Illiquid Homeownership and The Bank of Mom and Dad*

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Abstract

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 illiquid housing, in which the child and parent interact without commitment. I find that parental transfers account for 15 p.p. (31%) of the homeownership rate of young adults. Parental transfers increase homeownership for households with wealthier parents by relaxing borrowing constraints and reducing housing risk. Moreover, illiquid housing entails expenditure commitments, changing the strategic behavior of households. Children with wealthy parents increase their consumption of illiquid housing to extract larger future transfers, leading to a preference for illiquidity: 17% of 25-year old households prefer their own housing to be illiquid. Finally, I find that policies that decrease the sales cost of housing would be effective at increasing homeownership and decreasing the role of parent wealth in determining children's housing outcomes.

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1 Introduction

I study the role of transfers from parents to adult children in the housing decisions of young households. Around 30% of recent American first-time home buyers received downpayment assistance from parents. Households who received transfers for house purchases received an average transfer of $48,000 in 2012.[1] Housing is the largest asset in US households' portfolios and among middle-class households represents the primary means of wealth accumulation. Not only is owner-occupied housing the largest of an average household's portfolio, but it is illiquid. Both buying and selling a house entails transaction costs. In addition, households must meet a downpayment requirement to obtain a mortgage. These two frictions, transaction costs and credit constraints, generate a role for parental transfers to influence housing decisions beyond a wealth effect. First, transfers directly alleviate borrowing constraints. Second, future transfers decrease the probability that households have to sell their house after experience adverse income shocks.

Given the frequency with which parents help their children buy houses, I ask: how much of the homeownership rate among young (25-44) households is accounted for by parental transfers? To answer the question, I build a life-cycle overlapping generations model with altruistic parents and a rent/own decision. The child and the parent interact, without commitment, through both inter-vivos transfers and bequests at death from the parent. The key innovation to the altruism framework is to include illiquid housing, which interacts with transfers. In models without housing (e.g., Boar, 2018; Altonji et al., 1997; Barczyk and 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, households enter the economy when they are young, with low wealth and low income, and they must save to buy a house. The parents of these children, who

[1] Data from the Survey of Household Economic Decisionmaking and the Transfer Supplement of the 2013 Panel Study of Income Dynamics (see section 3).

are at the life-cycle peak of wealth and income, may choose to transfer money to alleviate minimum downpayment requirements. Second, adult children who own a house and experience income losses may avoid costly downsizing by receiving parental transfers.On the other hand, as in all models of transfers, future transfers decrease the savings motive, decreasing the homeownership rate. Whether parental transfers increase or decrease homeownership rates, and by how much, is thus an empirical question that may be answered by estimating a quantitative model.

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. By removing parental altruism, 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 for 19% and 65% of the parental transfer effect on homeownership, respectively. Next, I evaluate how policies increasing homeownership rates also affect the role of parent wealth in determining housing outcomes. Since homeownership, all else equal, is more attractive for households with wealthier parents, a decrease in minimum downpayments also increase the correlation between parent's wealth and children's ownership outcomes. Increasing liquidity, by decreasing sales and purchase costs, increase ownership and decrease the role of parent wealth. Finally, I study how housing illiquidity affects the strategic behavior introduced by the lack of commitment. I show that households with wealthy parents prefer illiquid housing, as it gives them a partial commitment technology.

By studying the role of intergenerational transfers, 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 et al., 2020), and changing borrowing constraints (Paz-Pardo, 2019; Mabille, 2020).

These studies highlight the importance of credit constraints and mortgage access in shaping demand for owner-occupied housing. However, once we consider parent-child interactions, borrowing constraints become less important, and we see that illiquidity is a key determinant of who becomes homeowners. My results highlight that the impact of policies not only depend on a household's characteristics, but also their parent's.

I also 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 and housing choices. The decision to rent or own is one of the most important financial decisions that a household makes. Studying how parental wealth increases a household's willingness to take risks by becoming homeowners with less precautionary savings and larger mortgages helps to shed light on the intergenerational persistence in both the level and returns to wealth (Fagereng et al., 2020a,b). 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). My results show that parent wealth is an important component of household portfolio choices by increasing their appetite for risk.

Finally, by introducing illiquid assets, I contribute to the growing literature that studies altruistic households who interact without commitment. A generic finding of such models is that, children undersave to increase transfers received from their parents (Altonji et al., 1997). However, illiquid housing (through adjustment costs) imposes future expenditure commitments (Chetty and Szeidl, 2007; Shore and Sinai, 2010). The child can use these expenditure commitments to increase transfers. Intuitively, the child can follow a strategy in which they invest in a large house and bring no liquid wealth to the next period. If the parent does not make 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. However, this mechanism only arises when housing is illiquid: the parent knows that the child will downsize to optimally balance housing and non-housing consumption when housing is liquid. I show the existence of this mechanism formally in the a simple two-period model based on Altonji et al. (1997). The same mechanism is quantitatively meaningful in the richer life-cycle model, and I find that 17% of 25-year old households prefer their housing to be illiquid.

The paper proceeds as follows. In section 2, I develop and solve a stylized two-period model of housing and parental transfers that shows that children with wealthy parents prefer illiquidity under general conditions. In section 3, I describe the data sources, sample selection, and summary statistics. I also test and verify three hypotheses derived from the stylized model about the existence of a parental wealth channel that impacts children's housing outcomes. Section 4 describes the quantitative model and section 5 discusses the structural estimation. Section 6 performs the main quantitative exercise and robustness tests. