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Working Paper The Impact of Developing Hispanic-Serving Institution Program on College Persistence, Completion Rates, and Student Debt

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The Impact of Developing Hispanic-Serving Institution Program on College Persistence, Completion Rates, and Student Debt

Abstract

The Developing Hispanic-Serving Institution (DHSI) Program is one of the largest federal grant programs that support Hispanic-Serving Institutions. We employ an eleven-year panel dataset of U.S. higher education institutions to implement a difference-in-differences (DID) design, two-way fixed effect model (TWFE), and propensity score matching (PSM) to compare DHSI grantee institutions with other Title V eligible higher education institutions that did not receive DHSI funding. We find that the receipt of DHSI grant funding helps these institutions significantly improve their retention rates (2~ percentage points), completion rates (1-3 percentage points), and reduce their students' debt level (e.g., \$500~\$1000 lower for graduated students). Our back-of-the-envelope cost-benefit calculation shows that the DHSI program benefits exceed cost.

JEL-Codes: H520, I220, I230, I280.

Keywords: Developing Hispanic-Serving Institution (DHSI) Program, Hispanic-Serving Institutions (HIS), difference-in-differences (DID) design, two-way fixed effect model (TWFE), propensity score matching (PSM) approach.

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1 Introduction

U.S. college enrollment demographics have been shifting over the years, with Hispanic students now making up the second-largest ethnic group enrolled at the undergraduate level. From 2000 to 2017, Hispanic college enrollment rates of 18 to 24-year-olds increased from 22% to 36% (McFarland et al. 2019). Institutions serving an undergraduate student population of at least 25% Hispanic may be eligible to be considered a Hispanic-Serving Institution. Hispanic-Serving Institutions (HSIs) account for approximately ten percent of higher education institutions but enrolled 65.6% of all Hispanic undergraduate students in 2021 (Laden 2001; HACU 2023b).¹ Latino student enrollment at HSIs has more than quadrupled from 490,000 students in 1994-95 to over 3.1 million, representing 21.1% of undergraduates (HACU 2023a; Santiago et al. 2016). Current projections predict Hispanic higher education enrollment to exceed four million students by 2026, a far higher predicted growth rate than any other racial-ethnic group (HACU 2023b).

These changes in the student population mirror changes in the U.S. population. In July 2022, the Hispanic population comprised 63.7 million people in the U.S. (19.1% of the total U.S. population), making people of Hispanic origin "the nation's largest ethnic or racial minority" (U.S. Census Bureau 2023). The Census Bureau (2018) projects this population to grow, reaching 111 million by 2060.

While changing demographics is not new in the U.S., concerns remain as to how well the U.S. education system is serving underrepresented groups and, in particular, Hispanic students. In 2001, Hispanics had the "lowest college enrollment rate of 18-24 year old high school graduates (35 percent) and had low high school graduation rates (64 percent)" (Benitez and DeAro 2004). Racial and ethnic disparities in completion rates for both high school and postsecondary education have persisted over time (Espinoza et al. 2017). These disparities in graduation rates helped motivate this paper.

This paper explores the impact of a large Title V federal grant program for HSIs on several institutional and student outcomes measures: retention, completion, and debt. The Developing Hispanic Serving Institutions (DHSI) program is a Title V federal grant program for HSIs. The purpose of the DHSI program is to expand the educational opportunities for Hispanic students.

¹ Importantly, there are questions of measurement and tracking here related to HSIs and their determination which suggests these numbers could be misleading given it is not always clear how HSI eligibility is tracked or measured. See Feng, Chih, Gai, and MacDonald (2020). The Department of Education did not publish HSI-eligible institutions prior to 2016.

Causal empirical analyses investigating the effects of the DHSI program on student outcomes are largely absent, incomplete, or rely on a small sample. By assessing the DHSI program, our work fills a void in the existing literature. We investigate the effect of the DHSI program on selected institutional outcome measures using an 11-year institution-level administrative panel dataset (2004-2014) covering all U.S. colleges and universities. We employ several causality methods, including the difference-in-differences (DID) design, two-way fixed effect (TWFE) model, and propensity score matching (PSM) approach, to untangle the effects of DHSI funding on retention, completion, and median student debt levels. Using new DHSI awards from 2009-2014 as our treatment group, we compare DHSI institutions with non-DHSI institutions. These data are then combined with a qualitative analysis of the stated goals in DHSI applications submitted by the recipient institutions to propose possible mechanisms behind the causality.

We find that DHSI funding has significantly improved student retention and completion rates and reduced student debt in both four-year and two-year institutions. When employing TWFE models on the full sample of full-time students in four-year universities, DHSI funding leads to a 2.64 to 2.83 percentage point (PP) increase in the short-term retention rates, a 1.88 to 2.23 PP improvement in six-year (i.e., 150%) completion rates among seniors, and an \$814.8~\$982.7 reduction in the graduated student's debt. Though differing in magnitude, similar effects are found for part-time students and for students at two-year institutions. These results remain robust across a wide variety of model specifications.

These findings offer several critical economic and policy insights. They shed light on whether additional institutional funding positively impacts student persistence, college completion rates, and student debt levels. Our project provides insight into whether institutional investments reach low-income and first-generation students. The effectiveness of these programs could have short-, medium-, and long-term benefits for students directly affected by these programs, as well as social benefits in terms of intergenerational mobility.

2. Institutional Background: HSI and DHSI

In 1992, the U.S. Department of Education established the HSI designation for eligible, accredited, non-profit institutions of higher education that serve an undergraduate population of at least 25% Hispanic.² This designation is not automatic but requires higher education institutions to apply for HSI eligibility. Once an institution is deemed eligible, which also requires meeting some requirements over core expenditures and share of needy students, the institution can then apply for HSI-specific programs and associated grant funding.³ In 2016, 415 institutions of higher education applied and were deemed HSI eligible (70 of which were in Puerto Rico) (U.S. Department of Education). By 2021-2022, there were 572 HSIs. (HACU 2023b) These HSI-eligible designations are almost evenly split between two-year and four-year schools (Santiago et al., 2016). Persistence and completion rates tend to be higher than graduation rates at HSIs, and completion rates are higher at 4-year institutions than at 2-year institutions. Persistence rates are similar across institution types. (Santiago et al., 2016)

The U.S. Department of Education offers several competitive Title III and Title V grant programs open to HSI-eligible institutions. The longest-running and most expansive program is the Developing Hispanic-Serving Institution (DHSI) Program, established in 1998 to expand educational opportunities and improve the educational attainment of Hispanic students. These Title V DHSI funds allow HSIs to improve academic offerings, programs, and even institutional stability (U.S. Department of Education). In FY 2023, the DHSI program's total appropriation was more than \$277.7 million, with 64 institutions receiving new awards and 278 institutions receiving continuation awards. Typically, DHSI awards last five years and provide annual funding of around half a million dollars per institution (U.S. Department of Education). According to Santiago et al. (2016), Title V grants may be small, but they still are a significant contributor to an HSI's budget. While these funds typically account for 1-2 percent of the institution's annual budget, these funds may provide directed resources for innovating and engaging in pilot programs to serve Hispanic students (Santiago et al. 2016).

DHSI grants are awarded through a competitive process and are only available to institutions that have already successfully applied and been designated as HSI-eligible. DHSI funds may be

² Requires 25% or more full-time equivalent undergraduate enrollment.

³ In addition to non-profit status, accreditation status, and 25%+ Hispanic, two additional factors influence eligibility: 50%+ of an institution's degree-seeking students must receive financial assistance through select programs such as the Pell grant and the institution's core expenses per FTE must be lower than average for the institutional group. See Cottrell and Smith (2018).

used for various activities, including instructional equipment, facilities, educational materials, student support services, and teacher education.⁴ Additionally, amendments to the Higher Education Opportunity Act of 2008 (HEOA) expand the allowable activities to include: "activities to improve student services, including innovative and customized instruction courses designed to retain students and move the students into core courses; articulation agreements and student support programs designed to facilitate the transfer of students from two-year to four-year institutions; and providing education, counseling services, and financial information designed to improve the financial and economic literacy of students and their families," and distance education technologies (U.S. Department of Education).

With its defined activities and objectives, the DHSI grant prioritizes applicants who address the goals outlined in section 521(d) of the HEA (20 U.S.C. 1103). The Secretary of Education prioritizes applications that provide satisfactory evidence that a Hispanic-Serving Institution is or will be engaged in a collaborative partnership with at least one local educational agency or community-based organization. This collaboration aims to assist in reducing dropout rates among Hispanic students, enhancing the academic achievement rates of Hispanic students, and increasing the enrollment rates of Hispanic secondary school graduates in higher education (U.S. Department of Education).

3. Literature Review

While a sizable body of qualitative literature on the topic draws attention to important considerations relevant to the HSIs (Garcia 2019; Bensimon 2005; Laden 2001; de los Santos and Cuamea 2010; Malcom-Piquex and Lee 2011; Benitez and DeAro 2004), empirical findings are somewhat limited.

While there are several quantitative studies (Flores and Park 2013; Flores and Park 2015; Park, Flores, and Ryan 2018), causal analysis of the DHSI Program is missing from the existing literature. There have been several analyses of Title V funding programs, and so far, these analyses have yielded mixed findings. Using institutional-level data from 76 four-year HSIs, Perez (2020) found that Title V grants were positively correlated with Latinx undergraduate degree attainment,

⁴ DHSI funds may be used for "scientific or laboratory equipment for teaching; construction or renovation of instructional facilities; faculty development; purchase of educational materials; academic tutoring or counseling programs; funds and administrative management; joint use of facilities; endowment funds; distance learning academic instruction; teacher education; and student support services" (U.S. Department of Education).

but they weren't a significant factor in Latinx graduation rates. Pineda (2010) found Title V funding did not affect Hispanic enrollment or degree attainment. Aguilar-Smith and Yun (2023) analyzed how equitably Title V grant funds were received across HSIs.

Though analysis of the DHSI program is still primarily qualitative, there is substantial research on other programs and policies that might improve student outcomes. For example, there is plenty of work addressing simplification of the financial aid application process, college coaching, mentoring, and other outreach aimed at boosting student enrollment and attainment (Deming and Dynarski 2009; Carrell and Sacerdote 2017; Dynarski et al. 2018; Andrews et al. 2020). Some work has explored the effectiveness of first-year experience programs on enrollment and completion (Wilkerson 2008; Jamelske 2009) and financial literacy and financial education on student debt and other economic outcomes (Urban et al. 2018; Bernheim et al. 2001; Collins and O'Rourke 2010; Hastings et al. 2013). Prior literature points out that low-income and minority students are much more likely to take on student loan debt and go into student loan default in the future (Gross et al. 2009; Kelchen and Li 2017).

Previous work often focuses on State financial aid on student completion as suggested by California's Cal Grant (Bettinger et al. 2019), Florida Student Access Grant (Castleman and Long 2016), Texas Longhorn Opportunity Scholars (Andrews et al. 2020), Knox Achieve (Carruthers and Fox 2016), Gates Millennium Scholars (Melguizo 2010), and West Virginia PROMISE program (Scott-Clayton and Zafar 2019). In addition, there is evidence of the impact of Pell Grants on student persistence, graduation, and earnings (Bettinger 2004; Denning et al. 2019; Seftor and Turner 2002). These studies generally find a positive impact of financial aid on student enrollment and degree attainment or completion rates. However, some studies find negligible effects of grant aid and student loans on education outcomes, though they do increase students' accumulated debts (Denning and Jones 2021; Rubin 2011; Marx and Turner 2018). One recent meta-analysis of forty-two causal studies finds that grant aid improves persistence and degree attainment (Nguyen, Kramer, and Evans 2019).

Chakrabarti et al. (2020) point out that less selective institutions tend to rely on State funding, and these institutions "also serve a disproportionate percentage of students from lowincome and disadvantaged backgrounds." Chakrabarti et al. (2020) highlight that reductions in State appropriations contribute to resource disparities between institutions—with more resources concentrated in elite universities. They find that changes in State appropriations for higher education that occur while students are in college affect both short and long-run outcomes. Students enrolled at four-year institutions respond to prices, i.e., an increase in state funding leads to a decrease in net tuition, and students reduce their student loan amount in response. Students at four-year institutions also shorten their time to BA attainment. When State funding increases, students enrolled at two-year institutions experience higher rates of BA attainment. This leads to higher student debt among two-year students, but the probability of delinquency or default is lower. (Chakrabarti et al. 2020)

Our paper helps fill the current void found in the literature. This paper is the first large-scale, causal quantitative analysis of the role DHSI funds play in influencing short-, medium-, and long-term student outcomes at the institutional level.

