House Price Growth when Kids are Teenagers: A Path to Higher Earnings?

Daniel Cooper*
Federal Reserve Bank of Boston

María José Luengo-Prado
Northeastern University

April 11, 2013

Abstract

This paper examines whether rising house prices immediately prior to children entering college have an impact on their earnings as adults. Higher house prices provide homeowners with additional funding to invest in their children's human capital. The results show that a one percentage point increase in house prices, when children are 17 years old, results in roughly 1 percent *higher* annual income for the children of homeowners, and 1.5 percent *lower* annual income for the children of renters. The children who benefit the most from rising house prices are those whose parents are most likely liquidity constrained homeowners.

*The views in this paper are our own and not necessarily those of the Federal Reserve Bank of Boston or the Federal Reserve System. We would like to thank Stephan Ball, Chris Foote, Olga Gorbachev, and participants at the 2012 HULM spring conference and the 2012 Federal Reserve System Applied Microeconomics conference for their insightful comments, Kevin Todd for helpful research assistance, and Elizabeth Murry for her useful editorial advice.

1 Introduction

The United States has long been a country that promotes homeownership through the mortgage interest deduction, Federal Housing Administration loans, and the non-taxability of imputed rental income. Encouraging homeownership is often viewed as a public policy mechanism for improving households' economic stability and generating increased community investment. For example, homeowners can use the accumulated equity in their homes as collateral for loans (or lines of credit) to finance home improvements or other needed expenditures. Cooper (2012), Hryshko et al. (2010) and Lovenheim (2011), among others, consider the role of housing wealth as borrowing collateral. Indeed, how fluctuating house values impact consumer behavior has become an important topic for economists, especially given the recent housing boom and bust.

This paper investigates whether house price changes at the Metropolitan Statistical Area level (MSA-level) just before children graduate from high school impact their future earnings ability. The idea is that house price appreciation raises owners' housing equity and in turn their ability to borrow against their homes to finance desired expenditures. In particular, house price gains immediately before children enter college (teenage year house price growth) potentially increase homeowners' ability to invest in their children's human capital.

Children of homeowners who start college following a run-up in house prices may have greater educational opportunities than children of homeowners who start college following a period of flat or falling housing prices, or than the children of renters. With additional parental financing, college students potentially need to work less to help pay for their studies and/or are able to attend a better quality institution—an outcome that is considered by Lovenheim and Reynolds (2010). Better educational opportunities for children often translate into higher lifetime earnings. Rising house prices are likely to be particularly beneficial for the children of homeowners who are otherwise financially constrained.

We analyze whether house price fluctuations when kids are 17-years-old impact their earnings as adults using data from the Panel Study of Income Dynamics (PSID), a dataset that allows us to track parents and their offspring over time. The PSID includes earnings, education, location, and a multitude of other demographic and financial data for both parents and their children. We also have access to restricted geographic identifiers that enable us to use house price growth for the MSA in which households lived when their kids were age 17. We can therefore investigate the impact of house price gains during

kids' teenage years on their future earnings holding parental income and other relevant factors fixed. MSA-level house price variation is arguably exogenous with respect to parents' human capital investments in their children, and these kids' earnings later in life. A potential concern is that households move to a given MSA to take advantage of future house price growth and improve their future capacity to invest in their children's education. It seems unlikely, however, that homeowners can predict house price growth when they move, which is often well in advance of their children being college aged.

To our knowledge, this paper is the first to examine the link between house price growth during children's teen years and their future earnings. We further contribute to the literature by examining fluctuations in house prices as a source of exogenous variation in liquidity for parents (homeowners) looking to invest in their children's human capital. Our dataset also enables us to exploit differences in parents' housing tenure choice and financial resources when considering children's earnings as adults.

Our results show that house price appreciation during children's teenage years has an effect on their future earnings conditional on parental income and other demographic factors. House price growth is beneficial for the children of homeowners but not for the children of renters living in similar locations. In particular, when children are 17-years-old, a one percentage point increase in house prices results in roughly 1 percent *higher* average annual income for owners' children (later in life) and 1.5 percent *lower* income for renters' children. Further analysis suggests that house price growth boosted mainly the earnings of children whose parents were homeowners but who had limited non-housing financial resources. In particular, a one percentage point gain in house prices for homeowners with below median non-housing wealth raises their kids' earnings as adults by 2.4 percent. This finding is consistent with house price growth during children's teenage years helping liquidity constrained parents invest in their kids' human capital, which in turn opens up greater earning opportunities for these children as adults.

Our results are robust to controlling for local economic conditions as well as MSA fixed effects that might be correlated with house prices and children's educational and economic opportunities. Alternative measures of house price growth yield similar results and falsification tests (using house price growth at different ages) confirm that it really is house price growth at age 17 that matters for the future earnings of the children of (likely) liquidity constrained parents.

We also show that house price growth at age 17 leads to higher educational attainment for children of homeowners. Children of constrained parents who experience housing appreciation when they are 17 years old also have lower non-collateralized (school and

other) debt as adults conditional on attending college than similar kids whose parents did not experience house price growth. All of these results are consistent with homeowning parents being able to invest more in their children's human capital when house prices rise.

There is much existing research that examines either the factors that impact (children's) educational outcomes or what influences intergenerational earnings. A paper closely related to this one is Boehn and Schlottmann (1999), which examines the relationship between parental homeownership and children's education. The paper finds that the children of homeowners, on average, are more likely to have higher educational achievement than the children of renters. The analysis focuses primarily on parents' housing tenure choice (rent versus own). The authors do not, however, consider whether changing house prices have an impact on kids' achievement beyond their parents' homeownership status, nor do they investigate whether housing has a differential effect for the children of liquidity constrained parents.

Another closely related study is Lovenheim (2011), which looks at how changing house prices during teenage years impact children's college enrollment decisions. The motivation behind this line of research is similar to ours—that is, Lovenheim argues that rising house prices increase homeowners' equity and thus parents have an additional source of funds they can tap to help pay for their children's college education. He finds that after 2000, house price growth raised college attendance among households with limited income. Lovenheim's research, however, does not consider the longer-term impact that house price growth has on children's earnings mobility when they are adults and focuses primarily on the most recent housing boom and bust.

Dynarski (2003) looks at the relationship between parents' financial liquidity and children's college attendance. In particular, she exploits the 1992 rule change that exempted parents' home equity from being considered in financial aid need calculations, which made many students newly eligible for federal college loan programs. Dynarski uses data from the Current Population Survey and the Survey of Income and Program Participation and finds that students eligible for loans are more likely to go to college. There is also a shift among these students toward attending four-year institutions.[1] Brown et al. (2009)

[1]According to the Department of Education, home equity was included in federal need analysis until the Higher Education Amendments of 1992 eliminated home equity from the federal aid calculations beginning in the 1993-94 academic year. Schools are still allowed to incorporate home equity in calculating students' eligibility for *non-federal* financial aid programs, although many eliminated home equity from their private financial aid calculations in the early 2000s. Our results are robust to controlling for the 1992 change in the federal financial aid formulas.

also consider the college financial aid market and show theoretically and empirically that parents tend to under-invest in their children's education when there is uncertainty about whether their children will succeed in college.

The related literature also includes Carneiro and Heckman (2002), who find that credit constraints are not sufficient to explain the gaps in college attendance across income groups. Belley and Lochner (2007) look at the effect of cognitive ability and parental income on children's educational attainment and find that credit constraints matter for explaining poorer families' educational attainment. In comparison, Cameron and Taber (2004) provide evidence against credit constraints playing a role in educational attainment. Recent papers that consider the relationship between parental income and children's achievement include Dahl and Lochner (2011), Oreopoulos et al. (2008) and Morris and Duncan (2011). These papers find that parental income plays and important role in determining children's achievement. This literature, however, does not consider the relationship between parental homeownership, house prices and children's achievement.

The remainder of the paper proceeds as follows. Section 2 discusses our empirical approach and Section 3 describes the data. Section 4 presents our results. Section **??** discusses our results and provides some suggestions for future work based on this paper's findings.

2 Empirical Approach

In a world without frictions, parents should be able to invest optimally in the human capital of their child, and in principle the child should reach his or her full earnings potential based on that investment. In reality, college tuition costs are a large financial burden, and at times prevent parents from investing optimally in their children's education.[2] Changing house prices around the time kids are college-aged may therefore impact children's earnings as adults because rising home values increase parent's housing equity and in turn their capacity to borrow to finance their kids' educations.

Our empirical approach considers the impact that changing house prices have when kids are 17 years old on their future earnings as adults. We condition this analysis on parental income (and other controls) given the existing literature examining the link between parental and children's earnings (see for example Solon, 1992; Zimmerman, 1992).

[2]See Becker (1962) for a general discussion of human capital investments, and Mulligan (1997) for a discussion of parental investment in their children.

In particular, we estimate the following equation:

$$y^{i,c} = \beta_0 + \beta_1 y^{i,p} + \beta_2 g^{h,17} + \beta_3 g^{h,17} \times d^{i,p} + e_i \ , \tag{1}$$

where $y^{i,c}$ is a child's (log) earnings, $y_t^{i,p}$ is his or her parent's (log) earnings, $g^{h,17}$ is real house price growth in the MSA in which the parent(s) and child lived over the two years prior to the child turning 17, and $d^{i,p}$ is an indicator variable that takes a value of one if the parent(s) is (are) likely liquidity constrained and zero otherwise. We also include controls for the age and family size of parents and the birth year and family size of their children. This approach is similar to the one in Charles and Hurst (2003) and captures any life-cycle factors that might influence the relationship between children's and parent's income, since parent and child resources are not measured at the same point of the life-cycle. MSA-level house price data come from the Federal Home Finance Agency (formerly OFHEO). As part of our robustness checks we also include additional parental and demographic controls to ensure that house price growth is not simply picking up other socioeconomic factors that might impact children's earnings as adults. The data, including how we identify parent-child pairs, are discussed in more detail in the next section.

There should be a positive relationship between house price appreciation and kids' earnings as adults to the extent that an increase in parents' housing equity allows them to invest more in their kids and either send them to college when they otherwise could not have and/or send them to a better college than was previously affordable. This conjecture yields a number of testable predictions for the estimates of equation (1). First, the earnings of children of homeowners should benefit from rising house prices, while the earnings of renters' children should not necessarily benefit and could even be worse off. Renters do not have any equity in their homes to borrow against, and rising house prices are positively correlated with rising rents (as shown in the appendix) so renters may have less available income to invest in their children's education. Renters may also be planning to buy in the future and higher house prices may require them to save more for a down payment, leaving less income available for their children's education expenses. We would therefore expect that the impact of house prices on children's earnings, β_2, should be positive for the children of owners and zero or negative for the children of renters.[3]

[3]We split the sample to examine the effect of house price growth on the earnings of renters versus owners' children rather than include an interaction term for homeownership in order to allow all the parameters in equation (1) to vary freely based on households' housing tenure choice. We are primarily interested in the effect of tenure choice on the relationship between house prices and children's earnings,

In addition, amongst the children of homeowners, the ones whose earnings should really benefit from rising house prices are those kids with parents who are potentially liquidity constrained. Such parents are the ones who likely lack the resources and/or borrowing capacity to optimally invest in their children. Unconstrained parents can optimally invest in their kids' human capital, and thus housing appreciation prior to college should have little if any impact on the earnings of these parents' children because they do not face a binding college financing constraint. Conditional on homeownership, we therefore expect house price growth when kids are 17 years old to have a differentially large effect on the earnings of children with constrained parents, $\beta_3 > 0$.

