Working Papers

FEDERAL RESERVE BANK OF BOSTON

No. 14-13

House Price Growth When Children are Teenagers: A Path to Higher Earnings?

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Abstract:

This paper examines whether a rise in house prices that occurs immediately prior to children entering college has an impact on their earnings as adults. Higher house prices provide homeowners with additional funds to invest in their children's human capital. The results show that a 1 percentage point increase in house prices, when children are 17 years-old, results in roughly 0.9 percent *higher* annual income for the children of homeowners, and a 1.5 percent *lower* annual income for the children of renters. House price appreciation at age 17 also leads to higher college enrollment rates at age 19 and an increased likelihood of attendance at higher-ranked post-secondary institutions for the children of homeowners, as well as lower college enrollment rates for the children of renters.

JEL Classifications: E21, I22, I24

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The authors thank the editor at the *Journal of Urban Economics* and three anonymous referees, Stephan Ball, Chris Foote, Olga Gorbachev, Osborne Jackson, and participants at the 2012 HULM spring conference and the 2012 Federal Reserve System Applied Microeconomics conference for their insightful comments; Sarah Freitas, Ye Ji Kee, and Kevin Todd for helpful research assistance; and Elizabeth Murry for editorial assistance.

This version: December 23, 2014

1 Introduction

The United States has long been a country that promotes homeownership through the federal tax deduction for interest paid on mortgages, 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. Studies by Cooper (2013), Hryshko, Luengo-Prado, and Sorensen (2010), and Lovenheim (2011), among others, consider the role of housing wealth as borrowing collateral. According to the Survey of Consumer Finances, housing wealth comprises over 70 percent of net worth for the median U.S. household.[1] Understanding how fluctuating house values impact consumer behavior has become an important topic for economists, especially given the housing boom and bust in the mid-2000s.

This paper investigates whether local-area house price changes that occur just before most children usually make college enrollment decisions impact their future earnings. House price gains when children are teenagers increase homeowners' housing equity and their ability to invest in their children's human capital and/or to finance other expenditures. Children who start college following a run-up in house prices and whose parents are homeowners may have greater educational opportunities than homeowners' children who start college following a period of flat or falling housing prices, or than the children whose parents rent their home. Better educational opportunities typically translate into higher lifetime earnings. With additional parental financing available for college, students also potentially benefit by needing to work less to finance their post-secondary education and/or by being able to attend a better quality institution. Both outcomes should improve student achievement and result in potentially higher earnings for these students as adults.

We analyze whether house price fluctuations when children are 17 years-old impact their earnings as adults by using data from the Panel Study of Income Dynamics (PSID)—a dataset that provides detailed demographic and financial information on parents and their offspring over time. We also have access to restricted geographic identifiers that enable us to use the house price growth for the MSA in which households lived when their children were 17 years-old. We can therefore investigate the impact of

[1] See, for example, Wolff (2010).

what arguably are exogenous house price fluctuations for owners and renters during their children's teenage years on their children's future earnings by holding parental income and other relevant factors fixed.

To our knowledge, this paper is the first to examine the link between house price growth during individuals' teenage years and their earnings as adults, and how this link varies based on parents' homeownership status. Our results show that house price appreciation during children's teenage years has an effect on these children's future earnings conditional on parental resources 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 1 percentage point increase in house prices results in roughly 0.9 percent *higher* average annual income for owners' children (later in life) and 1.5 percent *lower* average annual income for renters' children. These findings are robust to controlling for local economic conditions that might be correlated with house prices as well as with children's educational and economic opportunities. In our baseline specification, we measure house price growth as a two-year change from when children are age 15 to age 17. Using different measures of house price appreciation (one-year, four-year, or cumulative) yields similar results—house price growth when children are about 17 years-old matters for their future adult earnings. Examining the effect of house price growth at different ages confirms that homeowners' cumulative house price gains prior to their children entering college matter the most for their children's future earnings, while the earnings of children whose parents are renters were most most impacted by short-term house price changes around the time these children were 17 years-old.

We also show that house price growth when children are 17 years-old leads to higher college enrollment rates when they are 19 years-old, and results in increased attendance at higher-ranked post-secondary institutions for the children of homeowners, while housing appreciation at age 17 lowers the likelihood that renters' children are enrolled in college at age 19. All of these findings are consistent with the hypothesis that homeowning parents are able to invest more in their children's human capital when house prices rise. For renters' children, higher housing costs due to rising house prices likely reduce college enrollment because these parents have fewer resources to help finance their children's eduction.

The paper proceeds as follows. The next section discusses the existing literature on homeownership and various economic outcomes. Section 3 discusses our empirical approach and Section 4 describes the data. Section 5 presents our results. Section 6

discusses our results and provides some suggestions for future related work.

2 Existing Literature

Our paper relates to an extensive literature examining the impact of parents' homeownership status on children's outcomes. The most frequently cited studies include Green and White (1997), Aaronson (2000), Haurin, Parcel, and Haurin (2002), and Harkness and Newman (2003). Green and White (1997) analyze whether the children of homeowners are more likely to stay in school longer than the children of renters and also whether the female children of homeowners are less likely to give birth as teenagers compared to renters' daughters. The authors find that the children of homeowners end up with better outcomes both in terms of years of schooling and rates of teenage parenthood. This is especially true within the group of low-income parents. Similarly, Harkness and Newman (2003) find that homeownership has a positive impact on a number of childhood-related outcomes—including educational achievement, unwed births, and wage rates—especially for low-income families. Aaronson (2000) considers whether parental homeownership impacts children's educational attainment and finds that the residential stability associated with homeownership favorably affects education. Haurin, Parcel, and Haurin (2002) analyze the impact of homeownership on the cognitive and behavioral outcomes of children. They find that compared to the children of renters, the children of homeowners grow up in a more stimulative and emotionally supportive environment, which improves their cognitive ability and reduces behavioral problems.

Other relevant papers include Lien, Wu, and Lin (2008) who use census data from Taiwan to examine the link between one's home environment and educational attainment. They find that increases in living space, parental homeownership, and residential stability are positively related to children's educational achievement. Dietz and Haurin (2003) review the literature on the economic and social consequences of homeownership.

Our paper contributes to the literature on the relationship between homeownership and children's outcomes by analyzing the impact of house price fluctuations on children's future earnings—an outcome that likely works through the education channel. We also examine how the impact of house price appreciation differs for the children of homeowners versus renters. Even though parents who are renters do not have claim to any equity in their home, they may benefit or suffer based on the housing costs associated with fluctuating house prices. Local conditions associated with changing house prices, such

as higher or lower property tax bases and revenues, may also impact renter parents and their children.

There is also a broad and related literature examining the factors that impact children's educational achievement. Two particularly relevant papers are Boehn and Schlottmann (1999) and Lovenheim (2011). Boehn and Schlottmann (1999) examine the relationship between parents' homeownership status and children's educational attainment. They find that the children of homeowners, on average, are more likely to have completed higher levels of schooling compared to the children of renters. The authors, however, only consider the impact of parents' housing tenure choice on educational outcomes and not the role that house price fluctuations may play in decisions about post-secondary education.

Lovenheim (2011) investigates how changing house prices during children's teenage years impact their college enrollment decisions. The motivation behind his research is similar to ours—rising house prices increase homeowners' equity and thus parents have an additional funding source they can tap to help pay for their children's college education. Lovenheim (2011) finds that after the year 2000, house price growth raised college attendance—especially among households with limited income. Lovenheim's research, however, does not consider the longer-term impact of house price growth on children's earnings as adults and his analysis focuses primarily on the most recent housing boom and bust. Moreover, he assumes that renters are a control group and are not affected by house price appreciation, while we show that this is not the case.

Other related research includes Dynarski (2003), who examines the relationship between parents' financial liquidity and their children's college attendance. In particular, she exploits a 1992 rule change that exempted parents' home equity from being considered in calculations of a family's need for financial aid, which made many students newly eligible for federal college loan programs. She finds that these students are more likely to go to college, and they also shift toward attending four-year institutions.[2]

Brown, Scholz, and Seshadri (2012) also examine the college financial aid market and show both theoretically and empirically that parents underinvest in their children's education when there is uncertainty about whether their children will succeed in college. In addition, there are a number of recent papers that consider the relationship between parental income and children's achievement including Dahl and Lochner (2012),

[2]According to the Department of Education, home equity was included in federal financial aid need analysis until the Higher Education Amendments of 1992 eliminated home equity from the federal aid calculations beginning with the 1993–94 academic year. Colleges are still allowed to incorporate parents' home equity in calculating students' eligibility for *nonfederal* financial aid programs, although many eliminated home equity from their private financial aid calculations in the early 2000s.

Oreopoulos, Page, and Stevens (2008), and Morris, Duncan, and Rodrigues (2011). All these papers find that parental income plays an important role in determining children's educational achievements. This literature, however, does not consider the relationship between parental homeownership, house prices, and children's financial success as adults.

3 Empirical Approach

For many years college tuition costs have been a large financial burden for U.S. families—at times these high costs have prevented parents from investing in their children's post-secondary education (see Section 4 for a discussion of tuition costs in our sample).[3] Changing house prices around the time children are entering the traditional college years may therefore impact their earnings as adults. In particular, appreciating home values raise housing equity, which can increase homeowners' investment in their children's education, either simply because these parents feel wealthier or because they have more collateral against which they can borrow to finance college. Parents who are renters do not have any equity in their homes to borrow against, and may have less available income to invest in their children's education when house prices increase since rising home prices are positively correlated with rising rents (as shown in Appendix B). In addition, renters who are planning to purchase a home in the future face larger necessary downpayments when house prices rise, requiring more saving and leaving less current income available to finance their children's education and other expenses.

Our empirical approach considers the impact of changing house prices when children are 17 years-old on their future earnings as adults given their parent's income and housing tenure. We estimate the following baseline equation separately for owners and renters:

$$y_i^{bl} = \alpha + \beta g_l^{17} + \mathbf{X}_i^{17}\mathbf{\Omega} + \delta u_l^{17} + \nu_b + \upsilon_l + \epsilon_i \ , \tag{1}$$

where y_i^{bl} is (log) earnings as an adult for child i, born in year b who lived in location l at age 17. Children's earnings as adults are measured as the average of their income in the 2005 and 2007 PSID waves; g_l^{17} is real house price growth in MSA l over the two years prior to the child turning 17; $\mathbf{X_i^{17}}$ is a matrix of parental controls when the child was 17 years-old including earnings, nonhousing wealth, home values, education, type of census tract they lived in, age and family size; u_l^{17} is the unemployment rate in location l when

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

the child was 17 years-old in order to account for local economic conditions at the time most college decisions are made; υ_b and υ_l denote birth-year and location fixed effects (the state in the baseline specification or the MSA in alternative specifications).