4. Data and Empirical Approach

4.1 Data

To explore whether receiving new DHSI funding improves institution-level student outcomes, we constructed a panel dataset covering the 2004-2014 academic years, which includes five years before and after the first DHSI award we observed in 2009. This panel dataset combines data from the College Scorecard, the Office of Postsecondary Education (OPE), the U.S. Census Bureau, and the Bureau of Labor Statistics (BLS). College Scorecard data are from multiple sources, including the Integrated Postsecondary Education Data System (IPEDS) and the National Students Loan Data System for Students (NSLDS). It offers a wide variety of college and student characteristics, as well as a variety of outcome measures such as completion rates, retention rates, and debt levels. By combining College Scorecard data with multiple other data sources, we have created a comprehensive dataset that includes institution-level characteristics, student characteristics, economic measures, regional indicators, and DHSI funding information. This allows us to explore the relationship between DHSI funding and institution-level student outcomes of retention rates, completion rates, and median debt levels.

The outcome variables of interest are institution-level student outcomes, which can be assessed in terms of short-, medium-, and longer-term impacts. Short-term outcomes include full-time and part-time retention rates (one year forwarded) for four-year and two-year institutions. Retention is a measure of persistence in higher education. As such, the terms persistence and retention are used interchangeably. It is short-term because they measure the retention rate change within a year. For example, it measures the retention rates when students go from their freshman year to their sophomore year (hence, one year forwarded). Among the DHSI awardees, it measures the one-year impact on retention rates.

The medium-term outcomes are 150%-time completion rates (one-year, two-year, and threeyear forwarded) in two-year institutions, and 150%-time completion rates (one-year to six-year forwarded) in four-year institutions. These medium-term outcomes measure the impact of DHSI funding up to six years after a school receives the award. For example, when an institution received its initial DHSI funding in the 2009-10 school year, four cohorts of students were attending the university and could benefit from any new programs or initiatives.

The freshman cohort started their study in this institution in 2009. The 150%-time completion rates (six-year forwarded) measure this freshman cohort's completion rates six years later in 2015. Similarly, another cohort of students started their junior year in 2009. Then, the 150%-time completion rates (four-year forwarded) measure this junior cohort's completion rates four years later in 2014. Each institution of higher education may focus its programs on different groups of students. For example, first-year common experience will tend to benefit freshmen and sophomores, while a career counseling course may benefit junior and senior students more. *A priori*, it is unclear which cohort could benefit more from DHSI funding. Hence, we examined all four cohorts to investigate the likelihood of heterogeneous impacts across different student cohorts. Suppose these new programs and counseling courses and services are consistently offered throughout students' college years, and as such, the impact on their completion rates should be larger than that of other latter cohorts, such as the juniors. See Figure 1 for an explanation of different cohorts.

<Insert Figure 1 Here>

Debt burdens across multiple subsamples of student populations measure the longer-term view of institutional student outcomes. All debt levels are inflation-adjusted and are expressed in real 2015 dollars. It includes median cumulative debt burdens for students who relied on student loans to help finance their education and median debt level for first-generation students, low-income

students, graduates, and those who withdrew from the institutions. For a complete list of variables and their definitions, see Table 1.

<Insert Table 1 Here>

The key variable of interest, i.e., the treatment variable, DHSI, is a dummy variable indicating new Title V Developing Hispanic Serving Institution funding awarded between 2009 and 2014. New DHSI grants are awarded each year through a competitive process. The time period between 2009 and 2014 was selected for several reasons.

First, in 2008, the Higher Education Opportunity Act (HEOA) amended the section on DHSI to include additional authorized activities such as "activities to improve student services, including innovative and customized instruction courses designed to retain students and move the students into core courses; articulation agreements and student support programs designed to facilitate the transfer of students from two-year to four-year institutions; and providing education, counseling services, and financial information designed to improve the financial and economic literacy of students and their families."⁵ Given this change to the authorized activities, using a period with consistent, allowable uses of funding eliminates confounding estimation concerns.

Second, institution-level DHSI award information is only available beginning in 2009. Finally, given the timing of the award and the ability to match funding with student cohorts, 2014 is the last year that will deliver treatment effects within the timeframe of our data. Between 2009 and 2014, 189 new DHSI grants were awarded to 177 institutions. On average, these institutions receive between \$530,000 and \$695,000 annually for a period of five years. Over the five-year award period, this amounts to approximately 2.5 to 3.5 million dollars.

It is important to note that institutions that receive a new award are a small subset of institutions that benefit from the DHSI funding. New awards comprise about 10% of the Department of Education's DHSI funding allocation; continuation awards comprise a significant portion of each year's budget. Detailed information on continuation awards is not publicly available, and therefore, our analysis focuses on newly awarded DHSI grant funds.

Figure 2 provides a map illustrating the geographical location of DHSI recipients from 2009-2014. Notably, we see a concentration of DHSI recipients in the south and west. Institutions in

⁵ https://www2.ed.gov/programs/idueshsi/index.html

border states such as Texas, California, New Mexico, and Arizona received a substantial number of new awards between 2009 and 2014. Some DHSI awards are granted to the Midwest and North institutions, though not in the same concentration as in the South and West.

<Insert Figure 2 Here>

This pattern likely corresponds to population growth in southwest states and highlights the fact that most HSIs developed more recently related to changing enrollment demographics driven by the growing local area Hispanic population (Benitez and DeAro 2004; Flores and Park 2015). As a result, HSIs are generally located in states with large Hispanic populations, such as California, Florida, New Mexico, New York, and Texas (Garcia and Taylor 2017). It may also reflect networking effects from HSI anchor institutions, i.e., institutions at the forefront of institutional reform and are change agents (Porter 2016). Geographical proximity to other DHSI recipient institutions may offer more opportunities for institutions to collaborate and for the anchor institutions to help other institutions successfully apply for and receive funding.

Between 2009-2014, 177 institutions received new DHSI awards. We refer to these colleges and universities as DHSI institutions and the others as non-DHSI institutions. We have complete data on 160 out of the 177 DHSI institutions. In our sample period, four DHSI institutions are missing a large portion of the years. The Polytechnic University of Puerto Rico-Orlando has six years of data; Moreno Valley College and Norco College have four years each; the University of North Texas at Dallas only has one year of data. Some other colleges and universities did not appear until the later years in the sample period, and some institutions underwent fundamental changes, such as splitting into two distinct entities.

To circumvent issues with unbalanced data, these four schools and 763 non-DHSI schools are dropped. The majority of these dropped institutions have less than six years of data. After this adjustment, the number of institution-year observations decreased from 39,477 to 35,596.

<Insert Table 2-1 Here> <Insert Table 2-2 Here> Tables 2-1 and 2-2 provide summary statistics for two-year and four-year DHSI institutions and non-DHSI institutions. Notably, DHSI institutions have a mean Hispanic student population comprising approximately 35% and 33% of undergraduate enrollments in two-year and four-year DHSI institutions compared to non-DHSI institutions with less than 7% Hispanic undergraduate enrollment. Both part-time and full-time retention and completion rates for two-year and four-year institutions are lower at DHSI institutions than non-DHSIs. Across all debt categories, DHSI institutions report lower average debt burdens associated with these institutions than non-DHSI institutions.

In four-year institutions, the mean principal loan debt amount is \$2,885.29 (10,242.16 vs. 13,127.45) lower for students in DHSI than non-DHSI institutions. And the difference is \$1,679.92 (4,330.73 vs. 6,010.65) in two-year institutions. The difference is larger among students who graduated from DHSI and non-DHSI, \$3,894.38 (16,507.78 vs. 20,402.16) in four-year institutions and \$2,288.27 (7,338.39 vs. 9,626.66) in two-year institutions.

Unlike students who graduated from DHSIs, withdrawn students are less likely to benefit from student success initiatives such as financial literacy programs. Therefore, we expect a smaller difference: \$247.79 (6,993.46 vs. 7,241.25) in four-year institutions and \$332.74 (4,018.44 vs. 4,351.18) in two-year institutions.

DHSI institutions see higher proportions of first-generation students, Pell grant recipients, and part-time students. DHSI institutions show a lower mean real family income of \$41,353 vs. 58,891 in non-DHSI institutions in four-year institutions and \$22,032 vs. \$27,918 in two-year institutions.

<Insert Table 2-3 Here>

Table 2-3 presents summary statistics for DHSI and non-DHSI institutions with Hispanic student enrollment ranging from 15% to 30%. Consistent with the overall sample, there are notable differences between DHSI and non-DHSI institutions in this sub-sample. Specifically, DHSI institutions report lower average debt levels across all debt categories compared to non-DHSI institutions. Furthermore, DHSI institutions have higher proportions of first-generation students, Pell Grant recipients, and part-time students.

To bolster our empirical approach, we conduct a qualitative examination and analysis of DHSI application abstracts from 2009 to 2014. Using abstracts from only those institutions that received

new DHSI awards, we can help show how the DHSI program's priorities and incentives influenced the grant awardees proposed approaches to improving student success. We employed NVivo language processing software to search for patterns within the 188 proposals that received new DHSI grants between 2009 and 2014.⁶

To better understand the term "student success," we conducted a qualitative search for various indicators of student achievement that aligned with the DHSI program's priorities. These indicators encompass short-term measures such as student enrollment and transfer rates, medium-term measures like completion, retention, and graduation rates, and long-term measures of student success, including career outcomes, financial literacy, and income.

In NVivo, we group words based on word frequency and their stemmed forms. For instance, "enrolled" and "enrolls" are grouped together under "student enrollment" to streamline the analysis. Table 3 summarizes the qualitative analysis conducted on 188 awarded proposals. The findings reveal a strong emphasis on student success, aligning with the priorities of the DHSI program. Notably, more than 150 proposals focus on increasing transfer rates from two-year community colleges to four-year institutions, particularly on cooperative development grants.

<Insert Table 3 Here>

Furthermore, more than 100 proposals, accounting for over 50% of the awarded proposals, highlight goals for improving student completion rates, graduation rates, income levels, and student enrollment. Additionally, various other aspects of student success, including enhancing retention rates, fostering better career outcomes, and promoting financial literacy, are mentioned in over 50 proposals, representing more than 25% of all awarded proposals.

Finally, while the awarded proposals do not explicitly address the reduction of student debt after graduation, they do emphasize other long-term measures of student success, such as fostering financial literacy, enhancing income prospects, improving career outcomes, and developing essential skills. These measures can be regarded as proxies for the commitment of awarded HSIs to alleviate the financial burden on students.

⁶ The awarded proposals comprise 29 abstracts in 2009, 78 abstracts in 2010, 13 abstracts in 2011, 19 abstracts in 2012, 11 abstracts in 2013, and 38 abstracts in 2014.

4.2 Empirical Methodology

We used difference-in-differences (DID), panel models with two-way fixed effects (TWFE), and Propensity Score Matching (PSM) to address the possibility that the estimated relationship could be spurious. For example, there could be many reasons why a small group of HSIs increased success measures faster than all other U.S. institutions over the sample period. It could be coincidental that they got small infusions of money from the same program around the same time. There could be regional factors that affected treatment and control groups differently. For additional robustness tests, we estimated heterogenous difference-in-differences (HDID) models.

Our first model employs DID design to estimate the causal relationship between DHSI and outcome measures. The DID method is a quasi-experimental design to compare the pre-policy differences between treatment and control groups with their post-policy differences. Empirically, the DID estimator is the coefficient for the interaction terms between two binary indicators: an indicator that equals one for the treatment group and zero for the control group; another indicator that equals one for the post-intervention period and zero for the pre-intervention period.

