

# Illiquid Homeownership and the Bank of Mom and Dad<sup>\*</sup>

## Job Market Paper

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### Abstract

Housing is the largest asset in U.S. households' portfolios but parental transfers are important for housing outcomes. How much of the homeownership rate among young households is accounted for by parental transfers? I build and estimate a life-cycle overlapping generations model with housing, in which children and parents interact without commitment. I find that parental transfers account for 15 percentage points (31%) of the homeownership rate of young adults. Transfers from wealthy parents increase homeownership by relaxing borrowing constraints and reducing housing risk. Policies and regulations that decrease the sales cost of housing increase homeownership and weaken the link between parent wealth and housing outcomes. Finally, I study how housing illiquidity affects the commitment frictions between parents and children. Children with wealthy parents increase their consumption of illiquid housing to extract larger future transfers.

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# 1 Introduction

Housing is the largest asset in US households' portfolios and among middle-class households represents the primary means of wealth accumulation. There are growing concerns about housing affordability and inequality in access to housing. One contributing factor to inequality in housing outcomes is parental transfers. Around 30% of American first-time homebuyers received downpayment assistance from parents in 2009-2016. Parental downpayment assistance averaged \$48,000 among receiving households.<sup>1</sup> Owner-occupied housing bears adjustment costs that make it illiquid. In addition, households must meet a downpayment requirement to obtain a mortgage. These two frictions, transaction costs and credit constraints, increase the importance of transfers for homeownership. First, transfers directly alleviate borrowing constraints. Second, future transfers decrease the probability that households have to sell their house after experiencing adverse income shocks. Third, illiquid housing acts as a commitment device that the child uses to extract future transfers.

In this paper, I ask: how much of the homeownership rate among young (25-44) households is accounted for by parental transfers? In addition, I quantify how much different financial and housing regulations affect the link between parental wealth, transfers, and their children's housing outcomes. Finally, I study how housing illiquidity affects the commitment problem between children and parents.

To answer these questions, I merge the literatures on models of housing, which ignore transfers, with models of parental transfers, which ignore housing. I build a life-cycle overlapping generations model with altruistic parents and a rent or own decision. Children and parents interact, without commitment, through both inter-vivos transfers and bequests at death from the parent. My key innovation to the altruism framework is to include illiquid housing, which interacts with transfers. In models without housing (e.g., [Boar, 2018](#); [Altonji, Hayashi, and Kotlikoff, 1997](#); [Barczyk and](#)

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<sup>1</sup>Data from the Survey of Household Economic Decisionmaking and the Transfer Supplement of the 2013 Panel Study of Income Dynamics (see [Section 2](#)).

Kredler, 2014), the only transfer motive is to increase the child’s goods consumption when they are up against a borrowing constraint. Illiquid housing introduces two additional transfer motives. First, young adult children enter the economy with low wealth and low income and they must save to buy a house. Parents, who are at the life-cycle peak of wealth and income, may choose to transfer money to alleviate minimum downpayment requirements. Second, children who own a house and experience income losses may avoid costly downsizing by receiving parental transfers. Moreover, children can extract future transfers from their parents by shifting liquid wealth to illiquid housing (“house-rich, cash-poor”). On the other hand, as in all models of transfers, future transfers decrease the savings motive, decreasing the homeownership rate.

I estimate the model by matching data on homeownership, savings, and transfers from the Panel Survey of Income Dynamics (PSID). I then compute a counterfactual homeownership rate by simulating the model without parental transfers. Without parental transfers, the model collapses to a standard life-cycle model with housing. I find that parental transfers account for 15 p.p. (32%) of the young homeownership rate. Two frictions, a minimum downpayment requirement and an adjustment cost on housing, account separately for 77% and 61% of the parental transfer effect on homeownership, respectively. In the benchmark model the supply of owner-occupied housing is perfectly elastic, but my results are robust to other supply elasticities. I use my model to quantify the contribution of parental transfers to the black-white homeownership gap: in the US young white households are twice as likely to be homeowners as black households. I find that parental transfers account for 30% of the black-white homeownership gap.

After documenting that parental wealth and transfers are an important determinant of homeownership I study how policies that increase homeownership also affect the link between parental wealth and children’s housing outcomes. Decreasing minimum downpayments strengthens the link between parental wealth and children’s

housing outcomes since households with wealthy parents find homeownership more attractive. Increasing liquidity, by decreasing sales and purchase costs, weakens the link between parental wealth and children’s housing outcomes by reducing the risk of ownership which is more important for households with poorer parents. Finally, I study how housing illiquidity affects the strategic behavior introduced by the lack of commitment. I find that 13% of young households prefer to face sales costs as they can reduce liquid wealth by over-investing in housing and thus extract larger future transfers. On the other hand, sales cost increase precautionary savings motives, and so households with less wealthy parents save more, decreasing the need for future transfers.

By introducing parental transfers to models of housing, my paper contributes to the literature studying the determinants of homeownership over the life-cycle. Recent papers focus on marriage and family formation (Fisher and Gervais, 2011; Chang, 2020; Khorunzhina and Miller, 2019), housing demand in old-age (McGee, 2019; Barczyk, Fahle, and Kredler, 2020), and changing borrowing constraints (Paz-Pardo, 2019; Mabilie, 2020). These studies highlight the importance of credit constraints and minimum down payments in constraining demand for owner-occupied housing. However, by considering parent-child interactions, I show a dichotomy based on parent wealth in the importance of constraints. For households with poorer parents, the sales and purchase costs decrease ownership by it riskier to own. This risk is less important for households with richer parents making mortgage credit constraints more important. My results highlight that policies that increase ownership by subsidies to first-time buyers will lead to increased housing inequality.

I contribute to the growing literature that studies altruistic households who interact without commitment by studying how illiquid housing affects the commitment problem. In these models children undersave to increase parental transfers (e.g., Altonji et al., 1997; Boar, 2018; Barczyk and Kredler, 2014). However, adjustment costs on housing impose future expenditure commitments (Chetty and Szeidl, 2007; Shore

and Sinai, 2010). I show that expenditure commitments have two distinct effects on child-parent interactions. First, the child can buy a house and bring no liquid wealth to the next period. If the parent does not give a transfer, the child must sell his house and pay adjustment costs or decrease consumption drastically. A wealthy altruistic parent likes neither of these outcomes and responds by transferring. Second, by giving gifts that push the child to buy the parent makes future undersaving more expensive since the child cannot easily sell his house. Both mechanisms are quantitatively meaningful. First, 17% of 25-year old households prefer their housing to be illiquid to extract future transfers. Second, illiquid housing increases the child-parent wealth ratio from 0.09 to 0.11.

Finally, I contribute to the literature on parental transfers and life-cycle outcomes by focusing explicitly on how parental transfers to young adult households change their savings choices through homeownership. My results show that households with wealthier parents are willing to buy sooner, take higher leverage, and need to hold less liquid precautionary savings. My results highlight how parental wealth increases the persistence of wealth inequality by affecting household risk-taking. Previous literature has generally studied parental investment in their children’s human capital (e.g., Lee and Seshadri, 2019; Daruich, 2018) or transfers from adult children to retired parents (e.g., Mommaerts, 2016; Barczyk and Kredler, 2018; Barczyk et al., 2020), instead of the effect of parental wealth on household portfolio choices.

The paper proceeds as follows. In Section 2, I describe the data sources, summary statistics, and document that parental wealth is associated with better housing outcomes. Section 3 describes the quantitative model and Section 4 discusses the structural estimation. Section 5 performs the main quantitative exercise and robustness tests. Finally, Section 6 studies how policies intended to increase homeownership also affect the role of parent wealth and housing illiquidity.

## 2 Data on Transfers, Family, and Housing

I first present the estimation sample, taken from 1997-2017 waves of the Panel Study of Income Dynamics (PSID). I also use two other surveys to discuss the time trends in the reliance on parental transfers for house down payments. Finally, I use the estimation sample to show that parental wealth is positively associated with better housing outcomes.

### 2.1 Panel Study of Income Dynamics

The primary data source is the Panel Study of Income Dynamics (PSID), which follows a nationally representative sample of US households and their descendants over time since 1968. The PSID is the only publicly available US dataset that satisfies this paper’s three requirements. First, it has detailed wealth, income, and housing data for both parents and adult children. Second, it has some information about inter-vivos transfers from parents to children. Third, it follows households over time, so we can observe the transitions from renting to owning and how the transition relates to parental wealth.

I use data from 1999 to 2017. In 1999 the PSID started to collect detailed wealth data every other year. In most waves of the PSID, there is limited transfer data, and the main question is whether households received gifts or bequests over \$5,000 dollars in the last two years. In 2013 the PSID collected more detailed transfer data in the Family Roster and Transfer Module. They asked parents how much they gave their children in the last calendar year and how much they had given over their lifetime for school, house purchases, or other purposes. Household characteristics such as age, gender, and education refer to the household head. I classify top-coded values as missing observations. All monetary variables are expressed in constant 2016 US dollars (in thousands).

*Sample Selection:* Throughout this paper, the sample includes all households

aged 25-84 in the PSID, excluding the Survey of Economic Opportunity and the Latino sub-samples to obtain a representative sample. All summary statistics are calculated using the provided family weights.

*Matching Parents with Children:* I use the Parent/Child file from the PSID's 2013 transfer supplement. I can observe each household's reported transfers to and from parents and children. This leads to discrepancies, where the child and parent does not agree on the amount given from the parent to the child. I only use the parent's reported transfer. First, there may be some stigma about receiving transfers, which may induce receiving children to under-report. Second, in the model, parents determine the size of the transfer they give to their child. I treat each parent-child pair as separate so that two siblings with the same parent household are counted as two independent households.

*Definition of Transfers:* The 2013 transfer supplement asks all parent households whether they gave money, gifts, or loans of \$100 or more to their children in 2012. There is no identifying information on whether these transfers are gifts or loans, and I treat all as gifts.<sup>2</sup> Since this paper focuses on transfers that are a) related to housing and b) quantitatively meaningful, I set transfers below \$500 to \$0.<sup>3</sup>

## 2.2 Descriptive Statistics: Who Receives Transfers?

I now discuss descriptive statistics from the PSID sample in 2013 for households aged 25-44 with a non-missing parent household. Tables 1 and A4 contain the sample means and medians, broken down by age, wealth, marriage, house tenure, and whether households received transfers in the last year. In panel a), the first two columns compare the whole sample, broken down by whether they received transfers or not in the last calendar year. The mean transfer is relatively high at \$3,940,

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<sup>2</sup>While transfers may be given as a loan, we know that parental loans are often not-repaid, are interest-free, and are loans in name only.

<sup>3</sup>Ignoring small transfers decreases the transfer rate from 32% to 24% and increases the mean transfer from \$2,921 to \$3,944.

and 27% of households received transfers in the last year. Both groups have similar wealth levels, but transferring parents are much wealthier, with a median wealth of \$339,000 relative to non-transferring parents who had \$96,860. Recipients are more likely to be college-educated, white, and a little younger. Receivers are somewhat less likely to be homeowners (39% vs. 43%).

By breaking down the sample by marital status, we see that married or cohabiting households are wealthier, have higher household income, are more likely to be white, slightly older, and have approximately three times the homeownership rate of single households. Married households are somewhat more likely to receive transfers and receive slightly larger transfers. Next, I break the sample down by whether they are renting or owning. Homeowners have ten times the wealth of renters and also have significantly wealthier parents. There is no difference between renters and owners in the receipt rates, but transfers to owners are on average \$1,000 larger. Only 6% of renters owned in the previous period, while 21% of owners rented in the previous period. Further, receivers are more likely to switch from renting to owning: 21% of receiving owners rented two years ago, compared to 15% of non-receiving owners.

Next, I break the sample into five age groups from 25-44. We see that household's wealth, income, and homeownership rates increase with age. As households become wealthier they are less likely to receive transfers. Interestingly, owners are more likely to receive transfers than renters: among households aged 29-32, 32% of non-receivers and 40% of receivers were homeowners. Not only are those who received more likely to own, they are also likelier to be new homeowners: Only 13% of owning non-receivers are new homeowners, compared to 21% of owning receivers.



Table 1: Descriptive Statistics (Means), Households Aged 20-44

Receiver	All		Single		Married		Renter		Owner	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Transfer	0.00	3.94	0.00	3.49	0.00	4.49	0.00	3.91	0.00	4.00
Wealth	78.41	108.33	30.71	56.93	126.76	171.11	13.42	42.02	163.53	210.84
Wealth Parent	404.94	1028.86	325.54	1038.78	485.26	1016.56	241.36	1016.47	619.05	1048.00
Income	72.70	74.24	46.08	47.16	99.69	107.32	46.79	52.84	106.65	107.32
College	0.35	0.51	0.35	0.49	0.35	0.53	0.28	0.47	0.45	0.58
White	0.73	0.85	0.64	0.82	0.83	0.90	0.65	0.81	0.84	0.92
Owner	0.43	0.39	0.22	0.19	0.64	0.64	0.00	0.00	1.00	1.00
Owner t-2	0.41	0.37	0.21	0.17	0.62	0.63	0.06	0.06	0.85	0.79
Age	33.98	32.90	32.79	31.45	35.19	34.66	32.22	31.33	36.29	35.32
Observations	2404	656	1094	304	1310	352	1453	400	951	256

Receiver	25-28		29-32		33-36		37-40		41-44	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Transfer	0.00	4.09	0.00	4.12	0.00	3.28	0.00	5.28	0.00	2.97
Wealth	33.65	46.23	37.63	78.53	54.21	125.35	118.43	154.32	173.42	212.88
Wealth Parent	320.86	1221.09	379.41	1193.31	361.26	835.07	339.04	643.02	649.47	975.38
Income	43.43	47.88	63.03	69.73	71.47	86.00	93.38	91.86	102.47	102.73
College	0.34	0.55	0.35	0.58	0.32	0.52	0.34	0.43	0.41	0.39
White	0.68	0.83	0.69	0.83	0.73	0.87	0.79	0.88	0.80	0.89
Owner	0.19	0.16	0.32	0.38	0.47	0.47	0.60	0.61	0.66	0.59
Owner t-2	0.14	0.14	0.28	0.30	0.43	0.43	0.60	0.60	0.65	0.53
Age	26.49	26.49	30.48	30.45	34.50	34.33	38.49	38.46	42.62	42.40
Observations	572	195	566	163	562	127	384	99	320	72

Receiver	Quintile 1		Quintile 2		Quintile 3		Quintile 4		Quintile 5	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Transfer	0.00	2.88	0.00	2.46	0.00	3.04	0.00	5.29	0.00	4.95
Wealth	-53.90	-53.15	-1.08	-1.64	8.15	8.25	39.97	42.02	339.67	403.71
Wealth Parent	231.92	464.99	108.63	270.87	218.55	559.62	391.03	1111.01	938.08	2046.24
Income	59.21	53.99	32.94	33.66	45.83	46.19	77.58	78.29	131.73	123.11
College	0.47	0.58	0.14	0.15	0.21	0.40	0.37	0.52	0.52	0.68
White	0.73	0.85	0.56	0.68	0.71	0.81	0.78	0.95	0.84	0.88
Owner	0.27	0.17	0.08	0.13	0.18	0.16	0.63	0.49	0.87	0.76
Owner t-2	0.28	0.14	0.10	0.11	0.19	0.22	0.56	0.44	0.80	0.67
Age	33.04	31.57	32.43	33.03	32.56	31.29	34.17	33.14	36.95	34.77
Observations	459	148	478	91	518	121	471	137	478	159

*Notes:* Data from the PSID Transfer, Individual, and Family modules. Weighted using family weights. Transfer, wealth, and income measured in 1000s of 2016 USD.

Finally, I break down the sample by wealth quintiles. Within each wealth quintile, receivers and non-receivers have virtually identical wealth, income, and age. Still, receivers are slightly more likely to be white and college-educated within each quintile. The largest difference is that the receiver’s parents are much wealthier. We also see the clear inter-generational correlation of wealth: Parents with children in the top quintile have four times the wealth of parents with children in the bottom quintile.

I now briefly summarize the main results. In 2013, 27% of young households received a transfer, and transfers averaged \$3,940. Receivers have significantly richer parents, have similar wealth and income as non-receivers, and are less likely to own. Receiving transfers increases the probability of transitioning from renting to owning, especially in the age groups where households are most likely to buy. Parents’ wealth is strongly correlated with the probability of receiving a transfer.

## 2.3 Parental Transfers for Owners Over Time

From the PSID transfer supplement, we have seen how those who receive transfers differ from their counterparts in 2012. Two additional data sources show that parental transfers for housing have increased over the last two decades.

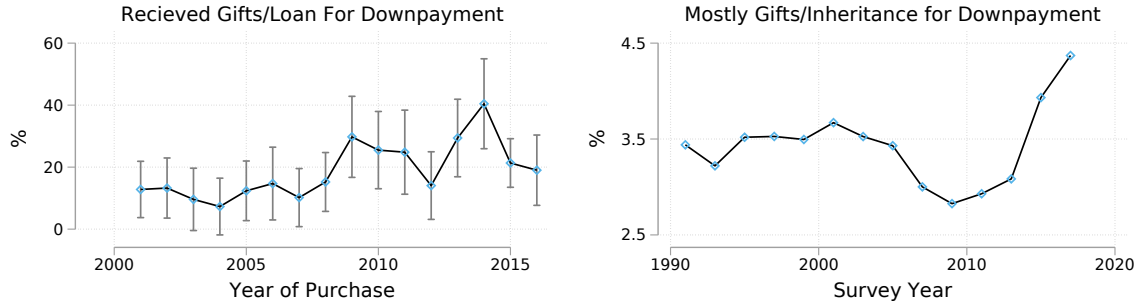
*Survey of Household Economics and Decisionmaking (SHED)*: To better understand US households’ financial health, the Federal Reserve first conducted the SHED in 2013. It is an annual cross-sectional survey with a focus on financial well-being. In 2015 and 2016, the survey asked homeowners when they bought their home and how they funded the downpayment.<sup>4</sup> The results are plotted in the left panel of Figure 1. The main observation is the large increase in the role of inter-vivos transfers for homeowners since 2001. In 2001-2007, only 5-18% of first-time buyers received transfers, while 20-40% received transfers after 2009.

In 2013, 2014, and 2016 the SHED contained a question asking renters why

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<sup>4</sup>The data were recorded for owners who bought since 2001 in the 2015 wave and those who bought since 2015 in the 2016 wave.

Figure 1: Increased Reliance on Parental Transfers for Down Payments



*Notes:* The left panel uses data from the SHED. First-time homeowners are defined as those who did not use proceeds from previous property sales for the downpayment. Bars indicate 95% confidence intervals. The right panel uses data from the public AHS file. The patterns are different since the horizontal axis is different and that the AHS sample includes all owner-occupied units.

they rent. The main barrier to homeownership was borrowing constraints: 57% of US households mentioned that they could not afford a down-payment or did not qualify for a mortgage. In addition to borrowing constraints, the survey reveals that illiquidity the associated with owner-occupied decreases homeownership: 26% mentioned that renting was more convenient and 23% that planning to move as reasons for renting.

*American Housing Survey:* I use the AHS to obtain a time series back to 1991. The AHS follows roughly 60,000 housing units over time and asks households in owner-occupied units how they funded the downpayment (right panel of Figure 1). We see a relatively flat trend in the '90s, followed by a quick decline in 2005-2008 as more households were using mortgages with low down payments. Finally, we see a dramatic increase in the years after the housing bubble. The horizontal axis denotes the survey year and not the year of purchase. Small changes thus indicate large changes among new owners who are a small subset of all owners.

## 2.4 Hypothesis I: Households With Wealthier Parents Are Less Likely To Downsize

If parent wealth provides insurance, households with wealthier parents should be less likely to downsize after income losses. I perform an event study on the effect of unemployment on housing consumption to test this hypothesis.

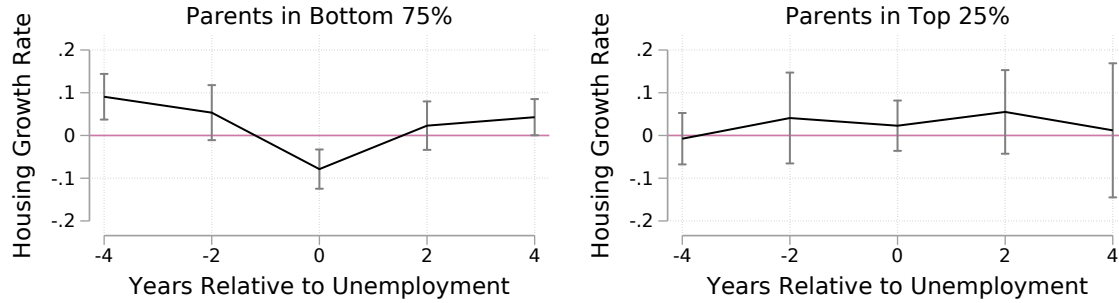
The sample is limited to household heads who are unemployed only once between ages 25 and 45. The consumption value of owner-occupied housing is set to 6% of the market value as in Boar, Gorea, and Midrigan (2020). For renters, I use the rental payment. The log growth rate is defined as the difference in log housing consumption between  $t$  and  $t - 2$ . Households who switch between renting and owning are coded as missing.<sup>5</sup> I use parental wealth as a proxy for transfers since transfers were only observed in 2013. I divide the sample by whether a household’s parents were in the top parental wealth quartile at the time of unemployment.

