Take It, or Leave It? Analyzing How Unsubsidized Federal Loans Affect Six-Year Degree Attainment Across Income Groups

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This study examined the effects of unsubsidized federal Stafford loans on six-year degree attainment at 4-year colleges and universities in the U.S., and how these differentially impact students across income groups. For this, nationally representative data from the Beginning Postsecondary Students (BPS:04/09) and the Integrated Postsecondary Education Data System (IPEDS) was merged to analyze N=6,561 students attending n=651 four-year institutions. To account for possible selection bias in loan borrowing and the nested data structure, this study employs a propensity score matching, multilevel modeling approach. In addition to financial aid measures, the analytic model draws from the heterogeneous research approach and incorporates students' college experiences and institutional context to estimate effects. Results reveal a comparatively large, negative association with the outcome measure for low-income students. For every $1,000 borrowed additionally in unsubsidized loans, low-income students are found to be 5.45% (p<.000) less likely to graduate within six years. Beyond that, results show no significant effect for other income groups. Findings provide further support for the need to monitor student borrowing behavior, creating a more targeted approach to student aid that minimizes the use of unsubsidized loans for low-income students, and more closely examining differential effects of aid types across various student groups.

S tudent loans and college debt have received considerable attention in the media and policy arena in recent years. This is not surprising as the nation's student debt crossed the $1 trillion threshold in 2012 and further increased to $1.5 trillion in 2018, just six years later (Mitchell, 2016; Studentloanhero, 2019). Data show that Americans now owe more in student loans than on their credit cards and that today's college-goers are the most indebted students in the country's history (Hershbein & Hollenbeck, 2015). Indeed, they are significantly more indebted than those who preceded them just a decade ago, as federal loan borrowing increased 31% in inflation-adjusted dollars from 2006-07 to 2016-17, despite declining from its peak in 2010 (College Board, 2018b).

Spurred by the dramatically increasing cost of higher education, which rose by 35% *beyond* the rate of general inflation for public 4-year institutions over the past decade (College Board, 2018a), 59% of students who completed a bachelor's degree in 2016-17 had incurred loan debt, owing now on average $28,500. In spite of this growing reliance on loans as the prevalent form of aid, however, little is known about their

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impact on a variety of college-related outcomes, such as student persistence and degree completion (Herzog, 2017; Hossler, Ziskin, Gross, Kim, & Cekic, 2009).

In 2016-17, the federal government spent a total of $154.6 billion in financial aid, which represents an increase of 49% over the past decade, even after adjusting for inflation (College Board, 2018b). Although funding for the Pell Grant program initially rose sharply under the Obama Administration and continued to grow over time, Federal Student Aid (FSA) expanded most notably in its loan programs, more specifically the unsubsidized loan program. In fact, unsubsidized Stafford loan volume increased by 73% between 2006-07 and 2016-17 (see Figure 1). In 2016-17, the federal government issued more than twice as many unsubsidized ($50.8 billion) than subsidized loans ($22.0 billion) to borrowers, making it by far the largest federal student aid program (College Board, 2018b).

Figure 1

Trends in Federal Unsubsidized and Subsidized Loans, 1992-93 to 2016-17 (constant 2017 $$, billion)
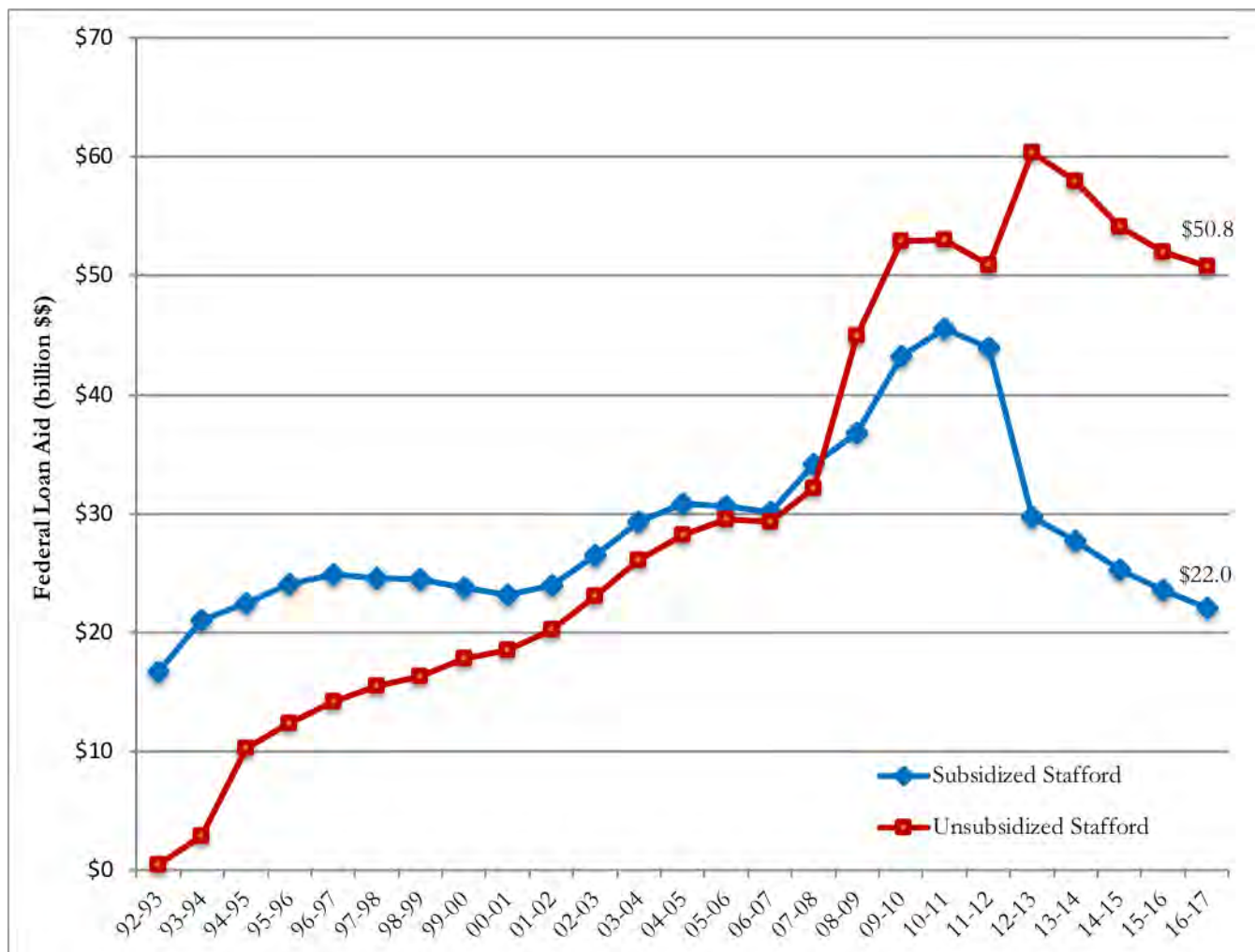
Distinguishing between these two loan forms is relevant, as unsubsidized federal loans are substantially different from their subsidized alternative (Cho, Xu, & Kiss, 2015). Not only are they costlier, as they accrue interest while students are enrolled in college or are in deferment, they also have higher borrowing limits and students do not have to demonstrate financial need. Until August 2013, unsubsidized loans also carried considerably higher interest rates (6.8% at the time), but this provision was eliminated with the passing of

the Bipartisan Student Loan Certainty Act of 2013 (H.R. 1911). With this legislation, interest rates for unsubsidized and subsidized loans were set to be equal at the undergraduate level and are pegged to the 10-year U.S. Treasury note. Thus, rates can fluctuate significantly over time, from approximately 3.6% to 6.6% using historical data for the past decade alone. Current (AY 2018-19) interest rates for unsubsidized loans are 5.05% for undergraduates and 6.6% for graduate students (Federal Student Aid, 2018).