3 The Data

We use data from the PSID which in 1968 started interviewing about $4,800$ households. Sixty percent of the initial households belong to a cross-national sample from the 48 contiguous states, while the other portion is a national sample of low-income families from the Survey of Economic Opportunity. The PSID conducts annual interviews (biennial since 1997), thereby creating a panel dataset with extensive socioeconomic information. What makes this dataset very useful for studying intergenerational linkages in the United States is that over time the PSID follows the original households and the households started by their offspring.

To construct our matched sample of parents and children, we proceed as follows. We start in 2007, the latest year for which family income data were available when we initiated this project, and keep individuals aged 25–65 years who are heads of households—we refer to these individuals as children although they are adults when we collect their income information.[4] The PSID contains identifiers to link children with their parents (we link a child to his/her father and if not possible to his/her mother). There are also data on children's birth year, so we can compile data on family or parental variables around the time their children were 17-years-old assuming they still lived at home (more details below). We keep respondents from both the representative PSID sample and the low-income sample since our focus is on the effect of credit constraints on human capital investment, and credit constraints could affect low-income families to a greater extent.

however, the direct relationship between parents and children's earnings could also be impacted by whether or not a family rents or owns its housing.

[4]When studying intergenerational income correlations, it is standard to restrict the sample to individuals who are below the typical retirement age, and who are most likely to have completed their education. We employ the same age restrictions for parents.

The PSID maintains Geocode Match Files that contain the identifiers necessary to link the main PSID data to other datasets with information on the characteristics of respondents' neighborhoods, cities, or states.[5] In our case, we identify the MSA children lived in during the year they turned 17 and add in the relevant MSA house price appreciation data at that time from the Federal Housing Finance Agency (FHFA). Since MSA-level house price indices from FHFA start in the late 1970s our final sample contains 913 "child" respondents who turned 17-years-old between 1979 and 1999 (the median year is 1990, and the respondents are 25–45-years-old in 2007), and live in 126 different MSAs.[6] There is great variation in house price growth in our sample: the two-year mean real growth is 2 percent, with a 9 percent standard deviation. The maximum price decline over a two-year period is 28 percent and occurred in the Eugene-Springfield MSA in 1981, while the maximum appreciation, 39 percent, took place in the Boston MSA in 1986.[7]

We focus on MSA-level house price data because they are less subject to measurement error than households' self-reported house values in the PSID, and the variation in MSA-level house prices that we use in our analysis is arguably exogenous with respect to kids' future earnings. Endogeneity between house prices and kids' future income arises if one believes that households who want to send their children to college are selecting into MSAs with high expected house price growth. That is, parents know they want to invest in their children's education, and thus they pro-actively move to MSAs where they expect house prices to increase prior to their kids entering college. This argument relies on households' being able to anticipate future movements in house prices, which is unlikely since house price changes tend to be unforecastable. Our sample does not include the early 2000s housing boom when households may have indeed moved to areas where they thought house prices would continue to increase (even though they ultimately did not). In addition, the average homeowner in our sample has lived over nine years in his/her existing home by the time his/her child is 17 years old. It is therefore a bit of a stretch to say that households moved to an area at least 8 years ahead of their kids going to college because they expected house prices to increase over that period.

Along with several socioeconomic variables for children from the 2007 survey, we

[5]The Geocode Match data are highly sensitive (usually pinpointing the census tract in which families live), and are available only under special contractual conditions designed to protect the anonymity of respondents.

[6]We would like to include children who turned 17-years-old before 1979 or after 1999. Our estimation setup and the availability of MSA house price data (1975 through 2011), however, prevent the inclusion of additional children in our sample.

[7]We use the all-item-less-housing CPI to deflate house prices.

collect parental and family variables around the time the child was 17-years-old. Table 1 presents weighted summary statistics using the PSID family (household) weights. Parental age when children are age 17 ranges from 32–65 years (the median age is 44), so they are on average older than the children we observe as heads of households in 2007 who range in age from 25–45 years (the median age is 33). The median family size for the parents is four, while it is three for their children. When calculating intergenerational income elasticities, we control for these differences by including a second-degree polynomial for parent's and children's family sizes, a third-degree polynomial for parent's ages, and year-of-birth dummies for children. A smaller share of children (53 percent) are homeowners compared to their parents (77 percent) due to the fact that children are on average ten years younger when we observe their asset holdings. In addition, 18 percent of the heads of households in the parental generation are black, 86 percent are male, 24 percent have a bachelor's degree or higher, and the average number of completed years of schooling is 13.71.[8] In comparison, 17 percent of children are black, 50 percent are married, 40 percent have at least a college degree, and on average they have 13.69 years of completed education. Since in some instances we restrict the sample to children whose parents were homeowners when they were 17-years-old, appendix Table A-1 presents summary statistics for this sub-sample of roughly 590 children. Overall, the demographic variables are similar between the two samples, although the individual members comprising the owners' sample not surprisingly have, on average, higher income, wealth, and years of schooling.

Our baseline estimates include a measure of parental (family) income, which is the sum of head of household's and any spouse's taxable income (earnings, asset income, net profit and business income), head of household and spouse transfer income, head of household and spouse social security income, plus taxable income, transfer income and social security income from other family members. We average parental income over a five-year period centered around the year their child turns 17 to alleviate the downward bias from measurement error pointed out by Solon (1992) and others in the intergenerational earnings literature.[9] For children, we average their reported family income data for the survey years 2005 and 2007.[10] Average parental family income (in

[8]In the PSID, the head of household is preferably the adult male living in the residence. In addition, heads of households who are black include those individuals who identify as bi-racial. As a result, the percent black in our sample is slightly higher than in aggregate U.S. population statistics.

[9]For example, for a child who turns 17 in 1988, we use parental income for 1986 to 1990. Note however, that for younger children, the number of observations used to calculate average family income may be as low as three because the PSID becomes biennial after 1997.

[10]Reported income in these surveys is for 2004 and 2006, respectively. In addition, we ensure children

2000 dollars) is roughly $63,000, and is about $10,000 higher than children's average family income. Parental income might appear high, but it is a five-year average so transitory variations are attenuated. Average family income is also calculated close to the income peak over the life-cycle for most parents, while we observe their children's resources at a younger age.

Identifying Constrained Households

We identify possibly liquidity constrained parents in different ways. First, we consider parents' non-housing wealth (wealth excluding home equity) using data from the PSID wealth supplements. The PSID started collecting wealth data in 1984 at five-year intervals up to 1999 and biennially afterwards. We use parents' (non-housing) wealth observation closest to, and if possible before, the year their child turns 17.[11] Mean non-housing wealth is approximately $171,000 (median non-housing wealth is $45,000). Second, we construct a measure of parents' liquid wealth as the sum of balances in stocks, bonds, and cash-related accounts using additional information from the wealth supplements. Mean parental liquid wealth is roughly $49,000 in our sample, while median liquid wealth is about $4,000.[12] Third, to avoid possible measurement error problems arising from the infrequency of the wealth supplements, we consider an alternative wealth measure constructed from regularly collected data on households' asset income (dividends, interest, and rental income).[13] We use the value of households' asset income in the year their child turns 17—mean asset income is around $1,300 while the median is zero. Parents with higher asset income likely have higher wealth holdings, and Table 2 shows that indeed the various wealth measures are moderately correlated. We classify a family as potentially liquidity constrained if its non-housing wealth, liquid wealth, and/or asset income holdings are at or below the median of the variable in question.

We interact the liquidity constraint dummy variables with (real) house price growth

are heads in both 2005 and 2007, but include those children with only one year of available income data. The results are similar if we only use children's 2007 income.

[11]We prefer to use parental wealth before the child turns 17 as non-housing wealth may appear low when using a forward observation if parents have already paid for college with non-housing related assets. For kids who turn 17 before 1984 (about 18 percent of the sample), using prior wealth data for their parents is not possible, so we use these parents' 1984 wealth information instead. Our results are similar when we omit these parent/child pairs from our sample.

[12]The number of observations is lower for this variable because the PSID imputes missing observations for comprehensive wealth measures using additional information from the regular family surveys, but it does not do the same for the individual wealth components.

[13]The exact variable definitions vary over the survey years, but we construct as consistent a measure of asset income as possible.

in the MSA where children lived at age 17 to examine the differential effect of house price growth on children's earnings for potentially constrained versus unconstrained families. We use two-year house price growth in our baseline analysis but also discuss results for house price growth measured at different frequencies.

Credit Availability during our Sample Period

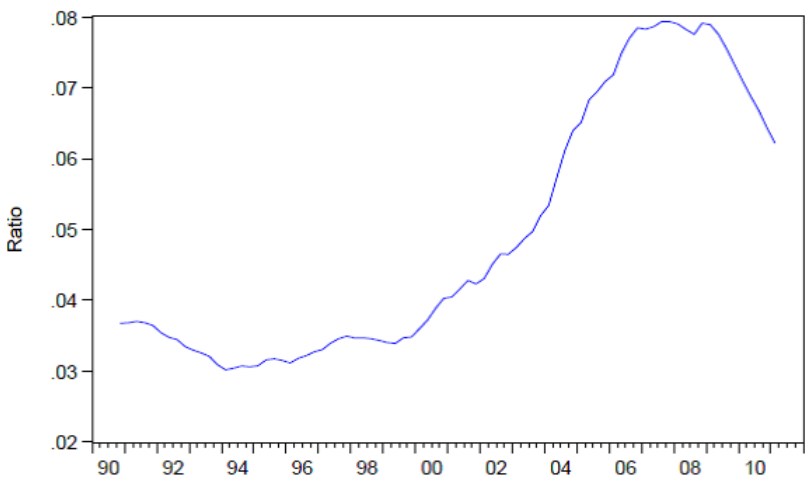
Our sample covers a period of substantial home equity borrowing despite ending prior to the housing boom of the early 2000s. Households' use of home equity borrowing to finance expenditures received much press (and use) during the 2000s house price boom, but such borrowing has been prominent since the elimination of Regulation Q in the early 1980s, and the ensuing liberalization of the credit markets.[14] The 1986 Tax Reform Act that eliminated the interest deduction for non-collateralized (credit card) borrowing and made the interest on primary mortgages and up to $100,000 of home-equity borrowing tax deductible also made Home-equity borrowing a more attractive form of financing. Banks also began publicizing homeowners ability to borrow against their housing equity in the early 1980s and the amount of home equity debt outstanding jumped from $1 billion in 1982 to $100 billion in 1988.[15] In addition, home equity debt outstanding was roughly 4 percent of GDP during the early 1990s, as shown in Figure 1, and while this amout was well below the peak ratio of 8 percent during the 2000s it suggests that households borrowed a substantial amount of money against their homes well before the housing boom in the early 2000s.[16]

[14]Regulation Q limited the interest rates banks were able to pay on deposits and forbade them from paying interest on checking account balances. See Gerardi et al. (2010) for a further discussion of Regulation Q and its effect on limiting household credit. We unfortunately cannot test the impact of this policy change on households' use of home equity borrowing for investing in their children's education because of data availability.

