Student Loan Supply, Parental Saving & Portfolio Allocation

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Abstract

I show that an expansion of student loan supply affects parents' saving decisions and portfolio allocation. By exploiting policy-induced variation on expected student aid, I find a sizable increase in parental saving for college. This surprising result is driven by the positive effect of student aid on children's college enrollment probability. Consistent with this interpretation, I find a disproportionate increase in college enrollment for children of families affected by the reform. The positive saving response is largest among lower- and middle-income families, in areas with higher average college expenses and for parents with strong saving preferences. A placebo test validates that the effect is absent in families without children. Moreover, I show that affected parents shift the allocation of saving flows towards riskier assets.

Keywords: Student loans, household finance, saving behavior, portfolio choice

JEL classification: D14, E21, G11, I22

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1 Introduction

The swift rise in student borrowing in recent years made educational debt the largest non-mortgage liability for U.S. households (Brown et al., 2014).[1] This exponential growth has attracted the interest of economists and policymakers, as high levels of educational debt may adversely affect students' future consumption, investment and default decisions (Rothstein and Rouse, 2011; Krishnan and Wang, 2019; Mueller and Yannelis, 2019; Chakrabarti et al., 2020; Goodman et al., 2021; Mezza et al., 2020; Black et al., 2020; Chu and Cuffe, 2021; Looney and Yannelis, 2021). While a growing literature studies the relationship between student debt and graduate outcomes, much less is known about the effects on families' financial decisions. This paper is the first to demonstrate the causal effect of student loan supply on parental saving behavior. The parental saving response to the rise in student loans potentially has important implications for the allocation of assets within households, and more broadly, as personal saving corresponds to 6% of the U.S. GDP, to the distribution of wealth in the economy.[2]

Parental saving is intimately linked to the provision of educational financing as 70% of parents accumulate financial wealth to finance college expenses of their children (Fidelity, 2018). The parental saving decision is characterized by a trade-off between consumption smoothing and expected college attendance of their children. Economic theory provides two opposing mechanisms through which student aid levels directly affect parental saving decisions. On the one hand, the supply of student aid *reduces* parental savings since family wealth is a substitute for student loans in alleviating credit constraints of students. On the other hand, the provision of student aid lowers the entry barrier of marginal college entrants. Since the effective costs of obtaining the college premium are reduced, marginal students, who would have previously not attended university, enroll for college. As college attainment becomes a positive NPV investment for marginal students, parents *increase* their savings

[1] The outstanding student debt stood at \$1.57 Trillion in the second quarter of 2021 (Federal Reserve Bank of New York, 2021)

[2] This percentage is calculated using Bureau of Economic Analysis data for the year 2019

to cover the remaining unmet financing needs.[3] Similarly, attendance of a flagship college can become a positive NPV investment and induces parents to save more (Biswas, 2021). Ultimately, it is an empirical question which of these effects dominates.

Empirical identification of the relationship between student loan levels and parental saving behavior is particularly challenging for three reasons. First, it is typically difficult to observe both the parental saving behavior over time as well as the college enrollment outcomes of children. Observing the saving behavior of parents over the entire lifespan of their children is important since saving for college expenses mostly occurs when the children are young.[4] Second, even with appropriate data, a simple regression of student loan excess on parental saving is unlikely to provide causal interpretation. For example, students from families that accumulated little wealth receive more grants and have access to cheaper (subsidized) student loans. A third challenge is that any observed cross-sectional differences in saving behavior could simply reflect systematic differences in unobserved heterogeneity (Gale and Scholz, 1994; Attanasio and Brugiavini, 2003). In particular, households with a high 'taste' for saving may accumulate more wealth and exhibit a lower demand for student loans. An ideal empirical analysis requires a shock in the supply of student loan supply that is exogenous to idiosyncratic saving preferences.

I address these challenges by exploiting the passage of the 1992 higher education amendment act as a plausibly exogenous shock to the supply in student loans in the United States. This reform removed home equity from the set of assets that were 'taxed' by the federal aid formula. Consequently, many students suddenly received higher levels of federal aid solely because the family balance sheet contains large home equity holdings (Dynarski, 2003b). I overcome the first empirical challenge by combining administrative data on college enrollments with detailed household-level survey data following wealth accumulation of parents

[3] Long and Riley (2007) show that these remaining unmet needs are substantial. They estimate an average annual unmet need of $7,195 of students after accounting for family's expected contribution and the receipt of all aid.

[4] Since parental wealth accumulation occurs before children reach college-age, it is the parents' expectation of future student loan access that potentially affects saving decision.

over time. I address the second empirical challenge by exploiting the exogenous variation in the expected student loan eligibility as a result of the reform. Given the importance of unobserved heterogeneity in saving behavior, it is crucial to account for the household-specific saving preference. I address the final empirical challenge by comparing within household saving changes, therefore the estimated difference in saving behavior can be plausibly attributed to student loan supply (Gormley and Matsa, 2013).

The results consistently show that parents *increase* their savings after an expansion in student aid. The saving response is economically sizable since an one-standard deviation increase in expected student aid yields a 2.2 percentage point increase in the fraction of income saved by the mean household. The positive saving response of parents suggests that the marginal college entrance effect dominates the substitution effect. This interpretation is further corroborated by the finding that college enrollment disproportionately increases in families that are more affected by the reform. I estimate that college enrollment increases by 12 percentage points. Moreover, this result provides evidence that the expansion of student aid programs succeeded in its primary goal to promote access to post-secondary education for students that would otherwise be unable to attend college.

I validate the positive parental saving responses by using an alternative identification strategy that exploits the notion that expected student aid amount sharply increases if siblings are likely to attend college simultaneously. In line with the marginal college entrance mechanism I find that the positive parental saving response is largest among lower- and middle-income families, in areas with higher average college expenses, and for parents with strong saving preferences. Moreover, a placebo test validates that the saving response to student aid supply is absent in families without children. In the final part of the paper I provide evidence that an increase in expected student aid also shifts the allocation of saving flows towards riskier assets.

In sum, this paper is the first to provide systematic evidence on the relationship between the supply of student loans and financial decisions of parents. Documenting this new relationship between student loan supply and families' portfolio decisions improves our understanding of the intergenerational effects of student aid supply, and more broadly, contributes to explaining the observed heterogeneity in households' saving and portfolio decisions. This paper adds to several strands of literature. First, the results contribute to a growing literature that studies spill-over effects of student aid provision on non-educational outcomes (Bleemer et al., 2017; Bachas, 2019; Goodman et al., 2021; Scott-Clayton and Zafar, 2019; Di Maggio et al., 2020; Mezza et al., 2020). While most of these papers focus on consumption, investment and repayment decisions at the graduate level, I demonstrate that student loan supply also directly affects parental lifetime consumption. A small number of papers show that parental wealth decreases the demand for student loans (Ionescu, 2009; Brown et al., 2011; Amromin et al., 2017; Abbott et al., 2019; Hotz et al., 2021). I extend this discussion by demonstrating how student aid supply affects the accumulation of parental wealth. Second, I contribute to the literature on the role of family composition in household portfolio decisions (Kennickell and Starr-Mccluer, 1997; Barnea et al., 2010; Bogan, 2015; Addoum, 2017; Olafsson and Pagel, 2018; Ke, 2021). While the empirical papers in this literature focus mostly on financial decision making between spouses, there is some theoretical work that suggests that the arrival of children affects savings and portfolio choices because of future college expenses (Love, 2009; Hubener et al., 2015). While I do not directly test these models, the empirical results in this paper are consistent with the theoretical prediction that parents incorporate expected college expenses of their children in their savings decision. Finally, the mechanism identified in this paper is directly relevant to the current policy debate regarding the optimal design of federal loan programs to stimulate college enrollment while minimizing the consequences for consumption smoothing (Hendel et al., 2005; Lochner and Monge-Naranjo, 2011; Hanushek et al., 2014; Lochner et al., 2021; Abbott et al., 2019). I document a new spillover effect of student aid supply on parental wealth accumulation and asset allocation.

