The Housing Crisis and the Rise in Student Loans

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Abstract

We study if the collapse in U.S. house prices over the 2000s contributed to the rise in student loans. Using household-level panel survey data, we find that as home prices fall households are 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 subsitution is driven entirely by households that are liquidity constrained. We find little evidence that individual home equity significantly affects enrollment decisions, although local economic conditions do matter. We extend our analysis with credit bureau data to expand the sample and trace longer-run effects of this additional 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 households responded by continuing to enroll in college and relying on student loans. A back-of-the-envelope calculation suggests the 30% fall in house prices from the 2006 peak resulted in the average college student borrowing more than $1300 more in student loans.

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

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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 households 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] and Cooper and Wang [2014]). 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.

The recent rise in student loans happened to occur in a period when student loans became relatively more expensive. Figure 1 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. As a result, for most borrowers 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 the housing market drove students to borrow more or even alter their enrollment decision. Lovenheim [2011], Lovenheim and Reynolds [2013], and Stolper [2014] argue that increases in home equity credit access significantly affected the intensive and extensive margins of college enrollment decisions. In

contrast, Brown, Stein and Zafar [2015] find little evidence that declines in house prices and home equity borrowing caused households to take on more student debt. In addition, 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, but not because of any effect on the individual household's access to home equity, but instead because rising house prices were correlated with expansions in labor markets.

We examine if changes in access to home equity credit affect how households finance college enrollment and their enrollment decisions 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 to the PSID. 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.

To identify the effects of access to home equity credit we adapt an identification strategy similar to Lovenheim [2011], where we exploit changes in 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 are able to exploit the very large movements in house prices in a period when home equity extraction was relatively common (Greenspan and Kennedy [2008]). While it is plausible that changes in home values are outside the control of a household, it is possible that they are correlated with other local factors that could affect enrollment or financing. So we also check if local aggregated house price movements are driving our results and determine that our results are coming from the effects of the individual's own house price.

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 household fixed effects, 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. 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. Given the sizable magnitudes, it is plausible that changes in home equity credit access might significantly affect the financing of college enrollment or enrollment itself.

Our central result is that changes in the ability to borrow against home equity driven by house prices caused 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 the 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. We also find that as this support declines students are more likely to enter the labor force while enrolled. Our are robust to an extensive set of controls including changes in local house prices and various fixed effects. Moreover, we find little evidence that movements in individual house prices affect the household's decision to enroll in college, but movements in state-level house prices are negatively correlated with the college enrollment decision. This emphasizes that our results are driven by movements in access to home equity and not by local 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. Households that have little liquid wealth relative to their income respond respond to house prices by increasing equity extraction and reducing student loan borrowing. This suggests that liquidity constraints are central to this mechanism, but we also find that unconstrained households reduce their dependence on student loans as house prices increase, but they do not extract equity. We posit that this 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.

While the PSID gives us a very detailed perspective along important dimensions, it suffers from a relatively small sample size. This limits our ability to precisely estimate longer run effects of these exogenous changes in student leverage as well as perform extensive subsample analysis. To

address these limitations we extend our analysis with credit bureau data. This work is currently in progress.

To summarize, we document 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 $1000 of additional student loans. This increase is equal to about 10% of the median student loan balance in 2007 or to over 25% of the increase in the median student loan balance from 2007 to 2013 in our sample. This figure likely understates the size of the effect on households that planned on using home equity to primarily pay for college. Our estimate suggests that if parents were unable to borrow $25,000 of equity to pay for college enrollment, then students took on between $10-15,000 more student debt. Because liquidity-constrained households were the primary households responding to these shocks this higher cost of financing college falls on households with little spare liquidity, 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. $\Delta \log(HP_{it})$ 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 including growth in house prices and find that local shocks are not driving our results.

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.

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 still useful. 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 wealth 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. To understand the effects net of any enrollment decision, the effects on students who do decide to enroll, and the presence of selection in estimates of model 2, we report estimates from both models when appropriate. 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

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 collapse 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. 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.[1] 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.

Tables 1 and 2 provide baseline summary statistics for our sample in each year excluding

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

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.[2] 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 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 and the plausibility. LTVs are generally low, starting out at about 40% in 2001 and declining to

[2]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]).

23% in 2013.

Given these high levels of home equity it is plausible that households could extract this 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. To quantify equity extraction and its relationship with consumption Cooper [2010] defines equity extraction 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 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 $20,000 and $30,000. 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 somewhat smaller than the numbers reported by Bhutta and Keys [n.d.]. Since they have a higher frequency identification technique relying on 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 significant variation within each of these years, which allows to use differences within years and states for identification. The vast majority of variation in individual house prices is idiosyncratic with over 75% of the variation remaining after netting out state-year fixed effects.

2.1.2 Consumer Credit Panel

[in progress]

3 PSID Results

All specifications, unless otherwise noted 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.[3] Column two shows that households with members enrolled in college are about four percentage points more likely to extract equity. 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 have essentially no different probability of extracting 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 being driven by households that do not enroll college age members 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 seem rely on both home equity and student loans to finance college enrollment, although home equity borrowing is less frequent and smaller on average. This is partly a function of the way these quantities are defined: households report the student loan balance as long as the balance is positive, while equity extraction is a one time event. Later we cumulate these numbers to take into account this different in timing. This table establishes that both types of financing are prevalent in the data and in

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

relatively large quantities, so that some margin for substitution between the types of credit is possible

We now turn to testing if movements in house prices affect college enrollment or the way households finance college enrollment. We expect that as house prices increase, households have access to more home equity and so will become more likely to rely on equity extraction to finance college enrollment or possibly more likely to enroll in college. As a result, households might rely less on financing education with student loans. In table 4 we examine the same outcomes but now we include the interaction of four-year house price growth with the indicators for college age or college enrollment. We include state- or household-level fixed effects to check the robustness of the results to household unobservables. The coefficient on the interaction between college age and house price growth in columns one and two shows that on average, changes in house prices have a small negative effect on the probability of college enrollment. The coefficient in column two suggests a 10% increase in house prices (over four years) reduces the probability of attending college by about 0.6 percentage point. Given the results in Lovenheim [2011], Stolper [2014], or Charles et al., 2015, we might have expected to find a result in either direction. We do limit our analysis to households that are homeowners across the entire sample, which would likely amplify the liquidity effects of Lovenheim [2011] and possibly dampen the labor supply effects in Charles et al., 2015. It is also possible that the self-reported change in the household's home is a poor proxy for the boom in local economic conditions highlighted by Charles et al. [2015]. We examine this possibility below. Given that we find only a small enrollment response, at least upon the extensive margin, our estimates conditioning on enrollment are unlikely to suffer from severe selection bias when we look at other outcomes.[4]

Columns three and four turn to the probability of equity extraction. We find that as house prices increase a household that chose to enroll a member in college is more likely to extract equity. Both columns report estimates indicating that 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

[4] **Appendix table ?? examines the intensive margin of enrollment where we check if household expectations of educational attainment vary with house prices.**

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 regression suggest that as households have access to more home equity they become increasingly reliant on equity extraction to finance college enrollment.

In contrast, columns seven and eight of table 4 show that as house prices increase households with a member enrolled in college are less likely to have a student loan. The magnitudes are comparable to if 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 of 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 affects 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 coefficient from column nine, the 30% decline in house prices from 2006 to 2010 resulted in an average increase of about $1,500. To the best of our knowledge, this is the first empirical evidence that the house price bust contributed to the increase in student loan debt because of a change in the accessibility of home equity credit.

However, an important possibility is that movements in house prices, while outside of the control of households, are still correlated with other shocks affecting households. The chief alternative would be local house prices, which are likely to be heavily correlated with individual house prices but would imply a distinct mechanism. To check for this we include interactions of our indicators with the four-year change in state-level house price indexes from Zillow along with our interaction with the household's own house price change. If the household's own house price change is simply

standing in for changes in local conditions then we would expect the coefficient on individual house prices to be statistically and economically insignificant while the state-level house price index would reflect our previous results. Table 5 reports these results for the four primary outcomes with specifications including state- or household-level fixed effects.

Columns one and two show that while there is still a mild negative effect of individual home prices on college enrollment, state-level changes in house prices have a large negative effect. A 10% increase in the state-level house price index reduces the probability that a household enrolls a college-age member in college by 2 to 3 percentage points while the household's home prices have a negligible effect. This result is very consistent with Charles et al. [2015], who argue that local labor market conditions driven by house price movements significantly affected college enrollment. While they focus on the boom period prior to the 2000s, this result suggests the same mechanism was important in the late 2000s. The 30% decline in house prices during the collapse implies that households were over 6 percentage points more likely to enroll in college, but not because of changes in the value of that household's own home.

Columns three through six turn to the probability of equity extraction and the amount extracted. We estimate very similar coefficients on the interaction of enrollment with personal home price changes but the estimates are not statistically significant at standard levels. However, we estimate the effects on the interaction of state-level house prices and enrollment to be centered on zero or slightly positive with large standard errors. We do find that growth in both the personal and the state-level house prices increase the probability of equity extraction by similar amounts, although only the effect of personal prices is statistically significant. Turning to the amount of equity extracted in columns five and six we find that only individual house prices have any effect on the amount of equity extracted to finance college enrollment. Our estimated coefficients on the interaction of enrollment with personal house prices are essentially unchanged from the regression without state-level house price growth apart from larger standard errors. The estimated coefficients on the state-level house prices are actually negative, but the magnitude depends on the level of fixed effects and the standard errors are too large to make any inference with precision. These results all indicate that it is the value of the household's own home that drives the relationship between equity extraction and enrollment and it is not driven by movements in the local housing market or its effects on labor markets.

Finally, in columns seven through ten we check if state-level or individual house prices are driving our results on student loans. As with equity extraction, we find almost no change in the coefficients on the interaction between college enrollment and individual house price growth after controlling for the state-level house prices and enrollment indicator. We still estimate that the probability college enrollment is financed with student loans is falling with individual house prices and the dollar amount of the decline is only slightly smaller (a 10% increase reduces the student loan balance by $400 as opposed to $470). Overall, these estimates indicate that it is the household's own house price growth that drives our results and not overall conditions in the housing market. In contrast to the equity results, we do find a negative, albeit imprecise, relationship between state-level house prices and financing college enrollment with student loans, both in probabilities and loan balances. Both estimates are very imprecise, but potentially consistent with local labor market conditions affecting the intensive margin of the enrollment decision.

However, a very robust finding is that the probability of using student loans and the balance of student loans are both increasing in state-level house prices. In contrast, both of these outcomes exhibit little to no relationship with individual house price growth. Notice that this relationship is conditional on actually being enrolled in college, so it is not driven by student loan balances of current students. This apparent effect of average house prices on student loan debt is unique in that it is the only estimated effect that is extremely sensitive to the inclusion of year fixed effects. When year fixed effects are dropped this coefficient is much less positive and cannot be distinguished from zero. Critically, the interaction estimates in which we are primarily interested are essentially robust to dropping all other fixed effects (see **Appendix**). Given the instability of the estimated effects of average state-level house price growth we do not emphasize them.

These results establish that individual house price growth affects the financing of college enrollment by increase reliance on equity extraction and reducing student loan borrowing. To sharpen this tradeoff we now estimate the effect of reduced home equity borrowing on student loan credit directly using model 3. As we discussed, we instrument for equity extraction with the interaction of the college age or enrollment indicators with individual house price growth. The identifying assumption is that house prices do not affect the amount of student loan debt except through their effect on equity extraction. By conditioning on college enrollment our estimate excludes households who chose not to enroll in college as a result. However, our results earlier suggested that this margin

of adjustment was relatively unimportant.

