The Housing Crisis and the Rise in Student Loans

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Abstract

We study if the changes in U.S. house prices over the 2000s affected growth in student loans. Using household-level panel survey data, we find that as home prices fall households depend less on home equity extraction to finance college enrollment and depend more on student loans. We estimate that for every lost dollar of home equity credit that would have been used to finance college enrollment, households increase student loan debt by forty to sixty cents. This substitution is driven entirely by households that are liquidity constrained. We extend our analysis with credit bureau data to trace longer-run effects of this leverage on students. Our results show that the decline in house prices reduced households' ability to finance college enrollment with home equity credit, but that constrained households mostly responded by continuing to enroll in college and relying on student loans. Our estimates suggests the 30% fall in house prices from the 2006 peak resulted in the average college student borrowing more than $1,300 more in student loans with liquidity-constrained households borrowing almost $3,800 more in student loans.

Keywords: Student loans, household finance, house prices, home equity credit, education.

JEL Codes: D12, D14, E21, E44, G20, I22, I24.

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1 Introduction

We study if the dramatic changes in home prices over the 2000s affected how households financed college. While house prices and credit supply were elevated, households were able to borrow against home equity and use this relatively inexpensive debt to pay college tuition. But as house prices collapsed and the financial crisis spread, households could no longer easily access home equity credit. In response parents may have shifted the burden of financing college enrollment to students through student loans. Consistent with this view, Sallie Mae reports a decline in the share of college costs covered by the students' families from 50% between 2003 and 2007 to 43% between 2007 and 2012 (SallieMae [2013]). At the same time, student loans were the only type of consumer credit to increase throughout the financial crisis and subsequent recession. A shift in financial burden of funding college from parents to students could have large ramifications for individuals' educational attainment, wealth accumulation, financial stability, entrepreneurship, and household formation (Ambrose, Cordell and Ma [2015], Bleemer, Brown, Lee and Van der Klaauw [2014], Brown and Caldwell [2013], Cooper and Wang [2014], and Rothstein and Rouse [2011]). Additionally, Eberly and Amromin [2016] argue that changes in who funds college enrollment, parents or students, can have important aggregate implications on savings and welfare. Given these potential effects, it is important to understand the extent to which the collapse in the housing market increased how much students had to borrow to finance their education.

Figure 1 plots the aggregate and average flow of student loans over the 2000s. The left panel shows that both subsidized and unsubsidized federal student loans increased sharply by almost $30 billion from 2007 to 2010. At the same time, the private student loan market fell by about $10 billion while parent PLUS loans increased by about $2 billion dollars. The right panel of figure 1 shows that average student loan flows also increased sharply over the same period, increasing by almost $2,000. This sharp increase in student loan borrowing took place in a period when student loans became relatively more expensive. Figure 2 plots the interest rates on four types of household debt often used to finance college enrollment: subsidized and unsubsidized student loans, PLUS loans (parent student loans), and home mortgage debt. After 2005, the average interest rate on mortgage debt was lower than the rates on any kind of education loan except subsidized federal student loans, which are need-based and have strict limits.[1] For borrowers with a home, equity extraction was a relatively inexpensive way to finance college enrollment. However, there is no clear evidence that households substituted home equity for student loans when possible or if the collapse in house prices drove students to borrow more or perhaps even alter their enrollment decision. Brown, Stein and Zafar [2015] rely on credit bureau data and find little evidence that declines in house prices and home equity borrowing caused households to take on more student debt, although their ability to observe student loans is limited. Lovenheim [2011], Lovenheim and Reynolds [2013] and Stolper [2014] provide evidence that home equity affects both the intensive and extensive margins of college enrollment decisions, but it is not clear if this driven by wealth effects or liquidity. In addition, aggregate house price movements can also affect enrollment decisions. Charles, Hurst and Notowidigdo [2015] argue that the housing boom led to increased opportunity cost for education, which then caused a decline in college enrollment among students likely to attend 2-year colleges and so, presumably, less borrowing to finance college. As a result, this mechanism would also reduce the aggregate quantity of student loan debt as house prices increase, but not because of any effect on home equity, but instead because rising house prices were correlated with changes in labor markets.

Our paper focuses on how households respond to shocks to one particular type of college financing, home equity credit, and the long-run implications of these shocks. We do so by looking more closely at the debt dynamics between parents and students. Our baseline analysis relies on data from the Panel Study of Income Dynamics (PSID) including the Transition to Adulthood Survey (TAS) supplement. These data have extensive information on household composition and balance sheets. Critically, they allow us to link changes in the value of a household's home to that household's equity extraction, student loan debt, and college enrollment decisions. By observing these outcomes together we are able to determine if changes in access to home equity credit affects college enrollment and the extent to which student loans are used to finance that enrollment. To the best of our knowledge, this is the first time the links provided by the TAS data have been used to answer these questions. We supplement this work with individual-level credit bureau data from the Neq York Federal Reserve-Equifax Consumer Credit Panel (CCP) aggregated to form households and identify likely students. Because we only observe individuals if they have a credit report this

[1] Limits

sample is inherently selected, but it gives us a much larger sample, the ability to use very local controls and variation, a higher frequency, and the ability to observe longer run outcomes for many more individuals than are available in the TAS data.

To identify the effects of access to home equity credit we adapt an identification strategy similar to Lovenheim [2011], where we exploit changes in individual house prices as exogenous movements in home equity credit access. The primary advantage of this approach is that much of the variation in house prices over this period is likely to be outside of the control of households and so is appropriately considered a shock (Lovenheim [2011]). Additionally, by studying these house price movements over the 2000s we exploit these very large movements in house prices in a period when home equity extraction was relatively common (Bhutta and Keys [2016], Greenspan and Kennedy [2008]). While it is plausible that changes in home values are outside the control of a household, it is likely that they are correlated with other local factors that could affect enrollment or financing through distinct mechanisms. So we also check if our results are driven by house price movements or local labor market conditions.

We first document that equity extraction is a relatively common way to fund college enrollment in our sample. After conditioning on a broad set of controls, including having a college-age member, we find that households with a member enrolled in college are about four percentage points more likely to extract equity and take out about $3,000 of equity on average relative to households not enrolling a member in college. This is a sizable effect considering that in our sample households with a member enrolled in college have a 40 percentage points higher probability of having student loans and report a balance of about $9,000. These magnitudes suggest it is plausible that changes in home equity credit access might significantly affect the financing of college enrollment and possibly enrollment itself.

Our central result is that changes in the ability to borrow against home equity driven by house prices cause households to substitute between parents' mortgage debt and students' loans. Using only variation in equity extraction driven by movements in house prices, we estimate that for every dollar of home equity extracted for college enrollment a household borrows between forty and sixty cents less in student loans. Our estimates suggest households use this funding to at least partially pay for tuition and that as this support declines students are more likely to enter the labor force while enrolled. Our results are robust to an extensive set of controls including changes in aggregated house prices and various levels of fixed effects and our estimated rate of substitution holds across both the PSID and CCP. We find some evidence that movements in house prices reduce enrollment in college. We check if this substitution between home equity and student loans is the result of local labor market changes at both the state and county level. We consistently find that house prices are the dominant driver of substitution. As an additional check, we run a placebo test with the CCP data to see if the same pattern of substitution driven by house prices takes prior to 2005. Given that home equity is relatively more expensive than student loans prior to 2005 (2) we should not observe any substitution between home equity and student loans if our effects post-2005 are due to home equity access. However, if our results are caused by the correlation of house prices with labor market conditions we should see similar patterns even before 2005. We find no evidence of substitution between home equity and student loans prior to 2005, consistent with our estimates primarily picking up access to home equity. Finally, we estimate that students are less likely to report being in the labor force while enrolled as house prices increase, consistent with increased support from their parents and inconsistent with house prices primarily reflecting labor market conditions.

Using a standard measure of a household liquidity constraints (Cooper [2013], Zeldes [1989]), we find that our results are almost entirely driven by liquidity-constrained households. Liquidity-constrained households respond to increases in the value of their home by increasing equity extraction and reducing student loan borrowing. This suggests that liquidity constraints are the central mechanism underlying the observed substitution, but we do find that unconstrained households reduce their dependence on student loans as house prices increase. However, unconstrained households financing college enrollment do not extract equity, which is consistent with these households having access to cheaper methods of paying tuition. We posit that the observed decline in house prices might be due to house prices having a wealth effect on unconstrained households that encourages them to tap into wealth that they might otherwise leave as a buffer stock, but we leave this for further work.