Our coefficient of interest is β. As discussed, we expect the impact of house prices on children's earnings to be positive for the children of owners and negative for the children of renters as appreciating housing values increase home equity for owners but raise renters' housing costs at the expense of nonhousing expenditures like education.[4]

We condition the analysis on parental resources (including income and wealth) based on the existing literature that examines the link between parents' earnings and children's earnings (see for example Solon, 1992; Zimmerman, 1992). We also control for local unemployment rates to separate the effect of house price fluctuations on children's future earnings from the direct impact of local economic conditions around the time children are usually making decisions about attending college. In addition, our estimates of equation (1) incorporate dummy variables for children's birth years to control for age, since children's earnings are measured at different points in their life cycle. These birth-year controls also help to account for the fact that obtaining home-equity-based credit may have become easier over our sample period—an issue we discuss further in the next section. We also include state fixed effects in our estimates because residents of states with good-quality and relatively low cost public higher education might face different education-related decisions (financial or otherwise) than residents of other states. The identification of β comes from variation in house price growth (relative to the average house price growth for a given cohort) across MSAs and over time within a state.

We cluster the standard errors of the estimates at the "MSA at 17" level, meaning the MSA in which children live when they are 17 years-old. This approach accounts for the fact that the estimation errors may be correlated within MSAs over time. Clustering the standard errors at alternative levels (MSA $\times$ year at 17, state at 17, or family) does not alter our conclusions. More details about the data, including how we identify parent-child pairs, are discussed in both the next section and Appendix A.

Identification and Selection

Our identification strategy relies on MSA-level house price variation being exogenous to parents' human capital investments in their children and these children's earnings in

[4]Of course, this effect could be partially offset—making it smaller in absolute value—if fluctuating house prices impact secondary school quality due to shifting property tax revenues and the children of renters are able to go to better (worse) post-secondary schools and/or get better (worse) jobs because of house price induced shifts in their training.

their adult lives. A potential concern is that financially capable parents who plan to invest more in their children's human capital move and buy a home in a given MSA to take advantage of anticipated house price growth and improve future borrowing capacity for their children's education. This argument relies on believing that homeowners or households that wish to become homeowners are able to anticipate future movements in house prices. Our sample does not, however, include the early 2000s housing boom when some U.S. households may have indeed moved to areas where they thought house prices would continue to increase for a period of time. In addition, the average homeowner in our sample has lived for more than nine years in his/her existing home by the time his/her child is 17 years-old. It is unlikely that households moved to an area and purchased a home at least nine years ahead of their children going to college because they expected house prices to increase over that period.

Arguably, parents who are renters could also move in anticipation of house price changes even if they cannot afford to purchase a home. For example, these households could move and rent in an area where they anticipate house prices might increase and help improve the quality of the local schools through higher property tax revenues. These parents might face higher housing costs but also obtain better schooling for their children—perhaps offsetting some of the negative effect of higher housing costs on their children's future earnings. Yet finding a strong and negative coefficient for β for renters' children would argue against this scenario. In addition, we show that our results for homeowners and renters are robust to removing the predictable component of house price growth. This argues that it is the unpredictable component of house prices which drives our observed estimates of β and not households' location decisions.

Another potential concern is that an unobserved "third-factor" could cause the correlation between house price growth and future earnings. For example, the variation in house price appreciation across MSAs could simply proxy for long-term differences in economic growth. Under this scenario, individuals who spent their childhood years in MSAs with strong house price growth and stayed there (or moved back after college) earn more than individuals who grew up in MSAs that had weaker house price growth. In other words, if house prices are rising in economically dynamic places, we could see adults in those locations earning higher wages because of, for example, more abundant job opportunities.

With a sufficiently large sample and enough variation across both MSAs and the years in which children turn 17, we could address this issue by including location-year (MSA and year-at-17) fixed-effects in regressions that utilize self-reported house price growth

or more geographically disaggregated house price growth to exploit within-MSA house price appreciation 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 concern. In particular, our results are robust to using relative income as the dependent variable (children's income less MSA per-capita income) rather than the absolute level of individuals' income. If everyone is better (worse) off living in a given location regardless of whether their parents were an owner or a renter, then house price growth should not impact children's relative income as adults. Including place-based economic conditions at the time earnings are measured does not alter our conclusions. We also report results that include MSA fixed effects (for the location where children lived when 17 years-old) instead of state fixed effects to control for more localized, pre-college, location-specific economic conditions.

Higher house price growth at the MSA-level could also be indicative of better quality (more in-demand) primary and secondary public school systems, which in turn could explain children's higher earnings later in the life cycle. We show, however, that our results are robust to including controls to account for this possibility, such as median home values at the census-tract level that proxy for the value of the local property tax base. Since a given percentage change in housing prices may impact households differently depending on the value of the home they own or rent, we also consider specifications that account for the values of the parents' particular home or local house values and discuss the results in detail in Section 5.

Finally, in our regressions we split the sample to examine the effect of house price growth on the earnings of renters' children versus owners' children, while allowing all the parameters in equation (1) to vary freely based on housing tenure choice.[5] A potential concern is that parents' housing tenure choice may be related to their children's earnings. However, we are not trying to predict the effect of parental homeownership on children's earnings, but rather are interested in the effect of arguably exogenous house price fluctuations on children's earnings. Nevertheless, we control for a broad range of family characteristics (parental income, wealth, and education) that might distinguish owners and renters. We also account for possible heterogeneity within the group of owners and renters based on factors besides the parents' financial resources. In particular, we include dummy variables for whether a parent is a renter in an owner-dominated census tract, or

[5]The alternative of including a parental homeownership dummy variable and interaction terms for homeownership and housing appreciation delivers similar conclusions with a bit less precision for the housing appreciation effect.

an owner in a renter-dominated census tract. These owner/renters could systematically differ from their peers who live in areas dominated by households with similar housing tenure status; for example, in terms of educational preferences for their children. That is, individuals who rent in owner-dominated census tracts rather than in areas with many other renters may value certain amenities more than other households, and perhaps may even be willing to pay more to live in such areas and reap the perceived benefits like better school systems.

A remaining issue is that perhaps parents who become homeowners are better at predicting future house price changes. This claim is difficult to test directly, but we do control for selection into homeownership by using a two-step Heckman selection correction approach. Our results are unchanged, and the relevant estimates are discussed in detail in Appendix C.

4 Data and Estimation Sample

We use data from the PSID, which started interviewing about $4,800$ households in 1968. 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. The dataset is particularly useful for this study because the PSID follows the original parent households and the households established by their offspring.

To construct our matched sample of parents and children, we proceed as follows. Our sample period runs from 1979 to 1999, prior to the Great Recession in 2007, and we include those 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. Using the relevant PSID identifiers, we link a child to his/her father, and if this is not possible to his/her mother, then compile data on family or parental variables around the time their children are 17 years-old, assuming they still live at home. Geocode match files allow us to identify the MSA children live in when they turn 17, then we collect house price data from the Federal Housing Finance Agency (FHFA). Since house price data coverage begins in the late 1970s, our final estimation sample contains 892 "child" respondents who had their seventeenth birthday between 1979 and 1999 and who are 25–45 years old in 2007. These respondents live in 134 different MSAs. In addition,

there is substantial variation in house price growth in our sample: the two-year mean real growth is 3 percent, with a 10 percentage point standard deviation. Appendix A contains detailed information about our matching and sample selection process, as well as summary statistics for our 892 matches.

We measure the dependent variable in equation (1) as the log of real family income, which is the sum of the head of household's and his/her spouse's (if any) taxable income (earnings, asset income, net profit, and business income), transfer income, social security income, plus taxable income, transfer income, and social security income from other family members. We average the family income reported for the 2005 and 2007 survey years.[6] Parents' family income is defined analogously but is averaged over a five-year period centered around the year their child turns 17 to better capture the parents' permanent income. Parents' home values (where applicable) are measured as the average value over the same five-year window, while parents' nonhousing wealth (wealth excluding home equity) is measured using the wealth observation closest to, and if possible before, the year their child turns 17.[7]

In addition, unemployment data come from the Bureau of Labor Statistics, and local area homeownership rates and house value information come from the U.S. decennial census. We use the decennial census data to classify and control for parents who are "atypical" homeowners or renters. In particular, a parent is an atypical owner if he/she owns a house in a renter-dominated census tract, and is an atypical renter if he/she rents a house in an owner-dominated census tract. This information along with local area house values allow us to better distinguish the effect of homeownership on children's future earnings versus—for example, the quality of local elementary and secondary school education systems that are often tied to home values and local economic conditions.

Further information on all these data, including how they are constructed, can be found in Appendix A.

Credit Availability During Our Sample Period

Our 1979-1999 sample period covers a time of substantial home equity borrowing despite its ending prior to the housing boom of the early 2000s. The use of home eq-

[6]Reported income in these surveys covers the 2004 and 2006 calendar years, respectively. In addition, we ensure that the children in our sample are heads of household 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 2006 income.

[7]Wealth data in the PSID was collected every five years up to 1999 when the PSID switched to biennial wealth data collection.

uity borrowing to finance household expenditures received much press (and use) during the early 2000s, but such borrowing has been prominent since the elimination of Regulation Q in the early 1980s, and the ensuing liberalization of the credit markets.[8] In particular, the 1986 Tax Reform Act eliminated the interest deduction for noncollateralized (credit card) borrowing, while making the interest paid on primary mortgages and up to $100,000 of home-equity borrowing tax deductible. These policy changes made home-equity borrowing a more attractive form of financing. In addition, banks began promoting 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.[9] In the early 1990s, home equity debt outstanding was roughly 4 percent of GDP. Even though this amount of debt relative to GDP was well below its peak ratio of 8 percent during the 2000s, it suggests that households borrowed a substantial amount of money against their homes well before the recent housing boom.[10]

In addition, every wave of the PSID collects data on household mortgage debt—both first and second mortgages—which enable us to check whether homeowners took advantage of available credit and accessed their housing equity to potentially invest in their children's education. We identify home equity borrowers as those parents who increase their mortgage debt around the time their children are 17 years-old, conditional on them not moving.[11] In particular, we focus on parents who extracted equity during the time their children were between 17–21, 15–19, or 19–21 years of age, after not having extracted equity for at least the three years prior to the time their children were in these age groups. We find that regardless of the age range considered, roughly 65 percent of parents who extracted equity around the time their children were college-age, had children enrolled in college when they were 19.

[8]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, Rosen, and Willen (2010) for a further discussion of Regulation Q and its effect on limiting household credit. It is unfortunate that due to data availability constraints, we cannot test the impact of this policy change on parents' use of home equity borrowing for investing in their children's education.

[9]Louise Story, The Debt Trap: Home Equity Frenzy Was a Bank Ad Come True, *New York Times*, August 15, 2008, Section A, Page 1. Available at 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.

[10]GDP data come from the Bureau of Economic Analysis, while home equity debt data come from the Federal Reserve's Flow of Funds Accounts.

[11]Homeowners that move may increase their mortgage debt simply by purchasing a more expensive home and/or through a smaller downpayment on an equally valued new property.

Tuition Costs Over Our Sample Period

Even though tuition costs have risen dramatically over time—especially in recent years—the tuition costs faced by parents wanting to invest in their children's post-secondary education in our sample period (1979–1999) were not trivial. In particular, we merged state-by-year (in-state) average tuition data with our sample for the state children lived in when they were 17 years-old and compared the tuition costs with our baseline measure of parents' income (the five-year average around the year their children turn 17).[12] In our sample, the median tuition costs relative to parents' income when children turn 17 are roughly 0.08 (8 percent of permanent income). However, tuition relative to parental income nearly doubles at the 75th percentile of the distribution, is 0.32 at the 90th percentile, and is 0.53 at the 95th percentile. These data suggest that college tuition costs are a burden for a nontrivial portion of the parents in our sample. Keep in mind as well that these costs are based on in-state tuition rates that exclude room and board, so these estimates do not reflect the full cost of a post-secondary education. Parents wishing to send their children to potentially better out-of-state schools or private in-state schools, likely face even higher tuition costs.

5 Results

Table 1, columns (1)–(3) report our baseline results. Standard errors, clustered by the respondent's MSA at age 17, are shown in parentheses. Focusing on column (1), where owners and renters are pooled together, we observe that greater parental resources (income, nonhousing wealth, home values, and parents' own college education) when their children are 17 years-old are associated with higher income for these children when adults in 2005–2007. For example, the estimated elasticity of children's income with respect to their parents' income is 0.29, and having a college-educated parent increases children's earnings by 15 percent. Parents' housing wealth also appears to have a larger earnings effect than nonhousing wealth, as it typically represents a larger fraction of wealth for many households.

Additional control variables, such as the unemployment rate at age 17 and whether parents are renters in an owner-dominated tract or owners in a renter-dominated tract, try to capture childhood influences on offspring that go beyond parental income, education, and wealth. These variables control for the quality and economic well-being of the local

[12]We calculated average tuition at public (in-state) colleges and universities by state and year using data from the Integrated Post-Secondary Education System (IPEDS).

area where parents live when their children are 17 years-old. Indeed, existing research suggests that parental values and/or types and especially the area in which a child grows up have an impact on his/her future outcomes (see for example Ludwig et al., 2013; Kling, Liebman, and Katz, 2007)

The idea behind controlling for the type of area in which parents lived when their child was 17 years-old is that nonwealthy parents who particularly care about their children's education might choose to rent and live in an area with a good school system over owning a home in a more affordable area that has less reputable schools. These parents might be systematically different in terms of their personal values or how they raise their children compared to other renters. Similarly, parents who own homes in renter-dominated census tracts might have different preferences and values than other homeowners. We find that the children of renters who grow up in owner-dominated census tracts have consistently higher earnings than the children of renters who do not grow up in such census tracts. Similarly, the children of owners who live in renter-dominated tracts tend to have lower earnings than other owners' children. In addition, worse local economic conditions when children are 17 years-old lead to lower future income: a 1 percentage point increase in the unemployment rate when children are 17 years-old results in roughly 3 percent lower annual income for them as adults.

Turning to our key explanatory variable, two-year real house price appreciation (not annualized, measured in percent) in the MSA where the children lived at age 17 has a positive but not precisely estimated impact on future earnings. Since we expect a potentially differential effect for owners and renters, we split our sample accordingly in columns (2) and (3). We 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 10 percentage point increase in housing prices results in 14.6 percent lower annual income for renters' children and 8.8 percent higher annual income for owners' children.[13] This translates to roughly $4,985 of additional annual earnings for owners' children and $5,487 less annual income for renters' children based on the median earnings for the two groups.[14] These findings are consistent with the idea that the children of homeowners benefit from their parents' higher housing wealth and borrowing collateral, while renters' children are potentially hurt by the higher housing costs (rents) most often

[13]We cannot reject the null hypothesis that these estimated effects are the same size in absolute value (p-value 0.6268).

[14]The median income for owner's children is $56,643 and is $37,580 for renter's children. The calculation assumes that house prices appreciate 10 percentage points between age 15 and 17 and then applies the estimated effect for renters and owners to the relevant income measure.

associated with housing appreciation.

The impact of the variation in house price growth across geographic areas and over time on children's earnings as adults is also economically meaningful. For example, other things equal, the child of a homeowner at the 75th percentile of the house price growth distribution (growth around 6.5 percent) is predicted to have about 8.1 percent higher income as an adult than the child of a homeowner at the 25th percentile of the house price growth distribution (growth around –2.7 percent). For renters, who face a similar house price distribution, a child at bottom of the house price growth distribution (25th percentile) would have about 12.9 percent higher income than a child at the 75th percentile.

It is possible to provide economic context for our results within the vast literature on the returns to education. Recent work by Abel and Deitz (2014) shows that, on average, the earnings return to a four-year college degree is about 15 percent while the return to a two-year associate's degree is between 13 percent and 15 percent.[15] A 10 percentage point increase in home prices, therefore, leads to an earnings increase for the children of homeowners that is about half the average return to a college degree. Also, in a simple regression of log family income on years of education in our PSID sample (with the same controls as in Table 1 columns (8) and (9), but excluding house price growth) we estimate that one additional year of education is associated with 6 percent higher annual income.[16] Given this simple return-to-education effect, the 3 percent average housing appreciation for homeowners in our sample leads to an annual income increase of 2.6 percent, which is equivalent to the return on about five months of additional education.

It is important to recognize that our estimated impact of housing appreciation on future earnings for children captures an *average* house price appreciation effect on children's earnings as adults. This average effect encompasses the house price growth outcomes of three different types of children: those who were unaffected by the house price changes, those whose college attendance decision (and future earnings) were affected, and those whose college attendance decision was unaffected but whose college quality was affected. In addition, our story is not just about an individual's ability to complete college, but

[15]These estimated returns take into account both wages as well as college costs and control for a host of individual characteristics. The authors, however, are unable to control for differences in returns due to differences in the innate ability of individuals who attend college and those who do not. Still, their analysis provides a reasonable benchmark for the average return to education.

[16]Other estimates of the returns to post-secondary schooling, surveyed in Card (1999), suggest somewhat larger annual earnings effects, 9–10 percent, which is not surprising since our respondents are relatively young 25–45 year-olds, and not yet at the peak years of their adult earnings.

rather about his/her ability to attend college and/or be able to afford to attend a better (more expensive) or worse school. Conditional on completing college, someone whose owner-parents experienced favorable house price growth may also be better off because that student did not have to work as much while in school to fund his/her education. This reasoning applies to renters' children as well—they experience a negative earnings effect when house prices rise because, for instance, increased housing costs lead them to attend a lower quality, less expensive school or perhaps not be able to afford college at all.

A potential concern with our differential earnings effects between owners' children and renters' children is that we are simply picking up the fact that compared to owners, renters live in less desirable MSAs based on house prices and/or other economic conditions. The summary statistics in Table 2 show, however, that there are no substantial differences in MSA-level house prices, income growth, or unemployment rates between the sample of owners and renters.[17] In addition, house prices and rents are strongly and positively correlated at the metropolitan level, and homeowners' self-reported house price growth is also positively correlated with rent increases reported by renters living in the same MSA in the PSID (see Figure B.1 and the discussion in Appendix B for further details). These findings support our claim that renters are likely hurt by rising housing costs when home prices appreciate (and *vice versa*). Renters planning to purchase a home in the future may also be impacted by rising house prices, as this means they need to save more for a downpayment. Indeed, 43.5 percent of (parent) renters in our sample move to owner-occupied properties in subsequent years and half of them do so within five years of their children turning 17 years-old.

Arguably, a potential explanation for the correlation between house price growth at age 17 and children's adult income is that differences in house price appreciation signal long-term differences in economic growth across MSAs. To address this concern, we report results from three different specifications. First, in columns (4) and (5) of Table 1, we measure children's income relative to the per-capita income in the MSA in which they live at the time their earnings are recorded. The results are very similar to our initial findings: house price appreciation when children are 17 years-old leads to higher (relative) income for them as adults if their parents were homeowners, and lower relative

[17]The number of observations for MSA income growth at the time the child is 17 years-old is lower than in our baseline regressions because we could not match all observations to available MSA-level income data from the Bureau of Economic Analysis. In later regression analysis, we fill in missing values with state-level income growth to preserve our sample size.

income if their parents were renters. Thus, it does not appear that earnings as adults are higher (lower) simply because economic growth flourishes in some MSAs and falls behind in others.

To account for potential economic growth differences based on where children lived at age 17, we also consider a specification that includes MSA (at age 17) fixed effects. The results are shown in Table 1 columns (6) and (7). Identification for these estimates comes from house price growth variation over time within an MSA. The results are qualitatively and quantitatively similar to the previous columns but the estimates have less precision (p-values of 0.101 and 0.15 for owners and renters, respectively) given the more limited variation for identification purposes in our small sample. Finally, in columns (8) and (9), we explicitly add controls for economic conditions (unemployment rates and income growth) at the MSA-level in 2006, when children's income is measured.[18] We also include census-tract level median house values around the time children are 17 years-old to proxy for the local property tax base and the quality of local primary and secondary education systems. Indeed, property taxes are the primary source of funding for many U.S. school systems at the local level, and better local schools are often associated with higher incomes in adulthood. The estimated house price growth effect for both homeowners and renters is of similar magnitude to previous estimates after including these additional variables.[19]

Finally, in columns (10) and (11), we report estimates that use labor income instead of family income as the dependent variable.[20] If the effect of house price growth on children's earnings as adults operates through human capital accumulation, then we should obtain similar results using an income measure that is more closely tied to labor productivity, such as labor earnings. The estimated earnings effects using labor income are indeed of similar magnitude to our baseline findings for both owners and renters, but are a bit less precise, likely because we lose about 30 observations for children with no labor income. One could argue that using labor income as our outcome variable is a more direct approach to estimating the impact of house price growth during children's teenage years on their future earnings, since total family income likely also depends on

[18]Recall that reported income in the 2007 PSID wave covers 2006.

[19]The estimated atypical owner/renter coefficients become smaller and statistically insignificant after including census-tract level median house values in the regressions, suggesting that indeed the atypical owner/renter variables may, at least in part, be picking up the effect of elementary or secondary school quality.

[20]Labor income in the regressions is defined as the sum of wages for the head of the household and his/her spouse (if any) plus any unemployment benefits.

one's family structure and nonlabor earnings. However, we believe that the advantages of higher education go beyond one's own wages, including being able to find a full-time job, assortative matching, financial literacy, and so on—factors that are all better captured by total family income. Going forward we will continue to use total family income as our dependent variable, and all specifications will include the full set of controls in columns (8) to (11) of Table 1.

5.1 *Alternative Measures of House Price Growth*

Table 3 considers alternative timing for measuring house price growth during children's high school years. To facilitate comparisons, the different measures are normalized before running the regressions—the mean and standard deviation of each measure is reported in the last two rows of the table. Recall that our baseline housing appreciation measure is two-year house price growth in the year that the child turns 17. As alternatives, we consider one-year house price growth, four-year house price growth, and cumulative housing appreciation during the period the parents have lived in their current home.[21]

Housing appreciation over a longer period might arguably be a better indicator of parents' total home equity available for use as borrowing collateral, at least for parents who have not yet tapped into their housing equity. Our findings indicate that the effect of housing appreciation on homeowners' children's earnings is similar regardless of the timing of the house price measure considered, although the estimated effect is less precise for one-year housing appreciation (p-value of 0.13). Overall, the results continue to show that house price growth during a child's teenage years has a positive impact on adult earnings for the children of homeowners. In contrast, short-term local area housing appreciation matters more for renters' children than does long-term appreciation, as the house price effect on earnings goes down and becomes noisier when moving from the one-year measure to the cumulative measure. This finding might reflect the fact that most renters have been at their current residence for a shorter period of time than homeowners (mean and median tenure for owners is 9.3 and 9 years, respectively, while it is 3.3 years and 1 year for renters).