Research has shown, obtaining a college degree becomes increasingly important for upward mobility and a higher quality of life (Carnevale, Smith, & Strohl, 2010; Hout, 2012) and in light of constant and dramatic tuition increases, students and their families, subsequently, are faced less with the question *whether* to borrow, but rather *how much* to borrow in order to access higher education. The incontrovertible reliance on student loan financing, however, has triggered conversations among policy makers, scholars, and practitioners about potential negative implications, either long-term or short-term, and the appropriate level of borrowing (Avery & Turner, 2012; Cho et al., 2015; Hossler et al., 2009). Although empirical data is limited, scholars hypothesize that taking out too much in student loans may contribute to long-term financial hardship, delaying major purchases or investments, or family decisions such as getting married or having children (Cooper & Wang, 2014; Malcom & Dowd, 2012). In the short-term, scholars seek to answer whether and to what degree student loans (in general or their specific sub-forms) foster student persistence and college completion, and with that either exacerbate or ameliorate educational inequalities (R. Chen & DesJardins, 2008; Hossler et al., 2009). Particularly, the toll that financial stress may exert on students' choices and reenrollment decisions for low-income students and other groups has received increased attention (Britt, Ammerman, Barrett, & Jones, 2017).

Despite the heightened interest in recent years, however, research specifically directed at the intersection of degree completion, financial aid, and student income is surprisingly slim in quantity and challenged methodologically (Alon, 2005; R. Chen, 2008; Dowd, 2008; Hossler et al., 2009). Particularly, limited empirical research has been devoted to study the effects of various types of loans (e.g. unsubsidized, parental, private loans) on measures of student success. Even fewer studies distinguish effects by income or socioeconomic status (Avery & Turner, 2012; Dowd & Coury, 2006) to examine how cost-benefit variations may influence students differentially with regard to their chances to persist and graduate from college. Thus, the purpose of this study is to examine the impact of unsubsidized federal loans on baccalaureate degree attainment in six years. For this, I use a quasi-experimental, multilevel modeling approach while also examining differential effects across income groups.

The following section reviews federal student aid with particular emphasis on changes to the federal loan programs over time including recent policy proposals. Subsequently, I will review the pertinent literature, followed by the conceptual framework, a review of the methodology, and the study findings.

Overview Federal Student Aid and Student Borrowing

Federal Student Aid (FSA), an office of the U.S. Department of Education (DoEd), is the largest provider of financial aid in the United States. It is also the primary source of education loans. Government-backed student loans were first offered in the 1950s under the National Defense Education Act, but were extended more broadly under the 1965 Higher Education Act (HEA) with the goal of encouraging greater social mobility and equality of opportunity (Gladieux, 1995).

From the outset, federal loans were attractive for both borrowers and lenders. Student loans issued through federal programs were guaranteed by the federal government making them highly attractive for lenders (Wei & Berkner, 2008). By the same token, significantly lower interest rates, the fact that interest does not accrue while still enrolled in college or students are in deferment, and that loans are not priced to

any individualized measure of risk made federal student loans appealing to borrowers, particularly when compared to private lenders such as banks and credit unions (Wei & Berkner, 2008).

Initially, almost all federal student loans were subsidized and made available only to students with demonstrated financial need (Baker et al., 2017) . In the 1992 reauthorization of the HEA, the unsubsidized loan program was launched making federal loans also available to individuals who did not meet the need eligibility criteria. This also enabled students from middle and upper-middle income families to borrow from federal sources to pay for the continually increasing costs of a college education (Hannah, 1996). Subsequently, federal lending expanded noticeably and almost uninterruptedly for both programs between AY 1992-93 and AY 2010-11 with the subsidized program reaching a volume of $45.6 billion and the unsubsidized program providing a total volume of $ 53.0 billon (all in 2017 dollars; College Board, 2018b). Over this period, and largely unnoticed by the public, unsubsidized loans also became the primary source for financial aid in the U.S., overtaking the subsidized federal program by volume in AY 2008-09.

In 2011, the U.S. Department of Education became the sole lender of federal student loans through the exclusive use of the William D. Ford Direct Loan Program (Aud, 2013). This represented another major shift in the way that student loans were processed, awarded, and the interest rates that students would be locked into for repayment purposes.

More recently introduced legislation such as the Empowering Students Through Enhanced Financial Counseling Act (H.R. 1635) and the PROSPER Act (H.R. 4508) intend to make further and potentially far-reaching alterations to FSA. While the former focuses on changing counseling requirements for borrowers, the latter seeks to replace the current eight student loan repayment plans with two, limit loan forgiveness, and eliminate the fixed number of years for repayment, among other aspects (Douglas-Gabriel, 2017; NASFAA, 2018). The broadest change, however, would come to the suite of federal loan programs, which the PROSPER proposal seeks to consolidate into a new federal "ONE Loan." For this, the proposed legislation seeks to combine all existing programs, which includes subsidized, unsubsidized and institutional loan programs, into one *unsubsidized* loan per category of borrower, namely undergraduates, graduate students, and parents, in addition to also increasing borrowing limits. Though unlikely to be enacted at the time of writing, this legislation would mark a clear departure from the current FSA programs and further consolidate the shift witnessed over the past decades in student aid, not only from grants to loans (Hearn & Holdsworth, 2004), but to exclusively unsubsidized, thus costlier, loans.

Changes in Interest Rates and Borrowing Limits

Two pivotal elements within the federal loan programs have largely received very limited or no scholarly attention: changes in interest rates over time and loan borrowing limits. Prior to 2006, both unsubsidized and subsidized loans carried variable interest rates, which changed on a yearly basis and were pegged to the 91-day U.S. Treasury bill (Smole, 2013). Variable rates had the ability to change drastically from year to year and for better or worse, from as little as one tenth of a percentage point (such as in 2003 to 2004) to as much as almost two percentage points (such as in 2000 to 2001) in either direction. Over the past two decades, interest rates peaked between 1995 and 1997 at 8.25% (both loan types); rates were lowest in 2004 with 3.37%, a difference of 4.88 percentage points. Interestingly, interest rates for the 2003-04 student cohort under study in this paper were close to the all-time low since 1992 and set at 3.42% (Smole, 2013).

Since the 1992 HEA reauthorization, maximum annual loan limits have remained relatively constant until 2006, although changes can easily be implemented through federal policy. Currently, for dependent undergraduate students the combined (subsidized and unsubsidized) annual limit for freshmen is $5,500, $6,500 for sophomore, and $7,500 for junior and senior students, with the maximum annual limit for subsidized loans being $2,000 below the combined limits. However, the maximum aggregate (or cumulative)

loan amounts allowed over a student's academic journey have increased notably from $23,000 before 2006 to $31,000 today, a 35% increase. Cumulative limits are considerably higher for independent and graduate/professional students, with $57,500 and $138,500, respectively (Kantrowitz, 2014; Wei & Berkner, 2008).

Review of the Literature

The literature on the effects of financial aid, particularly on access to higher education, is broad and spans several decades. However, comparatively little is known about the effects on student outcomes such as degree completion and persistence (Baker, Andrews, & McDaniel, 2017; Hossler et al., 2009; St. John, 1999), despite heightened attention in recent years. Rigorous research focused largely on the effects of federal or state grant aid – both merit- and need-based – on college enrollment and, for the most part, report positive effects (Hossler et al., 2009; Kane, 2004). When examining effects of grants on student outcomes beyond higher education attendance, there is also noticeably fewer rigorous studies (Clotfelter, Hemelt, & Ladd, 2018). Recent evidence, however, shows that this form of financial assistance increases chances to persist and earn a college degree (for instance, Bettinger, 2004; Dynarski, 2003; Goldrick-Rab, Kelchen, Harris, & Benson, 2016; Scott-Clayton, 2011b)

Although we have witnessed rapid growth in the past four decades in enrollment and the use of student loans, our understanding of the effects of student borrowing on higher education access and success is limited, with studies showing mostly mixed results (Hossler et al., 2009; Welbeck, Diamond, Mayer, & Richburg-Hayes, 2014). While some studies have found positive effects on persistence and degree completion at two-year and four-year institutions (Cuccaro-Alamin & Choy, 1998; Hu & St. John, 2001; Somers, Woodhouse, & Cofer, 2004) primarily when compared to students who did not receive any form of aid (Hu & St. John, 2001), other scholars report either negative or not significant results (Dowd & Coury, 2006; Kim, 2007).