While we document the presence of substitution between home equity and student loans, the extent to which this is economically important depends on whether or not this substitution affects real outcomes for students. If the household behaves dynastically and parents later assume the burden, then the nominal distribution of the debt between household members is economically irrelevant.

To answer this question we rely on the CCP to examine longer-run effects of redistributing the financing burden between parents and students. We examine how variation in student loans driven by exogenous declines in house prices and equity extraction affect the likelihood that a student falls into delinquency, purchases a home, and the likelihood that a student moves across cities.

To summarize, we present the first evidence that households relied on home equity to fund college enrollment, and when it became unavailable, they turned to student loans. Our results suggest the degree of substitution was large enough that the deep decline in house prices is likely to have caused a significant shift in the financial burden of paying for college from parents to students for those households who had expected to rely mostly on home equity credit. Our estimates imply that the 30% decline in house prices from their peak in 2006 caused the average college student to take on more than $1300 of additional student loans. This increase is equal to about 10% of the median student loan balance in 2011 or to over 13% of the increase in the median student loan balance from 2005 to 2011 in our sample. This figure likely understates the size of the effect on households that planned on primarily using home equity to finance college. Our estimate suggests that if parents were unable to borrow $60,000 of equity to pay for college enrollment, then students took on between $30-36,000 more student debt. Because liquidity-constrained households were the primary households driving this substitution this higher cost of financing college falls on households with little spare capacity, potentially amplifying the effects on household welfare.

2 Methodology and Data

Our aim is to understand how changes in access to home equity credit affects the way a household finances college and the enrollment choice itself. To do identify shocks to how much a household can borrow against home equity we use changes in the value of a household's home. In our baseline analysis we estimate the following two differences-in-differences models

$$y_{it} = \alpha_{1i} + \beta_{1,1}1(\text{College Age})_{it} + \beta_{1,2}\widehat{HP}_{it} + \beta_{1,3}1(\text{College Age})_{it} * \widehat{HP}_{it} + \sigma_1 X_{it} + e_{1it}, \quad (1)$$

$$y_{it} = \alpha_{2i} + \beta_{2,1}1(\text{Enrolled})_{it} + \beta_{2,2}\widehat{HP}_{it} + \beta_{2,3}1(\text{Enrolled})_{it} * \widehat{HP}_{it} + \sigma_2 X_{it} + e_{2it}. \quad (2)$$

We let y_{it} be an outcome like the amount equity extracted for household i at time t. $1(\text{College Age})_{it}$ indicates if the household has a member of college age (between, inclusively, 18 and 22) and $1(\text{Enrolled})_{it}$ is an indicator for whether or not the household has a member who has been enrolled in college within the last two years. $\widehat{HP}_{it}$ is a measure of the change in a household's home values, and X is a vector of controls including various fixed effects.

The coefficients $\beta_{n,3}$ are the parameters of interest as they measure how changes in house prices affect the relevant outcome for households with college-age or enrolled members. The extent to which movements in the value of home values are exogenous is critical to the validity of these estimates. Large investments in houses or significant neglect clearly give households some dimension along which to alter the value of their home (Melzer [2010]). We cannot control explicitly for neglect or maintenance, but we can observe if large (greater than \$10,000) home improvements are driving our results. Potentially more problematic is that changes in the value of a home are correlated with local or aggregate shocks, particularly the health of the local housing sector. We check for this by including interactions of college age or enrollment with local conditions, particularly employment conditions.

An alternative to relying on movements in house prices as a measure of home equity credit access would be to exploit household LTV ratios. However, these ratios, even if they are lagged, have the clear drawback that they are strongly endogenous. In particular, past borrowing behavior might be correlated with the probability that a household goes to college or the cost of that college. It is also possible that households manipulate their past borrowing in order to qualify for more financial aid. While the vast majority of colleges and universities only rely on the FAFSA to calculate financial aid and the expected family contribution, a number of elite and expensive schools also use the PROFILE, which incorporates home equity. Even within these schools, there is significant variation in the weight placed on home equity. If households did manipulate their home equity it might suggest home equity credit does affect student borrowing, but not because households are exogenously borrowing constrained. So to avoid these issues, we rely on variation in how much a household can borrow against home equity that is driven by movements in the value of the home (changing the "V" in LTV). This still might affect aid packages, but it would not be as a result of household manipulation in their borrowing behavior.

Even granting that movements in house prices are exogenous with respect to households and not problematically correlated with local conditions, there is still a key question regarding the mechanism. In addition to effects on liquidity constraints, house prices might also have a wealth effect that would not necessarily involve any actual extraction of liquid wealth (Campbell and Cocco [2007], Carroll, Otsuka and Slacalek [2011]). We take an approach similar to Hurst and Stafford [2004] and exploit differences in responses between liquidity constrained and unconstrained households to help distinguish between these channels.

While college enrollment is endogenous, estimating a model conditioning on enrollment is useful and our primary specification. Households not enrolling a member in college do not face a financing problem and so will not be useful for estimating substitution between types of credit. In general, model 1 gives the average effect of house price movements net of any enrollment decision. Since being of college age is almost certainly exogenous with respect to house price movements the resulting estimates are not subject to endogeneity concerns along that dimension. At the same time, by ignoring the enrollment decision we will likely bias our estimate of substitution towards zero because we include households who are not funding college enrollment. By estimating model 2 we only use information on households who actually have to fund college enrollment. However, if selection into enrollment does respond to house prices then the estimated effects from model 2 will suffer from this selection bias. For example, if only very wealthy households continued to enroll in college we might not see any change in student loans since these households do not tend to rely on student loans. In general, we focus on estimates from the model conditioning on college enrollment because these results are more precise and we find very little evidence of selection observable as reported in section 3.

The coefficients from these models provide useful evidence on the effects of house prices on households facing college enrollment, but we are also interested in the direct substitution between home equity credit and student loans. We also provide instrumental variable estimates of the following model where we use college age or enrollment indicators interacted with house prices as instruments for equity extraction as in

$$\begin{aligned}\text{EquityExtracted}_{it} &= \alpha_{1i} + \gamma_1 1(\text{Enrollment})_{it} * \widehat{HP}_{it} + \sigma_1 X_{1it} + e_{1it}\\ \text{StudentLoans}_{it} &= \alpha_{2i} + \beta\text{EquityExtracted}_{it} + \gamma_2 1(\text{Enrollment})_{it} + \eta\Delta\log(HP_{it}) + \sigma_2 X_{2it} + e_{2it},\end{aligned} \tag{3}$$

The coefficient β reports how much a change in an additional dollar of equity affects the dollar amount of student loans. The exclusion restriction for this model is that movements in house prices do not affect student loans other than through their effect on home equity credit extraction for households enrolling members in college. One might conclude that this mechanically implies that β should be equal to negative one: for every dollar of home equity lost the household must replace it with a dollar of student loans. However, the exclusion restriction does not preclude margins other than student loans from also adjusting to the shock to home equity credit. For example, households might choose to go to a less expensive school, work more, or draw down other savings. So long as these other changes are driven by access to home equity credit, β gives a consistent estimate of the dollar rate of substitution between home equity and student loans net of other margins of adjustment. This allows us to answer if the boom and bust in home equity borrowing drove some of the rise in student loans, even after households responded optimally.

2.1 Data

We rely on two distinct datasets for our analysis. We use data from the Panel Survey of Income Dynamics (PSID) for our baseline results. The PSID is particularly useful because its longitudinal structure lets us observe if a household contains a college-age member, college enrollment decisions (from 2005 onwards), and the household balance sheet including equity extraction and student loans.

While the PSID data allow us to examine the basic mechanisms we are interested in, it is limited by a relatively small sample and low frequency (biennial). This limits the precision of our estimates on debt quantities as well as our ability to track student outcomes for longer horizons. Consequently, we extend our analysis with the New York Federal Reserve-Equifax Consumer Credit Panel (CCP). These data are a very large random sample of individuals with credit records and have been used extensively to study household debt behavior in recent years.

2.1.1 Panel Survey of Income Dynamics

We restrict the PSID sample to all households with the same head of household from 1999 to 2013 and that are homeowners throughout the sample. This helps reduce noise by ensuring households are likely to have non-trivial levels of home equity. This means we exclude any households that were renting at any point in our sample, but we do include households that move from one owned home to another so long as they did not move within the last four years. We allow households to age beyond typical retirement age. This structure provides us with a sufficiently large number of continuous observations so that we can filter out household fixed effects, which takes care of a large amount of potentially important unobserved heterogeneity. As a result of these exclusions we are left with a sample of approximately 1,600 households, although the panel is not balanced.