[15]http://www.nytimes.com/2008/08/15/business/15sell.html?_r=1&hp=&adxnnl=1&oref=slogin&pagewanted=all&adxnnlx=1315512301-HZZSBoCsUl9ZZA3evzVbRg accessed September 8, 2011.

[16]We unfortunately cannot explore whether the effect of house price appreciation on children's earnings has become stronger over time because our sample is small and the children in the more recent parent-child pairs are too young to reach meaningful conclusions.

FIGURE 1: Home Equity Debt Relative to Income



Source: Authors' calculations based on NIPA data (GDP) and Flow of Funds data (home equity debt).

4 House Prices and Children's Income

Table 3 reports our baseline results. Standard errors clustered by MSA-by-year (at age 17) are shown in parentheses. Column (1) reports that the estimated elasticity of children's income with respect to their parents' income is 0.45, which is in-line with previous estimates in the literature.[17] In column (2), we include controls for the state children (and their parents) lived in at age 17 and dummies for children's year of birth. With these additional controls, the estimated income elasticity, is just slightly lower than without them, 0.41, and still very much in line with the existing literature. We include state dummies because the constraints faced by residents of states with good-quality, state-run higher education with relatively low tuition might be different from the constraints faced by residents of other states. Including children's birth years accounts for the fact that home-equity extraction may have become easier over the sample period that includes children who were 17-years-old between 1979 and 1999.

In column (3), we include the two-year (real, not annualized) house price appreciation (measured in percents) in the MSA where the children lived at age 17. The estimated coefficient is positive, but it is not precisely estimated. Since we expect a differential effect

[17]For example, Mulligan (1997) estimates an intergenerational income elasticity of 0.43. Mazumder (2005), using U.S. Social Security Administration data, finds an elasticity of 0.47 when using six years of fathers' average earnings, and an elasticity of 0.65 when using an average of fathers' earnings over 15 years.

for owners and renters, we split our sample accordingly. Columns (4) and (5) present the results for renters and owners, respectively. The intergenerational elasticity for renters, 0.24, is significantly lower than the estimated elasticity for owners.[18] This finding may just reflect the fact that homeowners tend to have higher incomes than do renters. Our goal, however, is not to explain the different income elasticities between owners and renters, but rather to study the effect that house price growth has on children's income. We further find that house price growth at age 17 decreases adult income for renters' children and increases adult income for owners' children.

According to our estimates, a one percentage point increase in housing appreciation results in 1.5 percent lower (annual) income for renters' children and 1 percent higher income for owners' children. This translates to roughly $458 of additional earnings for owners' children and $459 less income for renters children based on the median earnings for the two groups.[19] These findings are consistent with the expectation that the children of homeowners benefit from their parents' higher housing wealth and collateral, and that the children of renters are potentially hurt by the higher rents that come with housing appreciation. The impact of fluctuating house prices on children's earnings is also economically significant within the group of homeowners. Other things equal, the child of a homeowner in the 75th percentile of house price growth (growth around 6 percent) is predicted to have about 8.5 percent higher income than the child of a homeowner in the 25th percentile of house price growth (growth about –2.5 percent).

The summary statistics in Table 4 show that there are no substantial differences in MSA-level house prices, income growth or unemployment rates between owners and renters. These data argue against the differential effect of house price growth on the adult earnings of children of renters versus owners being due to renters living in worse MSAs than owners (based on house prices and/or other economic conditions). In addition, house prices and rents are strongly positively correlated at the metropolitan level as shown in Figure A-1 in the appendix. The reported house price appreciation and reported rent increases by owners and renters living in the same MSA in the PSID are also positively correlated, so renters may indeed be hurt by higher rents when house prices rise. In our sample, 46 percent of (parent) renters move to owner-occupied properties in later years and half of them do so within 5 years of their children turning 17-years-old.

[18]The p-value for a χ^2-test of equality of both elasticities is 0.002.

[19]Median income for owner's children is $45,799 and $30,587 for renter's children. The calculation assumes that house prices appreciate one percentage point and then applies the estimated effect for renters and owners to the relevant income measure.

If financial constraints are important for the acquisition of higher education, we would expect house price growth for homeowners to have a larger effect on kids' income when parents are liquidity constrained. The results in columns (6) to (8) in Table 3 tell a very consistent story. The effect of house prices on income for the children of homeowners seems to operate mainly through the liquidity constraint channel: a one percentage point increase in house price growth results in about 2.4 percent higher annual income for the children of parents with below median non-housing wealth.[20] The median income for the children of low-wealth parents is about $32,000, so a 10 percent house price appreciation when these kids are 17-years-old would raise their future earnings by about $5,760. This finding suggests that house price growth during kids' teenage years has an economically meaningful impact on the future earnings of children with constrained parents. The house price effect is smaller and less precisely estimated for the kids of unconstrained parents. The implied earnings effect is similar based on the alternative estimates of liquidity constraints in columns (7) and (8). Since the results are similar for the different measures of liquidity constraints, we focus on the first measure, below median non-housing wealth, in the rest of our analysis. Going forward we will also focus on the outcomes for homeowner's children only in the interest of brevity. We do not find substantial differences in the effect of house price growth for potentially constrained versus unconstrained renters.

4.1 Robustness

This section considers the robustness of our results to alternative specifications and controls. Additional sensitivity analysis can be found in the the appendix. In particular, Table A-2 reports the results from alternative approaches to clustering the standard errors, and Table A-3 considers the symmetry of our findings. That is, we investigate whether housing depreciation around the time kids are 17 is associated with *decreased* earnings for these children as adults.

Additional Controls

The estimates in the first columns of Table 5 introduce some additional controls to our baseline specification. These estimates should be compared to columns (5) and (6) in Table 3. In columns (1) and (2), we add a quadratic house price growth term to check whether the interaction between house price changes and the borrowing constraint

[20]The number is calculated by adding the estimated coefficients for β_2 and β_3 in column (6) of Table 3.

indicator is simply picking up some nonlinearity in relationship between house price growth and children's earnings. The results suggest that this is not the case. The effect of house price growth on children's earnings is still much larger in magnitude for children with liquidity constrained parents.

To ensure that we are not picking up the effect of the families living in areas with more valuable housing stock and hence with potentially higher quality schools, columns (3) and (4) also control for the logarithm of parents' (self-reported) house values when their child was 17-years-old. Parents' house values have a substantial and precisely estimated impact on children's earnings as adults. The differential earnings impact of house price growth for the children of constrained versus unconstrained parents persists, however, even with the inclusion of parents' housing values.

Long-Term Differences in Economic Growth across MSAs

Arguably, a potential explanation for the positive correlation between house price growth at age 17 and children's income as adults is that differences in house price appreciation signal long-term differences in economic growth across MSAs. That is, earnings are higher for individuals who grow up in economically strong MSAs and either stay there after high school or come back after college. This argument does not explain, however, why earnings for renters' children are lower when house prices go up unless these children systematically live in or move to worse MSAs in our sample, which the data suggest is not the case.

We could more methodically address this location issue with a large sample that has sufficient variation across both MSAs and the year in which children are 17. In particular, we could include location-year (MSA and year at 17) fixed-effects in regressions that utilize self-reported house price growth from the PSID or more geographically disaggregated house price growth to exploit variation in house price appreciation within a MSA in a given year. The relatively small size of the PSID does not allow us to conduct such an exercise, but we employ some alternative approaches to address this location effect concern.

In columns (5) and (6) of Table 5, we measure parents' and children's income relative to the per-capita income in the MSA in which they live at the time their earnings are recorded (2007 for children; a five year interval centered around the year the child turns 17 for parents). Once again, the results are very similar to our baseline findings—house price growth when kids are 17-years-old leads to higher (relative) income for them as adults, and this effect is much larger for the children of liquidity constrained parents.

The only difference is that the estimated differential effect is less precise (p-value 0.11) since the sample is smaller due to the limited availability of MSA-level income data.

The results in columns (7) and (8) include MSA fixed effects instead of parents' and children's relative income. This approach addresses the concern that our findings are simply picking up unobserved differences in where child/parent pairs live when the kids are 17-years-old. Identification for these estimates comes from house price growth variation over time within an MSA based on homeowners self-reported house prices. The results are qualitatively and quantitatively similar to our baselines findings, but are estimated with less precision.

In addition, columns (9) and (10) report results for a sample of children who live in a different MSA in 2007 from where they lived at age 17 (about 30 percent of the original sample). By construction, these estimates should not be capturing long-term MSA-level growth trends since house price growth at 17 and children's income are measured in different locations. The estimates indicate a strong, direct impact of house price growth at 17 on children's income as adults. This finding is consistent with a robust housing wealth effect—parents whose house prices go up feel richer and consume more (or better) education on behalf of their children. There is however, no evidence of a larger impact of house price growth at 17 on the adult earnings of children of possibly liquidity constrained parents. Still, only around 21 percent of respondents in this sample have low wealth parents, which could indicate that those with less resources tend to remain closer to their families as adults.

Our results are also robust to controlling for local economic conditions when the children in our sample are 17-years-old for which house prices might be a proxy. These controls include two-year per-capita MSA income growth (measured over the same years as house price growth), and the MSA unemployment rate in the year kids have their 17th birthdays. Table 6 reports these results.

The Timing of House Price Growth

Table 9 considers alternative definitions and timing for measuring house price growth during children's adolescent years. In columns (1) and (2), we use a dummy variable for house price growth instead of the continuous two-year MSA house price growth variable in the baseline regressions. The dummy takes the value of 1 if two-year house price growth is positive and is 0 otherwise. According to our results, a child's income is roughly 15 percent higher in adulthood if housing appreciated in the MSA where he/she lived at age 17. We do not find a differential effect between constrained and unconstrained families

when using the dummy variable for house price growth, possibly because the variation in house prices is limited. The estimates in Columns (3) and (4) use households' relative house price changes—house price growth in the MSA in which they live when their kids are 17 relative to the national average. The results indicate that one percentage point housing appreciation above the national average is associated with roughly 1 percent higher income for kids as adults.

The estimates in columns (5) and (6) of Table 9 use one-year house price growth. The overall effect of housing appreciation on children's earnings is similar to the baseline case. A one percentage point increase in house price growth during kids' teenage years leads to 1.6 percent higher income when they are adults. In addition, the income effect for the children of financially constrained parents continues to be differentially large; a one percentage point increase in house prices leads to roughly 4.4 percent higher annual income or about $1,425 evaluated at these children's median earnings.[21] There also continues to be an economically meaningful effect of fluctuating house prices on children's adult earnings within the group of homeowners. For a homeowner in the 75th percentile of house price growth (growth around 3 percent), his or her child is predicted to have about 6.7 percentage points higher annual income than the child of a homeowner in the 25th percentile of house price growth (growth about –1.3 percent), all else equal.

The results in the remaining columns in Table 9 are based on house price growth measured over a *longer* time horizon. In particular, columns (7) and (8) incorporate four-year house price growth and columns (9) and (10) look at cumulative housing appreciation since parents purchased their current home.[22] Housing appreciation over a longer period is arguably a better indicator of parents' total equity available for use as borrowing collateral, at least for parents who have not tapped into their equity yet. The results continue to show that teenage year house price growth has a positive impact on children's earnings as adults.

The main difference between these longer horizon house price growth results and the baseline ones is that housing appreciation does not have a differential impact on the income of children with constrained parents. These results suggest that recent house price gains are what matter for the future earnings of children of liquidity constrained parents, while house price growth over longer horizons is more important for the average family.

[21] If we annualize the baseline two-year house price growth, then the equivalent estimated income effects of house price growth are 1.1 percent and 4.8 percent, respectively.

[22] If house price indices were not available for the entire tenure period, the cumulative house price growth refers to the longest time period for which it can be calculated.

This finding makes sense given the limited resources constrained households have. To the extent these households cannot or do not save, they likely would have spent any past gains in housing equity, and thus it is only recent gains in house prices that provide borrowing collateral for them to invest in their kids' educations. In comparison, households who are unconstrained are likely savers but still may wish to access the equity in their home to help finance their kids college education. For these households it is accumulated equity in their houses that determines how much they can borrow, and thus we see the direct effect of longer term house price growth on unconstrained households and not constrained households.

Falsification

If our main story holds and rising house prices when children are 17-years-old improve liquidity constrained parents' ability to send their kids to college and/or send them to a better (more expensive) institution, then housing appreciation during children's post-teenage years should have little or no impact on their earnings as adults. In contrast, housing appreciation during children's younger years might increase their earnings through enhanced community wealth and property tax revenues. There should not, however, be a differential house price effect for the children of constrained versus unconstrained parents at younger ages since rising house prices should have less of a direct impact on parents' immediate college financing needs—especially given the results in Table 9 that recent house price growth matters the most for constrained households. There may also be less of a differential earnings effect between the children of renters versus owners since higher community revenues through increased property values and taxes should impact the education of all children in the community.

Table 8 shows estimates of our baseline equation where we use house price growth when children are 13 and when they are 21. At age 13 house price growth is more likely going to impact local education than individual kids' ability to go to college. In addition, by age 21, most children are well into if not nearing the end of their post-secondary education and further changes in their parents' housing equity should have much less of an impact on their educational opportunities and achievements.

The results in columns (1) to (4) of Table 8 show that house price growth at age 13 has a positive and relatively large impact on children's earnings as adults. The effect is similar for children of owners and renters. Moreover, there is not a differential effect of housing appreciation on the earnings of constrained versus unconstrained owners' children. Both findings are consistent with the idea that house price growth when kids are younger is

most likely to impact all children's earnings through quality improvements in the overall local education system. Columns (5) to (8) update our baseline estimates with the sample restricted to those parent child pairs who have available data for house price growth at age 13 as well as age 21 to ensure the results in the preceding columns are not driven by the somewhat different sample. The results continue to show a negative impact of house price growth on the adult earnings of renters' children and a positive impact on owners' kids' income. In addition, children of constrained owners continue to benefit the most from increasing house prices around the time they go to college.

The remaining columns in Table 8 show little relationship between house price growth measured at the time kids are 21, and their earnings as adults. Taken together the falsification results are consistent with our findings picking up the impact of house price growth on parents' post-secondary education investments in their children and not a spurious relationship between house price growth and kids' earnings as adults.

Home Equity Levels

Lovenheim (2011) argues that households' (dollar) amount of home equity matters for parental ability to invest in children's post-secondary education since, other things equal, a given percentage increase in house prices raises the wealth levels of those with expensive houses more. We therefore further test the robustness of our results using the *level* of parental housing equity when their kids are 17. As seen in column (1) of Table 9, an additional $10,000 of home equity increases children's adult income by 0.9 percent, but the coefficient is not precisely estimated. If we interact housing equity with the low wealth level indicator, column (2), we find that $10,000 of additional equity increases kids' earnings as adults by 3.1 percent (significant at the 5 percent level).

Since housing equity is endogenous and likely reflects unobservable differences across households which are potentially correlated with education decisions and children's future earnings, we use MSA-level house price growth to construct an instrument in the remaining columns of Table 9. We define our instrument for housing equity (IV) as follows:

$$IV = (1 + g)H \ , \tag{2}$$

where g is house price growth and H is the parents' initial house value. This approach follows the one in Lovenheim (2011) and abstracts from refinancing decisions and mortgage payments.

In columns (3)–(4), we define g as our baseline two-year house price growth measure and H as households' self-reported home values two years before the reference period (year at age 17 for the child). We employ four-year house price growth and home values four periods prior to the reference period like Lovenheim (2011), in columns (5)-(6), and cumulative house price growth coupled with households' original home values (at time of purchase) in columns (7)–(8). The results are similar across these different specifications for the instrumental variable—$10,000 of additional home equity increase earnings by 1.4–2.1 percent on average.[23] For children whose parents are potentially liquidity constrained, the effect is significantly larger—ranging from 6.2–7.6 percent higher earnings per $10,000 of additional equity. In sum, these findings are also consistent with our hypothesis that parents' housing equity gains matter when it comes to financing their children's education (likely due to the low cost of home equity financing), particularly for those parents who are potentially liquidity constrained.

4.2 Direct Exploration of Children's Other Outcomes

There are two additional margins on which homeowners' children might benefit if house price growth influences their educational attainment. First, we would expect the number of college graduates to increase with house price appreciation and the number of children who achieve less than a college education to fall. With additional household resources, more children should have the financial means to complete college. In addition, the children of parents that finance more of their college education through home-equity borrowing should, all else equal, have less non-collateralized debt holdings as adults since they need to borrow less themselves to finance their education.[24] We analyze these outcomes as a further test of our claims about the relationship between house price growth and children's future earnings when adults.

To begin, we classify children into three broad educational categories—high school graduate or less, some college, and BA-BS degree or higher. We then investigate whether housing appreciation can predict college attendance (some college) and college completion (BA-BS degree or higher) using simple probit specifications. Other explanatory variables include family income at age 17 and two measures of family wealth: a dummy for having

[23]We restrict the sample to respondents who have been in their home for at least four years to have the same number of observations across columns in Table 9. Results are qualitatively the same if we include people with shorter housing tenure in columns (1)–(4).

[24]College loans, like credit cards, are classified as non-collateralized debt because this borrowing is unsecured.

below median non-housing wealth, and parents' self-reported home value when their child was 17. We also interact house price appreciation with low wealth to mimic our previous specifications, and include a dummy for whether the household head (parent) completed college along with the unemployment rate in the MSA where the child lived at age 17.

Table 10 reports estimated marginal effects of the relevant explanatory variables on children's educational attainment evaluated at the mean of all the other independent variables.[25] Higher parental income and housing values along with parental college education are associated with a higher probability of college completion and a lower probability of not continuing formal education beyond high school. In addition, children of low wealth parents are less likely to complete college and are more likely to just finish high school. Focusing on our variable of interest, children of constrained parents have roughly a 2 percent higher probability of completing college in response to one percentage point higher housing appreciation around their 17th birthday. For the same housing appreciation, children of constrained parents are 1.7 percent less likely than unconstrained households to complete only some college. These findings are consistent with house price growth enabling homeowners with limited financial resources to invest in their children's educations.

A somewhat surprising result in Table 10 is that the average impact of house price growth on college graduation is negative and *precisely* estimated. This finding is broadly consistent with housing appreciation positively affecting the educational attainment of the children of constrained parents only. A slightly more literal interpretation is that higher house price growth makes some children not attend college and only complete high school. For these kids rising house prices are likely correlated with overall good economic conditions, and they choose to pursue other opportunities afforded to them by the booming economy rather than attend college.

We also explore whether house price growth during children's teenage years affects their non-collateralized debt obligations as of 2007. If housing appreciation allowed these children's parents to finance more of their education then all else equal these kids should have less college related debt as young adults. For this analysis, we focus on households' "other debt," which includes liabilities such as "credit card charges, student loans, medical or legal bills, or loans from relatives." Despite being the only non-housing debt data available, this measure is appropriate since children with little parental financing for college may rely on credit cards to pay for their expenses in addition to student loans.

[25]The number of observations is slightly lower than in our previous specifications because unemployment rates are not available for all MSAs.

Table 11 summarizes the results. Children who have completed at least some college have higher non-collateralized debt, on average, as adults—a finding that is consistent with the long period over which college debt can be repaid (30 years). Debt is lower for college attendees, however, if house prices appreciated in the year they turned 17. This finding suggests that when house prices rise, financing sources other than student loans were available to pay for these individuals' education—a result that is consistent with our claim that rising house prices allow parents to invest more in their children's human capital.

4.3 *Mobility*

In the intergenerational mobility literature, it is standard to report transition matrices that are simple cross-tabulations of parents' and children's economic status after their status has been ranked into a finite number of groups. The elements of a transition matrix measure the probability of a child's economic position conditional on his/her parent's position. To further explore the role of house prices on income mobility we construct transition matrices as well. Since our sample size is small, we divide parents and children into quartiles of their respective income distributions. Given that in our data parents and children are observed at different stages of the life-cycle, we first regress log family income on second-degree polynomials for age and family size (separately for parents and children) and classify children and parents into four quartiles based on the residuals from these regressions.[26] The results are reported in Table 12 (for homeowners) and Table 13 (for renters).

The diagonal elements in a given matrix measure the probability of a child being in the same income quartile as his/her parent(s). Interpreting the off-diagonal elements of the matrices is similar. For example, the second entry in the first row of a given matrix tells us the probability of a child being in the second quartile of the income distribution conditional on his/her parent being in the bottom quartile and so on. The standard errors for these conditional probabilities are shown in parentheses.[27]

[26]The quartiles are calculated using the PSID family weights.

[27]The standard errors are calculated using the following formula:

$$\hat{\sigma}_{jk} = \sqrt{\frac{p_{jk} \times (1 - p_{jk})}{n_j}} \quad , \tag{3}$$

where p_{jk} is the probability of a household starting in position j and ending up in position k, and n_j is the number of households in position j. In our case, n_j is the number of parents who are

Since we are interested in the effect of house price growth on intergenerational mobility, we report transition matrices after splitting the sample based on whether house price growth was above or below the national average when children were 17-years-old. We use relative house prices because the cross-tabulations do not control for state of residence or year of birth effects. The top panel in Table 12 shows the transition matrix for the full sample of homeowners, the middle panel shows parent/child pairs with house price growth above the national average, and the bottom panel shows households with below average house price growth.

As extensively documented, the persistence of economic status is greatest for the top and the bottom income quartiles. Our full sample results are consistent with this pattern. Children with parents in the bottom income quartile have a 43 percent probability of being in the bottom income quartile themselves. Similarly, children with parents in the top income quartile have a 38 percent probability of being in the top income quartile themselves. The probability of children remaining in the second or third quartiles is lower, 24 percent and 35 percent respectively. Examining the split between households that experience favorable versus unfavorable house price changes yields some interesting results. In particular, the probability of children ending up in the highest income quartile is lower for all parent income quartiles when house price growth in the MSA the child was living in at age 17 is below the national average than when growth is above the national average. Children who at age 17 reside in MSAs that experience good house price growth have a 47 percent probability of remaining in the top income quartile conditional on their parents being in the top income quartile as compared to only a 27 percent probability for similar children who at age 17 live in areas that experience below average house price growth. This difference across income groups is statistically significant (t-statistic 11.7).[28] The result is especially interesting given that the children of high-income parents, other things equal, are more likely to attend college. The probability of children ending up in the lowest income quartile conditional on their parents being in a higher income group is also greater in the below average house price growth sample.

Unlike the sample of homeowners, house price growth does not appear to have a consistent influence on economic mobility for the sample of renters. Children living in

in a given quartile of the income distribution, and p_{jk} is the probability of a child ending up in a given part of the earnings distribution conditional on the position of their parents when they were age 17. For additional details on this approach for calculating standard errors go to http://fedc.wiwi.hu-berlin.de/xplore/tutorials/xfghtmlnode32.html.

[28]This inference is based on a difference of means test with unequal variance. There are 28 degrees of freedom.

areas of above average house price growth are slightly more likely to remain at the top of the income distribution than similar children living in areas of lower than average house price growth, conditional on their renter parents being at the top of the distribution. In contrast, children whose renter parents start in the first or third income quartiles are more likely to move to the top of the income distribution if they live in areas where house price growth was below average. A similarly varied pattern emerges if you consider children's downward mobility by location. House prices therefore do not seem to have much impact on the economic mobility of the children whose parents rented rather than owned a home, which is what we would expect if our story about house prices and children's future achievement is valid. Although these cross-tabulation results are only suggestive given the small sample sizes, they nevertheless are consistent with the idea that intergenerational income mobility is likely affected by changes in house prices.

5 Discussion and Conclusion

Our results indicate a link between housing appreciation when kids are teenagers and their future earnings as adults. This relationship appears to flow through children's access to post-secondary education and their parents' ability to invest in their human capital. Lovenheim (2011) identifies the link between house prices and college enrollment and we go a step further and look at the impact of house price growth on kids' future earnings.

Still, one question that remains—as Lovenheim (2011) points out—is whether the relationship between house prices and college enrollment and/or future earnings is due to a direct wealth effect or the relaxation of borrowing constraints. That is, do households consume more education (for their children) simply because they feel wealthier or is increased education consumption the result of parents' access to credit and/or cheaper financing?

The vast majority of our results point to an access to credit story—children of homeowners with limited resources are the ones whose educational opportunities and future earnings benefit the most from housing appreciation. This result is robust to many alternative specifications, and the finding is consistent with the results in Cooper (2012) that show housing wealth impacting overall consumption through the borrowing collateral channel. As noted in that paper, it is not clear that housing appreciation should make households feel wealthier because households are not necessarily any better off when

house prices rise since the cost of housing services also rises.

There are a few instances, however, where we do not find a differential effect on kids' earnings as adults based on their parents being constrained or not. This is particularly the case, as discussed earlier, when we restrict the sample to children who live in a different MSA as adults than they did at age 17. There, we find only a direct (and strong) effect of house price appreciation on their future earnings. As noted however, the lack of a differential effect could be due to the small sample size and/or the fact that children of constrained parents may stay closer to where they grew up as adults.

Either way, there is strong evidence that being the child of a homeowner who experiences positive house price growth during one's teenage years matters for that individual's earnings as an adult. Also, the effects we observe do not appear to be due to house prices simply acting as a proxy for local economic conditions or other geographical factors that might impact one's earnings as an adult.

It is also worth noting that we observe our effects through 1999. In comparison, Lovenheim (2011) finds his effects of housing appreciation on college enrollment primarily between 2001 and 2005 and not earlier—something he attributes to the great liberalization of household credit conditions in the early 2000s. As we point out, however, in Section 3, households had increased access and more incentives to borrow against their housing wealth starting in the mid-to-late 1980s. It is possible as well that housing appreciation in the 2000s mattered more in terms of kids enrolling in college who otherwise might not have been able to, while house price growth in previous years provided students who would have enrolled in college anyway with access to better educational opportunities. In addition, our results could in principle be even stronger if we include and focus on the 2000s. Given our desire to look at kids' earnings as adults, though, there are not enough years of post-housing boom data yet to look at the impact of house price growth in the early 2000s on children's future earnings.

The results we do obtain are also economically meaningful. Within the sample of homeowners, children from households that experience house price growth in the top quartile of the distribution have over 8 percent higher annual earnings as adults than children whose families experience house price changes in the bottom quartile of the distribution. Our findings also suggest some potential avenues for future research. One is to explore whether house price appreciation impacts children's college attendance (or completion) and also affects their college choice. Lovenheim and Reynolds (2010) explore the college choice aspect, but it would also be interesting to see whether the house price and college choice channel also has an impact on children's future earnings. Having

data to explore whether children are indeed able to work less while enrolled in college if their parents can finance more of their education would also be interesting. Similarly, it would be worth exploring whether post-secondary education financing choices impact children's job choice and other post-college outcomes. That is, do young adults with a lot of college debt search for and take higher paying jobs, all else equal, in order to repay their loans? Overall, this paper contributed to the earnings mobility and educational achievement literatures, but there is certainly interesting work to be done when additional data become available.

References

Gary Becker. Investment in human capital: A theoretical analysis. *Journal of Political Economy*, 70(5):9–49, 1962.

Philippe Belley and Lance Lochner. The changing role of family income and ability in determining educational achievement. *Journal of Human Capital*, 1(1):37–89, 2007.

Thomas P. Boehn and Alan M. Schlottmann. Does home ownership by parents have an economic impact on their children? *Journal of Housing Economics*, 8(3):217–232, 1999.

Meta Brown, John Karl Scholz, and Ananth Seshadri. A new test of borrowing constraints for education. 2009.

Stephen V. Cameron and Christopher Taber. Estimation of educational borrowing constraints using returns to schooling. *Journal of Political Economy*, 112(1):132–182, 2004.

Pedro Carneiro and James J. Heckman. The evidence on credit constraints in post-secondary schooling. *The Economic Journal*, 112(482):705–734, 2002.

Kerwin Kofi Charles and Erik Hurst. The correlation of wealth across generations. *Journal of Political Economy*, 111(6):1155–1182, December 2003.

Daniel Cooper. House price fluctuations: The role of housing wealth as borrowing collateral. Working Paper, Boston, MA: The Federal Reseve Bank of Boston, 2012. Available at: http://www.mitpressjournals.org/doi/pdf/10.1162/REST_a_00323.

Gordon Dahl and Lance Lochner. The Impact of Family Income on Child Achievement: Evidence from the Earned Income Tax Credit. *American Economic Review,* Forthcoming, 2011.

Susan Dynarski. Loans, liquidity, and schooling decisions. Working Paper. Available at: http://www.nber.org/~dynarski/Dynarski_loans.pdf, 2003.

Kristopher S. Gerardi, Harvey S. Rosen, and Paul S. Willen. The Impact of Deregulation and Financial Innovation on Consumers: The Case of the Mortgage Market. *Journal of Finance*, 65(1):333–360, February 2010.

Dmytro Hryshko, Maria J. Luengo-Prado, and Bent E. Sorensen. House prices and risk sharing. *Journal of Monetary Economics*, 57(8):975–987, 2010.

Michael Lovenheim. Housing Wealth, Liquidity Constraints and College Enrollment. *Journal of Labor Economics,* Forthcoming, 2011.

Michael Lovenheim and C. Lockwood Reynolds. The effect of housing wealth on college choice: Evidence from the housing boom. Working Paper. Available at: http://www.human.cornell.edu/pam/people/upload/Housing-Wealth-and-College-Choice.pdf, 2010.

Bhashkar Mazumder. The apple falls even farther from the tree than we thought: New and revised estimates of the intergenerational inheritance of earnings. In Gintis H. Bowles, S. and Osborne-Groves M, editors, *Intergenerational Inequality*. Princeton, 2005.

Pamela Morris and Greg J. Duncan. Does Money Really Matter? Estimating Impacts of Family Income on Young Children's Achievement with Data from Random Assignment Experiments. *Developmental Psychology*, June 2011.

Casey Mulligan. *Parental Priorities and Economic Inequality*. Chicago, IL: The University of Chicago Press, 1997.

Philip Oreopoulos, Marianne E. Page, and Ann Stevens. The Intergenerational Effects of Worker Displacement. *Journal of Labor Economics*, 26(3):455–484, July 2008.

Gary Solon. Intergenerational Income Mobility in the United States. *American Economic Review*, 82(3):393–408, June 1992.

Hal White. A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity. *Econometrica*, 48(4):817–838, May 1980.

David Zimmerman. Regression Toward Mediocrity in Economic Stature. *American Economic Review*, 82(3):409–429, June 1992.

