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## THE ROLE OF FEDERAL AND PRIVATE STUDENT LOANS IN HOMEOWNERSHIP DECISIONS

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**ABSTRACT:** This paper examines the effect of student loans on the decision to become a homeowner. Analyses use the Baccalaureate and Beyond 2008:2012 (B&B) panel data set collected by the US Department of Education that surveyed a representative sample of four-year college graduates from institutions across the country. Whereas previous analyses of student loan debt rely on cumulative loan balances, the present research examines both federal and private student loan impacts separately. Private student loan data is often unavailable in major datasets, but the B&B data provide rich information on sources and amounts of debt for recent graduates. We instrument student loans using in-state tuition rates and find that for four-year college graduates, a \$1,000 increase in a respondent's private student loan balance lowers the likelihood of buying a home by about 5 percentage points whereas a \$1,000 increase in federal loans has no significant impact on homeownership during this time.

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## THE ROLE OF FEDERAL AND PRIVATE STUDENT LOANS IN HOMEOWNERSHIP DECISIONS

In recent years, student loan debt has climbed to become the second highest category of consumer debt behind mortgage debt. Student loan debt reached an all-time high with an average loan balance of \$35,512 per student in mid-2015 and roughly 70% of students indicated graduating with some debt (Berman 2015). Factors such as the rising costs associated with obtaining a degree, coupled with flagging support programs have contributed to this increased reliance on borrowing to cover critical education expenses (College Board 2017b; Fitzpatrick and Turner 2007; Haughwout et al. 2015). Evidence suggests that the rising cost of obtaining a degree is not deterring students from attending college, rather, current students are borrowing more to attend than previous cohorts (Bleemer et al. 2017). Previous studies have noted decreased economic stability associated with student loan debt, and there is evidence that high levels of student loan debt might have an impact on degree attainment, school program and career choices, and later borrowing decisions (Gicheva and Thompson 2015; Haughwout et al. 2015; Letkiewicz et al. 2014; Robb 2017; Robb, Moody, and Abdel-Ghany 2011; Rothstein and Rouse 2011).

There has also been growing concern about private student loans, which typically have less favorable terms than federal student loans (Dynarski 2014). Whereas federal loans have fixed, low interest rates and a variety of flexible repayment options and deferment/forbearance options, private loans typically have higher interest rates<sup>1</sup>, often have variable rates<sup>2</sup>, and lack pre-specified alternative payment schedules. Although most lenders are often quite willing to modify repayment schedules in the event of financial difficulties, private loans may appear to consumers to be less flexible. Variable rate student

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1. Consumers must undergo a typical underwriting process to obtain private student loans, therefore, consumers with good credit or a cosigner may be able to secure a lower interest rate than federal loans (Consumer Banker Association). However, because most young borrowers have little to no credit history, rates will typically be higher than federal loans.

2. According to the Consumer Banker Association, about half of the private student loans originated since 2012 have been fixed rate loans.

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loans in an increasing rate environment can be very risky for consumers as increases in the interest rate may cause repayment difficulty for consumers. Private student loans made up about 25% of the total student loan market in 2007-2008 (College Board 2017c). Although the private student loan market share had decreased to 7% by 2011-2012 following the Great Recession, the market share has been on the rise since then, increasing to 11% in 2016-2017 (College Board 2017c). In most cases, students seek private student loans once federal financial aid options have been exhausted.

Although the impact of student loans may be debated, the fact that public subsidy of higher education represents a large investment by the federal government is obvious. Federal grants, work study, and tax benefits amounted to a little less than \$60 billion dollars of investment in the 2016-2017 academic year (College Board 2017a) – that is in addition to the nearly \$94.8 billion in total student loans disbursed (including undergraduate and graduate students) in 2016-2017(College Board 2017a). Despite this significant investment by the federal government, there are limits imposed on federal subsidized and unsubsidized loans (Federal Student Aid 2018). Annual and lifetime maximum amounts vary by students' dependent status. The existing maximum amounts of \$31,000 for dependent students and \$57,500 for independent undergraduate students may not cover the full cost of higher education in light of the significant cost increases in recent years. Understanding the full impact of higher education policy on consumer behavior is critical for policymakers. As a result, there have been increased efforts to empirically explore the potential impacts of this debt on later life outcomes.

We extend this important literature by examining two critical research questions; (1) whether student loan debt has an effect on homeownership in a nationally-representative dataset of college graduates, and (2) whether the type of student loan (i.e., federal or private) impacts homeownership decisions. Previous studies lacked the ability to distinguish between different loan types, so this is a valuable addition from the present study. An instrumental variable approach is applied to both probit and

two-stage least squared regression analyses. Results suggest that larger student loan balances are associated with lower odds of homeownership during the first four years after graduation. When controlling for student loan debt type, only possession of private student loan debt is associated with a lower likelihood of homeownership, with no significant effect noted for those with only federal loans.

## **STUDENT LOAN DEBT AND HOMEOWNERSHIP**

Several studies have found evidence of a negative relationship between student loan debt and homeownership. Mezza, Ringo, Sherlund, and Sommer (2016) analyzed a dataset consisting of merged administrative data from TransUnion, the National Student Clearinghouse, and the Integrated Postsecondary Education Data System (IPEDS). Mezza et al. controlled for changes in in-state tuition rates prior to enrollment as an instrument for the effect of student loans on homeownership rates. They found that, for student loan borrowers upon school exit, a 10 percent increase in student loan debt caused a one to two percent decrease in homeownership rates (Mezza et al. 2016). Cooper and Wang (2014) analyzed the Panel Study of Income Dynamics and the 1988 National Educational Longitudinal Survey and found a robust, negative relationship between student loan debt and homeownership in the 1990s. Their approach was to control for financial and demographic characteristics. Among their baseline estimates, Cooper and Wang (2014) estimated that individuals with student loan debt were 12 percentage points less likely to own a home than those without student loan debt. They further estimated that a 10 percent increase in the amount of student loan debt relative to the mean was associated with a 0.1 percentage point decrease in the likelihood of owning a home (Cooper and Wang 2014). Other research from the Federal Reserve Bank of New York used administrative data from Equifax-sourced New York Fed Consumer Credit Panel, Integrated Public Use Microdata Series, and IPEDS to examine student loan borrowing and homeownership decisions by using variation in state-level tuition as a source of exogenous

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variation for student loan debt in both fixed effects and instrumental variable models (Bleemer et al., 2017). They estimated that roughly 11-35% of the 8% decline in homeownership for 28-30 year olds from 2007-2015 could be attributed to increased student loan debt (Bleemer et al. 2017).

Two studies have used the 1997 cohort of the National Longitudinal Study of Youth (NLSY97) and found little to no effect of student loans on homeownership (Houle and Berger 2015; Letkiewicz and Heckman 2018). Houle and Berger (2015) analyzed the NLSY97 cohort and found a significant, but modest effect of student loans on homeownership outcomes (i.e., owning a home and for homeowners, mortgage amount and home equity). Their primary analytic approach was to control for a variety of individual-level characteristics, including, sociodemographic characteristics, social and economic characteristics, and postsecondary educational characteristics. They also used an instrumental variable approach as a robustness check using a financial aid to sticker price ratio as an instrument for the effect of student loans on homeownership. They concluded that although student loans may have a small marginal negative effect on home buying, the growth in student loans cannot fully explain declines in homeownership rates among young adults (Houle and Berger 2015). Letkiewicz and Heckman (2018) analyzed a subset of the oldest cohort members (i.e., ages 30-31) of the NLSY97 using the 2010 wave. Their approach was to control for a variety of economic, sociodemographic, and behavioral factors, including risk tolerance, risk perception, and personality measures. Among their sample, they found virtually no effect of student loans on homeownership but found evidence that young adults' perceptions of the riskiness of homeownership may have changed as a result of the Great Recession (Letkiewicz and Heckman 2018).

Although the literature has somewhat mixed findings on the effect of student loans on homeownership choices, most studies have reported a negative relationship between student loan debt and homeownership and none to our knowledge examine whether there are differential effects based on

student loan type (i.e., federal or private). We extend the literature by examining the influence of student loans on the decision to own a home in a nationally representative, longitudinal dataset. Furthermore, the data allow us to distinguish between federal and private student loans and, therefore, examine whether there are differential effects (particularly regarding the effect magnitude) of type of loan on homeownership, which is novel and may have important implications for federal student loan policies.