We define pre-policy periods as any year prior to 2009 and post-policy periods as years after 2009. The treatment group refers to those institutions that received new DHSI funding between 2009-2014, i.e., DHSI institutions. The control group refers to other higher education institutions that did not receive the funding, i.e., non-DHSI institutions during the same sample period. Title V funding eligibility requires institutions to be not-for-profit. Therefore, our control group only includes non-profit institutions. The DID model is as follows:

(1)
$$Y_{i,t+j} = \alpha_0 + \beta_1 Post_{2009} + \beta_2 T_i + \beta_3 Post_{2009} * T_i + \lambda_1 S_{i,t} + \lambda_2 U_{i,t} + \lambda_3 E_{i,t} + \varepsilon$$

where $Y_{i,t+j}$ is a vector of outcome variables, including retention rates, completion rates, and student debt, for each institution *i* at time t+j, where *j* represents the number of lead years necessary to reconcile cohorts between outcome and control variables appropriately. Completion rate lead years vary from j=3 to j=6.⁷ For the retention rate outcome, j=1; for the debt outcome, j=0. T_i equals one if institution *i* received new DHSI funding during 2009-2014; zero otherwise. *Post*₂₀₀₉ is a dummy variable equaling one during the treatment years, i.e., after 2009. The interaction term

⁷ For example, the 2009 College Scorecard data on 150% completion for four-year institutions, refers to the cohort entering in 2003-04 academic year. All details on cohort timing can be found in the College Scorecard Data Dictionary and Documentation.

coefficient β_3 measures the DHSI program's impacts on the three sets of outcome variables: retention rates, completion rates, and debt levels.

We have three sets of control variables: student characteristics $S_{i,t}$ which include students' average age at entry, family income and its squared term, shares of female, dependent, part-time, married, and first-generation students. $U_{i,t}$ refers to institution characteristics that include real, inflation-adjusted tuition and fees expressed in 2015 dollars, main campus indicator, private university indicator, four-year or above colleges or universities, and undergraduate enrollment. $E_{i,t}$ are relevant state-level economic characteristics, including the annual unemployment rate and the poverty rate.

In line with previous work, student characteristics, institution characteristics, and economic measures are all expected to be important predictors of college persistence, completion rates, and debt levels (Flores and Park, 2013; Denning, Marx, and Turner, 2019). Robust standard errors are estimated and clustered at the institution level.

The quasi-experimental DID design in Equation 1 assumes an exact date when a policy takes effect, affecting only the treatment group, not the control group. Researchers can then compare the difference between the two groups in the pre-policy period with their difference in the post-policy period. However, in this analysis, the first DHSI grant was awarded to 14 institutions in 2009, and the number of schools awarded went up yearly until 156 schools in 2014. Hence, there is no exact date when all treatment members received the treatment. The interaction term coefficient β_3 could thus be an incorrect measure of DHSI impact.

To address this problem, we used the second set of models, the TWFE model, as listed in Equation 2:

(2) $Y_{i,t+j} = \alpha_i + \delta_t + \beta T_{i,t} + \lambda_1 S_{i,t} + \lambda_2 U_{i,t} + \lambda_3 E_{i,t} + \varepsilon_{i,t}$

where $Y_{i,t}$ is a vector of outcome variables as defined in Equation 1. α_i and δ_t are institution and year-fixed effects. $T_{i,t}$ equals one if institution *i* received new DHSI funding during 2009-2014 at year *t*; zero otherwise. The TWFE estimator, i.e., coefficient, β measures the DHSI program impacts on the three sets of outcome variables: retention rates, completion rates, and debt levels. We have three sets of control variables: student characteristics, institution characteristics, and state-level economic characteristics, as listed in the DID models in Equation 1. In the third set of models, we re-estimate the TWFE by replacing the full sample with the Propensity Score Matching (PSM) sample. The PSM method is used to further reduce heterogeneity between DHSI institutions and non-DHSI institutions. We hypothesize that there might be heterogeneous results across different sectors and possible pre-existing differences between non-DHSIs that are very different from DHSIs. For example, many institutions do not enroll a lot of first-generation, low-income students or many minority students. The TWFE results in Equation 2 using the full sample would compare DHSIs with these control institutions, which may have had much better student outcomes prior to the funding. This comparison thus can lead to biased and inaccurate causal estimates.

Instead of comparing DHSIs with non-DHSIs in the full sample, we implemented a nearestneighbor propensity score matching algorithm to find a matching pair for each DHSI before 2009. We split the sample into two-year and four-year samples to ensure that the matching pair draws from the sector to where the DHSI belongs.

We used student, institution, and state-level variables to derive the propensity score in 2007, two years before the first award, to match ever-awarded institutions with those that were never awarded in 2007. We chose the pre-award year (i.e., 2007) for matching because student characteristics, etc., could be affected by the DHSI treatment after 2009. Such variables should be considered as outcomes, not controls or sample restrictions. After identifying the matched institutions in 2007, we used the same institutions to estimate the panel fixed effect models separately in the sample of two-year institutions and four-year institutions.

In the case of two-year community colleges, 105 colleges in the treatment group were paired with individual colleges in the control group. For example, San Antonio College in San Antonio, TX, from the treatment group, was matched with Tarrant County College in Fort Worth, TX, from the control group. Both are community colleges situated in large metropolitan areas with significant Hispanic populations. Similarly, in the case of four-year colleges, 51 colleges in the treatment group were matched with individual colleges in the control group. For instance, the University of Texas at Rio Grande Valley in the treatment group was matched with California State University – Long Beach in the control group. Both colleges are large public universities with a substantial proportion of first-generation students.

The last set of models is heterogenous difference-in-differences (HDID), which we use as an additional robustness check. The TWFE models (with full sample and PSM sample) may not be

accurate in causality analyses when there are heterogenous treatment effects, that is, when treatment is staggered in adoption and varies with time (Freedman et al., 2023, Roth et al. 2023; Callaway and Sant'Anna 2021; Liu 2023).

In this analysis, the first DHSI grant was awarded to 14 institutions in 2009, and the number of schools awarded went up yearly until 156 schools in 2014. Despite different treatment timing, the TWFE estimator can still be consistent if treatment effects are constant. However, the constant treatment effect assumption is restrictive. It requires that the causal effect of the treatment does not differ across units, groups, and time periods (Freedman et al., 2023).

Recent studies provided alternative DID and TWFE estimators for heterogeneous treatment effects (Roth et al., 2023; Callaway and Sant'Anna, 2021; Liu, 2023). To test the robustness of our results, we used the new program *xthdidregress* in Stata 18 to estimate heterogenous treatment effects on the treated (ATETs) that may vary over time and treatment cohorts. We did not include control variables other than the year-dummy variables and fixed effects because treatment can affect student characteristics, etc. Such variables should be considered as outcomes, not controls or sample restrictions.

5. Results

5.1 Difference-in-differences Results

Table 4 presents the results from Equation 1, i.e., DID estimates of the impact of new DHSI funding on retention rates, completion rates, and median debt. Model 1 is the benchmark (i.e., no control variables other than the treatment group indicator, post-treatment period indicator, and their interaction term. Model 2 adds the economic measures of the unemployment rate and the poverty rate. The models build on each other; therefore, all controls added in model 2 carry through to model 3 and so on. Model 3 adds institution controls such as whether the campus is the main campus, private institution indicator, bachelor's degree awarding institution, undergraduate enrollment, tuition, and fees adjusted for inflation. Model 4 adds student characteristics such as the average age of college entry, the share of female students, the share of married students, the share of dependent students, the share of first-generation college students, the share of part-time students, family income, and family income squared term. It is worth noting the number of observations decreased after including student characteristics.

<Insert Table 4 Here>

For two-year DHSI colleges, the short-term outcomes measured by full-time (one year forwarded) retention rates were associated with an increase of 2.67 to 3.11 percentage points (PP) and an increase of 3.27 to 3.90 PP in part-time retention rates (one year forwarded).

In medium-term outcomes, there were no impacts on 150% completion rates (one year forward), but the impacts were significant for 150% completion rates (two years forward) and 150% completion rates (three years forward). We also saw the increases were larger for 150% completion rates (three years forward) than 150% completion rates (two years forward). The former was a 2.60 to 3.61 PP increase, and the latter was a 1.16 to 2.32 PP increase. This finding was consistent with our previous discussions on how many years the DHSI award could affect first-year students, sophomores, juniors, and seniors. Compared to students in the 150% completion rates (two years forward) were affected by the DHSI award for an additional year.

There were significant debt decreases in the long-term outcomes. The largest declines were among the graduated students, ranging from \$629.9 to \$1023.7. The smallest declines were among the withdrawn students, ranging from \$259.6 to \$400.4.

Like the two-year DHSI colleges, four-year universities with DHSI awards had improved retention and completion rates, and lowered debt outcomes. In the short term, the DHSI awards were associated with an increase of 1.86 to 2.23 PP in full-time retention rates and 3.14 to 4.29 PP in part-time retention rates.

In the medium term, DHSI awards did not impact 150% completion rates (one year and two years forward). This was as expected because these students had already graduated before the university received DHSI awards. Hence, it was not supposed to affect pre-award student cohorts. The 150% completion rates (three years to six years forward) showed positive and significant impacts, and the impacts were larger in later years. Again, this direction was expected because 150% completion rates (five and six years forward) were for the cohorts of first- and second-year students, and the 150% completion rates (three and four years forward) were for the cohorts of third- and fourth-year students. The former student cohorts were exposed to DHSI grants for more years than the latter student cohorts. Therefore, they should exhibit better outcomes than the less affected students.

The long-term outcomes, measured by debts, showed mixed results. The DID estimates were insignificant in Model 4 when student characteristics were included, but they were negative and significant in other model specifications.

5.2 Two-way Fixed Effects Results

Table 5 exploits the benefits of the panel nature of the data and presents four different specifications based on Equation 2. Similar to Table 4, model 1 is a panel two-way fixed effect with no additional controls. Model 2 adds the economic measures of the unemployment rate and the poverty rate. The models build on each other; therefore, all controls added in model 2 carry through to model 3 and so on. Model 3 adds institution controls such as whether the campus is the main campus, private institution indicator, bachelor's degree awarding institution, undergraduate enrollment, tuition, and fees adjusted for inflation. Model 4 adds student characteristics such as average age of college entry, share of female students, share of married students, share of dependent students, share of first-generation college students, share of part-time students, family income and family income squared term. Like Table 4, the number of observations decreased after including student characteristics.

<Insert Table 5 Here>

In the short-term measures, for two-year colleges, the funding boosts full-time student retention by 1.50~2.14 PP. The impact is slightly larger in terms of magnitude in four-year DHSIs. For fouryear DHSIs, receiving DHSI funding translates to a 2.69 PP increase in full-time student retention in model 1, where there is no other control variable. This impact is robust across all model specifications, ranging from 2.64~2.83 PP. When we combine the first-time and full-time retention rates for both community colleges and four-year universities (not reported in Table 6), the impact of DHSI funding translates into roughly a two percentage points (PP) increase in retention rates.

For part-time students, the program's impact varies depending on institution type. Two-year colleges show a positive effect on retention that is larger than the impact on full-time students. It ranges from 3.60~3.83 PP. To the extent that the share of part-time students in DHSIs often makes up close to half of the student population, the effect of DHSI funding on part-time students is both statistically significant and economically important. We did not find statistically significant results for part-time student retention at four-year institutions except for model 4 (4.66 PP boost).

We now turn to DHSI's effect on college completion rates. We examined four different cohorts for four-year university completion rates. For example, when an institution just received its initial DHSI funding in the 2009-10 school year, four cohorts of students are attending the colleges and can potentially benefit from any new programs or initiatives. Depending on each specific higher education institution, they may focus their programs on different groups of students. For example, first-year common experience will benefit freshmen and sophomores, while a career counseling course will benefit junior and senior students more. A priori, we do not know which cohort could benefit more from DHSI funding. Hence, we examined all four cohorts to investigate the likelihood of heterogeneous impacts across different student cohorts.

The best outcome among all four cohorts is for the sophomore cohort. The sophomore cohort college complete rates improved by 3.01~3.39 PP followed by the freshman cohort college completion rates improvement of 2.75~3.14 PP. For junior and senior cohorts, the boost in six-year college completion rate (i.e., 150% completion rate) is 2.32~2.87 PP and 1.88~2.23 PP, respectively.

We examine two cohorts for two-year colleges: first- and second-year students. Their completion rates were measured by 150% completion rates (three-year forward) and 150% completion rates (two-year forward). To the extent that first-time and full-time students are a smaller share of the student population at these community colleges, we limit the cohort analysis to only first- and second-year student cohorts. The three-year college completion rate for the first-year students cohort increased by 2.17~2.81 PP. Similarly, there was a 1.66~2.14 PP increase in three-year college completion rates for the second-year students cohort.

