promise increased college enrollment by 5 percentage points, enrollment in four-year colleges by 8 percentage points, enrollment in Pennsylvania-based institutions by 10 percentage points, and second-year persistence by 4-7 percentage points. Despite the substantial investment, cost-benefit analyses suggest positive returns for the Promise (Page et al., 2019).

Pennsylvania Higher Education Context

The Pittsburgh Promise recipients have a wide variety of higher education institutions to choose from in Pennsylvania. First, the state's public institutions include 12 state-owned 4-year colleges that are part of the Pennsylvania State System of Higher Education⁴. These institutions, originally “normal schools,” are dispersed throughout the state and are known as one of the most affordable higher education options in the state. There are also 15 public community colleges with branch campuses conveniently located throughout the state.

Next, there are more than 90 nonprofit private 4-year colleges in Pennsylvania located throughout the state, including popular privates like Carnegie Mellon University, Drexel University, University of Pennsylvania, and Villanova University (Association of Independent Colleges and Universities of Pennsylvania, 2022).

Finally, unlike other states, Pennsylvania has a unique group of “state-related” universities that have a hybrid public-private status and are part of the Commonwealth System of Higher

⁴ The state colleges of Pennsylvania are Bloomsburg University, East Stroudsburg University, Cheyney University, Indiana University of Pennsylvania, Kutztown University, Lock Haven University, Mansfield University, Millersville University, Pennsylvania Western University, Shippensburg University, Slippery Rock University, West Chester University,

Education. Legally, these are private universities and were designated as state-related by the state legislature, but they receive state appropriations (accounting for less than 10% of their budgets), offer discounts to residents of the state, and include a small share of state representatives in their independent boards of trustees (Heller, 2006). PA's state-related colleges include Lincoln University of Pennsylvania, 24 regional campuses of the land-grant Pennsylvania State University, Temple University, and 5 campuses of the University of Pittsburgh. Tuition and fees of state-related colleges are much higher than those of state-owned colleges.

An important point for our analysis is that Pennsylvania's public, private, and state-related institutions differ in the degree of control the state legislature possesses over institutional operations. Public institutions in the state are constrained by the PA Board of Governors, which sets tuition and develops policies that guide the state's public institutions in the disbursement of scholarships and grants. However, both private and state-related institutions have ample control over setting tuition and other price levels and over distributing institution-specific financial aid. Given this unique variation in price setting across PA's higher education sectors, institutional responses to the Promise award increase may differ for public, private, and state-related colleges.

Table 1 displays colleges of these three types that enroll at least 100 Promise recipients. For each college, we report the number of Promise recipients attending in the academic years 2009-2010 to 2014-2015, as well as the average share of incoming freshmen who are Promise recipients. The table includes four state-related institutions, four public four-year institutions, and four private four-year institutions in Pennsylvania, suggesting that Promise students attend all three types of colleges. Notably, even among these institutions, Promise recipients account for a very small fraction of all incoming freshmen. The largest class of Promise students in a single institution was at Point Park University and consisted of about 55 students in one year, accounting for less than

5% of the entering freshmen class in that year. Additionally, the distribution of Promise scholars is relatively even across colleges, minimizing the possibility of our analyses being overpowered by specific large institutions.

Another feature of Pennsylvania's higher education market that is relevant to our analysis is that college attendance in Pennsylvania is among the most expensive in the nation. In the 2022-2023 academic year, the average published in-state tuition and fees at public four-year colleges were \$10,940 nationally and \$15,550 in Pennsylvania, the fourth highest in the country (Ma & Pender, 2022)⁵. In the same year, the in-district tuition and fees at public two-year colleges were \$3,860 nationally and \$5,793 in Pennsylvania, the ninth highest in the country (Ma & Pender, 2022). In contrast, the average state and local funding per public full-time equivalent student was \$9,330 in the US and only \$6,160 in Pennsylvania, the ninth lowest in the country⁶ (Ma & Pender, 2022). If nationally, the state and local funding provides, on average, about \$5.04 per \$1,000 in personal income, Pennsylvania students only get about \$2.4 per \$1,000 of personal income, the second lowest amount in the country (Ma & Pender, 2022). Because PA is such a high tuition and low-aid higher education market, institutions may carefully monitor state grants and outside scholarships to ensure all students are adequately funded. For example, institutions may want to provide aid to the greatest number of students or to those most in need by distributing institutional aid to students not receiving other state or private scholarships.

⁵ This ranking does identify Pennsylvania's state-related institutions as public institutions, which may inflate Pennsylvania's ranking.

⁶ One of the largest grants in the state is the PA State Grant, a need-based program operated by the PA Higher Education Assistance Agency (PHEAA). The amount a student receives can vary each year depending on the funding available, the number of applicants, and their financial need. Approximately 150,000 students in the academic year 2016-2017 received a PHEAA grant, with the average award estimated at \$2,600 and a maximum award of \$4,340 (NASSGAP, 2019).

Literature Review: Potential Institutional Responses to the Pittsburgh Promise

Several potential patterns and mechanisms of institutional responses to the Pittsburgh Promise award increase emerge from a review of the extant literature on federal, state, and local financial aid displacement (see Table A1 in Appendix A for the details of the studies discussed here).

Tuition & fees may increase at private and state-related colleges and decrease at public colleges

The degree of autonomy over tuition and fees appears to predict institutional adjustments of financial aid. It is likely that private colleges may increase tuition and fees after the Promise's maximum award doubled in 2012 based on the evidence of such increases (coupled with offers of more institutional aid in some contexts) in response to federal aid programs (Acosta, 2001; Curs & Dar 2010a, 2010b; Li, 1999; McPherson & Schapiro, 1991; Singell & Stone, 2007). Next, we can expect Pennsylvania's state-related colleges to raise tuition and fees because the state has limited authority over their tuition setting. Indeed, research suggests that after the introduction of both means-tested and merit awards, public colleges have increased tuition and fees in states (such as Kentucky or West Virginia) where there is less institutional oversight and governing boards allow public institutions more autonomy in price-setting (Hunt, 2016; Kramer et al., 2018; Upton Jr, 2014).

In contrast, public colleges may decrease tuition and fees since the Pennsylvania State System of Higher Education has more authority over their price-setting and may be interested in keeping tuition low. There is ample evidence showing that public colleges reduce tuition and fees after the introduction or increase of means-tested or merit aid programs in states with centralized tuition-setting authority or a multi-faceted policy approach to induce college enrollment across the state (Curs & Dar, 2010a, 2010b; Kramer et al., 2018; Lee, 2016; Long, 2004). To capture this

potential heterogeneity of institutional responses across sectors, we run our estimates separately for public, private, and state-related colleges.

Living expenses may increase in public colleges

While having little discretion in setting tuition, public colleges in Pennsylvania may react to the increase in the Promise award amount by raising room and board rates. Such increases in response to external aid awards are possible because both the state and federal governments afford colleges much discretion in calculating living expenses. Federal regulations even permit financial aid administrators to adjust the cost of attendance on a case-by-case basis to accommodate special circumstances (Federal Student Aid, 2019). Institutions typically rely on student surveys or rental listings to determine cost estimates, following guidelines from national financial aid administrator associations (Kelchen, 2018). Colleges also establish different living costs for specific student categories, such as students with disabilities and/or students with dependents. Unsurprisingly, there is considerable variation in living cost allowances among colleges, even those located in similar geographic areas (Kelchen et al., 2017). In support of this potential institutional response, Long (2004) finds that institutions with a large share of Georgia HOPE merit award recipients raised room and board rates after HOPE's inception. To capture evidence of this potential institutional response, we include the cost of room and board, books, and other living expenses in the list of outcome variables.

An important point here is that adjustments of these discretionary categories apply to all external aid recipients, so the size of the applicant pool with outside scholarships has implications for the unit of analysis researchers select. Clearly, institution-level estimates will capture increases in room and board in response to large programs like Pell or even Georgia's statewide HOPE

award, especially in colleges or sectors with a large share of recipients of these grants. However, institutional-level analyses may not capture Promise crowd out because Promise students comprise a small share of any college's entire student population (see Table 1). This implies that student-level analyses are needed to examine the crowd-out of the Pittsburgh Promise and other smaller-scale place-based programs. A recent institution-level difference-in-differences study by Delaney & Hemenway (2020) supports this point. Specifically, while Delaney & Hemenway (2020) found evidence of aid displacement at four-year colleges in response to promise implementations across the nation, when subsetting their data just to those promise programs that require students to enroll in one specific institution, the authors find no shifts in financial aid packages. To properly estimate institutional adjustments of the cost of living charges in response to the implementation of the Pittsburgh Promise program, we use administrative microdata and student-level analysis in this study.

Institutional aid may be reduced at an individual-student level in private and state-related colleges

It is possible that colleges may be capturing increased Promise funds by adjusting institutional aid on an individual student basis. There is evidence of such price discrimination across Pell eligibility, with Pell-eligible students receiving more institutional aid on the margin of eligibility but receiving less institutional aid for every additional dollar of Pell received above the eligibility margin (Lucca et al., 2019; Turner, 2014). Individual-level adjustment of institutional aid likely requires colleges to have sufficient resources to begin with, so this might be more common among colleges with abundant resources, most likely private and state-related colleges, although we acknowledge that not all private or state-related colleges are rich. In sum, resources that a college has for institutional aid may make an important stratification margin, in addition to or above the type of control. Our

data does not allow us to explore institutional responses across the levels of financial resources colleges have. However, given that research evidence demonstrating individual-student-level manipulation of aid awards comes from studies of Pell grants, we subset our sample by Pell eligibility status in order to register individual-level adjustment in financial aid.

Pittsburgh Promise aid crowd out may be driven by student and scholarship provider action rather than by colleges

One aspect somewhat neglected in the extant literature is the possibility that reduced non-Promise aid or increased net price may reflect the choices of students and scholarship providers. Specifically, it is possible that Promise recipients reduced scholarship application efforts and did not apply for as many other scholarships once they learned the Promise award had doubled in size. A related possibility is that college financial aid organizations may direct aid dollars to where they are believed to be needed the most. In other words, it is possible that scholarship providers were less likely to select students from the Pittsburgh Public Schools to receive their awards.

Additionally, the last-dollar nature of the Pittsburgh Promise may limit students' ability to apply for more aid. In particular, the Promise is awarded after and in addition to federal, state, and institutional awards received by the student, and thus it essentially reduces a student's financial need. If the Promise lowers a student's need to the extent that she becomes barely eligible (or ineligible) for additional aid (including campus-based aid available for the neediest students), she may choose not to apply for this additional aid (or she may not receive it even if she applies). This would be especially salient for lower-income students. Examining the impact of this mechanism on the displacement of Promise aid is a complex task due to challenges in operationalizing and measuring student or scholarship provider actions. To address this potential mechanism, we

include other grant aid amounts as an outcome variable proxying the result of student or aid provider behavior.