## THEORETICAL FRAMEWORK

The life-cycle approach to saving and consumption behavior has been explored under numerous distinct models, but a central characteristic of these models is that of income smoothing (Ando and Modigliani 1963). In essence, consumers seek to allocate current and expected future resources evenly over some assumed lifetime. Under this framework, young adults may borrow to cover education expenses with the reasonable expectation that the education itself is an investment in human capital. The cost of obtaining the degree (in this case inclusive of time, forgone earnings, and potential debt accumulation) is generally offset by a steeper earnings path post-graduation. These loans that are obtained to accumulate human capital should have a negligible effect on post-college decision making as the loan repayment process is redistributed over the remainder of the life cycle. Whereas theory suggests that long-term impacts of this debt should be relatively minor, graduating with debt may present unique, short-term constraints that limit opportunities immediately after graduation. In the first few years after graduation, students who used student loans to finance their education (either partially or in full) may face constraints based on their debt-to-income ratio or difficulties in accumulating wealth in the short run.

This potential for short-term constraints to limit individuals is supported by an analysis of subjective delays in home purchase behavior. In the Baccalaureate and Beyond 2008 panel dataset, individuals are asked whether the financial cost of their four-year degree delayed the decision to become a

homeowner (See Table 1, Model 1). Conditional on having student loans and controlling for demographic and income differences, respondents who had undergraduate student loans had about 128% higher odds to report delays in home buying. Further, the magnitude of respondents' student loan debt outstanding exaggerates this result (Table 1, Model 2). Respondents with a cumulative loan balance of greater than \$50,000 have about 233% higher odds to subjectively report a homeownership delay, relative to those who have student loans between \$0-\$10,000. In addition, Table 1 Model 3 shows that the type of student loan debt taken, federal or private, also strongly impacts the respondent's subjective reporting. These models suggest that the amount of cumulative student loan debt is associated with perceived delays in home ownership among the sample. One of the central questions in this analysis concerns the extent to which the perceived home buying delay is consistent with reality.

[Insert Table 1 about here]

Respondents with an obligatory student loan payment have less available money to allocate to their savings account than a respondent without a student loan payment, holding all else equal. If the respondent with a student loan payment wishes to purchase a home, it may take longer to accumulate a down payment. Respondents may choose to live at home after college to pay their student loan payments and save for a down payment on a house concurrently. At the same time, the student loans the respondent acquired may have led them to a higher paying job and increased monthly savings. The respondent may have a spouse who they met in college, also with higher post-college earnings and therefore higher household monthly savings.

To understand the impact of the respondent's student loan balances on the decision to become a homeowner, we propose the following reduced-form model: Let  $Y_i$  be a dummy variable denoting individual  $i$ 's decision to purchase a home during the 2008-2012 window. Let treatment  $X_i$  be the cumulative student loan balance of individual  $i$  as of 2008 and  $Z_i$  be a vector of control variables

including age, race, gender, college major, income, and residential area type (i.e., rural, suburban, or urban). In subsequent analyses, we will separate the cumulative balance  $X_i$  into federal and private student loans sub-categories to determine the effects of different types of loans but for now are considering the aggregate balance. Then let the model be:

$$Y_i = \beta_0 + \beta_1 X_i + \gamma' Z_i + \mu_i$$

Assume that  $\text{cov}(\mu, Z_i) = 0$ .

### Hypotheses

Based on the subjective results from our sample (Table 1), and considering the short time horizon for the present analysis, the following hypotheses are postulated:

1. The probability of becoming a first-time homeowner in the first four years after graduating from college will be lower as cumulative student loan balance increases, *ceteris paribus*.

Additional hypotheses were generated based on the fact that student loan debt is further divided into federal and private categories:

2. All else equal, the probability of becoming a first-time homeowner in the first four years after graduating from college will be lower as cumulative federal student loan balance increases.
3. All else equal, the probability of becoming a first-time homeowner in the first four years after graduating from college will be lower as cumulative private student loan balance increases.

### METHOD

#### Empirical Model

It is likely that student loans  $X_i$  are not randomly assigned, or that  $X_i$  and  $\mu_i$  are correlated due to an omitted variable. If student loans are affected by unobserved factors such as ability, and individuals with higher ability self-select more student loans (or potentially less) and are more likely to buy a home, then student loans  $X_i$  will be correlated with the error term  $\mu_i$ . On one hand, high ability students may borrow more student loans to go to better schools because they expect higher future income. On the other hand, students with high ability may have parents with high ability (and therefore high incomes) and borrow less for their education. It is not clear a priori which direction the bias goes. In any case, student loans are likely endogenous and the correlation between  $X_i$  and  $\mu_i$  will produce a coefficient which may be upward (or downward) biased relative to the true coefficient.

To deal with the potential bias, we add two instruments for student loans<sup>3</sup>. The first uses the public-school tuition rate in the state the student went to college. The second is an indicator function for if the student attended a public or private college. The tuition rate is correlated with the amount of student loans an individual takes out during their bachelor's degree, but does not have an independent effect on the unobservables present in the homeownership decision<sup>4</sup>. It is reasonable to question the later part of this statement. If a state-wide negative shock changes tuition rates in that state, and it also impacts some unobservable factor in the homeownership decision, that individual may be less likely to buy a house. We check this possible correlation in the results section through the addition of postal code level economic data, but it may be a limitation to this study. The second instrument, an indicator for if the respondent attended a publicly funded university, is a relevant instrument because publicly funded universities tend to have lower tuition rates due to the availability of state funds for college costs. Money collected through

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3. Having two instruments is useful for the analysis below where we separate the cumulative student loan balance into federal loans and private loans, allowing our model to be just-identified with two instruments and two endogenous regressors.

4. One question is whether it matters if respondents saw larger tuition increases early in their baccalaureate degree or later, with the idea that late large tuition increases may have been unanticipated, causing the respondent to take out more private student loans. We included this in our model and there were no significant differences in results.

tuition for public universities does not need to cover the full cost of education like a privately funded university might. Lower tuition rates imply lower student loans needed to fund an individual's education, but have no independent effect on the homeownership decision, making it a valid instrument for this analysis.

Both an instrumental variable probit model and two-stage least squares model are used to quantify the effects of loans on homeownership. Assuming a probit model, we can estimate the model as:

$$Y_i = I(\beta_0 + \beta_1 X_i + \gamma' Z_i + \mu_i > 0)$$

$$X_i = \alpha_0 + \alpha_1 T_j + \alpha_2 P_i + \nu_i$$

where  $I()$  is an indicator function taking the value of one if true and zero if false,  $T_j$  is the state tuition rate for state  $j$ , the state the respondent went to college, and  $P_i$  is the indicator function taking the value of one if the student attended a public university. We are interested in an unbiased estimate of  $\beta_1$ . Assuming a two-stage least squares model, we can estimate the model as:

$$Y_i = (\beta_0 + \beta_1 X_i + \gamma' Z_i + \mu_i)$$

$$X_i = (\alpha_0 + \alpha_1 T_j + \alpha_2 P_i + \nu_i)$$

Second stage estimation of  $Y_i$  produces a local average treatment effect (LATE) estimate of student loan debt on homeownership, where the treatment group is the traditional sample of respondents that attended public universities. Our LATE estimate of  $\beta_1$  is the effect of student loan debt on homeownership for the compliers, or those treatment group individuals whose debt levels are sensitive to tuition changes. For students from wealthy families, changing tuition rates likely do not impact student loan balances because debt is not needed to pay for college. The estimate will reflect only those students who are on the margin, whose student loan balances are affected by tuition changes, which are exactly the group of students relevant in policy analysis.

The remainder of the paper will be divided into the following sub-analyses:

[Model 1] Instrumental variable analysis of  $Y_i$ , the indicator function for whether or not the respondent purchased a home in the first four years after graduating from college on cumulative total student loans, and

[Model 2] Instrumental variable analysis of  $Y_i$  on federal student loans and private student loans<sup>5</sup>.