These magnitudes align with recent findings from a meta-analysis of grant aid on degree attainment. Nguyen et al. (2019) found the average effect of grant aid on degree completion is around 2.4 percentage points.

The long-term outcomes were measured by various debt types. In two-year institutions, the principal loan debt amount was around \$279.7~\$711.0 lower for students who graduated from DHSIs than non-DHSIs. Given the average debt for DHSIs was around \$4330.73 (see Table 2-1 Two Year), these dollar amounts translate to 6 percent to 16 percent of the debt reduction.

Previous research has documented that students who withdraw often struggle to repay their college debt (Podgursky et al. 2002; Dynarski 1994; Volkwein et al. 1998). We examine several subsamples to test the robustness of these results. Compared with students who graduated from

DHSIs, withdrawn students are least likely to benefit from student success initiatives such as financial literacy programs. Therefore, we expect to see a smaller effect. The DHSI program reduced withdrawn student debt by \$142.3-\$331.1. Students who graduated saw their debt reduced by between \$334.8~\$807.4.

To the extent that DHSI institutions often enroll more low-income and first-generation students than non-DHSIs, the outcomes for these subsamples are important to consider as well. Pell-eligible students attending DHSIs end up with less college debt in the range of \$274.8 to \$696.4, and the same is true for first-generation students in the range of \$334.8 to \$807.4.

In four-year institutions, we observed significant debt reductions among graduated students, ranging from \$814.8 to \$982.7. Because the average debt for DHSIs was around \$10,242.16 (see Table 2-2 Four Year), these dollars translate to 8 percent to 10 percent of the debt reduction. There were no significant effects on the debt of withdrawn students, suggesting that withdrawn students are least likely to benefit from student success initiatives such as financial literacy programs. The DHSI grants were associated with reductions in the principal loan debt, debt level for students on Pell Grant, and debt for first-generation rates. However, the effects were insignificant in Model 4 when student characteristics were included.

5.3 Propensity Score Matching Results

Table 6 reports the results of TWFE models using PSM samples. As explained in the methodology section, heterogeneous characteristics exist across different sectors, and pre-existing differences between non-DHSIs differ significantly from DHSIs, as reflected in Tables 2-1 and 2-2.

We split the sample into two-year and four-year samples to ensure that the matching pair draws from the sector to where the DHSI belongs. In the case of two-year community colleges, 105 colleges in the treatment group were paired with individual colleges in the control group. Similarly, in the case of four-year colleges, 51 colleges in the treatment group were matched with individual colleges in the control group. To assess the balance between treated and untreated groups, Appendix Tables 1 and 2 demonstrate that matching effectively mitigated most of the covariate bias, resulting in a more balanced distribution across all covariates.⁸ Furthermore, Appendix Figures 1 and 2 illustrate a substantial overlap in the covariate distributions for both 2-year and 4-

⁸ For 4-year college group comparison in Appendix Table 2, it seems that there was an increase in bias observed in the covariates of "age of entry" and "female". However, the significance levels for both covariates remain unchanged.

year colleges, indicating ample common support. This guarantees adequate units for both treated and untreated groups to establish meaningful matches. The post-matching outcome analysis is given in Table 6.

<Insert Table 6 Here>

For the PSM sample in two-year colleges, there were no statistically significant results for retention rates and college completion rates except for model 4 for part-time retention rate of 2.26 PP improvement. For debt outcomes, nearly all model specifications are statistically significant except for model 4 for overall debt and debt level for students on Pell Grant. The debt outcomes usually saw a reduction from the low end of debt level for students who withdrew (\$135.3~\$199.5) to the high end for students who graduated from the community colleges (\$470.1~\$624.0). When we average the coefficients among various debt types, the average overall debt reduction is around 200 dollars.

For the four-year university PSM sample, the increase in retention rates for full-time students is 3.02~3.31 PP, which is almost one percentage point higher than the full sample analysis in Table 5. The retention rate increase for part-time students is 6.47~7.48 PP, nearly two percentage points higher than the full sample analysis.

Though the college completion rates are not as strong as the full sample, most of the models retain their statistical significance. For example, sophomore, junior, and senior cohorts' college completion rates all saw improvements of 2.01~2.34 PP, 1.59~2.43 PP, and 1.73~2.13 PP. Interestingly, the freshman cohort college completion rates did not show any statistical significance. There is one and only one debt outcome that showed statistical significance: the median debt for students who graduate from the university saw a reduction of \$555.0~906.5, which is smaller in magnitude (\$814.8~\$982.7 in the full sample).

To test the robustness of the results, we report the results from HDID models in Appendix Table 3. Similarly to other models, they are estimated using two-year and four-year institution samples separately. We continue to observe significant effects of DHSI programs.

5.4 Back-of-the-envelope Cost and Benefit Analysis of the DHSI Program

To put our study into the broader context of higher education funding, we conducted a backof-the-envelope calculation to provide a rough estimate of the magnitudes of the DHSI program based on prior literature. For example, Chakrabarti et al. (2020) showed the general funding from the state's investment in higher education. They find that for four-year colleges and universities, each one-thousand dollar increase in the state's appropriation to the higher education sector increases the college completion rates by 1.5 percent. They also find that such investment leads to 2 PP lower college loan debt origination.

In our sample, each DHSI award usually distributes about \$500,000 per year. The average enrollment size of the institution is around 9,794 in two-year institutions and 8,972 in four-year institutions (see Tables 3-1 and 3-2). So, the **average per student per year costs \$51.05** (\$500,000 /9,794) and **\$55.73** (\$500,000 /8,972) in two-year and four-year institutions.

The calculated benefits of the program can be estimated via either **reduced debt** outcomes or **increased college completion rates** since there are readily available studies that can translate these benefits into dollar amounts. We will examine debt outcomes first.

In our analysis using **the two-year college sample** in Table 5, we find that the principal debt origination went down by $279.7 \sim 711.0$ dollars. In this sample, there are 1,642 students taking debt (see Table 2-1 Two Year). The total benefits for an average two-year college will be between \$459,760 (1,642×280) and 1,167,462 (1642×711). Since the average enrollment size is 9,794, **the per-student benefit** will be **\$46** (\$459,760/9794) and **\$119** (1,167,462/9794).

Turning to **four-year sample** results on debt origination in Table 5, we find that the principal debt origination went down by 466~584 dollars. In this sample, there are 3,665 students taking debt (see Table 2-2 Four Year). The total benefits for an average four-year college will be between 1,707,890 (3665×466) and 2,140,360 (3665×584). Since the average enrollment size is 8972, **the per-student benefit** will be **\$190** (\$1,707,890/8972) and **\$239** (\$2,140,360/8972).

Based on our calculations of per-student cost, both two-year and four-year samples will reap enough benefits to exceed the program's cost. These benefits are much larger in four-year samples than in two-year samples.

Next, we estimate the benefits in terms of increased college completion rates. On average, the college completion rates increase by 1~3 PP for four-year university students in Table 5. According to Tamborini et al. (2015), the lifetime earnings differentials between some colleges

and bachelor's degree earners are around $0.42 \sim 0.67$ million dollars for female and male graduates. The average enrollment size for our four-year DHSIs is 8,972. Suppose we assume that 1 PP (the low number in our estimates of $1 \sim 3$ PP) of these 8,972 students will receive their bachelor's degree. In that case, there will be an additional 89 (8,972×0.01) students receiving their bachelor's degree after the institution receives the DHSI funding. For each student, the additional lifetime earnings benefit will be $0.42 \sim 0.67$ million. The total additional lifetime earnings for all of these 89 students will be $$37.38 \sim 59.63 million (89×0.42 million $\sim 89 \times 0.67$ million). To calculate the per student per year benefit, we will need to divide the total benefits by its enrollment size of 8,972, and we get **\$4,166~\$6,646 per student per year additional benefits** from the increase in the college completion rate.

We can use similar reasoning to calculate the per student per year benefits of completing a two-year degree program. Using the same study referenced above (Tamborini et al., 2015), the additional lifetime benefits of receiving some college is around 0.2 million. For our two-year sample, the impact of DHSI on college completion rates is around 1~2 PP. If we multiply these two numbers, we derive the per student per year benefits in additional lifetime earnings. This works out to be **\$2,100~\$4,200** dollars. Additional calculations can be done for students in different income cohorts and year cohorts. To summarize, we find that the program's benefits are much higher than the annual per-student cost of the program of \$51.05 and \$55.73 in two-year and four-year institutions.

5.5 Causal Mechanism

As explained in the Data section and Table 3, we conducted a qualitative analysis of abstracts or activity plans submitted by the 2009-2014 DHSI recipient institutions. These plans were submitted to the U.S. Department of Education as part of the DHSI grant application process. This analysis allows for a better understanding of institution goals associated with the receipt of DHSI funding and suggests possible causal mechanisms through which DHSI funding affected various outcomes.

Common themes and goals emerged across the applications. These findings are presented in Table 3. On average, institutions listed 3-4 main goals, with "student success" being the most common goal among DHSI award recipients. Student success seems to be a catch-all term to cover a wide range of activities. Kuh et al. (2006) envision student success as both short-term academic achievements, such as test scores, college GPA, and progression toward the degree, and medium-

term goals, such as postgraduate enrollment. However, it can also include long-term success, such as labor market earnings and job security.

Moreover, student success can also include student professional growth, development, student civic engagement, and other much broader societal benefits. Some institutions further defined or provided measures for student success. For instance, to enhance student success, Texas State University proposed a first-year experience course involving a university seminar and shared reading program combined with personalized academic mentors and career counseling. These programs are expressed as efforts to improve academic performance in the first year. Texas A&M International University highlighted seven major goals for student success, which included enhancing the academic quality of students' educational experiences to increase retention, graduation, and transfer rates by developing coordinated linkages and faculty development. Each institution is different and will need different approaches and focuses to achieve student success. The additional funding from the DHSI program provides financial support and opportunities, especially for budget-constrained staff members, to spend more resources and time on practices that would work for their institutions and students.

This qualitative analysis also bears out several key outcomes examined in this paper. For example, over 120 activity plans specifically mentioned efforts to improve completion rates, and nearly 100 institutions mentioned efforts to improve retention rates. Nearly 50 reports mentioned financial services or financial literacy in their planned activities.

The themes from the qualitative analysis pair well with our quantitative findings. By reviewing the DHSI application materials, we find our quantitative findings align with the program goals set out by DHSI institutions. Our results confirm that DHSI funding helps these institutions to accomplish the goals set out in their activity plan. These activities ultimately help their students persist, finish their degrees, and make sound economic decisions.

In addition, it should be pointed out that the benefits of debt reduction and completion may not be due to the DHSI funding alone. The Secretary of Education prioritizes applications that provide satisfactory evidence that a Hispanic-Serving Institution is or will be engaged in a collaborative partnership with at least one local educational agency or community-based organization. Therefore, these awarded institutions should have additional support from these collaborated agencies and organizations. The aims of these collaborations were consistent with the priorities in the grant proposals. Therefore, the benefits we observed could be the total effects of the DHSI programs and these collaborations.

6. Discussion and Conclusion

We find that the DHSI Title V funding, a federal program aimed at improving student outcomes, has large effects on both postsecondary outcomes and student college debt levels. Our results consistently show that additional funding from the DHSI program has sizable percentage effects on improving full-time student retention rates, completion rates, and reducing student debt levels. These estimated effects are robust across different specifications and different model assumptions. Through qualitative analysis of the application abstracts, we demonstrate that these effects align with what these institutions set out to accomplish.

Data limitations restricted the analysis to DHSI institutions from 2004 to 2014. As such, it is important to remember that the DHSIs in our sample may not reflect the entire population of institutions that ever received DHSI funding. This offers an area for future work. Our work focuses on the Developing Hispanic Serving Institutions program, which is the largest Department of Education federal funding program that targets HSIs, but it is not the sole source of HSI-designated funding. An interesting area for future research is exploring the impact of other funding programs geared toward HSIs.

Despite these limitations, three important policy lessons emerge. First, we show that DHSI funding improves full-time student retention rates by 1.50-2.83 PP, improves college completion rates by 1.07-3.39 PP for four-year universities, and improves completion rates by 1.66-2.81 PP for two-year colleges. These magnitudes align with a recent meta-analysis of grant aid on persistence and degree attainment, where the estimated effects are around 2.4 PP (Nguyen et al. 2019). These results should be of interest to policymakers interested in the development of university-wide efforts to improve student outcomes.