Table 1: Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Parents					
Age	44.53	5.79	32	65	907
Family size	3.91	1.38	1	12	907
Homeowner	0.77	0.42	0	1	907
Years of Schooling (completed)	13.71	2.37	3	17	907
College or higher degree	0.24	0.43	0	1	907
Male head of household	0.86	0.35	0	1	907
Black[1]	0.18	0.38	0	1	906
Married	0.75	0.43	0	1	907
Two-year house price growth	0.03	0.10	–0.28	0.39	907
Two-year house price growth dummy	0.59	0.49	0	1	907
Two-year house price growth relative	0.02	0.09	–0.33	0.33	907
Two-year house price growth	0.05	0.17	–0.45	0.65	907
Four-year income growth (annualized)	0.03	0.11	–0.54	0.72	859
Family income (five-year average)	63419	53901	696	746907	913
Liquid wealth	48924	358525	–10230	9992737	847
Non-housing wealth	170819	610909	–330158	14393858	902
Asset income	1317	5957	0	91158	913
Below med. liq. wealth at age 17	0.35	0.48	0	1	841
Below med. liq. wealth × hp growth	0.01	0.05	–0.28	0.38	841
Below med. non-housing wealth at age 17	0.36	0.48	0	1	896
Below med. non-housing wealth × hp growth	0.01	0.05	-0.22	0.38	896
Below med. asset income	0.53	0.50	0	1	907
Below med. asset income × hp growth	0.02	0.06	–0.22	0.38	907
Children					
Age	33.97	5.32	25	45	907
Family size	2.61	1.50	1	9	907
Homeowner	0.53	0.50	0	1	907
Years of schooling (completed)	13.69	2.61	0	17	907
College or higher degree	0.40	0.49	0	1	907
Male head of household	0.72	0.45	0	1	907
Black[1]	0.17	0.38	0	1	902
Married	0.50	0.50	0	1	907
Family income (two-year average)[2]	52879	51421	554	633714	913
Labor income	44903	44325	0	376400	913

Notes: Statistics are weighted using the PSID family weights. Income and wealth figures are in real 2000 U.S. dollars. [1]Black headed households include heads of households who identify as bi-racial; [2]Includes one-year of income data for households without two years of income data available.

Table 2: Cross-correlations

Variables	Liquid wealth	Non-Housing wealth	Asset income	Below med. liq. wealth	Below med. n-housing wealth	Below med. asset inc.
Liquid wealth	1.00					
Wealth no housing	0.19	1.00				
Asset income	0.12	0.43	1.00			
Below median liq. wealth	–0.11	–0.24	–0.18	1.00		
Below median no-housing wealth	–0.11	–0.29	–0.19	0.65	1.00	
Below median asset income	–0.01	–0.14	–0.28	0.44	0.38	1.00

Table 3: Children's Family Income and House Price Growth.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All			Renters	Owners			
Log.Parent Income, 5-y avg.	0.451***	0.413***	0.413***	0.243***	0.471***	0.440***	0.468***	0.479***
	(0.037)	(0.043)	(0.043)	(0.069)	(0.072)	(0.079)	(0.083)	(0.075)
House Price Growth at 17			0.391	–1.465**	1.028***	0.550	0.337	0.447
			(0.306)	(0.620)	(0.334)	(0.337)	(0.317)	(0.408)
Below med. no-housing wealth						–0.124		
						(0.077)		
Below med. wealth × hp gr.						1.816**		
						(0.898)		
Below med. liq.wealth							–0.030	
							(0.085)	
Below med. liq.w. × hp gr.							2.286**	
							(0.963)	
Below med. idr income								0.006
								(0.070)
Below med. idr income × hp gr.								1.301*
								(0.713)
N	913	913	913	319	594	592	551	594
Adj. R sq.	0.19	0.34	0.34	0.21	0.37	0.38	0.37	0.37

Notes: We estimate $y^{i,c} = \beta_0 + \beta_1 y^{i,p} + \beta_2 g^{h,17} + \beta_3 g^{h,17} \times d^{i,p} + e_i$, where $y^{i,c}$ and $y^{i,p}$ are the log of family income for child and parent respectively, averaged over several periods as described in the text. $g^{h,17}$ is real house price growth in the MSA in which the parent(s) and child lived over the two years prior to the child turning 17, and $d^{i,p}$ is an indicator variable that takes a value of one if the parent(s) is (are) likely liquidity constrained and zero otherwise. Additional controls for columns (2)-(8) only: age, age squared and age cubed for parent, family size and family size squared for respondent and parent, year of birth dummies for respondent and fixed-effects for the state where the respondent lived at age 17. Standard errors clustered by MSA-by-year (at 17) in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 4: MSA House Price Growth and Income Growth: (Parents) Owners vs. Renters

	mean	**p50**	**std. dev.**	**min**	**max**	**N**
			Parent Renter			
MSA house price growth	0.019	0.014	0.082	–0.217	0.361	319
MSA income growth	0.029	0.029	0.035	–0.084	0.126	319
MSA unemployment rate	0.058	0.054	0.020	0.023	0.157	269
			Parent Owner			
MSA house price growth	0.022	0.015	0.092	–0.280	0.391	594
MSA income growth	0.033	0.033	0.038	–0.090	0.143	594
MSA unemployment rate	0.058	0.053	0.023	0.022	0.208	467

Table 5: Children's Earnings as Adults and House Price Growth. Additional Controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Squared Term		House Value		Inc. relative MSA		MSA FE		Diff. MSA	
Log.Parent Income, 5-y avg.	0.475***	0.441***	0.369***	0.356***	0.329***	0.322***	0.333***	0.304***	0.339**	0.334**
	(0.072)	(0.079)	(0.082)	(0.086)	(0.096)	(0.105)	(0.086)	(0.089)	(0.139)	(0.151)
House-price growth at 17	1.184***	0.661*	1.175***	0.686*	1.249***	0.698	1.022**	0.590	1.433**	1.478**
	(0.411)	(0.376)	(0.400)	(0.371)	(0.414)	(0.460)	(0.436)	(0.429)	(0.716)	(0.679)
House-price growth sq.	–1.661	–1.113	–2.310	–1.742	–0.792	–0.886	–1.623	–0.890	–1.984	–2.109
	(1.919)	(1.673)	(1.869)	(1.644)	(2.355)	(2.225)	(2.045)	(1.870)	(3.552)	(3.459)
Below med. no-housing wealth		–0.124		–0.073		–0.052		–0.107		–0.010
		(0.077)		(0.079)		(0.091)		(0.094)		(0.191)
Below med. x hp gr.		1.765**		1.732**		1.707		1.771		–0.279
		(0.879)		(0.876)		(1.085)		(1.085)		(1.754)
Log.Parent house value, 5-y avg.			0.170***	0.163***	0.170**	0.166**	0.136**	0.133**	0.216*	0.215*
			(0.058)	(0.058)	(0.067)	(0.067)	(0.054)	(0.055)	(0.121)	(0.122)
N	592	592	582	582	479	479	582	582	178	178
Adj. R. sq	0.37	0.38	0.39	0.39	0.37	0.38	0.36	0.37	0.47	0.46

Notes: We estimate $y^{i,c} = \beta_0 + \beta_1 y^{i,p} + \beta_2 g^{h,17} + \beta_3 g^{h,17} \times d^{i,p} + e_i$, where $y^{i,c}$ and $y^{i,p}$ are the log of family income for child and parent respectively, averaged over several periods as described in the text. $g^{h,17}$ is real house price growth in the MSA in which the parents and child lived over the two years prior to the child turning 17 (variations indicated by column headings), and $d^{i,p}$ is an indicator variable that takes a value of one if the parent(s) is (are) likely liquidity constrained and zero otherwise. Additional controls: age, age squared and age cubed for parent, family size and family size squared for respondent and parent, fixed-effects for the state where the respondent lived at age 17 and year of birth dummies for respondent. Income for both children and parents in columns (5)-(6) is income minus MSA income per capita at the time and location where the child/parent was living when income was measured. MSA income per capita was obtained from the Bureau of Economic Analysis. Columns (7)-(8) include MSA fixed-effects instead of state fixed effects at 17. Columns (9)-(10) consider a sample of children who live in a different MSA from that at age 17. Standard errors clustered by MSA-by-year (at 17) in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 6: Children's Family Income and House Price Growth, Owners. Local Economic Conditions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log.Parent Income, 5-y avg.	0.471***	0.440***	0.472***	0.441***	0.470***	0.456***	0.468***	0.457***
	(0.072)	(0.079)	(0.072)	(0.080)	(0.082)	(0.088)	(0.081)	(0.088)
House Price Growth at 17	1.028***	0.550	1.190***	0.689*	0.679	–0.047	0.889*	0.128
	(0.334)	(0.337)	(0.399)	(0.399)	(0.463)	(0.448)	(0.511)	(0.491)
Below med. no-housing wealth		–0.124		–0.120		–0.084		–0.078
		(0.077)		(0.077)		(0.082)		(0.082)
Below med. wealth × hp gr.		1.816**		1.793**		2.497**		2.441**
		(0.898)		(0.895)		(1.117)		(1.108)
MSA income growth at age 17			–1.247	–1.012			–1.812	–1.362
			(1.399)	(1.378)			(1.596)	(1.557)
MSA unemployment rate at 17					–0.031	–0.025	–0.038	–0.030
					(0.024)	(0.023)	(0.025)	(0.024)
N	594	592	594	592	467	465	467	465
Adj. R sq.	0.37	0.38	0.37	0.38	0.31	0.32	0.31	0.32

Notes: We estimate $y^{i,c} = \beta_0 + \beta_1 y^{i,p} + \beta_2 g^{h,17} + \beta_3 g^{h,17} \times d^{i,p} + e_i$, where $y^{i,c}$ and $y^{i,p}$ are the log of family income for child and parent respectively, averaged over several periods as described in the text. $g^{h,17}$ is real house price growth in the MSA in which the parents and child lived over the two years prior to the child turning 17, and $d^{i,p}$ is an indicator variable that takes a value of one if the parent(s) is (are) likely liquidity constrained and zero otherwise. Unemployment rate data are not available for all MSAs. Additional controls: age, age squared and age cubed for parent, family size and family size squared for respondent and parent, fixed-effects for the state where the respondent lived at age 17 and year of birth dummies for respondent. Standard errors clustered by MSA-by-year (at 17) in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 7: Children's Earnings as Adults and House Price Growth.
House Price Growth Variations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Two-year Dummy		Two-year Relative		One-year Price Growth		Four-year Price Growth		Cumulative Price Growth	
Log.Parent Income, 5-y avg.	0.483***	0.451***	0.473***	0.436***	0.475***	0.439***	0.475***	0.440***	0.474***	0.442***
	(0.071)	(0.078)	(0.072)	(0.080)	(0.073)	(0.079)	(0.072)	(0.080)	(0.072)	(0.080)
House-price growth at 17	0.198***	0.150**	1.037***	0.576*	1.565**	0.610	0.512***	0.361	0.551***	0.494***
	(0.062)	(0.068)	(0.335)	(0.349)	(0.623)	(0.640)	(0.196)	(0.221)	(0.163)	(0.190)
Below med. no-housing wealth		–0.156		–0.102		–0.132*		–0.112		–0.095
		(0.110)		(0.077)		(0.077)		(0.079)		(0.078)
Below med. x hp gr.		0.115		1.743*		3.771**		0.440		0.098
		(0.141)		(0.979)		(1.621)		(0.514)		(0.431)
N	592	592	592	592	592	592	592	592	592	592
Adj. R. sq	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37