Table 6 reports OLS and IV estimates with and without household fixed effects and with and without state-level house price interactions. Column one regresses the level of student loan debt on the amount of equity extracted and essentially recovers a zero. This is expected as most equity extraction has nothing to do with financing education. The remaining columns isolates the variation in equity extraction driven by individual house prices and households enrolling a member in college. We find an economically and statistically significant negative relationship between equity extraction and student loan debt. Column two 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 three controls for the interaction of college enrollment with state-level house price growth, which reduces the substitution by about ten cents. Columns four and five control for household fixed effects and recover very similar coefficients, ranging from fifty to forty cents of student loan debt for every foregone dollar of extracted home equity. Notice that because this estimate isolates movements in student loan debt correlated with home equity credit this estimate does not reflect wealth effects unless those wealth effects induced additional equity extraction. These estimates provide the most direct evidence yet that the collapse in the home equity market increased the amount of student debt used to finance college enrollment. Consider a household planning on extracting $25,000 to finance college enrollment. Assuming the household was unable to access this equity our estimates imply this resulted in the student taking on an additional $10-15,000 in student loans.

That this coefficient is not exactly negative one could result from several factors. First, complications in measuring equity extraction and the timing of student loan balances might reduce the apparent substitution. Second, households are capable of adjusting along additional margins as they respond to the change in student loans. These margins include the student working, enrolling in a less expensive school, or alternative types of debt like credit cards.

We shed some light on these additional responses and other possible uses for the extracted equity in table 7. Column one reports the effects on the probability that a student has taken out a credit card or other loan. While this probability seems to decline slightly with house prices for households enrolling a member in college, the estimated effect is relatively small and statistically insignificant. Column two 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, but 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 negative relationship is consistent with students increasing their labor supply as support from parents falls. This increased labor income partially suggests that households do not substitute one-for-one into student loans as home equity falls.

We also examine in table 7 how three potential uses of additional home equity covary with enrollment and individual house prices. Column three examines the probability that the household covers 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. A 10% increase in house prices increases the probability of covering tuition by almost one percentage point. Column three 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.[5] 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 five 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.

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 did not

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

stop enrolling in college, instead a significant fraction of the financial burden fell on students and student loans. Students are also more likely to join the labor force as support from their parents declines.

3.1 Liquidity Constraints

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 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 regressions on each of these samples. 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 8 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 much more important for households that are liquidity constrained.

In contrast to the equity extraction results, both types of households behave very similarly when it comes to how house prices affect dependence on 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 it is likely that 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.

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 (in the Appendix) if our results are driven by the education-level of a household. In general, we find some difference in equity extraction behavior with the equity extraction of less-educated households somewhat more responsive to house price movements. 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 relatively more important.

4 Consumer Credit Panel Results

[in progress]

5 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. The long-run consequences of this tradeoff and intergenerational transfer is a topic left for further research.

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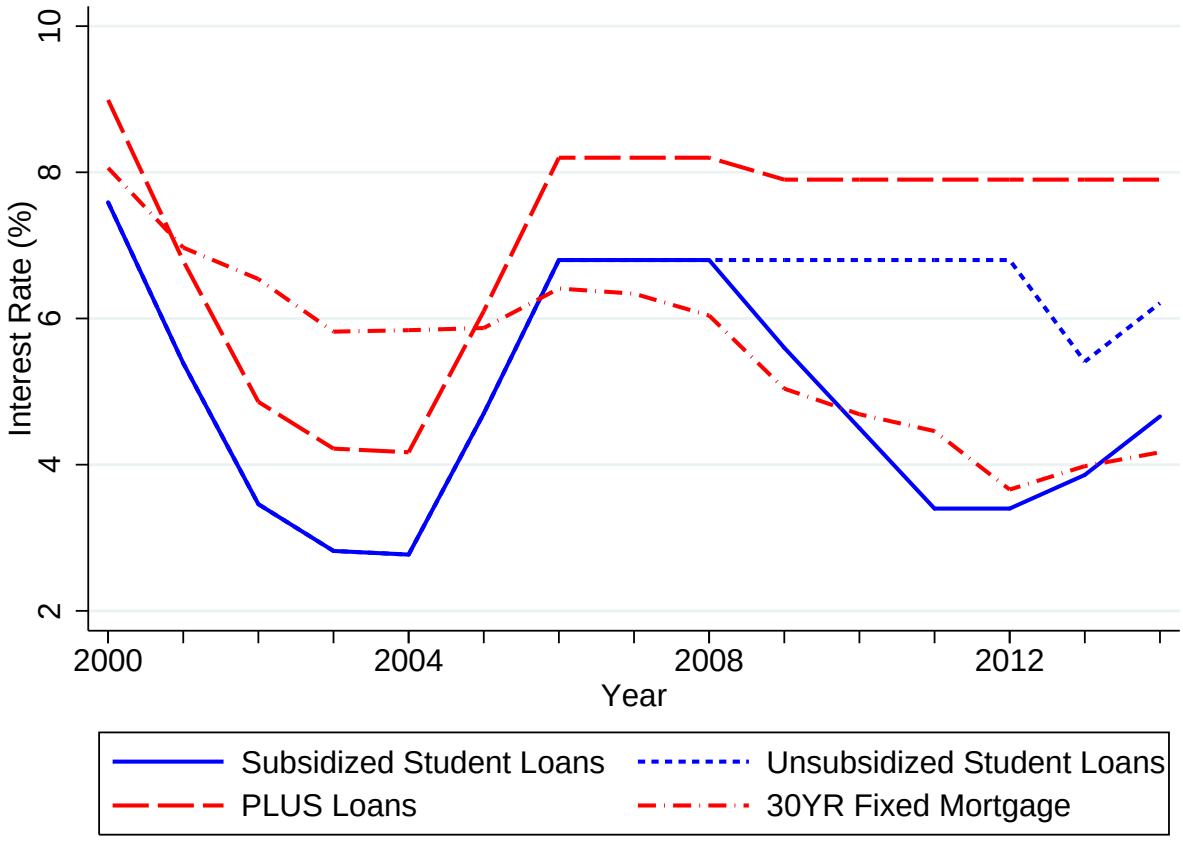
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6 Figures

Figure 1: 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.