Scholars attribute these heterogeneous effects on a combination of aspects, for instance differences in outcomes studied, methodological issues around selection bias, differences in data sources, and conceptual issues (Alon, 2005; Baker et al., 2017; Hossler et al., 2009). When examining the impact of loans on post-enrollment outcomes, several studies have shown positive effects on short-term measures, such as first to second year persistence (Cofer & Somers, 2000a, 2000b; McKinney & Burridge, 2015). In contrast, when studying effects on long-term persistence or six-year graduation rates, loans showed no or even negative effects on these student outcomes (Dowd, 2004; Dowd & Coury, 2006; McKinney & Burridge, 2015). However, a recent study using event history modeling and a quasi-experimental approach for non-traditional students attending community colleges, found that all measured forms of financial aid, including loans, actually reduced drop-out risks even for long-term outcomes (J. Chen & Hossler, 2017), thus contributing to the a somewhat unclear picture on loan effects.

The degree to which loans influence short-term or long-term student outcomes may also vary according to individual background characteristics, such race/ethnicity, income, or first-generation status. For instance, Jackson and Reynolds (2013) descriptively examined loan effects for students of color and found that Black students taking out federal loans had an 18 percentage points higher rate of completing a degree in six years. Few studies have sought to examine loan effects differentiated by income groups. Among these, Kim (2007) finds that loan utilization has more significant negative effects on degree attainment for low-income students compared to their middle- and high-income peers. Similarly, Herzog (2017) using data from a public research university reports a negative effect on second-year reenrollment for students from low-income backgrounds. However, other studies have found no significant difference when examining loan effects across income groups (R. Chen & DesJardins, 2008; Dowd, 2004).

Recent scholarly work shows, the way in which students access various types of loans and aid differs across race/ethnicity and socioeconomic status (Boatman, Evans, & Soliz, 2017; Kim, 2007). And yet, only few but a growing number of studies disaggregate aid and loan types, such as unsubsidized and subsidized, and use rigorous methods in analyzing effects on student outcomes (J. Chen & Hossler, 2017; Dowd & Coury, 2006; Franke, 2015; Herzog, 2017; Singell Jr, 2004). Though approaches and data vary noticeably across these studies, and despite the substantial differences between subsidized and unsubsidized federal loans, evidence indicates that subsidized loans may benefit student retention whereas effects are mixed for their more expensive subsidized form (J. Chen & Hossler, 2017; R. Chen & DesJardins, 2008; Singell Jr, 2004). These studies, however, are limited in a variety of ways, as they focus, for instance, solely on a single institution, do not account for selection bias, or focus on one student group within the community college sector (despite accounting for endogeneity).

Borrowing Decisions and Loan Selection

Student loans differ from grants in their economic nature. A grant is essentially a price subsidy, whereas a student loan is a consumption-smoothing device, which requires students to pay back owed amounts after graduation (or when the loan becomes due). Given the different financial incentives grants and loans offer, the latter are typically perceived as a 'last resort' source of aid after both merit and need-based grants have been exhausted (Herzog, 2017; Ziskin, Fischer, Torres, Pelicciotti, & Player-Sanders, 2014). Recent research indicates, a majority of students (68%) know the difference between subsidized and unsubsidized loans (Goldrick-Rab, 2016). Thus, students faced with the choice between two loan alternatives, all else being equal, are assumed to choose the less costly, or subsidized, option. However, individuals who qualify for subsidized loans may still select to take out unsubsidized loans, if the former is insufficient to cover actual or perceived financial needs (Avery & Turner, 2012; Cadena & Keys, 2013).

Differences between grants and loans also extend into individual decision processes, thus have consequences for the examination of potential effects on student outcomes. Amounts for grant aid offered in financial aid packages, for instance, are mostly set with eligibility rules clearly cut, thus offer little discretion for the student to select and accept or reject (Herzog, 2017). However, in regard to loans, individuals have greater flexibility in deciding whether to borrow and if so, for what amount. Details are included in the award letter, often with the default choice indicating acceptance. First-time loan borrowers are also required to attend loan counseling, sign a promissory note, and other requirements all of which add intermediary decision and action points for students. Subsequently, scholars argue that individuals' characteristics and preferences may play a more influential role in the decision to borrow and take out loans than to accept grant aid (Herzog, 2017; Hossler et al., 2009), a pivotal aspect that needs to be incorporated in the examination of potential effects on student degree completion.

As the review of the empirical literature has shown, the omission to distinguish between subsidized and unsubsidized loans has been identified as one likely reason for the in part widely discrepant findings on loan effects (R. Chen, 2008; Singell Jr, 2002). Additionally, only few studies have taken into account the self-selection effects in regard to student attributes and background characteristics discussed above, which can mask the true effect of aid on student persistence and degree completion (Hossler et al., 2009). Thus, this study seeks to address these limitations and contribute to our understanding by examining the impact of unsubsidized and subsidized federal loans using a methodological approach that accounts for both potential self-selection bias (one form of endogeneity) and the nesting of the data as students attend different four-year institutions, while also accounting for differential effects across income groups.

Conceptual Framework

In an attempt to overcome limitations in the literature, this study draws from the *heterogeneous research approach* for the study of financial aid effects (R. Chen, 2008; R. Chen & DesJardins, 2010; Herzog, 2017). This approach builds on earlier studies examining effects of higher education costs and financial aid on student behavior, differentiated by socioeconomic groups (Heller, 1997; St. John, Cabrera, Nora, & Asker, 2000), and has been conceptualized by Chen (2008). The heterogeneous approach builds on two pivotal elements. First, as suggested by Perna (2006), student success is best understood when using multiple theoretical perspectives, and second, aid effects on student behavior need to be examined by subgroups, such as income, race/ethnicity, or gender.

Building on Chen's (2008) approach, I draw mostly from theoretical models in economics, sociology, and the literature on persistence/degree attainment in higher education. On economic theory, this study builds on human capital (Becker, 1980) and price response theory (Heller, 1997; Leslie & Brinkman, 1987) and incorporates financial factors at the pre-college, transition, and college attendance phase (Franke, 2014).

The human capital model can be used to explain how different types of financial aid impact student outcomes. In its basic form, this theory assumes that students have full and equal access to credit markets and make college decisions to maximize the net present value of their lifetime income. However, in reality credit imperfections exist and not every individual has access to credit at the same rate and under the same conditions. According to Cameron and Taber (2004), these variations directly influence the net price students pay for college, and even though the differences might be small, they can lead to large responses in educational attendance and attainment by making beneficial human capital investments impossible. Therefore, for students with access to only few resources, such as low-income students, a relatively small loan can have a large impact on decisions related to higher education persistence and degree completion (Goldrick-Rab, Harris, & Trostel, 2009). Given that unsubsidized loans accrue interest while students are still enrolled in college (and carried higher interest rates during selected years), thus are expensive to the individual, human capital theory would also predict effects to be more pronounced for this type of financial aid. Due to these differences, loans and particularly unsubsidized loans have been conceptualized as 'last resort' source of aid after need- and merit-based grants have been exhausted (Ziskin et al., 2014)

From sociology, I mostly draw from social and cultural capital theory (Bourdieu, 1986; McDonough, 1997) to account for potential differences across income groups. To examine differences across institutional types, I build on the conceptualization of organizational impact (Berger & Milem, 2000; Titus, 2004), focusing mostly on structural-demographic (control, selectivity, size) and institutional context measures. Lastly, the conceptual model builds on theoretical models and empirical evidence on student persistence (Bean, 1980; DeAngelo & Franke, 2016; Nora, 2004) to guide variable selection at the student and institutional level.

Methodology

This study examines the effects of federal loans on six-year degree attainment at 4-year colleges and universities. In particular, I seek to analyze the effects of unsubsidized federal Stafford loans and how these differentially impact students across income groups. To better account for potential estimation biases (i.e. through self-selection) and the nested data structure, this study employs a propensity score matching, multilevel modeling approach. In addition to financial aid measures, this study incorporates students' college experiences and institutional context primarily as control measures to more reliably estimate effects.

The main research questions guiding this study are:
1. What is the influence of unsubsidized federal loans on six-year degree attainment for dependent, full-time students attending 4-year institutions in the U.S.?
2. How do effects vary by income group (quartiles)?

Data Source, Sample, and Dependent Variable

The Beginning Postsecondary Students (BPS:04/09) and the Integrated Postsecondary Education Data System (IPEDS) data are the two primary data sources for this study. The BPS:04/09 is a longitudinal, nationally representative database containing detailed financial aid and degree attainment data and information on a variety of individual-level aspects, such as students' background, educational goals, and academic and social experiences in college. Institutional-level data is drawn from IPEDS, which contains information on a variety of institutional characteristics, such as size, costs, faculty and staff, and institutional finances.

The full BPS:04/09 dataset is comprised of 18,640 students, of which 16,680 (89.5%) had enough data from the student interviews and administrative sources at the conclusion of the data collection to be classified as BPS:04/09 study respondents. The sample for this study is restricted to full-time, dependent students who enrolled in bachelor's granting degree programs at 4-year institutions in AY 2003-04. Given the centrality of financial aid in this study, the sample was further restricted to U.S. citizens and permanent residents; student athletes have been excluded. After applying these data restrictions, the sample contained N=6,561 students at n=651 4-year institutions. Subsequently, the BPS measure INCGRP was used to distinguish income quartiles.

The dependent variable is degree attainment status six years after initial enrollment (derived from ATHTYF6Y) and coded (1) for students who received a 4-year degree at the initial institution of enrollment, and (0) for students who did not.

Conceptual Model and Independent Variable Blocks

The literature review and conceptual model guided variable selection for this study. For the organization of the model, I build on Titus' (2004) multilevel approach in that I conceptualize student-level and institutional-level influences on six-year degree attainment – utilized as control measures in this study. However, I organize student-level influences temporally and incorporate three main phases: pre-college phase, transition, and college attendance. Each of the phases contains multiple variable blocks, representing characteristics, influences, and experiences specific to the individual phase that are hypothesized to affect degree attainment. All financial aid measures (covariates) are entered in the college attendance phase.

At the institutional level, the model hypothesizes two main influences on degree attainment. In addition to structural-demographic characteristics (control, selectivity) I incorporate measures on institutional/peer context (percent part-time and percent minority enrollment) (Oseguera & Rhee, 2009; Titus, 2004).

Analytic Approach

To estimate effects on six-year degree completion and minimize endogeneity, I rely on a combination of two statistical approaches. First, I use propensity score matching to reduce potential bias in the estimation of financial aid effects (Rosenbaum & Rubin, 1985; Rubin, 2006). Second, this study employs hierarchical generalized linear modeling (HGLM) to examine factors impacting degree completion at the student and institutional level and better account for the nested data structure (Raudenbush & Bryk, 2004). Given the nature of the BPS dataset, for the analyses I also incorporate adjustments for complex survey designs

through the Taylor series linearization procedure in MPlus (Heeringa, West, & Berglund, 2010; Levy & Lemeshow, 2008).

Propensity Score Matching. Propensity score techniques have been increasingly used in educational research in recent years. Generally, these techniques rely upon the counterfactual framework (Rubin, 1979) and build on the premise that selection bias in observational data can be sufficiently reduced, or even removed, by eliminating differences between the groups that did and did not receive a treatment (Graham & Kurlaender, 2011). For this, a propensity score will be estimated and evaluated as the first step of the analysis.

In regard to this study, for a student that took out unsubsidized federal (Stafford) loans, the counterfactual is the hypothetical impact on six-year degree completion (outcome), had the student *not* received this form of financial aid. In contrast, for a student not taking out unsubsidized loans the counterfactual is the potential likelihood of graduating within six years if that student *had* received this form of financial assistance.

According to Rosenbaum and Rubin (Rosenbaum & Rubin, 1985; Rubin, 2006), the propensity score is defined as the conditional probability of an individual of being in the treatment group (receiving unsubsidized federal loans), given a group of observed covariates. Given the binary nature of the treatment variable (1=receipt of treatment; 0=no treatment), they suggest using logistic or probit analyses to estimate an individuals' propensity (probability) score for being in the treatment group (Guo & Fraser, 2010).

For proper estimation, selecting the appropriate treatment measure is key. Given the focus of the study, I use a dichotomous measure indicating whether students had borrowed unsubsidized federal loans in their first year of study, regardless of actual amount taken out. Based on federal financial aid regulation, unsubsidized Stafford loans do not require the student to demonstrate financial need, thus borrowers are hypothesized to be present across the income spectrum (with potentially different borrowing-motives present). This assumption was confirmed by the data and subsequently the treatment measure selected for the estimation.

For the propensity score estimation, I fit a logistic regression model of the following form to the data:

$$P(W_i \mid X_i = x_i) = E(W_i) = \frac{e^{x_i\beta_i}}{1 + e^{x_i\beta_i}} = \frac{1}{1 + e^{-x_i\beta_i}} \tag{1}$$

where W_i represents the binary treatment ($W_i = 1$ for receiving unsubsidized loans, $W_i = 0$ for control condition) for the ith student ($i=1, \ldots; N$); X_i represents a vector of conditioning variables, and β_i the vector of regression parameters (Guo & Fraser, 2010).

In selecting the specific predictors to be included in the logistic regression model, it is important to consider pretreatment factors that may impact selection into the treatment or control group that are also related to the outcome (Graham & Kurlaender, 2011). Based on previous research, I included various background and socioeconomic characteristics, academic preparation, educational goals, and precollege factors in the estimation. In total, the propensity score estimation model contained 22 covariates and additional interaction terms.

This study uses a reweighting, propensity score approach. In reweighting the dataset, I rely on suggested calculations by Guo and Fraser (2010) and Nichols (2008) to create a weight for the average treatment effect (ATE). The average treatment effect represents the average response to treatment for a random sample from the population. Thus, the ATE effect provides an estimate of the difference in an outcome between individuals receiving the treatment and individuals that did not among students that had similar probabilities

of receiving this form of financial aid. In other words, the ATE provides an estimate for the causal effect of unsubsidized loans, after biases in the data are reduced or even removed.

The estimation and evaluation of the quality of the propensity score involved multiple steps. For the estimation, STATA 15 was used, which employs a highly rigorous variable balance test within estimated strata and removes outlying cases. After the final model was fit for the estimation, tests for variable imbalance before and after reweighting the dataset were carried out. Results show a significant reduction in variable bias for the estimations. During the estimation, cases too far outside the common support area were removed to improve balance in the data[1]. The common support area for treated and non-treated cases was also inspected visually (see Figure 3, Appendix).

After creating final propensity score weights, a series of t-tests was carried out to compare conditional variable means before and after adjustment. For this, variable means were compared for all covariates for students that did and did not borrow unsubsidized federal loans.

Hierarchical Generalized Linear Modeling (HGLM). The main analysis in this study is carried out using a hierarchical generalized linear model (HGLM) approach. In addition to estimating the effects of student-level variables, this technique takes the nested data structure into account and properly estimates the influence of institutional-level characteristics on the outcome.

The approach provides a statistical model that allows examination of the distinct effects of individual/student-level and institutional-level variables. For this, HLM separates variance occurring at the various levels in the analysis (Raudenbush & Bryk, 2004). By partitioning the variance—for this study between individuals and institutions—we can more accurately identify significant predictors at multiple levels of observations and produce more reliable estimation for standard errors (De Leeuw & Meijer, 2008; Raudenbush & Bryk, 2004).

The level-1 (student-level or within-institution) model is given by:

$$\text{Log}\left[\frac{\Phi_{ij}}{1-\Phi_{ij}}\right] = \beta_{0j} + \beta_{1j} * (\text{Pre} - \text{College})_{ij} + \beta_{2j} * (\text{Transition})_{ij} \tag{2}$$
$$+ \beta_{3j} * (\text{College Experience})_{ij} + \beta_{4j} * (\text{Aid})_{ij} + \beta_{5j} * (UNSUB)_{ij}$$

where *i* denotes the individual student and *j* represents the institution. *UNSUB* is the key measure of interest in this study, which represents the actual dollar amounts students had borrowed in their first year. *Pre-College, Transition, College Experience,* represent vectors of control variables and *Aid* a vector of financial aid covariates in the estimation according to the conceptual model.