Second, Dynarski (1994) shows that withdrawn students often have lower debt, but they often face future financial distress. Our findings show the receipt of DHSI funding translates into lower debt across various student subpopulations, including lower debt for students who withdraw.

The receipt of DHSI funding is associated with \$279.7~\$711.0 lower principal loan debt for students in two-year non-DHSI institutions. In four-year institutions, we observed significant debt reductions among graduated students, ranging from \$814.8 to \$982.7. These estimated effects are

in line with the broader literature of Chetty et al. (2020). Their mobility report cards indicate that several HSIs are associated with improved intergenerational mobility for low-income and first-generation students. We show that the DHSI program's focus on low-income and first-generation students has paid off in terms of lowering these students' college debt for Pell grant recipients and for first-generation students.

On average, our sample of DHSIs has much larger enrollments: 9794.74 compared to 3,278.35 in two-year non-DHSI institutions and 8972.10 compared to 4421.80 in four-year non-DHSI institutions. Additionally, more than half of the student population are first-generation students, and more than 85% receive Pell grants. The effects of the DHSI program on first-generation and low-income students are pronounced and have important policy implications. These findings indicate the importance of targeted funding programs for HSIs and their students. Targeted funding combined with student-success-oriented institutional goals and programs can make substantial headway in improving college persistence, completion, and reducing student debt levels.

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TABLES

Table 1. Variable Names and Definitions*

Variable	Source	Definition
DHSI	OPE	dummy variable indicating if an institution received new HSI-designated funds through the Title V Developing Hispanic-Serving Institutions Program
Outcome Measures		anythile between the years of 2009-2014
Full-time Retention (4yr)	IPEDS	first-time, full-time student retention rate at four-year institutions
Part-time Retention (4yr)	IPEDS	first-time, part-time student retention rate at four-year institutions
Full-time Retention (2yr)	IPEDS	first-time, full-time student retention rate at two-year institutions
Part-time Retention (2yr)	IPEDS	first-time, part-time student retention rate at two-year institutions
150% completion (4yr)	IPEDS	completion rate for first-time, full-time students at four-year institutions (150% of expected time to completion, i.e., 6 years)
150% completion (2yr)	IPEDS	completion rate for first-time, full-time students at two-year institutions (150% of expected time to completion i.e., 3 years)
Debt	NSLDS	real median original amount of the loan principal upon entering repayment, in 2015 dollars
Grad Debt	NSLDS	real median debt for students who have graduated from the institution, in 2015 dollars
Withdraw Debt	NSLDS	real median debt for students who withdrew from the institution, in 2015 dollars
First-Gen Debt	NSLDS	real median debt for first-generation students, in 2015 dollars
Pell Debt	NSLDS	real median debt for Pell students, in 2015 dollars
Student Characteristics		
Age of Entry	Treasury	average age of entry of the student
Female	NSLDS	share of female students
Dependent	NSLDS	share of dependent students
First Gen	NSLDS	share of first-generation students
Family Income	NSLDS	average family income in real 2015 dollars
Married	NSLDS	share of married students
Loan	NSLDS	share of students who received a federal loan while in school
Pell Grant	NSLDS	share of students who received a Pell Grant while in school
Part-time	IPEDS	share of part-time students
Institution Characteristic	cs	
Net Tuition	IPEDS	real net tuition revenue per full-time equivalent student in 2015 dollars (net tuition revenue indicates tuition revenue minus discounts and allowances) divided by the number of FTE students (undergraduates and graduate students)
Admission Rate	IPEDS	admission rate for campuses rolled up to the 6-digit OPE ID
Main campus	IPEDS	indicator variable for the main campus
Private	IPEDS	indicator variable for private university
4-year Institution	IPEDS	indicator variable for bachelor's degree granting institutions
Enrollment	IPEDS	total number undergraduate students (in thousands)
Hispanic	IPEDS	share of Hispanic undergraduate students
Black	IPEDS	share of black undergraduate students

Region	IPEDS	vector of 8 indicator variables indicating U.S. region. Regions include: New England, Mid East, Great Lakes, Plains, Southeast, Southwest, Rocky Mountains, and Far West. New England is the reference group.
Economic Variables		
Unemployment rate	BLS	annual state-level unemployment rate
Poverty rate	Census	annual state-level poverty rate

Notes: Data source indicating: IPEDS, NSLDS, and Treasury, are all available from the College Scorecard data. Note that median debt measures, refer to institution-specific median debt for students who relied on student loans to help finance their education. For all debt measures, family income, and net tuition, all values are adjusted for inflation using the CPI and have been expressed in constant 2015 dollars.

	DHSI Funding Status						
	Never DHSI Funded DHSI Funded Total			otal	Test		
Number of Observations	Sample	Deveentees	Sample	Deveentees	Sample	Deverations	
Number of Observations	512e	Percentage	51Ze	Percentage	512e	Percentage	
	16,079	93.3%	1,153	6.7%	17,232	100.0%	
Outcome Variables (2yr)	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	0.001
Debt	6,010.65	(3274.535)	4,330.73	(1234.565)	5,876.05	(3192.714)	< 0.001
Pell Debt	6,037.06	(3449.637)	4,391.27	(1305.708)	5,899.53	(3354.889)	< 0.001
Withdraw Debt	4,351.18	(1543.871)	4,018.44	(983.280)	4,324.07	(1508.748)	< 0.001
Grad Debt	9,626.66	(4775.979)	7,338.39	(3283.479)	9,451.70	(4717.947)	< 0.001
First-Gen Debt	6,013.83	(3279.079)	4,328.82	(1209.398)	5,873.17	(3192.797)	< 0.001
Full-time Retention (1yr forward)	0.624	(0.166)	0.618	(0.099)	0.623	(0.162)	0.301
Part-time Retention (1yr forward)	0.461	(0.203)	0.414	(0.108)	0.458	(0.198)	< 0.001
150% completion (1yr forward)	0.394	(0.279)	0.208	(0.102)	0.381	(0.275)	< 0.001
150% completion (2yr forward)	0.394	(0.277)	0.207	(0.095)	0.381	(0.273)	< 0.001
150% completion (3yr forward)	0.395	(0.275)	0.208	(0.092)	0.382	(0.271)	< 0.001
Student Characteristics	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	
Age of Entry	26.965	(3.118)	24.95	(1.588)	26.829	(3.081)	< 0.001
Female	0.622	(0.134)	0.597	(0.069)	0.62	(0.130)	< 0.001
Married	0.216	(0.100)	0.151	(0.053)	0.211	(0.099)	< 0.001
Dependent	0.43	(0.174)	0.531	(0.104)	0.437	(0.172)	< 0.001
First-gen	0.521	(0.093)	0.55	(0.062)	0.523	(0.092)	< 0.001
Part-time	0.378	(0.237)	0.581	(0.128)	0.392	(0.237)	< 0.001
Family Income (in \$1000s)	27.918	(12.359)	22.032	(5.481)	27.521	(12.110)	< 0.001
Institution Characteristics	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	
Main	0.925	(0.263)	0.931	(0.253)	0.926	(0.262)	0.444
Private	0.184	(0.387)	0.018	(0.134)	0.173	(0.378)	< 0.001
Undergraduate Enrollment	3,278.35	(5083.336)	9,794.74	(8399.571)	3,714.74	(5611.074)	< 0.001
Number of Students in Debt	2,110.57	(4295.187)	1,642.19	(2290.000)	2,073.61	(4174.001)	< 0.001
In(Net Tuition)	8.584	(1.237)	7.702	(0.914)	8.525	(1.237)	< 0.001
Hispanic Enrollment	0.069	(0.131)	0.35	(0.226)	0.088	(0.156)	< 0.001
Black Enrollment	0.118	(0.168)	0.075	(0.092)	0.116	(0.165)	< 0.001
Pell Grant Recipients	0.787	(0.146)	0.928	(0.061)	0.799	(0.147)	< 0.001
Federal Loan Recipients	0.584	(0.268)	0.272	(0.196)	0.557	(0.276)	< 0.001
Economic Variables	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	
Unemployment	0.067	(0.021)	0.072	(0.024)	0.067	(0.022)	< 0.001
Poverty	0.137	(0.028)	0.151	(0.026)	0.138	(0.029)	< 0.001

Table 2-1. Summary Statistics for DHSI Institutions and non-DHSI Institutions (2-year institutions)

Note: The statistics are derived from raw data with non-missing observation-level information. Standard deviations are noted within parentheses. The Test column reports the p-value from linear regression, which are equivalent to pooled t-tests.

	DHSI Funding Status						
	Never DF	Never DHSI Funded DHSI Funded Total					Test
Number of Observations	Sample Size	Percentage	Sample Size	Percentage	Sample Size	Percentage	
N	17,801	96.9%	563	3.1%	18,364	100.0%	
Outcome Variables (4yr)	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	
Debt	13,127.45	(4589.203)	10,242.16	(4002.562)	13,035.28	(4599.600)	< 0.001
Pell Debt	14,298.75	(5072.376)	10,836.91	(4487.454)	14,185.93	(5091.507)	< 0.001
Withdraw Debt	7,241.25	(2518.909)	6,993.46	(2391.763)	7,233.25	(2515.218)	0.023
Grad Debt	20,402.16	(4944.944)	16,507.78	(5247.203)	20,276.24	(5002.498)	< 0.001
First-Gen Debt	13,341.31	(4826.293)	10,260.91	(4088.039)	13,240.75	(4834.973)	< 0.001
Full-time Retention (1yr forward)	0.744	(0.134)	0.725	(0.103)	0.744	(0.133)	< 0.001
Part-time Retention (1yr forward)	0.483	(0.293)	0.471	(0.222)	0.482	(0.290)	0.383
150% completion (1yr forward)	0.533	(0.195)	0.425	(0.134)	0.529	(0.195)	< 0.001
150% completion (2yr forward)	0.534	(0.196)	0.43	(0.136)	0.531	(0.195)	< 0.001
150% completion (3yr forward)	0.536	(0.196)	0.436	(0.134)	0.533	(0.195)	< 0.001
150% completion (4yr forward)	0.537	(0.196)	0.439	(0.134)	0.534	(0.195)	< 0.001
150% completion (5yr forward)	0.538	(0.196)	0.44	(0.134)	0.534	(0.195)	< 0.001
150% completion (6yr forward)	0.538	(0.196)	0.442	(0.133)	0.535	(0.195)	< 0.001
Student Characteristics	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	
Age of Entry	23.043	(3.483)	23.977	(1.950)	23.072	(3.449)	< 0.001
Female	0.581	(0.116)	0.621	(0.097)	0.583	(0.115)	< 0.001
Married	0.122	(0.110)	0.121	(0.063)	0.122	(0.108)	0.763
Dependent	0.718	(0.208)	0.63	(0.135)	0.715	(0.206)	< 0.001
First-gen	0.341	(0.109)	0.446	(0.075)	0.345	(0.109)	< 0.001
Part-time	0.142	(0.158)	0.229	(0.113)	0.144	(0.158)	< 0.001
Family Income (in \$1000s)	58.891	(21.584)	41.353	(13.613)	58.352	(21.596)	< 0.001
Institution Characteristics	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	
Main	0.965	(0.183)	0.979	(0.145)	0.966	(0.182)	0.088
Private	0.679	(0.467)	0.334	(0.472)	0.668	(0.471)	< 0.001
Undergraduate Enrollment	4,421.80	(6281.552)	8,972.10	(8375.603)	4,561.43	(6404.052)	< 0.001
Number of Students in Debt	2,589.19	(4188.716)	3,664.63	(3299.803)	2,623.37	(4167.587)	< 0.001
In(Net Tuition)	10.113	(0.906)	9.65	(0.873)	10.098	(0.908)	< 0.001
Hispanic Enrollment	0.05	(0.070)	0.331	(0.239)	0.059	(0.094)	< 0.001
Black Enrollment	0.108	(0.190)	0.077	(0.081)	0.107	(0.188)	< 0.001
Pell Grant Recipients	0.566	(0.154)	0.736	(0.119)	0.572	(0.156)	< 0.001
Federal Loan Recipients	0.912	(0.094)	0.778	(0.168)	0.908	(0.101)	< 0.001
Economic Variables	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	
Unemployment	0.066	(0.021)	0.07	(0.022)	0.067	(0.021)	< 0.001
Poverty	0.135	(0.029)	0.15	(0.027)	0.135	(0.029)	< 0.001

Table 2-2: Summary Statistics for DHSI Institutions and non-DHSI Institutions (4-year institutions)

Note: The statistics are derived from raw data with non-missing observation-level information. Standard deviations are noted within parentheses. The Test column reports the p-value from linear regression, which are equivalent to pooled t-tests.

Table 2-3: Summary Statistics for DHSI Institutions and non-DHSI Institutions (Hispanic student ratio between 15% and 30%)

	DHSI Funding Status						
	Never DHSI Funded DHSI Funded				То	Test	
	Sample		Sample		Sample		
Number of Observations	Sıze	Percentage	Size	Percentage	Size	Percentage	
N	577	68.5%	265	31.5%	842	100.0%	
Outcome Variables (4yr)	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	
Debt	14,026.36	(5587.113)	9,177.10	(3722.466)	12498.84	(4999.749) (4740.024)	< 0.001
Pell Debt	14,367.24	(5281.476)	9,915.80	(3562.581)	12905.03	(4740.024)	< 0.001
Withdraw Debt	7,101.32	(2420.181)	6,0134.20	(2290.811)	23806.67	(23/9.429)	0.015
Grad Debt	20,918.24	(5011.075)	16,092.80	(5340.198)	19398.22	(5114./48)	< 0.001
First-Gen Debt	12,1577.25	(5017.350)	9,912.51	(3901.472)	86402.85	(4665.848)	< 0.001
Full-time Retention (1yr forward)	0.702	(0.115)	0.754	(0.112)	0.718	(0.114)	< 0.001
Part-time Retention (1yr forward)	0.501	(0.308)	0.480	(0.251)	0.494	(0.290)	0.420
150% completion (1yr forward)	0.521	(0.205)	0.417	(0.150)	0.488	(0.187)	< 0.001
150% completion (2yr forward)	0.530	(0.195)	0.437	(0.135)	0.500	(0.176)	< 0.001
150% completion (3yr forward)	0.537	(0.196)	0.433	(0.135)	0.504	(0.176)	< 0.001
150% completion (4yr forward)	0.539	(0.196)	0.433	(0.135)	0.505	(0.176)	< 0.001
150% completion (5yr forward)	0.539	(0.196)	0.442	(0.139)	0.508	(0.178)	< 0.001
150% completion (6yr forward)	0.539	(0.196)	0.442	(0.139)	0.508	(0.178)	< 0.001
Student Characteristics	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	
Age of Entry	23.012	(3.490)	24.001	(1.949)	23.323	(3.004)	< 0.001
Female	0.610	(0.117)	0.635	(0.098)	0.617	(0.111)	< 0.001
Married	0 1 2 2	(0.444)	0 101	(0.0.57)	0.121	(0,00,0)	
	0.122	(0.111)	0.121	(0.065)	0.121	(0.096)	0.826
Dependent	0.122	(0.111) (0.210)	0.121 0.636	(0.065) (0.139)	0.703	(0.096) (0.187)	0.826 <0.001
Dependent First-gen	0.734 0.345	(0.111) (0.210) (0.110)	0.121 0.636 0.424	(0.065) (0.139) (0.100)	0.703 0.369	(0.096) (0.187) (0.106)	0.826 <0.001 <0.001
Dependent First-gen Part-time	0.122 0.734 0.345 0.143	$(0.111) \\ (0.210) \\ (0.110) \\ (0.157)$	0.121 0.636 0.424 0.230	(0.065) (0.139) (0.100) (0.120)	0.703 0.369 0.170	(0.096) (0.187) (0.106) (0.145)	0.826 <0.001 <0.001 <0.001
Dependent First-gen Part-time Family Income (in \$1000s)	0.122 0.734 0.345 0.143 59.071	(0.111) (0.210) (0.110) (0.157) (20.691)	0.121 0.636 0.424 0.230 41.302	$(0.065) \\ (0.139) \\ (0.100) \\ (0.120) \\ (14.502)$	0.121 0.703 0.369 0.170 53.473	$(0.096) \\ (0.187) \\ (0.106) \\ (0.145) \\ (18.741)$	0.826 <0.001 <0.001 <0.001 <0.001
Dependent First-gen Part-time Family Income (in \$1000s) Institution Characteristics	0.122 0.734 0.345 0.143 59.071 Mean	(0.111) (0.210) (0.110) (0.157) (20.691) Std. Dev.	0.121 0.636 0.424 0.230 41.302 Mean	(0.065) (0.139) (0.100) (0.120) (14.502) Std. Dev.	0.121 0.703 0.369 0.170 53.473 Mean	(0.096) (0.187) (0.106) (0.145) (18.741) Std. Dev.	0.826 <0.001 <0.001 <0.001 <0.001
Dependent First-gen Part-time Family Income (in \$1000s) Institution Characteristics Main	0.122 0.734 0.345 0.143 59.071 Mean 0.958	(0.111) (0.210) (0.110) (0.157) (20.691) Std. Dev. (0.175)	0.121 0.636 0.424 0.230 41.302 Mean 0.976	(0.065) (0.139) (0.100) (0.120) (14.502) Std. Dev. (0.142)	0.121 0.703 0.369 0.170 53.473 <u>Mean</u> 0.963	(0.096) (0.187) (0.106) (0.145) (18.741) Std. Dev. (0.164)	0.826 <0.001 <0.001 <0.001 <0.001
Dependent First-gen Part-time Family Income (in \$1000s) Institution Characteristics Main Private	0.122 0.734 0.345 0.143 59.071 Mean 0.958 0.682	(0.111) (0.210) (0.110) (0.157) (20.691) Std. Dev. (0.175) (0.481)	0.121 0.636 0.424 0.230 41.302 Mean 0.976 0.352	(0.065) (0.139) (0.100) (0.120) (14.502) Std. Dev. (0.142) (0.481)	0.121 0.703 0.369 0.170 53.473 Mean 0.963 0.578	(0.096) (0.187) (0.106) (0.145) (18.741) Std. Dev. (0.164) (0.481)	0.826 <0.001 <0.001 <0.001 <0.001 0.089 <0.001
Dependent First-gen Part-time Family Income (in \$1000s) Institution Characteristics Main Private Undergraduate Enrollment	0.122 0.734 0.345 0.143 59.071 Mean 0.958 0.682 4,500.71	(0.111) (0.210) (0.110) (0.157) (20.691) Std. Dev. (0.175) (0.481) (6381.410)	0.121 0.636 0.424 0.230 41.302 Mean 0.976 0.352 9,004.25	(0.065) (0.139) (0.100) (0.120) (14.502) Std. Dev. (0.142) (0.481) (8282.571)	0.121 0.703 0.369 0.170 53.473 Mean 0.963 0.578 5919.32	(0.096) (0.187) (0.106) (0.145) (18.741) Std. Dev. (0.164) (0.481) (6980.27)	0.826 <0.001 <0.001 <0.001 <0.001 0.089 <0.001
Dependent First-gen Part-time Family Income (in \$1000s) Institution Characteristics Main Private Undergraduate Enrollment Number of Students in Debt	0.122 0.734 0.345 0.143 59.071 Mean 0.958 0.682 4,500.71 2,621.20	(0.111) (0.210) (0.110) (0.157) (20.691) Std. Dev. (0.175) (0.481) (6381.410) (3912.801)	0.121 0.636 0.424 0.230 41.302 Mean 0.976 0.352 9,004.25 3,604.52	(0.065) (0.139) (0.100) (0.120) (14.502) Std. Dev. (0.142) (0.481) (8282.571) (3301.770)	0.121 0.703 0.369 0.170 53.473 <u>Mean</u> 0.963 0.578 5919.32 2930.94	(0.096) (0.187) (0.106) (0.145) (18.741) Std. Dev. (0.164) (0.481) (6980.27) (3720.32)	0.826 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001
Dependent First-gen Part-time Family Income (in \$1000s) Institution Characteristics Main Private Undergraduate Enrollment Number of Students in Debt In(Net Tuition)	0.122 0.734 0.345 0.143 59.071 Mean 0.958 0.682 4,500.71 2,621.20 10.110	(0.111) (0.210) (0.110) (0.157) (20.691) Std. Dev. (0.175) (0.481) (6381.410) (3912.801) (0.906)	0.121 0.636 0.424 0.230 41.302 Mean 0.976 0.352 9,004.25 3,604.52 9.62	(0.065) (0.139) (0.100) (0.120) (14.502) Std. Dev. (0.142) (0.481) (8282.571) (3301.770) (0.880)	0.121 0.703 0.369 0.170 53.473 Mean 0.963 0.578 5919.32 2930.94 9.955	(0.096) (0.187) (0.106) (0.145) (18.741) Std. Dev. (0.164) (0.481) (6980.27) (3720.32) (0.897)	0.826 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001
Dependent First-gen Part-time Family Income (in \$1000s) Institution Characteristics Main Private Undergraduate Enrollment Number of Students in Debt In(Net Tuition) Pell Grant Recipients	0.122 0.734 0.345 0.143 59.071 Mean 0.958 0.682 4,500.71 2,621.20 10.110 0.572	(0.111) (0.210) (0.110) (0.157) (20.691) Std. Dev. (0.175) (0.481) (6381.410) (3912.801) (0.906) (0.152)	0.121 0.636 0.424 0.230 41.302 Mean 0.976 0.352 9,004.25 3,604.52 9.62 0.728	(0.065) (0.139) (0.100) (0.120) (14.502) Std. Dev. (0.142) (0.481) (8282.571) (3301.770) (0.880) (0.122)	0.121 0.703 0.369 0.170 53.473 <u>Mean</u> 0.963 0.578 5919.32 2930.94 9.955 0.621	(0.096) (0.187) (0.106) (0.145) (18.741) Std. Dev. (0.164) (0.481) (6980.27) (3720.32) (0.897) (0.142)	0.826 <0.001 <0.001 <0.001 0.089 <0.001 <0.001 <0.001 <0.001 <0.001
Dependent First-gen Part-time Family Income (in \$1000s) Institution Characteristics Main Private Undergraduate Enrollment Number of Students in Debt In(Net Tuition) Pell Grant Recipients Federal Loan Recipients	0.122 0.734 0.345 0.143 59.071 Mean 0.958 0.682 4,500.71 2,621.20 10.110 0.572 0.905	(0.111) (0.210) (0.110) (0.157) (20.691) Std. Dev. (0.175) (0.481) (6381.410) (3912.801) (0.906) (0.152) (0.101)	0.121 0.636 0.424 0.230 41.302 Mean 0.976 0.352 9,004.25 3,604.52 9.62 0.728 0.789	(0.065) (0.139) (0.100) (0.120) (14.502) Std. Dev. (0.142) (0.481) (8282.571) (3301.770) (0.880) (0.122) (0.162)	0.121 0.703 0.369 0.170 53.473 <u>Mean</u> 0.963 0.578 5919.32 2930.94 9.955 0.621 0.868	(0.096) (0.187) (0.106) (0.145) (18.741) Std. Dev. (0.164) (0.481) (6980.27) (3720.32) (0.897) (0.142) (0.120)	0.826 <0.001 <0.001 <0.001 0.089 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001
Dependent First-gen Part-time Family Income (in \$1000s) Institution Characteristics Main Private Undergraduate Enrollment Number of Students in Debt In(Net Tuition) Pell Grant Recipients Federal Loan Recipients Economic Variables	0.122 0.734 0.345 0.143 59.071 Mean 0.958 0.682 4,500.71 2,621.20 10.110 0.572 0.905 Mean	(0.111) (0.210) (0.110) (0.157) (20.691) Std. Dev. (0.175) (0.481) (6381.410) (3912.801) (0.906) (0.152) (0.101) Std. Dev.	0.121 0.636 0.424 0.230 41.302 Mean 0.976 0.352 9,004.25 3,604.52 9.62 0.728 0.728 0.789 Mean	(0.065) (0.139) (0.100) (0.120) (14.502) Std. Dev. (0.142) (0.481) (8282.571) (3301.770) (0.880) (0.122) (0.162) Std. Dev.	0.121 0.703 0.369 0.170 53.473 Mean 0.963 0.578 5919.32 2930.94 9.955 0.621 0.868 Mean	(0.096) (0.187) (0.106) (0.145) (18.741) Std. Dev. (0.164) (0.481) (6980.27) (3720.32) (0.897) (0.142) (0.120) Std. Dev.	0.826 <0.001 <0.001 <0.001 0.089 <0.001 <0.001 <0.001 <0.001 <0.001
Dependent First-gen Part-time Family Income (in \$1000s) Institution Characteristics Main Private Undergraduate Enrollment Number of Students in Debt In(Net Tuition) Pell Grant Recipients Federal Loan Recipients Economic Variables Unemployment	0.122 0.734 0.345 0.143 59.071 Mean 0.958 0.682 4,500.71 2,621.20 10.110 0.572 0.905 Mean 0.065	(0.111) (0.210) (0.110) (0.157) (20.691) Std. Dev. (0.175) (0.481) (6381.410) (3912.801) (0.906) (0.152) (0.101) Std. Dev. (0.020)	0.121 0.636 0.424 0.230 41.302 Mean 0.976 0.352 9,004.25 3,604.52 9.62 0.728 0.728 0.789 Mean 0.072	(0.065) (0.139) (0.100) (0.120) (14.502) Std. Dev. (0.142) (0.481) (8282.571) (3301.770) (0.880) (0.122) (0.162) Std. Dev. (0.024)	0.121 0.703 0.369 0.170 53.473 <u>Mean</u> 0.963 0.578 5919.32 2930.94 9.955 0.621 0.868 <u>Mean</u> 0.067	(0.096) (0.187) (0.106) (0.145) (18.741) Std. Dev. (0.164) (0.481) (6980.27) (3720.32) (0.897) (0.142) (0.142) (0.120) Std. Dev. (0.022)	0.826 <0.001 <0.001 <0.001 0.089 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001

Note: The statistics are derived from raw data with non-missing observation-level information. Standard deviations are noted within parentheses. The Test column reports the p-value from linear regression, which are equivalent to pooled t-tests.