7 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 (13.0)	51.0 (15.0)	53.0 (15.0)	55.0 (15.0)	57.0 (16.0)	59.0 (15.0)	61.0 (16.0)
Size of Household	4.0 (3.0)	3.0 (3.0)	3.0 (2.0)	3.0 (2.0)	2.0 (2.0)	2.0 (2.0)	2.0 (1.0)
School Expenses	1.8 (5.4)	1.8 (7.8)	2.7 (10.3)	2.0 (9.9)	2.7 (11.5)	3.8 (10.9)	4.6 (14.1)
Student Loans	. (.)	. (.)	5.4 (10.2)	10.2 (13.2)	14.9 (28.2)	14.3 (24.8)	14.8 (21.3)
Gross Income	85.3 (73.0)	80.2 (69.5)	78.8 (72.6)	80.5 (78.2)	81.6 (80.9)	76.2 (75.4)	77.1 (75.9)
Mortgage Debt	53.0 (106.0)	53.3 (113.5)	48.2 (113.4)	45.8 (120.0)	41.6 (120.9)	36.2 (114.3)	27.8 (101.8)
Home Value	147.2 (142.5)	170.2 (181.6)	181.4 (215.6)	203.5 (234.0)	198.1 (203.1)	190.6 (171.5)	180.4 (175.8)
Liquid Wealth	17.7 (78.9)	20.4 (86.9)	19.3 (90.5)	21.4 (112.9)	21.8 (98.1)	19.1 (92.4)	18.5 (99.0)
Illiquid Wealth	41.2 (113.1)	39.7 (113.6)	42.8 (138.6)	46.8 (156.7)	39.6 (124.9)	42.9 (173.1)	46.3 (175.8)
Home Equity	86.0 (104.5)	102.1 (130.5)	116.6 (158.4)	142.4 (183.1)	115.9 (158.5)	107.7 (148.6)	111.0 (151.7)
LTV	38.3 (62.7)	34.0 (59.7)	28.1 (55.6)	23.4 (51.7)	25.0 (58.0)	23.2 (57.1)	20.0 (55.7)
Equity Extracted	20.7 (30.5)	23.5 (35.7)	24.1 (42.0)	29.0 (42.0)	26.2 (45.3)	21.3 (52.1)	23.0 (38.0)
House Price Growth (%)	6.1 (23.5)	6.0 (24.1)	6.4 (28.3)	3.7 (24.5)	-7.5 (19.8)	-3.8 (19.7)	-2.9 (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 College Enrollment and the 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)	(10)
	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)
College Age	0.516***	0.387***								
	(0.022)	(0.022)								
College Age * %Δ HP	-0.076***	-0.035*								
	(0.019)	(0.019)								
Enrolled in College			0.036**	0.045	2.772**	2.671	0.405***	0.320***	9.226***	5.740***
			(0.015)	(0.031)	(1.159)	(2.508)	(0.023)	(0.032)	(0.829)	(0.914)
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	0.014***	0.014	0.034***	0.038***	3.076***	2.567***	0.005	0.002	0.325***	0.319*
	(0.005)	(0.009)	(0.009)	(0.011)	(0.719)	(0.877)	(0.004)	(0.005)	(0.118)	(0.179)
Controls + Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Household FE	No	Yes	No	Yes	No	Yes	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	0.458	0.777	0.076	0.349	0.074	0.362	0.378	0.620	0.185	0.527

Note: This table reports OLS estimates for the probability of enrollment in college, and borrowing behavior as functions of college age or enrollment and the interaction of these indicators with house price growth. The estimates show a small effect of house prices on college enrollment. But as house prices increase households are significantly more likely to extract equity and less likely to depend 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 5: The Effect of House Prices on College Enrollment and the Source of Funding: Individual or State-level House Prices

	P(Enrolled in College)		P(Extract Equity)		Equity Extracted		P(Has Student Loans)		Student Loans	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)	β /(se)
College Age	0.520***	0.404***								
	(0.025)	(0.027)								
College Age * %Δ HP	-0.038*	-0.014								
	(0.019)	(0.016)								
College Age * %Δ HPI	-0.261***	-0.231***								
	(0.082)	(0.066)								
Enrolled in College			0.039**	0.058*	2.802*	4.619	0.408***	0.305***	9.515***	5.622***
			(0.017)	(0.031)	(1.473)	(2.980)	(0.029)	(0.033)	(1.089)	(1.175)
Enrolled in College * %Δ HP			0.077	0.092	8.018**	9.458**	-0.119**	-0.113***	-3.859***	-4.061***
			(0.046)	(0.056)	(3.822)	(4.345)	(0.046)	(0.040)	(1.216)	(1.413)
Enrolled in College * %Δ HPI			0.006	0.043	-0.645	-2.565	-0.198	-0.181	-6.204*	-5.490
			(0.080)	(0.101)	(5.025)	(6.102)	(0.133)	(0.144)	(3.433)	(4.192)
%Δ HP	0.008*	0.019***	0.033***	0.046***	3.355***	2.979**	0.004	-0.002	0.272*	0.287
	(0.005)	(0.007)	(0.012)	(0.015)	(0.892)	(1.110)	(0.004)	(0.006)	(0.161)	(0.262)
%Δ HPI	0.033*	0.037	0.029	0.035	-1.567	-0.362	0.055***	0.053***	1.967***	1.843***
	(0.017)	(0.024)	(0.033)	(0.039)	(1.576)	(2.123)	(0.012)	(0.016)	(0.468)	(0.680)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	No
Household FE	No	Yes	No	Yes	No	Yes	No	No	No	Yes
N	4714	4714	4714	4714	4714	4714	4714	4714	4714	4714
Clusters	40	40	40	40	40	40	40	40	40	40
R2	0.468	0.787	0.077	0.368	0.072	0.375	0.386	0.649	0.183	0.556