## Data

The 2008:2012 Baccalaureate and Beyond Study conducted by the NCES within the U.S. Department of Education provides a longitudinal study of bachelor's degree recipients' labor market experiences from graduation (2008)<sup>6</sup>. The intent of this study is to track post-baccalaureate decision making including labor market, graduate education, family formation, and household financial planning. The survey collects data on a sample of respondents in 2008 when they graduate (16,000 observations), then again in 2009, 2012, and a final collection is expected in 2018. The level of attrition from 2009 to 2012 is 9.7% (1,560 observations dropped). The data in the base year are collected from financial aid records given by the institution attended (provided by the National Postsecondary Student Aid Study NPSAS and includes the respondents FAFSA, Student Aid Report, Financial Aid Need Analysis Form, and Comprehensive Financial Aid Report). The data in the follow-up years are obtained from multiple sources, both recorded during interviews with the respondents and obtained from the National Student Loan Data System (NSLDS) records.

To prepare the data for our analyses, we performed the following steps: (1) merged the 2008, 2009, and 2012 panel datasets together, losing 1,560 observations to attrition, (2) using a complete case approach, only included respondents in our analyses who did not have any missing data for the variables

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5. Our choice of an instrumental variable approach was further confirmed with the Durbin-Wu-Hausman test. For both models, no endogeneity was strongly rejected at the 99% confidence level.

6. The B&B dataset is limited to four-year college graduates, so our research does not address non-completers or graduates from two-year institutions. As a group, four-year graduates tend to have relatively less difficulty in loan repayment than non-completers so we expect the homeownership delay for non-completers to be larger but cannot make any conclusive statements using this dataset.

we were regressing (see N in regression tables), (3) created age variables for the respondents under 60 and for the respondents under 30, who we call “traditional students”, and (4) merged in key external data to use in our instrumental variable regressions. Note that the NCES does not allow exact sample sizes from restricted-use data files to be published, so the reported sample sizes in this paper are rounded. All analyses were appropriately weighted for analyzing data from all three rounds of data collection and data directly from the interview transcripts. The weights were adjusted for nonresponse and calibrated to IPEDS and NPSAS control totals.

The main regressor of interest, cumulative student loan debt, is an accumulation of both federal and private student loan debt as of 2008. Public student loan debt includes both subsidized and unsubsidized Stafford loans and Perkins loans and ignores loans obtained by parents of the respondents through the Parent Plus program<sup>7</sup>. A unique feature of the B&B2008:12 dataset is that it contains a measure for private student loans, a distinction often ignored in other studies. Private student loan debt is a reported figure obtained during the interview process, whereas public student loan debt is obtained from the NSLDS. The self-report nature of the private student loan debt introduces a limitation to our analysis, as there may be measurement error in the figures provided by respondents for the private student loan debt. We use the nominal amounts reported in the survey because inflation does not change significantly over the short time window. See Figure 1 for the division of loan sources and Figure 2 for the distribution of student loan balances in our dataset.

Several types of demographic, schooling, and post-schooling control variables were used in our regression analysis. An indicator variable for whether the respondent received a need-based Pell grant is included to control for family characteristics, namely if a respondent comes from a low-income family. The race categories are Black, White, Hispanic, Asian, and Other. An indicator variable is included for

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7. Parent plus loan repayment is the responsibility of the parent, not the student, and therefore does not play a part in respondent decision making.

whether the respondent applied to graduate school after their baccalaureate degree was completed, to account for future graduate school plans. Log income is log of respondent income from 2011. Log spousal income is log of the respondent's spouse income from 2011. Unmarried respondents have a value of 0 for log spousal income. High school GPA is included to account for participant ability. Parent education is measured as the highest level of education (between mother and father) in the household, including no high school degree, some college, a four-year degree, a masters or professional degree, and a doctoral degree. The reference group in the regression analysis is any parent education below a four-year degree. The respondent's credit card balance as of 2008 is included to account for other types of respondent debt held. An indicator function for whether the respondent is living with their parents four years out of college is also included. A summary of these variables is found in Table 2.

The dependent variable is an indicator function denoting if the respondent purchased a home in the four-year window after graduating from their baccalaureate degree. We are interested in the decision to become a homeowner for the first time. The homeowner variable is zero for people who never purchased a home or people who already owned a home at graduation. The variable is labeled one if the person transitioned to a status of homeowner at any point during the time frame.

The data used for the instrument, public four-year in-state tuition and fees rates from 2004-2008, was obtained from College Board Annual Survey of Colleges. Figure 3 shows a distribution of the tuition changes at the state level. More than half of the states had percentage increases between 15% and 30%, with some high and low outliers. For example, Colorado had a 46% tuition increase and Oklahoma had a 41% tuition increase in this four-year window. Figure 4 shows the division of respondents attending public and private universities for the second instrument used. Zip code level economic data was included in a number of the models as a robustness check. Unemployment rates for 2008 and 2012 at the zip code level were merged into the dataset from the Bureau of Labor Statistics (see Figure 5).

## RESULTS

First stage estimation results are reported in Table 3. Column 1 shows the relationship between the two instruments, the in-state tuition rate and the public university dummy, on cumulative total student loans borrowed for a respondent's undergraduate degree. The estimates for both instruments are highly statistically significant, indicating a strong first stage. Column 2 tests the robustness of this result by adding in Pell grant controls, college major controls and zip code-level unemployment rates. The results are also highly statistically significant. Column 1 and 2 indicate that a \$1,000 increase in in-state tuition in the four years the respondent went to college is associated with a roughly \$130 increase in student loan balance, and that going to a public university is associated with a \$10,000 decrease in cumulative loan balance. Column 3 and 4 show the same results for cumulative federal student loans, and column 5 and 6 show the results for cumulative non-federal student loans. The *F*-statistic is also reported in Table 3. As suggested by Stock, Wright, and Yogo (2002), the *F*-statistic is greater than 10 in each specification of the model, indicating there is likely not a weak instrument problem. Given the first stage statistical significance and the F-statistic values, we conclude that we do not have a weak instrument problem.

In the second stage, model [1], the results of both the instrumental variable probit model and the two-stage least squares analyses are reported in Table 4 and 5. The IV probit model has a pseudo R-squared of 0.215 and the 2SLS results have an adjusted R-squared of 0.20. The Wald test of exogeneity was rejected at the 99.9% confidence level. Our results show that a \$1,000 increase in cumulative student loans lowers the likelihood of purchasing a home in the four-year window after graduation by about 1.7 percentage points, holding all other variables at their means, a result that holds under a variety of specifications of the model as seen in the results tables. This result holds after controlling for family background, location of living, race, major, and income level.

Other significant factors in home buying from model [1] include being married and having children. Healthcare and business majors are significantly more likely to purchase a home than general studies majors. A one unit increase in log income increases the probability of becoming a homeowner by about 13 percentage points, and a one unit increase in log spousal income increases the probability of becoming a homeowner by about 5 percentage points. Respondents who moved in with their parents immediately after graduation were weakly more likely to purchase a home in this window. Respondents who attended college away from home were weakly less likely to purchase a home in the four-year window.

Results for model [2] are shown in Table 6. The pseudo R-squared for this model is 0.216. The Wald test of exogeneity was rejected at the 99.9% confidence level. Notably, a \$1,000 increase in private student loans causes a decrease in the probability of becoming a homeowner by about 5 percentage points, holding all other variables at their means, and there is no conclusive statistically significant result for cumulative federal student loans. This suggests that the above result in model [1] was largely driven by the respondents' private student loan balances. This result holds under a variety of specifications, as seen in Table 6. A test of the extensive margin is also considered, wherein both private and public student loan debts are modeled as present or not (0/1). The results from this model are statistically significant. Additional models testing for potential skewness of the private loan response data were conducted but are not reported here. Even in a series of two-stage models conditional on having some private student loan debt, this measure is statistically significant as a predictor of homeownership.

When comparing model [1] with an instrumental variable to model [1] using a standard probit analysis, we see that the coefficient is negatively biased without the instrument. This supports the hypothesis above that the effect of high ability respondents receiving financial help from their parents,

and subsequently borrowing less, outweighs the effect of high ability respondents borrowing more because they expect higher future incomes.

## DISCUSSION AND IMPLICATIONS

Subjective data from the sample suggests that respondents perceive a real impact of their student loan debt on home purchase decisions (See Table 1). As Hypothesized (H1), results of the IV probit regression are consistent with respondent perceptions, with the probability of a transition to homeownership decreasing as cumulative student loan debt increases by roughly 1.7 percentage points (Table 4). This finding is consistent in direction with earlier work by Mezza et al. (2016). Other significant predictors of the transition to homeownership during the first four years after graduation include marital status, the presence of dependents, income (individual or household), major area of study, and living situation. Not surprisingly, personal and spousal income is positively associated with a transition to homeownership, as greater household resources enable earlier acquisition of these assets.