The remainder of Table 3 reports the results from specifications that focus on the unpredicted component of two-year house price growth in order to check that our findings are not driven by parents who move to areas where they anticipate that house prices will

[21] If house price indices are not available for parents' entire tenure period, cumulative house price growth covers the longest time period for which it can be calculated.

increase—either homeowners wishing to build their housing equity or renters anticipating an improvement in the quality of the local schools. To isolate the unpredicted component of house price growth, we estimate different specifications for house prices as follows. For column (5), we first run the regression:

$$\ln hpi_{it} = \beta_1 + \beta_2 \ln hpi_{i,t-1} + \gamma_i + v_t + u_{it},$$

where $\ln hpi_{it}$ is the log of the house price index in MSA i in year t, γ_i is an MSA fixed effect, and v_t is a time fixed effect. For column (6), we fit the regression:

$$ghpi_{it} = \beta_1 + \beta_2 ghpi_{i,t-1} + \gamma_i + u_{it},$$

where $ghpi_{it}$ is the growth rate of house prices in MSA i in year t. For column (7), we add MSA income growth to the above specification (the number of observations is lower because MSA income data are not available for all MSAs in our sample for the time period considered and we did not impute missing values). We calculate the unpredicted component of two-year house price growth as $\widehat{u}_{it} + \widehat{u}_{i,t-1}$ given each specification.

Overall, our baseline findings for both renters and owners are robust to using the unpredicted component of house price growth rather than overall housing appreciation. This suggests that our results are not driven by parents moving to an area in anticipation of future house price increases.

5.2 House Price Growth at Different Ages

Table 4 shows estimates of our baseline equation when we measure house price growth at ages other than when the child turns 17 years-old: two-year house price growth when children turn 13 years-old and when they turn 21 years-old (one at a time and together). When a child is 13 years-old, house price growth is more likely to impact local education through increased property tax revenue than by directly affecting a child's ability to go to college. 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. For ease of viewing the results we only show the estimates for our coefficients of interest.

In Table 4, columns (1) and (5) repeat our baseline estimates for owners and renters, respectively, but restrict the sample to be compatible with the sample for house price growth at other ages. Relative to the results in Table 1, we lose observations because

MSA-level house price indices are not available in earlier years. As a result, our estimates of house price growth at age 17 are less precise, particularly for renters (p-value 0.09).[22] House price growth at age 13, shown in columns (2) and (6), has a positive impact on the adult earnings of both renters' children and owners' children, although the coefficient is not precisely estimated for renters (p-value 0.15). This result is consistent with the idea that house price growth when children are younger is most likely to impact all children's earnings as adults through quality improvements in the local education system, given enhanced community wealth and property tax revenues. House price growth at age 21 also has a positive coefficient for both owners and renters but the coefficients are not statistically different from zero (columns (3) and (7), with p-values about 0.54 for both owners and renters).

In column (4) we consider the three measures of house price growth together for owners. Both house price growth at age 17 and house price growth at age 13 are significant at conventional levels and we cannot reject the null hypothesis that the coefficients for the three measures (at different ages) are the same. The magnitude of the estimated effects suggests that house price growth prior to age 17 is what matters the most for the future earnings of homeowners' children—a finding that makes sense given that equity in one's home tends to build over time. This result is also consistent with our previous estimates in Table 3, which showed that house price growth over longer time periods prior to a child's 17th year is what impacts future earnings the most. In addition, the strength of the house price growth effect at age 13 does not necessarily invalidate our claim that house price growth around age 17 matters for children's earnings as adults—since we cannot rule out housing appreciation at that time impacting overall school quality in a given area. Indeed, the fact that the children of renters also benefit from house price growth at age 13 is consistent with house price appreciation potentially impacting local school quality.

When we combine all three house price growth measures for renters (column 8), the coefficient estimates lack precision (the p-values are 0.16, 0.17, and 0.57 for house price growth at ages 13, 17, and 21, respectively). However, we can reject the null hypothesis that the (negative) effect of house price growth at age 17 is the same as the (nonnegative) effects at the other ages (p-value of 0.09)—a finding that suggests the future earnings of renters' children are differentially impacted by house price growth around age 17. This result is also consistent with our previous finding that the house price growth occurring

[22]The p-value for house price growth for owners is 0.065.

closest to age 17 matters the most for the future earnings of renters' children. We reach similar conclusions when we pool owners and renters together and allow the house price growth coefficients to differ by housing tenure but restrict all other coefficients to be the same (column 9).

One might be concerned that the negative coefficient for house price growth at age 17 for renters is not statistically significant at the conventional levels shown in columns (8) and (9). We believe that this lack of precision, however, is due to a power issue related to the smaller sample size compared to our baseline estimates rather than indicative of the effect being spurious. First, house price appreciation lowers the likelihood that renter's children enroll in college, as discussed in the next section. Second, the coefficient for house price growth at age 17 is significant at conventional levels in alternative specifications such as the one shown in column (10) where we use an individual's relative income as the dependant variable (p-value is 0.07).

5.3 House Prices and Children's Post-Secondary Educational Outcomes

We have argued that house price growth around the time children are 17 years-old impacts their earnings as adults because it affects, among other things, their financial access to post-secondary education—a claim that we can test using available education data in the PSID. In particular, if house price changes positively (negatively) affect parents' available resources to invest in their children's human capital, then there should be an increase (decrease) in the number of college attendees and graduates. Moreover, children whose parents experience a positive financial resource shock may be able to attend more selective colleges—with potentially higher tuition—and earning a degree from these institutions could command a wage premium in the labor market.

In Table 5, Columns (1) and (2) examine how changes in house prices around the time children are 17 may impact whether they enroll in college by age 19—an approach similar to that in Lovenheim (2011). We consider someone to have enrolled in college by age 19 if he/she reports having 12 or more years of education by that age and says that he/she is a student. The number of observations is lower than in our previous regressions because the PSID does not record one's completed level of education in every year. House price increases have a positive and precisely estimated impact on college enrollment for the children of homeowners and a negative but insignificant effect on college enrollment for the children of renters. This finding is consistent with rising house prices increasing

homeowners' ability on the margin to finance their children's college attendance. In contrast, rising house prices represent higher costs for renters who may want to purchase a home in the future or face rising rental costs; either way they may have less resources to devote to their children's post-secondary education.

Columns (3) and (4) consider the link between house price changes and college completion, rather than enrollment. In this case, the house price effects are positive but small and very imprecisely estimated for both owners and renters. These results are not necessarily surprising since changing house prices likely have a more immediate impact on college enrollment decisions when one is a teenager, but less of an effect on children's decisions to attend college later in life. That is, fluctuating house prices around age 17 likely have less effect on the completion rates of individuals who delay starting college until well past the end of high school than they do on individuals choosing to enroll in college by age 19.

We also consider whether house price appreciation impacts the rank of the college children attend; these results are shown in columns (5) and (6). The idea is that some children may go to college or complete college regardless of house price changes, but their parents may be able to send them to a better school—a more expensive school or one with less financial aid options—if their housing equity increases. The rank information makes use of recently released data by the PSID on the post-secondary school attended (if any) by the household head (and spouse). We discuss these data and how we construct our measure of school quality based on colleges' SAT score data in detail in Appendix A.

The dependent variable equals one if the individual attends a college or university in the top quartile of the school rank distribution, and is zero otherwise. Note that the sample size is small since we only have post-secondary school rank data if an individual has at least some college education. The results suggest that house price appreciation leads to an increased likelihood that owners' children attend a college ranked in the top quartile.

Taken together, the educational attainment results for owners' children are consistent with our claim that rising house prices allow parents to invest more in their children's human capital. The results for renters are less precisely estimated, but we document a negative relationship between housing appreciation and college enrollment rates for renters' children—a finding that is consistent with the idea that higher housing costs reduce renters' ability to invest in their children's education.

5.4 Incorporating Differences in House Values

Lovenheim (2011) argues that households' (dollar) amount of home equity is what matters for parent's ability to invest in their children's post-secondary education. Other things equal, a given percentage gain in house prices leads to greater dollar wealth gains for parents living in more expensive homes. In a similar vein, we explore if dollar gains in house values, rather than house price growth, affect children's earnings as adults by estimating the following equation:

$$y_i^{bl} = \alpha + \beta \Delta H_i^{17} + \mathbf{X}_i^{17} \mathbf{\Omega} + \delta u_l^{17} + \nu_b + \upsilon_l + \epsilon_i, \tag{2}$$

where $\Delta H_i^{p,17}$ denotes exogenous changes in house values when the child i was 17 years-old, and all other variables are defined as in equation (1). Exogenous changes in house values are constructed as $\Delta H_i^{17} = g_l^{17} \times H_i^{15}$, where g_l^{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 (as before), and H_i^{15} is parents' initial house value (divided by 10,000). H_i^{15} is calculated differently for owners and renters (as explained below), but the idea of this specification is to translate house price growth into potential dollar gains or losses in house values due to exogenous house price changes. We follow this approach rather than an instrumental variable (IV) technique because IV cannot be used for renters, who have zero home equity by definition but can still be affected by changes in home values.

For homeowning parents, H_i^{15} equals their self-reported home values when their child was 15. The interpretation is that ΔH_i^{17} reflects potential home equity gains from housing appreciation, abstracting from refinancing decisions and mortgage principal payments. For renters, we use two different approaches to calculate initial home values. First, we match renters' children with the median home value in the census tract when they were 15 years-old, H_i^{15}, based on where the child and parents lived when the child was 17 years-old. Second, we assume annual rental payments represent on average 5 percent of home values and calculate H_i^{15} as parents' real annual rent payment when their children are 15 years-old divided by 0.05. This second approach yields less observations because rental payment data are not available for all respondents. ΔH_i^{17} for renters can be interpreted as an exogenous increase in housing costs (rents or future purchase prices).

To reiterate, we have already established that housing appreciation lowers (increases) the adult income of renters' (owners') children, but would like to determine if house price levels play a role. The idea is that the same percentage change in house prices might represent very different total dollar amounts in terms of home equity or rental costs (or

downpayment amounts if renters wish to purchase a home in the future), when existing housing costs differ across households. We explore the effect of changing house values on income and educational outcomes and summarize the results in Table 6.

As shown in column (1), higher home values are associated with higher earnings for owners' children—similar to what Lovenheim (2011) finds. An additional $10,000 of home equity—arguably due to exogenous house price changes—increases children's annual income as adults by about 3.6 percent. For renters' children we find that an increase of $10,000 in median home values in their census tract leads to 6.7 percent lower actual annual income, as shown in column (2), but the estimate is imprecise (p-value 0.24). When measuring home value changes using the approach that relies on rental payment information, shown in column (3), the coefficient has nearly the same magnitude as in column (2), but is quite precisely estimated. Overall, these findings show that our baseline conclusions hold even if we account for differences in the amount of housing equity across homeowners, and relative house values across MSAs when renters' children are 17 years-old.

In terms of educational outcomes, our results accounting for house values are also similar to those in Table 5, where we use house price growth as our main regressor. In particular, there is a link between home value changes and college enrollment at age 19—including a small but positive effect for homeowners' children, and a precisely estimated, negative effect for renters' children—and no precise relationship between house value fluctuations and college completion. Higher home values also result in an increased likelihood that homeowners' children attend a top-ranked post-secondary institution.

6 Conclusion

Overall, our results indicate a link between housing appreciation when children are teenagers and their future earnings as adults, and that this effect differs for owners and renters. When housing appreciates around the time children are 17 years-old, the adult earnings of owners' children rise, while the adult earnings of renters' children fall. This finding is robust to using house price growth or home value changes and 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 for homeowners. We go a step further and look at the impact of house price growth on children's future earnings while documenting the differential

effects for owners and renters.

Note as well that we observe our house price effects through 1999. In comparison, Lovenheim (2011) observes his effects of housing appreciation on college enrollment primarily between 2001 and 2005 and not earlier—a choice he attributes to the great liberalization of household credit conditions in the early 2000s. However, households had increased access to credit and more incentives to borrow against their housing wealth starting in the mid-to-late 1980s. It is possible as well that in the 2000s appreciating house values mattered more for children enrolling in college who otherwise might not have been able to attend, while house price growth in earlier years provided students who would have enrolled in college anyway with access to better educational opportunities. Our finding that housing appreciation increases the likelihood that homeowners' children attend a higher ranked post-secondary institution is broadly consistent with this conjecture.

In addition, our results could, in principle, be even stronger if we include the early 2000s housing boom (also a period of rising tuition costs) in our estimates. That is, rising tuition costs likely increased the financial need of children wishing to attend college—a need that was potentially met, at least in part, by rising house prices and increased housing equity to use as collateral. To the extent that this occurred, our results would suggest a particularly important college attendance and earnings effect for the recent cohort of young adults. Given our desire to look at children's earnings as adults, however, there are not enough years of post-housing boom data yet to examine the actual impact of house price growth in the early 2000s on children's future earnings.

As Lovenheim (2011) points out, a remaining question 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 household borrowing constraints. That is, do parents consume more education (for their children) simply because they feel wealthier or is the increased education consumption the result of parents' greater access to credit and/or cheaper financing? The fact that we find that a majority of homeowners increase their housing-related borrowing for the first time in the years around when their children are college-aged suggests this phenomenon perhaps tells a credit constraint story. Of course, homeowners may not be constrained in the strict sense that they cannot borrow absent house price increases, but given the size of college tuition payments they may choose to borrow against their homes—at least in the short run—because of the convenience and relatively low cost of such financing. In addition, it is unclear that housing appreciation should make parents feel wealthier because they are not necessarily better off when house

prices rise since the implicit cost of the housing services they consume also rises.

Given our findings, some potential additional avenues for future research include exploring whether house price appreciation impacts children's labor supply while at college if their parents can finance more of their education. Similarly, it would be worth investigating whether post-secondary education financing choices impact children's job choice and other post-college outcomes. That is, do young adults with substantial college debt search for and take higher paying jobs, all else equal, in order to repay their loans? Overall, this paper contributed to the literature on homeownership and children's outcomes and the educational achievement literature, but there is certainly interesting work to be done when additional data become available.

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Table 1: Family Income and House Price Growth when Children are 17 Years-Old

	Baseline			Relative Income		MSA Fixed Effects		Additional Controls		Labor Income	
	All	Owners	Renters	Owners	Renters	Owners	Renters	Owners	Renters	Owners	Renters
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
House Price Growth at 17	0.149	0.879**	–1.461**	0.901**	–1.424**	0.852	–1.303	0.983**	–1.324**	0.916*	–2.065*
	(0.387)	(0.427)	(0.644)	(0.408)	(0.637)	(0.627)	(0.833)	(0.431)	(0.637)	(0.546)	(1.081)
Unemployment Rate at 17	–3.264*	–1.351	–2.434	–0.634	–1.642	–1.064	0.484	–1.099	0.481	–0.512	–6.175
	(1.854)	(2.442)	(2.881)	(2.347)	(2.651)	(5.606)	(5.239)	(2.575)	(3.128)	(3.376)	(4.183)
Log.Parent Income, Five-Year avg.	0.292***	0.351***	0.156*	0.334***	0.147	0.335***	0.108	0.324***	0.135	0.252**	0.086
	(0.061)	(0.089)	(0.093)	(0.089)	(0.090)	(0.102)	(0.099)	(0.090)	(0.090)	(0.098)	(0.132)
Log.Parent House Value, Five-Year avg.	0.016**	0.111**		0.080		0.085		0.004		–0.030	
	(0.007)	(0.052)		(0.054)		(0.057)		(0.052)		(0.078)	
Log.Parent Nonhousing Wealth	0.006	0.003	0.013*	0.005	0.013*	0.003	0.020**	0.004	0.012*	0.002	0.008
	(0.005)	(0.006)	(0.008)	(0.006)	(0.007)	(0.008)	(0.009)	(0.006)	(0.007)	(0.006)	(0.011)
Parent-Renter in Owner Tract	0.199*	0.000	0.238*	0.000	0.269**	0.000	0.260	0.000	0.142	0.000	0.147
	(0.104)		(0.126)		(0.118)		(0.175)		(0.124)		(0.147)
Parent-Owner in Renter Tract	–0.283**	–0.185		–0.230*		–0.208		–0.153		–0.244	
	(0.129)	(0.135)		(0.137)		(0.171)		(0.135)		(0.193)	
Parent College Grad	0.150**	0.098	0.048	0.087	0.054	0.062	0.087	0.066	0.009	0.081	0.127
	(0.064)	(0.066)	(0.187)	(0.066)	(0.185)	(0.089)	(0.244)	(0.067)	(0.184)	(0.072)	(0.230)
Unemployment Rate in 2006								–0.025	–0.179*	–0.047	–0.198*
								(0.035)	(0.095)	(0.038)	(0.112)
MSA Income Growth in 2006								0.501	–0.484	0.935**	1.090
								(0.397)	(0.496)	(0.426)	(0.670)
Log. Median Census Tract House Value at 15								0.272***	0.234***	0.390***	0.404***
								(0.088)	(0.070)	(0.122)	(0.111)
Birth-Year Fixed Effects[1]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Location Fixed Effects[2]	State	State	State	State	State	MSA	MSA	State	State	State	State
Number of Observations	892	582	310	582	310	582	310	582	310	569	297
R-Squared	0.35	0.39	0.36	0.37	0.35	0.46	0.47	0.40	0.38	0.37	0.32

Notes: We estimate $y_i^{bl} = \alpha + \beta g_l^{17} + \mathbf{X}_i^{17}\mathbf{\Omega} + \delta u_l^{17} + \nu_b + \upsilon_l + \epsilon_i$. The term y_i^{bl} is (log) family income (2005 and 2007 average) for respondent child i, born in year b who lived in location l at age 17. The term g_l^{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. The term u_l^{17} is the unemployment rate in location l (MSA if available, county or state otherwise) when the child was 17 years-old and controls for local economic conditions. The term $X_i^{p,17}$ is a matrix of parental controls (those reported in the table plus age and age squared of the parent head of household, and family size and family size squared for the parents). ν_b and υ_l denote birth-year and location fixed effects. Standard errors clustered at the MSA (at 17) level are in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level. [1] There are 20 birth-year cohorts. [2] Owners (renters) live in 41 (34) different states.

Table 2: MSA House Price Growth and Income Growth:
Parent-Owners versus Parent-Renters

	Mean	**Median**	**Std. dev.**	**Min**	**Max**	**Obs**
			Parent Renter			
MSA House Price Growth	0.019	0.015	0.083	–0.217	0.361	310
MSA Unemployment Rate	0.061	0.056	0.021	0.023	0.157	310
MSA Income Growth	0.057	0.054	0.027	–0.049	0.144	310
			Parent Owner			
MSA House Price Growth	0.021	0.015	0.093	–0.280	0.391	582
MSA Unemployment Rate	0.060	0.055	0.023	0.022	0.208	582
MSA Income Growth	0.058	0.055	0.027	–0.015	0.165	582

Notes: House price growth data come from the Federal Home Finance Agency. Unemployment rate data come from the Bureau of Labor Statistics, and income growth data come from the Bureau of Economic Analysis.

Table 3: Family Income and House Price Growth when Children are 17 Years-Old: House Price Growth Variations

	One Year (1)	Two Years (2)	Four Years (3)	Cumulative (4)	Residual 1 two-year (5)	Residual 2 two-year (6)	Residual 3 two-year (7)
Owners							
House Price Growth at 17	0.066	0.088**	0.071**	0.063**	0.074**	0.062	0.094*
	(0.043)	(0.039)	(0.033)	(0.031)	(0.032)	(0.045)	(0.051)
Number of Observations	582	582	582	582	582	582	511
R-Squared	0.40	0.40	0.40	0.40	0.40	0.40	0.38
Renters							
House Price Growth at 17	–0.114**	–0.118**	–0.086	–0.078	–0.094*	–0.107*	–0.125**
	(0.054)	(0.057)	(0.054)	(0.075)	(0.047)	(0.063)	(0.061)
N	310	310	310	310	310	310	281
R sq.	0.38	0.38	0.38	0.38	0.38	0.38	0.41
Birth-Year Fixed Effects[1]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects[2]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Summary Stats for House Price Growth Measures (normalized for regressions)							
Average	0.01	0.02	0.04	0.04	0	0	0
Standard Deviation	0.05	0.09	0.15	0.17	0.08	0.06	0.05

Notes: The estimates follow the baseline specification in columns (8) and (9) of Table 1 except that house price growth is calculated differently in each column. For easier comparison, the different house price growth measures are normalized. Column (1) uses one-year house price growth in the MSA where the respondent lived the year he/she turned 17. Column (2) is our baseline, two-year house price growth measure, and column (3) incorporates four-year house price growth. Column (4) uses cumulative house price growth which is based on the number of years each parent has been at his/her current address as of the year his/her child turns 17. Columns (5)–(7) capture the unpredicted component of two-year house price growth. For column (5), we run the regression $\ln hpi_{it} = \beta_1 + \beta_2 \ln hpi_{i,t-1} + \gamma_i + v_t + u_{it}$, where $\ln hpi_{it}$ is the log of the house price index in MSA i in year t, γ_i is an MSA fixed effect and v_t is a time fixed effect. For column (6), we fit the regression $ghpi_{it} = \beta_1 + \beta_2 ghpi_{i,t-1} + \gamma_i + u_{it}$, where $ghpi_{it}$ is the growth rate of house prices in MSA i in year t. For column (7), we fit the regression $ghpi_{it} = \beta_1 + \beta_2 ghpi_{i,t-1} + gy_{i,t-1} + \gamma_i + u_{it}$, where $ghpi_{it}$ is the growth rate of house prices in MSA i in year t and $gy_{i,t-1}$ is lagged income growth. We calculate the unpredicted component of house price growth as $\widehat{u}_{it} + \widehat{u}_{i,t-1}$ based on the residuals of each specification. Standard errors clustered at the MSA (at 17) level are in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level. [1] There are 18 birth-year cohorts. [2] Owners (renters) live in 40 (34) different states.