The remainder of this paper is organized as follows. Sections 2 and 3 describe the policy environment and data sources respectively. Section 4 discusses the identification strategy. Section 5 present the empirical results and section 6 concludes.

2 Institutional Background

2.1 Federal Student Loan Programs

The U.S. federal student loan programs have been the most important source of college financing for decades. The popularity of these loans is largely explained by two unique features. First, interest rates on federal student loans are generally lower than private market loans (Avery and Turner, 2012). On top of the low interest rates, students receiving a subsidized federal loan are exempted from paying interest during their studies and in grace periods. As a result student borrowers frequently exhaust the available federal student loans before moving to private credit sources. Second, the vast majority of students is able to access the loan programs since there is no underwriting involved. Unlike many other forms of credit federal student loans do not require collateral or a good credit history. Although the qualification for subsidized loan is determined on the basis of financial need, unsubsidized loans are available for all students. These loans have the same low interest rate as subsidized loans, however the student starts paying interest during their studies.[5]

To apply for federal student loans, (prospective) students fill out a form that collects detailed information on family income, market value of household assets, family composition and indicate the colleges they are considering.[6] Using this information the U.S. Department of Education determines the Expected Family Contribution (EFC), the dollar amount a family is expected to pay out of pocket to cover college expenses.[7] In addition to the family

[5]Another distinct feature of all federal students loans is that, unlike other types of credit, they are non-dischargeable in personal bankruptcy.

[6]The current Free Application for Federal Student Aid (FAFSA) form was introduced in 1992. Prior to 1992 students had to apply for federal student loans by submitting a paper application to central processors like American College Testing (ACT) and College Scholarship Service (CSS). Although the application form has evolved over time, the primary components consistently were family income, assets and demographics.

[7]The EFC formula is different for 'independent' students as the government does not expect these students

income and assets, household demographics also affect this calculation. Most notably, the EFC sharply decreases as the number of college-going family members increases (Brown et al., 2011).

The EFC is a key determinant for the student's eligibility for subsidized (cheaper) loans. More specifically, the eligibility is determined by the difference between EFC and the estimated cost of attendance of the indicated college, with an annual limit that caps the amount that students are allowed to borrow. Hence, students with a low EFC have access to cheaper credit. Once the amount and type of loan program is determined, the student aid office at the higher education institution is responsible for the distribution of the student loan. Typically universities subtracts the tuition fee, and whatever amount of aid granted is left can be transferred to the student. Repayment generally begins after a six month grace period after the student stops attending college, either by dropping out or graduating.

2.2 Policy Change in 1992

In 1992, the Higher Education Amendment act (HEA) created a major shift in the federal student loan provision.[8] The HEA constituted three main changes. First, HEA created the unsubsidized student loan program, which extended federal loans to previously ineligible students. This expanded the student loan supply to students without demonstrated financial need. Second, the student loan limits were raised. While the annual loan limits for freshmen remained unchanged, the borrowing capacity of second year students grew from $2,625 to $3,500 and for third- and fourth year students the limits increased from $4,000 to $5,000. However, the most important feature of HEA was the removal of home equity from the computation of EFC. In their book on student aid in the 1990s McPherson and Schapiro (1998, p.35) write: *"Most strikingly, a family's home equity was no longer counted as an asset"*. As

to rely on family contributions. A student is classified as independent if she is (i) twenty-four or older or (ii) married.

[8]The goal of this reform was to promote access to post-secondary education for students from lower- and middle-income families. The policymakers argued that rising college costs combined with increasing restrictions on eligibility for federal aid squeezed out middle-income students who could neither qualify for support nor afford to pay outright (Hannah, 1996).

a result of its passage many students who were previously ineligible suddenly received access to federally subsidized student loans since their EFC decreased dramatically. The reform became effective starting from the 1993-94 academic year. Since home equity constitutes a large proportion of household assets, federal student loan levels increased substantially. Figure 1 shows that, after adjusting for inflation, the total amount of federal student loans increased by 43% from 1992-93 to 1994-95 while grants remain relatively stable.

Since there is substantial variation between households in the share of home equity in total wealth holdings, the reform introduced heterogeneity in the intensity how families were affected by this expansion in student loan availability. The main beneficiaries were households with most of their wealth in home equity. Figure 2 illustrates the differential effect of HEA on families with high home equity levels. Using data from the Beginning Postsecondary Students Longitudinal Study waves of 1990 and 1996 I show that the growth in student loans is driven by students with high parental home equity levels.[9] The average amount a student borrows from federal programs grows substantially in the higher home equity brackets, whereas the it slightly decreases in the lower home equity brackets.

[Figure 1 about here.]

[Figure 2 about here.]

3 Data

In order to observe both parental saving behavior over time and enrollment choices of children in the family I link administrative enrollment data to a nationally representative panel survey. The primary data on the financial choices of parents come from the Panel Study of Income Dynamics (PSID) for the years 1984 to 1999. The PSID is an annual panel data survey,

[9] The Beginning Postsecondary Students data is representative of first-time university students (Deming et al., 2012). The data contain information on students and their parents from a selection of National Postsecondary Student Aid Study participants, and supplements this with Department of Education financial aid records.

which contains detailed information on family income, housing, family structure and other demographics. In additional wealth supplements, households are asked questions on their net worth and financial asset holdings for the years 1984, 1989, 1994, and 1999. The information on wealth holdings over time allows me to measure a household's saving behavior over time. This allows me to include household fixed effects that capture unobservable risk preferences, beliefs and other time-invariant characteristics. To measure the enrollment outcomes of children growing up in these households, I link the PSID data to administrative records on enrollments from the National Center for Education Statistics (NCES). Since this data contains records of the universe of students in the U.S., I can follow the educational career of all children that grew up in the PSID respondent families. I create variables that determine for each child whether they attended college.

The basic sample includes every household in the PSID sample that owned a house between 1984 and 1999. I exclude renters from this sample since, by construction, they have no housing equity wealth. Since I am interested in measuring changes in parental saving behavior after the introduction of HEA, an ideal analysis requires households that could have started saving for college expenses before this reform. Therefore, I follow families with at least one child between 5 and 15 in 1992.[10] I apply several filters to this sample to obtain my final dataset. I start with the definition that households are unique families if the head of household remains the same over the period 1984 to 1999, and drop households that exhibited a change in head of household as is standard in the literature.[11] In several cases households report a very low house value, therefore I follow the suggestion of Gerardi et al. (2010) and eliminate all observations for which the reported house value is below $5,000. I exclude a household-year observation if the household head is retired in that particular year. To eliminate gross outliers from the sample I follow Juster et al. (2006) and trim the top

[10] The exclusion of families with no children at the time of the reform also mitigates a potential concern that the student aid supply might affect household fertility choices.

[11] The exclusion of these households addresses the concern that a change in household head affects the unobserved heterogeneity in saving behavior. In total there are 155 households in which the head changes, however the main results are not sensitive to their exclusion.

and bottom percentile of each wealth component, income and home equity.[12] After deleting observations with missing values for income, wealth or demographic variables the baseline sample consists of 3,111 observations, in 1,207 unique households.

3.1 Household Saving Measures

Households' saving is calculated following the *active saving* approach of Juster et al. (2006). This measure captures the change in total household wealth *minus* capital gains for housing and financial assets, inheritances and gifts received *plus* the value of debt repayment. The active saving approach is particularly well suited to measure changes in saving behavior, because capital gains (passive saving) are not included. For example, household wealth accumulation may reflect revaluation of assets that are independent from an active saving decision. Since my analysis focuses on changes in actual parental saving, I eliminate these capital gains to obtain a more precise measure of the true saving intention of a household (Dynan et al., 2004). Naturally, higher-income households may have the ability to save more, therefore I normalize total household saving by the total family income. More formally, I define a saving rate for household i at time t:

$$SavingRate_{i,t} = \frac{\sum_{j=1}^{J} ActiveSaving_{t-1,t}^{i,j}}{Income_{t-1,t}^{i}} \tag{1}$$

where the sum of accumulated wealth in all assets (j) over the years $t-1$ to t is divided by total income of household i over the same period. I consider a wide range financial and real assets[13], however I exclude home equity as saving vehicle because I use variation in home equity to define treatment exposure. The measurement of active saving of household i in asset j ($ActiveSaving_{t-1,t}^{i,j}$) depends on the presence of potential capital gains in that

[12]All results remain with winsorizing the top and bottom percentile.