Results of the IV probit analysis controlling for student loan type, distinguishing between federal and private student loans, are presented in Table 6. Controlling for the different loan types yields some interesting findings. Individuals with greater cumulative private loans, *ceteris paribus*, were less likely to become homeowners in the first four years after college, with the probability of homeownership decreasing by about 5 percentage points per \$1,000 borrowed, holding all other variables at their means. This finding is in line with Hypothesis 3. Hypothesis 2 was not supported by the present findings, as federal student loans were not significantly associated with the transition to homeownership. These findings indicate that those holding private student loan debt (roughly 21% of the sample) are less likely to make the transition to homeownership during the four-year period after graduation. It is important to note that only about 4% of the present sample would be classified as having only private student loans,

with another 17% holding private and federal loans (Figure 1). It is entirely possible that it is the additional burden of stacking loans from multiple sources that is driving the present results. The majority of students indicating that they have private loans in our sample also have federal loans, so our results likely speak to the overall strain of having to draw upon multiple sources.

Income and area of study remained important contributors to the model, with higher earning respondents indicating a greater likelihood of transitioning to homeownership (a similar effect is noted for spousal income). Career path based on area of study is highly correlated with earnings, so it is not surprising that students choosing majors in the areas of STEM, business and healthcare are more likely to become homeowners during the observed period when compared with general studies majors. Pell grant recipients are notably less likely to transition to homeownership during the initial four years after graduation, which is not entirely surprising given that these are need-based grants and students are not far removed from their pre-college economic conditions. Those individuals who report living with their parents shortly after graduation (2009) were also consistently more likely to become home owners by 2012. Whether this is based on their ability to save more money (assuming a lower cost of rent and other living expenses when living at home after college) or on more generous parental transfers to those children who stay close after college is unclear.

Despite the rich information on student loan debt and post-college behavior presented by the B&B, there are certain limitations that these data pose for our analysis. One limitation of our approach is that we lack valuable information about the exact timing of the home purchase decision. We expect that a person who becomes a homeowner immediately after graduation would have different characteristics than a person who becomes a homeowner at the end of the four-year window. Because the time frame is short, these differences are not expected to be large, but it is a notable shortcoming of the data collection process. The short time frame of the present study serves as an additional limitation, as we are only

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capable of addressing the first few years after graduation. The 2018 wave of this panel will provide additional insights into the first ten-year period of a respondent's post-college life.

Another important limitation is that the B&B dataset includes only four-year college graduates, so our results do not extend to students who accumulated student loan debt but did not complete college, or students who attended other types of institutions. Because non-completers typically have higher loan default rates and more difficulty with student loan repayment, we expect the results for this group to be different but do not have the data available to draw conclusions. It is also important to note that the data collection period (2008-2012) was an unusual economic time for the United States, as this was a time period with stricter underwriting standards than previous years or the years that follow. Although it is possible that the findings are largely an artifact of this unique time period, the results do match up nicely with previous work conducted in the 1990's and earlier 2000s. Finally, whereas the public student loans are based on administrative data, there is the potential for measurement error on the private student loan data. Although these data are collected soon after graduation (when full accumulation amounts should be fixed), and before students have begun making payments on their debt, there is still the possibility of individuals imperfectly recalling or reporting these values.

Considering the significant amount of media attention that the growth in student loan debt has garnered over the past decade, the distinctions between private and federal student loan debt articulated in the present study are notable. In many cases, student loan debt is referred to as a 'crisis' and no clear distinctions are drawn between different types of debt or approaches to debt management. Student loan debt (defined broadly) is often blamed for limiting the life choices of recent college graduates (Anderson 2015; Lanza 2016). The present results do not refute these claims, but they do provide important context to the discussion. Our findings suggest that more emphasis should be placed on understanding the differential impact of private student loans on those students who choose to use them. It is also important

to note that there is significant variety in the private student loan market, and the present results are not intended to suggest that any loan by itself is inefficient or a poor choice for consumers. This is a topic that demands further study, and it is also an area that requires vigilance and attention on the part of borrowers choosing these products.

From a policy standpoint, the present findings raise questions about current limits on federal student aid. Under the current cost environment, many students are unable to fully cover their education expenses using federal student loans (subsidized or unsubsidized), turning to private market alternatives when federal options have been exhausted. It is unclear from the present analysis whether a higher maximum federal student loan limit would prove to be welfare enhancing for students, but this is certainly an issue worthy of future study. Critical analysis of how caps on borrowing influence consumer welfare should be undertaken to determine whether the current limits on federal student aid are a good fit for the current higher education environment. It is obvious from the current data that a significant percentage of undergraduate borrowers do choose to borrow from both federal and private sources. Whereas we lack specific details on the terms associated with any private loans, it is reasonable to assume that many individuals would have taken on more federal debt if borrowing limits were higher. How consumers are being informed of differences in loan types should be explored in more detail, as consumers may not be adequately informed on how private and federal student loans differ and what it could mean for them in the future.

## CONCLUSION

This paper examines the effect of student loans on the decision to become a homeowner for four-year college graduates. The research adds to the current literature by examining both federal and private student loan impacts separately, which is novel given that private student loan data is often unavailable in

major datasets. We instrument student loans using in-state tuition rates and find that, consistent with previous studies, a \$1,000 increase in a respondent's cumulative student loan balance of four-year college graduates lowers the likelihood of buying a home by about 1.7 percentage points. Furthermore, after separating respondent federal and private loan balances, we find that a \$1,000 increase in the respondent's private student loan balance lowers the likelihood of buying a home by about 5 percentage points, with no statistically significant results on the federal student loan balance variable.

The present findings explore an important issue regarding the different methods of financing a college degree and how different options may lead to different outcomes for borrowers. In many prior analyses, student loans are treated as being generally equal, with an emphasis on cumulative balances or the existence of debt versus no debt. The present analysis demonstrates that breaking out different debt types provides a more nuanced picture, and may also serve as a better guide for policymakers interested in helping consumers to make more effective borrowing decisions. Given that current regulations place caps on the amount of federal student loans an individual can borrow, it is reasonable to consider the question of whether these caps are still appropriate for the current higher education marketplace.

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Table 1: Subjective Delays

	1 Reported Home Delay	2 Reported Home Delay	3 Reported Home Delay
Had undergraduate loans (indicator)	2.278*** -0.159		
Student loans (10,000-20,000)		1.705*** -0.138	
Student loans (20,000-50,000)		2.494*** -0.181	
Student loans (above 50,000)		3.325*** -0.467	
Had federal loans (indicator)			1.842*** -0.133
Had private loans (indicator)			1.486*** -0.0994
Age (no outliers)	0.975*** -0.00617	0.970*** -0.00623	0.975*** -0.00617
Middle income level (24,000-73,000)	0.834** -0.0529	0.850* -0.0541	0.827** -0.0527
High income level (73,000-150,000)	0.343*** -0.0497	0.345*** -0.0502	0.336*** -0.0486
Very high income level (Above 150,000)	0.190** -0.105	0.185** -0.0984	0.197** -0.105
Hispanic	1.201 -0.133	1.271* -0.144	1.225 -0.136
Asian	0.591** -0.103	0.617** -0.106	0.610** -0.105
Black	0.919 -0.15	0.9 -0.148	0.924 -0.151
White	0.691* -0.101	0.691* -0.1	0.688* -0.101
Female	0.968 -0.0607	0.956 -0.06	0.955 -0.0601
Married	0.704** -0.0774	0.726** -0.0806	0.715** -0.0787
Dependents	0.844 -0.0983	0.842 -0.0988	0.859 0.0999
N	12,260	12,260	12,260

Note 1: This table presents the logit regression results of subjectively reporting a home buying delay due to the financial cost of college on student loans indicator variables. Odds ratios reported; Standard errors in parentheses. Student loans reference group is the low level from 0-10,000. Income reference group is the low-income level from 0-24,000.