III. Methods

Data

Our analyses rely on data from several sources. First, we use student-level administrative records from the Pittsburgh Promise on Promise recipients from the Pittsburgh Public Schools (PPS) graduating classes of 2009 through 2015.⁷ The Promise requires each student's institution to complete and submit an invoice detailing the student's financial aid package. Through this invoicing process, the Promise captures detailed, student-level cost and financial aid information, including EFC, institutional charges by category, and financial aid. This comprehensive information enables the Promise to calculate the last-dollar scholarship amount for each student. From a research perspective, these data allow us to observe each student's total cost of attendance and grant-based financial aid from all possible sources. Our second source of data is PPS administrative records. From these files, we use the following student-level demographic, academic, and behavioral variables: sex, race/ethnicity, high school GPA, year of graduation, PSAT scores, and high school attendance rate. Merging these two data sources yields a sample of 6,172 unique student records across seven graduating cohorts.

We make several restrictions to arrive at our final analytic sample. We restrict our analysis to those students attending four-year institutions and drop 1,258 students who attended a community college. Due to more limited resources and low tuition costs, two-year institutions do

⁷ Although the Promise began with the graduating class of 2008, it did not collect information on individual student charges until the 2009-2010 academic year.

not provide much institutional aid and therefore have little opportunity to alter aid allocations in response to external aid. Further, in the context of the Promise, two more factors substantiate our decision to exclude community colleges from our analytic sample. First, nearly all Promise recipients attend the Community College of Allegheny County (CCAC) in Pittsburgh. If we were to include two-year colleges in the data, our analyses would be confined to this single college. Second, and more importantly, students attending two-year colleges receive refunds if their financial aid exceeds their cost of attendance. This implies that the issue of financial aid displacement is not a concern for Promise recipients attending community colleges.

Next, we exclude an additional 178 students attending for-profit institutions, reasoning that we do not have sufficient data to estimate the effects for this sector. Finally, we drop 810 students who did not enroll in college immediately after high school graduation and 235 students who attended out-of-state institutions during the academic year but who enrolled in a Pennsylvania institution in the summer (presumably when home from their primary institution).

Because our analytic strategy relies on comparing students across cohorts who attend the same institution, we drop an additional 656 students attending institutions where no or only one Promise student attended in one of the years in our analysis. Eligibility criteria in the Promise's first two years of operation were less stringent than in later years (for more information, see Page et al., 2019). Therefore, to keep student cohorts similar across years, we drop 56 students from cohort 2009 who did not meet the eligibility criteria in later years of a 90% high school attendance rate and a 2.5 graduating GPA. Our final sample includes 2,979 first-year college students across 23 PA four-year institutions.

In Table 2, we present descriptive statistics for student characteristics and time-variant institutional characteristics. Promise recipients in our analytic sample have an average GPA of

3.25, a high school attendance rate of 97%, and an average PSAT score in the 40th percentile of the national score distribution. Approximately 47% of recipients are nonwhite, and three in five are female. Due to skewness in the EFC distribution, we take the natural log of EFC after adding 1 for those students with EFCs of zero. More than half of the Promise students in our sample have EFCs that qualify them for need-based federal and state aid.

We emulate extant studies examining institutional responses to financial aid by including in our models measures for demand for placement at the institution (Rizzo & Ehrenberg, 2003; Lee, 2016), the wealth of the institution (Acosta, 2001; Curs & Dar, 2010a), and the economic conditions in the institution's county (Acosta, 2001). These time-variant covariates allow us to account for the number of students requiring aid each year, the amount of financial aid the institution can distribute to students, and the cost of living in the institution's community which is used in calculating a student's other living expenses.

Empirical Strategies

Interrupted Time Series

Our analytic strategy capitalizes on the shift in the maximum Promise award from \$5,000 / year to \$10,000 / year starting with the graduating class of 2012. Institutions are aware of the amount each student is eligible to receive in Promise dollars through the invoicing process. If institutions are adjusting student charges or financial aid awards in response to Promise funding, we would expect to see a discontinuous change in charges and/or aid packages for Promise recipients in the class of 2012 and beyond. To explore this possibility, we use an interrupted-time series approach similar to Pallais' (2015) examination of student responses to the increase in the

number of free-score sends that the ACT provided to test-takers in 1997. Our analytic model takes the following form:

$$Y_{ijs} = \alpha_j + \rho_s + \beta_1 2012_i^+ + \beta_2 Year_i + \beta_3 2012^+ \times Year_i + \gamma X_i + \varphi W_{ij} + \varepsilon_{ijs} \quad (1)$$

where the dependent variable is a measure of institutional charges or a financial aid award component for student i in institution j who graduated from high school s . 2012_i^+ is a binary indicator equal to 1 if a student graduated from high school in 2012 or beyond.⁸ $Year_i$ indicates the year student i completed high school, centered on 2012, and β_2 represents the linear trend in time, while $2012^+ \times Year_i$ adjusts for a differing linear trend post-2011. To control for any shifts over time in the characteristics and qualifications of students, X_i is a vector of student-level characteristics, which includes all those reported in Table 2. W_j is a vector of institution-level characteristics that vary by year and can also be found in Table 2. We include institution fixed effects, α_j , to focus on variation in expenses and aid for students attending the same institution. We also include high school fixed effects, ρ_s , to control for high school-specific factors, such as college-going cultures, behaviors, and supports regarding financial aid. β_1 is our primary coefficient of interest and represents changes in institutional charges or financial aid award components from 2011 to 2012, when the Promise doubled in maximum generosity. We cluster standard errors at the higher education institution by graduation year level.

Using this model specification, we comprehensively examine shifts over time in students' college costs and other financial aid awards. Specifically, we examine shifts in the total cost of attendance, Promise award amounts, Pell awards, and other grants and scholarships. We examine

⁸ Similar to Pallais (2015), we first included an indicator for whether a student graduated in 2012 and another indicator for whether a student graduated after 2012. We hypothesized that institutions may not respond to the Promise increase in its first year and that we may only see the effects of the increase in later cohorts after institutions were more attuned to the increase in scholarship level. We found that results were similar across years and therefore estimate a pooled effect for 2012 and beyond.

each student charge and financial aid component both in 2016 dollars and as a percentage of the total cost of attendance in that year. Finally, we consider the aggregate effect of these financial aid package components by examining student net price. We use the IPEDS definition of net price, which is the total cost of attendance (including tuition, fees, room and board, books, and other living expenses) minus all grants and scholarships received. This allows us to estimate the impact of the Promise increase on out-of-pocket costs borne by the student.

Quasi-Difference-in-Differences

A threat to the validity of our estimates is that the changes in student costs and aid packages that we observe before and after 2012 may be a function of changes over time in the higher education funding environment in Pennsylvania rather than changes in response to the shift in Promise generosity. A stronger analytic design would be possible if we could observe financial aid information for students who were observationally similar to and attended the same colleges at the same time as Promise recipients. With these data, we would match Promise students to their non-Promise counterparts and use a matched difference-in-differences design in which we compared differentials in aid packages before and after 2012.

Unfortunately, we lack access to this ideal comparative student-level data. Instead, to address this concern, we turn to information available through the Integrated Postsecondary Data System (IPEDS). IPEDS is a system of surveys conducted by the US Department of Education that provides publicly available data about all institutions of higher education in the US participating in the federal student financial aid program. From IPEDS, we observe year-by-year information on financial aid awards for the typical student within each of the institutions on which we focus. The use of IPEDS data is predicated on the idea that we would not see changes in the

aggregated institution-level data in response to a place-based scholarship, and, therefore, this data serves as a reasonable point of comparison. Because Promise students comprise only a small share of the entering freshmen class (see Table 1), we reason that the Promise students in any institution are unlikely to have an impact on the aggregate financial aid values as reported in IPEDS. With these data, we consider how, if at all, Promise Scholars' financial aid awards differ from their average peer attending the same institution in the same year. To make this comparison, we augment our student-level data set with IPEDS-reported average levels of financial aid for the same institution in the same academic year and calculate for each Promise recipient the deviation of their college costs and financial aid components from the average levels reported in IPEDS.

More specifically, we match each individual Promise student to the average amount first-time, full-time students at the same institution and in the same year received in Pell, institutional grants, and other awards separately.⁹ Because institutions may alter a student's living expenses and financial need in response to outside aid the student receives (Kelchen et al., 2017), we also match Promise students to the average student total cost of attendance charges reported in IPEDS.

We refer to our resulting analytic approach as a "quasi-difference-in-differences" strategy, where students' deviations from campus-cohort levels serve as a first difference, and we compare the magnitude of these differences before and after 2012. We use the same model specification as articulated in equation (1) but with the differential from the campus average as the outcome. The coefficient on 2012+ in equation (1) tells us whether this differential became larger or smaller for the 2012 cohort. If there is a significant change in this differential in 2012, we may infer that

⁹ Unfortunately, we are not able to disaggregate federal, state, and private grants and scholarships that Promise students have received because institutions do not have to list each individual award on their invoice to the Promise. Instead, we use IPEDS' summation of federal, state, and local scholarships received by the average student and match this to the summation of these same grants received by Promise students.

the difference in outcomes between Promise recipients and the average student changed due to the Promise award increase. If institutions are adjusting financial aid packages, we should see either a positive coefficient on student charges (indicating that costs grew among Promise recipients relative to the average student) or a negative coefficient on institutional financial aid awards (indicating that award amounts for Promise recipients decreased relative to the average student). We use pre-policy shift differentials to contextualize the magnitude of the effects that we estimate.

With both ITS and quasi-DiD, we conduct analyses where we subset the sample into public, private, and state-related institutions. We also subset the sample across Pell eligibility, using the yearly Federal Pell Grant payment schedules from 2009 to 2016 to identify, based on EFC, those Promise students who would have been Pell-eligible according to that year's EFC Pell schedule. These subgroup analyses produce sample sizes that are small, rendering our estimates somewhat noisy. For this reason, we consider both statistical and practical significance in our interpretations.

Threats to validity

Our analytic strategies assume that trends in college costs and non-Promise financial aid awards of Promise recipients in each institution prior to 2012 would be informative of the costs and aid components for Promise recipients at these same institutions in 2012 and beyond, absent any changes to the Promise award maximum. The validity of this assumption would be threatened if Promise recipients attending a given institution were substantially different before and after the increase in the maximum award in 2012. To determine whether institutions enrolled qualitatively different Promise recipients after the Promise became more generous, we estimate trends in student characteristics using a model following the structure of equation (1) with student characteristics as outcomes. We present results by institutional sector in Table 3. There is a statistically significant

increase of 15 percentage points in the proportion of male students attending public institutions in 2012. We test for differences in outcomes between male and female students by subsetting the sample by gender and modeling Equation (1). We find no statistically significant or practical differences. We also observe a small decrease in the PSAT scores of students attending public and private institutions in 2012. We control for both high school GPA and attendance rate, which provide additional information about each student's academic ability and background. Overall, our results do not suggest large within-institution shifts in the composition of Promise recipients¹⁰.