I then compare the housing consumption responses when households become unemployed by parental wealth to examine whether households with wealthier parents are less likely to downsize. The results are displayed in Figure 2. Households with non-wealthy parents decrease the growth rate of housing consumption from 4% to 6%, a significant change at the 5% level. Households with parents in the top 25% have no statistically significant decrease in housing consumption growth rates. Moreover, I replicate this event study using simulated data from the quantitative model and show that the results are similar (see Section 4.4 and Figure 4).

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<sup>5</sup>This methodology is inspired by Chetty and Szeidl (2007) who find that housing consumption responds less to unemployment than non-durable consumption, as predicted by a model with illiquid housing. I focus on showing that parental wealth supports a household’s housing consumption. Further details are in Appendix A.2, where I also report results separately for renters and owners. I report results from the event study with control variables in Appendix A.2.1, and the results are quantitatively similar.

Figure 2: Event Study: Housing Consumption at Unemployment by Parental Wealth



*Notes:* Solid lines denote means, and bars denote the 95% confidence interval. Sample consists of households aged 25-45 with exactly one unemployment spell and without changes in head and/or spouse in the four years before and after unemployment.

## 2.5 Hypotheses II: Parental Wealth Affects House Purchases

The previous results provide strong evidence that parent wealth provides insurance against downsizing after income losses. I now show that households with wealthier parents also buy more expensive houses and are less likely to be behind on mortgage payments, controlling for household characteristics.

### 2.5.1 Households With Wealthier Parents Buy Larger Houses

I run an ordinary least square (OLS) regression on house values at purchase for first-time buyers and test whether parent's wealth is positively associated with larger house purchases, controlling for net worth, income, education, age, family size, and race:

$$\ln HouseSize_i = \beta_1 \ln(Wealth)_{p(i),t-2} + \beta_2 \ln(Income_{i,t-2}) + \beta_3 \ln(NetWorth_{i,t-2}) + \gamma X_{i,t} + \varepsilon_i,$$

Parent's wealth, as well as household income and net-worth, are logged. Households are denoted by  $i$ , their parents by  $p(i)$ , and  $X_{i,t}$  denotes a vector of controls including time, age, education, state and race dummies.

Column 1 of Table 2 reports the results from an OLS regression of house values

among first-time buyers. We can see that households with wealthier parents buy larger houses: A 1% increase in parental wealth is associated with a 0.042% increase in the purchase value of the child’s house. The effect of parental wealth is almost as large as that own the child’s own net worth (0.068%).

### 2.5.2 Households With Wealthier Parents Are Less Likely to Have Mortgage Difficulties

I now show that households with wealthier parents are less likely to be behind on their mortgages, even though they buy more expensive houses. Since 2009 the PSID has collected information on whether households are behind on their mortgages. The percentage of households behind on mortgage payments has decreased from 3.8% in 1999 to 1.8%. Overall, 8.6% of the sample have been behind at least once. This result stresses that parental transfers relax borrowing constraints and also reduce the downsides of illiquid housing. Households who take out large mortgages and cannot follow the payment plan may be behind on mortgage payments, ultimately ending in foreclosure. Being behind on mortgage payments is an indicator of financial stress and is typically expensive due to fees. I now measure whether parental wealth decreases households’ probability of being behind on mortgage payments, controlling for demographic variables.

I perform OLS regressions of the following form:

$$EverBehind_i = \beta_1 \ln(Wealth)_{p(i),t-2} + \beta_2 \ln(Income_{i,t-2}) + \beta_3 \ln(NetWorth_{i,t-2}) + \gamma X_{i,t} + \varepsilon_i,$$

where the sample is limited to the first time a household is observed as owners. In column (2) of Table 2, I report results when the outcome variable is whether households are ever behind on mortgage payments, and we see that parental wealth in the period before purchase decreases the probability that a household will ever be behind: A 1% increase in parent wealth decreases the probability of being behind

Table 2: Housing Choices and Parental Wealth

	(1) House Size	(2) Ever Behind	(3) Behind First	(4) Behind RE	(5) Behind FE
<i>Parent</i>					
Wealth (t-2)	0.052** (0.019)	-0.019* (0.008)	-0.022** (0.007)	-0.008* (0.004)	-0.007 (0.009)
<i>Child Household</i>					
Net Worth (t-2)	0.068*** (0.015)	-0.010 (0.007)	-0.013+ (0.007)	-0.008* (0.003)	-0.003 (0.005)
Income (t-2)	0.309*** (0.033)	-0.004 (0.015)	0.017 (0.013)	-0.002 (0.008)	0.014 (0.012)
High School=1	0.260*** (0.067)	-0.017 (0.032)	-0.074* (0.032)	-0.003 (0.021)	-0.000 (0.095)
College =1	0.538*** (0.078)	-0.034 (0.036)	-0.064+ (0.036)	-0.029 (0.023)	0.007 (0.103)
White=1	0.056 (0.057)	-0.057* (0.027)	0.035 (0.023)	0.004 (0.015)	0.000 (.)
Family Size	0.094* (0.046)	0.027 (0.021)	0.008 (0.019)	0.007 (0.010)	-0.011 (0.022)
N	884	709	372	2,057	2,057

*Notes:* Standard errors in parentheses. ‘Behind’ refers to whether the households is behind on a mortgage. Wealth, income, parental wealth, mortgage, family size, and house values are logged. All regressions include year and state fixed effects and control for age and age-squared of both the child and parent. Specifications 1-3 uses ordinary least squares while specifications 4 and 5 use random and fixed effects, respectively.

by 0.019 percentage points, and is significant at the 1% level. The effect of parental wealth is larger than the effect of the child’s net worth but smaller than the effect of the child’s income. In Column (3) the outcome variable is whether households are behind in the first period, and we see coefficients and significance levels are virtually unchanged.

I also report the results from two specifications where I follow the same households as in Column (2) after purchase. I report results from random effects and household fixed effects regressions in Columns (4) and (5), respectively. Once we follow households over time, the effect of parental wealth decreases. With household fixed effects the effect is no longer significant. However, the FE regressions must be interpreted with caution since there is little time variation in parental wealth within a family. Indeed, the random effects and the fixed effect coefficient are almost the same (0.007 vs 0.008). Overall, the results support the hypothesis that parental wealth decreases the probability of being behind on mortgage payments.

### **3 A Quantitative Model of Family Banking and Housing**

This section describes my life-cycle model of housing choices with overlapping generations, idiosyncratic earnings risk, and altruistic inter-vivos transfers from parents to children (“kids”). The model has two main building blocks. The first is altruism and no commitment. Parents are altruistic towards their children and derive utility from their kid’s utility, and they can affect their kid’s choices by transferring non-negative amounts in any period. Altruism without commitment creates strategic behavior, where both households understand how their choices affect the other’s future behavior.

The second building block is the introduction of illiquid housing into an altruism model. When housing is liquid, the only interaction with altruism is that parental



transfers relax mortgage borrowing constraints. With illiquid housing, children and parents both expenditure commitments. The model also becomes a two-asset model, in which both wealth and portfolio compositions matter for transfers. In particular, owning children with low liquid wealth ('house-rich cash-poor') have a high marginal utility of non-housing consumption and may receive transfers. Finally, when housing is illiquid and income is uncertain, a risk of owning is that households may have to sell after receiving adverse income shocks. However, wealthy parents provide partial insurance against both income losses and may even transfer to ensure that their child can stay in their house and not pay the sales cost.

### 3.1 Demographics, Preferences and Technologies

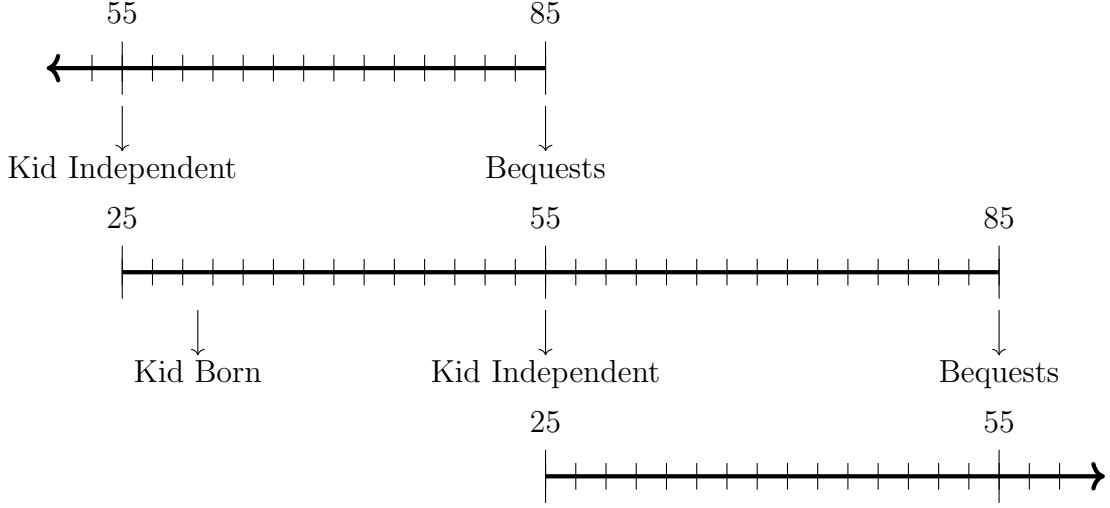
Time is discrete and finite. Each period consists of two years. At the beginning of each period, a constant mass of new households enter and exit the economy. The only economic agents in the model are households.

*Demographics:* Households are economically active from age  $a \in \mathcal{A} = \{25, 27, \dots, 83\}$ . A family consists of one adult kid  $k$  household (25-53) and a parent  $p$  household (55-83). New households are born to the adult kid at age 30, but the new kid is economically inactive until age 25. When a kid turns 55, three things happen simultaneously. First, the parent at age 85. Second, the kid's kid becomes economically active. Third, the kid is now a parent. Thus, each parent-kid pair overlaps for 15 periods (30 years) with an age gap of 30 years and only two households are economically active in any dynasty at a time. Figure 3 shows the life cycle of two generations.

*Altruism:* The parent is altruistic towards the kid in the sense of Barro (1974). The parent places weight  $\eta$  on the utility of the adult kid. Altruism to later generations is not explicitly modeled.

*Inter-Generational Transfers:* In each period, the parent can transfer a non-negative amount  $t_p$  that the child receives immediately. Additionally, any wealth left

Figure 3: Individual's Life Cycle



after death is bequeathed to the child. If transfers and bequests were not allowed, the policy functions would be identical to a model without altruism ('autarky').

*Income Endowment:* Households supply one unit of labor inelastically each period. All households face a common age-dependent deterministic life-cycle earnings  $l_a$ . Children (25-53) face persistent idiosyncratic age-dependent productivity shocks  $y_{i,a} \in \mathcal{Y}_a = \{y_1, \dots, y_{N_y}\}$ . The process follows an age-dependent Markov chain, where  $\pi_a(y'|y)$  denotes the probability of switching from state  $y$  to  $y'$  at age  $a$ . Parents face no income uncertainty. The earnings of household  $i$  receives at age  $a$  is thus

$$w_{i,a} = l_a y_{i,a} \quad \forall a \in \{25, 27, \dots, 53\}, \quad (1)$$

$$w_{i,a} = l_a \quad \forall a \in \{55, 57, \dots, 83\}. \quad (2)$$

While this dichotomy in labor income risk is primarily chosen to reduce the state space, it is also largely consistent with the empirical fact that labor income risk is decreasing with age (Sanchez and Wellschmied, 2020). Furthermore, this paper focuses on the role of parental transfers for kid's housing choices, so parental income

risk is not a primary concern. However, I perform robustness exercises with income and health expenditure risk for parents in Appendix C.1.

*Housing:* Households value consumption and housing services. They can obtain housing services from the rental market or the owner-occupied market. They can rent housing of size  $h_r$ , or own houses of size  $h_o$ . The unit price of housing is  $p$ , and  $q$  denotes the rent-to-price ratio. Homeowners pay depreciation and maintenance  $\delta$  on their housing. I assume adjustment costs that are proportional to the market value for owner-occupied housing, as in Yang (2009)

$$adj(h_{a+1}, h_a) = \begin{cases} m_b p h_{a+1} & \text{if } h_a = h_r \text{ \& } h_{a+1} \neq h_r, \\ m_s p h_a & \text{if } h_a \neq h_r \text{ \& } h_{a+1} = h_r, \\ 0 & \text{if } h_{a+1} = h_a, \end{cases} \quad (3)$$

where  $m_s$  and  $m_b$  denote selling and purchasing costs. In this notation,  $h_a$  is the house a household enters the period with and  $h_{a+1}$  the house chosen in the given period. These adjustment costs make housing illiquid since households cannot freely adjust their housing choices.

*Financial Market:* Households can save in a one-period risk-free bond with a return  $r$ . Borrowing against collateral (owner-occupied housing) is allowed, but households must satisfy a loan-to-value (LTV) constraint. I model borrowing as a one-period mortgage that is rolled over each period. The mortgage has an interest rate of  $r + r^m$ , where  $r^m \geq 0$  is the mortgage premium. Since the mortgage premium is positive, households will never simultaneously hold both a mortgage and save in the risk-free bond. Let  $b$  denote the net position in bonds. The interest rate households face is

$$r(b) = \begin{cases} r & \text{if } b \geq 0, \\ r + r^m & \text{if } b < 0. \end{cases} \quad (4)$$

The borrowing constraints take the following form depending on the rent/own deci-

sion

$$\begin{cases} b \geq -LTV \times ph_{a+1} & \text{if } h_{a+1} = h_o, \\ b \geq 0 & \text{if } h_{a+1} = h_r. \end{cases}$$

*Initial Conditions of the New Kid:* A household's starting wealth and productivity at age 25 is stochastic and allowed to be correlated with the parent's wealth and productivity at age 53,  $x_{25}, y_{25} \sim F(x_{53}, y_{53})$ . All households start as renters but are allowed to purchase housing in the first period. The distribution of  $F$  is crucial to generate sufficient inter-generational correlations in initial conditions.<sup>6</sup>

*Preferences:* Parents and children have time-separable expected utility preferences over consumption and housing services. Households discount the future at rate  $\beta$ . The per-period utility function for kids is age-independent

$$U_k(c_k, h_k) = u(c_k, h_k) = \frac{(c^\xi s(h)^{1-\xi})^{1-\gamma} - 1}{1-\gamma}, \quad (5)$$

where  $s$  denotes housing services,  $\gamma$  measures risk aversion, and  $\xi$  the expenditure shares on non-housing consumption. The function  $s()$  maps housing qualities into values comparable to consumption and takes the following form

$$s(h) = \begin{cases} h_r & \text{if renting } (h_{a+1} = h_r), \\ \chi h & \text{if owning } (h_{a+1} = h_o). \end{cases} \quad (6)$$

The parameter  $\chi$  measures the owner-occupied utility premium and captures any enjoyment households derive from owning rather than renting. It also serves as a proxy for any pecuniary benefits associated with owning that is not explicitly modeled (e.g., tax benefits).

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<sup>6</sup>While this paper abstracts from parental investment in their child's human capital, these are important part of the initial conditions (Daruich, 2018; Lee and Seshadri, 2019). This specification of the stochastic initial conditions allows me to match the intergenerational correlation in both wealth and income.

Finally, the parent's per-period utility function is identical, just augmented by the altruistic utility derived from the kid:

$$U_p(c_p, h_p, c_k, h_k) = u(c_p, h_p) + \eta u(c_k, h_k). \quad (7)$$

*Timing:* First, the productivity state of children is realized first. Dynasties with newly economically active kids (aged 25) also draw the initial wealth level of the kid from  $F$ . Next, the parent chooses consumption  $c_p$ , non-negative inter-vivos gifts  $t_p$ , bond position  $b_p$ , and housing choice  $h_p$ . The kid chooses consumption  $c_k$ , housing  $h_k$ , and savings  $b_k$  after observing the parent's choices. The parent moves first to be consistent with mortgage regulation in the US, which requires gifts to be deposited before mortgages are approved.

*State Variables:* The state variables of a parent  $p$  are the beginning of period wealth for the kid  $x_k \in X = [0, \infty)$ , the parent's starting wealth  $x_p \in X$ , the housing states  $h_k \in H = \{h_r, h_o\}$ ,  $h_p \in H$ , the child's productivity  $y_k \in Y_a = \{y_1, \dots, y_{N_y}\}$ , and the age of the child  $a_k \in A_k \in \{25, 27, \dots, 53\}$ . Let the state variable of the parent be denoted by  $\mathbf{s}_p \equiv (x_k, x_p, y_k, h_k, h_p, a_k)$ .

Due to the model's timing assumption, the child makes choices after the parent. The parent's choices affect the kid's feasible choice set (transfers  $t_p$  increases cash-on-hand  $x_k$ ) and next period state variables (the parents choices for net-bond position  $b_p$  and housing  $h_p$ ). At the beginning of the second stage, the state space of the child expands to  $(x_k, x_p, y_k, h_k, h_p, a_k; t_p, b'_p, h'_p)$ , where  $'$  denote next-period state variables. The kid is indifferent between a change in own wealth or transfers but cares about disposable wealth including transfers  $\tilde{x}_k \equiv x_k + t_p$ . Further, since he moves after the parent, the parent's starting wealth  $x_p$  and housing  $h_p$  are redundant for the kid, so we can rewrite the state space to be  $\mathbf{s}_k = (b'_p, h'_p, x_k + t_p, y_k, h_k, h'_p, a_k)$ . Let  $V_k(s_k)$  denote the kid's value function in the second stage.

## 3.2 Household Decision Problems

I now describe the recursive formulation of the household's decision problems. Households take all prices as given. Each household's decision problem is divided into a discrete owning/renting choice. Households first find the optimal consumption, savings, and transfer policies conditional on a housing choice and then pick the housing choice that maximizes utility.

### 3.2.1 Decision Problems of the Kid-Parent Pair

I now show the decision problems of both households, conditional on them choosing to own  $h'_k = h_o$ . Appendix B.2 contains the problems conditional on renting and for the final period of life of the parent.

*Kids - Second Stage:* The kid chooses consumption, savings, and housing. I **highlight** variables directly related to strategic considerations which would disappear without altruism ( $\eta = 0$ ).

$$\begin{aligned}
V_k(\mathbf{s}_k) = & \max_{c_k, b'_k, h'_k = h_o} u(c_k, h'_k) + \beta \mathbb{E}[V_k(\mathbf{s}'_k)] \\
\text{s.t. } & b'_k = x_k + t_p + w_k - c_k - ph'_k - \text{adj}(h_k, h'_k) \\
& x'_k = b'_k(1 + r(b'_k)) + ph'_k(1 - \delta) \\
& b_k \geq -LTVph'_k.
\end{aligned} \tag{8}$$

Where  $\mathbf{s}_k = (b'_p, h'_p, x_k + t_p, y_k, h_k, h'_p, a_k)$ ,

$$\mathbf{s}'_k = (b_p^*(\mathbf{s}'_p), h_p^*(\mathbf{s}'_p), x'_k + t_p^*(\mathbf{s}'_p), y'_k, h'_k, a_k + 2).$$

Transfers from parents increase kid's cash-on-hand. In addition to this wealth effect, a transfer may relax the borrowing constraint. The transfer does not directly interact with the adjustment cost, but, as discussed in Section G, the adjustment costs incentivizes kids to overconsume housing. Kids takes into account how their choices, by affecting the parents state  $\mathbf{s}'_p$ , affect the parent's next-period choices. Denote

the resulting policy functions by  $c_k^*(\mathbf{s}_k), h_k'^*(\mathbf{s}_k), b_k'(\mathbf{s}_k)$ , where the superscript asterisk denote the optimal choices. It will be convenient to denote next-period wealth by  $x_k'^*(\mathbf{s}_k)$ .

*Parents - First Stage:* The parent chooses consumption, savings, housing and the transfer:

$$\begin{aligned}
V_p(\mathbf{s}_p) = & \max_{c_p, b_p', h_p' = h_o, t_p} u(c_p, h_p) + \eta u(c_k^*(\mathbf{s}_k), h_k'^*(\mathbf{s}_k)) + \beta \mathbb{E} [V_p(\mathbf{s}_p')] \\
\text{s.t. } & b_p' = x_p + w_p - c_p - t_p - ph_p' - adj(h_p, h_p') \\
& x_p' = b_p'(1 + r(b_p') + p'h_p'(1 - \delta)) \\
& t_p \geq 0, \\
& b_p' \geq -LTV \times ph_p'.
\end{aligned} \tag{9}$$

Where  $\mathbf{s}_k = (b_p', h_p', x_k + t_p, y_k, h_k, h_p', a_k)$ ,

$\mathbf{s}_p = (x_k, x_p, y_k, h_k, h_p, a_k)$

$\mathbf{s}_p' = (x_k'^*(\mathbf{s}_k), x_p', y_k', h_k'^*(\mathbf{s}_k), h_p', a_k + 2)$ .