[13]The PSID contains information on real estate other than home equity, a farm or private business, vehicles, checking and saving accounts, money market funds, certificates of deposit, government saving bonds, and treasury bills, individual retirement accounts, stocks, mutual funds, investment trusts, bonds, cash value of life insurance, valuable collections and total non-mortgage debt.

particular asset. The exact method is described below, however the main intuition is to exclude potential capital gains by measuring net flows. Since this wealth data was gathered in 5 year intervals, the household saving rate ($SavingRate_{i,t}$) is defined for the periods 1984 to 1989, 1989 to 1994 and 1994 to 1999.

For assets where capital gains do not play a major role according to the PSID classification, I define active saving as the difference between the market value in period t and its value in period $t-1$. More specifically, I compute equation 2 using reported values of households' saving and checking accounts, bond holdings, vehicle values and consumer debt.

$$ActiveSaving^{i,j}_{t-1,t} = V^{i,j}_{t} - V^{i,j}_{t-1} \tag{2}$$

$AactiveSaving^{i,j}_{t-1,t}$ represents the active saving of household i in asset j over time period $t-(t-1)$ where $V^{i,j}_{t}$ is simply the reported value of asset j in time t.

For assets with potentially large capital gains, such as stocks, IRA accounts, other real estate, and investments in a private businesses, active saving of the household over a certain period is defined in equation 3. The value of these assets can change because it is sold or purchased (active saving) or the price of the asset changes (capital gains or passive saving). To isolate the active saving, I compute the net flows of these assets. For instance the amount of equity purchased by the household during a 5 year period *minus* any money they received from selling stocks. In contrast, increases in financial wealth due to stock price appreciation do not count as active saving. Hence active saving for these assets are equivalent to the change in value of holdings *minus* capital gains.

$$ActiveSaving^{i,j}_{t-1,t} = I^{i,j}_{t-1,t} - R^{i,j}_{t-1,t} \tag{3}$$

Again, $ActiveSaving^{i,j}_{t-1,t}$ represents the active saving of household i in asset j over time period $t-$*(t-1)*. $I^{i,j}_{t-1,t}$ is the net amount invested in asset j over period $t-1$ to t, like the amount of stocks purchased in the previous 5 years in the sample above. Conversely, $R^{i,j}_{t-1,t}$

represents the total value that the household sold of asset j. This value captures selling equity, but also the money received from a full or partial sell of the households' interest in a private business or real estate.

To validate the main results I also use an alternative measure of household saving behavior proposed by Cronqvist and Siegel (2015). They measure savings as the change in a household's total non-housing wealth, and scale this amount by the disposable income over the same period. Therefore the saving rate of household i is defined as:

$$SavingRate_{i,t} = \frac{\Delta NetWorth_t^i - \Delta HomeValue_t^i}{Income_{t-1,t}^i} \tag{4}$$

where $NetWorth_t^i$ is the sum of the wealth value in all asset classes at year t *minus* total debt. $HomeValue_{t-1,t}^i$ measures capital gains in housing value over a 5 year period, excluding households that moved between two consecutive periods.

3.2 Descriptive Statistics

Table 1 reveals several key facts about the distribution of saving and income in the sample. The average annual savings rate of households in the sample is 4.9%. This figure is roughly comparable to the average annual U.S. personal saving rate in this period estimated by Parker (1999).[14] Table 1 also shows that 34% of the households in the sample is not accumulating wealth. This is consistent with the notion that many U.S. households are not saving (Lusardi et al., 2001). Note that I am likely to overestimate the fraction of non-savers in the sample since I ignore accumulation of housing wealth while this is an important saving vehicle for many households. An important feature is that I observe substantial heterogeneity in the fraction of home equity by total household wealth in 1989. This variation implies a wide range in household-specific student loan growth that is crucial for my identification. Figure 3

[14] Using data from the National Income and Product Account (NIPA) he shows that this period was characterized by a decline in personal savings rate from 6% to below 1%, with a stable period of 5% between 1988 and 1993. The estimated saving rates closely mirror this trend as the average savings rate for the periods 1985-1989, 1990-94 and 1995-99 are 6.5%, 5.3% and 2.2% respectively.

confirms this observation as it reveals that households are roughly evenly distributed among all possible fractions of home equity by total household wealth in 1989.

[Table 1 about here.]

[Figure 3 about here.]

Furthermore, Table 1 shows that the average household consists of roughly 2 children, a 43 year old head and an average (median) annual family income of $57.48k ($51.36k). The table reports few marital transitions, however this is at the household-year level. At the household level these are substantially larger as 8.8% of the families gets married and 5.6% experiences a divorce during the sample period.

4 Empirical Strategy

While the legal expansion of student aid constitutes an economy-wide shock, I propose to isolate its effect on family finances by studying differential post reform changes across households. The removal of home equity in the federal aid formula induces variation between households in expected student aid. I construct a household-specific treatment intensity based on the share of household wealth represented by home equity shortly before the reform. This empirical approach is similar to Lucca et al. (2019), who study the effect of federal student aid expansion on tuition fees using variation in treatment intensities among universities. This differences-in-differences specification eliminates the potential concern that a trend in tuition fees increased students' reliance on federal loans over time (Lochner and Monge-Naranjo, 2011). Equation 5 shows the baseline regression I estimate using the PSID panel data.

$$SavingRate_{i,t} = \alpha_i + \alpha_{st} + \beta I[HEA]_t \times \frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}} + \lambda C_{i,t} + \epsilon_{i,t} \tag{5}$$

The dependent variable is saving rate of household i over a five year period (from *t-1* to t), as defined in section 3.1. $I[HEA]_t$ is an indicator that equals zero if t is 1994 or earlier and one afterwards. Since the timing of the wealth supplements in the PSID only allows me to measure household savings over the periods 1984-1985, 1989-1994 and 1994-1999, I define only the latter period as post-treatment. Even though the treatment indicator is not perfectly aligned with the timing of HEA, this specification biases against finding any parental saving response to the student loan expansion. The coefficient of interest is β, which captures the effect of student aid supply on the saving propensity of the parents. Since families accumulate most of the wealth to cover college expenses before the children go to university, this coefficient can be interpreted as the savings response of families to expected student loan supply available to their children. Furthermore, $C_{i,t}$ is a vector that contains time-varying household level characteristics that affect savings decisions. These controls include income volatility, household size, age of the head, age squared and three indicator variables that equal one if the head owns a business in the previous year, got married or got divorced. By including household fixed effects (α_i) I effectively study the effect of HEA on within-household saving behavior. Hence, it is unlikely that my results are driven by unobserved heterogeneity in time-invariant characteristics that correlate with saving behavior and demand for debt. For instance, religious households tend to save more, while they borrow less (Guiso et al., 2003). In this specification, I absorb any state-level shocks by including state $\times$ year fixed effects (α_{st}). The mean effect on the population over the sample period is absorbed by the inclusion of α_{st}. All regressions cluster standard errors at the household level, since observations are unlikely to be independent within households.

A crucial assumption for this estimator to be valid is that treatment and control groups follow parallel trends in absence of the reform. Unfortunately PSID only started collecting wealth data in 1984, therefore I am unable to extent the saving rate measure to periods before 1989. In order to examine the similarity between saving trends of the treatment and control groups I rely on a different PSID question that asks respondents whether the household has any savings. Although this is a crude measure of saving behavior, an indicator for household savings is used more often (e.g. Puri and Robinson (2007)). In Figure 4, I plot the average share of households with positive savings from 1971 to 2003. I split the sample by the median level (0.62) of the treatment indicator $\frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}}$. The graph shows that the two groups follow parallel trends prior to the reform. After the introduction of HEA, the propensity to save of affected families exponentially increases relative to the control group.

[Figure 4 about here.]