A final consideration is understanding the key differences in student characteristics between Promise students and the general student population, as reported in IPEDS. First, Promise students are from lower-income households compared to the average incoming first-year student at the institutions in our sample. When we compare the proportion of Promise students receiving Pell to the Pell-recipient rates of the student bodies at the same institutions, we find that Promise students are more likely than the average student on their campus to receive Pell funds. Thus, it follows that Promise students receive more in means-tested state and federal aid. The differences in Pell rates between these two student populations remain consistent throughout the study's timeframe, providing support for the parallel trends assumption necessary for a difference-in-differences strategy.

Additionally, students may be charged differentially based on the program of study. STEM (Science, Technology, Engineering, and Math) degrees, especially engineering and computer-related fields, cost more for universities to produce. Therefore, many institutions charge students in STEM fields more in tuition and fees (American Institutes for Research, 2013). Universities

¹⁰ In Table B.6 (Appendix B), we present a version of Table 3 where these tests for differentials on observables use the full specification of equation (1), including other covariates. These estimates are substantively similar to those in Table 3.

may also charge students different prices based on the financial returns to their degrees. For example, this has led some universities to charge more to students enrolled in business programs (Stange, 2015). We compared the proportion of students enrolled in STEM, business, and education majors in the fall incoming classes of 2010, 2012, and 2014 as reported in IPEDS, and the analogous proportion of Promise students in these fields in the same cohorts. Overall, the differences in fields of study between the IPEDS data and Promise students are stable over the three time periods.¹¹ Therefore, it would be reasonable to expect differentials in charges also to be relatively stable over time.

One more assumption that should hold for the quasi-DiD estimates to yield valid causal inference is equality of changes over time in outcomes for Promise recipients and students in 4-year colleges in PA prior to the doubling of the Promise in 2012. Our analyses confirm that these changes are indeed equal both in the full sample and in subsamples of students attending public, state-related, and private colleges, providing support for our quasi-DiD estimates. For parsimony, we only present Figures 1-3, which depict the changes in net price, total cost of attendance, and total non-Promise grant aid, respectively, for Promise recipients and the IPED average. Analyses pertaining to other outcomes that are “absorbed” in net price shown in Figure 1 and total cost of attendance shown in Figure 2 (e.g., tuition and fees, Pell grant amounts, etc.) are available upon request.

IV. Results

Descriptive trends

¹¹ IPEDS began tracking enrollment in specific fields of study in 2010 and continues to record this data for every other academic year. We omit this table of results from the paper for parsimony, but it is available upon request.

We begin by examining descriptive trends in average Promise awards across Promise cohorts to demonstrate visually the impact the Promise award increase had on out-of-pocket college costs for Promise recipients. In Figure 4, we present the average first-year Promise award by cohort in 2016 dollars.¹² The average Promise award nearly doubled in size in 2012. This is true both overall and within each institutional sector. The trends in net price after accounting for all grants and scholarships (including Promise) shown in Figure 1 suggest that the average student attending the same institution in the same year paid substantially more in out-of-pocket costs than did the average Promise student prior to 2012. Consistent with the timing of the 2012 scholarship increase, Promise recipients from this year forward experienced a large decrease in out-of-pocket costs in all three types of colleges.

Promise awards and net price

To interpret the results from our quasi-DID models, we must understand the magnitude of the change in differentials in 2012 in conjunction with the magnitude of the differentials in 2011. For example, the fitted 2011 mean provides the difference (Promise value – IPEDS value) in each of the outcomes between Promise students and the average student population prior to the doubling of the Promise award. The coefficient on 2012+ tells us whether this differential became larger or smaller for the 2012 cohort. If there is a significant change in this differential in 2012, we may infer that the difference in outcomes between Promise recipients and the average student changed due to the Promise award increase. To calculate the differential in 2012, we simply add the 2011 fitted mean and the coefficient on 2012+. If institutions are adjusting financial aid packages to capture value from the increased Promise award, we should see either a positive coefficient on

¹² Note that dollar amounts have been converted to 2016 real dollars; therefore, reported Promise dollars received by students may be greater than \$5,000 in 2011 or prior cohorts or \$10,000 in 2012 or later cohorts.

student charges (indicating that costs grew among Promise recipients relative to the average student) or a negative coefficient on institutional financial aid awards (indicating that award amounts for Promise recipients decreased relative to the average student).

We present the results for changes in Promise dollars and net price for each institutional sector in Table 4. The left panel presents results from the interrupted time series model using only Promise recipient scholarship award values, while the right panel presents quasi-DID results for net price. The top panel displays the results for public institutions. In 2011, the Promise accounted for almost 19% of the total cost of attendance for Promise recipients attending public institutions. Once the Promise doubled in size, the award accounted for 41% (19 + 22) of the total cost of attendance. Due to higher costs, the Promise award amounted to only one-quarter of the total cost of attendance in 2012 at private institutions and about one-third of the costs at state-related institutions.

We next turn to the right panel of Table 4, which presents the results of the quasi-difference-in-differences model on net price. If institutional prices and financial aid remain constant across time and students, we would expect to see an increase in Promise dollars that corresponds to a one-for-one decrease in net price. We do not find this to be true within any of the institutional sectors. For example, at public institutions, the average student was responsible for \$7,741 more in out-of-pocket costs than the average Promise student in 2011. This differential only increased by \$2,825 in 2012, which translates to 61% of the average increase in the Promise award received at these institutions. This trend also exists within private institutions, where the decrease in net price is also 61% of the average increase in the Promise award. At state-related institutions, the net price change amounts to 81% of the Promise increase. These results suggest that adjustments to Promise students' financial aid packages could be occurring.

Total cost of attendance

We next turn to results examining the changes in the cost of attendance in Table 5. The first column of the top panel shows that the average student attending a public institution in 2011 faced approximately \$641 less in total costs than did the average Promise student. In 2012, this differential grew by \$271. Most of this increase is due to a statistically significant \$789 change in the 2012 room and board differential. One potential mechanism explaining this result is that Promise students could be selecting more expensive living arrangements and/or meal plans after the increase in Promise generosity. Institutions in our sample do offer students a variety of meal plan and dorm options. Students in particular fields of study, athletics, or honors programs, in particular, may have other living options available to them. Another possibility is that institutions are charging Promise students more in room and board fees. We find this latter hypothesis improbable as room and board fees are standardized.

We find no other statistically or practically significant changes in the remaining cost differentials. Although we observe nonsignificant but practically large changes in the other living expenses differential at public and state-related institutions, the changes in room and board fees lead us to believe that other living expenses in this sample may be affected by changing student living arrangements rather than institutional responses to the Promise increase.

Financial aid awards

Table 6 displays the shifts in non-Promise financial aid awards. The first panel reveals that Promise students attending public institutions in 2011 received approximately \$3,317 more in financial aid than the average student attending the same institution. The majority of this aid is from the Pell

and non-Pell federal, state, and local grants categories. Unfortunately, we are unable to break this latter category down further due to how the Promise invoice is structured. It is unknown if these grants are means-tested government-provided aid or from private sources. We find that the total grant aid differential between Promise students and the average student at public institutions decreases by \$1,524 in 2012¹³. This decline appears to be concentrated in the non-Pell federal, state, and local grants category. We observe a similar decline in this aid category among students attending the other two institutional sectors. It is possible that other award-granting organizations disbursed less aid to Promise students once the Promise award doubled. Another mechanism driving this result may be that additional Promise dollars are exceeding Promise students' financial need calculation (e.g., TCA – EFC). For example, a student may qualify for a government grant if their financial need has not been met by other sources of aid; however, if the additional Promise dollars received in 2012 exceeds a student's financial need, they will no longer qualify for the government grant. It may be that Promise dollars are displacing other awards. We test for this hypothesis and find that student net cost (TCA minus total grants excluding the Promise) remains unchanged from 2011 to 2012 within all institutional sectors. However, including the Promise in this calculation greatly decreases net cost further. This may have implications for student eligibility for campus-based aid such as the Federal Supplemental Educational Opportunity Grant (FSEOG), which is only available to a campus' neediest students.

¹³ In Table B.7 (Appendix B), we show quasi-DID results for total non-Promise grant aid under different standard error assumptions. Table B.7 displays results for models with: institution-by-year clustering, institution clustering, and heteroskedasticity-consistent standard errors without clustering. The interpretation of results does not change as a result of these different standard error approaches. Further, in Figure B.1 (Appendix B), we present event study estimates for total non-Promise grant aid, using 2011 as a reference year. These figures show no substantial difference between Promise students and IPEDS-reported institutional averages in non-Promise grant aid prior to the doubling of the Promise award in 2012. In the post-2011 years, although not always statistically significant, there does appear to be some evidence that Promise students received less in non-Promise grant aid than the average student at the same institution in the same year. This aligns with our overall findings.

Finally, we turn to changes in institutional grants. We find no meaningful changes in the grant differentials at public or state-related institutions. At private institutions, Promise recipients received \$1,104 (251 – 1,355) less in institutional aid in 2012 than did the average student; however, this result is not precisely estimated.

EFC subgroup analysis

Public institutions

We next examine changes in financial aid and costs by Pell eligibility status within institutional sectors. We subset our results by Pell eligibility as determined by the year-relevant Pell-eligible EFC range. We only discuss those tables of results that provide more clarity to the main results presented in the previous sections. The remaining tables we do not discuss here can be found in Appendix B.

Table 7 displays cost of attendance results for those students attending public institutions. The top panel displays results for Pell-eligible students, while the bottom panel displays results for non-Pell-eligible Promise recipients. The bottom panel of Table 7 shows that students not eligible for Pell are responsible for the increases in the room and board differential discussed above, as well as the changes in the other living expenses category. We also find a \$600 increase in the tuition and fees differential in 2012 among non-Pell-eligible students. This may suggest that higher-income students are opting into different living arrangements.

The top panel of Table 8 shows that students with EFCs within the year-relevant Pell range experienced a large reduction in non-Pell federal, state, and local grants. In 2011, Promise recipients received approximately \$2,562 more in these grants than did the average student. In 2012, however, this differential decreased by 56%. For lower-income students that receive a large

amount in need-based aid, the Promise award could be disqualifying them from receiving awards from private scholarship organizations or from campus-based sources available to the neediest students.

State-Related Institutions

We turn to results by Pell eligibility within the state-related sector. In Table 9, we find that Pell-eligible students in 2012 may have selected or been placed in different living arrangements, as the differential decreased by \$1,179. In contrast, we find no significant changes in room and board among higher-income students. However, we do observe that the other living expenses differential is reduced quite substantially in 2012. It is possible for institutions within this sector to increase financial need by inflating a student's other living expenses to ensure the student's financial awards are not displaced by other awards. For example, the University of Pittsburgh, where many Promise recipients enroll, already has a policy against award displacement in place (Prudente, 2017).

Private Institutions

We finally turn to results by Pell eligibility status within private institutions. Table 10 displays the quasi-DID results for non-Promise financial aid. The top panel shows that Pell-eligible students received \$3,854 more in non-Promise grants than did the average student. In 2012, this differential decreased by \$2,747. The reason for this large decrease is due to a reduction in the non-Pell federal, state, and local grants category. Similar to the results discussed above for students attending public institutions, it may be that the Promise award is displacing means-tested aid for lower-income students. This is particularly noteworthy at private institutions because Promise recipients did not experience a statistically significant change in net price after the Promise award doubled.