The parent moves first and takes into account how his choices will affect the choices of the kid in the second stage. There are two distinct strategic considerations. First, the parent affects the kid's consumption in this period. Second, the parent affects the kids housing tenure and savings choices. For example, it may be that the parent observes that the kid will sell his house without transfers. However, the parent can prevent this by transferring sufficient funds to keep this 'house-rich and cash-poor' kid in their home.

### 3.3 Measures of Households

I now define the measures of households and the related laws of motion. The state-space of a parent household is  $S_p = X_k \times X_p \times Y_k \times H_k \times H_p \times A_k$ , with  $\mathbf{s}_p$  denoting generic elements therein and  $\mathcal{S}_p$  the associated Borel- $\sigma$  algebra. The state space of a

kid household is  $S_k = B_p \times H_p \times X_k \times Y_k \times H_k \times A_k$ , where  $B_p = \mathbb{R}$ . For conciseness, I omit further definitions for the kid. Let  $\psi_p(\mathbf{s}_p)$  be a probability measure over  $(S_p, \mathcal{S}_p)$  so that  $\psi(\mathbf{s}_p)$  denote the measure of households with state  $\mathbf{s}_p$  (i.e., after the shock is realized but before choices are made). Finally,  $\Psi_p$  denotes the corresponding cumulative distribution function. The mass of households for each age is normalized to 1/15.

*Law of Motion for Dynasties with Kids Aged 25-51:* The mass of households with state  $\mathbf{s}_p$  is the mass of families that choose policies for housing and savings such that they can end up in this state multiplied by the probability of that specific income shock

$$\begin{aligned} \psi(\mathbf{s}'_p) = \int_{\mathbf{s}_p \in \mathcal{S}_p} & \mathbf{1}_{\{x'_p = x'^*_p(\mathbf{s}_p)\}} \mathbf{1}_{\{h'_p = h'^*_p(\mathbf{s}_p)\}} \mathbf{1}_{\{x'_k = x'^*_k(\mathbf{s}_k(\mathbf{s}_p))\}} \mathbf{1}_{\{h'_k = h'^*_k(\mathbf{s}_k(\mathbf{s}_p))\}} \times \\ & \pi(y'_k | y_k) d\psi(\mathbf{s}_p). \end{aligned} \quad (10)$$

Note that the kid's state  $\mathbf{s}_k(\mathbf{s}_p)$  in these expressions depend on the choices of the parent which depend on their state (e.g.,  $h'^*_k(\mathbf{s}_k(\mathbf{s}_p)) = h'^*_k(b'^*_p(\mathbf{s}_p), h'^*_p(\mathbf{s}'_p), x'_k + t'^*_p(\mathbf{s}'_p), y'_k, h'_k, a_k + 2)$ ).

*Law of Motion for Kids Aged 53:* In this special case, the distribution will depend on the choices of the new parent (old kid), the now deceased parent and the stochastic initial conditions of the new kid.

$$\begin{aligned} \psi(\mathbf{s}'_p; a_k = 25) = \int_{\mathbf{s}_p \in \mathcal{S}_p} & \mathbf{1}_{\{x'_p = x'^*_p(\mathbf{s}_p) + x'^*_k(\mathbf{s}_k(\mathbf{s}_p))\}} \mathbf{1}_{\{h'_p = h'^*_p(\mathbf{s}_p)\}} \mathbf{1}_{\{h'_k = h'_k\}} \times \\ & F(x'_k, y'_k | x_k, y_k) d\psi(\mathbf{s}_p; a_k = 53), \end{aligned} \quad (11)$$

where we limit  $\mathcal{S}_p$  to only include the subset of the state-space where  $a_k = 53$ . The initial wealth and productivity of the child depends on the wealth  $x_k$  and productivity  $y_k$  of the new parent at age 53. Further, all kids start out as renters, and the next-period wealth of the new parent is savings plus bequests.

Finally, the function  $\mathcal{H}$  operates on the distribution  $\psi(\mathbf{s}_p)$  and policy functions



and maps them into a new distribution in accordance with equations (10, 11):

$$\psi_{n+1} = \mathcal{H}(\psi_n, g^*), \quad (12)$$

where the subscript denotes the iteration of the distribution. A stationary distribution is then a fixed point of equation (12).

### 3.4 Equilibrium Definition

A stationary equilibrium, which is also Markov Perfect, is a collection of value functions  $V_k(\mathbf{s}_k)$  and  $V_p(\mathbf{s}_p)$ , policy functions of the kid  $c'_k(\mathbf{s}_k)$ ,  $b'_k(\mathbf{s}_k)$ ,  $h'_k(\mathbf{s}_k)$  and the parent  $c'_p(\mathbf{s}_p)$ ,  $b'_p(\mathbf{s}_p)$ ,  $h'_p(\mathbf{s}_p)$ ,  $t'_p(\mathbf{s}_p)$ , and a distribution of households  $\psi(\mathbf{s}_p)$  such that:<sup>7</sup>

1. In each repetition of the parent-kid stage-game:
  - (a) The parent's policy functions are optimal given the kid's policy functions.
  - (b) The kid's policy functions are optimal given the parent's policy functions.
2. The measure of households is invariant.

Finally, since this is an infinitely repeated game the equilibrium need not be unique. However, I experiment with different starting positions and verify that they all yield the same equilibrium.

### 3.5 Model Discussion

Several properties of this setup are worth noting. The lack of commitment generates strategic interactions. The parent faces the Samaritan's Dilemma, where the kid undersaves to receive larger transfers. Second, the parent may be able to give 'gifts-to-autarky', where the parent can push the kids into self-sufficiency (see Section G for

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<sup>7</sup>In Section 5.3 I additionally include endogenous supply of owner-occupied units, where the supply depends on the price  $p$ .

details). Further, both households internalize fully how their behavior will affect the other in current and future periods. Since households lack a commitment technology, there is only limited risk-sharing between parents and kids, a result well-established in the empirical literature (Boar, 2018; Attanasio, Meghir, and Mommaerts, 2018).

In models with rental and owner-occupied markets potential homeowners buy housing if, and only if, the benefits of owning exceed those from renting. Thus, differences in an individual's desire to own will be affected by differences in net benefits. What is the impact of altruism and illiquid housing on the relative benefits of owning? There are four distinct mechanisms that I now discuss in detail.

First, the introduction of altruism lowers the kid's savings motive. Since households only buy once they cross a wealth threshold, the decreased savings motive lowers homeownership.

Second, the LTV constraint introduces another transfer motive. Consider a child that would benefit from owning but cannot satisfy the LTV constraint. When the LTV constraint is binding, the marginal utility of wealth is high, and so transfers are more valuable. This mechanism increases homeownership.

Third, transfers decrease the downside risk of illiquid housing when there is income risk. A child that owns and receives a sequence of bad income shocks will sell and pay the sales cost  $m_s$ , unless the parent transfers. This channel increases the expected net benefit of owning for households with wealthier parents and so increases homeownership.

Fourth, illiquid housing can increase future transfers. A child who spends all his wealth on buying a house in a given period will in the next period either have low goods consumption or will sell the house, pay the sales cost, and balance housing and non-housing consumption. In the first case, the parent may want to transfer since the child's marginal utility of non-housing consumption is high. In the second case, the parent may want to transfer to keep the child in the house, keeping the sales cost in the family. Thus, the child may want to over-invest in illiquid housing

to extract future transfers.

The model has implications for the propensity to be liquidity-constrained (hand-to-mouth). Households who are liquidity constrained have higher marginal propensities to consume and are important drivers of aggregate consumption responses (Kaplan and Violante, 2014). The downside of being liquidity constrained is lower with altruism since transfers may provide insurance against income shocks. The upside is also larger since ‘house-rich, cash-poor’ households may receive additional transfers. A policy rebate targeted to hand-to-mouth households may then disproportionately flow to households who a) would get parental transfers without the policy, b) have wealthier parents, and c) have strategically chosen to have low liquidity. Further, Boar et al. (2020) show that heterogeneity in discount factors and risk aversion may be an important element in the propensity to be hand-to-mouth. However, having wealthier parents decreases savings rates and increases consumption, which is observationally similar to higher discount rates or higher intertemporal elasticity.

### 3.6 Stylized Two-Period Model

In Appendix G I solve a more tractable stylized two-period model based on the workhorse model of Altonji et al. (1997). I use this model to show study the effects of sales costs on the transfer behavior in a setting where the only frictions are the lack of commitment and a sales cost on housing. I find that, with illiquid housing and no commitment, a) children with wealthy parents prefer sales costs, b) these children invest in illiquid housing to extract future transfers increasing their discounted utility, and c) these results are true under a broad set of utility functions.

## 4 Parameter Selection

To quantify the effects of parental assistance on homeownership and evaluate counterfactual policies, I estimate the model using data from the PSID. I follow a standard

two-step estimation procedure. In the first step I estimate parameters that do not require the model structure directly from the data or take them from the literature. In the second step I estimate the remaining parameters using simulated method of moments (SMM). After estimating the model I validate the model using non-targeted moments from the PSID as well as experimental evidence from previous empirical work.

All data moments come from the 1999-2017 waves of the PSID. Income, wealth, and housing values are all winsorized at the 1st and 99th percentiles to limit the role of outliers when calculating ratios. All calculations use family weights.

## 4.1 Parameters Chosen Independently and Externally

All externally calibrated parameters and values are summarized in Table 3.

*Period Length:* Each decision period is calibrated to be two years to overlap with the PSID interview frequency. I report all parameters in their bi-annualized forms (e.g., the interest rate is the two-year interest rate).

*Income Process:* The income processes consist of a deterministic life-cycle component  $l_a$  for all ages and shocks  $y_a$  for kids. I first find the weighted average household income by age and year. I weight each year equally to obtain the life-cycle profile. I then regress average income on a fifth-order polynomial of age. I use the predicted values from this regression as the deterministic life-cycle component of income  $l_a$  for households aged 25-63. Next, to find retirement income  $l_r$ , I take the average income for households aged 65-83 and divide it by the predicted income at age 63. Multiplying this ratio by the predicted income at age 63  $l_{63}$  gives retirement income  $l_r$ . Figure A6a displays the data and predicted values.

To calibrate the stochastic income process  $y_{i,a}$ , I first set  $N_y = 3$  to obtain a three-state Markov Chain. The sample is divided into age-specific income tertiles. I then find the empirical age-dependent transition matrices, plotted in Figure A6c. To find the values  $v_{i,a}$  for each tertile, I normalize each household's income by the

median income within each age group and then find the median income within each tertile. The results are plotted in Figure A6b.

*Initial Conditions of the Young  $y_{k,25}, x_{k,25} \sim F(x_{k,53}, y_{k,53})$ :* This joint distribution is important to match intergenerational correlations in initial wealth and productivity. To provide a simple and intuitive method, I estimate it nonparametrically. First, I use  $N_k^x = 4$  quantiles for wealth and the  $N_y$  productivity tertiles for households aged 25. For the parents, I divide wealth into  $N_p^x = 4$  quantiles for each of the productivity tertiles. I then find the probability of each parent-kid combination in the data and use this as the PDF.

*Housing Parameters:* I set the rental-rate  $q = 0.10$  as is standard in the literature and estimated in Davis, Lehnert, and Martin (2008). Housing depreciation and maintenance  $\delta$  is set to 0.05 to match depreciation of existing housing capital as estimated in Harding, Rosenthal, and Sirmans (2007). The sales cost  $m_s$  is set to 7.5% and the purchase cost  $m_b = 2\%$ , based on Yang (2009).

*Financial Parameters:* I set  $LTV = 0.80$ , a standard value in the literature which also matches the average LTV ratio at loan origination for prime mortgages from Freddie Mac. The interest rate on savings is set to be  $r = 0.04$ .

*Risk Aversion and Housing Expenditure Share:* I set the risk aversion parameter  $\gamma = 2.0$  a standard value in the literature. The risk aversion parameter  $\gamma$  is the strength of the transfer motive, as it pins down the slope and curvature of the utility functions. To aid comparisons with the literature, I set  $\gamma = 2.0$  as in Boar (2018).<sup>8</sup> The parameter  $\xi$  pins down the expenditure share of housing consumption and is set to 0.175. This parameter is typically set to be around 0.15-0.2 (e.g., Kaplan, Mitman, and Violante, 2020; Chatterjee and Eyigungor, 2015; Paz-Pardo, 2019) based on the share of nominal housing expenditures in nominal personal consumption expenditures. However, I internally estimate the discount factor  $\beta$  since there are no

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<sup>8</sup>I have experimented with estimating this parameter internally. However, it is difficult to jointly identify risk aversion  $\gamma$  and  $\eta$  without introducing other sources of risk that would help determine risk aversion.

Table 3: Summary of Externally and Independently Estimated Parameter

Parameter		Value	Source
Period Length	—	2 years	PSID Frequency
Rental Price	$q$	0.10	Standard
Deprecation	$\delta$	0.05	Standard
Risk-free Rate	$r^f$	0.04	Standard
Expenditure Share Housing	$\xi$	0.175	Standard
Risk Aversion	$\gamma$	2.0	Standard
Max Loan-to-Value	LTV	0.8	Standard
Rental Size	$h_r$	1.0	Normalization
Initial Distribution	$F(x_{53}, v_{53})$	Fig. A6d	PSID
Deterministic Income	$l_a$	Fig. A6a	PSID
Productivity Shocks for Kids	$y, \Pi(y' y)$	Fig. A6b, A6c	PSID
Selling & Buying Cost	$(m_s, m_b)$	(0.075, 0.02)	Yang (2009)

*Notes:* Rental price  $q$ , depreciation  $\delta$ , and the risk-free rate  $r$  are bi-annualized (two-year values). All moments estimated from the PSID use waves from 1999-2017.

standard values for it in a model with housing and transfers.<sup>9</sup>

## 4.2 Moments and Identification

The remaining six parameters  $\theta = (\beta, \eta, \chi, r^m, p, h_o)$  are chosen to minimize the distance between eight simulated moments and empirical moments. All empirical moments are taken from the 1999-2017 PSID, and are listed in Table 5 along with the simulated moments. I now discuss how each moment is estimated in the data and give a heuristic explanation of why the moments identify the parameters. For each moment (e.g., median wealth), I aggregate over age bins (25-44 & 55-74) and years. To remove year effects, I aggregate over all years giving each year equal weight.

I target two moments related to wealth accumulation over the life-cycle that are important for altruism intensity  $\eta$  and the discount factor  $\beta$ : median wealth of young (\$23,500) and old (\$206,700) households. I target the median for two reasons. First, this paper is not about the wide dispersion and fat tails in the US wealth

<sup>9</sup>To the best of my knowledge, my paper is the first life-cycle model with transfers and both rental and owner-occupied housing.

distribution, so targeting the mean will make households too rich. Second, parental transfers for housing are most important for dynasties who are neither poor nor rich, so matching the middle of the wealth distribution is more important. The peak of life-cycle income is largely determined by the discount factor  $\beta$ . At the same time, the wealth of young households help to identify altruism  $\eta$ : when the parent is more altruistic their children increase overconsumption, decreasing wealth.

I target two moments directly related to housing: the homeownership rate of young households (49.4%) and the rent-to-income ratio for young renters (0.23).<sup>10</sup> The young homeownership rate is a crucial moment to match for this paper. The rent-to-income ratio ensures correct selection into homeownership by income. Both of these moments depend on many of the parameters but are particularly affected by the price level  $p$  and the relative size of the owner-occupied unit  $h_o$ . In particular, higher prices increase the rent-to-income ratio, while lower house sizes increase the homeownership rate.

Next, I target two moments related to the timing of first purchase: average LTV (0.67) and average age (32.5) when households become first-time homeowners. LTV at purchase is defined as the mortgage balance over house value in the period households are first observed as homeowners. Age at purchase is similarly defined.<sup>11</sup> It is important to match these moments so that the rent-to-own transition happens while households are young, have not accumulated too much wealth, and take out large mortgages, as in the data. The LTV at purchase is affected by the mortgage premium  $r^m$ , as a lower premium decreases the costs of borrowing, while the age at purchase is pinned down by the price level (higher prices delays ownership) and the ownership preference shifter  $\chi$ .

Finally, I target two moments related to transfers: the average transfer rate to young kids (35.8%) and the transfer rate around first-time purchases (39.0%). Both

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<sup>10</sup>Rent-to-income values outside (0, 1) are coded as missing.

<sup>11</sup>LTVs above 1 are coded as missing. I cannot observe time of purchase for households who enter the sample as homeowners. To be consistent with the model, such households who enter at age 25 or 26 have an age-at-purchase of 25, while the others are coded as missing.

moments are estimated from matched child-parent pairs from the 2013 transfer supplement. I ignore transfers of less than \$500, as these transfers are not quantitatively important but increase the transfer rate significantly. For transfers around first-time home purchases, I include transfers given in the period before, during, and after purchase. I include transfers after purchase since the empirical results suggest that future transfers increase the relative benefit of owning. Further details about the estimation of transfer moments are in Appendix B.1. These moments are important to ensure that the transfers frequencies are correct. The transfer rate pins down the altruism intensity  $\eta$ . The transfer rate around purchase is most informative about the price level, as an excessively high price level implies that children who own are so wealthy that parents do not transfer.

### 4.3 Model Fit

I estimate the remaining six parameters by the simulated method of moments (SMM). I first draw a large set of quasi-random parameter vectors from a Sobol sequence. For each parameter vector, the model fit is defined as the squared distance between the eight simulated moments  $m^s$  and the empirical moments  $m^e$

$$\hat{\theta} = \arg \min \sum_{j=1}^8 \frac{(m_j^d - m_j^e)^2}{m_j^e}, \quad (13)$$

where the squared distance of each moment is normalized by its empirical mean. The parameter vector that minimizes the objective (13) is the approximate global optimizer. I use this vector as the starting point for a local optimizer that uses a simplex algorithm to find the local minimum. In Appendix E.2 I show how this method can verify that each parameter is identified and how each moment is affected by the different parameters.

The estimated parameters are reported in Table 4 and are in line with previous literature and their direct empirical counterparts. The main preference parameters  $\beta$



Table 4: Estimated Parameters

	Parameter	Value	Std. Err.	Ident. Moment
$\beta$	Discount Factor	0.925	0.004	Median Wealth (55-74)
$\eta$	Altruism	0.457	0.068	Parent Transfers (55-74)
$\chi$	Ownership Pref.	1.379	0.156	Age First Own (25-44)
$r_k^m$	Mortg. Prem	0.019	0.006	LTV at purchase (25-44)
$\frac{h_o}{h_r}$	Size Ratio	3.120	0.291	Rent / Income (25-44)
$p$	House Price	81.966	6.610	Owner (25-44)

*Notes:* Standard errors calculated from estimating the model to 100 bootstrapped samples. The table lists one main identifying moment.

and  $\eta$  are in line with estimates in related papers (e.g., [Boar 2018](#); [Darulich 2018](#); [Lee and Seshadri 2019](#)). The ownership preference shifter indicates that households gain 38% more housing services by owning relative to renting and is somewhat lower than in related papers (e.g., [Corbae and Quintin 2015](#); [Chang 2020](#); [Fisher and Gervais 2011](#)). The mortgage premium  $r_m$  is estimated to be 0.019, or 1% per annum. This is low relative to the true mortgage premium in the US which is estimated to be around 2-4% (e.g., [Boar et al. \(2020\)](#); [Cocco \(2005\)](#)). However, standard theory suggests the interest rate on risk-free one-period bonds would be lower than on long-term bonds with default. The owner-occupied size is 3.12, relative to a rental size normalized to 1, and the price is estimated to be \$81,966 in 2015 dollars per housing unit. This implies that the owner-occupied house costs \$255,734. In the PSID the average market value of owner-occupied units among households aged 25-44 is \$232,918. The size ratio is hard to compare between models and depends on the number of house sizes. Still, my estimate of 3.12 is in the middle of the range estimated in [Kaplan et al. \(2020\)](#). I expand on verifying identification in [Appendix E.2](#).

Table 5 shows that the model matches targeted moments well. It matches wealth, the homeownership rates, rent-to-income, age of first ownership, and LTV at purchase very precisely. It overpredicts the two-year transfer rate somewhat (36% vs 45%) but matches the transfer rate around kid's house purchases. It should be noted that the

Table 5: Targeted Moments

Moment	Data	Model
Median Wealth (25-44)	23.54	23.49
Median Wealth (55-74)	206.67	206.82
Owner (25-44)	0.49	0.48
Rent / Income (25-44)	0.23	0.21
Age First Own (25-44)	32.53	32.89
LTV at purchase (25-44)	0.67	0.66
Parent Transfers (55-74)	0.36	0.45
Transfers Around Purchase (25-44)	0.39	0.38
Sum Squared Distances		0.03

*Notes:* All moments calculated from the 1999-2017 waves of the PSID, using households aged 25-83, except transfers which is from the 2013 PSID Transfer Supplement. Wealth is measured in 1000s of 2015 US dollars.

transfer moments are also least precisely estimated since they only use data from a single wave of the PSID.