 Table 3. Qualitative Analysis of Student Success Outcomes

	· • •	(1)Benchmark (No control)	(2)Economic Measures	(3)Institution Characteristics	(4)Student Characteristics
Two-year ins	titutions				
	Full-time Retention (1yr forward)				
	DHSI×Post-Policy Period	0.0272***	0.0281***	0.0311***	0.0267***
	Robust Std. Err.	(0.00585)	(0.00598)	(0.00610)	(0.00607)
	R-squared	0.00241	0.00247	0.00332	0.00485
chart torm	# of institutions - years	14784	14784	14679	13302
short-term	Part-time Retention (1yr forward)				
	DHSI×Post-Policy Period	0.0327***	0.0346***	0.0390***	0.0381***
	Robust Std. Err.	(0.00763)	(0.00774)	(0.00790)	(0.00830)
	R-squared	0.00235	0.00324	0.00360	0.00225
	# of institutions - years	12801	12801	12746	12210
	150% completion (1yr forward)				
	DHSI×Post-Policy Period	-0.00507	-0.00478	0.00255	0.00608
	Robust Std. Err.	(0.00543)	(0.00548)	(0.00582)	(0.00573)
	R-squared	0.000398	0.000676	0.00193	0.000661
	# of institutions - years	14983	14983	14867	13391
	150% completion (2yr forward)				
	DHSI×Post-Policy Period	0.0116**	0.0138***	0.0202***	0.0232***
term	Robust Std. Err.	(0.00499)	(0.00496)	(0.00532)	(0.00555)
term	R-squared	0.000269	0.00129	0.000809	0.000715
	# of institutions - years	14809	14809	14691	13263
	150% completion (3yr forward)				
	DHSI×Post-Policy Period	0.0260***	0.0296***	0.0347***	0.0361***
	Robust Std. Err.	(0.00542)	(0.00549)	(0.00590)	(0.00629)
	R-squared	0.00277	0.00702	0.00492	0.00213
	# of institutions - years	14624	14624	14502	13124
	Debt				
	DHSI×Post-Policy Period	-830.8***	-757.8***	-668.9***	-356.3***
	Robust Std. Err.	(83.87)	(81.09)	(83.51)	(79.30)
	R-squared	0.351	0.365	0.375	0.475
	# of institutions - years	13417	13417	13304	12056
	Pell Debt				
long-term	DHSI×Post-Policy Period	-773.4***	-682.9***	-610.7***	-300.4***
	Robust Std. Err.	(94.44)	(90.34)	(92.51)	(89.87)
	R-squared	0.307	0.330	0.342	0.424
	# of institutions - years	12218	12218	12127	11422
	Withdraw Debt				
	DHSI×Post-Policy Period	-400.4***	-367.8***	-358.0***	-259.6***
	Robust Std. Err.	(76.30)	(73.70)	(73.80)	(74.01)

Table 4. Difference-in-Differences, Full sample

	R-squared	0.364	0.373	0.381	0.415
	# of institutions - years	11539	11539	11463	10884
	Grad Debt				
	DHSI×Post-Policy Period	-1023.7***	-948.5***	-922.6***	-629.9***
	Robust Std. Err.	(190.9)	(187.9)	(188.7)	(192.6)
	R-squared	0.381	0.393	0.404	0.439
	# of institutions - years	11679	11679	11587	10782
	First-Gen Debt				
	DHSI×Post-Policy Period	-875.5***	-792.7***	-711.3***	-381.1***
	Robust Std. Err.	(86.70)	(83.64)	(86.44)	(83.14)
	R-squared	0.324	0.343	0.352	0.456
	# of institutions - years	12782	12782	12685	11834
Four-year in	stitutions				
	Full-time Retention (1yr forward)				
	DHSI×Post-Policy Period	0.0230***	0.0233***	0.0186***	0.0227***
	Robust Std. Err.	(0.00692)	(0.00697)	(0.00706)	(0.00695)
	R-squared	0.00411	0.00427	0.00202	0.0143
short torm	# of institutions - years	18923	18923	18775	15091
short-term	Part-time Retention (1yr forward)				
	DHSI×Post-Policy Period	0.0324*	0.0343*	0.0314*	0.0429**
	Robust Std. Err.	(0.0184)	(0.0182)	(0.0184)	(0.0186)
	R-squared	0.000211	0.00108	0.00124	0.00449
	# of institutions - years	12461	12461	12329	11482
	150% completion (1yr forward)				
	DHSI×Post-Policy Period	0.00399	0.00433	-0.00386	0.00196
	Robust Std. Err.	(0.00760)	(0.00764)	(0.00733)	(0.00765)
	R-squared	0.00125	0.00128	0.00209	0.0130
	# of institutions - years	19298	19298	19142	15426
	150% completion (2yr forward)				
	DHSI×Post-Policy Period	0.00880	0.00911	0.000883	0.00603
	Robust Std. Err.	(0.00559)	(0.00562)	(0.00536)	(0.00565)
madium	R-squared	0.00122	0.00114	0.00196	0.0130
term	# of institutions - years	19394	19394	19239	15527
	150% completion (3yr forward)				
	DHSI×Post-Policy Period	0.0143***	0.0145***	0.00551	0.0111**
	Robust Std. Err.	(0.00532)	(0.00535)	(0.00519)	(0.00516)
	R-squared	0.00219	0.00196	0.00282	0.0147
	# of institutions - years	19489	19489	19336	15627
	150% completion (4yr forward)				
	DHSI×Post-Policy Period	0.0163***	0.0166***	0.00737	0.0118**
	Robust Std. Err.	(0.00525)	(0.00526)	(0.00522)	(0.00499)
	R-squared	0.00380	0.00353	0.00307	0.0179

	# of institutions - years	17769	17769	17618	14270
	150% completion (5yr forward)				
	DHSI×Post-Policy Period	0.0231***	0.0233***	0.0141**	0.0173***
	Robust Std. Err.	(0.00587)	(0.00590)	(0.00610)	(0.00549)
	R-squared	0.00501	0.00465	0.00278	0.0192
	# of institutions - years	16037	16037	15889	12900
	150% completion (6yr forward)				
	DHSI×Post-Policy Period	0.0222***	0.0226***	0.0143**	0.0172***
	Robust Std. Err.	(0.00633)	(0.00636)	(0.00670)	(0.00587)
	R-squared	0.00503	0.00456	0.00138	0.0169
	# of institutions - years	14281	14281	14132	11494
	Debt				
	DHSI×Post-Policy Period	-774.9***	-670.3***	-592.3**	-313.3
	Robust Std. Err.	(222.2)	(229.5)	(231.8)	(236.8)
	R-squared	0.428	0.448	0.463	0.514
	# of institutions - years	17624	17624	17504	14483
	Pell Debt				
	DHSI×Post-Policy Period	-827.3***	-679.1**	-590.7**	-328.5
	Robust Std. Err.	(255.9)	(264.9)	(265.7)	(264.0)
	R-squared	0.355	0.388	0.406	0.453
	# of institutions - years	17276	17276	17156	14416
	Withdraw Debt				
	DHSI×Post-Policy Period	-392.1**	-394.7**	-386.8**	-284.0
long-term	Robust Std. Err.	(181.0)	(180.6)	(180.8)	(189.4)
	R-squared	0.202	0.203	0.203	0.231
	# of institutions - years	17003	17003	16883	14141
	Grad Debt				
	DHSI×Post-Policy Period	-982.7***	-841.9***	-658.9**	-611.1**
	Robust Std. Err.	(251.9)	(261.2)	(259.4)	(263.2)
	R-squared	0.660	0.518	0.532	0.577
	# of institutions - years	16918	16918	16798	14046
	First-Gen Debt				
	DHSI×Post-Policy Period	-847.7***	-728.3***	-666.2***	-297.5
	Robust Std. Err.	(236.9)	(242.4)	(244.3)	(247.0)
	R-squared	0.341	0.362	0.372	0.451
	# of institutions - years	17245	17245	17125	14448

Notes: *, **, and ***refer to significance at 10%, 5%, and 1% levels. Roubst standard errors are noted within parentheses.

		(1)Benchmark (No control)	(2)Economic Measures	(3)Institution Characteristics	(4)Student Characteristics
Two-year in	nstitutions				
short-term	Full-time Retention (1yr forward) DHSI Robust Std. Err. R-squared # of institutions - years Part-time Retention (1yr forward)	0.0212*** (0.00632) 0.00553 14784	0.0192*** (0.00630) 0.00610 14784	0.0214*** (0.00632) 0.00789 14679	0.0150** (0.00616) 0.0168 13302
	DHSI Robust Std. Err. R-squared # of institutions - years	0.0368*** (0.00807) 0.00609 12801	0.0360*** (0.00797) 0.00621 12801	0.0383*** (0.00798) 0.00722 12746	0.0364*** (0.00809) 0.0108 12210
medium- term	150% completion (1yr forward) DHSI Robust Std. Err. R-squared # of institutions - years 150% completion (2yr forward) DHSI Robust Std. Err. R-squared # of institutions - years 150% completion (3yr forward) DHSI Robust Std. Err. R-squared	0.00676 (0.00542) 0.00491 14983 0.0203*** (0.00516) 0.00631 14809 0.0281*** (0.00612) 0.0131	0.00771 (0.00547) 0.00526 14983 0.0208*** (0.00530) 0.00658 14809 0.0277*** (0.00628) 0.0132	0.00877 (0.00538) 0.00678 14867 0.0214*** (0.00523) 0.00727 14691 0.0276*** (0.00625) 0.0137 14592	0.00668 (0.00552) 0.0121 13391 0.0166*** (0.00532) 0.0169 13263 0.0217*** (0.00632) 0.0264 12124
long-term	 # of institutions - years Debt DHSI Robust Std. Err. R-squared # of institutions - years Pell Debt DHSI Robust Std. Err. R-squared # of institutions - years Withdraw Debt DHSI Robust Std. Err. Robust Std. Err. 	-711.0*** (89.64) 0.384 13417 -696.4*** (98.91) 0.356 12218 -331.1*** (85.28)	-648.8*** (86.86) 0.389 13417 -639.6*** (96.35) 0.362 12218 -293.2*** (82.91)	-595.6*** (87.55) 0.396 13304 -595.8*** (96.09) 0.368 12127 -282.5*** (82.80)	-279.7*** (79.68) 0.505 12056 -274.8*** (89.66) 0.456 11422 -142.3* (79.59)