The bottom panel of Table 10 displays analogous results for non-Pell-eligible Promise recipients. Although not robust, we find a large change in the differential on institutional grants. Results indicate that Promise recipients received \$4,844 more, on average, in institutional grants than did the general population attending the same institutions in 2011. In 2012, the differential decreased by \$4,317. This is suggestive evidence that private institutions may be awarding less aid to those students who are not eligible for means-tested aid.

V. Discussion and Conclusion

Place-based scholarships are often the result of community initiatives with limited funding and substantial investments in ongoing fundraising. The true value and potential longevity of such programs are important considerations for every promise program. If institutions respond to these programs by lowering aid to promise recipients, promise programs essentially subsidize institutions rather than students. If decreases in institutional aid match promise dollars nearly one-for-one, a student's net price does not decrease.

The purpose of this study was to determine whether and how institutions respond to generous place-based scholarships by strategically adjusting financial aid packages and/or student costs. Using detailed data on the financial aid packages of students' awarded scholarship funds through the Pittsburgh Promise and IPEDS data, we do not find conclusive evidence that institutions are altering the financial aid packages of students receiving Promise dollars.

We find some evidence of such institutional "maneuvering" at private institutions in response to the Pittsburgh Promise. Specifically, there is suggestive evidence that private institutions are responding to the Promise through decreases in institutional aid for wealthier students not eligible for the Pell award. Although results are noisy, there is a substantial drop in

institutional aid received by these students at private institutions once the Promise award increased and a nonsignificant reduction in net price.

Overall, we find that the Promise is a considerable piece of the aid package that Promise students receive. It significantly reduces costs, especially at public institutions. The difference in net price between Promise students and the average student attending the same institution in the same year is a testament to Promise's impact on the total cost of attendance.

The surprising result is that students across institutional sectors experienced a large reduction in non-Pell federal, state, and local grants, although we are unable to break this category down further due to data limitations. This finding supports the hypothesis that Promise aid crowd out could be driven by its last-dollar nature (and resulting student/aid organization actions) rather than by colleges.

Notably, most of the reduction in this aid category is occurring among lower-income students that qualify for Pell, suggesting that the Promise award, being the last-dollar scholarship, reduces a student's financial need to the extent that they become ineligible for any additional need-based aid. To allow Pell-eligible students to get additional aid and keep the Promise funds, institutions could adjust Pell-eligible Promise recipients' financial need, as the National Scholarship Providers Association recommended to reduce private scholarship award displacement (NSPRA, 2013).

Several recommendations for future research emerge from our study. First, since the extent to which these results generalize to other Promise settings is unknown, we encourage other promise programs to conduct similar analyses to investigate whether and to what extent promise crowd out could be occurring at institutions where their students enroll. Future research on award displacement should also explore Pell eligibility or other measures of socioeconomic status as a

stratification margin when examining whether institutions provide less institutional aid to students receiving other awards. Next, since the most selective institutions are more likely to capture outside aid (Singell & Stone, 2003), we recommend conducting studies that examine shifts in institutional aid within the college sectors by selectivity.

Another important avenue for future research is exploring what colleges do with the additional resources if and when they capture some outside aid by reducing institutional aid. The existing literature lacks analyses of aid displacement that, while not excusing colleges for reducing aid, would emphasize that the acquisition of external aid by colleges is not necessarily detrimental or unfair to students. What matters more is how colleges spend that captured aid. If colleges capture external aid and allocate it towards enhancing instructional quality or providing additional student support, students may benefit from such investments, increasing their chances of academic success. Economic research has demonstrated that investments in instruction and student support yield positive outcomes for students (Deming & Walters, 2017; Webber, 2012; Webber & Ehrenberg, 2010). While the Pittsburgh promise applies to a small share of students in any college to empirically investigate this point, we believe future research should address it, particularly considering the context of state appropriations that have yet to fully recover from the impact of the Great Recession.

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Tables and Figures

Table 1. Number of first-time Promise recipients attending each of the most commonly-attended colleges from 2010-11 to 2015-16

Institution name	Total Number of Promise Recipients, 2010-2016	Share of Promise Recipients in Incoming Freshmen
Public Four-Year Institutions		
Slippery Rock University	285	3%
Indiana University of Pennsylvania	226	1%
California University of Pennsylvania	196	3%
Edinboro University of Pennsylvania	114	1%
Private Four-Year Institutions		
Point Park University	323	26%
Robert Morris University	236	5%
Duquesne University	182	2%
Carlow University	197	16%
State-Related Four-Year Institutions		
University of Pittsburgh – Main	511	2%
Pennsylvania State University - University Park	321	<1%
Temple University	150	<1%
Pennsylvania State University – McKeesport	115	9%

Sources: Promise administrative files from academic years 2010-11 to 2015-2016 and the Integrated Postsecondary Education Data System (IPEDS) from academic years 2010-11 to 2015-2016.

Notes: The second column shows the number of Promise recipients enrolling in each of the 12 schools across all cohorts. These numbers do not reflect the numbers of students in the final analytic sample. The average proportion of incoming freshmen attending each of the 12 schools that receives Promise dollars is reported in the third column.

Table 2. Analytic sample descriptive statistics

Variables	Mean (SD)
Student characteristics:	
Female	0.59 (0.49)
Nonwhite	0.47 (0.50)
HS GPA	3.25 (0.43)
HS Attendance Rate	96.94 (2.67)
PSAT	114.46 (49.77)
Missing PSAT	0.13 (0.33)
Off Campus	0.13 (0.34)
Log EFC	5.65 (4.44)
Time-variant Characteristics	
Admit yield	32.75 (9.40)
Percent Admitted	69.06 (15.10)
Endowment FTE	20,858.60 (30,934.76)
Gifts FTE	2,290.13 (2,734.04)
Investment FTE	1,453.96 (5,309.69)
State Appropriations (in thousands)	58,700 (94,300)
Average Rent in Institution County	772.18 (92.90)
N	2,979

Sources: Pittsburgh Promise, Pittsburgh Public Schools, IPEDS, and US Census.

Notes: Means and standard deviations (in parentheses) are reported for all cohorts.

Table 3. Differences in covariates before and after Promise increase

	Female	Nonwhite	HS GPA	Attendance	Logged EFC	PSAT Score	Missing PSAT
Public Institutions, N=834							
2012+	-0.15*	-0.04	-0.00	-0.46	0.21	-7.77*	0.00
	(0.08)	(0.06)	(0.06)	(0.36)	(0.65)	(4.43)	(0.02)
R-squared	0.039	0.211	0.147	0.182	0.094	0.764	0.861
State-Related Institutions, N=1,111							
2012+	-0.08	0.01	0.05	0.33	0.73	1.98	-0.01
	(0.05)	(0.07)	(0.05)	(0.26)	(0.61)	(4.28)	(0.02)
R-squared	0.053	0.272	0.446	0.323	0.219	0.745	0.850
Private Institutions, N=1,034							
2012+	-0.00	0.03	0.09	0.36	0.33	-7.55**	0.03**
	(0.08)	(0.06)	(0.06)	(0.33)	(0.45)	(2.96)	(0.01)
R-squared	0.194	0.175	0.187	0.199	0.126	0.767	0.910

* p<0.10, ** p<0.05, *** p<0.01

Source: Pittsburgh promise administrative files.

Notes: Coefficients presented from OLS regressions as a function of graduating in a year in which the Promise doubled in value. Standard errors are presented in parentheses.

Table 4. Promise awards and net price

ITS, Promise Student Sample		Quasi-DID	
Promise		Net Price	
% TCA	\$ 2016	% TCA	\$ 2016
Public Institutions, N=834			
2012+	21.48*** (0.83)	4,636.13*** (170.21)	-16.30*** (3.77)
Fitted 2011 Mean	18.56	5,065.43	-30.72
R²	0.645	0.726	0.575
State-Related Institutions, N=1,111			
2012+	15.70*** (1.26)	4,166.99*** (241.46)	-13.37*** (3.03)
Fitted 2011 Mean	16.69	4,967.49	-22.57
R²	0.578	0.692	0.371
Private Institutions, N=1,034			
2012+	11.48*** (0.95)	4,262.52*** (251.59)	-6.80* (3.94)
Fitted 2011 Mean	12.27	5,089.81	-19.92
R²	0.652	0.694	0.378

* p<0.10, ** p<0.05, *** p<0.01

Sources: Pittsburgh Public Schools, Pittsburgh Promise administrative files and IPEDS.

Notes: Coefficients presented from OLS regressions predicting financial aid outcomes as a function of receiving a Promise award up to \$10,000 for cohorts 2012 to 2015. Data are restricted to first-time, full-time students enrolling in college in the year immediately after high school graduation. All models include covariates displayed in Table 2. Models include institution and high school fixed effects.

Standard errors are clustered at the year by institution level and are presented in parentheses.

Interpretation of the estimates. The left panel presents ITS estimates showing how the average amount of the Promise award received by the students changed after the 2012 doubling of the Promise. The right panel presents quasi-DiD estimates showing how the net price (=total cost of attendance - grants and scholarships) changed for Promise recipients compared to the average PA student (from IPEDS) after the 2012 doubling of the Promise. We show both the Promise amount received in the left panel and the net price in the right panel as a percentage of the total cost of attendance (in the "% TCA" columns) and in 2016 dollars (in the "\$ 2016" columns). The "Fitted 2011 Mean" row shows the estimate of the average for each outcome in 2011. Coefficients in the "2012+" row demonstrate the estimated change in each outcome when the Promise doubled in size in 2012.

Table 5. Cost of Attendance, Quasi-DID results

	Total Cost of Attendance	Tuition and Fees		Room and Board		Books		Other living expenses	
	\$ 2016	% TCA	\$ 2016	% TCA	\$ 2016	% TCA	\$ 2016	% TCA	\$ 2016
Public institutions, N=834									
2012+	280.83 (347.50)	-0.23 (0.58)	71.13 (215.78)	2.94 (1.82)	788.77* (456.31)	0.05 (0.15)	26.13 (28.93)	-2.75 (1.72)	-615.20 (395.17)
Fitted 2011 Mean	641.14	-0.72	75.45	-0.37	174.54	-0.21	-13.96	1.30	405.11
R-squared	0.418	0.441	0.142	0.397	0.630	0.463	0.242	0.272	0.222
State-Related Institutions, N=1,111									
2012+	128.80 (861.35)	-1.42 (2.31)	-230.97 (278.44)	-2.44*** (0.84)	-581.57** (257.17)	-0.25 (0.20)	-47.64* (25.67)	4.11 (3.00)	988.98 (824.14)
Fitted 2011 Mean	-937.48	3.78	375.08	0.49	-46.04	0.60	143.33	-4.87	-1,409.85
R-squared	0.227	0.180	0.179	0.211	0.282	0.404	0.505	0.147	0.254
Private Institutions, N=1,034									
2012+	-421.92 (679.51)	-0.12 (1.81)	-11.16 (585.70)	1.02* (0.59)	42.08 (167.25)	-0.09 (0.15)	-1.45 (49.57)	-0.81 (1.89)	-451.39 (735.81)
Fitted 2011 Mean	709.85	-0.51	409.52	-1.22	-388.35	0.21	125.03	1.51	563.65
R-squared	0.388	0.481	0.238	0.106	0.192	0.613	0.739	0.372	0.360

* p<0.10, ** p<0.05, *** p<0.01

Sources: Pittsburgh Public Schools, Pittsburgh Promise administrative files and IPEDS.