## 4.4 External Validity

To validate the model, I show that the model also matches non-targeted moments. In addition, a simulated panel from the model replicates reduced-form estimates on the role of parental wealth and transfers on children’s housing outcomes covered in Section 2.4.

First, the model replicates the correlation between parental wealth and children’s homeownership. In the PSID, young homeowners’ parents are 2.52 times as wealthy as young renters’ parents. I call this ratio the parental wealth gradient (in homeownership). This number is useful to summarize the role of parental wealth in their kids’ housing outcomes. The model predicts a very similar ratio of 2.49. The value of the parental wealth gradient will be one of the main outcomes of interest in counterfactual exercises and positive policy analysis.

Next, I show that the model matches other moments related to homeownership

Table 6: Non-Targeted Moments

Moment	Data	Model
Parent Wealth Gradient (25-44, median)	2.52	2.49
Owner (25-73)	0.65	0.60
Wealth at Purchase (25-44)	33.36	45.69
Mortgage (25-44)	143.95	123.93
$Prob(NewOwner t_p > \$5000, Controls)$ $-Prob(NewOwner t_p \leq \$5000, Controls)$	(0.03-0.08)	0.07

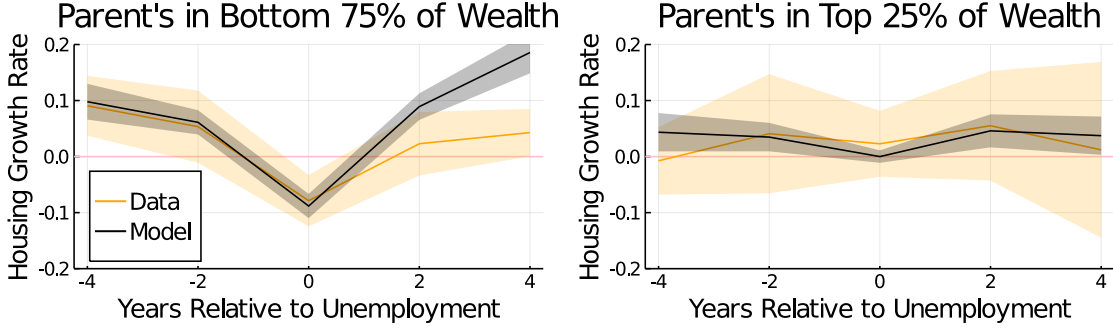
*Notes:* All moments calculated from the 1999-2017 waves of the PSID, using households aged 25-83. Wealth is measured in 1000s of 2015 US dollars. The last row reports the regression results from [Lee et al. \(2018\)](#) and the simulated panel (see discussion in the main text and Section [E.4](#) for details).

and housing purchase decisions. First, the aggregate homeownership among households aged 25-73 is 65%, while the model predicts 60%. Second, the wealth at purchase of \$45,690 in the model is slightly higher than in the data (\$33,360), but almost with the bootstrapped standard error of \$10,438. The slightly high wealth at purchase is likely a result of the slightly high minimum downpayment in the model ( $LTV=0.8$ ), while some households do have access to mortgages with lower down payments ([Corbae and Quintin, 2015](#); [Hatchondo, Martinez, and Sánchez, 2015](#)). In the PSID, young homeowners' average outstanding mortgage balance is \$143,950, while the model equivalent is \$123,930.

The last row reports the effect of receiving larger transfers on the probability of becoming a home owner, controlling for a set of observables. In particular, I replicate the regression from [Lee, Myers, Painter, Thunell, and Zissimopoulos \(2018\)](#), Tables 7-8. These regressions use a linear probability model to estimate the effect of receiving a transfer over \$5,000 on the probability of becoming a homeowner in the PSID and the HRS<sup>12</sup>. The estimated treatment effect varies from 0.03-0.08, while the simulated panel finds that the effect, after controlling for wealth, income, and age, is 0.07.

<sup>12</sup>Similar regressions are also used in [Engelhardt and Mayer \(1998\)](#); [Guiso and Jappelli \(2002\)](#); [Blickle and Brown \(2019\)](#), who find roughly similar magnitudes. A full description of the regression specification is in Appendix [E.4](#). These results should not be interpreted causally: for example, households may receive transfers specifically because they are buying a house.

Figure 4: Event Study: Housing Consumption at Unemployment by Parental Wealth



*Notes:* Lines denote means, and shaded areas indicate 95% confidence intervals. The light orange area denotes the empirical estimates (Section 2.4), and the darker black areas denote the results from the simulated panel. Unemployment in the model is defined as the lowest productivity level. The sample consists of households aged 20-45 with exactly one unemployment spell and without changes in head or spouse in the four years before and after unemployment.

As a final external validation, I show that the model approximately replicates the reduced-form evidence from the event study in Section 2.4 by repeating the event study in the simulated panel. Households are counted as unemployed if their productivity state drops to the lowest level for only one period. Otherwise, I mimic the exercise exactly. Figure 4 shows the results. We see that the simulated model matches both the qualitative and quantitative patterns from the empirical sample (Figure 2). Households with non-wealthy parents decrease housing consumption by 8% and 9% in the simulated and empirical samples, and the two confidence intervals overlap. We cannot reject the null hypothesis of no effect for wealthy households in either the empirical or simulated data.

## 5 Homeownership Rates Without Transfers?

In this section I answer the question: what would the homeownership rate be without transfers? I simulate the model under the same parameters but set  $\eta = 0$  in order to eliminate transfers and bequests. The model is then a standard life-cycle housing model.

Importantly, I assume that the supply of housing is perfectly elastic (i.e. that the house price does not change). While this assumption is *prima facie* incorrect, keeping prices constant allows for a clean decomposition of the various mechanisms that change the homeownership rates with and without transfers. However, while homeownership of the young decreases significantly without transfers, the aggregate ownership rate falls less, limiting the scope of price adjustments. Finally, I show that the results are not sensitive to an endogenous housing supply for any supply elasticity.

## 5.1 Results with Constant Prices

Table 7 reports how the moments change without altruism and transfers. Homeownership rates go down by 15 pp. from 49, a decrease of 31% among young (25-44) households. This is a large decrease – in comparison, homeownership only decreased by 8 percentage during the financial crisis.

What are the drivers of this decrease in homeownership? Without altruism, the median wealth doubles among the young and is unchanged among parents, all else equal, increasing homeownership. However, the age at first purchase increases from 33 to 37.5. The change is driven by changes in the threshold where owning becomes more attractive than renting: i) the LTV at purchase decreases from 0.66 to 0.46, ii) wealth at purchase increases by \$28,000, and iii) households are less willing to take out mortgages and debt among owners decreases by 50%. The overall homeownership rate (25-70) falls by only 5 pp. (8%). Finally, without altruism the parental wealth gradient falls from 2.46 to 1.25, with the remaining effect driven by persistent productivity through initial conditions  $F()$ . The LTV at purchase falls without transfers, implying that the LTV constraint is no longer binding for most households.

There are three takeaways from this experiment. First, parental transfers are important for the homeownership rate of young households. Second, this effect is

Table 7: Homeownership Decreases while Wealth Increases Without Altruism

Moment	Data	Altruism $\eta > 0$	No Altruism $\eta = 0$
<i>Targeted Moments</i>			
Median Wealth (25-44)	23.54	23.47	42.13
Median Wealth (55-74)	206.67	206.78	208.20
Owner (25-44)	0.49	0.48	0.33
Rent / Income (25-44)	0.23	0.21	0.20
Age First Own (25-44)	32.53	32.89	37.52
LTV at Purchase (25-44)	0.67	0.66	0.46
Parent Transfers (55-74)	0.36	0.45	0.00
Transfers Around Purchase (25-44)	0.39	0.37	0.00
<i>Non-Targeted Moments</i>			
Parent Wealth Gradient (med)	2.53	2.49	1.25
Owner (25-73)	0.65	0.60	0.55
Wealth at Purchase (25-44)	33.36	46.85	74.31
Mortgage (25-44)	143.95	123.93	60.25

driven not by a wealth effect but that homeownership is less attractive without transfers. Third, transfers, not intergenerational persistence in productivity, is the main driver behind the correlation between parent wealth and housing outcomes.

## 5.2 Which Frictions Generate a Role for Transfers?

Why are transfers so important for the housing decisions of young households that they account for 15 percentage points (31%) of the homeownership rate? To understand this question, I now decompose the effect of three frictions: i) LTV requirement, ii) illiquidity of housing, and iii) uninsurable income risk. The LTV requirement accounts for 77%, illiquidity for 61%, and income risk for 97% of the parental transfers effect on the homeownership rate of young adults. The results are reported in Table A3.

*Removing the LTV requirement:* When there is no minimum downpayment ( $LTV = 1.0$ ) all renters can afford to buy, and all owners can afford to stay in their house. In

this case, the homeownership rate increases to 55% with altruism, and to 51% without. Parental transfers account for  $\frac{0.04}{0.55} = 7\%$  of the homeownership rate when there is no downpayment requirement. The LTV friction thus accounts for  $1 - \frac{0.07}{0.31} = 77\%$  of the parental transfer effect in homeownership. LTV requirements increase the role of parent wealth since transfers relax borrowing constraints.

*Making housing liquid:* Housing is liquid when both sales  $m_s$  and purchase costs  $m_b$  are 0. At this point housing is risk-free since the price is constant, and households can sell their house without loss if they experience a bad shock. Homeownership now increases to 51% with altruism, and to 45% without altruism, and transfers account for 12% of the homeownership rate with liquid housing. Thus, the illiquidity of housing accounts for  $1 - \frac{0.12}{0.31} = 61\%$  of the parental transfer effect. Illiquidity increases the role of parent wealth for two reasons. First, parents provide partial insurance against having to pay the sales cost. Second, some households with wealthy parents invest in housing because it is illiquid to extract future transfers. An interesting side effect, which I explore in Section 6.2 below, is that the parental wealth gradient decreases from 2.49 to 1.62.

*Removing income uncertainty:* To remove income risk while not changing average income, I set the productivity shifter within each age to the average level at that age. With certain income the homeownership rate increases to 62% with altruism, and 61% without, and transfers account for  $\frac{0.01}{0.62} = 1\%$  of the homeownership rate without income risk. and uninsurable income risk accounts for  $1 - \frac{0.01}{0.31} = 97\%$  of the parental transfer effect in homeownership of the young.

### 5.3 Endogenous House Prices

In this section, I show that the decrease in homeownership rates without parental transfers remains even with endogenous supply of owner-occupied housing and a market clearing price. Since the fall in overall homeownership is much smaller than among young households (15 and 5 percentage points, respectively) there is only

limited room for endogenous adjustment to affect the results. As shown in [Greenwald and Guren \(2020\)](#), how one closes the housing market has large impacts on how changes in demand and credit conditions affect aggregate homeownership rates.<sup>13</sup>

I close the housing market by introducing an exogenous reduced-form housing supply equation

$$\ln H^S = \alpha_0 + \alpha_1 \ln p, \quad (14)$$

where  $\alpha_1$  is the aggregate elasticity of supply to prices, and  $H^S$  denotes the level of supplied housing. Letting  $\alpha_1 \rightarrow \infty$  yields a perfectly elastic supply function which keeps the prices constant, which is the same experiment as in the main quantitative exercise (Table 7). When  $\alpha_1 = 0$ , housing supply is in perfectly inelastic, and the price must decrease to keep the homeownership rate constant. The benefits of this approach are its transparency and agnosticism on the drivers of housing supply changes. I calibrate the housing supply elasticity from equation (14) as follows. For any elasticity  $\alpha_1$ , I set  $\alpha_0$  to be such that housing supply would equal housing demand in the benchmark model with altruism:  $\alpha_0(\alpha_1) = \ln(H^d) - \alpha_1 \ln p$ , where  $p$  is estimated price in Table 4.

I report results when house prices are perfectly inelastic, perfectly elastic, and one intermediate case with an elasticity of 5.<sup>14</sup> Table 8 reports the results. The main takeaway from these results is that allowing house prices to adjust does not matter a great deal for the aggregate outcomes in steady state. Given the small difference in the overall homeownership rate with and without altruism this is as expected. Even

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<sup>13</sup>It is also important how rental rates  $q$  are determined, especially for the potential of so called “rental traps” where high rental prices make saving for a down payment difficult. The degree of segmentation between the rental market and housing market is usually modeled with full or no segmentation. If there is full segmentation (e.g., [Favilukis and Van Nieuwerburgh, 2017](#); [Justiniano, Primiceri, and Tambalotti, 2019](#)) there is a constant supply of owner-occupied housing. Any change that makes homeownership more likely must then increase the house price (relative to rents). The other extreme is to have perfectly elastic supply of rental units (e.g., [Kaplan et al., 2020](#)), typically through deep-pocketed landlords who convert rental units to owner-occupied units if the market price exceeds the present value of rents. I follow the latter approach.

<sup>14</sup>I use twice the long-run elasticity estimated in [Aastveit, Albuquerque, and Anundsen \(2020\)](#) to allow for more adjustment as I ignore other equilibrium effects.



Table 8: Housing Supply Elasticities Not Quantitatively Important

Moment	Altruism	Without Altruism		
	Benchmark	Elastic	Middle	Inelastic
<i>Aggregate Moments</i>				
Supply Elasticity		$\infty$	5.00	0.00
House Price	81.97	81.97	80.89	77.85
Owner (25-73)	0.60	0.55	0.56	0.60
<i>Targeted Moments</i>				
Median Wealth (25-44)	23.47	42.13	42.24	43.00
Median Wealth (55-74)	206.78	208.20	209.95	206.32
Owner (25-44)	0.48	0.33	0.35	0.37
Rent / Income (25-44)	0.21	0.20	0.20	0.19
Age First Own (25-44)	32.89	37.52	36.72	36.81
LTV at Purchase (25-44)	0.66	0.46	0.48	0.49
Parent Transfers (55-74)	0.45	0.00	0.00	0.00
Transfers Around Purchase (25-44)	0.37	0.00	0.00	0.00

in the extreme case of perfectly elastic housing supply, prices fall by only 5.0%. None of the moments are sensitive to supply elasticity. In the benchmark experiment, with elastic supply, transfers account for 15 percentage points of the homeownership rate. Transfers still account 11 percentage points (22%) of the homeownership rate even when housing supply is perfectly inelastic.

## 5.4 Black-White Homeownership Gap

Racial differences in economic and financial outcomes, and among them homeownership, have recently received increased attention.<sup>15</sup> In the United States, young white households are almost two times as likely to be owners as young black households. I find that differences in parental transfers, driven only by racial differences in income, accounts for 30% of the black-white homeownership gap of 48%.

Ashman and Neumuller (2020) use a life-cycle model and find that the black-white income gap of 40% can explain most of the black-white wealth gap of 90%. In

<sup>15</sup>For example, “Top of the list [policies reducing racial inequality] is tackling housing segregation that is central to America’s racial economic inequality” (The Economist (July 9th), p 8).

a similar vein, [Aliprantis, Carroll, and Young \(2020\)](#) show that a reduction in the income gap will take a long time to close the wealth gap. While these papers do include racial differences in inheritances, they do not include inter-vivos transfers. Second, on the asset side, the biggest difference between poor and middle-class households is whether they own and rent. [Bond and Eriksen \(2020\)](#) find that parental wealth accounts for 28% of the black-white mortgage application gap and that the most important variable predicting whether households remain homeowners is parental wealth. Similarly, [Charles and Hurst \(2002\)](#) find that differences in parental wealth account for 25% of the black-white mortgage application gap.

To study the contribution of parental transfers to the black-white homeownership gap, I follow the methodology in [Ashman and Neumuller \(2020\)](#) and [Aliprantis et al. \(2020\)](#) closely. I shift down the deterministic life-cycle by racial differences in income: In the matched parent-child household white households have 8% higher income and black households 47% lower. I then solve the model for white households. When I solve the model for black households, I reduce the size of housing by 23% to match the rent-to-income ratio and the homeownership rate of young black households. I then solve the models without altruism. The results are reported in Table 9.

The black-white homeownership gap among young households is  $1 - \frac{0.28}{0.54} = 48\%$  in the data and 46% in the model with altruism. Without altruism the black-white homeownership gap decreases to 32%. Transfers account for 14 percentage points or  $\frac{0.32}{0.46} = 30\%$  of the black white homeownership gap. Transfers are less important for young black households mainly because their parents have accumulated less wealth than white parents, and most moments change less when altruism is turned off for black households than for white. My results show that differences in parents wealth and income, which affect transfers, are significant contributors to racial inequality in housing outcomes. However, my model omits many other factors that affect the black-white homeownership gap such as discriminatory lending and price evaluations (e.g., [Shapiro \(2004\)](#)). However, these results combined with my policy analysis sug-

gests that policies such as tax rebates for low-income first-time buyers, as suggested by President Elect Biden, will not significantly affect the black-white homeownership gap.

Table 9: Black-White Homeownership Rate

Moment	White			Black		
	Data	Altr	No Altr.	Data	Altr.	No Altr.
<i>Targeted Moments</i>						
Median Wealth (25-44)	32.99	26.76	47.02	3.70	20.38	21.98
Median Wealth (55-74)	265.40	227.86	233.34	39.26	105.12	98.47
Owner (25-44)	0.54	0.52	0.37	0.28	0.28	0.23
Rent / Income (25-44)	0.22	0.20	0.19	0.24	0.25	0.25
Age First Own (25-44)	31.94	32.56	36.73	34.87	36.02	37.40
LTV at Purchase (25-44)	0.69	0.67	0.49	0.57	0.42	0.37
Parent Transfers (55-74)	0.40	0.47	0.00	0.21	0.20	0.00
Transfers Purchase (25-44)	0.45	0.45	0.00	0.20	0.06	0.00
<i>Non-Targeted Moments</i>						
Parent Wealth Gradient	1.79	2.49	1.28	2.91	2.23	1.43
Owner (25-73)	0.70	0.67	0.62	0.44	0.41	0.37
Wealth Purchase (25-44)	37.33	42.36	69.57	16.19	80.81	86.94
Mortgage (25-44)	147.57	124.63	62.98	107.15	59.05	42.17

## 6 Policy, Illiquidity, and Parental Wealth

### 6.1 Policies and the Importance of Parental Transfers

Policies in many countries intend to increase homeownership rates among households, and recent years have seen an increased focus on housing affordability and delayed transitions into ownership (Goodman and Mayer, 2018; Mabile, 2020). Several policies have been proposed to combat the decrease in homeownership. I now evaluate how three different policies impact the role of parental wealth in housing outcomes.

I study the impact of three policies: increasing LTV ratios, decreasing purchase costs, and lowering sales costs. To trace out the impact of these policies, I use the fol-

lowing procedure. I solve the model with one policy change, where the policy change is only relevant for households aged 25-43.<sup>16</sup> I then take the stationary distribution (without policy changes) and simulate it for 15 periods (an entire generation) with the new policy functions and find the new distribution to understand the immediate impact of this policy.

*Lowering Downpayments:* The economic literature typically thinks of the downpayment requirement as the main detriment to homeownership, particularly in combination with high real house prices. Many cities have introduced grants or loans that decrease the downpayment among first-time buyers. I increase the LTV from 0.8 to 0.85 to study such policies' impact on homeownership and the parent wealth gradient.

*Decreasing Purchase Costs:* Related to lower minimum down payments, some cities and countries have decreased mandatory taxes, fees, and closing costs for first-time homebuyers. These policies intend to make it easier to transition from renting to owning, just as one would decrease the downpayment. To study these policies, I decrease the purchase cost ( $m_b$ ) from 2% to 0%.

*Decreasing Sales Costs:* The results from the quantitative model have highlighted the role of illiquidity, particularly the interaction between transfers and the sales cost  $m_s$ . To understand whether this policy would increase homeownership rates and its effect on the parent wealth gradient, I decrease the sales cost  $m_s$  from 7.5% to 5.5%.

### 6.1.1 Decreasing Costs Decrease Role of Parental Wealth

Table 10 reports all results, while Figure 5 plots the homeownership rates of young households by policy change and whether the parent's wealth is above/below the median. First, increasing the LTV increases homeownership rates among the young by 6pp (12.5%) by increasing the size of mortgages and decreasing wealth at purchase. However, the parent wealth gradient also increases, and parents of owners are now

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<sup>16</sup>The policies are typically targeted to young households and first-time buyers. Keeping track of first-time buyers would require the introduction of another state variable.

3.36 times richer than parents of renters. Relaxing the LTV constraint increases homeownership among households whose parents' wealth was above (below) median wealth of parents by 12 (1) percentage points.