Along with information from the baseline individual and family files, we import data from the Supplemental Wealth Files and the Transition into Adulthood Study (TAS), which is only available from 2005 onwards. The TAS supplement interviews members of a PSID household who are at least 18 years old and who also participated in the Child Development Supplement (up to two per family). These data provide critical information on whether or not a child who left the household went to college, took on student debt, and other related outcomes. Prior to the TAS, college enrollment could only be inferred if the student lived at home or once they formed a new household (Lovenheim [2011]). This fills a critical gap in the PSID as over 50% of PSID children do not form a household covered by the PSID by the time they turn 24.[2] Students living away from home in college dormitories were recorded as "institutionalized" with no information about their borrowing behavior recorded. The TAS data allow us to capture students living in dorms or who were not otherwise followed.

[2] See the user guide to the TAS `https://psidonline.isr.umich.edu/CDS/TA05-UserGuide.pdf`.

Tables 1 and 2 provide summary statistics for our sample in each year excluding 1999. Note that we will only be using the years including and following 2005 in our regressions. Throughout our paper we do not weight our estimates.[3] Unless otherwise noted all quantities are in thousands of real dollars, adjusted by the PCE deflator with 2009 as the base year. Because of the structure the age of the household head gradually increases and household size declines. About 24% of households have a college age member, which we define as having a member between 18 and 22. This number declines as the sample continues and households age. We record an individual as enrolled if they claim to be currently enrolled in college or have been enrolled in college in the last two years. Between 9 and 16% of households report having a member enrolled in college and roughly 59% of households with a college-age member have a member enrolled in college, similar to enrollment numbers reported in Lovenheim [2011]. We do not count college enrollment of non-traditional students such as the parents. Between 2 and 9% of households report having a member with a student loan and, conditional on having a student loan, the median household reports a high of $15,000 worth of student loans in 2009.

The median gross household income is relatively high at $80,000. This is somewhat to be expected as we have conditioned on being a relatively stable homeowner, but this distribution does have a wide distribution with an interquartile range of about the same size. The median household is carrying about $50,000 in mortgage debt in 2001 and this declines to $30,000 by 2013, but the range here is around $120,000. The households tend to carry large sums of liquid (cash, savings and checking accounts, stocks and bonds) and illiquid (vehicle, retirement, and secondary real estate) wealth. The median household starts the sample with about $80,000 of home equity, which peaks at about $140,000 in 2007 and then falls to $100,000 by 2013. To calculate the value of the household's home we rely on the self-reported prices in the PSID. While households might make mistakes with these numbers, Lovenheim [2011] documents that they do not significantly differ from the FHFA repeat sale index, although this is for the years 1980 to 2005. Even if households do consistently make mistakes, for a household to extract equity they must at some point have an accurate idea of their home's current value. By relying on self-reported values we will necessarily only be using information to which the household also has access, which should improve precision

[3] We are interested in estimating causal effects and applying the PSID longitudinal weights does not affect our estimates other than reducing the precision (Solon, Haider and Wooldridge [2015]).

and the plausibility. LTVs are generally low, starting out at about 40% in 2001 and declining to 23% in 2013.

Given these high levels of home equity it is plausible that households could extract equity in the event of large liquidity shocks such as financing college. While the PSID collects some information about equity loans and HELOCs it does not explicitly address if a household extracted equity through refinancing a loan. Cooper [2010] defines equity extraction in the PSID as when a household either (1) increases its mortgage debt and does not move or (2) reduces its equity and does move. The resulting quantity of equity extracted is then the respective difference in debt or equity. We adopt this definition except we drop equity extraction through moving and we require the household's current loans to contain at least one refinanced loan or some type of home equity loan. According to this definition between 15 and 20% of households in our sample extract equity with the median amount of equity extracted between $20-$30,000 across the years. These numbers are similar to those reported in Cooper [2010] for a different set of PSID households for the years 1999 to 2007, but they are smaller than the numbers reported by Bhutta and Keys [2016]. Since they have a higher frequency identification technique using credit bureau data it is plausible that our numbers are somewhat attenuated. Finally, the boom and bust in house prices are clearly visible in the self-reported home values. Through 2007 the median house price was growing rapidly, between 6 and 4 percentage points across the two-years. After 2007 the average house was declining in value by up to 8 percentage points. Critically, there is substantial variation in individual house prices within states and even cities (Guerrieri, Hartley and Hurst [2013]), which allows to use differences for our estimation. Even so, it is still important to address variation in local labor market conditions.

2.1.2 Consumer Credit Panel

The Federal Reserve Bank of New Yorks Consumer Credit Panel (CCP) is a longitudinal dataset of key fields from individual credit reports. The dataset is comprised of a 5% random sample of individuals with valid credit files collected by Equifax Inc. The individuals are drawn into the sample if their Social Security numbers end in one of five pre-determined digit pairs. Each quarter, Equifax Inc. provides data on these individuals liabilities and payment status, as reported to the credit bureau. These randomly selected individuals represent the primary sample of CCP households.[4] Lee and van der Klaauw (2010) provide an extensive summary of CCP sample design.

Importantly for our study design, the CCP is not limited to the primary sample. The dataset attempts to construct household identifiers by linking credit reports of each primary individual with all other reports associated with the same physical billing address in a given quarter. For instance, a 50-year old individual in the primary sample has the same billing address as another 52-year old and 18-year old individuals in a given quarter. These three individual borrowers are then assigned to the same household identifier. This linkage substantially increases the overall CCP dataset as it brings in individuals beyond the 5% primary sample. Crucially, it also allows one to form a fuller picture of household-level liabilities and potential reallocation of these liabilities within households over time.

However, constructing household-level debt dynamics is quite challenging. The household ID that is assigned to household members in a given quarter is not time invariant, although individual borrower IDs are permanent. Identifying a household over time thus requires proceeding from quarter to quarter, pooling together all records that share a household ID with the primary member and then assessing whether this association is real or spurious. For instance, a student-aged household member that moves out to attend college may change their billing address to that of their college dorm and appear with dozens of other household members sharing this address. In practice, we use the following algorithm to construct our sample.

We start by randomly selecting 20% of all primary credit records in the CCP for which the borrower is between the ages of 18 and 22 in 2005:Q1. For our purposes, we will call this the primary student sample, which contains 97,214 individual borrowers. Because they are part of the primary CCP sample, we nearly always observe their credit records for the entire duration of the panel (2014:Q4 in our case). We then pull any additional credit record that is ever associated with the primary borrower by virtue of sharing the same household ID in a given quarter. These records are then jointly assigned a time-invariant household ID keyed off each primary borrower. Note that the CCP keeps records for non-primary borrowers only in quarters when they are associated with a primary borrower.

We then flag instances where there is a college-aged primary person (ages 18-22) and an adult-

[4]The panel of primary CCP households is refreshed each quarter. That is, each quarter starting in 1999:Q1 all households with the five pre-determined SSN digit pairs are drawn into the sample. This assures that deceased individual exit the sample and individuals with newly established credit files enter the sample.

aged person (ages 40-65) in the household. The earliest quarter where we observe this relationship is used to construct a core household. In particular, starting from this quarter, we identify all adult member(s) who are observed in that household for the longest amount of time. These individuals, along with the primary member, are designated as the core household. For many analyses, only the debt associated with members in this core are included in aggregate household debt portfolios. By construction, each core household consists of a primary student borrower and one or more adult borrowers.[5] Altogether, we identify 88,768 such households. The median (mean) overlap of student and adult household members is 11 (16) quarters. Finally, to provide a control group, we supplement the student-adult households with a random sample of CCP borrowers whose household structure never includes a student-aged member. This does not guarantee that these households do not have students, but it likely reduces this chance.

[5]It is possible that some of the adult members of the core households are themselves a part of the primary CCP sample. Such double coincidence households have the advantage of containing records of adult household members well after the student borrower leaves to form a new household. Future analysis will focus heavily on this subset of households.

3 Results

All specifications, unless otherwise noted include a quadratic in the age of the head of household, the household size, four-year lags of loan-to-value ratio (LTV), home value (level), total wealth (level), two-year lags of liquid wealth, log income, and year fixed effects. All specifications also include, as noted, either state or household fixed effects. We restrict the sample to the years 2005 onwards when we can observe the TAS data. All standard errors are clustered at the state level.