Notes: Coefficients presented from OLS regressions predicting financial aid outcomes as a function of receiving a Promise award up to \$10,000 for cohorts 2012 to 2015. Data are restricted to first-time, full-time students enrolling in college in the year immediately after high school graduation. All models include covariates displayed in Table 2. Models include institution fixed effects. Standard errors are clustered at the year by institution level and are presented in parentheses. Fitted outcomes for students in cohort 2011 presented as baseline means.

Table 6. Non-Promise grant aid, Quasi-DID results

	Total non-Promise grant aid		Non-Pell federal, state, and local grants		Pell		Institutional grants	
	% TCA	\$ 2016	% TCA	\$ 2016	% TCA	\$ 2016	% TCA	\$ 2016
Public institutions, N=834								
2012+	-4.93 (3.56)	-1,540.39* (849.89)	-2.62 (2.15)	-776.82 (505.75)	-0.35 (1.51)	-198.61 (340.10)	-1.96 (2.13)	-491.39 (497.55)
Fitted 2011 Mean	11.60	3,316.74	5.42	1,470.83	6.70	1,798.03	-0.52	-98.72
R-squared	0.567	0.567	0.228	0.219	0.813	0.822	0.187	0.182
State-Related Institutions, N=1,111								
2012+	-2.05 (2.92)	-658.83 (902.95)	-4.18 (3.02)	-1,114.08 (822.78)	1.59* (0.83)	352.67 (233.09)	0.55 (3.27)	189.14 (993.01)
Fitted 2011 Mean	5.49	1,607.87	11.70	3,384.75	4.21	1,216.92	-10.42	-3,116.39
R-squared	0.324	0.332	0.200	0.207	0.789	0.821	0.204	0.182
Private Institutions, N=1,034								
2012+	-4.49 (3.62)	-2,095.97 (1,771.01)	-1.08 (2.34)	-604.80 (1,334.07)	0.14 (0.68)	-50.38 (234.08)	-3.55 (3.66)	-1,355.21 (1,903.88)
Fitted 2011 Mean	7.23	4,234.51	5.13	2,285.80	3.82	1,522.21	-1.72	251.15
R-squared	0.414	0.337	0.202	0.222	0.781	0.806	0.275	0.164

* p<0.10, ** p<0.05, *** p<0.01

Sources: Pittsburgh Public Schools, Pittsburgh Promise administrative files and IPEDS.

Notes: Coefficients presented from OLS regressions predicting financial aid outcomes as a function of receiving a Promise award up to \$10,000 for cohorts 2012 to 2015. Data are restricted to first-time, full-time students enrolling in college in the year immediately after high school graduation. All models include covariates displayed in Table 2. Models include institution and high school fixed effects. Standard errors are clustered at the year by institution level and are presented in parentheses. Fitted outcomes for students in cohort 2011 presented as baseline means.

Table 7. Cost of attendance by Pell eligibility status for students attending public institutions, N=834

	Total Cost of Attendance	Tuition and fees		Room and board		Books		Other living expenses	
	\$ 2016	% TCA	\$ 2016	% TCA	\$ 2016	% TCA	\$ 2016	% TCA	\$ 2016
Pell-Eligible, N=574									
2012+	-28.29 (436.59)	-0.95* (0.53)	-266.50 (251.05)	3.00 (1.96)	682.03 (499.53)	0.15 (0.18)	32.50 (36.98)	-2.20 (1.83)	-476.33 (414.39)
Fitted 2011 Mean	659.37	-0.86	77.96	-0.61	151.30	-0.26	-27.45	1.73	457.56
R-squared	0.417	0.596	0.167	0.416	0.616	0.470	0.196	0.353	0.383
Non-Pell-Eligible, N=260									
2012+	624.28** (229.42)	0.97 (0.93)	599.99** (229.47)	3.26* (1.83)	1,008.75** (438.38)	-0.09 (0.08)	14.06 (15.65)	-4.14** (1.88)	-998.51* (497.74)
Fitted 2011 Mean	548.97	-0.65	-43.59	-0.07	159.25	-0.11	9.30	0.83	424.02
R-squared	0.530	0.585	0.371	0.503	0.760	0.627	0.750	0.490	0.294

* p<0.10, ** p<0.05, *** p<0.01

Sources: Pittsburgh Public Schools, Pittsburgh Promise administrative files and IPEDS.

Notes: Coefficients presented from OLS regressions predicting financial aid outcomes as a function of receiving a Promise award up to \$10,000 for cohorts 2012 to 2015 in the top panel. Data are restricted to first-time, full-time students enrolling in college in the year immediately after high school graduation. All models include covariates displayed in Table 2. Models include institution and high school fixed effects. Standard errors are clustered at the year by institution level and are presented in parentheses. Fitted outcomes for students in cohort 2011 presented as baseline means. The bottom panel presents the coefficient on the linear time trend from equation (1).

Table 8. Non-Promise gift aid by Pell eligibility status at public institutions, N=834

	Total non-Promise grant aid		Federal, state, and local grants		Pell		Institutional grants	
	% COA	\$ 2016	% COA	\$ 2016	% COA	\$ 2016	% COA	\$ 2016
Pell-Eligible, N=574								
2012+	-6.17*	-2,215.72***	-4.89*	-1,452.13**	1.42	-19.61	-2.70	-669.38
	(3.19)	(760.50)	(2.42)	(571.91)	(1.35)	(320.01)	(2.36)	(548.84)
Fitted 2011 Mean	20.90	5,809.13	9.53	2,562.36	12.30	3,302.10	-0.94	-202.49
R-squared	0.373	0.321	0.180	0.147	0.694	0.686	0.196	0.189
Non-Pell-Eligible, N=260								
2012+	1.23	407.45	2.83	698.02	-0.84	-21.06	-0.76	-196.84
	(3.71)	(909.63)	(1.89)	(447.69)	(1.22)	(274.92)	(3.33)	(792.31)
Fitted 2011 Mean	-11.54	-2,270.75	-5.03	-1,245.62	-7.64	-1,953.47	1.13	282.96
R-squared	0.295	0.289	0.313	0.320	0.475	0.454	0.240	0.239

* p<0.10, ** p<0.05, *** p<0.01

Sources: Pittsburgh Public Schools, Pittsburgh Promise administrative files and IPEDS.

Notes: Coefficients presented from OLS regressions predicting financial aid outcomes as a function of receiving a Promise award up to \$10,000. Coefficients are estimated from a fully interactive model. Data are restricted to first-time, full-time students enrolling in college in the year immediately after high school graduation. All models include covariates displayed in Table 2. Models include institution and high school fixed effects. Standard errors are clustered at the year by institution level and are presented in parentheses. Fitted outcomes for students in cohort 2011 presented as baseline means.

Table 9. Cost of attendance by Pell eligibility status for students attending state-related institutions, N=1,111

	Total Cost of Attendance	Tuition and fees		Room and board		Books		Other living expenses	
	\$ 2016	% TCA	\$ 2016	% TCA	\$ 2016	% TCA	\$ 2016	% TCA	\$ 2016
Pell-Eligible, N=574									
2012+	-528.36 (1,018.83)	-1.24 (3.16)	-265.65 (239.88)	-4.11*** (1.29)	-1,179.37** (458.51)	0.03 (0.26)	-10.04 (39.52)	5.32* (3.16)	926.70 (833.96)
Fitted 2011 Mean	-189.47	4.10	642.05	1.93	469.22	0.63	168.53	-6.67	-1,469.27
R-squared	0.190	0.211	0.177	0.192	0.230	0.402	0.475	0.239	0.253
Non-Pell-Eligible, N=537									
2012+	1,311.58 (897.88)	-2.58 (2.45)	-40.01 (457.47)	-0.45 (1.49)	243.38 (445.62)	-0.61*** (0.08)	-82.20** (36.61)	3.63 (3.20)	1,190.41 (926.79)
Fitted 2011 Mean	-1,737.75	3.64	78.80	-0.78	-507.44	0.56	114.93	-3.42	-1,424.04
R-squared	0.371	0.234	0.285	0.357	0.551	0.482	0.560	0.163	0.311

* p<0.10, ** p<0.05, *** p<0.01

Sources: Pittsburgh Public Schools, Pittsburgh Promise administrative files and IPEDS.

Notes: Coefficients presented from OLS regressions predicting financial aid outcomes as a function of receiving a Promise award up to \$10,000 for cohorts 2012 to 2015 in the top panel. Data are restricted to first-time, full-time students enrolling in college in the year immediately after high school graduation. All models include covariates displayed in Table 2. Models include institution and high school fixed effects. Standard errors are clustered at the year by institution level and are presented in parentheses. Fitted outcomes for students in cohort 2011 presented as baseline means. The bottom panel presents the coefficient on the linear time trend from equation (1).

Table 10. Non-Promise gift aid by Pell eligibility status at private institutions, N=1,034

	Total non-Promise grant aid		Federal, state, and local grants		Pell		Institutional grants	
	% COA	\$ 2016	% COA	\$ 2016	% COA	\$ 2016	% COA	\$ 2016
Pell-Eligible, N=636								
2012+	-4.19 (3.64)	-2,746.56* (1,488.25)	-4.29** (2.14)	-2,249.74** (1,090.99)	0.63 (0.94)	-102.43 (319.75)	-0.52 (3.33)	-294.46 (1,373.12)
Fitted 2011 Mean	7.18	3,853.70	6.97	3,054.49	7.19	2,913.01	-6.98	-2,302.80
R-squared	0.504	0.486	0.275	0.361	0.646	0.675	0.454	0.330
Non-Pell-Eligible, N=398								
2012+	-6.13 (4.97)	-2,266.25 (2,631.81)	4.26 (4.18)	2,218.74 (2,459.10)	-0.57 (0.43)	-97.83 (178.70)	-9.83 (6.06)	-4,317.00 (3,563.90)
Fitted 2011 Mean	4.70	3,901.08	0.68	404.93	-3.49	-1,500.27	7.50	4,844.24
R-squared	0.443	0.371	0.260	0.254	0.660	0.496	0.282	0.243

* p<0.10, ** p<0.05, *** p<0.01

Sources: Pittsburgh Public Schools, Pittsburgh Promise administrative files and IPEDS.