Notes: We estimate $y^{i,c} = \beta_0 + \beta_1 y^{i,p} + \beta_2 g^{h,17} + \beta_3 g^{h,17} \times d^{i,p} + e_i$, where $y^{i,c}$ and $y^{i,p}$ are the log of family income for child and parent respectively, averaged over several periods as described in the text. $g^{h,17}$ is real house price growth in the MSA in which the parents and child lived prior to the child turning 17 (variations indicated by column headings), and $d^{i,p}$ is an indicator variable that takes a value of one if the parent(s) is (are) likely liquidity constrained and zero otherwise. Additional controls: age, age squared and age cubed for parent, family size and family size squared for respondent and parent, fixed-effects for the state where the respondent lived at age 17 and year of birth dummies for respondent. Standard errors clustered by MSA-by-year (at 17) in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 8: Children's Earnings as Adults and House Price Growth.
House Price Growth at Different Ages

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Price Growth at 13				Price Growth at 17				Price Growth at 21			
	All	Renters	Owners		All	Renters	Owners		All	Renters	Owners	
Log.Parent income, 5-y avg. at 17	0.445***	0.301***	0.480***	0.425***	0.440***	0.201**	0.509***	0.462***	0.439***	0.389***	0.447***	0.433***
	(0.062)	(0.102)	(0.095)	(0.102)	(0.062)	(0.098)	(0.101)	(0.112)	(0.062)	(0.102)	(0.091)	(0.104)
House Price Growth	1.170***	1.958*	0.932**	0.578	0.101	–2.108**	0.678*	0.377	0.259	0.415	0.079	0.224
	(0.397)	(1.143)	(0.379)	(0.409)	(0.367)	(0.936)	(0.391)	(0.400)	(0.410)	(1.117)	(0.435)	(0.479)
Below med. no-housing wealth at 17				–0.135				–0.142				–0.038
				(0.097)				(0.096)				(0.108)
Below med. wealth at 17 × hp gr				0.864				1.436*				–0.414
				(0.939)				(0.844)				(0.960)
N	576	199	377	376	576	182	394	393	576	156	392	391
Adj. R sq.	0.38	0.25	0.39	0.40	0.37	0.20	0.38	0.38	0.37	0.29	0.36	0.36

Notes: We estimate $y^{i,c} = \beta_0 + \beta_1 y^{i,p} + \beta_2 g^{h,21} + \beta_3 g^{h,21} \times d^{i,p} + e_i$, where $y^{i,c}$ and $y^{i,p}$ are the log of family income for child and parent respectively, averaged over several periods as described in the text. $g^{h,21}$ is real house price growth in the MSA in which the parents lived over the two years prior to the child turning 13, 17 or 21 as indicated in the columns, and $d^{i,p}$ is an indicator variable that takes a value of one if the parent(s) is (are) likely liquidity constrained and zero otherwise. Additional controls: age, age squared and age cubed for parent, family size and family size squared for respondent and parent, fixed-effects for the state where the respondent lived at age 17 and year of birth dummies for respondent. Standard errors clustered by MSA-by-year (at 17) in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 9: Children's Earnings as Adults and Home Equity Levels

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS		IV					
	Two-year Price Growth				Four-year Price Growth		Cumulative Price Growth	
Log.Parent Income, 5-y avg.	0.452***	0.413***	0.388***	0.352***	0.424***	0.379***	0.397***	0.355***
	(0.089)	(0.093)	(0.086)	(0.091)	(0.088)	(0.091)	(0.089)	(0.093)
Home equity at 17	0.009	0.006	0.021***	0.017***	0.014**	0.012*	0.019***	0.016**
	(0.006)	(0.005)	(0.006)	(0.006)	(0.007)	(0.006)	(0.007)	(0.007)
Below med. wealth × H. eq.		0.031***		0.055***		0.050*		0.060***
		(0.009)		(0.017)		(0.026)		(0.021)
N	458	457	458	457	458	457	458	457
Adj. R. sq	0.39	0.40	0.38	0.38	0.39	0.39	0.38	0.38

Notes: We estimate $y^{i,c} = \beta_0 + \beta_1 y^{i,p} + \beta_2 he^{h,17} + \beta_3 he^{h,17} \times d^{i,p} + e_i$, where $y^{i,c}$ and $y^{i,p}$ are the log of family income for child and parent respectively, averaged over several periods as described in the text. $he^{h,17}$ is parental home equity the year the child turns 17, and $d^{i,p}$ is an indicator variable that takes a value of one if the parent(s) is (are) likely liquidity constrained and zero otherwise. Additional controls: age, age squared and age cubed for parent, family size and family size squared for respondent and parent, fixed-effects for the state where the respondent lived at age 17 and year of birth dummies for respondent. In columns (3)–(8) we instrument home equity levels with house price growth for the MSA the parent and child live in when the child turns 17. Standard errors clustered by MSA-by-year (at 17) in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 10: House Price Growth and Educational Attainment (Marginal Effects)

	(1)	(2)	(3)
	High School or less	Some College	BA-BS or Higher
2-year house price gr., parent	1.169**	0.264	–1.221***
	(0.45)	(0.40)	(0.47)
Below med. no-housing wealth	0.125*	–0.000	–0.113*
	(0.07)	(0.06)	(0.06)
Below med. wealth × hp gr.	0.077	–1.749**	2.162***
	(0.70)	(0.70)	(0.76)
Parent head college dummy	–0.172**	–0.050	0.203**
	(0.08)	(0.07)	(0.09)
Log.Parent income, 5-y avg.	–0.118*	0.024	0.190***
	(0.06)	(0.05)	(0.07)
Log.Parent house value	–0.108***	–0.024	0.133***
	(0.04)	(0.03)	(0.05)
MSA unemployment rate at 17	–0.005	–0.022	0.024
	(0.02)	(0.02)	(0.02)
N	446	457	453
Pseudo R sq.	0.24	0.14	0.28

Notes: Probit regressions. The LHS variable is a dummy variable equal to one if the child respondent fits within the education category indicated by the column heading and zero otherwise. Additional controls: age, age squared and age cubed for parent, family size and family size squared for respondent and parent, fixed-effects for the state where the respondent lived at age 17 and year of birth dummies for respondent. Standard errors clustered by MSA-by-year (at 17) in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 11: Children's Other Debt, College and House Prices

	(1)	(2)	(3)
	Log	Log	Level
House Price Growth at 17	–1.03***	–0.10	4454.60
	(0.38)	(0.63)	(3640.69)
Log. Parent Income, 5-y avg.	0.59	0.37	2311.07
	(0.37)	(0.38)	(1709.44)
some college or more		1.88***	5053.46**
		(0.58)	(2382.87)
some college or more × house price gr.		–1.58**	–5331.76
		(0.76)	(3796.08)
N	586	586	586
Adj. R sq.	0.09	0.10	0.11

Notes: Linear regressions. LHS is other debt in dollars for the level specification and log(1+debt) for the log specification. Additional controls: age, age squared and age cubed for parent, family size and family size squared for respondent and parent, fixed-effects for the state where the respondent lived at age 17 and year of birth dummies for respondent. Standard errors clustered by MSA-by-year (at 17) in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 12: Children of Owners: Transition Matrices by house price Growth in MSA at Age 17

All Sample size: 594				
	Children's Income Quartile			
Parents' Income Quartile	1	2	3	4
	%	%	%	%
1	43.3	30.3	16.3	10.1
	(3.7)	(3.4)	(2.8)	(2.3)
2	28.2	24.2	28.9	18.8
	(3.7)	(3.5)	(3.7)	(3.2)
3	22.2	19.3	34.8	23.7
	(3.6)	(3.4)	(4.1)	(3.7)
4	15.2	22.0	25.0	37.9
	(3.1)	(3.6)	(3.8)	(4.2)

house price growth higher than national average Sample size: 309				
	Children's Income Quartile			
Parents' Income Quartile	1	2	3	4
	%	%	%	%
1	43.9	28.0	15.9	12.2
	(5.8)	(5.3)	(4.3)	(3.8)
2	23.0	24.1	32.2	20.7
	(4.9)	(5.0)	(5.4)	(4.7)
3	20.6	22.1	32.4	25.0
	(4.3)	(4.4)	(4.9)	(4.6)
4	13.9	16.7	22.2	47.2
	(3.7)	(4.0)	(4.5)	(5.4)

house price growth lower or at national average Sample size: 285				
	Children's Income Quartile			
Parents' Income Quartile	1	2	3	4
	%	%	%	%
1	42.7	32.3	16.7	8.3
	(5.0)	(4.8)	(3.8)	(2.8)
2	35.5	24.2	24.2	16.1
	(6.1)	(5.4)	(5.4)	(4.7)
3	23.9	16.4	37.3	22.4
	(5.2)	(4.5)	(5.9)	(5.1)
4	16.7	28.3	28.3	26.7
	(4.8)	(5.8)	(5.8)	(5.7)

Table 13: Children of Renters: Transition Matrices by House-Price Growth in MSA at Age 17

All
Sample size: 319

Parents' Income Quartile	Children's Income Quartile 1 %	2 %	3 %	4 %
1	48.8	30.2	13.2	7.8
	(4.4)	(4.0)	(3.0)	(2.4)
2	37.2	25.6	23.1	14.1
	(5.5)	(4.9)	(4.8)	(3.9)
3	25.0	26.9	21.2	26.9
	(6.0)	(6.1)	(5.7)	(6.1)
4	18.3	28.3	30.0	23.3
	(5.0)	(5.8)	(5.9)	(5.5)

House-price growth higher than national average
Sample size: 180

Parents' Income Quartile	Children's Income Quartile 1 %	2 %	3 %	4 %
1	46.4	33.3	14.5	5.8
	(9.8)	(9.2)	(6.9)	(4.6)
2	37.0	28.3	19.6	15.2
	(6.1)	(5.7)	(5.0)	(4.5)
3	32.3	22.6	22.6	22.6
	(6.5)	(5.8)	(5.8)	(5.8)
4	23.5	26.5	23.5	26.5
	(6.8)	(7.1)	(6.8)	(7.1)

House-price growth lower or at national average
Sample size: 139

Parents' Income Quartile	Children's Income Quartile 1 %	2 %	3 %	4 %
1	51.7	26.7	11.7	10.0
	(6.5)	(5.7)	(4.1)	(3.9)
2	37.5	21.9	28.1	12.5
	(8.6)	(7.3)	(7.9)	(5.8)
3	14.3	33.3	19.0	33.3
	(7.6)	(10.3)	(8.6)	(10.3)
4	11.5	30.8	38.5	19.2
	(6.3)	(9.1)	(9.5)	(7.7)

6 Appendix

House Prices and Rents

We have conjectured that the effect of house price growth on renters might be due to the fact that rents tend to increase when house prices rise, leaving renters with less resources to finance their children's education (and *vice versa* when house prices go down). We provide some support for this conjecture here. Using rent data from REIS, we calculate rent growth by metropolitan area and correlate it with house price growth from FHFA, the data used for our main analysis. (The metropolitan area definitions from REIS do not exactly correspond to MSA census boundaries but they are close). We have data for 60 metropolitan areas for the period 1980–1999 (recall PSID respondents in our sample turn 17 in years 1979–1999 but rent data start in 1980). The mean correlation of rent growth and house price growth across metropolitan areas is 0.37, consistent with our conjecture. Figure A-1 presents a scatter plot of rent and house price growth using these data that further illustrates the positive correlation.