Table 3 reports estimates of how household financial decisions are related to student loans and equity extraction. Column one gives the probability that a household with a college-age member reports having a child enrolled in college. Households with college age children are about 50 percentage points more likely to have a member enrolled in college. This is larger than estimates of the current fraction of 18- to 24-year olds enrolled in college over this time that range between 37 to 41 percent, but is consistent with our sample being wealthier than average.[6] Column two shows that households with members enrolled in college are about four percentage points more likely to extract equity relative to households without a member enrolled in college. Column three checks that this is actually a feature of college enrollment by controlling for college-age members. Doing so has almost no effect on the probability of extracting equity. Households with college-age members who do not enroll in college are not more likely to extract equity. Columns four and five report estimates of the dollar amount of equity extracted as a function of enrolling in college. Both columns indicate households extract about $3,000 more equity on average with none of this coming from households with college-age members not enrolled in college. Columns six through nine report the effects on probability of reporting student loans and the dollar amount of the student loan balance. Households enrolling a member in college are about forty percentage points more likely to report a student loan and carry about $9,000 more in student loan debt. These results show that households rely on both home equity and student loans to finance college enrollment, although home equity borrowing is less frequent and smaller on average. Since both types of financing are prevalent in the data and in relatively large quantities, some margin for substitution between the types of credit is possible

We now turn to testing if movements in house prices affect the way households finance college

[6] Digest of Education Statistics 2013 `http://nces.ed.gov/programs/digest/d13/ch_3.asp`.

enrollment, conditional on actually enrolling a member in college. Later we examine the enrollment decision itself. We expect that as house prices increase and households have access to more home equity they will rely more on equity extraction to finance college enrollment. As a result, households might rely less on student loans. Table 4 reports our difference-in-difference estimates where we interact four-year house price growth with the indicator for whether or not the household has a member enrolled in college. We include state- or household-level fixed effects to check the robustness of the results to household unobservables. Columns one and two examine the probability of equity extraction and show that a household enrolling a member in college is more likely to extract equity as house prices increase: a 10% increase in house prices increases the probability of equity extraction by about 1 percentage point, with the regression controlling for household fixed effects somewhat larger. Notice that the effect of house prices interacted with enrollment is substantially stronger than the effect of house price growth alone. This is consistent with households relying on home equity to respond directly to specific liquidity shocks (such as financing education). This is also consistent with the estimates predicting equity extraction in Cooper [2010]. Columns five and six of table 4 shows that households with college-enrolled members do extract significantly more equity in response to house prices increases. For these households the same 10% increase in house prices results in $800 to $900 more dollars of extracted equity on average. As with the probability of extraction, the response of household enrolling a member in college to house price growth is much higher than the response of a household not enrolling a member in college, which is $250 to $300 on average. These regressions suggest that as households have access to more home equity they become increasingly reliant on equity extraction to finance college enrollment.

In contrast to the results on equity extraction, columns seven and eight show that as house prices increase households with a member enrolled in college are less likely to have a student loan. The magnitudes are slightly larger than those for the probability of equity extraction: a 10% increase in house prices reduces the probability of a student loan by about 1.2 percentage points. Columns nine and ten turn to student loan balances and show that these differences result in almost $500 less student loan debt on average in response to the same 10% increase in house prices. All of these estimates are unchanged if the specification has household instead of state fixed effects, suggesting household-level heterogeneity is not driving our effects.

These results show that movements in house prices affect how households finance college enrollment. As the amount of equity available to households increases, households are more likely to depend on equity extraction and less likely to rely on student loans. These differences are economically large. Taking the coefficients from columns four and eight, the 30% decline in house prices from 2006 to 2010 resulted in an average increase in student loans of $1,500 while causing equity extraction to fall by $2,800 among households enrolling a member in college.

To get a direct estimate of the rate of substitution between home equity and student loans, we estimate the instrumental variable model (equation 3). In the first stage we instrument for the amount of equity extracted with the interaction of college enrollment times growth in house prices. We then regress the balance of student loans reported on the instrumented amount of equity extraction. Thus, the estimated coefficient on equity extraction will only pick up movements in student loans correlated with movements in house prices that affected equity extraction. This reduces the chance that pure wealth effects are driving our results. Column nine regresses the level of student loan debt on the amount of equity extracted without instrumenting and recovers a zero. This is expected as most equity extraction is unrelated to financing education with 20% of households extracting equity enrolling a member in college. The remaining columns isolate the variation in equity extraction driven by individual house prices and households enrolling a member in college. Consistent with the difference-in-difference estimates, we find an economically and statistically significant negative relationship between equity extraction and student loan debt. Column ten indicates that for every lost dollar of home equity intended to finance college enrollment households carry an additional sixty cents of student loan debt. Column eleven controls for a household fixed effect and, which reduces the estimated rate of substitution to fifty cents but increases the precision substantially. That this coefficient is not exactly negative one could result from several factors. First, complications in measuring equity extraction relative to student loan balances might reduce the apparent substitution. Second, households are also capable of adjusting along additional margins as they respond to the change in equity extraction. These margins include not enrolling or enrolling in a cheaper university, the student working, or relying on alternative types of debt like credit cards. We examine these additional outcomes below.

These estimates provide direct evidence that the collapse in the home equity market increased the amount of student debt used to finance college enrollment, but the size of the effect varies significantly across households. Not all students come from parents that own their homes, not all homeowners finance college enrollment with equity, and potentially not all equity extracted is used to finance college. At the extreme, our estimates suggest that a household unable to extract equity due to house price or credit supply contractions would take out a significant amount of student loan debt. In our sample the average household extracting equity while enrolling a member in college in 2007 withdrew about $60,000 of equity. If all of the equity was intended to financing college our estimates imply this would result in the student borrowing $30-36,000 in student loans. While our estimates suggest some households did stop extracting equity as a result of house price movements, many households probably just extracted less equity. To aggregate our estimates for a back-of-the-envelope calculation requires the average effect of equity extraction given by the difference-in-difference estimate in column four. So we simply need to multiply this number by the change in house prices and the size of the relevant population of students. According to the Department of Education, an average of 20 million students were enrolled in college for each academic year 2008-2009 and 2009-2010. At the same time the average four-year decline in aggregate house prices (to match our estimation framework) was about 30%. According to the TAS data, about 70% of households that enrolled a member in college in our sample are homeowners and according to the Department of Education between 60 and 70% of students enrolled in college match the age range of the TAS sample we use for estimation.[7] If we apply the 30% decline in house prices along with our estimated rate of substitution of -0.5 to the 20 million students times 0.7 (homeowners) times (0.65) young, this implies that across these two years households extracted $26 billion less in equity, which then resulted in an additional $13 billion dollars in student loan balances. Across these same two years the total balance of student loan debt increased by $150 billion (Looney and Yannelis [2015]). Therefore, our estimates imply the collapse in house prices was responsible for about 9% of the aggregate increase in student loan balances from 2008 to 2010. However, this calculation ignores any reduction in equity extraction and subsequent increase in student loans due to the contraction in credit supply to households independent of individual house price movements. So the total amount of substitution between home equity and student loans could be even larger.

Economic theory and evidence suggests that movements in house prices and home equity are likely to be most important for households that are liquidity constrained, unless wealth effects are very large (Cooper [2013], Zeldes [1989]). Following this literature, we measure liquidity constraints

[7] http://nces.ed.gov/programs/digest/d09/tables/dt09_191.asp

using the sample average of a household's liquid wealth-to-income ratio (LW) and then divide households according to the median of this ratio. We then re-estimate our difference-in-difference regressions on each of these samples. If liquidity constraints are driving our results then we expect households with a high LW ratio to respond less to movements in house prices while households that are generally liquidity constrained will be more responsive.

Table 5 reports the estimated effects for equity extraction and student loan debt. We find that the two types of households behave very differently when it comes to college enrollment and financing education. Liquidity-constrained households enrolling a member in college are significantly more likely to extract equity as house prices increase (columns one and two) relative to unconstrained households and they appear to extract about four times as much equity (columns three and four). This is consistent with evidence in Hurst and Stafford [2004] and Cooper [2013] that changes in credit access are more important for households that are otherwise liquidity constrained.