Table 2: Summary Statistics by Loan Type

	1	2	3	4	5
	No Loans Received	Federal Loans Only	Private Loans Only	Both Federal and Private Loans	All Respondents
Cumulative Student Loans	-	18,139.48	17,074.74	32,487.02	18,550.57
Cumulative non-federal loans borrowed for undergrad	-	-	17,074.74	13,037.51	5,343.32
Cumulative federal loans borrowed for undergrad	-	18,139.48	-	19,449.51	13,207.08
Attended a public institution	0.6458	0.6271	0.6004	0.4776	0.5765
Pell grant recipient	0.2200	0.5173	0.2087	0.4395	0.3998
Student Loan Default Rate	0.0000	0.0055	0.0000	0.0075	0.0046
Deferment or Forbearance Rate	0.0000	0.1821	0.0000	0.1843	0.1286
Loans repaid with income-based repayment plan	0.0000	0.1171	0.0689	0.1432	0.0940
Purchased a home between 2008-2012	0.2183	0.2037	0.2226	0.2126	0.2115
Parent education: less than highschool	0.0369	0.0429	0.0335	0.0414	0.0405
Parent education: highschool diploma	0.1286	0.2049	0.1732	0.1976	0.1810
Parent education: some college	0.1816	0.2594	0.2559	0.3035	0.2549
Parent education: college degree	0.2758	0.2527	0.2362	0.2325	0.2509
Parent education: masters or professional degree	0.2967	0.1900	0.2402	0.1832	0.2174
Parent education: doctoral degree	0.0708	0.0352	0.0433	0.0309	0.0433
2011 income	39,082.19	36,294.68	42,097.36	37,569.81	37,693.65
Spouse income in 2011	39,828.70	36,172.31	43,362.68	40,162.96	38,909.98
Applied to graduate school in 2008	0.3471	0.3318	0.3051	0.3039	0.3247
Age in 2009	26.14	26.89	27.34	26.29	26.49
Age in 2009, no outliers	26.06	26.76	27.13	26.19	26.38
Age in 2009, traditional students	23.84	24.27	24.19	24.09	24.09
Hispanic	0.0879	0.0961	0.1280	0.0885	0.0922
Asian	0.1055	0.0726	0.1142	0.0576	0.0772
White	0.8144	0.7704	0.7579	0.8057	0.7945
Black	0.0653	0.1315	0.1280	0.1165	0.1084
Married by 2008	0.1663	0.1687	0.2106	0.1301	0.1554
Married by 2009	0.2929	0.3261	0.3504	0.3033	0.3098
Married by 2012	0.4101	0.4211	0.4634	0.3990	0.4105
Has dependents	0.1155	0.1683	0.1772	0.1267	0.1394
Number of dependents in 2009	0.2437	0.3718	0.3524	0.2843	0.3052
N	3,980	5,060	510	5,500	15,050

Note 1: This table presents a data summary of key variables for individuals with no student loans, with only federal student loans, with only private student loans, and with both federal and private student loans. Means reported.

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Table 3: IV Estimation First Stage Results

	1 Cumulative loans	2 Cumulative loans	3 Cumulative federal loans	4 Cumulative federal loans	5 Cumulative non-federal loans	6 Cumulative non-federal loans
State tuition rate	0.199*** (0.0323)	0.177*** (0.0363)	0.0733*** (0.0202)	0.0838*** (0.0217)	0.126*** (0.0230)	0.0927*** (0.0262)
Attended a public university, indicator	-8.758*** (0.5790)	-8.977*** (0.6380)	-3.658*** (0.3610)	-3.774*** (0.3780)	-5.100*** (0.4230)	-5.203*** (0.4790)
Pell grant recipient, indicator		8.408*** (0.5590)		9.604*** (0.4200)		-1.196*** (0.3450)
Control for College Major	NO	YES	NO	YES	NO	YES
Control for Unemployment Rate	NO	YES	NO	YES	NO	YES
Constant	16.46*** (1.0190)	14.62*** (1.5410)	11.63*** (0.6480)	9.285*** (1.0310)	4.836*** (0.7350)	5.338*** (1.0580)
Observations	12,570	11,310	12,570	11,310	12,570	11,310
F	135.40	66.26	59.82	81.26	89.77	17.13

Note 1: This table reports the first stage OLS results of the effect of the state tuition rate and public school indicator on the endogenous loans regressors at the individual level. Columns 1 and 2 report the results for cumulative total loans borrowed for undergrad, adding in various control variables. Columns 3 and 4 report the results for cumulative federal loans, and columns 5 and 6 report the results for cumulative non-federal loans. Standard errors in parentheses.

Table 4: IV Probit Estimation Results, Second Stage

	1 Purchased a home between 2008-2012	2 Purchased a home between 2008-2012	3 Purchased a home between 2008-2012	4 Purchased a home between 2008-2012	5 Purchased a home between 2008-2012
Cumulative loans, in 1,000s	-0.0133** (0.0046)	-0.0146*** (0.0046)	-0.0184*** (0.0047)	-0.0172*** (0.0047)	-0.0178*** (0.0051)
Pell grant recipient, indicator	-0.146* (0.0744)	-0.1240 (0.0746)	-0.0940 (0.0750)	-0.1130 (0.0747)	-0.0956 (0.0771)
Age in 2009, traditional students	0.0098 (0.0190)	0.0096 (0.0191)	0.0192 (0.0200)	0.0226 (0.0203)	0.0241 (0.0210)
Hispanic	-0.284** (0.0993)	-0.266** (0.1010)	-0.298** (0.1060)	-0.313** (0.1100)	-0.241* (0.1120)
Asian	-0.230* (0.1130)	-0.287** (0.1100)	-0.1660 (0.1090)	-0.1690 (0.1120)	-0.1890 (0.1250)
Black	-0.1630 (0.1210)	-0.2050 (0.1200)	-0.1140 (0.1260)	-0.1320 (0.1260)	-0.1410 (0.1270)
Race other than black, white, asian, hispanic	-0.0592 (0.1470)	0.0125 (0.1530)	-0.0796 (0.1610)	-0.0619 (0.1640)	-0.0999 (0.1690)
Female	-0.0109 (0.0548)	-0.0019 (0.0557)	0.0294 (0.0578)	0.0212 (0.0585)	-0.0152 (0.0609)
Married by 2012	1.051*** (0.0619)	1.034*** (0.0623)	0.570*** (0.1790)	0.609*** (0.1790)	0.541** (0.1930)
Had dependents by 2012	0.272*** (0.0783)	0.273*** (0.0797)	0.335*** (0.0844)	0.343*** (0.0848)	0.329*** (0.0870)
Undergraduate GPA, 4.0 scale	-0.0837 (0.0545)	-0.0931 (0.0551)	-0.0635 (0.0573)	-0.0418 (0.0576)	-0.0159 (0.0616)
Major: STEM		0.225** (0.0770)	0.204* (0.0807)	0.215** (0.0817)	0.200* (0.0844)
Major: Business		0.266*** (0.0729)	0.233** (0.0751)	0.234** (0.0759)	0.185* (0.0815)
Major: Healthcare		0.603*** (0.0994)	0.537*** (0.1010)	0.534*** (0.1020)	0.523*** (0.1040)
Major: Humanities		-0.1370 (0.0707)	-0.161* (0.0734)	-0.157* (0.0738)	-0.1480 (0.0759)
Major: Prelaw		-0.4730 (0.3770)	-0.2400 (0.3710)	-0.2620 (0.3680)	-0.2330 (0.4380)
Log respondent income in 2011			0.141*** (0.0229)	0.142*** (0.0235)	0.133*** (0.0228)
Log respondent spouse income in 2011			0.0498** (0.0170)	0.0488** (0.0170)	0.0594*** (0.0183)
Credit card balance as of 2008, in 1,000s				0.0255 (0.0150)	0.0284 (0.0158)
Living with parents in 2009				0.128* (0.0597)	0.161* (0.0626)
College distance from home town, in 1,000s of miles				-0.0715* (0.0358)	-0.0762* (0.0373)
Unemployment rate at zipcode level, 2012					-0.0306*

Constant	-0.9120 (0.5030)	-0.9610 (0.5040)	-2.671*** (0.5860)	-2.893*** (0.5970)	(0.0145) -2.661*** (0.6110)
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Observations 8,660 8,660 8,270 8,270 7,370

Note 1: This table reports the instrumental variable second stage results using an IV probit model. Cumulative undergraduate loans are instrumented by both the state tuition rate for the years the student went to college, and an indicator for if the student attended a public school.