Table 4: Family Income and House Price Growth at Different Childhood Ages

	Parent-Owners				Parent-Renters				All	Relative Income
House price growth	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Age 17, Parent-Owner	0.798*			0.997**					0.888**	0.856**
	(0.429)			(0.395)					(0.414)	(0.408)
Age 13, Parent-Owner		0.887**		1.173***					1.080***	1.088***
		(0.364)		(0.401)					(0.409)	(0.416)
Age 21, Parent-Owner			0.285	0.725					0.503	0.256
			(0.460)	(0.512)					(0.533)	(0.504)
Age 17, Parent-Renter					–1.179*			–1.008	–0.632	–0.818*
					(0.689)			(0.724)	(0.467)	(0.443)
Age 13, Parent-Renter						0.921		0.969	1.085	1.023
						(0.636)		(0.679)	(0.676)	(0.672)
Age 21, Parent-Renter							0.589	0.602	1.127	0.959
							(0.956)	(1.065)	(0.813)	(0.847)
Birth-Year Fixed Effects[1]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects[2]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	512	512	512	512	273	273	273	273	785	785
R-Squared	0.42	0.42	0.42	0.43	0.38	0.38	0.38	0.39	0.41	0.39

Notes: The estimates follow the baseline specification in columns (8) and (9) of Table 1. Standard errors clustered at the MSA (at 17) level are in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level. [1] There are 18 birth-year cohorts. [2] Owners (renters) live in 40 (34) different states.

Table 5: House Price Growth when Children are 17 Years-Old and Post-Secondary Educational Attainment

	Enrollment at Age 19		College Degree		College Ranking	
	Owners	Renters	Owners	Renters	Owners	Renters
	(1)	(2)	(3)	(4)	(5)	(6)
House Price Growth at 17	0.481*	–0.422	0.074	0.050	0.647*	0.411
	(0.27)	(0.63)	(0.24)	(0.37)	(0.38)	(0.47)
Unemployment Rate at 17	3.348**	–1.618	1.663	–0.409	3.610	3.391
	(1.51)	(3.18)	(1.55)	(1.58)	(2.34)	(3.75)
Log.Parent Income, Five-Year avg.	0.098*	0.066	0.126***	0.027	0.068	0.095
	(0.06)	(0.05)	(0.04)	(0.04)	(0.08)	(0.10)
Log.Parent Nonhousing Wealth	0.004	0.013*	0.004	–0.006	0.002	–0.008
	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
Log.Parent House Value, Five-Year avg.	–0.016		0.020		–0.016	
	(0.04)		(0.04)		(0.06)	
Parent College Grad	0.157***	0.264***	0.190***	0.140**	0.085	–0.084
	(0.06)	(0.10)	(0.05)	(0.06)	(0.09)	(0.07)
Parent-Renter in Owner Tract		–0.170		–0.056		–0.155*
		(0.10)		(0.07)		(0.08)
Parent-Owner in Renter Tract	0.113		0.045		0.107	
	(0.07)		(0.06)		(0.14)	
Log.Median Census Tract House Value at 15	0.103	0.069	0.212***	0.047	0.185*	0.123
	(0.07)	(0.10)	(0.05)	(0.04)	(0.10)	(0.07)
Birth-Year Fixed Effects[1]	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects[2]	Yes	Yes	Yes	Yes	Yes	No
Number of Observations	460	255	460	255	195	44
R-Squared	0.28	0.29	0.38	0.31	0.40	0.72

Notes: The dependent variable in columns (1)–(2) equals one if a child is enrolled in college at age 19 and has at least 12 years of education at that time. The dependent variable in columns (3)–(4) equals one if an individual completes college or obtains more education and is zero otherwise. The dependent variable in columns (5)–(6) equals one if an individual attends a college or university in the top quartile of the school rank distribution, and is zero otherwise. Regressions follow a linear probability model. Additional controls include age and age squared of the parent head of the household, and family size and family size squared for the parents. Standard errors clustered at the MSA (at 17) level are in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level. [1] There are 20 year of birth cohorts in columns (1)–(5) and 15 year of birth cohorts in column (6). [2] Owners live in 34 states in columns (1) and (3) and 29 states in column (5). Renters live in 34 states in columns (2) and (4).

Table 6: Changes in House Values at Age 17 and Children's College Outcomes

	Family Income			Education					
				Enrollment at Age 19		College Degree		College Ranking	
	Owners	Renters		Owners	Renters	Owners	Renters	Owners	Renters
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Change in House Value/10,000	0.036**	–0.067	–0.067**	0.026	–0.104**	–0.009	–0.049	0.034*	0.025
	(0.018)	(0.058)	(0.034)	(0.02)	(0.04)	(0.02)	(0.03)	(0.02)	(0.03)
Unemployment Rate at 17	–2.186	2.608	0.456	2.997*	–1.992	1.249	–1.194	3.475	3.012
	(2.402)	(3.360)	(3.915)	(1.54)	(2.79)	(1.55)	(1.67)	(2.18)	(3.82)
Log.Parent Income, Five-Year avg.	0.320***	0.133	0.154	0.097*	0.068	0.126***	0.028	0.064	0.087
	(0.090)	(0.089)	(0.100)	(0.06)	(0.05)	(0.04)	(0.04)	(0.08)	(0.10)
Log.Parent Nonhousing Wealth	0.004	0.012*	0.012	0.004	0.013*	0.004	–0.006	0.002	–0.009
	(0.006)	(0.007)	(0.008)	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
Log.Parent House Value, Five-Year avg.	0.002			–0.017		0.022		–0.015	
	(0.051)			(0.04)		(0.04)		(0.06)	
Parent College Grad	0.069	0.019	–0.063	0.158***	0.257***	0.191***	0.132**	0.080	–0.100
	(0.067)	(0.181)	(0.199)	(0.06)	(0.09)	(0.05)	(0.06)	(0.09)	(0.09)
Parent-Renter in Owner Tract	0.000	0.129	0.165		–0.174*		–0.059		–0.143
		(0.124)	(0.122)		(0.10)		(0.07)		(0.08)
Parent-Owner in Renter Tract	–0.161			0.115		0.041		0.115	
	(0.135)			(0.07)		(0.06)		(0.14)	
Log.Median Census Tract House Value at 15	0.271***	0.253***	0.153**	0.101	0.070	0.207***	0.045	0.173*	0.110
	(0.089)	(0.073)	(0.070)	(0.07)	(0.10)	(0.05)	(0.05)	(0.10)	(0.07)
Unemployment Rate in 2006	–0.020	–0.179*	–0.177						
	(0.036)	(0.095)	(0.112)						
MSA Income Growth in 2006	0.507	–0.515	–0.372						
	(0.393)	(0.507)	(0.531)						
Birth-Year Fixed Effects[1]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects[2]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Number of Observations	582	310	264	460	255	460	255	195	44
R-Squared	0.40	0.38	0.41	0.28	0.30	0.38	0.32	0.40	0.72

Notes: In columns (1)-(3), we estimate $y_i^{bl} = \alpha + \beta \Delta H_i^{17} + \mathbf{X}_i^{17}\mathbf{\Omega} + \delta u_l^{17} + \nu_b + \upsilon_l + \epsilon_i$, where ΔH_i^{17} denotes exogenous changes in house values (divided by 10,000) when child i was 17 or $g_l^{17} \times H_i^{15}$. The term g_l^{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 H_i^{15} is calculated differently for owners and renters as follows. For owners, column (1), H_i^{15} is their self-reported home value when their child was 15. In column (2) for renters, $H_i^{p,15}$ is real median home value in the census tract where the respondent and parent lived at age 15. In column (3) we assume annual rental payments represent 5 percent of home values and calculate $H_i^{p,15}$ as parents' real annual rent at age 15 divided by 0.05. Columns (4)-(9) are linear probability regressions for children's educational outcomes. All columns for renters use the first approach to measure $\Delta H_i^{p,17}$. The dependent variable in columns (4)–(5) equals one if a child is enrolled in school at age 19 and has at least 12 years of education at that time. The dependent variable in columns (6)–(7) equals one if an individual completes college or more education and is zero otherwise. The dependent variable in columns (8)–(9) equals one if an individual attends a college or university in the top quartile of the school rank distribution, and is zero otherwise. Additional controls for all columns include age and age squared of the parent head of the household, and family size and family size squared for the parents. Standard errors clustered at the MSA (at 17) level are in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level. [1] There are 20 birth-year cohorts in all columns except column (9) which has 15. [2] Owners live in 41 states in column (1), 39 in columns (4) and (6), and 29 states in column (8). Renters live in 34 states in columns (2), (3), (5), and (7).

Appendices

A Data Construction and Summary Statistics

Parent-Child Matching and the Final Matched Sample

In the 2007 PSID survey, there are about 6,000 respondents who are 25–65 years-old (we keep respondents from both the representative sample and the low-income sample). We are able to match 3,571 of these respondents to their parents. About 1,805 of these matches have information regarding the MSA they were living in at age 17. For 1,018 of them, those who were 17 years-old in the period 1979–1999, we can construct house appreciation measures when they were 17. Some additional observations are lost because of missing or invalid income or parental wealth records.

Data Matching

The PSID maintains Geocode Match Files that contain the identifiers necessary to link the main PSID data to other datasets that contain information on the characteristics of respondents' neighborhoods, metropolitan areas, or counties. These geocode data are highly sensitive, usually pinpoint the census tract in which families live, and are available only under a special contractual agreement with the PSID that is designed to protect the respondents' anonymity. Using these data, we identify the MSA children lived in during the year they turned 17 and merge the relevant MSA data on, among other things, house prices, unemployment, and income.

Income

The family income data we use are the sum of head of household's and any spouse's taxable income (earnings, asset income, net profit, and business income), transfer income, social security income, plus taxable income, transfer income, and social security income from other family members. To obtain children's earnings as adults we average reported family income for the 2005 and 2007 survey years. Reported income in these surveys covers the 2004 and 2006 calendar years, respectively. In addition, we ensure children are household heads in both 2005 and 2007, but include those children with only one year of available income data. The results are similar if only the children's 2006 income is used. Parent's family income is averaged over a five-year period centered around the year their child is 17 years-old to better capture their permanent income. For example, if a child turned 17 in 1988, we use his/her parent's income data 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. The median family income (in 2000 dollars) for the children (respondents) is roughly $48,000, and is about $20,000 higher for their parents. Parental income might appear high, but it is a five-year average, so transitory variations are attenuated. Family income is also calculated close to the income peak over the life cycle for most parents, while we observe

their children's earnings at a younger age.

House Prices

MSA house price appreciation data come from the Federal Housing Finance Agency (FHFA). Since MSA-level house price indices from the FHFA start in the late 1970s we are able to include 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 134 different MSAs. We would like to include children who turned 17 years-old before 1979, but our estimation setup and the availability of MSA house price data prevent the inclusion of these additional children.

There is great variation in house price growth in our sample: two-year mean real growth is 3 percent, with a 10 percentage point standard deviation. The maximum real price decline over a two-year period is 28 percent and occurred in the Eugene-Springfield (Oregon) MSA in 1981, while the maximum appreciation, 39 percent, took place in the Boston (Massachusetts) MSA in 1986. We use the all-item-less-housing CPI to deflate house prices.