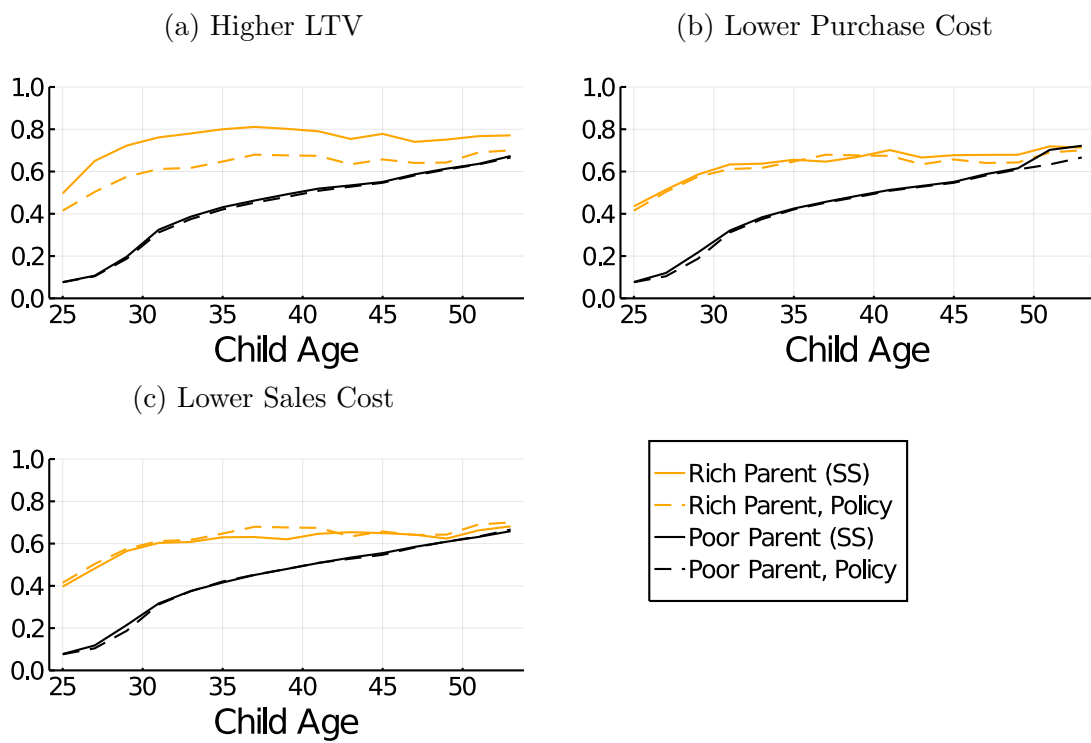
Policies that decrease purchasing costs  $m_b$  increase homeownership rates only by 1 percentage point. When purchase costs fall, owning is more attractive, and households require less wealth and lower mortgages. Unlike when the LTV constraint is relaxed, the increase in homeownership is equal among households with poor and wealthy parents. The parental wealth gradient only decreases slightly since the change in homeownership is small and almost independent of parent wealth

The last column of Table 10 reports the result when the sales cost is decreased, and we see that the homeownership rate actually decreases by 1 percentage point. While this result may seem counterintuitive, it can be explained by selection into ownership. Homeownership among children with wealthy parents decreases by 3 percentage points, while the homeownership among children with poor parents increases by 1 percentage point, leading to a net decline. This has a large impact on the parent wealth gradient, which now falls to 2.27 from 2.49. There are two mechanisms at play. First, housing is less risky and so parent wealth is less important, increasing ownership of households relatively more among households with poor parents. Second, since housing is more liquid, it is harder for households with wealthy parents to extract future transfers, decreasing the homeownership rate among children with wealthy parents (Figure 5c).

These experiments highlight two main results. First, parent wealth is an important determinant of homeownership, and having richer parents make households more likely to prefer owning to renting. Some common policies intended to increase homeownership rates change the role of parental wealth in housing outcomes. Relaxing credit constraints increase homeownership but also the role of parental wealth, since housing is more attractive to households with wealthier parents.

However, increasing liquidity, either through reducing purchase costs or sales

Figure 5: Effect of Policy Changes on Homeownership by Parent Wealth



Notes: Dashed lines indicate homeownership rates in the benchmark stationary distribution, while solid lines indicate homeownership rates after the policy change, after one generation.

Table 10: Evaluating the Impact of Policies on Parent Wealth Gradient

Moment	Benchmark	LTV 0.85	$m_b = 0.0$	$m_s = 0.055$
<i>Targeted Moments</i>				
Median Wealth (25-44)	23.47	17.66	25.83	19.21
Median Wealth (55-74)	206.78	204.28	208.94	206.78
Owner (25-44)	0.48	0.54	0.49	0.47
Rent / Income (25-44)	0.21	0.21	0.21	0.21
Age First Own (25-44)	32.89	31.92	33.03	32.95
LTV at Purchase (25-44)	0.66	0.68	0.65	0.66
Parent Transfers (55-74)	0.45	0.46	0.44	0.44
Transfers Purchase (25-44)	0.37	0.37	0.35	0.36
<i>By Parent Wealth</i>				
Owner (25-44), Top 50%	0.61	0.73	0.62	0.58
Owner (25-44), Bot 50%	0.34	0.35	0.35	0.35
Parent Wealth Gradient	2.49	3.36	2.51	2.27

*Notes:* All experiments start with the stationary distribution. I then find the decision rule after changing one policy parameter for young households (25-43) and simulate the model for 15 periods to trace out the impact of the policy on the next generation. Wealth is measured in 1000s of 2015 US dollars.

costs, decrease the role of parent wealth. Increasing liquidity can have negative effects on homeownership, as children of wealthy parents can no longer use it as a commitment device to receive larger transfers.

## 6.2 Which Households Prefer Adjustment Costs?

The previous section established that sales cost can increase the demand for owner-occupied housing for households with wealthy parents. I now show that some households with wealthy parents in fact prefer sales costs.

First, I take the benchmark stationary distribution. I then see how many child households prefer that they and future children in their own dynasty do not face sales costs ( $m_s = 0$ ). This hypothetical is equivalent to each child answering whether they would prefer that a benevolent agent pays the sales cost for all children in the dynasty forever. Parents always prefer their childrens' housing to be liquid. Table 11 breaks down the characteristics by whether the child supports the elimination of adjustment

Table 11: Household Observables and Support for Keeping Adjustment Cost

	Dislike Costs	Prefer Costs	All Children
Fraction of Children	0.89	0.11	1.00
Child Wealth	16.74	30.28	26.38
Parent Wealth	165.50	523.48	197.68
Child Ownership Rate	0.44	0.91	0.49
Transfer Rate	0.40	0.69	0.43
Transfer Size	6.48	20.40	8.00

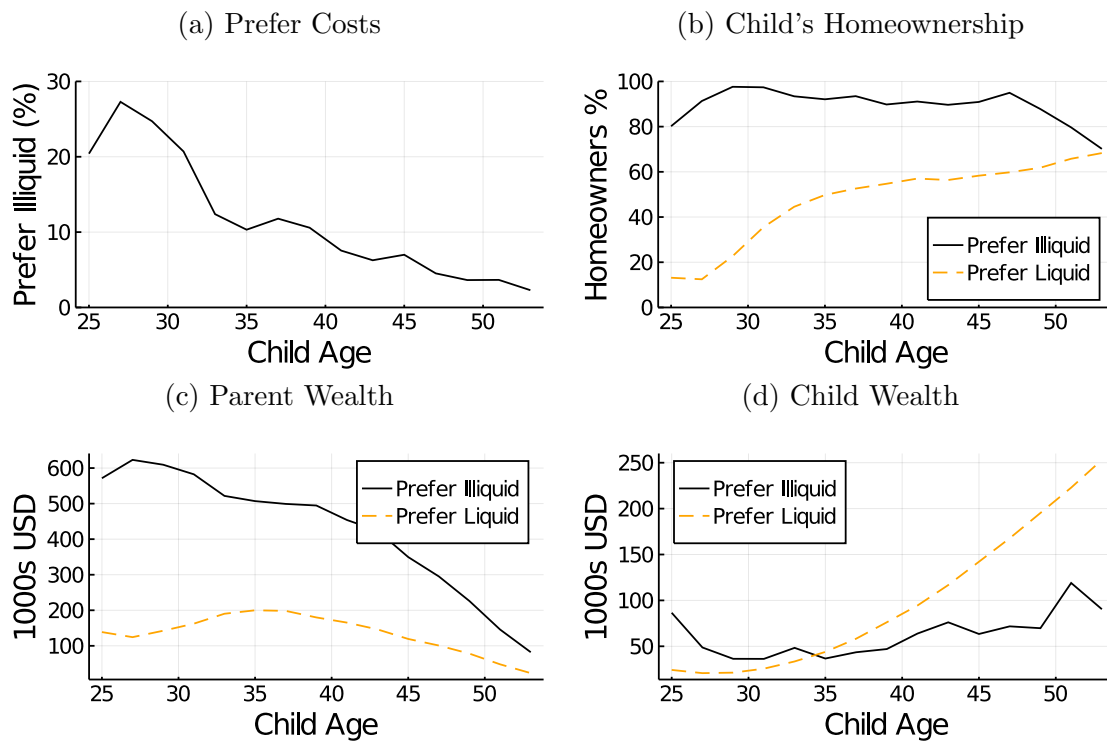
*Notes:* Only includes dynasties where the child household is aged 25-44. Wealth is measured in 1000s of 2015 US dollars.

costs. First, we can see that 11% of children prefer to keep sales costs. These children are twice as rich than those who do not. The most dramatic difference between the two groups is parent wealth: the parents of children who prefer cost are three times richer. Perhaps surprisingly, households who own are more likely to prefer sales costs on their own housing. Children who prefer costs are also more likely to receive transfers (69% vs 40%), and the transfers they receive are three times larger.

We can better understand why some households prefer illiquidity by studying the age patterns. To that end, Figure 6a plots the fraction of children who would prefer to keep housing illiquid. We see illiquidity preference is decreasing with age. As the child ages, parenthood is closer, and no parents prefer their child's housing to be illiquid. Next, Figure 6b plots the homeownership rate among households by their liquidity preference. To extract transfers through illiquid housing you must own and so almost all children who prefer sales costs are homeowners. Figure 6c plots parent wealth by the child's liquidity preference. To extract transfers, your parents must be sufficiently wealthy, and so households who prefer illiquidity have wealthier parents. Finally, Figure 6d plots the child's wealth by their liquidity preference. We see that households who prefer illiquidity are initially wealthier, but this relation flips at age 33. The relationship flips because households only benefit from their housing being subject to sales cost if they are homeowners, requiring some wealth. Then, to keep benefiting, they must be liquidity-constrained (homeowners with low wealth)



Figure 6: Liquidity Preference over Age



Notes: These figures break down the sample of households by whether they prefer illiquidity based on the experiment described in the text.

to induce transfers.

## 7 Conclusion

In this paper, I investigate the role of inter-vivos transfers from parents on their children’s housing decisions. I build and estimate a rich over-lapping generations life-cycle model with altruistic parents and housing. Through a counterfactual experiment without altruism (the standard life-cycle model) I find that transfers account for 15 percentage points (31%) of the homeownership rate. I show that policies intended to increase homeownership amplify the importance of parental wealth on housing outcomes. Finally, I study the role of housing illiquidity and parental transfers. I show that some households with wealthy parents prefer housing to be illiquid and that this results is not sensitive to preference parameters, and holds in both in the estimated quantitative model and in a stylized two-period model.

The first contribution of this paper is to study and quantify the role of parent inter-vivos transfers on the homeownership rate. Transfers increase homeownership through four distinct mechanisms: i) transfers decrease savings, decreasing ownership, ii) transfers relax borrowing constraints, increasing ownership, iii) transfers reduce the probability of costly downsizing, increasing ownership, and iv) households with wealthy parents invest more in illiquid housing, increasing ownership. My paper thus provides to a better understanding of the determinants of homeownership. More broadly speaking, my paper contributes to a growing literature that studies the role of family economics in shaping macroeconomic outcomes (e.g., [Doepke and Tertilt \(2016\)](#); [Daruich \(2018\)](#)).

The second contribution of the paper is to include a second illiquid asset into models of altruistic transfers. In models with altruistic parents, transfers flow to borrowing-constrained households since they have a large marginal utility of wealth ([Boar, 2018](#); [Barczyk and Kredler, 2018](#)). With a single asset, this implies that

households who receive transfers are poor. In the data, around 20% of all households are ‘wealthy hand-to-mouth’ and have positive wealth but no liquid wealth (Kaplan and Violante, 2014; Attanasio, Kovacs, and Moran, 2020). My paper bridges these two strands of the literature. First, I show that some households with wealthy parents choose to be liquidity-constrained to receive larger transfers. Second, I show that transfers flow to both borrowing-constrained and liquidity-constrained households.

I made several simplifying assumptions to keep the model tractable. Incorporating richer housing dynamics would allow one to study other interesting questions, such as the extent to which transfers support price increases. Transfers are important for ownership and so increase housing demand. This increased demand increases house prices, thus increasing the wealth of parents who own, possibly spurring larger transfers. An interesting extension of my theoretical work would be to formalize and study the notion that illiquidity may reduce the commitment problem in the family. Another extension is to introduce richer heterogeneity in the income process. In ongoing work, inspired by Ashman and Neumuller (2020) and Aliprantis et al. (2020), I use the model to quantify the contribution of parental transfers to the black-white homeownership gap.

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Table A1: Variable Definitions in the PSID

Variable	PSID code	Description	Note
<i>Transfer Related</i>			
Wheter Rcvd Transfer	ER67962	2/5years, gift/inherit \$10,000+	Changing def.
Transfer given	RT13V125	Loans/gifts to child in 2012	2013 prnt/chld file
Transfers	RT13V125	Amount given in 2012	2013 prnt/chld file
<i>Other</i>			
Behind on Mortgage	ER66062	Behind on mortgage payments	
Income	ER65349	Total Household Income	
Employment Status	ER66164	Working, Unemployed etc	
House Value	ER60031	Reported Market Value	
Dollars Rent	ER66090	Monthly Rent	
Family Weight	ER71570	Weight of family (household) unit	

*Notes:* This lists the main variables I use from the PSID and their name in the PSID codebook

## A Data Appendix

### A.1 Variable Definitions (PSID)

Table [A1](#) lists the most important variable definitions from the 2015 PSID wave.

### A.2 Event Study Details

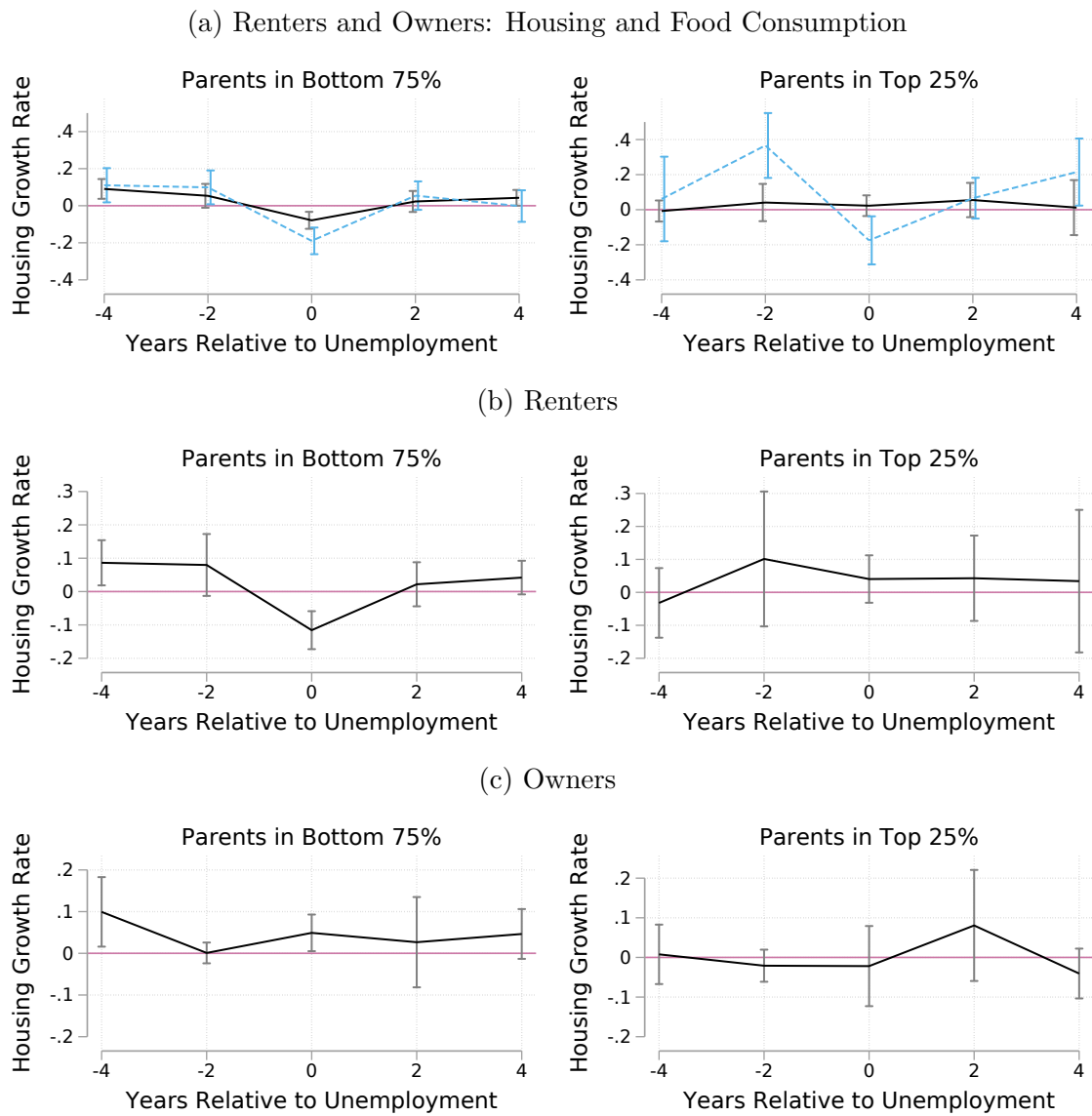
In the end, the sample consists of 2,200 non-missing log growth rates of housing consumption with 974 unique households. Means and standard errors are constructed using family weights.

In Figure [A1](#), I also report the results where I do the exercise separately for renters and owners. We see the same pattern as in the main exercise, but the results are insignificant at the 5% level for owners.

#### A.2.1 Event Study Controlling for Household Characteristics

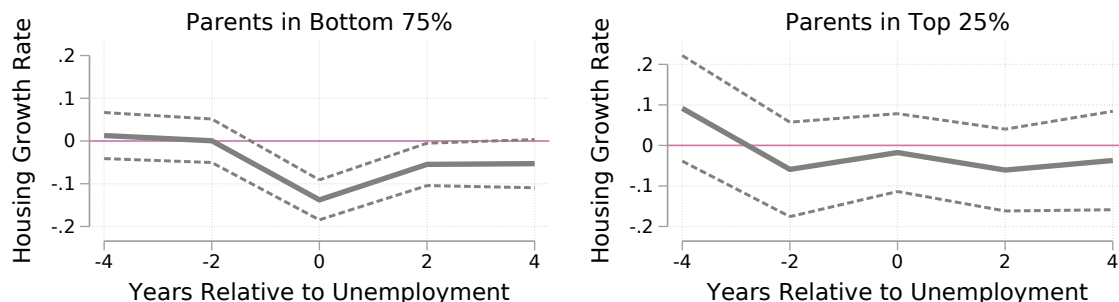
The main event study does not control for household characteristics for three reasons. First, this replicates the analysis in [Chetty and Szeidl \(2007\)](#). Second, this makes it straightforward to replicate the event study in the model. Third, for ease of interpretation. I now show that the results are robust to including household controls.

Figure A1: Event Study: Housing Consumption at Unemployment by Parental Wealth



Note: Solid lines are the means and bars denote the 95% confidence interval. Sample consists of households aged 20-65 with exactly one unemployment spell, and without changes in head and/or spouse in the four years before and after unemployment.

Figure A2: Event Study: Housing Consumption at Unemployment by Parental Wealth



*Notes:* Solid lines denote means and dashed lines denote the 95% confidence interval. Sample consists of households aged 25-45 with exactly one unemployment spell and without changes in head and/or spouse in the four years before and after unemployment. Controls variables include wealth and income quantiles, as well as dummies for age, year, state, marriage, race, and education.

I use the same estimation samples and variable definitions. I then run linear regressions where I interact years relative to unemployment with a dummy for having wealthy parents at unemployment. The set of controls include dummies for children's wealth and income quintiles, a full set of age, year, and state dummies, and dummy variables for college, high-school, and marriage. The regressions are weighted by family weights and plotted in figure A2. The main result is that households with wealthier parents do not significantly decrease housing consumption at unemployment. However, the hypothesis that the effect of unemployment is the same for both groups is rejected at the 95% confidence interval but not at the 90%.

## B Quantitative Model Details

### B.1 Calculation of Transfer Moments

The 2013 wave of the PSID includes a more detailed transfer module that I use to calculate transfer moments.<sup>17</sup> However, this question only includes information

<sup>17</sup>Another alternative would be use a question related to transfers and inheritances over \$10,000. While this question is available every year it is limited to transfers over \$10,000 and includes

regarding transfers in 2012. Among matched child-parent pairs in the 2013 PSID, where children are aged 25-44, 24% report a transfer from parents from kids with an average value (conditional on transfers) of \$3,900 in 2012. I biennialize by increasing the annual transfer rate by 1.5 and the transfer size by 1.33.<sup>18</sup>

## B.2 Complete set of Decision Problems

### B.2.1 Decision Problem Conditional on Choosing to Rent

The household problem, conditional on choosing to rent, has the following differences from the problem conditional on choosing to own: i) the choice of housing itself, ii) households pay rent  $qph$  instead of the market value  $ph$ , iii) households bring no housing wealth to next period, and iv) the borrowing constraint becomes a no-borrowing constraint. The kid's problem becomes

$$\begin{aligned} V_k(\mathbf{s}_k) &= \max_{c_k, b'_k, h'_k = h_r} u(c_k, h'_k) + \beta \mathbb{E}[V_k(\mathbf{s}'_k)] \\ \text{s.t. } &b'_k = x_k + t_p + w_k - c_k - qph'_k - adj(h_k, h'_k) \\ &x'_k = b'_k(1 + r(b'_k)) \\ &b_k \geq 0.0, \end{aligned}$$

and the parent's problem is changed in the same way.

### B.2.2 Decision Problems at Age 53 and 83

When the kid is 53 the following changes: i) the continuation value is given by the parent's value function, ii) the expectation is over initial wealth of the new kids wealth and productivity instead of the 'old' kid's productivity and iii) his next period

---

inheritance.

<sup>18</sup>This assumption is valid when half of transferring households (12% of the sample) would not transfer in 2013, that half of transferring households (12% of the sample) would transfer the same amount in 2013, and that 12% of the total sample would transfer \$3,900 only in 2013. This yields a two-year transfer rate of 36% and a two-year transfer size of \$5,200.

wealth includes bequests. For a kid aged 53, conditional on choosing to rent, the problem becomes:

$$\begin{aligned}
V_k(\mathbf{s}_k; a_k = 53) &= \max_{c_k, b'_k, h'_k = h_r} u(c_k, h'_k) + \beta \mathbb{E}_{x_k, 25, v_k, 25} [V_p(\mathbf{s}'_{p, 25}; a_k = 25)] \\
\text{s.t. } b'_k &= x_k + t_p + w_k - c_k - \kappa p h'_k - \text{adj}(h_k, h'_k) \\
x'_{p, 25} &= b'_{k, 53}(1 + r(b'_k)) + x'_{p, 53} \\
b_k &\geq 0.0,
\end{aligned}$$

where  $k, 53$  and  $p, 53$  denotes the variables associated with old kid (new parent) and the old parent (dead parent). The dying parent's problem has the following changes: i) the continuation value is given by the new parent's value function  $\eta V_p(\mathbf{s}'_p; a_k = 25)$ , ii) the expectation is over initial wealth of the new kids wealth and productivity instead of the 'old' kid's productivity and iii) the new parent's next period wealth includes bequests, and is otherwise changed in the same way as the kids.

### B.3 Decision Problems with Commitment

The decision problem with commitment changes significantly from the no-commitment formulation. The main change is that a single planner maximizes utility, placing weight  $\theta$  on the child's utility. To illustrate, I show the decision problem of the planner, conditional on both households entering as renters and renting in the current period:

$$\begin{aligned}
V_f(\mathbf{s}_f) &= \max_{c_k, c_p, h'_k = h'_p = h_r, b'_f} (1 - \theta)u(c_p, h'_p) + [(1 - \theta)\eta + \theta] u(c_k, h'_k) + \\
&\quad \beta \mathbb{E} V_f(\mathbf{s}'_f), \\
\text{s.t. } b'_f &= x_f + w_k + w_p - c_k - c_p - qp(h'_k + h'_p), \\
x'_f &= b'_f(1 + r(b'_f)), \\
b'_f &\geq 0, c_k \geq 0, c_p \geq 0.
\end{aligned}$$

When the kid is aged 53, and it's the final period for the current period, the continuation value changes. The family planner discounts the expected future (namely initial conditions of the kid), and places weight  $(\theta + (1 - \theta)\eta)\beta$  on the future. I assume that the Pareto weight is held constant throughout the dynasty.

## C Robustness Exercises

### C.1 Parental Income Risk

In the benchmark model, households face no income risk after age 55. I now show that the results are robust to this assumption. To do so, I perform the following modifications. First, the labor income of parents is now assumed to be the product of a transitory productivity shock:

$$w_{i,a} = l_a \nu_{i,a} \quad \forall a \in \{55, 57, \dots, 83\}.$$

The process is calibrated as follows. First, I keep households aged 55-85. I subtract healthcare expenditures from household income as healthcare expenditure risk is a significant risk for older households (Hubbard, Skinner, and Zeldes, 1995). Next, I divide the sample into year-age specific income tertiles, find the median income within each age, and average over years to find the parent productivity shifter  $\nu_{i,a}$ . The results, fitted to a cubic trend, are plotted in Figure A3a. The shock is transitory, and the PDF  $\Pi(\nu)$  takes the value 1/3 for any outcome.

The results are reported in Table A2. We see that the introduction of income risk for the old has small effects and leaves the main findings intact. Mainly, it increases the wealth of parents by \$20,000. Second, we see that income risk slightly decreases young households' homeownership rates with altruism. Nonetheless, parental transfers still account for 13pp (28%), down from 15pp (31%), when parents face transitory income risk.

## C.2 Aggregate and/or Idiosyncratic Price Risk

In the benchmark model house prices are certain. I now show that the results are robust to introducing price risk in the manner of [Corbae and Quintin \(2015\)](#). This introduces a new state variable  $z$  that denotes the aggregate price level, and the house price is either low, normal, or high depending on the value of  $z$ . The transition matrix for  $z$  follows

$$\Pi(z'|z) = \begin{bmatrix} 0.90 & 0.10 & 0.00 \\ 0.02 & 0.96 & 0.02 \\ 0.00 & 0.25 & 0.75 \end{bmatrix}. \quad (15)$$

The aggregate house prices are set to be  $(p_l, p_n, p_h) = (0.7, 1.0, 1.3)p_{bench}$ , where  $p_{bench}$  is set to be the estimated value from Table 4. I then solve the model with price uncertainty, but simulate the economy when house prices are at the normal level.

The results are reported in Table A2. We see that the introduction of aggregate price uncertainty increases savings for both young and old households, with and without altruism. It also induces households to buy housing slightly later, with lower LTV's and higher wealth at purchase. However, the main quantitative finding remains: Parental transfers now account for 15pp (31%) of the homeownership rate.

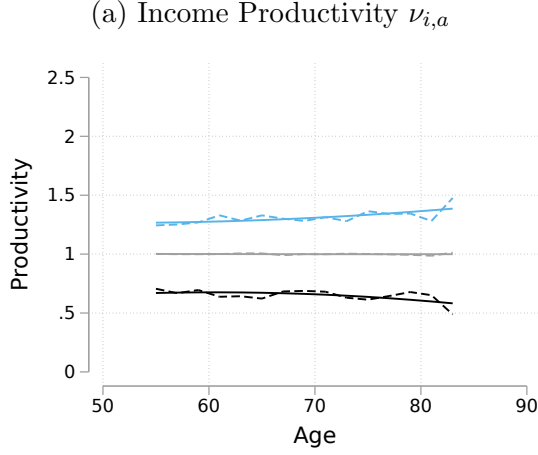
## D Numerical Solution Algorithm

### D.1 Numerical Details

I now briefly discuss some details in the numerical solution of the model.

*Solving Decisions Problems:* Due to the non-convex nature of the decision problems, occasionally binding constraints and discrete nature of housing I use grid search as a slow, but robust approximate solution algorithm. For a detailed discussion of these issues see [Chu \(2020\)](#) and [Barczyk and Kredler \(2020\)](#). The value and policy

Figure A3: Calibration of Robustness Exercises



Notes: Dashed lines are the empirical age-medians and solid lines are fitted second order polynomials that are used in the model calibration. The lines denote the value of  $\nu_{i,a}$  in the first tertile (black), middle (gray), and top (blue) by age.

Table A2: Results Robust to Old-Age Risk and Uncertain House Prices

Moment	Data	Benchmark		Old Risk		Price Risk	
		$\eta > 0$	$\eta = 0$	$\eta > 0$	$\eta = 0$	$\eta > 0$	$\eta = 0$
<i>Targeted Moments</i>							
Median Wealth (25-44)	23.54	23.65	42.10	22.75	42.36	33.68	55.74
Median Wealth (55-74)	206.67	206.86	208.64	222.66	227.48	212.77	221.08
Owner (25-44)	0.49	0.48	0.33	0.46	0.33	0.47	0.32
Rent / Income (25-44)	0.23	0.21	0.20	0.21	0.20	0.21	0.20
Age First Own (25-44)	32.53	32.85	37.52	32.89	36.94	32.50	36.86
LTV at Purchase (25-44)	0.67	0.65	0.46	0.65	0.46	0.58	0.44
Parent Transfers (55-74)	0.36	0.45	0.00	0.44	0.00	0.44	0.00
Transfers Around Purchase (25-44)	0.39	0.36	0.00	0.39	0.00	0.26	0.00
<i>Non-Targeted Moments</i>							
Hand to Mouth (25-44)		0.42	0.23	0.40	0.23	0.40	0.21
Wealth at Purchase (25-44)	33.36	45.69	74.29	47.73	74.70	57.51	79.96
Owner (25-73)		0.60	0.55	0.59	0.55	0.58	0.55
Parent Wealth Gradient (med)	2.53	2.53	1.26	2.13	1.19	2.65	1.21



functions are linearly interpolated in kid and parent wealth/savings, conditional on the discrete choices.

*Interpolation Details:* The policy function for consumption and savings are non-continuous in wealth which makes interpolation unattractive. However, the policy functions, conditional on choosing a specific house quality are smoother, and do not display large jumps in the quantitative model. When I interpolate the policy functions of the parent when solving the kid's problem, and vice versa, I therefore do the following. I first find the interpolated policies for each housing choice, and then find the probability that the parent/child makes this choice. The probability is the interpolated policy discrete choice function, which is binary  $\{0, 1\}$ , while the interpolated policy (with flat extrapolation) is continuous between  $[0, 1]$ .

Next, one must be careful with the interpolated policy functions around the borrowing constraints. If the interpolated consumption choice of the kid  $c_k$  leads to a net bond position  $b_k$  that violates the borrowing constraint I set  $b_k$  equal to the constraint and reduce  $c_k$  to make it hold.

*Reflecting Boundary:* If the accidental bequest is large and the young household is saving, then it is likely that the young household will escape any grid one enforces in the numerical calculation. For that reason the top grid point is assumed to reflecting. This is never the optimal choice, but since a) the decision problems are non-convex and b) solved using discrete grid search these points must also be evaluated.

*Simulation of Households:* I simulate  $N=10,000$  dynasties. The initial states of each dynasty (initial kid and initial old)  $(x_p, h_p, x_k, v_k, h_k, a_k = 25)$  is drawn from a five-dimensional joint uniform distribution. I then simulate all dynasties for 5 generations, since the distribution, as measured by average homeownership, wealth, and, productivity levels stabilizes after four generations. I discard observations from the first four kids and parents in each dynasty.

*Computational Packages:* The program is written in Julia v1.5.0. I rely on the `interpolations.jl` v0.12.10 package for numerical interpolation routines and

Optim.jl v0.22.0 for the Nelder-Mead algorithm used in the structural estimation.

## E Estimation

### E.1 Heuristic Identification

I now provide a brief argument for why at least one moment is informative for each parameter. We know that wealth accumulation is strongly affected by the discount factor  $\beta$ . The transfer rate identifies the strength of altruism  $\eta$  since higher altruism increases transfers. The age of first purchase decreases when the preference shifter  $\chi$  for owning increases. With lower mortgage rates, households are willing to take on higher loans, and so the LTV ratio at purchase identifies the mortgage premium  $r_m^k$ . When minimum owner-occupied house sizes increase, households have higher income and wealth before they buy, so the average rent-to-income ratio decreases. Finally, the house price is pinned down by the homeownership rate, as higher prices delay ownership. The model is highly non-linear, and all parameters influence at least one moment. See Section E.3 for graphical plots.

### E.2 Estimation Algorithm

There are  $P = 6$  parameters that are estimated internally. Define a  $P$ -dimensional hypercube of uniform distributions. Then I draw  $N_s = 40,000$  quasi-random candidate parameter vectors from this hypercube generated by Sobol sequencing. I solve the decision problems, find the stationary distribution, and find the  $M = 8$  moments for each candidate parameter vector. After solving the model under the  $N_s$  candidate vectors, I find the one that minimizes the distance (equation 13). I use this as the starting point for a local optimization, using a Nelder-Mead algorithm. This final step improves the model fit slightly, and the objective function decreases from 0.033 to 0.029.

### E.3 Identification

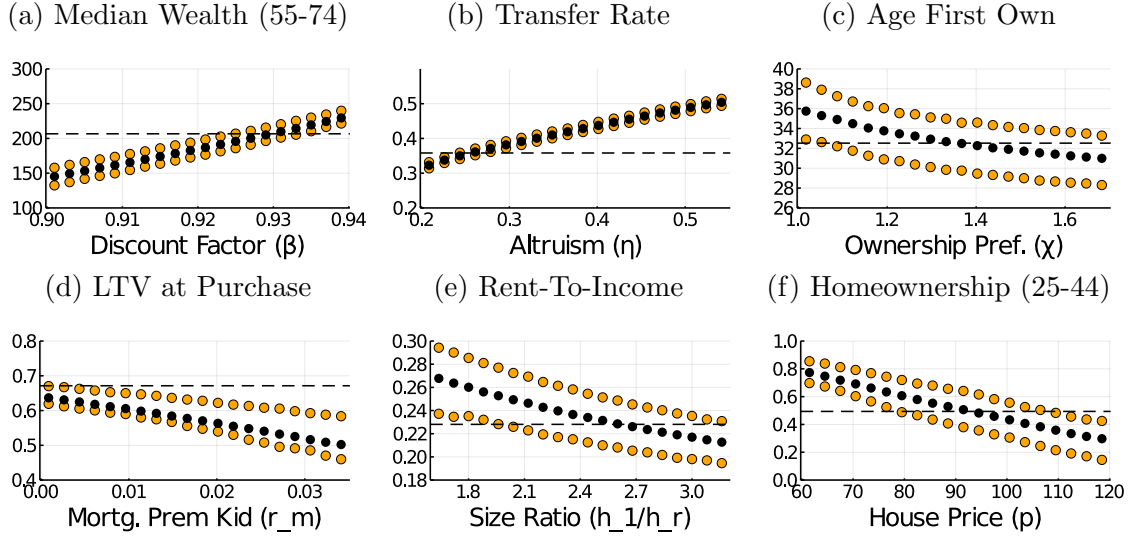
The global optimization procedure lends itself to verifying identification. After solving the model for  $N_s$  parameter vectors and finding the simulated moments, one can do the following procedure for all moments and parameters. First, pick a parameter, say  $\beta$ , and divide it into 20 quantiles. Within each quantile of  $\beta$ , I find the 25th, 50th, and 75th percentiles for a moment, say the transfer rate. The remaining  $P - 1$  parameters are uniformly distributed within each quantile of  $\beta$ . We can then show how the transfer rate depends on  $\beta$ , by plotting the percentiles within each quantile of  $\beta$ . One can think of this procedure as taking the (numerical) partial derivative of the transfer rate with respect to  $\beta$ , keeping the distribution of other parameters constant. We can then repeat this process for every parameter and every moment.

A moment is informative for a parameter if, as we move across quantiles keeping the distribution of other parameters constant, the moment percentiles move. The steeper the slope, the more informative the moment is for the parameter. A parameter is relatively more important when the distance between the 25th- and 75th-moment percentiles is smaller.

Figure A4 shows that each parameter affects at least one moment. For example, we can see that median wealth at age 55-74 is strongly affected by the discount factor  $\beta$  in Figure A4a. In Figure A4b, we see that the transfer rate is very informative about the altruism intensity parameter  $\eta$ . We can see that ownership preference shifter  $\chi$  is pinned down by the age of first-time homeowners. However, other moments also have a significant impact on this moment. For example, house prices are also important: everybody would own if housing were free, or few would own when prices are high. The remaining figures are interpreted in similar ways.

Finally, the main objective of this paper is to study the role of altruism on housing demand, and it turns out that the altruism parameter  $\eta$  affects all moments (Figure A5). First, median wealth is initially strongly decreasing altruism as households decrease savings to receive more transfers. Altruism also slightly decreases the wealth of

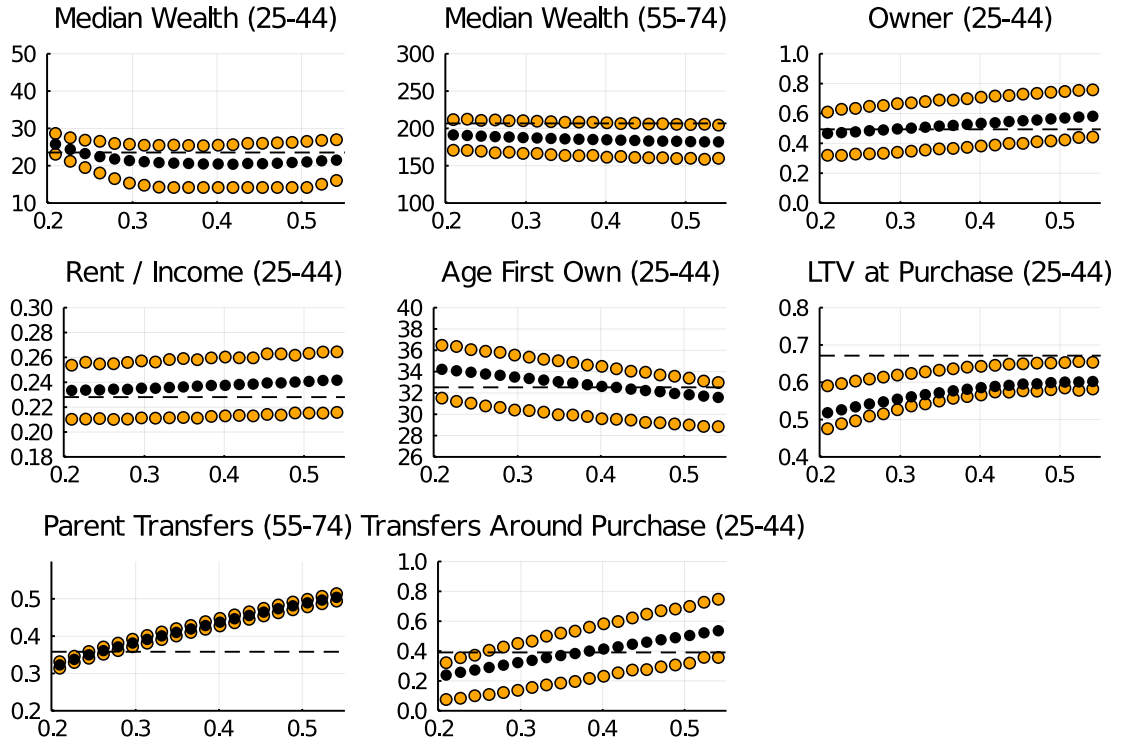
Figure A4: Identification of parameters



Notes: Dashed line is the moment's empirical value. Yellow and black dots denote the 25th, 50th, and 75th percentile of the empirical moment for each quantile of the parameter, keeping the distribution of other parameters constant.

older households: households save less when young and parents give more resources to the kid. Homeownership rates are also increasing in altruism: altruism decreases the downsides and increases the benefits of homeownership. Altruism slightly increases the rent-to-income ratio, but this is driven by selection into homeownership. With higher altruism, the age at which households first own is strongly decreasing: households are willing to buy housing sooner, and they receive larger transfers that push them into owning. We also see that the LTV at purchase is strongly increasing in altruism: Households are willing to take on more leverage. Finally, both the overall transfer rate and the transfers around home purchases are also increasing in transfers. However, altruism does not uniquely pin down transfers around purchase since this moment is also affected by other parameters that affect the decision to buy or rent. I include identification plots for all estimated parameters in the online appendix

Figure A5: Identification of Altruism  $\eta$



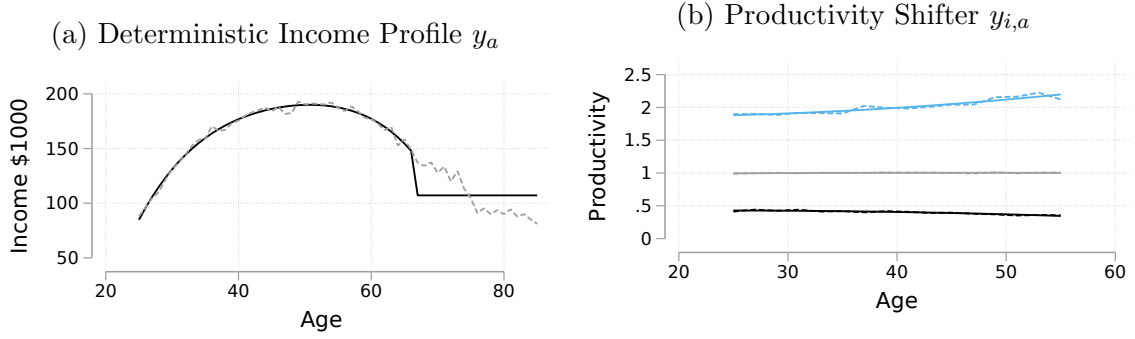
*Notes:* Dashed line is the moment's empirical value. Yellow and black dots denote the 25th, 50th, and 75th percentile of the empirical moment for each quantile of the parameter, keeping the distribution of other parameters constant. The x-axis denotes values of  $\eta$  and the y-axis the moment.