Note: This table reports OLS estimates college enrollment and borrowing behavior as functions of college age or enrollment and the interaction of these indicators with individual house price growth and with state-level house price index growth. The estimates show that controlling for local house prices has almost no effect on the estimated effects except for college enrollment. College enrollment moves strongly and negatively with state-level house price growth. 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: The Effect of Equity Access on Student Loan Debt: Instrumental Variable Estimates

	(1) OLS β /(se)	(2) IV β /(se)	(3) IV β /(se)	(4) IV β /(se)	(5) IV β /(se)
Equity Extracted	0.008	-0.602**	-0.481*	-0.510***	-0.429**
	(0.007)	(0.287)	(0.270)	(0.191)	(0.176)
Enrolled in College	8.994***	10.893***	10.863***	7.101***	7.605***
	(0.823)	(1.357)	(1.545)	(1.418)	(1.700)
Enrolled in College * %Δ HPI			-6.514*		-6.591
			(3.960)		(4.361)
%Δ HPI			1.213		1.688**
			(0.756)		(0.735)
Controls + Year FE	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	No	No
Household FE	No	No	No	Yes	Yes
N	6386	6386	4714	6386	4714
Clusters	51	51	40	51	40
Robust F-stat		6.623	4.403	6.686	4.738
Weak ID P-value		0.030	0.048	0.036	0.057

Note: This table reports OLS and IV estimates of the effects of equity extraction on student loan debt. We use the interaction of enrollment with the changes in house prices as an instrument for equity extraction. All of the IV estimates indicate that households substitute mortgage debt for student loans with one dollar of extracted equity replacing between forty and sixty cents of student loan debt. 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 7: House Price and College Enrollment: Additional Outcomes

	(1) P(Credit Cards) β /(se)	(2) P(Student Working) β /(se)	(3) P(Tuition Covered) β /(se)	(4) P(Personal Loan) β /(se)	(5) P(Home Improvement) β /(se)
Enrolled in College	0.307***	0.446***	0.473***	0.071***	-0.023
	(0.030)	(0.032)	(0.039)	(0.021)	(0.021)
Enrolled in College * %Δ HP	-0.043	-0.135***	0.096**	0.012	0.023
	(0.048)	(0.050)	(0.041)	(0.040)	(0.023)
%Δ HP	0.004	0.014*	0.004	0.003	0.034**
	(0.008)	(0.008)	(0.006)	(0.005)	(0.013)
Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes
N	6386	6386	6386	6386	6386
Clusters	51	51	51	51	51
R2	0.585	0.633	0.663	0.342	0.355

Note: This table reports OLS estimates for the younger member borrowing on credit cards, joining the labor force, 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 significantly reduce the likelihood that an enrolled member is in the labor force and increase the probability 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. See text for more details.

Table 8: 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.

A Appendix Tables

Table 9: The Effect of House Prices on Equity Extraction and Student Loans:
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	0.036	0.052	3.857	2.574	0.318***	0.318***	6.504***	5.559***
	(0.068)	(0.035)	(5.357)	(2.427)	(0.061)	(0.035)	(1.908)	(1.084)
Enrolled in College * %Δ HP	0.128**	0.087	9.546*	4.382	-0.112	-0.106*	-4.028*	-4.185**
	(0.063)	(0.080)	(5.314)	(4.696)	(0.072)	(0.057)	(2.367)	(1.946)
%Δ HP	0.022*	0.060***	1.570	3.687**	0.002	0.013	-0.086	0.842***
	(0.012)	(0.021)	(1.023)	(1.477)	(0.005)	(0.010)	(0.143)	(0.305)
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	0.354	0.449	0.353	0.666	0.625	0.610	0.532

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 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 do 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. See text for more details.