5 Results

5.1 Savings Response

This section studies the effect of expected student loans on parental saving. Table 2 suggests a strong causal effect of student aid expansion on parents' savings. The point estimate of the interaction term is consistently positive and statistically significant at the 1% level. The magnitude of the estimates remain stable if I saturate the model with fixed effects. The point estimate drops somewhat when I include household-fixed effects, which suggests that households with more housing wealth also have higher saving rates. Overall, the effect is economically sizable: a one-standard-deviation increase in expected student aid $\left(\frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}}\right)$ leads to an increase in annual savings rates by 2.1-2.3 percentage points (=[0.096×0.249]). This increase changes fraction of income saved by an average affected family from 4.9% to 6.1%. To provide an insight on the magnitude of this increase in dollar amounts, I make a simple back-of-the-envelope calculation. Relative to the average annual income in the sample, a 2.3 percentage point increase means that, each year, parents save an additional amount of 1,374$. Even if I include wealth quartile fixed effects in column 4, I find a sizable positive saving response by parents that is statistically significant at the 5% level. In this specification I compare families with similar levels of wealth, but differential levels of home equity. Hence, this finding directly mitigates the potential concern that the documented negative correlation between the exposure to the reform $\left(\frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}}\right)$ and family wealth in table **??**

leads to differential saving responses. In column 5, I validate the positive saving response of parents using a dichotomous indicator that equals one for families with an above-median home equity-wealth ratio.

[Table 2 about here.]

Consistent with the documented decline in household saving rates in the 1990s (Parker, 1999; Lusardi et al., 2001), I find a strong negative effect in the post HEA period. Also notable is the sizable positive effect of entrepreneurship on household saving rates. This result confirms previous findings that entrepreneurial risk increases households' savings (Quadrini, 2000; Gentry and Hubbard, 2004). The coefficients of age are negligible since there is little variation in age is left after including time trends.

5.2 College Enrollment

This section sheds further light on the mechanism behind the positive parental saving response. The human capital investment models in the spirit of Becker (1962) show that a student will only invest in college if the net rate of return is greater than the market rate of return one would earn by investing the forgone earnings and the direct cost of college. Since the provision of the subsidized student loan reduces the effective costs of college, this investment problem becomes a positive NPV investment for marginal students. Many students rely primarily on parental wealth contributions to cover the remaining unmet financial need after receiving student aid (Long and Riley, 2007). Hence, parents increase their savings after an expansion of expected student loans available because they face a higher probability of financing college expenses of their children in the future. A testable implication of this economic mechanism is that one should observe a disproportional increase in college enrollment in families with the highest increase in expected student loans.

I match the household wealth data with information on the educational attainment of children from the PSID 'Childbirth and Adoption History' file in 2017. Since this file asks individuals to report their completed education and provides unique identifiers for their parents, I am able to match the college enrollment of children to the household-variation in expected student aid. Note that the unique identifiers of the parents allows me to include children who no longer live in the same household as their parents in 2017. I collect the educational attainment of all children that were born between 1972 and 1989. Since the PSID contains no questions that directly ask about college enrollment, I follow the standard procedure in the literature and measure enrollment as having completed more than 12 grades of schooling.

I follow the empirical specification of Lovenheim (2011) and estimate the following linear probability model:

$$Enrollment_{i,k,t} = \alpha_t + \alpha_s + \beta I[HEA]_t \times \frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}} + \lambda C_{i,k,t} + \epsilon_{i,k,t} \tag{6}$$

where $Enrollment_{i,k,t}$ is a dummy variable equal to one if child k in household i enrolls in college in year t. Important to note is that the unit of observation changes from the family to the student since a household can have multiple children. $I[HEA]_t$ is a dummy that equals one if child k enrolls in college after the introduction of HEA, therefore their parents could have still adjusted their savings in response to the reform, and zero otherwise. $\frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}}$ measures the household-variation in exposure to the reform as the fraction of housing equity in total wealth before the reform. The coefficient of interest is β, which captures the causal effect of expected student aid on the college enrollment of children. The specification also includes a vector of student and household characteristics ($C_{i,k,t}$). I include gender and ethnicity dummies to control for student characteristics. Furthermore, I control for total family income and the number of children in the household in the year of college enrollment and a dummy that equals one if the household head has a college degree. Finally, I include college year fixed effects (α_t) and state fixed effects (α_s). In this specification I cannot include household fixed effects since there are only few households that contain both children who enroll before and after the reform.

This finding is in line with Sun and Yannelis (2016) as they find that college enrollment increases in states that lift restrictions on state branching of banks.

[Table 3 about here.]

Table 3 report the results. The coefficients consistently show a increase in college attendance of children in households with more exposure to the student aid expansion. The point estimates suggest a substantial increase in college attendance of 12 percentage points. This finding confirms previous evidence showing that student aid supply increases college enrollment (McPherson and Schapiro, 1991; Van der Klaauw, 2002; Nielsen et al., 2010; Solis, 2017). The disproportional increase in college enrollment provides additional evidence consistent with the economic mechanism that families increase their savings to support marginal college entrants. This mechanism is in line with the argument of Dynarski (2003a) that student aid provision can have a 'threshold effect' by assisting students to cross the hurdle of college entry.

5.3 Alternative Identification Strategy

To provide additional evidence for the positive saving response I use an alternative identification strategy that relies on the notion that student aid amount sharply increases if there are multiple college-going family members (Brown et al., 2011). To be more specific, I define a treatment indicator that equals one if a household contains at least two siblings with a birth spacing less than 4 years and zero if the household contains no 'overlapping' children. Since most college degrees require 4 years, the overlapping sibling indicator proxies for higher (per student) expected student aid. My alternative specification is then as follows:

$$SavingRate_{i,t} = \alpha_i + \alpha_{st} + \beta I[HEA]_t \times I[SiblingOverlap]_i + \lambda C_{i,t} + \epsilon_{i,t} \tag{7}$$

The main coefficient of interest remains β, the effect of sibling overlap (which proxies for expected financial aid) on saving behavior after student aid expansion. Panel A in Table 4 presents the results. Unless otherwise mentioned, I suppress all control variables for brevity.

[Table 4 about here.]

The number of observations slightly grows since I can include families where the home equity-wealth ratio is not properly defined (at least one of the inputs is negative). The results show that the main result, a positive saving response, remains unchanged using this alternative identification, albeit somewhat smaller as in Table 2.

In the first two columns of panel B of Table 4 I find a similar positive saving response using changes in non-housing wealth as proposed by Cronqvist and Siegel (2015). Since this alternative measure includes capital gains, it is a more comprehensive definition of saving. However, as discussed in section 3.1 the true intentions of households are likely to be better captured by the active saving rate that exclude these capital gains. The number of observations grows slightly since some households only report the amount of outstanding wealth and have missing observations on how much they have invested in a particular asset over a 5 year period. The final column of panel B tests whether the inclusion of housing wealth accumulation affects the main results since the house is one of the main saving instruments of many households. The results remain unaffected by including saving in housing wealth.

5.4 Home Equity Adjustments

Since the HEA provides households with an incentive to shift more wealth into housing, as the HEA removes an implicit wealth tax for this asset category, economic theory suggests that parents would adjust their home equity levels before adjusting their saving behavior. Therefore, any saving response that I find is in excess of home equity adjustments that households might do. However, friction limit households in the degree of home equity adjustments they can do (Kaplan and Violante, 2014). Moreover, accessing home equity wealth often entails large costs and it may not be optimal to shift all wealth into home equity (Hurst and Stafford, 2004). In table 5 I directly test whether households adjust their home equity levels actively. The results are mixed. I find no adjustment in the dollar values of outstanding mortgage balance but there is an slight increase in probability of moving to a more expensive house.

[Table 5 about here.]