## E.4 Mapping Lee et al. (2018) to the Model

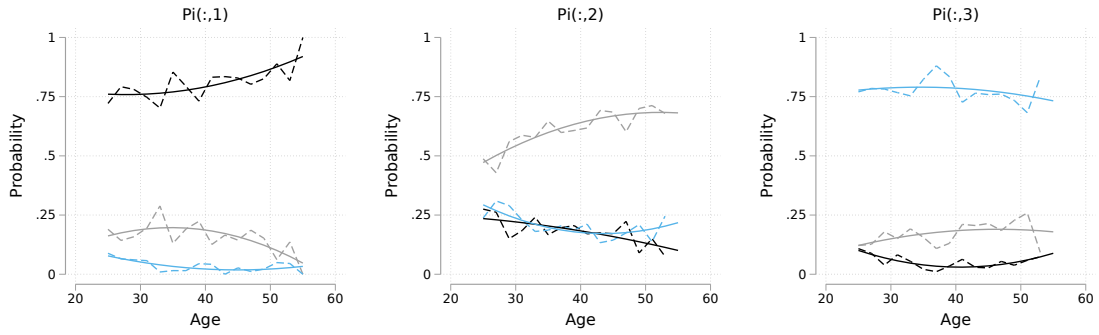
Lee et al. (2018) run regressions using the PSID that find the effect of receiving transfers on the probability of purchase. The sample is limited to households between the ages 25-44, who are not owners in  $t-2$  but are observed in  $t$ . All control variables are those observed in year  $t-2$  except the transfer indicator. Some control variables (race, regional characteristics, year, marital status, parent's education) do not exist in the model. I follow the specification as closely as possible by controlling for child age (in five-year bins), wealth and income (in logs) for child and parent and parent's housing status. I include dummies for the current productivity level of the child to control for 'education'.

## F Supplementary Figures and Tables

Figure A6: Calibrated Income Process

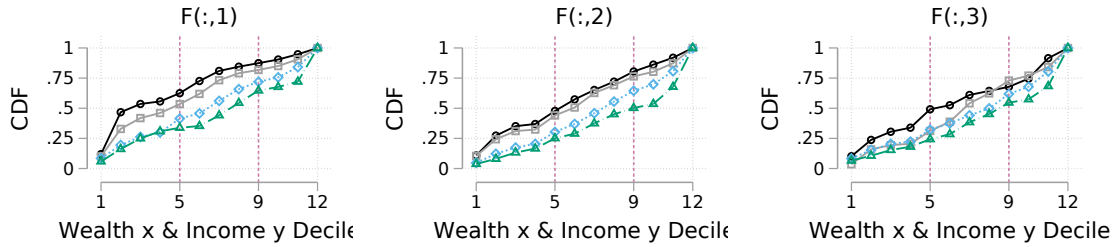


(c) Age-State Dependent Transition Probabilities  $\Pi(y_{i,a+2}|y_{i,a})$



Notes: Dashed lines are the empirical age-means and solid lines are fitted third order polynomials that are used in the model calibration. The bottom row plots the probability of moving to the bottom tertile (black), middle (gray), and top (blue) income tertiles by the income tertile the kid is currently in, by age.

(d) Initial Distribution  $F(x_{53}, y_{53})$  by wealth  $x_{53}$  and productivity  $y_{53}$



—○— 1st Quartile ( $x < 19$ ) —□— 2nd Quartile ( $x < 134$ ) —◇— 3rd Quartile ( $x < 442$ ) —△— 4th Quartile ( $x < \text{Inf.}$ )

Notes: The vertical lines denote the first, second, and third income shifters for the kids. Within each interval each point denotes a wealth quartile.

Table A3: Effects of Risk and Borrowing Constraints on Homeownership

Moment	Benchmark		No LTV		Liquid Housing		No Income Risk	
	Altr	No Altr	Altr	No Altr	Altr	No Altr	Altr	No Altr
<i>Targeted Moments</i>								
Median Wealth (25-44)	23.47	42.13	12.09	39.71	17.50	39.18	29.03	29.03
Median Wealth (55-74)	206.78	208.20	182.58	202.51	194.68	194.02	194.03	179.64
Owner (25-44)	0.48	0.33	0.55	0.51	0.51	0.45	0.62	0.61
Rent / Income (25-44)	0.21	0.20	0.22	0.18	0.23	0.22	0.13	0.13
Age First Own (25-44)	32.89	37.52	32.60	32.19	31.04	33.28	32.53	32.73
LTV at Purchase (25-44)	0.66	0.46	0.71	0.65	0.70	0.63	0.74	0.74
Parent Transfers (55-74)	0.45	0.00	0.44	0.00	0.42	0.00	0.33	0.00
Transfers Around Purchase (25-44)	0.37	0.00	0.48	0.00	0.43	0.00	0.22	0.00
<i>Non-Targeted Moments</i>								
Parent Wealth Gradient (med)	2.49	1.25	4.26	0.79	1.62	1.44	1.03	1.03
Owner (25-73)	0.60	0.55	0.68	0.73	0.65	0.67	0.85	0.85
Wealth at Purchase (25-44)	46.85	74.31	41.51	52.11	40.47	48.31	43.08	40.84
Mortgage (25-44)	123.93	60.25	146.85	125.28	126.81	90.93	186.84	186.70

*Notes:* Results using the *benchmark* model (5), with a higher *LTV* of 1.0 instead of 0.8, liquid housing ( $m_s = m_b = 0$ ), and with income certainty ( $v_{i,a} = 1.0$ ). All other parameters and prices are constant. To avoid numerical issues with extrapolation when the *LTV* is set to be 1.0, the numerical algorithm sets  $LTV = 1.0 + \varepsilon$ .



Table A4: Descriptive Statistics (Median), Households Aged 20-44

Demographics	All		Single		Married		Renter		Owner	
Receiver	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Transfer	0.00	1.53	0.00	1.02	0.00	2.03	0.00	1.53	0.00	1.22
Wealth	10.17	15.26	3.05	6.10	34.59	47.82	1.63	4.07	65.25	81.39
Wealth Parent	96.86	339.31	64.10	289.97	140.41	404.94	37.64	265.55	222.82	503.63
Income	56.51	56.64	35.06	35.82	84.55	81.90	36.51	40.70	91.60	81.50
College	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00
White	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Owner	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00
Owner t-2	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00
Age	33.00	32.00	32.00	29.00	36.00	35.00	31.00	30.00	37.00	36.00
Observations	2404	656	1094	304	1310	352	1453	400	951	256
Age	20-24		25-29		30-34		35-39		40-44	
Receiver	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Transfer	0.00	1.22	0.00	1.53	0.00	2.03	0.00	1.53	0.00	1.02
Wealth	4.60	6.00	5.09	19.33	12.31	31.24	22.38	23.91	44.16	53.92
Wealth Parent	43.79	279.79	81.39	351.01	100.73	396.80	127.18	336.77	145.70	404.94
Income	37.64	39.79	49.14	55.96	61.59	71.98	78.85	70.30	87.60	69.59
College	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
White	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Owner	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00
Owner t-2	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00
Age	26.00	26.00	30.00	30.00	34.00	34.00	38.00	39.00	43.00	43.00
Observations	572	195	566	163	562	127	384	99	320	72
Wealth Quintile	Quintile 1		Quintile 2		Quintile 3		Quintile 4		Quintile 5	
Receiver	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Transfer	0.00	1.02	0.00	1.22	0.00	1.02	0.00	1.53	0.00	1.53
Wealth	-31.95	-30.52	0.00	-0.51	7.62	7.83	36.76	37.64	186.19	185.17
Wealth Parent	67.66	234.01	18.62	138.88	46.75	234.11	155.67	422.23	345.93	719.32
Income	49.55	38.95	26.17	30.52	39.68	38.15	69.72	65.22	114.47	100.73
College	0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00
White	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Owner	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00	1.00
Owner t-2	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00	1.00
Age	32.00	30.00	32.00	32.00	32.00	29.00	33.00	32.00	38.00	34.00
Observations	459	148	478	91	518	121	471	137	478	159

*Notes:* Data from the PSID Transfer, Individual, and Family modules. Weighted using family weights. Wealth, transfer and income is measured in 1000s of 2016 US dollars.

## G Two-Period Model of Altruism and Housing

This section develops and solves a stylized two-period model with children (“kid”) and parents. The child and parent interact without commitment and non-cooperatively. The model highlights that housing adjustment costs, which make housing illiquid, increases parental transfers. Poor children with wealthy parents, if given the choice, would prefer adjustment costs on their housing expenditures. Finally, I introduce a commitment technology and show that adjustment costs have ambiguous effects on total welfare.

### G.1 Model Environment

The model simplifies the two-period model in [Altonji et al. \(1997\)](#) by ignoring income uncertainty and extends it by including illiquid housing in a similar vein to [Chetty and Szeidl \(2007\)](#).

*Population:* There are two households, kids  $k$  and parents  $p$ . Both are alive at the same time and live for two periods.

*Preferences:* Kid’s preferences are defined over first- and second-period consumption of goods  $c$  and housing services  $h$ , and are assumed to be time-separable and without discounting:

$$u(c_k, h_k) + u(c'_k, h'_k). \quad (16)$$

The parent household derives utility over their own goods consumption in both periods but do not consume housing services. They also value their kid’s utility weighted by the altruism parameter  $\eta > 0$

$$\mu(c_p) + \mu(c'_p) + \eta [u(c_k, h_k) + u(c'_k, h'_k)], \quad (17)$$

where  $\mu(c_p)$  maps parent’s consumption into utils. Finally, I assume that the kid’s

utility function satisfies the following conditions:<sup>19</sup>

A1: Limits for both goods: The first derivative of  $u$  approaches i) zero at infinity in both arguments (i.e.,  $\lim_{c \rightarrow \infty} u(c, h) = \lim_{h \rightarrow \infty} u(c, h) = 0$ ), and ii) children never prefer to have 0 goods consumption (i.e.,  $\lim_{c \rightarrow 0} u(c, h) = \inf_{c', h'}(c', h') \forall h$ )

A2: The marginal utility of consumption is non-decreasing in housing consumption ( $u_{ch} \geq 0$ )

*Endowment:* Both households are endowed with an initial level of financial wealth  $x_k, x_p$ . Households have no income.

*Financial Assets:* Households can save in an interest-free bond ('pillow technology'). There is no borrowing.

*Consumption and Housing:* Both households consume non-negative amounts of goods  $c$  in both periods, while kids can consume any non-negative amount of housing services  $h$ . Goods and housing both have a unit cost of unity. Housing is illiquid: the kid can adjust his housing choice in the second period  $h'_k$ , but doing so entails adjustment costs  $\kappa \geq 0$  proportional to the quantity of housing chosen in the first period  $h_k$ .

*Transfers:* In both periods the parent can transfer a non-negative amount  $t_p, t'_p \in \mathbb{R}_+^2$  to the child.

*No Commitment and Non-Cooperative:* Households cannot commit and act non-cooperatively.

*Timing:* Each period is divided into two stages. In the first stage, the parent chooses his goods consumption and transfers. The kid then receives the transfer and chooses his consumption allocation. Both households die at the end of period two.

---

<sup>19</sup>These assumptions allow for a wide class of utility functions including constant elasticity of substitution (when the elasticity of substitution is weakly less than 1) and separable power utility with a risk aversion of good consumption higher than 1. Note that assumption A2 in combination with A1 precludes cases where goods and housing are perfect substitutes. Chetty and Szeidl (2007) contains a detailed discussion of the role of these assumption.

## G.2 Solving the Game

I solve the game by backwards induction. The model cannot be solved in closed form, but the solution is unique. I solve the model numerically, and report results using Cobb-Douglas preferences with a risk aversion parameter  $\gamma = 1.2$ , a housing-expenditure share  $\chi$  of 0.4, and a altruism parameter  $\eta$  of 0.3.

### G.2.1 Final Period: Kid

I now show how adjustment costs induce kinks in the kid's marginal value of wealth. In the final period, his disposable wealth is  $x'_k + t'_p$ , which he allocates between housing and consumption.<sup>20</sup> The kid's problem can be broken down by whether he adjusts his consumption of housing ('moves') or not. If the kid does not move, they spend all their disposable wealth net of housing on consumption :

$$V_{k'}^0(x'_k + t'_p, h_k) = u(x'_k + t'_p - h_k, h_k). \quad (18)$$

If the kid moves, he can equate the marginal benefits of consumption and housing:

$$V_{k'}^m(x'_k + t'_p, h_k) = \max_{h'_k \geq 0} u(x'_k + t'_p - h'_k - \kappa h_k, h'_k). \quad (19)$$

Both value functions are differentiable in both arguments. Kids are only willing to pay the adjustment cost  $\kappa$  when the non-move allocation is far from the optimal within-period allocation:

$$V'_k(x'_k + t'_p, h_k) = \max \{V_{k'}^m(x'_k + t'_p, h_k), V_{k'}^0(x'_k + t'_p, h_k)\}. \quad (20)$$

Under assumptions A1 and A2 households follow a strategy where they move only when disposable wealth is outside of two thresholds  $s, S$ . The intuition for the

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<sup>20</sup>The solution to the second-period problem of the kid is very similar to the one in [Chetty and Szeidl \(2007\)](#). In this section I discuss pertinent effects of adjustment costs on the strategic transfer game between parents and kids.

thresholds is straightforward. If the kid enters the period with a large house, he must reduce good consumption dramatically to remain in the house. As wealth  $x'_k$  increases to  $x'_k + t'_p = s$ , it becomes optimal to suffer some misallocation but save the adjustment cost and consume more. As wealth rises above  $S$ , it becomes optimal pay the adjustment cost to move to a better house. A similar mechanism creates the upper limit of the no-move region  $S$ .<sup>21</sup>

The no-move region  $(s, S)$  creates kinks in the kid's value functions. Outside of  $(s, S)$  the slope of the value function is given by the envelope theorem applied to  $V_{k'}^m(\cdot)$ , where households optimally balance housing and consumption. Within  $(s, S)$  the child stays in the house, and the slope is given by the envelope theorem applied to  $V_{k'}^0(\cdot)$ . Once  $x'_k + t'_p > s$  households do not equate marginal benefits of housing and consumption, and so the slope is steeper as it moves us closer to within-period optimality. The value function is plotted in Figure A7a, which also shows the cases with free adjustment and infinite adjustment costs. The slope (Figure A7b) jumps up when wealth crosses either threshold from the left. Inside  $(s, S)$  the slope is initially higher than without costs but becomes lower at the point where not-moving would be optimal without adjustment costs. As we will see in the parent's problem, the optimal transfer is closely related to the kid's marginal value of wealth.

### G.2.2 Final Period: Parent

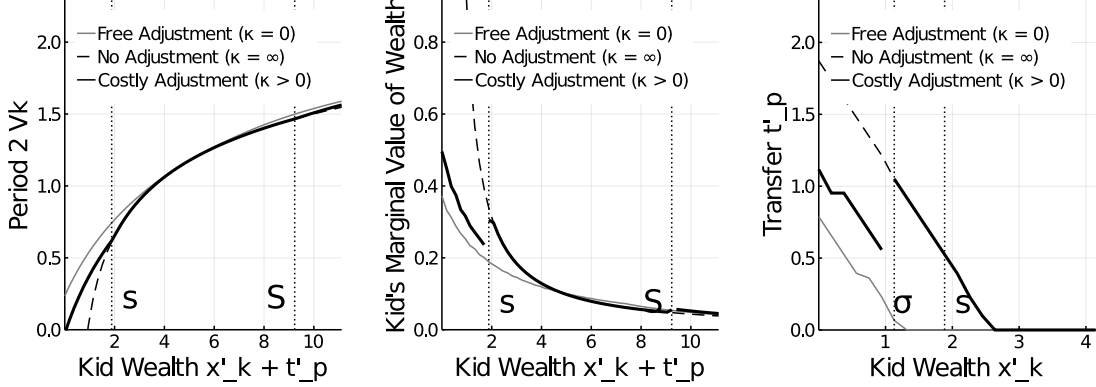
I now show how the adjustment costs affect the parent's transfer behavior in the final period. The parent must decide how much to transfer to his kid and consumes the rest. His states are his own wealth, his kid's wealth, and the kid's housing state.

---

<sup>21</sup>While not the main focus of this paper, it is worth noting the link adjustment costs have with the literature on low-liquidity households with large marginal propensities to consume, such as the 'wealthy hand-to-mouth' in Kaplan and Violante (2014). Household with a large house  $h_k$  can only consume  $x'_k + t'_p$ . Any change in disposable wealth (for example through transfer or income shocks) maps one-to-one into consumption unless the change is sufficiently large to make the household willing to pay the adjustment cost.

Figure A7: Adjustment Costs and Second Period Outcomes

(a) Period 2 Value Function (b) Period 2 Slope in Wealth (c) Period 2 transfer  $t'_p$



Notes: Vertical lines denoted  $s, S$  indicate the thresholds for staying in the current sized house, while  $\sigma$  denotes the level of wealth the kid must bring into the period to stay in his house, taking into accounts the gifts he then receives.

The parent's problem is

$$V_{p'}(x'_p, x'_k, h_k) = \max_{t'_p \geq 0} \{ \mu(x'_p - t'_p) + \eta V'_{k'}(x'_k + t'_p, h_k) \}, \quad (21)$$

where I have inserted  $V_{k'}(x'_k + t'_p, h_k)$  for  $u(c'^*_k(x'_k + t'_p, h_k), h'^*_k(x'_k + t'_p, h_k))$ . From the previous section we have established that  $V'_k$  is only differentiable when there are no adjustment costs ( $\kappa = 0$ ) or there is no adjustment at all ( $\kappa = \infty$ ), so the optimization problem is generally not twice differentiable.

Transfers are pinned down by the slope of the kid's value function when the value function is differentiable:

$$u'(x'_p - t'_p) = \eta V'_{k'}(x'_k + t'_p, h_k) + \lambda, \quad (22)$$

where  $\lambda$  is the multiplier on the non-negativity of the transfer constraint. From (22) we see that transfers are weakly decreasing in kid's wealth when the problem is smooth.

Since the kid's marginal utility jumps at the kinks (Figure A7b), the second-

period transfer policy  $t'_p$  also jumps. Figure A7c plots the policy for some  $(x'_p, h_k)$ . Transfers jump at a level  $x'_k = \sigma$  where the transfer changes the kid's extensive choice on moving.<sup>22</sup> Just below  $\sigma$ , the parent does not give enough to keep the kid in his house. At  $\sigma$ , the gift jumps to a level that is at least big enough to keep the kid in his house. Transfers are non-decreasing in kid's second period wealth with illiquid housing: Moving from  $x'_k = \sigma - \epsilon$  to  $x'_k = \sigma + \epsilon$  ensures the kid will obtain a much larger transfer.