In contrast to the equity extraction results, both types of households behave similarly when it comes to the relationship between house prices and student loans (columns five through eight). While liquidity-constrained households are more likely to rely on student loans and typically borrow more when enrolling in college, their dependence on student loans varies with house price growth at almost the same rate (potentially lower) as unconstrained households. However, because unconstrained households do not adjust their equity extraction with house prices, house prices are affecting their behavior through another mechanism. One possibility is that house prices have a wealth effect on unconstrained households that makes them more likely to finance college enrollment with alternative types of wealth. We also cannot rule out the possibility that both types of households adjust unobserved enrollment decisions in response to house price increases, although it seems unlikely that increased house prices would induce a reduction in school expenses given the results in Lovenheim and Reynolds [2013].

Overall, the liquidity splits suggest that movements in house prices drive a trade-off between equity extraction and student loans for constrained households. A result might be that the higher financing costs for college enrollment might have been borne by households with the relatively less financial capacity. However, we do find that movements in house prices may have had wealth effects in the financing decision for unconstrained households. But these unconstrained households do not appear to be substituting into mortgage debt in order to reduce their loan burden. We also check if our results vary substantially with the education-level of a household in the appendix (table 9). In general, we find some difference in equity extraction behavior with the equity extraction of less-educated households being slightly more responsive to house price movements but similar behavior in student loans. While we do not have the power to precisely distinguish between the role of education versus the effects of liquidity constraints, that the effects of house prices on equity extraction vary so starkly with liquidity constraints suggests that they are central to the mechanism.

3.1 Robustness and Additional Outcomes

The variation driven by liquidity constraints is strong evidence in favor of house prices affecting college financing through access to equity. However, an important alternative is that movements in house prices, while largely outside of the control of households, are merely picking up other correlated shocks driving household behavior. The chief alternative would be local house prices, which will clearly be correlated with individual house prices but which could also come with changes in local labor markets. Of particular concern is that movements in local labor markets could be drawing students into less expensive college enrollment as in Charles et al. [2015], which would also reduce student. Guerrieri et al. [2013] document that there is significant variation in house price growth across neighborhoods. We verify the presence of significant within-state variation with over 75% of the variation remaining after netting out state-year fixed effects. But it still might be the case that the source of this variation is correlated with local labor market opportunities. One a priori factor in favor of our results being driven by the effect of house prices on the financing decision is that our sample is restricted to higher income and wealthier households whose enrollment decisions are less elastic (Lovenheim [2011]). For these households with relatively inelastic enrollment decisions, it is plausible that the direct effect of home value on equity is significantly more important than the indirect effect of local house price growth on foregone labor market wages.

We are not able to disaggregate the public PSID data beyond the state-level, so in order to differentiate between local house price movements and local labor market conditions we rely primarily on the CCP data. However, we first check if there is an observable difference in the effects of house prices once we control for state-level changes in unemployment rates.[8] Table 6

[8]Here we report specifications using the four-year change in unemployment rates. Using the growth rate of unemployment gives similar results.

includes the interaction of our enrollment indicator with the unemployment difference for all of our relevant outcomes as well as the instrumental variable specifications. Overall we find essentially no effect on our results for the difference-in-difference estimates of equity extraction and student loan borrowing. Students who enrolled in college who come from states with increasing unemployment rates tend to have higher student loans, but this relationship is distinct from the effect of house prices. Our IV estimates are also very similar to those in 4, with estimates of the rate of substitution around -0.5.

Because there could be significant heterogeneity between between areas within a state our state-level unemployment rates might be an insufficient control. To overcome this we turn to the CCP data and reestimate our baseline results. Due to the differences in the data sets our specification in table 7 is not exactly identical to that in the PSID data. Instead of actual college enrollment, we interact an indicator for whether or not the household has a student present with zip-level house price movements from Corelogic and county-level four-year employment growth from the County Business Patterns. The frequency of the data is annual as opposed to biennial. We restrict the specifications to the years following 2005 to conform with the PSID specifications. For readability we omit stars to denote significance, but the coefficients of interest are all highly significant. The specifications include controls for credit score and components of the household portfolio, but we do not have the same degree of household and demographic characteristics available in the PSID. Columns one shows that local house price movements increase the amount of equity extracted to a similar degree as estimated in the PSID data: a 10% increase in house prices increases equity extraction by $800 for a household with a student present. Critically, this estimate averages across households with and without students, which likely attenuates the estimate somewhat. Controlling for county-level employment growth in column two leaves the estimate almost unchanged with a slightly negative coefficient on the interaction of employment growth and student presence. Similarly, columns three and four show that student loans are decreasing in house prices for households with a student present with no change after controlling for employment growth. Columns five and six estimate the IV specification and report a large estimate of substitution centered on -0.8 with essentially no change once we control for local employment movements. This rate of substitution might be larger than that recovered from the PSID in part because of selection in the sample construction. To observe an individual in the CCP the person needs to have a credit record and for many young people this occurs through student loan borrowing. So our estimates rely on a sample that is somewhat selected to have a higher propensity for borrowing. Even so, this estimate is within the range of the PSID estimate and its robustness to local employment movements is the central takeaway.

These results show that controlling for local employment trends does not change apparent substitution between home equity and student loans. As a further check, we estimate our instrumental variable specification again on the years preceding 2005. Since home equity is not clearly less expensive than student loans prior to 2005 we would not expect to see any substitution if access to home equity is the mechanism driving our previous results. But if house prices are simply standing in for an alternative mechanism we might expect to see similar patterns prior to 2005. As column seven of table 7 shows, there is essentially no evidence of substitution with the estimated coefficient on home equity actually turning positive. In general, there is less student loan borrowing with the student presence indicator suggesting about \$560 on average, which conforms with our PSID estimates suggesting relatively low student loan balances in the earlier years.

Given that our results appear to be driven by the effect of house prices on access to home equity, we now turn to additional outcomes that might be also be affected or additional margins of adjustment other than We first shed some light on these additional responses and other possible uses for the extracted equity in table 8 using the PSID data. Column one reports the effects on the probability that a household with a college-age member actually enrolls a member in college. Consistent with Charles et al. [2015], we see a slight negative effect with a 10% decline reducing the probability of enrollment by 0.5 percentage point. The magnitude of this effect might be relatively small due to our sample, which is composed entirely of homeowners and so slightly wealthier. In column two we find the probability that an enrolled student takes out a credit card has a credit card or other loan. While this probability seems to decline slightly with house prices, the estimate is relatively small and statistically insignificant. Column three examines the probability that the student reports working or looking for work. Households with a member enrolled in college are about 45 percentage points more likely to report a student in the labor force, and this probability is strongly declining with individual house price growth. A 10% increase in house prices reduces the probability the student is working by a little more than one percentage point. This relationship is consistent with the primary effect of house prices on these households being on equity access and student support and not through job market opportunities since this would suggest a positive relationship.

We also examine in table 8 how three potential uses of home equity covary with enrollment and individual house prices. Column four looks at the probability that the parents in the household cover some fraction of a student's tuition. Almost half of the households with a member enrolled in college pay some portion of the student's tuition with the average amount of tuition covered annually at about $12,000. Consistent with home equity financing college enrollment, households enrolling a member in college are more likely to cover tuition as house prices increase with a 10% increase in house prices increases the probability of covering tuition by almost one percentage point. Column four checks the probability that the student has taken out a personal loan from their immediate family or relatives. This event is quite rare with households enrolling a member in college reporting only seven percentage points more likely to take out such a loan. This probability does not increase significantly for households enrolling a member in college as local house prices increase. This might suggest that as households use their equity to finance college they treat this additional financing as an intra-household transfer or bequest. Finally, we check if these households are more likely to undertake large home improvement projects when house prices increase.[9] If households took advantage of a member leaving the household to renovate their home then we might find the same relationship between house prices, enrollment, and equity extraction but the causality would run in the opposite direction of the one we propose. Column six shows that this does not happen. In general there is a slightly lower probability of home improvements when a household enrolls a member in college and these households do not seem to respond to house prices. If households had been either using increased equity to finance improvements or generating increased home value with home improvements we would expect the interaction term to be positive and significant. On average, however, increased home values are positively correlated with home improvement.

These results paint a consistent picture. Households use home equity credit to help finance students' college enrollment. When access to home equity falls with house prices students from homeowners generally did not stop enrolling in college, instead a significant fraction of the financial burden fell on students and student loans. While we find that this has some effects on student

[9] To measure home improvement I rely on the definition used by the PSID, which asks if the household has undertaken any additions or improvements to the home of at least $10,000.

labor force participation while enrolled, a central question is if this shift in the financial burden matters for other outcomes such as mobility, delinquency, or home purchases. We turn to the CCP data to check this possibility.