Table 5. Two-Way Fixed Effects, Full sample

	R-squared	0.390	0.395	0.399	0.437
	# of institutions - years	11539	11539	11463	10884
	Grad Debt				
	DHSI	-987.5***	-914.2***	-899.3***	-561.6***
	Robust Std. Err.	(216.3)	(212.1)	(211.7)	(206.6)
	R-squared	0.422	0.428	0.433	0.470
	# of institutions - years	11679	11679	11587	10782
	First-Gen Debt				
	DHSI	-807.4***	-741.7***	-695.2***	-334.8***
	Robust Std. Err.	(91.89)	(88.71)	(89.96)	(83.05)
	R-squared	0.365	0.372	0.376	0.485
	# of institutions - years	12782	12782	12685	11834
Four-year i	nstitutions	-	-	_	
	Full-time Retention (1yr forward)				
	DHSI	0.0269***	0.0264***	0.0266***	0.0283***
	Robust Std. Err.	(0.00811)	(0.00815)	(0.00822)	(0.00837)
	R-squared	0.00768	0.00778	0.00811	0.0242
abort torm	# of institutions - years	18923	18923	18775	15091
short-term	Part-time Retention (1yr forward)				
	DHSI	0.0362	0.0384	0.0376	0.0466*
	Robust Std. Err.	(0.0265)	(0.0265)	(0.0269)	(0.0272)
	R-squared	0.00589	0.00601	0.00583	0.00878
	# of institutions - years	12461	12461	12329	11482
	150% completion (1yr forward)				
	DHSI	0.00343	0.00292	-0.000159	0.000406
	Robust Std. Err.	(0.00746)	(0.00752)	(0.00746)	(0.00760)
	R-squared	0.00267	0.00281	0.00455	0.0187
	# of institutions - years	19298	19298	19142	15426
	150% completion (2yr forward)				
	DHSI	0.0135**	0.0129**	0.0104*	0.0107*
	Robust Std. Err.	(0.00602)	(0.00602)	(0.00604)	(0.00611)
medium	R-squared	0.00324	0.00342	0.00499	0.0202
term	# of institutions - years	19394	19394	19239	15527
	150% completion (3yr forward)				
	DHSI	0.0223***	0.0214***	0.0188***	0.0193***
	Robust Std. Err.	(0.00620)	(0.00618)	(0.00618)	(0.00623)
	R-squared	0.00486	0.00528	0.00710	0.0257
	# of institutions - years	19489	19489	19336	15627
	150% completion (4yr forward)				
	DHSI	0.0287***	0.0283***	0.0262***	0.0232***
	Robust Std. Err.	(0.00696)	(0.00697)	(0.00695)	(0.00679)
	R-squared	0.00551	0.00560	0.00707	0.0283

	# of institutions - years	17769	17769	17618	14270
	150% completion (5yr forward)				
	DHSI	0.0339***	0.0338***	0.0316***	0.0301***
	Robust Std. Err.	(0.00740)	(0.00745)	(0.00741)	(0.00744)
	R-squared	0.00655	0.00655	0.00743	0.0292
	# of institutions - years	16037	16037	15889	12900
	150% completion (6yr forward)				
	DHSI	0.0314***	0.0314***	0.0307***	0.0275***
	Robust Std. Err.	(0.00785)	(0.00788)	(0.00797)	(0.00828)
	R-squared	0.00650	0.00650	0.00677	0.0319
	# of institutions - years	14281	14281	14132	11494
	Debt				
	DHSI	-584.4**	-579.6**	-465.5*	-225.0
	Robust Std. Err.	(251.3)	(252.7)	(255.3)	(250.2)
	R-squared	0.546	0.546	0.548	0.598
	# of institutions - years	17624	17624	17504	14483
	Pell Debt				
	DHSI	-691.1**	-682.2**	-564.0*	-299.3
	Robust Std. Err.	(287.6)	(289.4)	(289.5)	(278.7)
	R-squared	0.498	0.498	0.500	0.539
	# of institutions - years	17276	17276	17156	14416
	Withdraw Debt				
	DHSI	-88.20	-95.04	-42.43	55.63
long-term	Robust Std. Err.	(191.9)	(192.3)	(194.3)	(202.4)
	R-squared	0.220	0.220	0.221	0.252
	# of institutions - years	17003	17003	16883	14141
	Grad Debt				
	DHSI	-982.7***	-958.1***	-859.0***	-814.8***
	Robust Std. Err.	(251.9)	(251.0)	(250.8)	(251.5)
	R-squared	0.660	0.661	0.661	0.677
	# of institutions - years	16918	16918	16798	14046
	First-Gen Debt				
	DHSI	-712.7***	-704.4***	-595.7**	-176.9
	Robust Std. Err.	(267.8)	(269.2)	(271.3)	(265.8)
	R-squared	0.450	0.450	0.452	0.520
	# of institutions - years	17245	17245	17125	14448

1 π of instructions - years17251444Notes: *, **, and ***refer to significance at 10%, 5%, and 1% levels. Roubst standard errors are noted within
parentheses.10%

		(1)Benchmark (No control)	(2)Economic Measures	(3)Institution Characteristics	(4)Student Characteristics
Two-year in	nstitutions				
	Full-time Retention (1yr forward)				
	DHSI	0.00550	0.00366	0.00427	0.00410
	Robust Std. Err.	(0.0103)	(0.00929)	(0.00933)	(0.00951)
	R-squared	0.0758	0.0925	0.112	0.131
chart torm	# of institutions - years	1506	1506	1506	1505
short-term	Part-time Retention (1yr forward)				
	DHSI	0.0201	0.0191	0.0214	0.0226*
	Robust Std. Err.	(0.0146)	(0.0138)	(0.0134)	(0.0136)
	R-squared	0.0524	0.0565	0.0858	0.111
	# of institutions - years	1506	1506	1506	1505
	150% completion (1yr forward)				
	DHSI	0.00883	0.00994	0.0107	0.00907
	Robust Std. Err.	(0.00826)	(0.00801)	(0.00796)	(0.00769)
	R-squared	0.129	0.145	0.155	0.169
	# of institutions - years	1506	1506	1506	1505
	150% completion (2yr forward)				
madium	DHSI	0.0115	0.0115	0.0115	0.00982
term	Robust Std. Err.	(0.00825)	(0.00792)	(0.00795)	(0.00717)
term	R-squared	0.126	0.131	0.138	0.155
	# of institutions - years	1491	1491	1491	1490
	150% completion (3yr forward)				
	DHSI	0.00616	0.00562	0.00503	0.00505
	Robust Std. Err.	(0.00722)	(0.00710)	(0.00714)	(0.00653)
	R-squared	0.164	0.166	0.175	0.189
	# of institutions - years	1474	1474	1474	1473
	Debt				
	DHSI	-224.5**	-218.8**	-214.2**	-119.3
	Robust Std. Err.	(102.5)	(96.91)	(96.37)	(82.65)
	R-squared	0.446	0.460	0.463	0.513
	# of institutions - years	1335	1335	1335	1335
	Pell Debt				
long-term	DHSI	-211.6*	-208.4*	-203.1*	-116.2
	Robust Std. Err.	(111.9)	(106.7)	(105.8)	(93.13)
	R-squared	0.409	0.423	0.426	0.466
	# of institutions - years	1269	1269	1269	1269
	Withdraw Debt				
	DHSI	-199.5**	-195.9**	-193.1**	-135.3*
	Robust Std. Err.	(93.22)	(87.46)	(88.46)	(74.94)

Table 6. Two-Way Fixed Effects, PSM sample

	R-squared	0.494	0.515	0.515	0.556					
	# of institutions - years	1165	1165	1165	1165					
	Grad Debt									
	DHSI	-624.0**	-621.3**	-616.5**	-470.1**					
	Robust Std. Err.	(269.4)	(262.6)	(265.7)	(217.8)					
	R-squared	0.343	0.351	0.353	0.397					
	# of institutions - years	1113	1113	1113	1113					
	First-Gen Debt									
	DHSI	-311.9***	-307.5***	-302.3***	-205.3**					
	Robust Std. Err.	(109.0)	(102.8)	(102.0)	(84.85)					
	R-squared	0.427	0.443	0.445	0.494					
	# of institutions - years	1318	1318	1318	1318					
Four-year i	our-year institutions									
	Full-time Retention (1yr forward)									
	DHSI	0.0331***	0.0304***	0.0310***	0.0302***					
	Robust Std. Err.	(0.00975)	(0.00977)	(0.00996)	(0.0105)					
	R-squared	0.0602	0.0637	0.0680	0.100					
short-term	# of institutions - years	1057	1057	1057	1046					
	Part-time Retention (1yr forward)									
	DHSI	0.0689**	0.0654**	0.0647*	0.0748**					
	Robust Std. Err.	(0.0335)	(0.0323)	(0.0333)	(0.0327)					
	R-squared	0.0198	0.0216	0.0251	0.0332					
	# of institutions - years	967	967	967	960					
	150% completion (1yr forward)									
	DHSI	0.0174	0.0131	0.0108	0.00752					
medium- term	Robust Std. Err.	(0.0114)	(0.0106)	(0.0108)	(0.00937)					
	R-squared	0.0122	0.0250	0.0460	0.134					
	# of institutions - years	1083	1083	1083	1072					
	150% completion (2yr forward)									
	DHSI	0.0232**	0.0206**	0.0179*	0.0121					
	Robust Std. Err.	(0.0105)	(0.00945)	(0.00934)	(0.00802)					
	R-squared	0.0218	0.0257	0.0426	0.112					
	# of institutions - years	1081	1081	1081	1070					
	150% completion (3yr forward)									
	DHSI	0.0213**	0.0198**	0.0173*	0.0101					
	Robust Std. Err.	(0.00930)	(0.00920)	(0.00891)	(0.00692)					
	R-squared	0.0486	0.0497	0.0642	0.139					
	# of institutions - years	1078	1078	1078	1067					
	150% completion (4yr forward)									
	DHSI	0.0243***	0.0224***	0.0207**	0.0159**					
	Robust Std. Err.	(0.00856)	(0.00842)	(0.00814)	(0.00669)					
	R-squared	0.0719	0.0752	0.0852	0.128					

	# of institutions - years	978	978	978	968
	150% completion (5yr forward)				
	DHSI	0.0234***	0.0209**	0.0207**	0.0201**
	Robust Std. Err.	(0.00826)	(0.00839)	(0.00829)	(0.00882)
	R-squared	0.0758	0.0802	0.0924	0.126
	# of institutions - years	878	878	878	870
	150% completion (6yr forward)				
	DHSI	0.0156	0.0115	0.0120	0.00770
	Robust Std. Err.	(0.0102)	(0.00950)	(0.00960)	(0.0101)
	R-squared	0.0860	0.0969	0.132	0.201
	# of institutions - years	778	778	778	770
	Debt				
long-term	DHSI	15.56	38.55	67.62	1.105
	Robust Std. Err.	(235.7)	(248.4)	(246.4)	(216.6)
	R-squared	0.564	0.565	0.568	0.610
	# of institutions - years	1075	1075	1075	1064
	Pell Debt				
	DHSI	-232.8	-207.0	-139.6	3.440
	Robust Std. Err.	(278.2)	(291.5)	(282.4)	(255.2)
	R-squared	0.534	0.535	0.550	0.591
	# of institutions - years	1070	1070	1070	1059
	Withdraw Debt				
	DHSI	-67.63	-53.88	-22.70	-0.787
	Robust Std. Err.	(208.5)	(202.5)	(194.2)	(191.1)
	R-squared	0.353	0.354	0.373	0.412
	# of institutions - years	1053	1053	1053	1042
	Grad Debt				
	DHSI	-906.5**	-735.8**	-678.6*	-555.0*
	Robust Std. Err.	(358.3)	(358.5)	(350.5)	(322.7)
	R-squared	0.627	0.634	0.637	0.671
	# of institutions - years	1048	1048	1048	1037
	First-Gen Debt				
	DHSI	-130.4	-89.10	-45.68	-55.75
	Robust Std. Err.	(267.6)	(278.2)	(274.3)	(236.5)
	R-squared	0.494	0.494	0.500	0.567
	# of institutions - years	1074	1074	1074	1063

Image: Notes: *, **, and ***refer to significance at 10%, 5%, and 1% levels. Roust standard errors are noted within parentheses.10/41074106

FIGURES

Figure 1. Cohort Map for 150% Completion: Examples of 4-Year Forward and 6-Year Forward



Figure 2. Map of DHSI 2009-2014