Note 2: Marginal probabilities (at means) reported, standard errors in parentheses.

Table 5: 2SLS Estimation Results: Second Stage

	1 Purchased a home between 2008-2012	2 Purchased a home between 2008-2012	3 Purchased a home between 2008-2012	4 Purchased a home between 2008-2012	5 Purchased a home between 2008-2012
Cumulative loans, in 1,000s	-0.00303** (0.0012)	-0.00320** (0.0012)	-0.00406*** (0.0012)	-0.00374** (0.0012)	-0.00394** (0.0013)
Pell grant recipient, indicator	-0.0363* (0.0169)	-0.0321 (0.0168)	-0.0263 (0.0167)	-0.0307 (0.0165)	-0.0262 (0.0174)
Age in 2009, traditional students	0.00113 (0.0047)	0.000647 (0.0046)	0.00308 (0.0048)	0.00377 (0.0048)	0.00426 (0.0050)
Hispanic	-0.0659** (0.0211)	-0.0621** (0.0211)	-0.0654** (0.0217)	-0.0685** (0.0220)	-0.0534* (0.0229)
Asian	-0.0533* (0.0237)	-0.0667** (0.0231)	-0.0346 (0.0236)	-0.0339 (0.0239)	-0.0428 (0.0266)
Black	-0.0383 (0.0233)	-0.0491* (0.0231)	-0.0262 (0.0242)	-0.0299 (0.0239)	-0.0294 (0.0232)
Race other than black, white, Asian, Hispanic	-0.0127 (0.0341)	0.00226 (0.0352)	-0.0171 (0.0358)	-0.0137 (0.0361)	-0.0183 (0.0372)
Female	-0.00216 (0.0136)	0.000554 (0.0136)	0.00522 (0.0137)	0.00349 (0.0137)	-0.00457 (0.0143)
Married by 2012	0.330*** (0.0187)	0.322*** (0.0183)	0.161* (0.0629)	0.168** (0.0625)	0.139* (0.0665)
Had dependents by 2012	0.0849** (0.0264)	0.0827** (0.0264)	0.0940*** (0.0269)	0.0953*** (0.0268)	0.0918*** (0.0276)
Undergraduate GPA	-0.0201 (0.0138)	-0.0223 (0.0137)	-0.0125 (0.0139)	-0.00708 (0.0139)	-0.000195 (0.0150)
Major: STEM		0.0540** (0.0198)	0.0524** (0.0200)	0.0549** (0.0200)	0.0513* (0.0206)
Major: Business		0.0691*** (0.0194)	0.0624** (0.0198)	0.0618** (0.0198)	0.0479* (0.0212)
Major: Healthcare		0.171*** (0.0311)	0.156*** (0.0308)	0.154*** (0.0307)	0.152*** (0.0316)
Major: Humanities		-0.0324* (0.0150)	-0.0356* (0.0152)	-0.0343* (0.0151)	-0.0336* (0.0161)
Major: Prelaw		-0.0999 (0.0670)	-0.0502 (0.0652)	-0.0537 (0.0635)	-0.061 (0.0855)
Log respondent income in 2011			0.0256*** (0.0031)	0.0255*** (0.0031)	0.0248*** (0.0032)
Log respondent spouse income in 2011			0.0175** (0.0063)	0.0171** (0.0062)	0.0214** (0.0066)
Credit card balance as of 2008, in 1,000s				0.00604 (0.0035)	0.00649 (0.0037)
Living with parents in 2009				0.0281* (0.0137)	0.0373* (0.0146)
College distance from home town, in 1,000s of miles				-0.0142* (0.0058)	-0.0137* (0.0063)
Unemployment rate at zip code level, 2012					-0.00634 (0.0035)
Constant	0.208 (0.1260)	0.206 (0.1240)	-0.129 (0.1310)	-0.174 (0.1330)	-0.148 (0.1380)
Observations	8,660	8,660	8,270	8,270	7,370

Note 1: This table reports the instrumental variable second stage results using a two stage least squares model. Cumulative undergraduate loans are instrumented by both the state tuition rate for the years the student went to college, and an indicator for if the student attended a public school. Standard errors in parentheses.

Table 6: Federal vs Private Loans impact on Homeownership

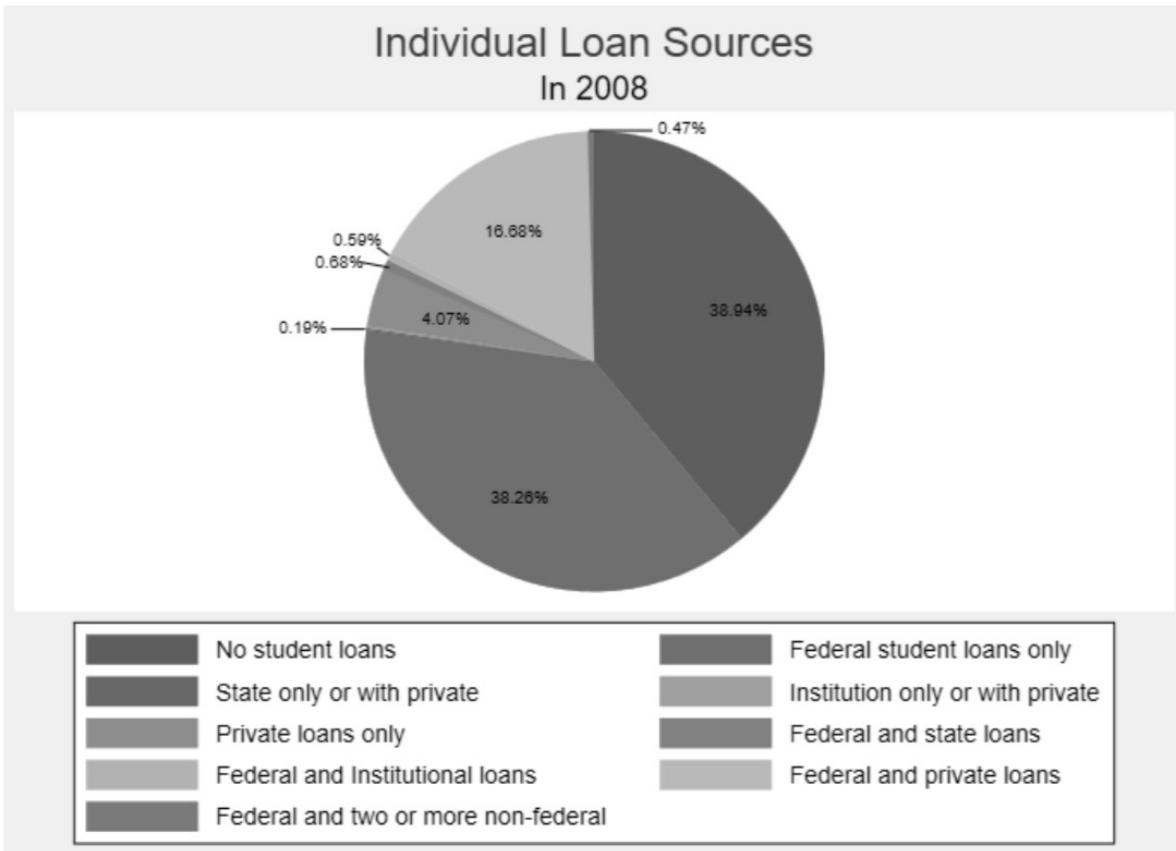
	1	2	3	4
	Purchased a home between 2008-2012			
Cumulative federal loans, in 1,000s	0.0467** (0.0167)	0.0453* (0.0222)	0.0382 (0.0258)	0.0435 (0.0264)
Cumulative non-federal loans, in 1,000s	-0.0508*** (0.0081)	-0.0530*** (0.0090)	-0.0496*** (0.0120)	-0.0526*** (0.0110)
Pell grant recipient, indicator	-0.530*** (0.1080)	-0.535*** (0.1390)	-0.501** (0.1640)	-0.545** (0.1730)
Age in 2009, traditional students	-0.0873** (0.0297)	-0.0801* (0.0365)	-0.0636 (0.0429)	-0.0726 (0.0431)
Hispanic	-0.0674 (0.1080)	-0.108 (0.1330)	-0.161 (0.1430)	-0.134 (0.1240)
Asian	-0.0496 (0.1210)	0.0553 (0.1240)	0.00446 (0.1330)	-0.0114 (0.1360)
Black	-0.349*** (0.0944)	-0.293** (0.1040)	-0.300** (0.1160)	-0.333** (0.1140)
Race other than black, white, asian, hispanic	0.194 (0.1280)	0.144 (0.1470)	0.121 (0.1600)	0.0902 (0.1650)
Female	-0.0573 (0.0460)	-0.0287 (0.0500)	-0.025 (0.0520)	-0.0543 (0.0519)
Married by 2012	0.746*** (0.1790)	0.399* (0.2000)	0.479* (0.2060)	0.397 (0.2090)
Had dependents by 2012	0.1347 (0.0861)	0.174 (0.1150)	0.219 (0.1190)	0.205 (0.1210)
Major: STEM	0.203** (0.0683)	0.194** (0.0730)	0.220** (0.0753)	0.219** (0.0769)
Major: Business	0.231*** (0.0675)	0.217** (0.0699)	0.227** (0.0715)	0.189** (0.0712)
Major: Healthcare	0.409** (0.1310)	0.366* (0.1520)	0.409** (0.1530)	0.386* (0.1610)
Major: Humanities	-0.0593 (0.0654)	-0.0789 (0.0751)	-0.089 (0.0782)	-0.0867 (0.0774)
Major: Prelaw	0.171 (0.3790)	0.296 (0.3650)	0.216 (0.3950)	0.0982 (0.4040)
Undergraduate GPA, 4.0 scale		-0.0235 (0.0537)	-0.013 (0.0542)	0.0164 (0.0559)
Log respondent income in 2011		0.0970** (0.0365)	0.107** (0.0370)	0.0971** (0.0375)
Log respondent spouse income in 2011		0.0371* (0.0179)	0.0394* (0.0182)	0.0476* (0.0206)
Credit card balance as of 2008, in 1,000s			0.0248 (0.0159)	0.025 (0.0175)
Living with parents in 2009			0.163** (0.0514)	0.171** (0.0559)
College distance from home town, in 1,000s of miles			-0.015 (0.0421)	-0.00896 (0.0461)
Unemployment rate at zip code level, 2012				-0.00205 (0.0192)

Constant	1.315 (0.7620)	0.0699 (1.2530)	-0.588 (1.4130)	-0.329 (1.3290)
Observations	8,660	8,270	8,270	7,370

Note 1: This table reports the instrumental variable second stage probit results where the endogenous student loan regressor is separated into federal and non-federal cumulative loans. Cumulative federal and non-federal loans are instrumented by both the state tuition rate for the years the student went to college, and an indicator for if the student attended a public school.

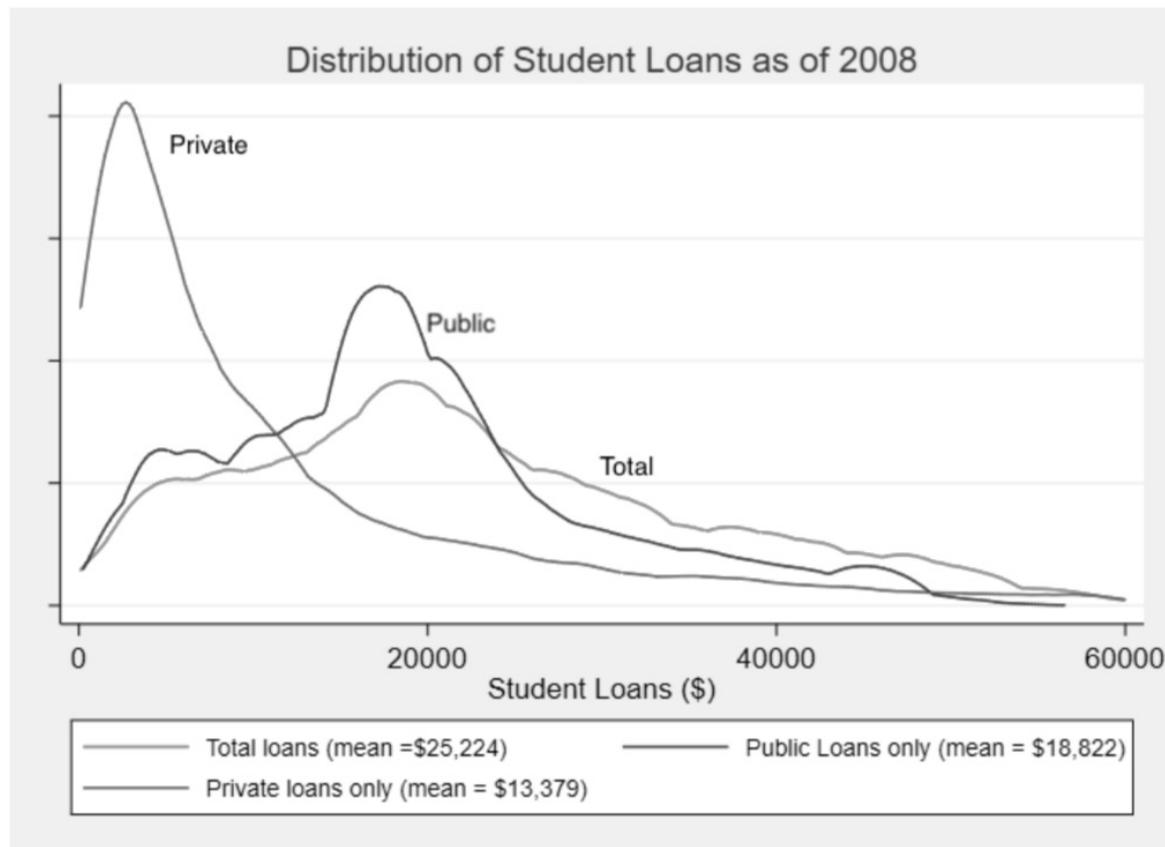
Note 2: Marginal probabilities (at means) reported, standard errors in parentheses

Figure 1: Division of Loan Sources



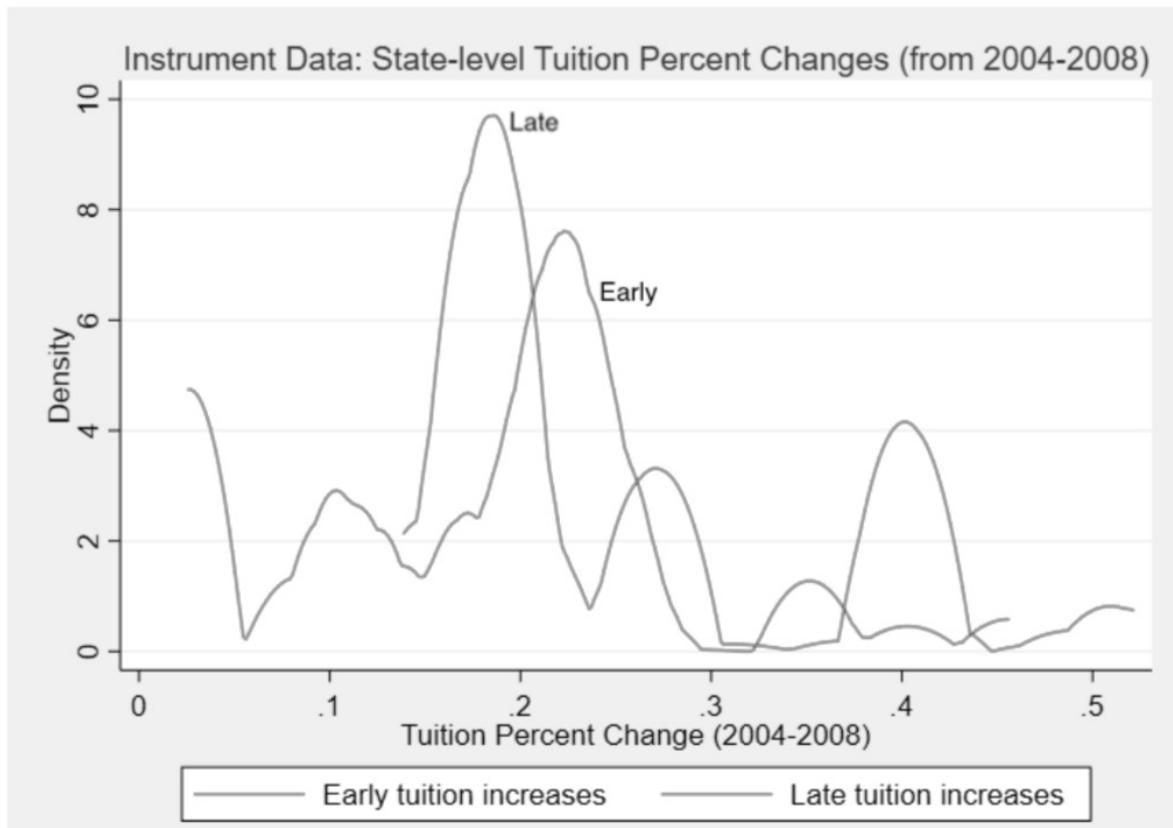
Note: This figure shows the percentage of respondents with various loan sources. The largest two categories, respondents with no student loans and respondents who have only federal student loans, make up 38.94% and 38.26% of the sample, respectively.