3.2 Longer Run Outcomes

4 Conclusion

Using household-level panel data that allow us to observe outcomes for parents and children, we evaluate the effects of access to home equity credit on student loan debt and college enrollment. We find that as parents are unable to borrow against home equity, they push the burden of financing college enrollment onto students through student loans. The magnitude of substitution that we estimate is large: for each dollar of home equity credit that parents do not take out students borrow between forty and sixty cents. These effects are strongest for households that are liquidity constrained, although we do find evidence that unconstrained households might change their behavior due to a wealth effect. We find little evidence that individual house prices affect the extensive or intensive margin of college enrollment, but local house price growth is negatively correlated with enrollment, consistent with a labor market substitution effect.

Our results show that the collapse in house prices over the late 2000s contributed to a significant intergenerational shift in the financial burden of paying for college. This shift could have far-reaching consequences for household formation, savings, entrepreneurship, and welfare. However, our results also imply that access to student loans avoided some of the effects on enrollment that might have been expected from the disruption to home equity credit.

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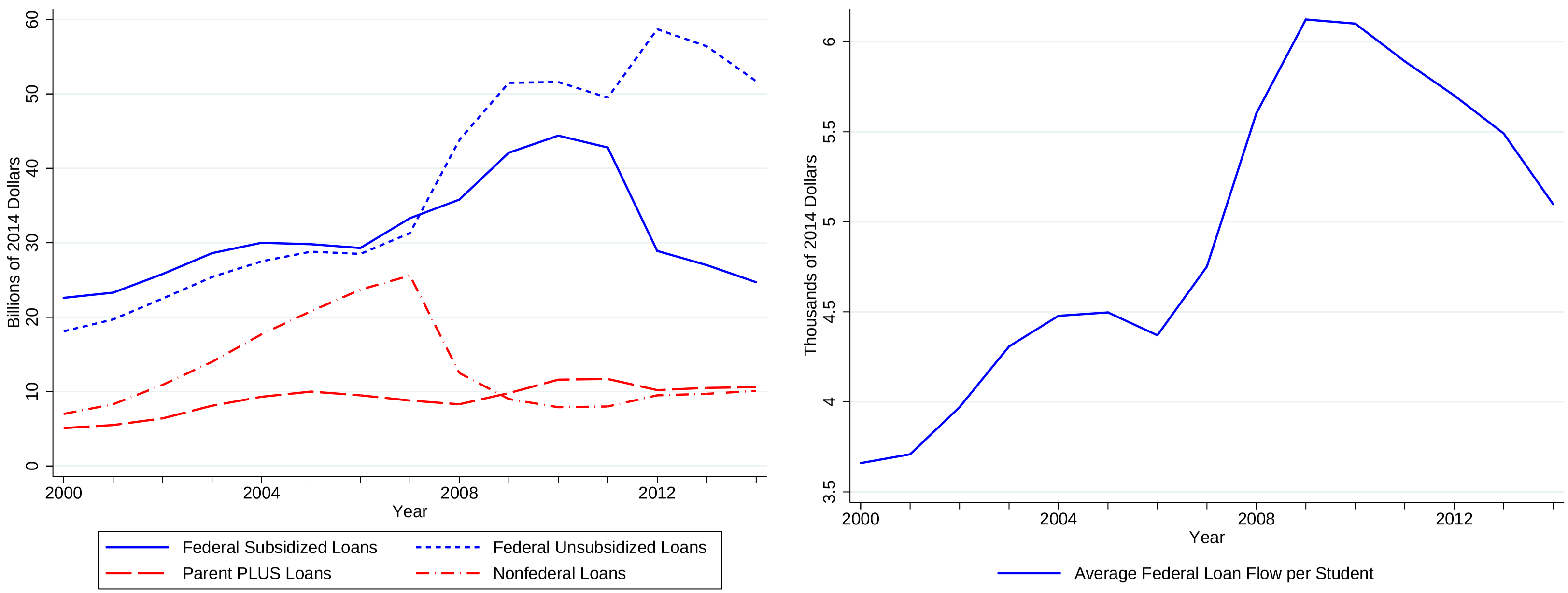
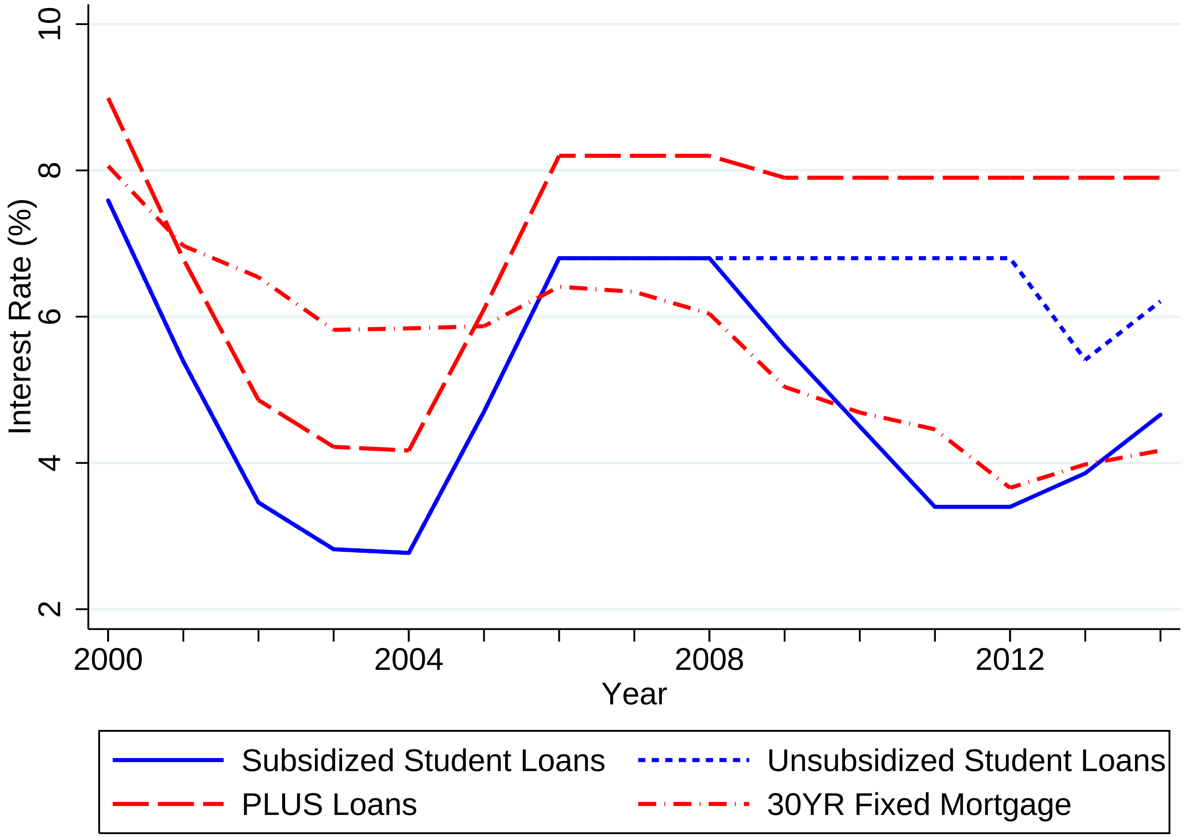
5 Figures

Figure 1: Flows of Federal Student Loans: Average and Aggregate



Note: The left figure plots the aggregate annual flow of total federal subsidized and unsubsidized loans, parent PLUS loans, and nonfederal loans. The total figure shows an sharp increase in the flow of student loans of about \$15 billion from 2006 to 2010, driven almost entirely by federal subsidized and unsubsidized loans. At the same time, the private student loan market fell and parent PLUS loans were relatively unchanged. The right-hand figure shows the average flow of federal student loans (subsidized and unsubsidized) per full-time equivalent student. The average flow of student loans increased by almost \$2,000 from 2006 to 2010. These statistics are constructed by the College Board and are based on various sources. See `http://trends.collegeboard.org/sites/default/files/trends-student-aid-web-final-508-2.pdf` for more details.