We also use PSID data to calculate house price growth and rent growth over time by MSA and correlate the two variables. We start at the individual level and calculate house value growth for owners and rent growth for renters who do not move between PSID waves (we winsorize observations above (below) the 95 (5) percentile of house price growth in a given MSA-year by replacing those values with the 95 (5) percentile because of extreme outliers in the data). We then calculate the median of the two rates by MSA-year restricting the analysis to MSA-years with at least 10 individual observations. We keep MSAs with at least five years of data and restrict the analysis to the period 1979–1999. This leaves us with 32 MSAs. The mean correlation of rent growth and house price growth using PSID data is 0.21. It is not surprising that this correlation is a bit lower than the previous one because house values (and rents) are self-reported in the PSID and house price increases could, measurement error aside, be reflecting factors other than pure capital gains (e.g., home improvements, house price expectations, etc.). The key finding is that the correlation is positive and non-trivial. Figure A-2 depicts the distribution of the correlation between house price and rent growth across MSAs in both the PSID and REIS/FHFA data.

Other Supporting Results

Tables A-1 to A-3 summarize supporting work to assess the robustness of our findings. Our results are robust to alternative approaches for clustering the standard errors. The standard errors in our baseline estimates are clustered at the MSA-by-year level at the time that the child turns 17, and the results are similar if we use White (1980) heteroscedasticity robust standard errors and/or cluster the standard errors at just the state or MSA level. Clustering the errors at the family (household) level to account for the fact we might have siblings in our sample also has little impact on the precision of our estimates (see Table A-2).

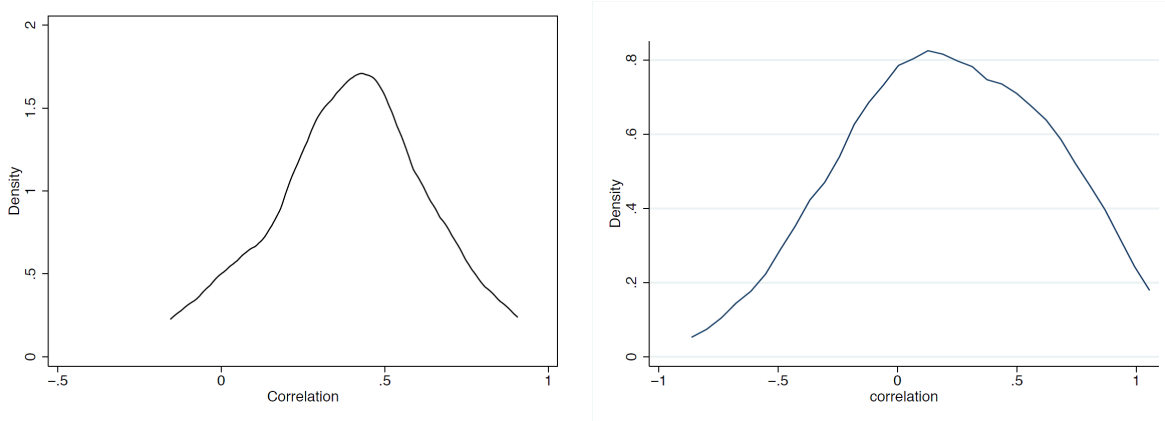
In addition, even though we describe our findings in terms of housing appreciation increasing children's earnings, the reverse is also true—housing depreciation is associated

with lower earnings for the children of homeowners who experience house price declines around the time their offspring graduate from high school. Table A-3 shows these results. The children of renters have a noticeably larger increase in earnings from a decline in house prices compared to the earnings loss they experience when house prices rise. This finding makes sense since lower house prices mean renters can purchase their desired home for less money than previously thought and/or have more of their income to spend on non-shelter costs. Lower house prices therefore free up resources for renters to invest elsewhere such as their children's education. We further cannot reject the equality of the coefficients on positive versus negative house prices at conventional levels for owners or renters.

FIGURE A-1: (MSA level)

Source: Authors calculations using rent data is from REIS and housing price data from FHFA.

FIGURE A-2: Price/Rent Correlation 1980–1999 (MSA level)



(a) REIS/FHFA Data

(b) PSID Data (Self Reported)

Table A-1: Summary statistics. Sub-sample of Parent Homeowners

Variable	Mean	Std. Dev.	Min.	Max.	N
Parents					
Age	45.22	5.51	33	65	590
Family size	4	1.17	1	10	590
Homeowner	1	0	1	1	590
Tenure	9.16	6.54	0	29	590
Years of schooling (completed)	13.99	2.3	3	17	590
College or higher degree	0.27	0.45	0	1	590
Male head of household	0.93	0.25	0	1	590
Black[1]	0.11	0.31	0	1	589
Married	0.86	0.35	0	1	590
Two-year house price growth	0.03	0.10	–0.28	0.39	590
Two-year house price growth dummy	0.59	0.49	0	1	590
Two-year relative house price growth	0.02	0.09	–0.33	0.33	590
Four-year house price growth	0.05	0.17	-0.45	0.65	590
Four-year income growth (annualized)	0.03	0.10	–0.47	0.44	566
Two-year home equity growth, PSID	0.17	0.57	–0.76	2.21	445
Two-year house price growth, PSID	0.03	0.21	–0.39	0.77	502
Family income (five-year average)	86437	59468	1523	746907	590
Liquid wealth	83687	462757	0	9992737	547
Non-housing wealth	319761	895064	–233043	14393858	588
Asset income	2564	8262	0	91158	590
Below med. liq. wealth at age 17	0.25	0.43	0	1	547
Below med. liq. wealth × hp growth	0	0.04	–0.28	0.38	547
Below med. non-housing wealth at age 17	0.26	0.44	0	1	588
Below med. non-housing wealth × hp growth	0	0.04	–0.20	0.38	588
Below med. asset income	0.44	0.50	0	1	590
Below med. asset income × hp growth	0.01	0.06	–0.20	0.38	590
Children					
Age	34.06	5.36	25	45	590
Family size	2.60	1.45	1	8	590
Homeowner	0.59	0.49	0	1	590
Years of schooling (completed)	13.94	2.67	0	17	590
College or higher degree	0.46	0.50	0	1	590
Male head of household	0.76	0.43	0	1	590
Black[1]	0.10	0.30	0	1	586
Married	0.53	0.50	0	1	590
Family income (two-year average)[2]	71990	66570	554	633714	590
Labor income	62184	56864	0	376400	590

Notes: Statistics are weighted using the PSID family weights. Income and wealth figures are in real 2000 U.S. dollars. [1]Black headed households include heads of households who identify as bi-racial; [2]Includes one-year of income data for households without two years of income data available.

Table A-2: Children's Earnings as Adults and House Price Growth. Alternative Standard Errors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Robust Errors		Clustered Errors					
			State at 17		MSA at 17		Family	
Log.Parent Income, 5-y avg.	0.471***	0.440***	0.471***	0.440***	0.471***	0.440***	0.471***	0.440***
	(0.074)	(0.082)	(0.094)	(0.100)	(0.081)	(0.081)	(0.077)	(0.083)
House Price Growth at 17	1.028***	0.550	1.028**	0.550	1.028***	0.550*	1.028***	0.550
	(0.361)	(0.355)	(0.433)	(0.338)	(0.366)	(0.318)	(0.359)	(0.366)
Below med. no-housing wealth		–0.124		–0.124		–0.124		–0.124*
		(0.076)		(0.084)		(0.078)		(0.075)
Below med. wealth × hp gr.		1.816**		1.816**		1.816**		1.816**
		(0.850)		(0.816)		(0.855)		(0.806)
N	594	592	594	592	594	592	594	592
Adj. R sq.	0.37	0.38	0.37	0.38	0.37	0.38	0.37	0.38

Notes: We estimate $y^{i,c} = \beta_0 + \beta_1 y^{i,p} + \beta_2 g^{h,17} + \beta_3 g^{h,17} \times d^{i,p} + e_i$, where $y^{i,c}$ and $y^{i,p}$ are the log of family income for child and parent respectively, averaged over several periods as described in the text. $g^{h,17}$ is real house price growth in the MSA in which the parents and child lived over the two years prior to the child turning 17, and $d^{i,p}$ is an indicator variable that takes a value of one if the parent(s) is (are) likely liquidity constrained and zero otherwise. Additional controls: age, age squared and age cubed for parent, family size and family size squared for respondent and parent, fixed-effects for the state where the respondent lived at age 17 and year of birth dummies for respondent. Standard errors clustered by MSA-by-year (at 17) in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table A-3: Children's Family Income and House Price Growth. Asymmetry

	(1) Renters	(2) Owners
Log.Parent Income, 5-y avg.	0.250***	0.472***
	(0.069)	(0.072)
House-price growth< 0	–2.974**	1.327
	(1.181)	(0.854)
House-price growth> 0	–0.604	0.852*
	(0.979)	(0.468)
N	319	594
Adj. R sq.	0.21	0.37

Notes: We estimate $y^{i,c} = \beta_0 + \beta_1 y^{i,p} + \beta_2 p^{h,17} + \beta_3 n^{h,17} + e_i$, where $y^{i,c}$ and $y^{i,p}$ are the log of family income for child and parent respectively, averaged over several periods as described in the text. $p^{h,17}$ is house price growth in the MSA in which the parents and child lived over the two years prior to the child turning 17 if they experienced housing appreciation and zero otherwise; $n^{i,p}$ is analogously defined for housing depreciation. Additional controls: age, age squared and age cubed for parent, family size and family size squared for respondent and parent, fixed-effects for the state where the respondent lived at age 17 and year of birth dummies for respondent. Standard errors clustered by MSA-by-year (at 17) in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level. p-values for a test of equality of the two coefficients for house price growth in columns (1) and (2) are 0.19 and 0.67, respectively.