5.5 Heterogeneity and Robustness

5.5.1 Treatment Heterogeneity

I analyze treatment effect heterogeneity to better understand which households drive the increase in parental savings. Consistent with a credit constraints interpretation, the observed effect is largest among lower- and middle-income families. In particular, the first five columns in Table 6 present the differential saving effect by income quartiles. I observe the largest effect in the lowest quartile, and the coefficient becomes statistically insignificant for the top half of the income distribution. This result is in line with previous findings that credit constraints in lower-income families reduce the demand for higher education (Acemoglu and Pischke, 2001; Sun and Yannelis, 2016). Additionally I examine the treatment effect heterogeneity in parental education. A large literature shows parental education increases the probability a child's college attendance (e.g. Black and Sufi (2002)) and influences the amount of household savings (e.g. Hubbard et al. (1995)). Column 5 shows the results of the triple difference approach that measures the differential saving response of college educated parents. I find that parents with a college degree save more compared to lower educated parents. This is consistent with the argument that a higher probability of college enrollment and a better ability to estimate future college costs, increases the expected return of the child's college graduation for more educated parents.

[Table 6 about here.]

5.5.2 Cross sectional Robustness Checks

This section tests important cross sectional implications that naturally follow from the hypothesized relationship. The effect of student aid supply on parental savings should not affect all households equally. If the provision of student aid induces parents to save more because it raises the expected marginal college returns, the relationship should be absent in families with no children. I test this implication by estimating equation 5 on a sample of childless families. The first two columns of Panel B in Table 7 report the results. I find that families without children that have a high share of wealth in home equity clearly do not adjust their saving behavior because they have no exposure to the student aid reform. This finding also mitigates the potential concern that a differential exposure to the housing market might drive the results in the previous sections.

The results in the previous sections suggest that parents increase their saving because they face a higher probability of financing a part of their children's college expenses because of the increased probability of college enrollment due to the student loan expansion. If parents incorporate the expected future college costs in their saving decision, we should observe a more pronounced saving response by families that live in areas with high average college expenses. In the first two columns of Panel A I split the sample between states with above-median levels of average college costs and states with low costs of attending college (below median). Consistent with the previous findings I find that parents that life in states with high college costs increase their saving by more compared to families that life in states with low college costs. The difference in saving responses is statistically significant at the 1% level.

[Table 7 about here.]

Additionally, one would expect the saving response to be largest for households with more positive saving attitudes. I measure attitudes towards saving using a question in the 1972 PSID survey that asks respondents whether they prefer to *'save for the future'* or *'spent money today'*.[15] The responses are coded as a five-point Likert scale. I follow Knowles and Postlewaite (2005) and focus on households that indicated a clear preference (disregard indifferent respondents). Since this measure is only available for households that were already in the PSID sample in 1972, the total number of observations shrinks to approximately 500. In the final two columns of Panel A in Table 7 I split this sample by saving attitudes. The results show that the saving response is driven by families with a positive saving attitude.

To learn about the timing of saving response of parents, I examine whether the age of children present in the household affects the saving response of parents. The final 2 columns in Panel B shows that the positive saving response is primarily driven by families with secondary school-aged children. This finding is consistent with the notion that parents typically learn about the child's ability during secondary school.

5.6 Asset Allocation

The results in previous sections consistently show that parental saving increases after a positive shock to student aid supply. While the ultimate objective is to explore the dynamics of wealth accumulation, recently the attention in the literature has shifted more towards the allocation of savings because it introduces heterogeneity in rates of return on household savings (e.g. Bach et al., 2018; Fagereng et al., 2019).

Therefore, in this section I focus on the natural question whether the positive saving response affects the allocation of wealth between riskless and risky assets. Table 8 reports the average change in stock market participation and household leverage after the introduction of HEA. A number of interesting findings emerge from Table 8. The first column shows that parents save by paying off debts after student loan provision. This finding suggests an intergenerational transfer of household leverage from parents to children.

[Table 8 about here.]

[15] The exact question was phrased: 'Would you rather spend your money and enjoy life today, or save more for the future?'

A second result is that, after an increase in student aid supply, parents increase their holdings in the equity markets. As is common in the finance literature (e.g. Guiso et al. (2008) and Giannetti and Wang (2016)) I measure equity market participation using an indicator variable that equals one if the household holds a any stocks at a given time. This includes both directly held stocks, and indirect equity holdings via investment trusts, mutual funds and retirement accounts. The linear probability model estimates in Column 2 show that equity market participation among affected parents increases. In the final two columns I examine the proportion of the liquid financial portfolio invested in equity of the full sample (column 3) and conditional on equity participation in the previous period (column 4). This ratio is a common measure of financial risk taking in household finance (e.g. Calvet and Sodini (2014)). I find that affected parents tilt their portfolio towards risky assets. These findings suggest that the provision of student aid have an additional impact on household wealth accumulation through household portfolio returns induced by a change in allocation of assets.

6 Conclusion

This paper examines intergenerational effects of the rise in student loans. The exponential growth in student debt attracted the interest of economists and policymakers, as high levels of educational debt may adversely affect students' future consumption, investment and personal default decisions. While some economists have suggested that the rise in student loans could also have large ramifications for the saving and portfolio choices of students' families (Amromin and Eberly, 2016; Amromin et al., 2017), this paper is the first to provide systematic evidence on this relationship. I exploit policy-induced variation in expected student aid to estimate its casual effect on parental saving behavior. My results show that parents *increase* their savings after an expansion in student aid. This change is economically sizable since a one-standard deviation increase in exposure to student aid yields a 2.2 percentage point increase in the fraction of income saved by affected families. The mechanism that drives this result is the anticipation by parents of the positive effect of student aid on college enrollment of their children, i.e. the college investment NPV becomes positive for students on the margin of college attendance. Parents increase their savings to cover the remaining unmet financing needs in college expenses after receiving student aid. Consistent with this interpretation, I show that college attendance disproportionately increases for families affected by the reform. Furthermore, I find that student credit expansion shifts parental wealth allocation towards riskier assets.

My findings point to a previously undocumented and non-trivial intergenerational impact of student credit. Most policy discussions have largely ignored the interaction between student loans and parental wealth as the two most important sources of college financing in the United States. My analysis suggests that the overall effect of providing subsidized student loans is likely to be higher since parental savings act as an complement to this subsidy. This implication challenges the common belief that student aid provision leads to substitution effects like lower student earnings during college (e.g. Evans and Nguyen, 2019).

The parental saving response to the rise in student loans potentially has important implications for the allocation of assets within households, and more broadly, the distribution of wealth in the economy. As this study illuminates, in addition to the effect of educational credit on students' future consumption, policymakers should also consider parents life-time consumption. These policy considerations are not trivial as lifetime consumption of both children and parents face multiple shocks. Since parental savings for college expenses is associated with lower retirement wealth (Skinner, 2007), a crucial feature to understand is how much retirement wealth parents sacrificed for the additional educational savings. For instance, traditional and Roth IRAs can be used to pay for college expenses. Additionally, the total effect of college enrollment on the lifetime consumption of marginal children depends on the effect of student loans on the risk of dropping out of college as several studies demonstrate a positive association between student aid receipt and college completion (e.g.

Castleman and Long, 2016).

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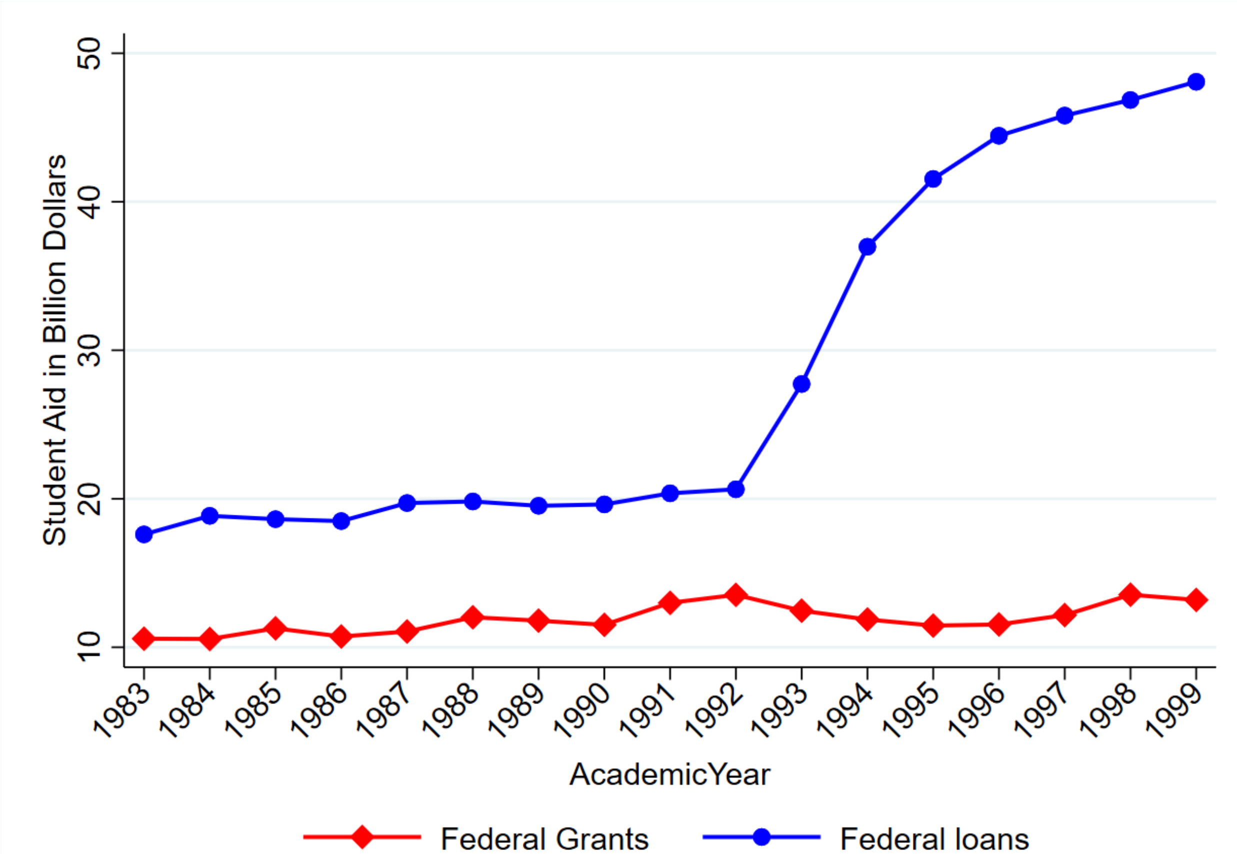
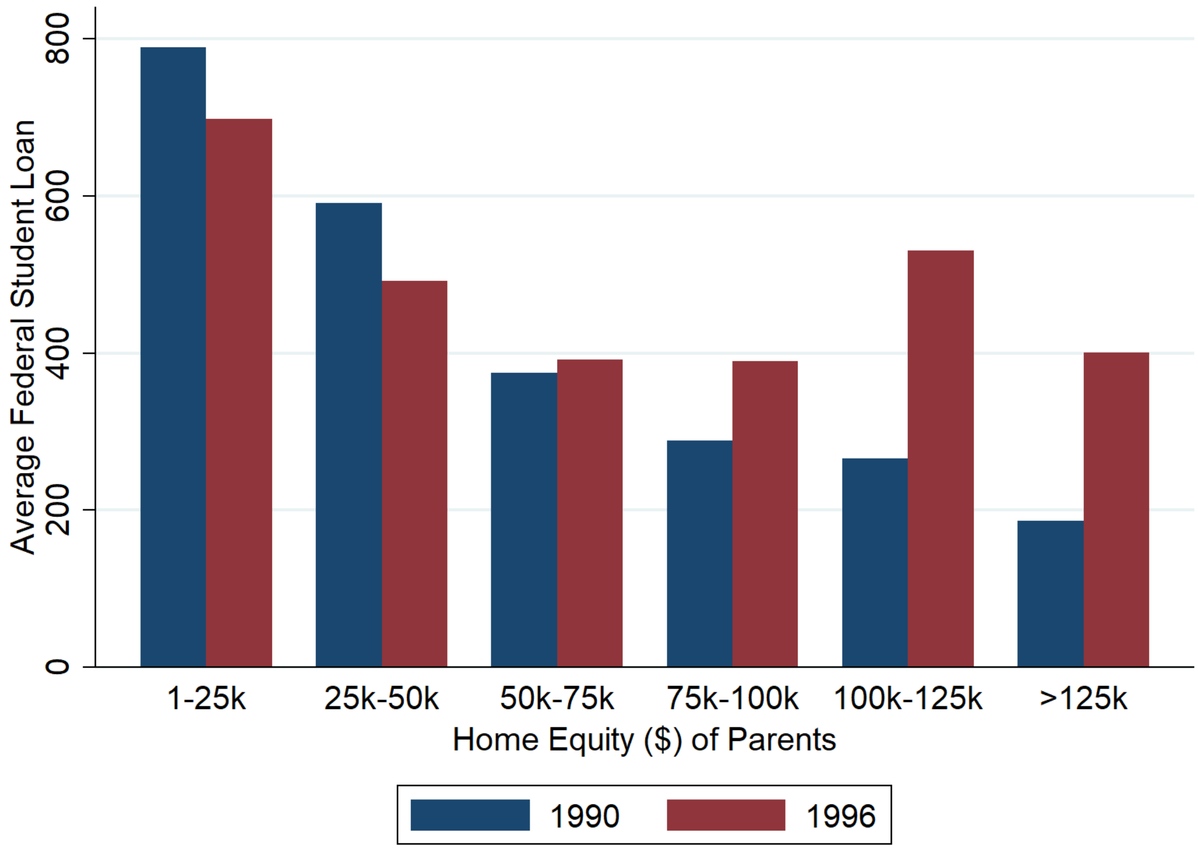
Figure 1: Total Annual Federal Student Loan and Grant Volume



This graph plots the total amount of annual student aid, split by grant aid and student loans. The figure displays the student loan expansions after the introduction of HEA, while the total grant aid remains constant. All figures are from the annual reports 'Trends in Student Aid' published by CollegeBoard and expressed in 2017 Dollars.

Figure 2: Average Federal Student Loans for various Home Equity levels



This graph plots the average amount of federal student loan received by first year undergraduate students in 1990 and 1996. The averages are presented in six brackets of home equity values of the parents. The average student loan values also include students that receive no loans since the extensive margin is also affected by home equity levels. Source: U.S. Department of Education, National Center for Education Statistics. Figures are computed using dependent student in the 1989-90 and 1995-96 Beginning Postsecondary Students Longitudinal Study.

Figure 3: Distribution of Home Equity Share

This histogram shows the distribution of $\frac{HomeEquity^i_{1989}}{NetWorth^i_{1989}}$, that captures the exposure to student loan expansion. The figure shows a left skewed distribution that is roughly uniform in the upper 80 percent. The vast majority of households holds a portion of their wealth in home equity, however there is substantial variation in the relative share.

Figure 4: Percentage of Households with Positive Savings (1994=1)

This graph plots the share of households that report having any savings, such as savings accounts or government bonds. I split the sample by 0.62 (median) of the treatment indicator $\frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}}$. 'High Equity Share' represents the group of households with above median levels of home equity by total wealth and 'Low Equity Share' represents below median households.

Table 1: **Descriptive Statistics**

This table reports descriptive statistics for my main variables of interest. I report mean, median, 10th percentile and 90th percentile for all observations at the household-year level. SavingRate$_{i,t}$ is total annual savings divided by income as defined in section 3.1. 'No Saving (d)' is a dummy variable that equals one if the household has non-positive savings in a given year. Similarly 'Equity Participation (d)' is an indicator variable that equals one if the household holds any stocks in publicly held corporations or mutual funds in a given year, including equity in IRAs. $\frac{HomeEquity^i_{1989}}{NetWorth^i_{1989}}$ is the fraction of home equity wealth of the total wealth in 1989, before the reform. 'Annual Family Income' is defined as the 5 year average income and '5yr Income Volatility' is the volatility of annual income over these 5 year periods. Furthermore, I include the number of children in the household ('Number of Children') and age of the head of the household ('Age (years)'). 'Entrepreneur (d)' and 'College Degree (d)' are dummies that equal one if the head of the household own a business or holds a college degree at a given year respectively. Marital transitions within the household are defined as dummies that equal one if the head of the household got married ('Married (d)') or got divorced ('Divorced (d)') in a given year. Finally, a dummy equals one if the head of the household is of black ethnicity ('Black (d)').