Figure 2: Interest Rates on Student Loans and Mortgages



Note: This figure plots the market interest rates on four types of household debt used to finance college enrollment: subsidized federal loans, unsubsidized federal loans, 30-year fixed rate mortgage debt, and PLUS loans. Starting in 2006, extracting equity is cheaper than student loans and PLUS loans. While subsidized student loans do track mortgage debt somewhat, these loans are need-based and have strict annual and total limits. Data are from the Department of Education and FRED.

6 Tables

Table 1: PSID Summary Statistics (1)

	2001 p50/iqr	2003 p50/iqr	2005 p50/iqr	2007 p50/iqr	2009 p50/iqr	2011 p50/iqr	2013 p50/iqr
Age	49.0	51.0	53.0	55.0	57.0	59.0	61.0
	(13.0)	(15.0)	(15.0)	(15.0)	(16.0)	(15.0)	(16.0)
Size of Household	4.0	3.0	3.0	3.0	2.0	2.0	2.0
	(3.0)	(3.0)	(2.0)	(2.0)	(2.0)	(2.0)	(1.0)
School Expenses	1.8	1.8	2.7	2.0	2.7	3.8	4.6
	(5.4)	(7.8)	(10.3)	(9.9)	(11.5)	(10.9)	(14.1)
Student Loans	.	.	5.4	10.2	14.9	14.3	14.8
	(.)	(.)	(10.2)	(13.2)	(28.2)	(24.8)	(21.3)
Gross Income	85.3	80.2	78.8	80.5	81.6	76.2	77.1
	(73.0)	(69.5)	(72.6)	(78.2)	(80.9)	(75.4)	(75.9)
Mortgage Debt	53.0	53.3	48.2	45.8	41.6	36.2	27.8
	(106.0)	(113.5)	(113.4)	(120.0)	(120.9)	(114.3)	(101.8)
Home Value	147.2	170.2	181.4	203.5	198.1	190.6	180.4
	(142.5)	(181.6)	(215.6)	(234.0)	(203.1)	(171.5)	(175.8)
Liquid Wealth	17.7	20.4	19.3	21.4	21.8	19.1	18.5
	(78.9)	(86.9)	(90.5)	(112.9)	(98.1)	(92.4)	(99.0)
Illiquid Wealth	41.2	39.7	42.8	46.8	39.6	42.9	46.3
	(113.1)	(113.6)	(138.6)	(156.7)	(124.9)	(173.1)	(175.8)
Home Equity	86.0	102.1	116.6	142.4	115.9	107.7	111.0
	(104.5)	(130.5)	(158.4)	(183.1)	(158.5)	(148.6)	(151.7)
LTV	38.3	34.0	28.1	23.4	25.0	23.2	20.0
	(62.7)	(59.7)	(55.6)	(51.7)	(58.0)	(57.1)	(55.7)
Equity Extracted	20.7	23.5	24.1	29.0	26.2	21.3	23.0
	(30.5)	(35.7)	(42.0)	(42.0)	(45.3)	(52.1)	(38.0)
House Price Growth (%)	6.1	6.0	6.4	3.7	-7.5	-3.8	-2.9
	(23.5)	(24.1)	(28.3)	(24.5)	(19.8)	(19.7)	(18.5)

Note: This table reports medians and interquartile ranges for relevant observables from our baseline sample of 1,600 households in the PSID. Each household has one observation per year. For student loans and equity extraction we only compute the relevant amount across non-zero observations. Missing values are due to data unavailability. See text for more details.

Table 2: PSID Summary Statistics (2)

	2001	2003	2005	2007	2009	2011	2013
College Age (%)	24.1	21.8	23.1	22.4	19.7	20.6	18.2
Enrolled in College (%)	.	.	8.9	13.7	15.6	16.1	15.2
Has Student Loans (%)	.	.	2.4	5.0	8.5	8.5	7.2
Extract Equity (%)	15.6	21.9	19.0	16.1	15.3	12.1	10.3

Note: This table reports means for relevant observables from our baseline sample of 1,600 households in the PSID. Each household has one observation per year. Missing values are due to data unavailability. See text for more details.

Table 3: College Enrollment and Source of Funding

	P(Enrolled in College)	P(Extract Equity)		Equity Extracted		P(Has Student Loans)		Student Loans	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)
College Age	0.510***		-0.006		-0.374		0.009		-0.752
	(0.022)		(0.017)		(1.059)		(0.011)		(0.467)
Enrolled in College		0.040***	0.044**	3.124***	3.362**	0.399***	0.394***	9.018***	9.498***
		(0.014)	(0.018)	(1.160)	(1.311)	(0.024)	(0.025)	(0.837)	(0.915)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	6386	6386	6386	6386	6386	6386	6386	6386	6386
Clusters	51	51	51	51	51	51	51	51	51
R2	0.456	0.073	0.073	0.066	0.066	0.373	0.373	0.179	0.180

Note: This table reports OLS estimates of college enrollment and types of borrowing as functions of college age and enrollment indicators. These estimates show that households with college age members enroll members in college and and households that are enrolling members in college are more likely to extract equity and take out student loans. Each specification includes a state fixed effect, a quadratic in the age of the head of household, the household size, lags of mortgage loan-to-value ratio, log income, home equity,and liquid wealth, and year fixed effects. Standard errors are clustered at the state level. See text for more details.

Table 4: The Effect of House Prices on Financing College Enrollment

	P(Extract Equity)		Equity Extracted		P(Has Student Loans)		Student Loans				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
									OLS	IV	IV
	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)
Equity Extracted									0.008	-0.602**	-0.510***
									(0.007)	(0.287)	(0.191)
Enrolled in College	0.036**	0.045	2.772**	2.671	0.405***	0.320***	9.226***	5.740***	8.994***	10.893***	7.101***
	(0.015)	(0.031)	(1.159)	(2.508)	(0.023)	(0.032)	(0.829)	(0.914)	(0.823)	(1.357)	(1.418)
Enrolled in College * %Δ HP	0.095**	0.119**	7.887**	9.372**	-0.124***	-0.127***	-4.744***	-4.776***			
	(0.043)	(0.050)	(3.065)	(3.624)	(0.044)	(0.043)	(1.403)	(1.513)			
%Δ HP	0.034***	0.038***	3.076***	2.567***	0.005	0.002	0.325***	0.319*		2.176**	1.627***
	(0.009)	(0.011)	(0.719)	(0.877)	(0.004)	(0.005)	(0.118)	(0.179)		(1.043)	(0.511)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes	No
Household FE	No	Yes	No	Yes	No	Yes	No	Yes	No	No	Yes
N	6386	6386	6386	6386	6386	6386	6386	6386	6386	6386	6386
Clusters	51	51	51	51	51	51	51	51	51	51	51
R2	0.076	0.349	0.074	0.362	0.378	0.620	0.185	0.527	0.167	-2.083	-2.066
Robust F-stat										6.623	6.686
Weak ID P-value										0.030	0.036

Note: The first eight columns report the difference-in-difference estimates of home equity and student loan borrowing as functions of college enrollment and the interaction of these indicators with house price growth. As house prices increase households are significantly more likely to extract equity and less likely to depend on student loans. Column 9 reports an OLS estimate of the effect of equity extraction on student loan borrowing and shows no relationship. Columns 10 and 11 instrument for equity extraction with the interaction of house price growth and college enrollment and we find a negative relationship: an addition dollar of extracted equity reduces student loan debt by fifty to sixty cents. Each specification includes a quadratic in the age of the head of household, the household size, lagged loan-to-value ratio of the household, log income, and year fixed effects. Standard errors are clustered at the state level. See text for more details.

Table 5: The Effect of House Prices on Equity Extraction and Student Loans: Sample Splits by Liquid Wealth

	P(Extracts Equity)		Equity Extracted		P(Has Student Loans)		Amount of Student Loans	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Low LW	High LW	Low LW	High LW	Low LW	High LW	Low LW	High LW
	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)
Enrolled in College	0.044	0.049	0.987	5.156	0.364***	0.254***	6.719***	4.173***
	(0.046)	(0.047)	(2.720)	(3.978)	(0.044)	(0.040)	(1.274)	(1.083)
Enrolled in College * %Δ HP	0.153**	0.056	12.599***	3.302	-0.100**	-0.173**	-4.368*	-5.155*
	(0.063)	(0.074)	(4.398)	(4.997)	(0.047)	(0.080)	(2.173)	(2.905)
%Δ HP	0.030**	0.039***	2.830**	2.172*	-0.001	0.003	0.219	0.317
	(0.014)	(0.013)	(1.206)	(1.083)	(0.009)	(0.007)	(0.193)	(0.258)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3198	3188	3198	3188	3198	3188	3198	3188
Clusters	46	47	46	47	46	47	46	47
R2	0.346	0.350	0.371	0.357	0.630	0.613	0.557	0.470

Note: This table reports OLS estimates of borrowing behavior as functions of college enrollment and the interaction of this indicators with house price growth. The sample is split by measures of household liquidity constraints. The estimates show that constrained households are driving equity extraction while both types of households reduce their dependence on student loans. Each specification includes a quadratic in the age of the head of household, the household size, lagged loan-to-value ratio of the household, log income, and year fixed effects. Standard errors are clustered at the state. See text for more details.