In the multilevel model, the intercept in equation (2), β_{0j}, varies between institutions. All other coefficients (β_{1j} through β_{5j}) in this study are restricted to be uniform across all institutions (random intercept model).

The level-2 (institution-level or between-institution) model is represented by:

$$\beta_{0j} = \gamma_{00} + \gamma_{01} * (\text{Structural} - \text{Demographic})_{ij} \tag{3}$$
$$+ \gamma_{02} * (\text{Peer/Institutional Context})_{ij} + u_{oj}$$

where *j* denotes the institution, γ_{00} represents the average likelihood of degree completion across all institutions, and u_{oj} the random variance component for institution j. The variables included in the

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[1] Propensity score estimations were carried out on the entire data set (N=6,561), before analytic filters were applied for the examination of effects on low-income student degree completion in later stages. During the PS estimation, cases that contained missing values were listwise deleted, resulting in N=6,430 cases used for the propensity score estimations.

institutional-level describe how the context at 4-year colleges and universities affects the student's average likelihood of completing a bachelor's degree within six years. These variables include structural-demographic, and institutional context measures.

To estimate influential factors on degree attainment, the HGLM analyses will be run on the entire sample and separate by income quartiles. Within these groups, I run separate analyses on the raw (unmatched) data to produce naïve estimators, and analyses using ATE weights. For ease of interpretation, results will be reported as delta-P statistics (delta-P) (Cruce, 2009; Petersen, 1985).

Limitations

There are multiple limitations to this study. First, like all secondary data analyses, this study is limited by the availability of variables in the dataset, and sample size. Despite the inclusion of additional pre-college experience variables and measures for educational goals, social and academic experience measures in the latest version of the BPS, the survey is predominantly designed to examine financial and economic aspects in the context of postsecondary education. Thus, estimates may suffer from omitted variable bias.

Second, even though a propensity score matching technique has been employed in this study, endogeneity may not have been fully removed. For this, a true experiment with full randomization would have to be carried out. Despite a broad theoretical and empirical model that incorporated essential variables such as students' educational aspirations, goals, and academic performance in addition to background and socio-economic measures, latent constructs such as an individual's motivation, which may influence both the likelihood of financial aid receipt and degree attainment, may not be fully accounted for in the estimation.

Lastly, this study has to acknowledge that the field of statistics is constantly evolving. Methodologies at the intersection of causal inference with propensity score methods, multilevel modeling, and complex survey data are still developing and have limited theoretical and empirical backing. Thus, estimations and techniques used in this study may have to be updated, as technology and knowledge on these topics evolve.

Results

Descriptive statistics show, the six-year degree completion rate for full-time students who enrolled in a bachelor's degree program at a 4-year institution in 2003-04 was 59.8%. This aggregate, however, masks an important underlying trend across U.S. colleges and universities. When assessing degree attainment rates across income groups (see Table 1), the data show that only 46.0% of the students coming from lowest income group obtain a degree within six years at their initial institution of enrollment. This compares to 55.6% for lower-middle income students, 62.1% for upper-middle income individuals, and 70.2% for their high-income peers.

The data further show a gender and racial/ethnic composition, similar to previous national studies (DeAngelo, Franke, Hurtado, Pryor, & Tran, 2011; Franke, 2015). For instance, women are slightly higher represented among low-income and lower-middle income students with 57.8% and 59.5%, respectively. Gender distribution among upper-middle and high-income students is somewhat more balanced, with 55.4% and 53.2%, respectively. In regard to race/ethnicity, among all students more than three-fifth (70.3%) of the students are White, compared to 8.6% African American, 10.1% Latino/a or Hispanic, 5.8% Asian, and 5.2% students identifying as other race/ethnicity. African American, Latino/a, and Asian students represent a larger share among low- and lower-middle income groups. Generally, representation declines for these groups as income increases; from 20.5% to 2.7% for African Americans, 22.6% to 5.0% for Latino/as and Hispanics, and 10.5% to 4.3% for Asian students across the four income groups.

Table 1

Selected Descriptive Statistics BPS:04/09 - Full-time, Dependent Students Enrolled at 4-Year Institutions (Pct.)

Variable	All Students (N=6,561)	Income Groups			
		Low (n=1,242)	Lower-Middle (n=1,493)	Upper-Middle (n=1,703)	High (n=2,123)
Six-Year Degree Completion	59.8	46.0	55.6	62.1	70.2
Gender: Female	56.2	57.8	59.5	55.4	53.2
White	70.3	41.2	68.5	79.5	83.2
African American	8.6	20.5	9.4	5.3	2.7
Latino/a or Hispanic	10.1	22.6	10.6	6.0	5.0
Asian	5.8	10.5	5.8	3.9	4.3
Other Race/Ethnicity	5.2	5.1	5.7	5.3	4.7
English is primary language	90.0	74.5	89.7	95.2	96.1

Note: Weighted with normalized BPS:04/09 study respondents weight (WTA000). Numbers reflect full-time, dependent students (excluding athletes and International students), enrolled in a Bachelor's degree program at 4-year institutions in the U.S.

Table 2

Average, First-Year Financial Aid Amounts and Student Need 2003-04, by Income (BPS:04/09)

Variables	All Students ($) (N=6,561)	Income Groups ($)			
		Low (n=1,242)	Lower-Middle (n=1,493)	Upper-Middle (n=1,703)	High (n=2,123)
Federal subsidized loans	1,127	1,775	1,743	970	348
Stafford unsubsidized loans	532	479	386	585	638
Other loans (State, Private)	392	318	429	493	328
Need-based grants (Fed., State, Inst.)	2,802	6,081	3,632	1,612	986
Merit grants (State, Institution)	1,633	1,104	1,705	1,770	1,811
Federal work-study	314	461	428	291	149
Unmet need (after EFC and aid)	3,122	5,156	3,919	2,538	1,647

Note: Weighted with normalized BPS:04/09 study respondents weight (WTA000). Numbers reflect full-time, dependent students (excluding athletes and International students), enrolled in a Bachelor's degree program at 4-year institutions in the U.S. EFC - Expected Family Contribution.

Table 2 provides detailed information on the average financial aid amounts and unmet need for dependent, full-time students during their first year. On average, students received $6,800 in financial aid from all sources listed, including subsidized and unsubsidized loans. When disaggregating by income, however, stark differences become apparent. Not surprisingly, low-income students receive most financial aid when comparing average amounts received across income groups. In total, they receive $10,218, of which a sizable amount ($6,081) comes in the form of need-based grants from all sources (federal, state,

institution). Lower-middle income students receive $8,323 in total aid, with $3,632 in need-based grants. Their upper-middle and high-income peers receive $5,720 and $4,259, respectively, in total financial aid, including loans.

However, low-income and lower-middle income students on average are borrowing higher amounts from all sources ($2,572 and $2,557, respectively) when compared to upper-middle ($2,048) and high-income ($1,315) peers. And, despite the higher amounts of loans they borrow to finance their education, students from low-income families are still left with the highest amount of unmet need ($5,156) after family contribution and all financial aid has been considered. Data in Table 2 shows that unmet need declines with income, leaving students from lower-middle income backgrounds on average with $3,919 and their upper-middle and high-income peers on average with $2,538 and $1,647, respectively, in unmet need.

When examining financial aid amounts only for those students that actually received the respective form of aid (see Figure 2), the data reveal interesting trends. Figure 2 shows that among those who borrowed, the lowest two income groups take out higher amounts when compared to their higher income peers. However, as one would expect, with increasing income, fewer students take out subsidized federal loans with the rate of borrowers being 60.8% among low-income students compared to 14.7% in the high-income group. The reverse trend is revealed for unsubsidized loans with generally fewer low-income individuals utilizing this form of aid. Among the lowest income group, 13.0% take out unsubsidized loans, which compares to 25.8% among their high-income peers. Interestingly, however, among those who borrow, average unsubsidized loan amounts are highest for the lowest income group, with $3,202 taken out. This compares to $2,805 for their lower-middle, $2,375 for the upper-middle, and $2,504 for high-income students, respectively. So, in short, fewer low-income students take out unsubsidized loans, but when they do, they borrow on average higher amounts compared to their higher income peers.