Notes: Coefficients presented from OLS regressions predicting financial aid outcomes as a function of receiving a Promise award up to \$10,000. Coefficients are estimated from a fully interactive model. Data are restricted to first-time, full-time students enrolling in college in the year immediately after high school graduation. All models include covariates displayed in Table 2. Models include institution and high school fixed effects. Standard errors are clustered at the year by institution level and are presented in parentheses. Fitted outcomes for students in cohort 2011 presented as baseline means.

Figure 1. Net price average among Promise and IPEDS samples.

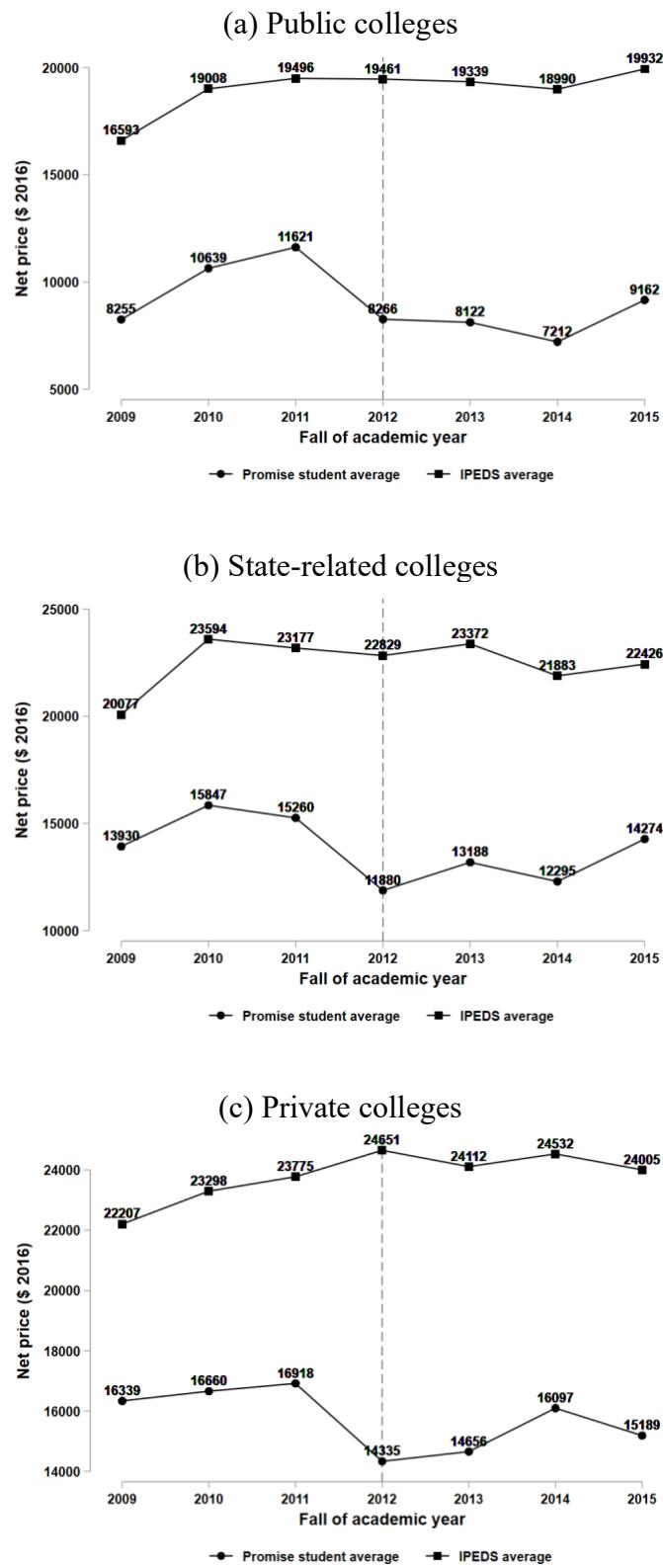


Figure 2. Total cost of attendance average among Promise and IPEDS samples.

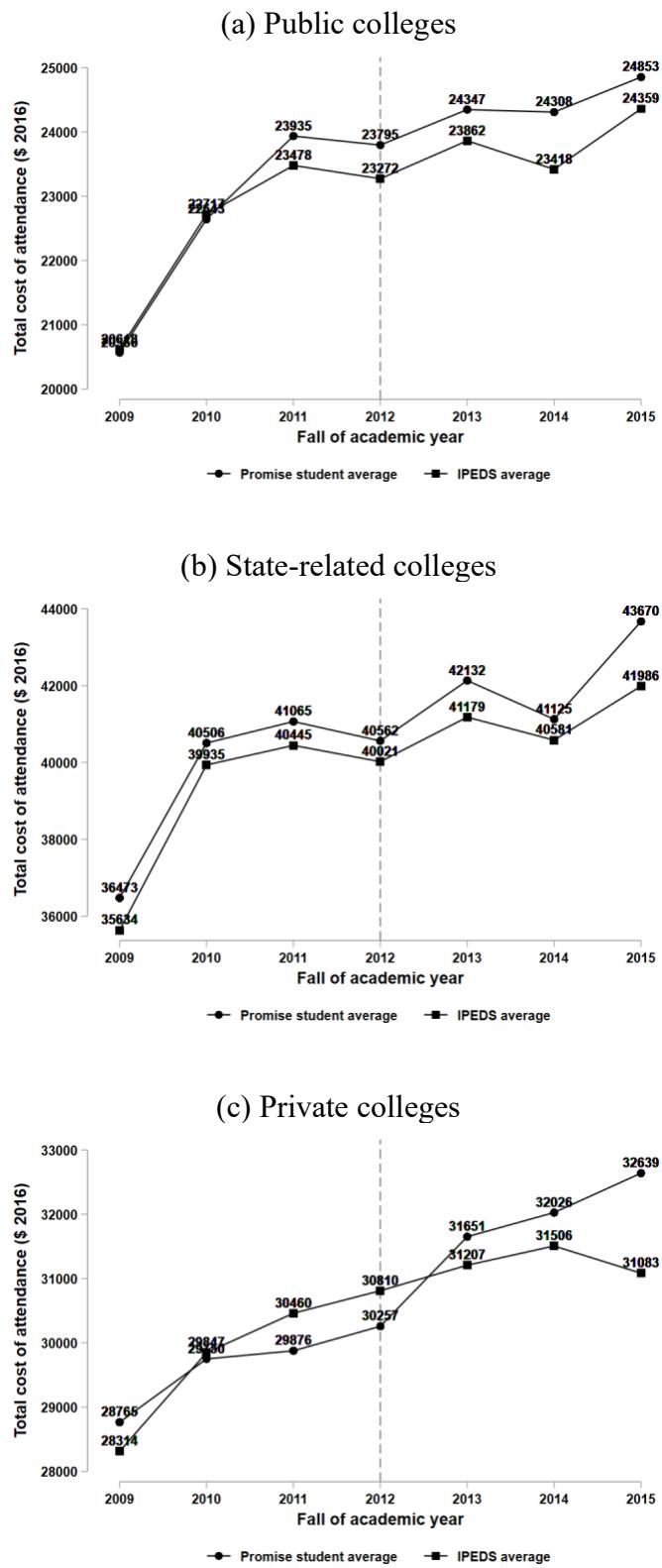


Figure 3. Total non-Promise grant aid average among Promise and IPEDS samples.

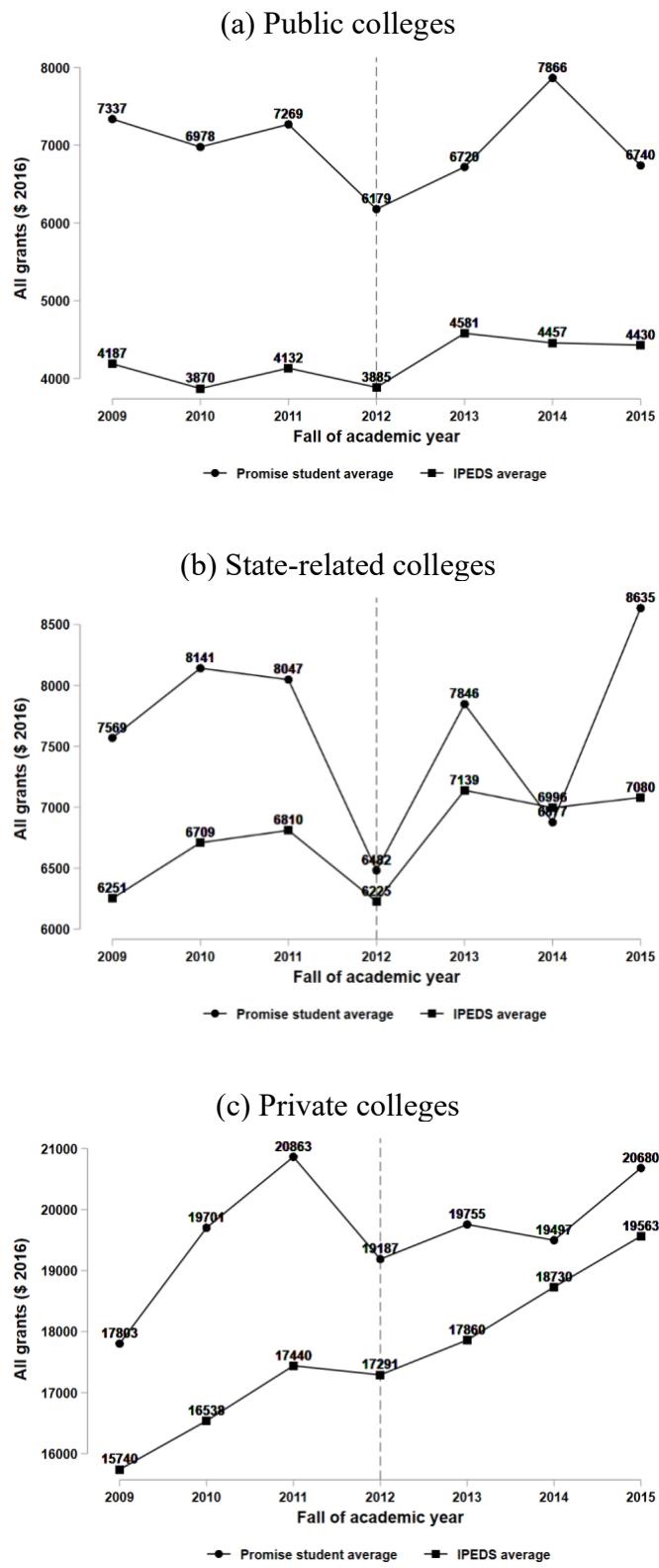
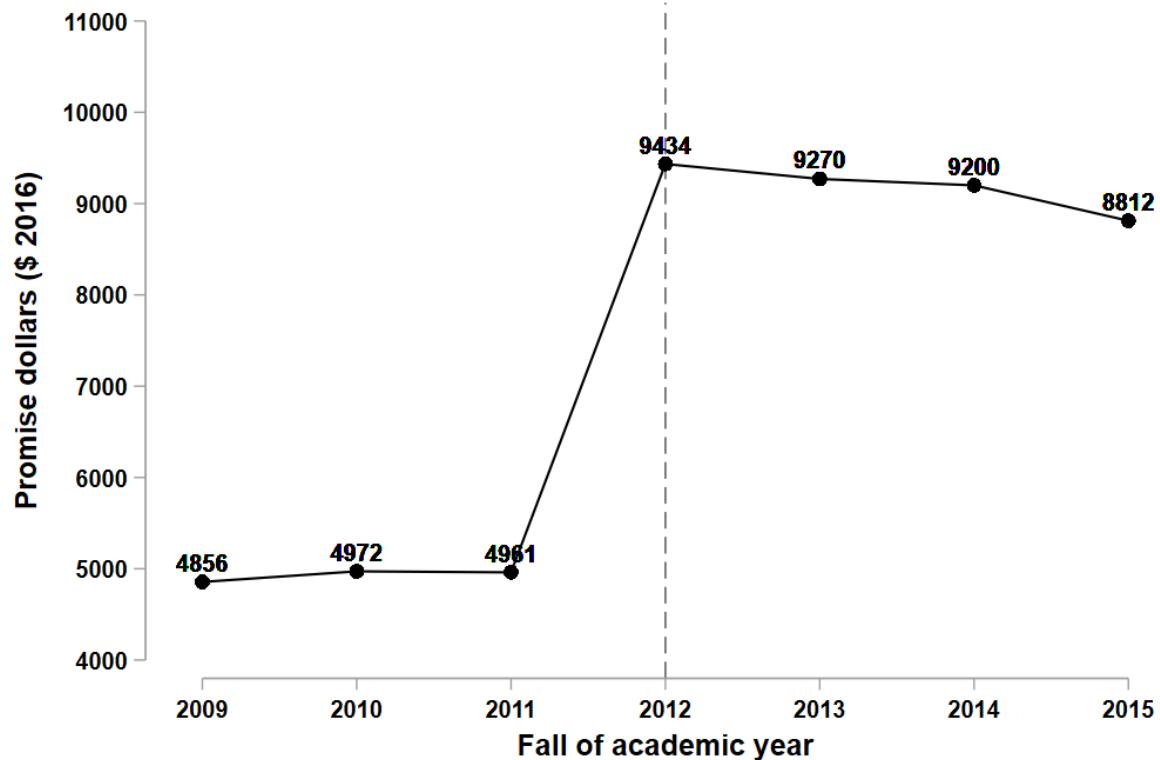