Figure 2: Distribution of Student Loan Balances



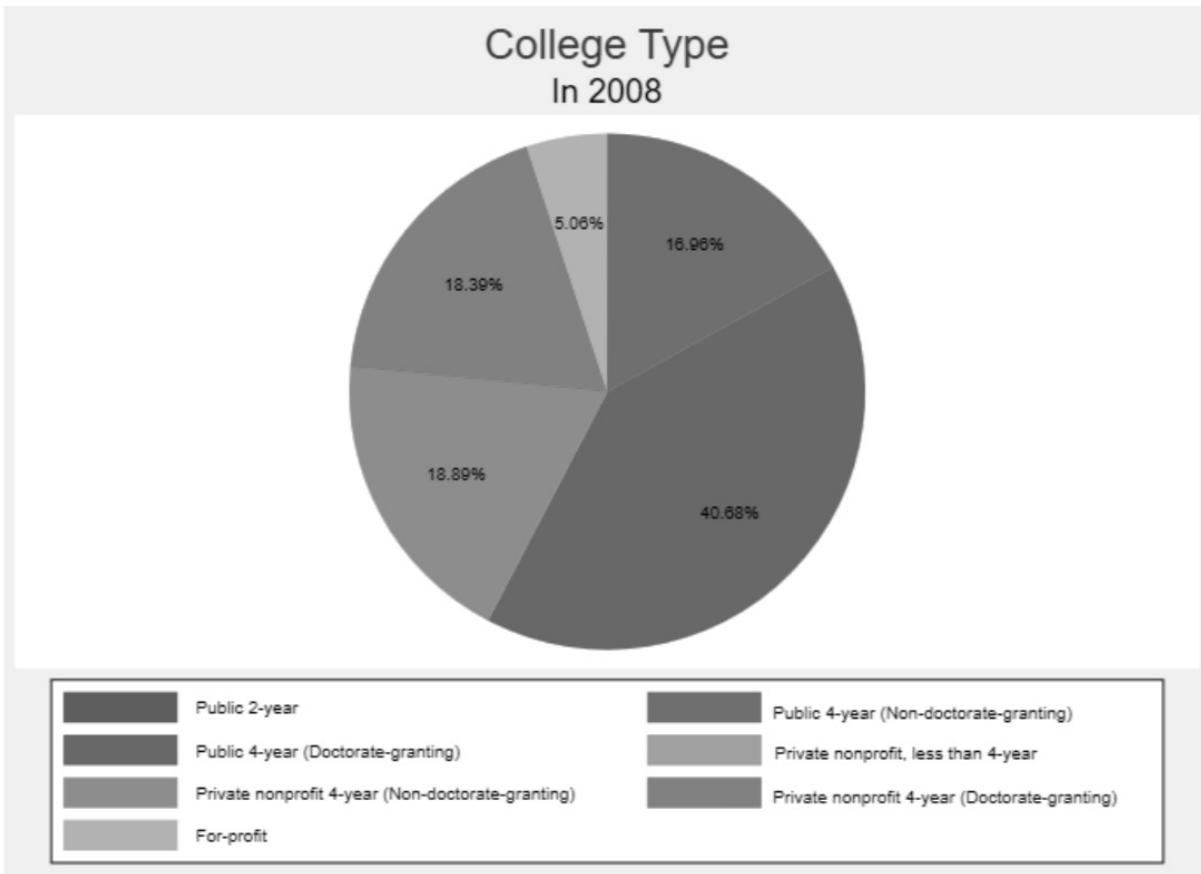
Note: This figure shows the distribution of cumulative total, federal, and private student loan balances for respondents in the sample at the date of college graduation.

Figure 3: State-level Tuition Percent Changes



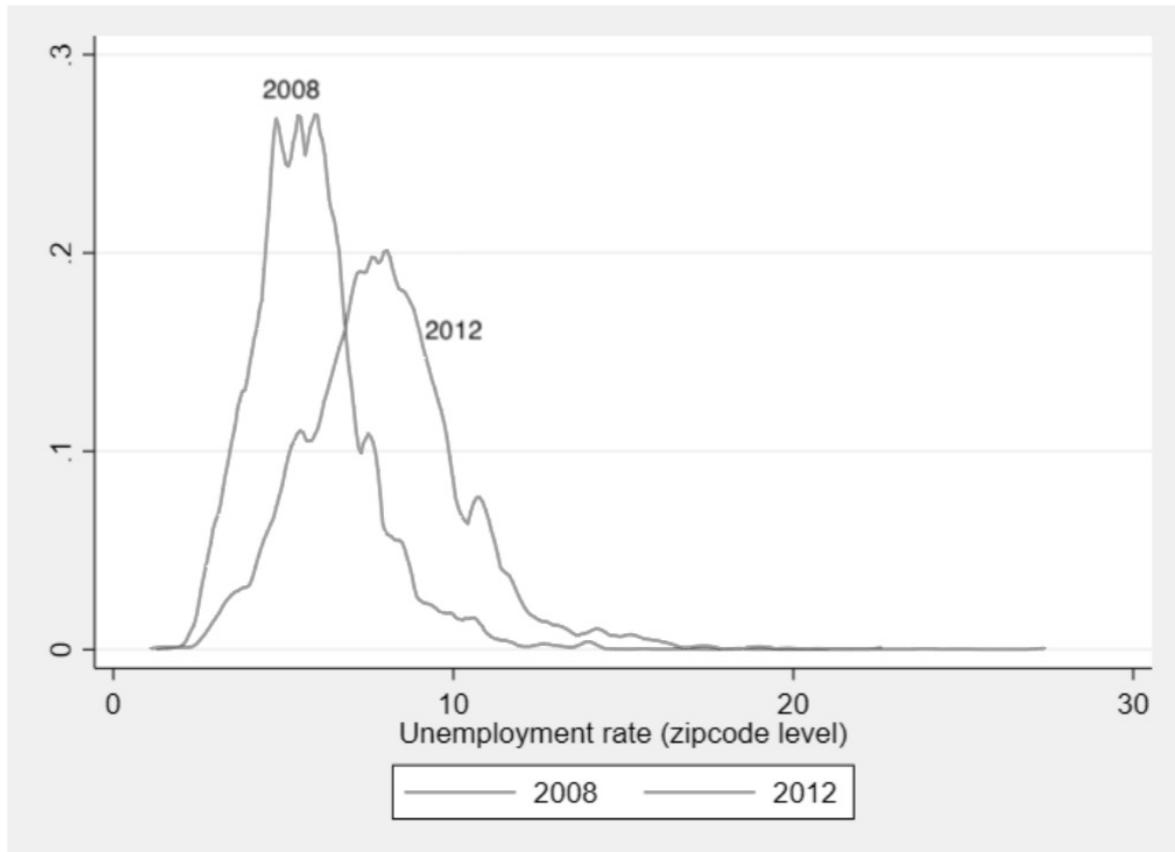
Note: This figure shows the distribution of state level tuition changes, calculated from the instrumental variable data obtained from the College Board Annual Survey of Colleges.

Figure 4: College Type



Note: This figure shows the percentage of respondents who attended various colleges in various sectors. Respondents who attended a public four-year institution made up 57.64% of the sample, whereas respondents who attended private institutions made up 37.28% of the sample.

Figure 5: Zip-code Level Unemployment Data



Note: This figure represents the distribution of unemployment rates that was used as an economic control in our models. Data was obtained from the Bureau of Labor Statistics.