Figure 2

First-Year Financial Aid by Income - Average Amounts among Actual Recipients, and Percent Share
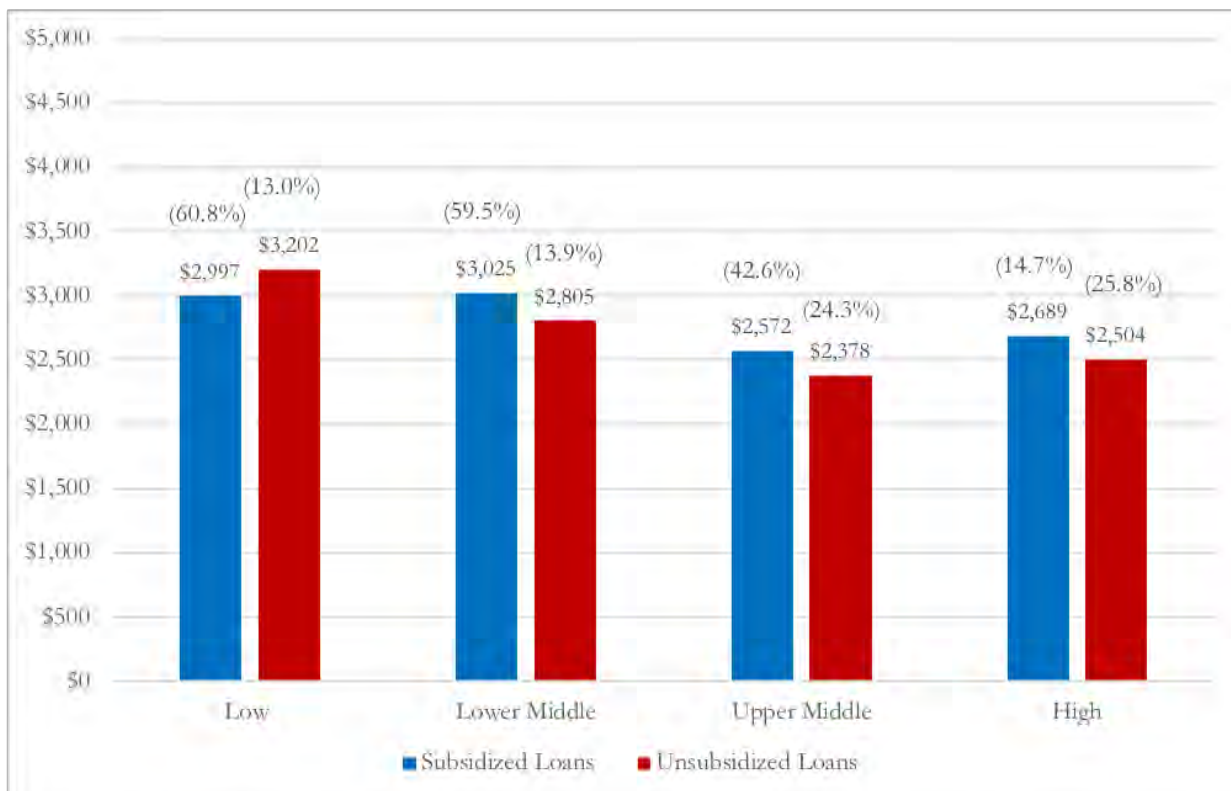
Naïve HGLM Results

In a first step, multilevel models (HGLM) were run to predict six-year degree completion using unmatched, or naïve, estimations to establish a baseline for the effects of unsubsidized loans and other financial aid. Table 3 shows the results for student- and institutional-level measures that have been incorporated based on the conceptual model. Focusing on effects for the various financial aid covariates, estimates show that need-based grants from federal and state sources do not appear to influence the likelihood to graduate within six years. Institutional need-based grants, however, show a significant positive effect on students' chances to obtain a degree (0.034, p<.01). Similarly, institutional merit-based aid also shows a significant positive association with degree completion (0.025, p<.05), whereas state merit-grants are found not significant. Federal subsidized loans are also found not significant; however, unsubsidized federal loans show a significant negative association with individuals' chances to obtain a baccalaureate degree in six years in the unmatched estimation (-0.065, p<.05).

Table 3

HGLM Model Results Predicting Six-Year Bachelor's Degree Completion - All Students (Naïve Results)

Independent Variables	All Students (N=6,561)		
	C	SE	p
Student-Level Variable (Level 1)			
Pre-College			
Demographic			
Age: 19+ years	-0.205	0.068	0.002 **
Gender: Female	0.207	0.075	0.006 **
African American (White)	-0.155	0.156	0.319
Latino/a or Hispanic (White)	-0.162	0.145	0.264
Asian (White)	-0.170	0.169	0.315
Other Race/Ethnicity (White)	-0.172	0.151	0.254
English is primary language	-0.171	0.155	0.271
Parental educ: HS or less (BA)	-0.030	0.102	0.767
Parental educ: AA degree (BA)	-0.150	0.099	0.128
Parental educ: MA or higher (BA)	-0.016	0.094	0.865
Parents: Single parent (Married)	-0.544	0.236	0.021 *
Parents: Div./sep./wid. (Married)	-0.121	0.090	0.180
Academic Preparation			
Admission test scores	0.036	0.029	0.221
High school GPA	0.197	0.046	0.000 ***
Earned college credits in HS	0.058	0.078	0.461
Economic/Financial Factors			
Low income (<$32k) (High)	-0.490	0.154	0.001 **
Low-mid income ($32-$59k) (High)	-0.276	0.115	0.017 *
Up-mid income ($60-$91k) (High)	-0.161	0.094	0.086
Transition			

Educational Goals & Inst. Commitment

Master's degree aspiration (BA)	0.147	0.085	0.085	
Doctorate aspiration (BA)	0.138	0.105	0.187	
Prof. degree aspiration (BA)	0.077	0.126	0.543	
Plan to transfer	-1.121	0.099	0.000	***

Pull Factors

Chose instit. for pers./family reas.	0.005	0.071	0.948	
Parents expected to get a job	0.017	0.101	0.867	

Economic/Financial Factors

Chose inst. for financial reason	0.102	0.074	0.172	

College

Academic and Social Experiences

Live on campus	0.673	0.085	0.000	***
Acad. integration index	0.003	0.009	0.725	
Social integration index	0.023	0.007	0.002	**
Major declared	0.085	0.079	0.279	
GPA in first year	0.092	0.006	0.000	***
Remedial course taken	0.064	0.093	0.511	

Pull Factors

1-10 hrs working (not working)	-0.056	0.111	0.618	
11-20 hrs working (not working)	-0.117	0.110	0.289	
20+ hrs working (not working)	-0.466	0.129	0.000	***
Distance from home	-0.101	0.028	0.000	***

Economic/Financial Factors

Fed. need-based grants ($1,000)	0.056	0.033	0.090	
State need-based grants ($1,000)	0.003	0.037	0.927	
Instit. need-based grants ($1,000)	0.034	0.012	0.004	**
State merit grants ($1,000)	0.013	0.043	0.769	
Instit. merit grants ($1,000)	0.025	0.012	0.037	*
Federal subsid. loans ($1,000)	0.013	0.026	0.606	
Stafford unsubsid. loans ($1,000)	-0.065	0.031	0.038	*
Unmet need ($1,000)	0.022	0.008	0.004	**

Institutional-Level Variables (Level 2)

Structural-Demographic

Control: Private	-0.138	0.102	0.177	
High selectivity (Mod. selectivity)	0.343	0.100	0.001	**
Low selectivity (Mod. selectivity)	-0.530	0.133	0.000	***

Institutional Context and Climate

Pct. minority enrollment	0.007	0.003	0.025	*
Pct. part-time enrollment	-0.009	0.004	0.023	*
Threshold	-0.277	0.248	0.265	

Variance Component	0.169	0.051	0.001	**
Loglikelihood	-3365.87			
AIC	6842.82			
BIC	7235.86			

* p<.05, ** p<.01, *** p<.001

Notes: For categorical measures, refence groups are displayed in parentheses. Analysis of BPS:04/09.
   Sample includes N=6,561 students, and n=651 institutions.
   Student and institutional-level data weighted by disaggregated WTA000 weight.