Figure 4. Promise dollars received by cohort.



Appendix A

Table A.1. Studies examining institutional responses to financial aid

Aid type	Unit of analysis	Citation	Method	Region & year	Results
A. Federal Aid Programs					
Pell	Institution	Singell & Stone (2003)	Causal: IVE	National: 1983-1996	Top 100 Selective Institutions: ↑ Pell: ↑ Net Tuition Institutions Outside Top 100: ↑ Pell: ↔ Net Tuition Public Institutions of Any Rank: ↑ Pell: ↔ Net Tuition Privates of Any Rank: ↑ Pell: ↑ Net Tuition
		Singell & Stone (2007)	Causal: IVE	National: 1989-1996	Public 4-yr: ↑ Pell: ↔ Tuition Private 4-yr: ↑ Pell: ↑ Tuition
		Lucca et al. (2019)	Causal: DID	National: 2000-2012	Overall: ↑ Pell: ↔ Tuition, ↓ Institutional Aid, ↔ Net Tuition
	Student	Turner (1997)	Causal: DID	National: 1972, 1980, 1982	Overall: ↑ Pell: ↓ Net Price *Institutions serving more low-income students saw larger reductions in net cost than more selective institutions
		Li (1999)	Causal: IVE	National: 1984-1994	Public 4-yr: ↑ Pell: ↑ List Tuition, ↑ Net Tuition, (Possible ↓ Institutional Aid) Private 4-yr: ↑ Pell: ↑ List Tuition, ↔ Net Tuition (Possible ↑ Institutional Aid)
		Turner (2014)	Causal: RD & Regression Kink	National: 1996, 2000, 2004, 2008 & 2012	Public 4-yr: ↑ Pell: ↓ Institutional Aid Selective private 4-yr: ↑ Pell: ↓ Institutional Aid *More selective colleges (both public and private) still provide Pell recipients with more institutional aid than non-recipients Less selective private 4-yr: ↑ Pell: ↔ Institutional Aid *Students marginally eligible for the Pell Grant: ↑ Institutional Aid *For every additional \$ of Pell above eligible margin: ↓ Institutional Aid
Various	Institution	McPherson & Schapiro (1991)	Correlational	National: 1978-1986	Public 4-yr: ↑ Federal Aid to Low-Income Students: ↑ Tuition, ↔ Institutional Aid ↑ State Aid to Higher-Income Students (Merit): ↑ Tuition Private 4-yr: ↑ Federal Aid: ↔ Tuition, ↑ Institutional Aid
		Acosta (2001)	Causal: IVE	National: 1991-1996	Public 4-yr: ↑ Federal Aid: ↓ Institutional Aid, ↑ Tuition, ↓ Net Tuition

					Private 4-yr: ↑ Federal Aid: ↑ Institutional Aid, ↑ Tuition, ↑ Net Tuition
	Gordon & Hedlund (2019)	Static Model	National: 1987-2010		Overall: ↑ Federal Aid: ↑ Net Tuition *Greatest impact at public non-selective institutions.
B. State Aid Programs					
State merit aid	Institution	Welch (2015)	Causal: DID	National: 1986-2010	Public 4-yr: ↑ Merit Aid: ↔ Tuition, ↔ Institutional Aid Private 4-yr: ↑ Merit Aid: ↔ Tuition, ↔ Institutional Aid
		Lee (2016)	Causal: DID	National (except AL, MD, MO): 1987-2009	Private 4-yr: ↑ Student Charges, ↑ Institutional Aid, ↔ Net Price ↔ Student Charges, ↑ Institutional Aid, ↓ Net Price Public 4-yr: ↓ Student Charges, ↑ Institutional Aid, ↓ Net Price Both Sectors: ↑ Student Charges, ↔ Institutional Aid, ↑ Net Price * Inconclusive results.
		Kramer et al. (2018)	Causal: DID	National: 1988-2009	Public 4-yr: Tuition Authority Centralized: ↑ Merit Aid: ↓ Tuition & Fees Autonomy over Tuition: ↑ Merit Aid: ↑ Tuition & Fees
Various	Institution	Rizzo & Ehrenberg (2004)	Correlational	National: 1979-1998	Public: ↑ Pell / ↑ State Need-Based Aid: ↑ Tuition ↑ State Merit Aid: ↔ Tuition
		Curs & Dar (2010a)	Causal: IVE	National: 2002-2008	Public 4-yr: ↑ Merit Aid: ↓ Tuition, ↔ Institutional Aid, ↓ Net Price ↑ Need-Based Aid: ↑ Tuition, ↓ Institutional Aid, ↑ Net Price Private 4-yr: ↑ Merit Aid: ↓ Tuition, ↓ Institutional Aid, ↔ Net Price ↑ Need-Based Aid: ↑ Tuition, ↔ Institutional Aid, ↑ Net Price
		Curs & Dar (2010b)	Causal: IVE	National: 2002-2008	Public 4-yr: ↑ State Aid: ↓ Tuition, ↔ Institutional Aid, ↓ Net Price ↑ Federal Aid: ↑ Tuition, ↑ Institutional Aid, ↔ Net Price *Governing Board Systems: ↓ Net Price *Coordinating Board Systems: ↑ Net Price Private 4-yr: ↑ State Aid: ↓ Tuition, ↓ Institutional Aid, ↔ Net Price ↑ Federal Aid: ↑ Tuition, ↑ Institutional Aid, ↓ Net Price

	Student	Doyle et al. (2009)	Correlational	National: 1999-2004	Public 4-yr: ↑ Merit Aid; ↓ Institutional Aid *Less institutional aid to low-income students, more aid for academic qualifications.
Georgia HOPE Scholarship	Institution	Long (2004)	Causal: DID	Georgia: 1989-1997	Public 4-yr: ↑ HOPE; ↓ List Tuition, ↑ Room & Board *Tuition results may have been part of a statewide initiative to induce college enrollment. Room & Board increases larger at institutions with more HOPE recipients Private 4-yr: ↑ HOPE; ↑ List Tuition increased, ↔ Room & Board, ↓ Institutional Aid *Tuition and Institutional Aid results larger at institutions with more HOPE recipients
Arizona Merit Scholarship		Upton Jr (2016)	Causal: DID & Synthetic Controls	Arizona: 2000-2010	Public 4-yr: ↑ AIMS: ↑ Tuition
Tennessee Education Lottery Scholarship		Dreier (2018)	Causal: DID	Tennessee: 2000-2009	Public 4-yr: ↑ TELS: ↔ Average Institutional Aid but ↓ in Later Years, ↑ # of Students Receiving Institutional Aid, ↓ Gross Institutional Aid *More selective institutions decrease institutional aid.

C. Place-Based Promise Programs or Private Scholarships

Private Scholarships	Institution	NSPRA (2013)	Descriptive	National: 2011	Public: ↑ Private Scholarships; ↑ COA (Fees) Private: ↑ Private Scholarships; ↓ Institutional Aid *Half of the surveyed institutions contact private scholarship providers to discuss how to approach student's overaward.
Florida Bright Futures Scholarship		Hunt (2016)	Causal: DID	Florida: 1991-2004	Public 4-yr: ↑ Bright Futures: ↑ Tuition and Fees, ↑ Room and Board, ↑ Institutional Aid Private 4-yr: ↑ Bright Futures: ↓ Tuition and Fees, ↔ Room and Board, ↔ Institutional Aid
Promise awards		Delaney & Hemenway (2020)	Causal: DID	National: 2000-2012	Public 2-yr (contingent on model): ↑ Promise: ↑ Fees, ↓ Institutional Aid Public 4-yr: ↑ Promise: ↑ Tuition, ↑ Institutional Aid
Tennessee Promise		Bell (2021)	Causal: DID	Tennessee: 2012-2016	Public 2-yr: ↑ Promise: ↑ Tuition & Fees Private 2-yr: ↑ Promise: ↔ Tuition & Fees

Appendix B

**Table B.1. Promise dollars and net price by Pell eligibility status at public institutions,
N=834**

	Difference, Promise Student Sample		Quasi-DID	
	Promise		Net price	
	% COA	\$ 2016	% COA	\$ 2016
Pell-Eligible, N=574				
2012+	22.11*** (1.18)	4,744.53*** (298.06)	-15.68*** (3.41)	-2,557.09*** (847.16)
Fitted 2011 Mean	19.29	5,081.10	-40.75	-10,230.87
R-squared	0.673	0.718	0.398	0.432
Not Pell-Eligible, N=260				
2012+	20.24*** (1.12)	4,312.80*** (264.62)	-21.22*** (3.95)	-4,095.96*** (972.03)
Fitted 2011 Mean	17.30	5,087.87	-6.31	-1,768.14
R-squared	0.806	0.780	0.508	0.457

* p<0.10, ** p<0.05, *** p<0.01

Sources: Pittsburgh Public Schools, Pittsburgh Promise administrative files and IPEDS.