Parental Wealth

The PSID started collecting financial wealth data in 1984 at five-year intervals up to 1999 and biennially afterwards. These data are available as part of the so-called PSID wealth supplements. We use the observation of parents' nonhousing wealth (wealth excluding housing equity) closest to, and if possible before, the year their respondent child turns 17. We prefer to use a parent's nonhousing wealth before their child turns 17 since nonhousing wealth may appear low when using a forward observation if parents have already paid for college with nonhousing-related assets. However, for children who turn 17 years-old before 1984 (about 18 percent of the sample), using prior wealth data for their parents is not possible, so we use their parents' 1984 wealth information instead. Our results are similar when we omit these parent/child pairs from our analysis. Mean and median nonhousing wealth (2000 dollars) are approximately $190,000 and $37,000, respectively.

We also include parents' self-reported home values in some specifications as a proxy for housing wealth. Home values are reported by homeowners in every survey year and we use an average over a five-year period centered around the year the child turns 17, although the results are similar using one-year house values. Average and median home values in our sample are about $164,500 and $99,000 (2000 dollars), respectively.

Local Area Unemployment and Income Data

We collect MSA-level data on unemployment rates from the Bureau of Labor Statistics in the year the respondent turned 17 to control for local economic conditions at the time most college decisions occur. In order not to lose too many observations, we supplement missing MSA-level unemployment rates with county-level data, if available, or state-level data. Otherwise, roughly 20 percent of our parent-child pairs would be lost. The

average unemployment rate the year respondents turn 17 is 6.2 percent, with a standard deviation of roughly 2 percentage points. To control for economic conditions at the time children's earnings are measured, we also collect unemployment rates in the MSA where the respondent lived in 2006, and supply missing values analogously. The average unemployment rate in 2006 is 4.6 percent with a standard deviation of one percentage point. We also include income growth in the MSA where the respondent lived in 2006; these data come from the Bureau of Economic Analysis (any missing values are replaced with the applicable state-level income growth data). Average income growth in 2006 is 4 percent with a standard deviation of two percentage points.

Local Area Homeownership and House Values

We obtain homeownership information at the census tract level using data from the decennial U.S. census. Among the 1980, 1990, and 2000 censuses we use the data from the closest census year to the year a child turned 17, and classify parents' housing tenure status as follows: a parent is an atypical owner if he/she owns a house in a renter-dominated census tract (a tract where the homeownership rate is below the 25th percentile of homeownership rates across all U.S. Census tracts). Similarly, a parent is an atypical renter if the parent rents in an owner-dominated tract (a tract where the homeownership rate is above the 75th percentile of homeownership rates across tracts). About 5 percent of parents in our sample are renters in owner-dominated tracts and 10 percent are owners in renter-dominated tracts.

We also obtain median home values at the census tract level. Starting with the closest census year to the year the child turns 15, we use house price indices at the MSA-level to project median home values to the exact year the child turned 15. If census tract identifiers are not available in the PSID, we use the median MSA-level home value instead. The average median home value across census tracts is $132,566, with a standard deviation of $91,183. We use age 15 instead of age 17 because this variable is used to construct exogenous changes in home values, and age 15 is the initial point.

Additional Summary Statistics

Further summary statistics, using the PSID family (household) weights, are reported in Table A.1. When the respondent children's income is measured, their ages range from 25 to 45 years (the median age is 35). The median family size for children is two, 49 percent are homeowners, 69 percent are males, 18 percent are black, 38 percent are married, 35 percent have at least a college degree, and on average they have about 14 years of completed education. In the PSID, the head of the household is always the adult male living in the residence unless there is no male present or he is incapacitated. In addition, heads of households who are black include those individuals who identify as biracial. As a result, the percentage of black respondents in our sample is slightly higher than in U.S. population statistics. Parents' age when children were 17 years-old ranges from 32–65 years old (the median age is 44), parental family size is four, and 77 percent of parents are homeowners when their children are 17.

Constructing School Rank Data

Recently, the PSID released data on the post-secondary school attended (if any) by the household head (and spouse). These data are available under a confidential and restricted data agreement with the PSID and include the necessary identifiers to link the schools to relevant educational statistics from Integrated Post-Secondary Education System (IPEDS) and other sources. From 1975 to 1985 these data were asked of any head/spouse that attended at least some college, while from 1986 onward college information was collected only for those individuals that *completed* college. Additional information about these data can be found at http://simba.isr.umich.edu/restricted/docs/NationalCenterEducation/ipeds75_11intro.pdf.

To generate the school rank variable, we collected institution-level 25th and the 75th percentile scores for SAT I Verbal and SAT I Math tests from IPEDS for the survey year 2001. The final rank variable is based on the average of three slightly different approaches for measuring school rank. The first measure was constructed using only the verbal SAT exam scores. In particular, the 25th and 75th percentile scores from each institution are added together and then sorted from highest to lowest with the school with the highest value getting a rank of one and so on. Ties are broken based on the school's ratio of the 75th percentile score to the 25th percentile score. The second measure of school rank adds the 25th and 75th percentiles of both the math and verbal SAT scores by school and orders them from highest to lowest and assigns ranks accordingly. Ties are again broken using the ratio of scores—in this case the ratio of the sum of the 25th percentile scores to the sum of the 75th percentile scores. The final rank measure is constructed using only the 75th percentile of the verbal and math scores for each school. The institution with the largest sum of the 75th percentile scores received the highest rank and so on, and if two institutions had the same sum, the tie was broken based on the ratio used for breaking ties in the second ranking approach. We obtained the final rank for each institution by averaging the three scores, ordering them from lowest to highest, and assigning the appropriate rank.

Using this procedure, the top-ten ranked schools from high to low are the California Institute of Technology, Harvard University, Massachusetts Institute of Technology, Swarthmore College, Stanford University, Harvey Mudd College, Princeton University, Pomona College, Dartmouth College, and Amherst College. These top schools are consistent with the top schools in closely followed U.S. college rankings such as those from *U.S. News and World Report*. Indeed, the correlation between our rank measure and that of *U.S News* is between 0.8 and 0.9. *U.S News* ranks colleges versus universities separately. These correlations are calculated based on matching the institutions in our sample to those available in the respective *U.S News* rankings. Our approach allows us to rank more schools than are followed by *U.S News*. These results suggest that our school ranking approach is reasonable.

Table A.1: Summary Statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Respondent, Child					
Age	34.56	5.46	25	45	892
Male Head	0.69	0.46	0	1	892
Family Size	2.26	1.43	1	9	892
Completed School Years	13.9	2.23	0	17	892
College or Higher	0.35	0.48	0	1	892
Black	0.18	0.38	0	1	891
Married	0.38	0.48	0	1	892
Family Income (2005–2007 avg.)[1]	60,573	57,350	554	633,714	892
Log.Family Income	10.68	0.84	6.32	13.36	892
Labor Income (2005–2007 avg.)[1]	45,239	44,632	0	376400	892
Log.Labor Income	10.32	1.08	2.40	12.83	866
Year Turned 17	1988.53	5.43	1979	1999	892
Homeowner	0.49	0.5	0	1	892
Parents (Head)					
Age	44.82	5.9	32	65	892
Male Head	0.87	0.33	0	1	892
Family Size	4.02	1.38	1	12	892
Completed School Years	13.68	2.38	3	17	892
College or Higher	0.23	0.42	0	1	892
Black	0.19	0.39	0	1	891
Married	0.77	0.42	0	1	892
Parent-Renter in Owner tract	0.05	0.22	0	1	892
Parent-Owner in Renter Tract	0.1	0.3	0	1	892
Family Income (Five-Year avg.)	76,414	57,457	696	746,908	892
Log.Family Income (Five-Year avg.)	11.01	0.76	6.55	13.52	892
House Value (Five-Year avg.)	164,513	521,875	0	8,193,191	892
Log.House Value	9.06	5.01	0	15.92	892
Nonhousing Wealth	189,567	884,467	–330,158	14,325,951	892
Log. Nonhousing Wealth	8.57	5.88	–12.71	16.48	892
Homeowner, Parent	0.77	0.42	0	1	892
Tenure	8.07	6.54	0	29	892
Tenure (Owners)	9.14	6.49	0	29	582
Tenure (Renters)	4.47	5.33	0	19	310
MSA-level variables					
MSA unemployment rate at age 17	6.19	2.37	2.2	20.82	892
Two-year house price gr. (baseline)	0.03	0.1	–0.28	0.39	892
One-year house price gr.	0.01	0.05	-0.14	0.23	892
Four-year house price gr.	0.05	0.17	–0.45	0.65	892
Cumulative house price gr. (based on tenure)	0.06	0.19	–0.49	0.89	892
Two-year unpredicted h. price gr. (residual 1)	0	0.08	–0.26	0.30	892
Two-year unpredicted h. price gr. (residual 2)	0	0.06	–0.23	0.21	892
Two-year unpredicted h. price gr. (residual 3)	0	0.05	–0.23	0.21	792
MSA Unemployment 2006	4.57	1.01	2.4	9.21	892
MSA Income Growth 2006	0.04	0.02	–0.02	0.09	892
Median Census Tract House Value at Age 15	132,566	91,183	14,632	786,332	892

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

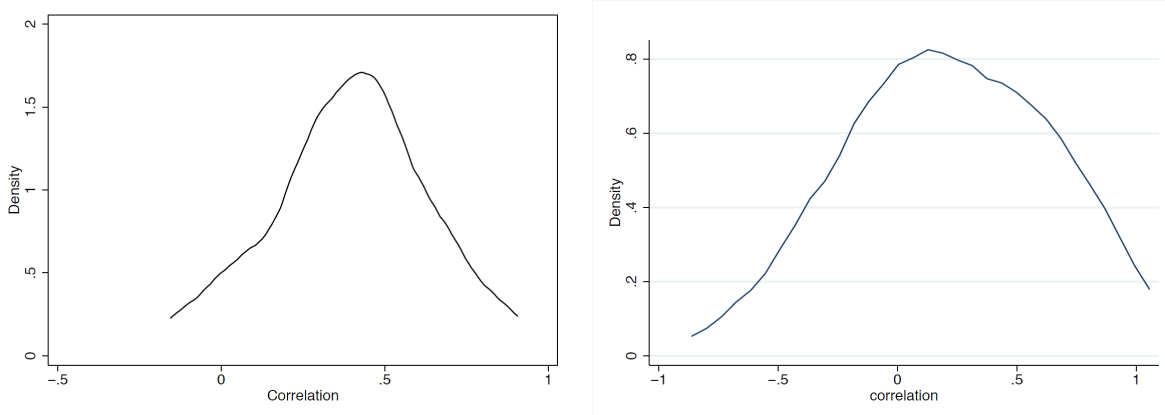
B House Prices and Rents

We conjecture 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). Here we provide some support for this conjecture. Using rent data from REIS, we calculate rent growth by metropolitan area and correlate it with house price growth from the FHFA, the data used for our main analysis. (The metropolitan area definitions from REIS approximately correspond to the actual MSA boundaries as defined by the Census Bureau.) We have data for 60 metropolitan areas for the period 1980–1999, during which our respondents turned 17 years-old. The mean correlation of rent growth and house price growth across metropolitan areas is 0.37, consistent with our conjecture. Figure B.1 shows 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 95th (5th) percentile of house price growth in a given MSA-year by replacing those values with the 95th (5th) 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 1979–1999 as in our main regresssions. This leaves us with house price and rent data for 32 MSAs. The mean correlation of rent growth and house price growth in these MSAs is 0.21. It is not surprising that this correlation is a bit lower than the one calculated using the FHFA and REIS data because house values and rents are self-reported in the PSID and house price increases could, measurement error aside, reflect factors other than pure capital gains (e.g., home improvements, house price expectations, etc.). The key finding, however, is that the correlation between house prices and rents is positive and nontrivial. Figure B.2 depicts the distribution of the correlation between house price and rent growth across MSAs in both the PSID and REIS/FHFA data.