   Control measures at the student-level largely confirm findings in the literature about their hypothesized influences on degree attainment (Adelman, 2006; DeAngelo et al., 2011; Nora, Barlow, & Crisp, 2005; Wohlgemuth et al., 2007). Results in Table 3 show, for instance, that increased age, having a single parent (compared to married), having transfer plans, working more than 20 hours per week, and attending college farther away from home significantly decrease chances to graduate. Also, compared to the high-income group, students from low- and lower-middle income families are significantly less likely to finish in six years. Other measures, such as gender (female), academic performance either in high school or during their first year, living on campus, and social integration increase students' chances to obtain a degree in this timeframe. Interesting results are also found at the institutional level, which show that compared to moderately selective institutions, students enrolling in highly selective colleges are more likely to graduate, controlling for other student- and institutional level characteristics. Conversely, individuals that initially enrolled at less selective institutions have a significantly lower chance to graduate in six years. Also, similar to what has been found elsewhere (Franke, 2014; Oseguera & Rhee, 2009), students attending colleges with a larger share of minority students, on average show higher chances to graduate in six years, whereas a larger share of part-time students on campus significantly decreases the likelihood of degree attainment.

Treatment Effects and Propensity Score Results

For the final estimation, propensity score matching and a multilevel modeling approach (HGLM) have been used to estimate the effects of unsubsidized federal loans on six-year degree attainment and reduce potential bias. For this, I ran separate regressions on the entire sample and by income group, based on the conceptual model and the review of the literature. Naïve parameter estimates (displayed on the left) and average treatment effects (ATE; shown on the right) for unsubsidized loans can be found in Table 4.

Table 4

HGLM Parameter Estimates Unsubsidized Loans on Six-Year Degree Completion (Naïve and ATE results)

		Naïve					Average Treatment Effect (ATE)			
	N	C	SE	p	delta-p	N	C	SE	p	delta-p
All Students	6,561	-0.065	0.031	0.038 *	-1.54	6,430	-0.047	0.036	0.191	
By Income										
Low (<$32k)	1,242	-0.256	0.072	0.000 ***	-6.38	1,157	-0.219	0.079	0.005 **	-5.45
Lower-Middle ($32k-59k)	1,493	-0.050	0.068	0.465		1,466	-0.014	0.072	0.844	
Upper-Middle ($60k-$91k)	1,703	-0.017	0.060	0.783		1,692	-0.049	0.067	0.462	
High ($92k+)	2,123	-0.065	0.048	0.172		2,115	-0.069	0.053	0.194	

* p<.05, ** p<.01, *** p<.000

Note: Parameters estimated using student-level and institutional-level covariates (see final HGLM model), and propensity score matching.

All effects reported per $1,000 received in federal unsubsidized Stafford loans.

Assessing effects for the entire sample, results for the naïve estimator show a significant, negative impact on students' propensity to graduate. For every $1,000 borrowed additionally in unsubsidized Stafford loans, students are 1.54% (p<.05) less likely to graduate. However, when assessing the PSM results for the average treatment effect on the entire sample, no significant effect is found.

When examining results by income groups, however, data show a more nuanced picture. Examining the results for the naïve estimators, the data show that for students from the lowest income strata, unsubsidized Stafford loans are found highly detrimental to their success. Results reveal a comparatively large, negative association with the outcome measure, as hypothesized for this form of aid. For every $1,000 in additional money borrowed in unsubsidized loans, low-income students are found 6.38% (p<.000) less likely to graduate within six years. This result is confirmed in the ATE estimation using the doubly robust PSM approach. The data show the detrimental effect to be marginally smaller, as for every $1,000 borrowed students are found 5.45% (p<.01) less likely to graduate.

Interestingly, this negative association for unsubsidized loans is only found among low-income students. As hypothesized in this study and elsewhere (R. Chen, 2008; St. John et al., 2000), the high costs associated with this form of financial assistance and its relatively low value when compared to other forms of aid, particularly grants and subsidized loans, appear to have detrimental effects on the chance to complete a degree for the least affluent students.

Effects for students in all other income groups taking out unsubsidized loans are noticeably different compared to their low-income peers. Results for both the naïve estimator and ATE find no significant effect on students' likelihood to complete a degree within six years. Even though a larger share of students uses unsubsidized loans, particularly among upper-middle and high-income students, and these individuals borrow notable amounts, this form of aid is not found influential on degree attainment. Given that also other types of financial aid did not produce significant results (omitted from the results table), factors other than economic or financial appear to impact the likelihood to obtain a degree within six years for these students. This seems to confirm results found elsewhere in the literature (Bourdieu & Passeron, 1990; McDonough & Nuñez, 2007).

Discussion and Implications

Over the past decades, college has become increasingly expensive in the United States. This left many students and their families with little choice, but to take out loans to attend postsecondary education. So, if the past is any indication of the future, this form of financial aid will continue to play a pivotal role in college access and success. The results of this study, subsequently, have implications for policy, practice, and research in higher education.

This study examined the effect of unsubsidized federal Stafford loans on six-year degree completion at 4-year colleges and universities in the U.S. Results provide more nuances to previous findings in the literature and underscore that this particular form of financial assistance may be detrimental for students from the lowest income backgrounds. Though the naïve HGLM estimation results may show an upward bias, the results of the propensity score matching approach employed in this study confirm the significant negative effect. For low-income students, I estimate that for every additional $1,000 borrowed in unsubsidized loans, students are 5.45% less likely to graduate (ATE). Results in this study do not reveal other significant effects for higher income students. Significant, negative results (-1.54%) found for unsubsidized loans in the estimation on the entire sample (naïve estimator) are not confirmed in the ATE estimation.

Although more research is needed, the effects reported here provide further evidence that different forms of financial aid may impact individuals differently, depending on their background, financial situation, and perceptions of aid (Britt et al., 2017; R. Chen, 2008; Hossler et al., 2009; Kim, 2007) and, as a result, can contribute to widening degree attainment gaps. In particular, results reported here point to a detrimental influence of unsubsidized federal loans on low-income students' chances to graduate, potentially an effect of their relatively high cost compared to subsidized forms of loans or other financial assistance that does not need to be repaid. The sizable negative effect is even more worrisome in light of the incontrovertible reliance on loans to fund one's education for today's generation of college goers, particularly as unsubsidized loans have become the largest source of federal aid in the U.S, a contributing factor in the now widely perceived student debt 'crisis' (Scott-Clayton, 2018). Results reported here confirm negative effects for low-income students previously reported in the literature. More specifically, Kim (2007) found that federal loans reduced the likelihood of degree attainment among low-income students by 2.2%. This study was also based on a national dataset; however, it failed to disaggregate federal loans, which may explain the smaller effect size.

Among policy initiatives aiming to improve student success, financial aid has become of increasing interest at the federal, state, and institutional level. Since its inception, the goal of the federal financial aid system has been to equalize college opportunity and provide assistance to low-income students. With the results presented in this study, however, policymakers ought to question whether the current suite of federal financial aid tools are fulfilling FSA objectives and whether a more targeted approach may be more effective. For instance, increasing Pell Grant funding, strengthening the work-study program, or campus-based loan programs, most of which have been empirically shown to actually increase success for the low-income students (Curs, Singell Jr, & Waddell, 2007; Scott-Clayton, 2011a), may be more effective and could prevent potential negative effects from taking out more expensive, unsubsidized loans.

Given the results in this study, federal regulation could adjust annual loan limits and differentiate these by EFC or income level. Low-income students, for instance, should receive only subsidized federal loans in addition to grant aid. Proportionately larger amounts of unsubsidized loans should be allocated to more affluent individuals, as for them this type of financial assistance does not appear to be as detrimental as for their low-income peers.