	Mean	*SD*	p_{10}	p_{50}	p_{90}	Obs.
$\frac{HomeEquity^i_{1989}}{NetWorth^i_{1989}}$	0.596	0.249	0.249	0.620	0.935	3,111
SavingRate$_{i,t}$	0.049	0.151	-0.073	0.028	0.189	3,111
No Saving (d)	0.346	0.476	0	0	1	3,111
Equity Participation (d)	0.464	0.498	0	0	1	3,111
Annual Family Income ($k)	57.48	30.08	25.32	51.36	96.19	3,111
5yr Income Volatility ($k)	12.48	13.54	3.09	8.36	24.54	3,111
Number of Children	1.801	1.106	0	2	3	3,111
Age (years)	43.087	7.006	34	43	52	3,111
Entrepreneur (d)	0.231	0.422	0	0	1	3,111
College Degree (d)	0.370	0.483	0	0	1	3,111
Black Ethnicity (d)	0.193	0.395	0	0	1	3,111
Marital Transitions						
Married (d)	0.021	0.142	0	0	0	3,111
Divorced (d)	0.014	0.117	0	0	0	3,111

Table 2: **Savings response of Families**

This table reports the results for the difference-in-difference regression specification of equation 5, with standard errors clustered at the household level in the parentheses. $I[HEA]_t$ takes the value of one after the introduction of HEA, and $\frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}}$ measures the household's exposure to the reform as the fraction of housing equity wealth of total wealth before the reform. I control for time-varying household characteristics as the number of children, age of the households head, age squared, and dummies that equal one if the household owns a business, holds a college degree, got married or divorced. Furthermore, I control for income shocks by including 5 year income volatility. In the first column I also include a dummy that equals one of the head of the household is black. I also report the number of observations (N). I control for household fixed effects ($HouseholdFE$), state times year fixed effects ($State \times YearFE$) and wealth quartile fixed effects (Wealth Quartile FE).

	$SavingRate_{i,t}$	$SavingRate_{i,t}$	$SavingRate_{i,t}$	$SavingRate_{i,t}$	$SavingRate_{i,t}$
$I[HEA]_t \times \frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}}$	0.096***	0.085***	0.088***	0.072**	
	(0.023)	(0.025)	(0.028)	(0.030)	
$I[HEA]_t \times I\left(\frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}} \geq p50\right)$					0.031**
					(0.015)
$\frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}}$	-0.097***				
	(0.013)				
$I[HEA]_t$	-0.088***	-0.070***			
	(0.016)	(0.020)			
Number of Children	0.004*	0.011*	0.018***	0.072	0.017***
	(0.002)	(0.006)	(0.006)	(0.006)	(0.006)
Entrepreneur (d)	0.027***	0.046***	0.064***	0.045***	0.066***
	(0.007)	(0.015)	(0.016)	(0.015)	(0.015)
Age (years)	-0.004	0.006			
	(0.004)	(0.006)			
Age^2	0.000	-0.000			
	(0.000)	(0.000)			
Married (d)	0.002	-0.034	-0.035	-0.011	-0.038
	(0.016)	(0.029)	(0.031)	(0.030)	(0.030)
Divorced (d)	0.013	0.019	0.022	0.077**	0.019
	(0.021)	(0.037)	(0.043)	(0.038)	(0.043)
5yr Income Volatility	-0.000	-0.000**	-0.000**	-0.000*	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
College Degree (d)	0.000	0.034	0.006	-0.025	0.007
	(0.005)	(0.039)	(0.040)	(0.030)	(0.041)
Black (d)	-0.008				
	(0.006)				
Household FE	No	Yes	Yes	Yes	Yes
State × Year FE	No	No	Yes	Yes	Yes
Wealth Quartile FE	No	No	No	Yes	No
N	3,111	3,003	3,000	2,893	2,980

Table 3: **College Enrollment**

This table reports the results of the test whether affected families experience a disproportional increase in college enrollment. The level of observation is the enrollment decision of the child in the household. I estimate equation 6 on the college enrollment decision of children given the household-variation in treatment exposure. $I[HEA]_t$ is a dummy that equals one if the child enrolls in college after the introduction of HEA and zero otherwise. $\frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}}$ measures the household's exposure to the reform as the fraction of housing equity to total wealth before the reform. I control for number of children and family income in the year of college enrollment. In the first two columns I include college year fixed effects (α_t) and state fixed effects (α_s), while in the final two columns I include the more stringent state times college year fixed effects ($State \times CollegeYearFE$) and wealth quartile fixed effects (*Wealth Quartile FE*). All standard errors are clustered at the household level and reported in the parentheses. Finally, I also report the number of observations (N).

	$Enrollment_{i,k,t}$	$Enrollment_{i,k,t}$	$Enrollment_{i,k,t}$	$Enrollment_{i,k,t}$
$I[HEA]_t \times \frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}}$	0.103*	0.115*	0.218**	0.173*
	(0.062)	(0.065)	(0.098)	(0.092)
Controls	Yes	Yes	Yes	Yes
College Year FE	No	Yes	No	No
State FE	No	Yes	No	No
State × College Year FE	No	No	Yes	Yes
Wealth Quartile FE	No	No	No	Yes
N	1,481	1,481	1,459	1,459

Table 4: **Alternative Specifications**

This table reports alternative empirical specifications that validate the results of Table 2. Panel A shows the results from an alternative identification strategy that relies on the notion that student aid amount granted sharply increases if there are multiple college-going family members. More specifically, I estimate a difference-in-difference regression specification with a treatment indicator that equals one if a household contains at least two siblings with a birth spacing less than 4 years and zero if the household contains no 'overlapping' children ($I[SiblingOverlap]_i$). The treatment indicator is interacted with '$I[HEA]_t$', that takes the value of one after the introduction of HEA. Panel B reports the results for the difference-in-difference regression specification of equation 5 with alternative saving rate measures. In the first two columns the dependent variable is the measure described in section 3.1. This measure captures the change in non-housing wealth between two periods (includes capital gains) and is scaled by the total income of the family over the same period. In the final column the dependent variable is a saving rate that includes saving in housing ('$\text{TotalSavingRate}_{i,t}$'). The number of observation drops since saving in housing wealth is only defined for households with information on recent moving activity. More specifically, saving in housing is defined as the change in home equity between two survey waves if the household moved and the change in total outstanding mortgage debt in the household did not move (Juster et al., 2006). In both panels I control for number of children, income volatility, age of the households head, age squared, and dummies that equal one if the household hold owns a business, holds a college degree, got married or divorced. Furthermore, I include household fixed effects ($HouseholdFE$) and state times year fixed effects ($State \times YearFE$). All standard errors are clustered at the household level and reported in the parentheses. Finally, I also report the number of observations (N).

	Panel A: Alternative Identification		
	$\text{SavingRate}_{i,t}$	$\text{SavingRate}_{i,t}$	$\text{SavingRate}_{i,t}$
$I[HEA]_t \times I[SiblingOverlap]_i$	0.040***	0.030*	0.038**
	(0.015)	(0.016)	(0.016)
Controls	Yes	Yes	Yes
Household FE	No	Yes	Yes
State × Year FE	No	No	Yes
N	3,261	3,122	3,119
	Panel B: Alternative Saving Measures		
	$\frac{\Delta NetWorth^i}{Income^i_{t-1,t}}$	$\frac{\Delta NetWorth^i}{Income^i_{t-1,t}}$	$\text{TotalSavingRate}_{i,t}$
$I[HEA]_t \times \frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}}$	0.095**	0.167***	0.086**
	(0.044)	(0.047)	(0.040)
Controls	Yes	Yes	Yes
Household FE	Yes	Yes	Yes
State × Year FE	No	Yes	Yes
N	3,328	3,324	2,027

Table 5: **Home Equity Adjustments**

This table reports the results of the effect of HEA on home equity adjustments of households, with standard errors clustered at the household level in the parentheses. Home equity adjustment decisions are measured by examining the effect on the total outstanding dollar value of the mortgage ('Total Mortgage Value$_{i,t}$'), a dummy variable that equals one if the family moved to another house and zero otherwise ('Moving (d)') and measure of the dollar value of the houses for the sample where there is information on moving ('Value of the House'). Similar to the main specification in equation 5, $I[HEA]_t$ takes the value of one after the introduction of HEA, and $\frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}}$ measures the household's exposure to the reform as the fraction of housing equity wealth of total wealth before the reform. I control for time-varying household characteristics as the number of children, age of the households head, age squared, and dummies that equal one if the household hold owns a business, holds a college degree, got married or divorced. Furthermore, I control for income shocks by including 5 year income volatility. I control for household fixed effects ($HouseholdFE$), state times year fixed effects ($State \times YearFE$) and wealth quartile fixed effects (Wealth Quartile FE). Finally, I also report the number of observations (N).