Notes: Coefficients presented from OLS regressions predicting financial aid outcomes as a function of receiving a Promise award up to \$10,000. Coefficients are estimated from a fully interactive model. Data are restricted to first-time, full-time students enrolling in college in the year immediately after high school graduation. All models include covariates displayed in Table 2. Models include institution and high school fixed effects. Standard errors are clustered at the year by institution level and are presented in parentheses. Fitted outcomes for students in cohort 2011 presented as baseline means in brackets.

Table B.2. Promise dollars and net price by Pell eligibility status at state-related institutions, N=1,111

	Difference, Promise Student Sample		Quasi-DID	
	Promise		Net price	
	% COA	\$ 2016	% COA	\$ 2016
Pell-Eligible, N=574				
2012+	14.73*** (1.19)	4,097.75*** (311.30)	-13.50*** (3.16)	-4,141.53*** (1,031.43)
Fitted 2011 Mean	17.43	5,128.44	-30.79	-9,300.11
R-squared	0.559	0.644	0.263	0.318
Not Pell-Eligible, N=537				
2012+	16.28*** (1.52)	4,432.99*** (313.42)	-14.72*** (4.39)	-3,082.73* (1,547.25)
Fitted 2011 Mean	15.98	4,761.54	-11.06	-4,535.52
R-squared	0.640	0.779	0.276	0.287

* p<0.10, ** p<0.05, *** p<0.01

Sources: Pittsburgh Public Schools, Pittsburgh Promise administrative files and IPEDS.

Notes: Coefficients presented from OLS regressions predicting financial aid outcomes as a function of receiving a Promise award up to \$10,000. Coefficients are estimated from a fully interactive model. Data are restricted to first-time, full-time students enrolling in college in the year immediately after high school graduation. All models include covariates displayed in Table 2. Models include institution and high school fixed effects. Standard errors are clustered at the year by institution level and are presented in parentheses. Fitted outcomes for students in cohort 2011 presented as baseline means in brackets.

Table B.3. Gift aid by Pell eligibility status at state-related institutions, N=1,111

	Total non-Promise grant aid		Federal, state, and local grants		Pell		Institutional grants	
	% COA	\$ 2016	% COA	\$ 2016	% COA	\$ 2016	% COA	\$ 2016
Pell-Eligible, N=574								
2012+	-0.91 (3.07)	-484.58 (830.20)	-2.15 (2.36)	-472.64 (600.89)	1.82* (0.94)	410.04 (277.11)	-0.59 (1.99)	-321.69 (620.91)
Fitted 2011 Mean	12.92	3,982.20	9.26	2,647.99	10.74	3,084.19	-7.08	-1,889.06
R-squared	0.253	0.291	0.208	0.232	0.585	0.682	0.382	0.350
Non-Pell-Eligible, N=537								
2012+	-1.35 (3.73)	-38.67 (1,094.17)	-7.64 (5.48)	-2,136.70 (1,511.85)	-0.35 (0.32)	-34.08 (109.77)	6.64 (5.36)	2,197.85 (1,572.34)
Fitted 2011 Mean	-5.25	-1,963.76	12.47	3,542.04	-3.65	-1,155.13	-14.07	-4,454.64
R-squared	0.235	0.230	0.214	0.216	0.777	0.674	0.219	0.209

* p<0.10, ** p<0.05, *** p<0.01

Sources: Pittsburgh Public Schools, Pittsburgh Promise administrative files and IPEDS.

Notes: Coefficients presented from OLS regressions predicting financial aid outcomes as a function of receiving a Promise award up to \$10,000. Coefficients are estimated from a fully interactive model. Data are restricted to first-time, full-time students enrolling in college in the year immediately after high school graduation. All models include covariates displayed in Table 2. Models include institution and high school fixed effects. Standard errors are clustered at the year by institution level and are presented in parentheses. Fitted outcomes for students in cohort 2011 presented as baseline means.

Table B.4. Promise dollars and net price by Pell eligibility status at private institutions, N=1,034

	Difference, Promise Student Sample		Quasi-DID	
	Promise		Net price	
	% COA	\$ 2016	% COA	\$ 2016
Pell-Eligible, N=636				
2012+	11.86*** (1.25)	4,103.86*** (384.04)	-7.43** (3.67)	-2,473.04 (1,646.61)
Fitted 2011 Mean	13.28	5,224.02	-20.94	-8,575.49
R-squared	0.628	0.681	0.451	0.592
Not Pell-Eligible, N=398				
2012+	11.60*** (1.04)	4,526.20*** (273.94)	-5.33 (5.60)	-2,526.90 (2,670.61)
Fitted 2011 Mean	10.65	4,885.81	-15.70	-7,550.15
R-squared	0.730	0.751	0.399	0.416

* p<0.10, ** p<0.05, *** p<0.01

Sources: Pittsburgh Public Schools, Pittsburgh Promise administrative files and IPEDS.

Notes: Coefficients presented from OLS regressions predicting financial aid outcomes as a function of receiving a Promise award up to \$10,000. Coefficients are estimated from a fully interactive model. Data are restricted to first-time, full-time students enrolling in college in the year immediately after high school graduation. All models include covariates displayed in Table 2. Models include institution and high school fixed effects. Standard errors are clustered at the year by institution level and are presented in parentheses. Fitted outcomes for students in cohort 2011 presented as baseline means in brackets.

Table B.5. Cost of attendance by Pell eligibility status for students attending private institutions, N=1,034

	Total Cost of Attendance	Tuition and fees		Room and board		Books		Other living expenses	
	\$ 2016	% TCA	\$ 2016	% TCA	\$ 2016	% TCA	\$ 2016	% TCA	\$ 2016
Pell-Eligible, N=636									
2012+	-1,115.73 (845.69)	-0.51 (2.42)	-576.12 (828.10)	1.60** (0.78)	40.05 (217.37)	-0.02 (0.18)	1.44 (54.56)	-1.07 (2.38)	-581.11 (884.11)
Fitted 2011 Mean	502.23	-0.56	232.19	-1.23	-428.76	0.12	69.92	1.68	628.87
R-squared	0.385	0.473	0.125	0.098	0.168	0.594	0.767	0.368	0.398
Non-Pell-Eligible, N=398									
2012+	-266.95 (913.33)	0.84 (1.60)	306.14 (608.20)	0.86 (0.86)	142.59 (306.34)	-0.16 (0.16)	-27.38 (71.51)	-1.54 (2.09)	-688.30 (918.54)
Fitted 2011 Mean	1,236.74	-0.43	812.94	-1.36	-345.84	0.36	214.86	1.43	554.78
R-squared	0.470	0.547	0.494	0.233	0.310	0.672	0.747	0.458	0.377

* p<0.10, ** p<0.05, *** p<0.01

Sources: Pittsburgh Public Schools, Pittsburgh Promise administrative files and IPEDS.

Notes: Coefficients presented from OLS regressions predicting financial aid outcomes as a function of receiving a Promise award up to \$10,000 for cohorts 2012 to 2015 in the top panel. Data are restricted to first-time, full-time students enrolling in college in the year immediately after high school graduation. All models include covariates displayed in Table 2. Models include institution and high school fixed effects. Standard errors are clustered at the year by institution level and are presented in parentheses. Fitted outcomes for students in cohort 2011 presented as baseline means. The bottom panel presents the coefficient on the linear time trend from equation (1).

Table B.6. Differences in covariates before and after Promise increase (estimates from the full specification of equation 1)

	Female	Nonwhite	HS GPA	Attendance	Logged EFC	PSAT Score	Missing PSAT
Public Institutions, N=834							
2012+	-0.07 (0.12)	0.02 (0.05)	-0.12** (0.06)	0.39 (0.50)	-8.94* (4.99)	-0.03 (0.03)	-0.07 (0.12)
R-squared	0.110	0.366	0.381	0.373	0.893	0.932	0.110
State-Related Institutions, N=1,111							
2012+	-0.14** (0.07)	0.01 (0.08)	0.08* (0.04)	0.14 (0.31)	-3.60 (3.54)	-0.03 (0.02)	-0.14** (0.07)
R-squared	0.131	0.397	0.593	0.463	0.853	0.903	0.131
Private Institutions, N=1,034							
2012+	-0.11 (0.10)	0.13** (0.06)	0.03 (0.05)	-0.08 (0.41)	-1.57 (2.38)	0.03*** (0.01)	-0.11 (0.10)
R-squared	0.242	0.322	0.416	0.356	0.860	0.939	0.242

* p<0.10, ** p<0.05, *** p<0.01

Source: Pittsburgh promise administrative files.

Notes: Coefficients presented from OLS regressions as a function of graduating in a year in which the Promise doubled in value. Standard errors are presented in parentheses.

Table B.7. Total non-Promise grant aid under different standard error assumptions

	Standard errors clustered by institution-by-year		Standard errors clustered by institution		Standard errors without clustering	
	% TCA	\$ 2016	% TCA	\$ 2016	% TCA	\$ 2016
Public institutions, N=834						
2012+	-4.93 (3.56)	-1,540.39* (849.89)	-4.93 (4.54)	-1,540.39 (1,031.58)	-4.93 (3.25)	-1,540.39** (760.26)
Fitted 2011 Mean	11.60	3,316.74	11.60	3,316.74	11.60	3,316.74
R-squared	0.567	0.567	0.567	0.567	0.567	0.567
State-Related Institutions, N=1,111						
2012+	-2.05 (2.92)	-658.83 (902.95)	-2.05 (3.97)	-658.83 (1,069.30)	-2.05 (3.14)	-658.83 (942.42)
Fitted 2011 Mean	5.49	1,607.87	5.49	1,607.87	5.49	1,607.87
R-squared	0.324	0.332	0.324	0.332	0.324	0.332
Private Institutions, N=1,034						
2012+	-4.49 (3.62)	-2,095.97 (1,771.01)	-4.49 (3.19)	-2,095.97 (1,362.17)	-4.49 (3.01)	-2,095.97 (1,448.66)
Fitted 2011 Mean	7.23	4,234.51	7.23	4,234.51	7.23	4,234.51
R-squared	0.414	0.337	0.414	0.337	0.414	0.337

* p<0.10, ** p<0.05, *** p<0.01

Sources: Pittsburgh Public Schools, Pittsburgh Promise administrative files and IPEDS.

Notes: Coefficients presented from OLS regressions predicting financial aid outcomes as a function of receiving a Promise award up to \$10,000 for cohorts 2012 to 2015. Data are restricted to first-time, full-time students enrolling in college in the year immediately after high school graduation. All models include covariates displayed in Table 2. Models include institution and high school fixed effects. Standard errors are clustered at the year by institution level in columns 1 and 2 and by the institution level in columns 3 and 4. Columns 5 and 6 present heteroskedasticity-consistent standard errors without clustering. Fitted outcomes for students in cohort 2011 presented as baseline means.

Figure B.1. Event study model results, total non-Promise grant aid.