The sizable negative effect found here on degree attainment is also relevant for the debate on loan program redesign and interest rates and provides evidence that rates and design aspects matter with regard to student success. Given that the cohort under study – students that entered higher education in 2003-04 – faced very favorable borrowing conditions with interest rates near the all-time low since the inception of the unsubsidized loan program (3.42%), the question arises what effects would be found if interest rates rise even beyond the current rate of 5.05% (AY 2018-19). If the trend towards higher interest rates continues in the current economic climate, this may become a highly relevant question to millions of student borrowers.

The results reported here should also inform debates around HEA reauthorization and legislative proposals, particularly in regard to their loan component. Consolidating all federal loans into a single program, as proposed under the PROSPER Act for instance, may provide efficiencies. However, moving away from what is now a mixed approach, providing students with both subsidized (less costly) and unsubsidized loans, to a program that provides subsidized (more expensive) loans only, would further privatize FSA and shift the cost burden to students and their families with potentially devastating effects to student access, success, and equal opportunity. Low-income students already have the largest remaining amount of unmet financial need, even after all aid has been considered, which in turn increases the need to take out additional loans or otherwise make up the difference. Taking away the interest subsidy, in place since the creation of the FSA system, may increase the financial burden and stress these students experience, contributing to the widening – not closing – of the attainment gap.

Based on the findings outlined in this study, practitioners and financial aid administrators may also need to rethink practices in regard to unsubsidized Stafford loans. Although only a relatively small share of low-income students relies on this form of aid – 13.0% in 2003-04, based on data presented here – their average unsubsidized loan amounts indicate that students may not have utilized the maximum in subsidized loans available under federal policy and annual borrowing limits at that time. Thus, reviewing and potentially adjusting financial aid packages in a way that prioritizes subsidized loans up to the maximum available amount, particularly for low-income students, is an important aspect. Ideally, other financial aid options that provide more value to the student and are less costly, whether direct or through campus-based programs, should be exhausted first with the goal of further minimizing unsubsidized loans for the most financially needy students.

Beyond that, financial aid administrators should be more mindful about the potential differential value of various forms of aid to different students and aspects of financial stress. Research does not yet provide a clear picture of how various aid types interact and how they differentially impact students. Thus, analyzing data and exploring the effects for students at their respective campuses, disaggregating by aid type and for various student groups, such as first-generation, low-income, and students of color may be an important step to better understanding and creating a more targeted, campus-based financial aid system. Ideally, this should be pursued with other campus offices, such as student counseling, institutional research and potentially educational researchers that, through its combination, may be able to provide additional insights into effects.

Lastly, the results reported here have implications for scholars and future research. Given the limited availability of work that seeks to disaggregate potential effects for various student groups – in this instance by income – in combination with adjustments for selection bias, and a clear focus on student persistence and degree attainment, more work needs to be advanced using institutional, state, and federal data sources. Given the dramatically increased reliance on student loans in recent decades, we need to better understand (a) what their overall impact is on short- and long-term student trajectories, choices and outcomes, and (b) how effects may vary across groups. In addition, we need to account for aspects previously not considered in scholarly work, such as changes in interest rates over time, additional fees (i.e. origination on loans), or

how borrowing decisions between students and their parents (i.e. PLUS loans) may interact and influence crucial education outcomes.

Nexus: Connecting Research and Practice

- This study found that for every additional $1,000 borrowed in unsubsidized loans, low-income students are 5.45% less likely to graduate in six-years. Average unsubsidized loan amounts among recipients further indicate that students may not have utilized the maximum in subsidized loans available under federal policy. Thus, financial aid administrators should monitor student loan borrowing and minimize the use of federal unsubsidized loans particularly for this group and students with low EFC.
- More generally, financial aid administrators should consider a targeted approach that prioritizes aid types and allocates financial aid with a high economic value to students with the highest unmet need (typically low-income students). In particular, grant aid from all sources should be exhausted first, followed by subsidized loans (both direct and campus-based) and work-study. Unsubsidized loans should be allocated to a higher degree to middle- and high-income students.
- Financial aid counseling and other entities on campus that interact with students should incorporate this knowledge in their advising and coordinate efforts with financial aid offices. Identifying students in financial hardship or distress may provide the opportunity to optimize aid packages and lower the likelihood of student attrition.
- Aid administrators should seek to be more mindful about the differential value of various forms of aid for different students and the potential implications. Analyzing in-house data and exploring the effects for students on campus, disaggregating by aid type and for various student groups, such as first-generation, low-income, and students of color, may be an important step to better understanding and creating a more targeted, equitable, campus-based financial aid model that improves degree attainment.

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Appendix

Table 5

Descriptive Statistics BPS:04/09 (N=6,561)

Variable	Min	Max	Mean	S.D.
Dependent Variable				
6-year degree completion	0	1	.60	.49
Student-Level Variables				
Age: 19 years or older	0	1	.34	.47
Gender: Female	0	1	.56	.50
White	0	1	.70	.46
African American	0	1	.09	.28
Latino/a or Hispanic	0	1	.10	.30
Asian	0	1	.06	.23
Other Race/Ethnicity	0	1	.05	.22
English is primary language	0	1	.90	.30
Low income (<$32,000)	0	1	.20	.40
Lower-middle income ($32,000-$59,999)	0	1	.24	.43
Upper-middle income ($60,000-$91,999)	0	1	.25	.44
High income (>$92,000)	0	1	.31	.46
Parental Education				
High school or less	0	1	.19	.39
Associate degree or some college	0	1	.22	.42
Bachelor's degree	0	1	.29	.45
Master's degree or higher	0	1	.30	.46
Family Status				
Married	0	1	.75	.43
Single parent	0	1	.04	.20
Divorced/separated/widowed	0	1	.21	.41
Admission test scores (ACT or SAT; 100)	4.20	16.00	10.75	1.85
High school GPA	1.00	5.00	4.23	.99
Earned college credits in HS	0	1	.44	.50
Education Goals & Aspirations				
Bachelor's degree aspiration	0	1	.23	.42
Master's degree aspiration	0	1	.48	.50
Doctorate aspiration	0	1	.20	.40
Professional degree aspiration	0	1	.09	.28
Plan to transfer	0	1	.13	.34
Distance institution from home (log)	0	9.42	4.22	1.64
Did not work (excl. work-study)	0	1	.54	.50
1-10 hours working (excl. work-study)	0	1	.14	.35
11-20 hours working (excl. work-study)	0	1	.17	.38

20+ hours working (excl. work-study)	0	1	.14	.35
Parents expected to get a job	0	1	.27	.45
Chose institution for personal/family reasons	0	1	.44	.50
Live on campus	0	1	.68	.46
Academic integration index	0	20	8.91	4.12
Social integration index	0	20	6.66	5.20
Major declared	0	1	.73	.44
GPA in first year	0	40	29.20	7.75
Remedial course taken	0	1	.16	.36
Financial Aid				
Unmet need (after EFC and all aid)	0	46.34	3.12	5.64
Fed. need-based grants ($1,000)	0	8.05	.88	1.66
State need-based grants ($1,000)	0	10.00	.59	1.43
Instit. need-based grants ($1,000)	0	20.00	1.72	3.94
State merit grants ($1,000)	0	10.00	.22	.83
Instit. merit grants ($1,000)	0	21.76	1.71	3.55
Federal subsid. loans ($1,000)	0	7.50	1.23	1.70
Stafford unsubsid. loans ($1,000)	0	6.63	.53	1.15
Institutional-Level Variables				
Public Institution	0	1	.64	.48
Private Institution	0	1	.36	.47
High selectivity	0	1	.29	.45
Middle selectivety	0	1	.56	.50
Low selectivity	0	1	.09	.29
Pct. minority enrollment	0.07	100.00	25.41	23.23
Pct. part-time enrollment	0.21	93.98	14.81	11.12

Note: Numbers reflect full-time, dependent students (excluding athletes and International students), enrolled in a Bachelor's degree program at 4-year institutions in the U.S.

Figure 3

Common Support Area, Propensity Score Estimation (Treatment = Unsubsidized Stafford Loans)