### G.2.3 First Period: Kid

I now show that adjustment costs increase the kid's incentive to undersave by spending more on illiquid housing. The kid's states in the first period are disposable wealth and the parent's savings decision. He takes into account how his choices will affect the second-period transfer:<sup>23</sup>

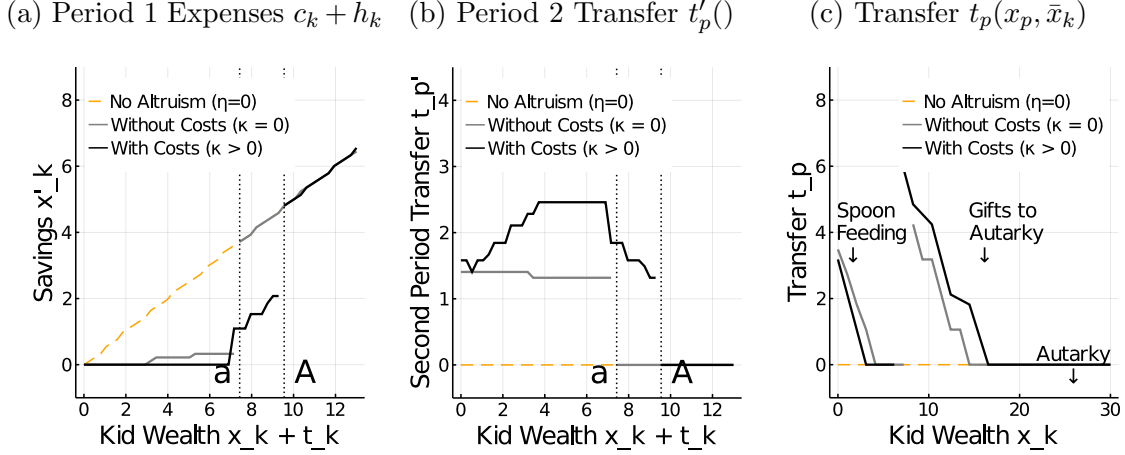
$$V_k(x_k + t_p, x'_p) = \max_{x'_k \geq 0, h_k \geq 0} u(x_k + t_p - x'_k - h_k, h_k) + V_{k'}(x'_k + t_p^*(x'_p, x'_k, h_k), h_k).$$

Figure A8a plots the kids savings  $x'_k(x'_p, x_k + t_k)$  for some level of parental wealth. Without altruism (autarky) the kid smooths perfectly since households do not discount the future, and savings are interest-free. With altruism households initially save nothing, increasing consumption today and receiving larger transfers in the second period. At some point, it is better to forego second-period transfers and smooth inter-temporally. With adjustment costs, the jump to autarky is delayed from  $a$  to  $A$ . The explanation is found in Figure A8b which shows the second period transfer  $t'_p(x'_p, x'_k, h_k)$  that the kid knows he will receive. With altruism but without costs,

<sup>22</sup>Note that  $x'_k + \sigma$  will generally be larger than  $s$ , as in the figure.

<sup>23</sup>The problem is solved numerically due to the non-differentiability of second-period objects. Namely, there are three problems i) adjustment costs induce kinks in  $V_k$  (Figure A7a), ii) the transfer policy is non-continuous in  $x'_k$  (Figure A7c) when  $0 < \kappa < \infty$  and iii) the transfer policy function has a kink where the non-negativity condition on transfers binds (Figure A7c).

Figure A8: The Effect of First-Period Choices



Notes: The vertical dashed lines indicate the threshold for where the kid behaves as if in autarky, without adjustment costs ( $a$ ) and with adjustment costs ( $A$ ). The x-axis varies cash-on-hand  $x_k + t_p$ , and the parent's first-period savings choice  $x'_p$  is held constant.

the second-period transfer is initially flat in cash-on-hand since the kid starts the second period in the same state:  $x'_p$  is already chosen by the parent and the kid doesn't save  $x'_k = 0$ .<sup>24</sup> With adjustment costs, the second-period transfer increases in cash-on-hand as the kid enters the second period with a larger house. While the kid still enters with zero wealth ( $x'_k = 0$ ), he also has a larger house, so the parent gives larger transfers moving the kid towards intra-temporal optimality between housing and goods.<sup>25</sup> The two remaining policy functions  $c_k$  and  $h_k$  are plotted in the appendix, in Figure A10.

<sup>24</sup>The first-period housing choice is irrelevant in the second period without adjustment costs.

<sup>25</sup>In fact, the increases in gifts are so large that kids prefer an economy with adjustment costs to an economy without (Figure A11a). First, somewhat wealthy kids prefer to have adjustment costs since this increases the second-period transfer. Second, altruism has no impact once the kid jumps to autarky. Appendix G.6 shows that this result is not sensitive to parameters as long as assumptions A1 and A2 hold. Interestingly, this result is true and economically significant in the estimated quantitative model (Section 6.2).



### G.2.4 First Period: Parent

The second-period adjustment costs also affect the parent's first-period problem by increasing the value of pushing kids to behave as if in autarky. The parent must decide how much to save and allocate spending on consumption and transfers. The parent considers how his transfer  $t_p$  increases the kid's cash-on-hand and that the savings decision  $x'_p$  informs the kid about the second-period transfers

$$V_p(x_p, x_k) = \max_{x'_p \geq 0, t_p \geq 0} \left\{ \mu(x_p - t_p - x'_p) + \eta u(c_k^*(x'_p, x_k + t_p), h_k^*(x'_p, x_k + t_p)) + V'_p(x'_p, x_k^*(x'_p, x_k + t_p), h_k^*(x'_p, x_k + t_p)) \right\}. \quad (23)$$

The first-period savings choice of the kid  $x'_k(x'_p, x_k + t_p)$  provides intuition about the parent's incentives. First, if the kid is close to behaving as in autarky, a large enough gift pushes the kid into autarky and eliminates the kid's strategic motives. Second, if the kid is poor while the parent is wealthy, the kid will consume less than the parent would choose for him without transfers. The parent can then effectively dictate the kid's consumption (spoon-feeding).<sup>26</sup> Figure A8c plots the parent's transfer decision and the effect of adjustment costs on these two transfer motives. When the kid is poor, the parent transfers to increase consumption in the current period, but the kid does not save. Then, there is a region without transfers before the parent's transfer policy jumps up to push the kid into autarky. As kid wealth increases, transfers go to zero, and kids behave as in autarky.

## G.3 What if Kids and Parents Could Commit?

This paper assumes, in line with the empirical results, that households cannot commit. What happens if one assumes the existence of a commitment technology?

When kids and parents can commit, they join forces and solve a family planner

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<sup>26</sup>Spoon-feeding is the main focus in Altonji et al. (1997), while Chu (2020) shows that the correct solution to the model includes a second transfer motive (gifts to autarky). Finally, Barczyk and Kredler (2020) derive the parameters that generate the different transfer motives.

problem where each household receives a Pareto weight at formation. The planner pools initial wealth  $x_f = x_k + x_p$ , and allocates consumption to achieve intra- and inter-temporal optimality. Let  $\theta$  denote the Pareto weight on the kid's utility function and  $V_c(x_f; \theta)$  denote the family planners value function:

$$\begin{aligned}
V_c(x_f; \theta) = & \max_{c_k, c'_k, c_p, c'_p, h_k, h'_k} \left\{ (1 - \theta)(\mu(c_p) + \mu(c'_p)) + \right. \\
& \left. [\theta + (1 - \theta)\eta](u(c_k, h_k) + u(c'_k, h'_k)) \right\}, \\
\text{subject to } & x'_f = x_f - c_k - h_k - c'_p, \\
& 0 = x'_f - c'_k - h'_k - c'_p - \mathbf{1}_{\{h'_k \neq h_k\}} \kappa h_k, \\
& x'_f \geq 0.
\end{aligned} \tag{24}$$

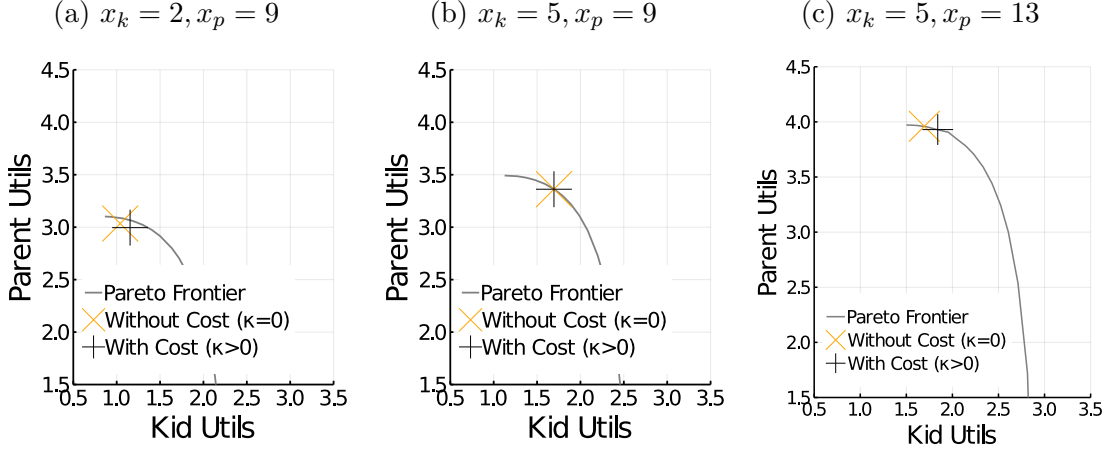
The optimal allocations of consumption and housing for initial family wealth  $x_f$  depends on the kid's Pareto weight  $\theta$ . We can define the kid's indirect utility from the commitment problem as

$$V_k^c(x_f; \theta) = u(c_k^c, h_k^c) + u(c_k'^c, h_k'^c), \tag{25}$$

where superscript  $c$  denotes the optimal allocation with commitment. The parent's indirect utility is similarly defined. It follows that the kid would only accept to join the family planner problem if his utility increases by doing so, that is if and only if  $V_k^c(x_f, \theta) \geq V_k(x_k + t_p(x_k, x_p), x_p)$ . There exists at least one  $\theta \in [0, 1]$  such that both households would be willing to commit for any initial endowment of kid and parent wealth since any feasible allocation without commitment is feasible with commitment.

Finally, the planner's solution is unaffected by the adjustment costs: The planner will, when  $\kappa = 0$  always smooth consumption and housing perfectly since  $\beta = \frac{1}{1+r}$  and there is no uncertainty. The same allocation is feasible with costs, and so the adjustment costs have no impact on the planners choice under these assumptions on

Figure A9: Illiquid Housing Improves Kid's Welfare



*Notes:* All models solved under the same parameters. Each subplot plots the utility of the child and parent: under commitment (Pareto Frontier), with liquid housing (yellow x) and illiquid housing (black +), under various initial wealth allocations. The child weakly prefers illiquid housing at the expense of his parent.

discount factors, interest rates, and uncertainty.

### G.3.1 Is Illiquid Housing Welfare Improving?

I now turn to study whether illiquid housing improves welfare. For an initial allocation  $x_p, x_k$  we can trace out the frontier of discounted life-time utility for kids and parents in  $V_k, V_p$  space by varying the Pareto weight on the kid. For each initial allocation we can also find the kid and parent life-time utilities in the same space with and without adjustment costs. Figure A9 plots the Pareto frontier and the no-commitment allocations with and without adjustment costs for a variety of initial allocations.

Figure A9a shows what happens when the kid is poor while the parent is moderately wealthy. The introduction of costs reduces parent's welfare and increases kid's welfare (by increasing the first-period gift). Next, I increase kid's wealth (Figure A9b), and the kid behaves as if in autarky. Thus both no-commitment allocations are identical and on the frontier. Figure A9c plots the results when I also

increase parental wealth and households no longer behave as if in autarky. Both no-commitment allocations are on the frontier, but the kid prefers adjustment costs since they increase gifts. These results for some initial allocations indicate that adjustment costs make kids weakly better off and parents weakly worse off.<sup>27</sup> I revisit this question in the estimated quantitative model (Section 6.2) and find that (18%) of 25-year old kids prefer their own housing to have adjustment costs, even with uninsurable income risk.

### **G.3.2 Taking the Commitment Allocations to the Data**

By assuming a commitment technology, we lose several objects necessary to bring the model to the data. First, we cannot observe the timing of transfers (but we can back out lifetime net-transfers). Second, wealth allocations within the family are indeterminate. A minimum standard of a model that quantifies the contribution of parent transfers to their children’s homeownership decisions must be consistent predictions on transfers. Second, it must match the wealth levels and relative wealth within the family. However, a model with commitment cannot speak to these issues.

## **G.4 Additional Details for the Two-Period Model**

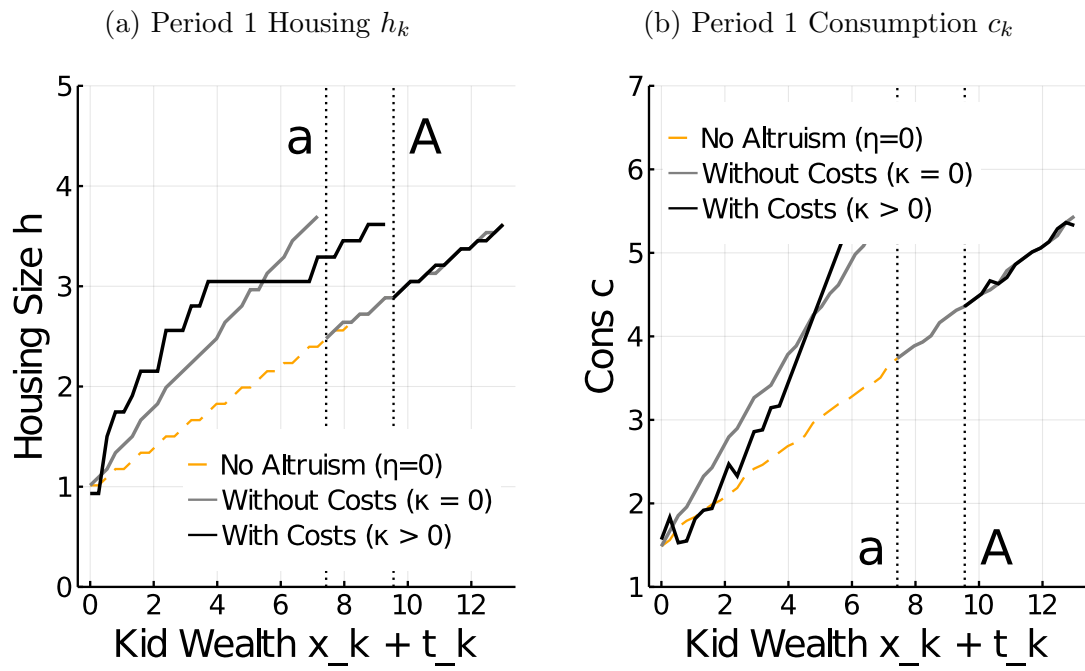
### **G.5 Full Set of Policy Rules without Commitment**

In the first-period problem we saw that the gifts the kid expects to receive can be increasing in cash-on-hand. Figure A11a shows the effect of this pattern on the value functions for the kid in the first period. We can see that poor kids with wealthy parents strictly prefer altruism, but as they jump to autarky they are indifferent. However, we see that adjustment costs increase kid’s welfare in the second-stage of the first-period.

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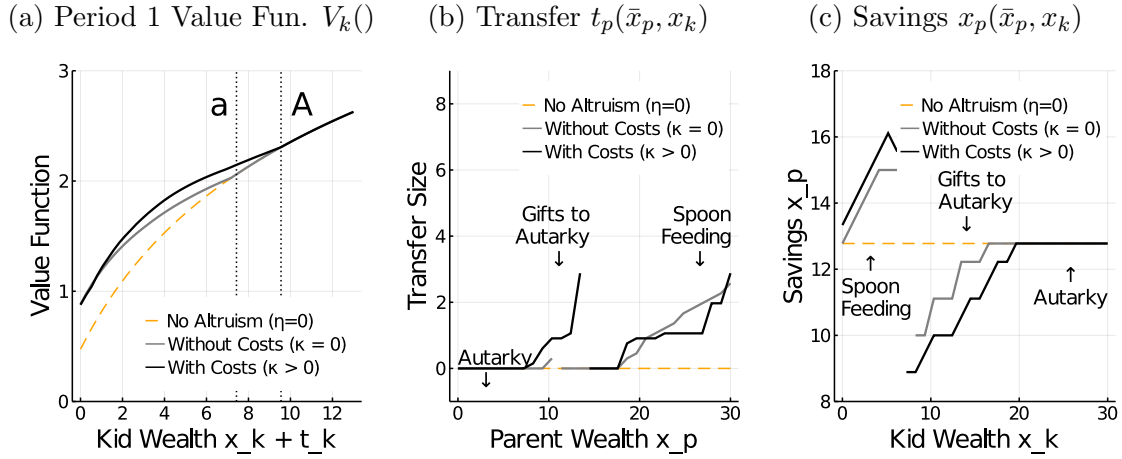
<sup>27</sup>In Appendix G.6 I show that these results are not sensitive to parameter values and that the results hold for any initial allocation that implies transfers in period one or period two. Additionally, adjustment costs never improve parents welfare.

Figure A10: First Period Kid Choices



*Notes:* The vertical dashed lines indicate the threshold for where the kid behaves as in autarky, taking into account the first-period gifts without, for the case without adjustment costs (a) and with adjustment costs (A).

Figure A11: First Period Parent Choices



Notes: These figures show how the three different regimes are induced by changes in parental and kid wealth. During spoon-feeding the parent transfers to the kid, but the kid receives a transfer also in the second period. During gifts to autarky, the parent gives enough to make the kid behave as if there was no altruism. During autarky, both households behave as if there was no altruism.

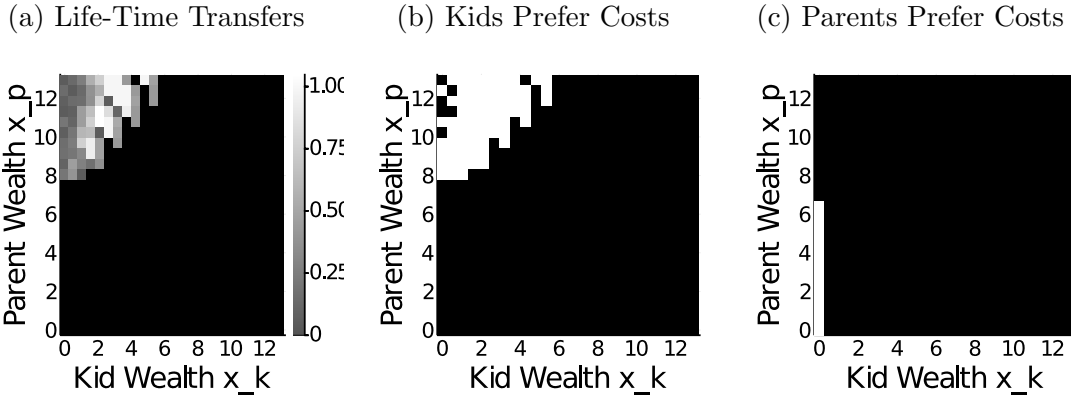
Figure A8c showed how adjustment costs decrease spoon-feeding but increase gifts to autarky. The same pattern holds when a kid's wealth is held constant while varying parental wealth, Figure A11b. With adjustment costs, spoon-feeding transfers are generally smaller since the kid buys larger houses to receive a larger transfer in the second period. At the same time, the gifts-to-autarky are generally larger, as the benefits of pushing the kid into self-sufficiency is larger. Finally, Figure A11c plots the savings policy, and we see that adjustment costs also have a non-monotone effect on parent's savings.

## G.6 Further Details on Welfare Improves of Adjustment Costs

### G.6.1 When do Kids Prefer Adjustment Costs?

It turns out that at any initial allocation, lifetime transfers are weakly larger with adjustment costs, as shown in figure A12a. Interestingly, this is true also for regions

Figure A12: Effect of Adjustment Costs on Life-Time Transfers and Utility



*Notes:* The intensity of the life-time transfer [A12a](#) denotes how much larger the transfer is with adjustment costs. Solid black denotes areas where the transfers are identical. In figures [A12b](#), [A12c](#) black denotes where the household is indifferent and white where it strictly prefers adjustment costs.

that generate spoon-feeding transfers (Figure [A8c](#)) where transfers are smaller in period 1. While spoon-feeding transfers are smaller with costs, the second-period transfers are larger, leading to increased lifetime transfers. However, we see that the kids who benefit the most from adjustment costs receive larger gifts-to-autarky.

Which kids strictly prefer adjustment costs? First, in initial allocations where there are no transfers (black areas of Figure [A12a](#)), kids behave as if in autarky. Since there is no uncertainty and  $\beta = \frac{1}{1+r} = 1$  households smooth perfectly across time, and the choices are identical for all  $\kappa \geq 0$ . The only area where kids may strictly prefer costs is when transfers happen with or without adjustment costs. Figure [A12b](#) shows that almost all kids that do receive transfers prefer the world with costs.

Which parents prefer adjustment costs? No parents strictly prefer adjustment costs: In the region where there are no transfers, they are indifferent. When transfers flow in at least one period, transfers are weakly higher with costs, and so parents are worse off with adjustment costs as plotted in Figure [A12c](#).

### G.6.2 Are the Results Robust to Parameter Values?

Figure A13 repeats the exercise from the previous section under different parameter values of risk aversion  $\gamma$ , altruism  $\eta$ , and expenditure share on housing  $\xi$ . The patterns remain qualitatively similar. The fact that the plots are not entirely smooth is unsurprising. Households' policies have numerous kinks, jumps, and non-convexities. Additionally, the solution is a numerical approximation.

The first panel A13a plots the results under the benchmark parameterization. The second panel plots the results with higher risk aversion  $\gamma$  A13e. An increase in risk aversion also increases the desire to smooth, and so parents transfer more to their kids (eq. 22), which increases the region where kids prefer adjustment costs. Next, panel A13f plots the result with higher altruism  $\eta$ . As transfers increase, the region where kids prefer costs grows. Finally, I increase the expenditure share on housing  $\xi$ . As households spend more on housing, a larger fraction of expenditures entails adjustment costs, and so the area where kids prefer adjustment costs increase. No parameter combinations make the parent prefer adjustment costs.



Figure A13: Stylized Model: Sensitivity Parameter Values