	Total Mortgage Value$_{i,t}$	Moving (d)	Value of the House
$I[HEA]_t \times \frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}}$	1056.22	0.124*	5388.76**
	(5673.57)	(0.071)	(2717.73)
Controls	Yes	Yes	Yes
Household FE	Yes	Yes	Yes
State × Year FE	No	No	Yes
Wealth Quartile FE	Yes	Yes	Yes
N	2,893	2,060	2,060

Table 6: **Treatment Effect Heterogeneity**

This table reports the results of analyzing treatment effect heterogeneity to better understand which households drive the positive effect of student aid supply on parental savings. I estimate a triple difference regression specification that adds a third difference using time-invariant classifications. $I[HEA]_t$ takes the value of one after the introduction of HEA, and $\frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}}$ measures the household's exposure to the reform as the fraction of housing equity wealth of total wealth before the reform. $I[IncomeQuartileQ]_i$ is a dummy variable that equals one if family i is in quartile Q (with $Q = 1$ representing the lowest income families) in the income distribution of 1991 and 0 otherwise. The triple interaction terms ($I[HEA]_t \times \frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}} \times I[IncomeQuartileQ]_i$) measures the difference in saving responses of families in a particular income quartile relative to families in the rest of the income distribution. For instance, $I[HEA]_t \times \frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}} \times I[IncomeQuartile1]_i$ estimates whether the baseline result is driven by the low-income families. All specifications are fully interacted, for brevity I suppressed all coefficients of the interaction terms between the income quartile dummies and $I[HEA]_t$ and $fracHomeEquity_i^{1989}NetWorth_i^{1989}$. I define a dummy variable that equals one if at least one of the parents is a college graduate ($I[ParentsCollege]_i$)). '$I[HEA]_t \times \frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}} \times I[ParentsCollege]_i$' captures the difference in saving responses between college-graduate parents and parents without a college degree. I control for number of children, income volatility, and dummies that equal one if the household hold owns a business, got married or divorced. Furthermore, I include household fixed effects ($HouseholdFE$) and state times year fixed effects ($State \times YearFE$). All standard errors are clustered at the household level and reported in the parentheses. Finally, I also report the number of observations (N).

	Saving Rate$_{i,t}$	Saving Rate$_{i,t}$	Saving Rate$_{i,t}$	Saving Rate$_{i,t}$	Saving Rate$_{i,t}$	Saving Rate$_{i,t}$
$I[HEA]_t \times \frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}} \times I[IncomeQuartile1]_i$	0.312***				0.333***	
	(0.093)				(0.094)	
$I[HEA]_t \times \frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}} \times I[IncomeQuartile2]_i$		0.071***			0.084***	
		(0.025)			(0.026)	
$I[HEA]_t \times \frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}} \times I[IncomeQuartile3]_i$			0.003		0.014	
			(0.012)		(0.013)	
$I[HEA]_t \times \frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}} \times I[IncomeQuartile4]_i$				-0.008		
				(0.014)		
$I[HEA]_t \times \frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}} \times I[ParentsCollege]_i$						0.152***
						(0.051)
$I[HEA]_t \times \frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}}$	-0.013	-0.004	0.005	0.006	-0.029	-0.021
	(0.015)	(0.016)	(0.016)	(0.016)	(0.019)	(0.019)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes	Yes
State × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	3,002	3,002	3,002	3,002	3,002	3,002

Table 7: **Cross Sectional Robustness Checks**

This table reports the results of testing cross sectional implications that naturally follow from the hypothesized relationship. In the first two rows of Panel A, I split the sample between states with above-median levels of average college costs and states with low costs of attending college (below median). I retrieve the average state level college expenses for four year public universities for the academic year 1993-1994 from Snyder and Hoffman (1995, p. 184). In the final two columns I split the sample by different saving attitudes. Column 3 limits the sample to families where the household head indicated in a 1972 survey that he/she rather 'save for the future' than 'spent money today'. In column 3 I limit the sample to households that prefer to spent. In Panel B, I examine how family composition affects the positive saving response of the parents. In the first two columns I estimate the difference-in-difference regression specification of equation 5 on a sample of families without children, that should not be affected by HEA. In the final two columns I split the sample by the age of the children to test whether parents exhibit a differential saving response if the household contains children in secondary school. $I[HEA]_t$ takes the value of one after the introduction of HEA, and $\frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}}$ measures the household's exposure to the reform as the fraction of housing equity wealth of total wealth before the reform. I control for number of children, income volatility, age of the households head, age squared, and dummies that equal one if the household hold owns a business, got married or divorced. Furthermore, I include household fixed effects ($HouseholdFE$) and state times year fixed effects ($State \times YearFE$). All standard errors are clustered at the household level and reported in the parentheses. Finally, I also report the number of observations (N). The difference between states with high college costs and low costs is statistically different at 1% level.

	Panel A: College Expenses & Saving Preferences			
	SavingRate$_{i,t}$	SavingRate$_{i,t}$	SavingRate$_{i,t}$	SavingRate$_{i,t}$
	High College Costs States	Low College Costs States	Saving Preference	Spending Preference
$I[HEA]_t \times \frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}}$	0.119***	0.073**	0.148***	-0.055
	(0.044)	(0.073)	(0.058)	(0.045)
Controls	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes
State × Year FE	Yes	Yes	No	No
N	1,796	1,173	245	239
	Panel B: Family Composition			
	SavingRate$_{i,t}$	SavingRate$_{i,t}$	SavingRate$_{i,t}$	SavingRate$_{i,t}$
	Families with no Children		Children in Ages of 1-10	Children in Ages of 11-17
$I[HEA]_t \times \frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}}$	-0.029	0.030	0.029	0.132***
	(0.027)	(0.080)	(0.043)	(0.056)
Controls	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes
State × Year FE	No	Yes	Yes	Yes
N	884	877	983	1,037

Table 8: **Asset Allocation**

This table reports the average change in asset allocation after the introduction of HEA. In the first column I consider the ratio of household debt over non-housing wealth. The second column examines equity participation using a dummy that equals one if the household is active in the stock market. The final two columns examines the average change in proportion of equity in the household's portfolio of cash, bonds and equity ('Risky Share'). The empirical specification of the difference-in-difference regression is similar as in Table 2. $I[HEA]_t$ takes the value of one after the introduction of HEA, and $\frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}}$ measures the household's exposure to the reform as the fraction of housing equity wealth of total wealth before the reform. I control for number of children, income volatility, amount of non-housing wealth, and dummies that equal one if the household hold owns a business, holds a college degree, got married or divorced. Furthermore, I include household fixed effects ($HouseholdFE$) and state times year fixed effects ($State \times YearFE$). All standard errors are clustered at the household level and reported in the parentheses. Finally, I also report the number of observations (N).

	(1) Household Leverage over total Wealth	(2) Equity Participation	(3) Risky Share	(4) Risky Share
$I[HEA]_t \times \frac{HomeEquity_i^{1989}}{NetWorth_i^{1989}}$	-1.409***	0.259***	0.111**	0.272*
	(0.452)	(0.076)	(0.055)	(0.141)
Controls	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes
State × Year FE	Yes	Yes	Yes	Yes
N	2,887	2,903	2,703	793