Table 6: Financing College Enrollment: House Prices or Labor Markets (PSID)

	Equity Extracted		Student Loans		P(Has Student Loans)		Student Loans			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9) IV	(10) IV
	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)
Equity Extracted									-0.546*	-0.482**
									(0.279)	(0.191)
Enrolled in College	0.033**	0.044	9.123	2.599	0.392***	0.309***	8.772***	5.438***	10.221***	6.689***
	(0.015)	(0.031)	(0.443)	(2.530)	(0.023)	(0.032)	(0.761)	(0.901)	(1.306)	(1.409)
Enrolled in College * %Δ HP	0.119***	0.145***	9.331***	10.931***	-0.135***	-0.125**	-5.092***	-5.265***		
	(0.044)	(0.051)	(2.647)	(2.901)	(0.047)	(0.047)	(1.810)	(1.748)		
Enrolled in College * %Δ UR	0.004	0.004	0.218	0.248	0.028***	0.031***	0.973**	0.954**	1.092***	1.073***
	(0.006)	(0.007)	(0.549)	(0.459)	(0.009)	(0.011)	(0.430)	(0.434)	(0.382)	(0.376)
%Δ HP	0.053***	0.056***	4.379***	3.663***	0.006	-0.000	0.332**	0.290	2.722*	2.054***
	(0.011)	(0.012)	(0.909)	(1.027)	(0.005)	(0.006)	(0.136)	(0.231)	(1.406)	(0.685)
%Δ UR	0.003	0.003	0.058	0.062	-0.000	-0.001	-0.045	-0.046	-0.013	-0.016
	(0.004)	(0.005)	(0.236)	(0.262)	(0.002)	(0.002)	(0.084)	(0.099)	(0.138)	(0.126)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	No	Yes	No	Yes	No	No	No	Yes	No	Yes
N	6386	6386	6386	6386	6386	6386	6386	6386	6386	6386
Clusters	51	51	51	51	51	51	51	51	51	51
R2	0.078	0.350	0.076	0.362	0.385	0.627	0.192	0.533	-1.679	-1.825
Robust F-stat									12.427	14.197
Weak ID P-value									0.016	0.018

Note: This table reports difference-in-difference and instrumental variable estimates of home equity and student loan borrowing as functions of college enrollment and its interaction with individual house prices and state-level changes in unemployment rates. The estimates show that controlling for unemployment rates has almost no effect on the estimated effects. Each specification includes a quadratic in the age of the head of household, the household size, lagged loan-to-value ratio of the household, log income, and year fixed effects. Unemployment rates are from the BLS. Standard errors are clustered at the state level. See text for more details.

Table 7: Financing College Enrollment: House Prices or Labor Markets (CCP) and Placebo Test

	Equity Extracted		Student Loans				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
					IV	IV	IV Placebo
	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)
Equity Extracted					-0.826	-0.789	0.150
					(0.077)	(0.092)	(0.021)
Student Present	6.086	6.712	9.123	7.902	14.349	13.311	0.559
	(0.769)	(0.904)	(0.443)	(0.327)	(0.978)	(1.063)	(0.141)
Student Present * %Δ HP	8.212	9.767	-7.024	-7.768			
	(0.738)	(1.118)	(2.647)	(0.222)			
Student Present * %Δ Emp		-5.766		2.552		-2.394	
		(3.806)		(0.688)		(2.801)	
%Δ HP	2.410	3.390	3.570	4.672	5.513	7.322	-1,801
	(0.552)	(0.838)	(0.151)	(0.169)	(0.578)	(0.871)	(0.338)
%Δ Emp		3.807		2.552		1.697	
		(2.572)		(0.688)		(1.966)	
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	353,256	239,297	347,032	237,514	334,914	225,364	194,923
Clusters	62,344	61,174	61,577	60,405	49,459	51,613	
R2	0.01	0.01	0.009	0.09			
Robust F-stat					32.38	35.21	58.62
Weak ID P-value					0.000	0.000	0.000

Note: This table reports difference-in-difference and instrumental variable estimates of home equity and student loan borrowing as functions of the presence of a likely student its interaction with zip-level house prices and county-level employment growth. The estimates show both that our results are robust to changing datasets and that employment growth has almost no effect on the estimated effects of house prices. Each specification includes a controls for credit score, household debt, and year fixed effects. Employment data are from the CPB. Standard errors are clustered at the individual level. See text for more details.

Table 8: Effect of House Prices on Enrollment and Other Outcomes: PSID

	(1) P(Enroll) β /(se)	(2) P(Credit Cards) β /(se)	(3) P(Student Working) β /(se)	(4) P(Tuition Covered) β /(se)	(5) P(Personal Loan) β /(se)	(6) P(Home Improvement) β /(se)
College Age	0.387***					
	(0.022)					
College Age * %Δ HP	-0.049*					
	(0.025)					
Enrolled in College		0.308***	0.449***	0.473***	0.072***	-0.022
		(0.030)	(0.031)	(0.039)	(0.021)	(0.021)
Enrolled in College * %Δ HP		-0.068	-0.154***	0.109**	0.007	0.017
		(0.045)	(0.052)	(0.052)	(0.045)	(0.026)
%Δ HP	0.019	0.008	0.017*	0.007	0.002	0.054***
	(0.011)	(0.010)	(0.009)	(0.007)	(0.005)	(0.017)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes	Yes
N	6386	6386	6386	6386	6386	6386
Clusters	51	51	51	51	51	51
R2	0.777	0.585	0.637	0.663	0.342	0.356

Note: This table reports OLS estimates for the younger household members enrolling in college, having credit cards, joining the labor force, for the family covering tuition, the student taking out a personal loan from relatives, and the household undertaking home improvements. The estimates show that individual house prices reduce the likelihood of enrolling in college, significantly reduce the likelihood that an enrolled member is in the labor force and increase the likelihood that the family covers some tuition. There are no significant effects on the probability of having a credit card, a personal loan, or home improvement. Each specification includes a quadratic in the age of the head of household, the household size, lagged loan-to-value ratio of the household, log income, and year fixed effects. Standard errors are clustered at the state level. See text for more details.

A Appendix Tables

Table 9: The Effect of House Prices on Financing College Enrollment: Sample Splits by Head Education

	P(Extracts Equity)		Equity Extracted		P(Has Student Loans)		Amount of Student Loans	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	No College	College	No College	College	No College	College	No College	College
	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)
Enrolled in College	0.035	0.052	3.877	2.552	0.319***	0.318***	6.573***	5.532***
	(0.068)	(0.035)	(5.472)	(2.424)	(0.061)	(0.035)	(1.917)	(1.079)
Enrolled in College * %Δ HP	0.149**	0.115	10.431**	5.711	-0.139*	-0.123*	-5.344**	-5.022*
	(0.074)	(0.082)	(4.607)	(5.190)	(0.081)	(0.073)	(2.624)	(2.659)
%Δ HP	0.031*	0.085***	1.876	5.397***	0.001	0.016	-0.189	1.009**
	(0.018)	(0.025)	(1.231)	(1.639)	(0.007)	(0.012)	(0.189)	(0.413)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2618	3768	2618	3768	2618	3768	2618	3768
Clusters	47	47	47	47	47	47	47	47
R2	0.403	0.356	0.449	0.354	0.666	0.625	0.613	0.532

Note: This table reports OLS estimates of borrowing behavior as functions of college enrollment and the interaction of this indicator with house price growth. The sample is split by whether or not the head of the household has some college education. The estimates show that both sets of households behave similarly, although equity extraction of less-educated households does appear to be more sensitive to house prices. Each specification includes a quadratic in the age of the head of household, the household size, lagged loan-to-value ratio of the household, log income, and year fixed effects. Standard errors are clustered at the state level. See text for more details.