FIGURE B.1: MSA-Level House Price and Rent Price Growth, 1980–1999

FIGURE B.2: MSA-Level Price/Rent Correlation 1980–1999



(a) REIS/FHFA Data (b) PSID Data (Self Reported)

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

C Controlling for Selection into Homeownership

As noted in the main paper there is a potential concern that parents choose to be homeowners because they anticipate that house prices in their area will appreciate and they want to use housing equity to finance their children's post-secondary education. Such a situation is potentially an issue because it suggests that it is the parents' choice of homeownership that impacts their children's earnings and not house price growth during their children's teenage years. It is hard to imagine, however, that some parents are better at predicting house prices than others and that perfect knowledge of these future gains is why they decide to become homeowners. Still, we test the robustness of our results to potential selection into homeownership using a two-step Heckman-selection estimator.

We use the percent of owners in a given census tract to predict whether households settle there as owners or renters. Neighborhoods with high homeownership rates are likely more attractive to households wanting to purchase a home than are neighborhoods that are predominantly occupied by renters. With more homeowners in the area there are less moral hazard issues regarding property upkeep, which likely leads to higher quality and better maintained neighborhoods—factors that in turn help to both boost and maintain property values.

The bottom part of Table C.1 reports estimates from the first stage. The percent of owners in a census tract is a strong predictor of whether someone living there is an owner or a renter. In addition, after controlling for potential selection issues, the estimates of the relationship between house price growth and children's earnings adults are very similar to our baseline findings—if not slightly larger in absolute value (top portion of Table C.1). Also, we cannot reject the null hypothesis that there is no sample selectivity issue ($\lambda = 0$). Overall, these results suggest that our main findings are not driven by parents' selection into homeownership.

Table C.1: House Price Growth and Children's Earnings with Heckman Correction

	Parent-Owners	Parent-Renters
	(1)	(2)
House Price Growth at Age 17	1.063**	–1.593**
	(0.430)	(0.709)
Unemployment Rate at Age 17	–2.087	–1.275
	(2.576)	(3.973)
Log.Parent Income, Five-Year avg.	0.355***	0.097
	(0.092)	(0.082)
Log.Parent House Value, Five-Year avg.	–0.008	
	(0.061)	
Log.Parent Nonhousing Wealth	0.002	0.016**
	(0.007)	(0.008)
Parent College Grad	0.058	0.019
	(0.079)	(0.116)
Parent-Renter in Owner Tract		0.051
		(0.189)
Parent-Owner in Renter Tract	–0.192	
	(0.121)	
Log.Median Census Tract House Value at 15	0.308***	0.255**
	(0.090)	(0.102)
Unemployment Rate in 2006	–0.048	–0.186**
	(0.045)	(0.080)
MSA Income Growth in 2006	0.577	–0.590
	(0.669)	(0.750)
Number of Observations	811	811
χ^2	319.20	148.43
First Stage		
Percent Owners Census Tract	2.299***	–2.299***
	(0.332)	(0.332)
House Price Growth at Age 17	–0.655	0.655
	(0.993)	(0.993)
Unemployment Rate at Age 17	2.376	–2.376
	(4.952)	(4.952)
Log.Median Census Tract House Value at 15	–0.000	0.000
	(0.148)	(0.148)
Log.Parent Income, Five-Year avg.	0.680***	–0.680***
	(0.117)	(0.117)
Log.Parent Nonhousing Wealth	0.033***	–0.033***
	(0.011)	(0.011)
Parent College Grad	0.066	–0.066
	(0.149)	(0.149)
Mills		
λ	0.15	0.06
	(0.20)	(0.18)
ρ	0.22	0.09
σ	0.69	0.66

Notes: Controls as reported plus age and age squared of the parent head, and family size and family size squared for the parents. *** significant at the 1-percent level, ** significant at the 5-percent level, and * significant at the 10-percent level.

D Intergenerational Mobility

It is also possible to examine the impact of house price growth on children's future outcomes through the lens of intergenerational mobility and so-called transition matrices, which 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.

We construct a series of transition matrices to explore how house price fluctuations impact children's earnings relative to their parents' earnings. Since our sample size is small, we divide parents and children into quartiles of their respective income distributions. Given that parents and children are observed at different stages of the life cycle in our data, 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. Income quartiles for both parents and children are calculated by pooling renters and owners together and using the PSID family weights. There are more parent-renters in the lowest parental income quartile (60 percent of renters versus 23 percent of owners) and more parent-owners in the top parental income quartile than renters (27 percent versus 10 percent, respectively). The results are similar if we instead calculate renter-specific and owner-specific income quartiles.

The results are reported below in Table D.1 for homeowners and Table D.2 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 reports 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 and calculated using the following formula:

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

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 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 see http://fedc.wiwi.hu-berlin.de/xplore/tutorials/xfghtmlnode32.html.

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 the children were 17 years-old. We use relative house prices because the cross-tabulations do not control for state-of-

residence or birth-year effects. The top panel in Table D.1 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 has been extensively documented, the persistence of economic status is greatest for the top and the bottom income quartiles (see, for example, Zimmerman, 1992). Our full sample results are consistent with this pattern. Children with parents in the bottom income quartile have a 42.5 percent probability of being in the bottom income quartile themselves as adults. Similarly, children with parents in the top income quartile have a 40.5 percent probability of being in the top income quartile themselves. The probability of children remaining in the second or third quartiles is lower—28 percent and 35.4 percent respectively.

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 is below the national average than when growth is above the national average. That is, children who at age 17 reside in MSAs that experience good house price growth have a 44.3 percent probability of remaining in the top income quartile conditional on their parents being in the top income quartile as compared to only a 35.7 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 6.1). This inference is based on a difference-of-means test with unequal variance. There are 28 degrees of freedom. The result is especially interesting given that overall the children of high-income parents, other things equal, are more likely to attend college than the children of lower-income parents so there appears to be a differential earnings effect based on house price fluctuations. The probability of children ending up in the lowest income quartile is also greater in the below-average house price growth sample, particularly for those children with parents outside the lowest income quartile.

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 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 in the top half of the income distribution. In contrast, children whose renter parents start in the first or second 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 when considering children's downward mobility conditional on house price exposure. Since the great majority of renter parents are in the two bottom income quartiles, if anything these tabulations point to increased mobility for the children of renters' parents when house prices decline. Using a simple *trace* index of mobility, we confirm that mobility does indeed increase for renters in periods of house price declines relative to periods of house price increases (0.889 vs. 0.9813). A trace index of mobility is defined as $m = (k - trace(P))/(k - 1)$, where P is the transition matrix and k is the number of

classes. Since the trace of a (square) matrix is the sum of its diagonal elements, zero mobility would imply $m = 0$, while perfect mobility would imply $m = 1$. For owners, the trace measure does not vary much over periods of appreciation and depreciation (0.848 vs. 0.846).

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. The patterns are also qualitatively the same if we use our relative income measure (income less MSA-level income per capita) instead of our baseline absolute income measure.

Table D.1: Transition Matrices by house price Growth in MSA when Homeowners' Children are Age 17

All
Sample size: 582

	Children's Income Quartile (Percent)			
Parents' Income Quartile	1	2	3	4
1	42.5	31.3	16.4	9.7
	(4.3)	(4.0)	(3.2)	(2.6)
2	25.9	28.0	19.6	26.6
	(3.7)	(3.8)	(3.3)	(3.7)
3	17.0	23.8	35.4	23.8
	(3.1)	(3.5)	(3.9)	(3.5)
4	14.6	20.3	24.7	40.5
	(2.8)	(3.2)	(3.4)	(3.9)

House Price Growth Higher Than National Average
Sample Size: 303

	Children's Income Quartile (Percent)			
Parents' Income Quartile	1	2	3	4
1	42.4	30.5	16.9	10.2
	(6.4)	(6.0)	(4.9)	(3.9)
2	20.3	30.4	22.8	26.6
	(4.5)	(5.2)	(4.7)	(5.0)
3	16.9	26.0	28.6	28.6
	(4.3)	(5.0)	(5.1)	(5.1)
4	12.5	18.2	25.0	44.3
	(3.5)	(4.1)	(4.6)	(5.3)

House Price Growth Lower or at National Average
Sample size: 279

	Children's Income Quartile (Percent)			
Parents' Income Quartile	1	2	3	4
1	42.7	32.0	16.0	9.3
	(5.7)	(5.4)	(4.2)	(3.4)
2	32.8	25.0	15.6	26.6
	(5.9)	(5.4)	(4.5)	(5.5)
3	17.1	21.4	42.9	18.6
	(4.5)	(4.9)	(5.9)	(4.7)
4	17.1	22.9	24.3	35.7
	(4.5)	(5.0)	(5.1)	(5.7)

Table D.2: Transition Matrices by House-Price Growth in MSA When Renters' Children are Age 17

All
Sample Size: 310

	Children's Income Quartile (Percent)			
Parents' Income Quartile	1	2	3	4
1	58.6	25.8	9.7	5.9
	(3.6)	(3.2)	(2.2)	(1.7)
2	39.7	25.9	24.1	10.3
	(6.4)	(5.8)	(5.6)	(4.0)
3	35.3	17.6	29.4	17.6
	(8.2)	(6.5)	(7.8)	(6.5)
4	59.4	18.8	15.6	6.3
	(8.7)	(6.9)	(6.4)	(4.3)

House Price Growth Higher Than National Average
Sample Size: 173

	Children's Income Quartile (Percent)			
Parents' Income Quartile	1	2	3	4
1	59.2	27.2	9.7	3.9
	(4.8)	(4.4)	(2.9)	(1.9)
2	45.5	27.3	18.2	9.1
	(8.7)	(7.8)	(6.7)	(5.0)
3	23.1	15.4	38.5	23.1
	(11.7)	(10.0)	(13.5)	(11.7)
4	66.7	8.3	16.7	8.3
	(9.6)	(5.6)	(7.6)	(5.6)

House Price Growth Lower or at National Average
Sample Size: 137

	Children's Income Quartile (Percent)			
Parents' Income Quartile	1	2	3	4
1	57.8	24.1	9.6	8.4
	(5.4)	(4.7)	(3.2)	(3.0)
2	32.0	24.0	32.0	12.0
	(9.3)	(8.5)	(9.3)	(6.5)
3	42.9	19.0	23.8	14.3
	(10.8)	(8.6)	(9.3)	(7.6)
4	37.5	50.0	12.5	0.0
	(17.1)	(17.7)	(11.7)	(0.0)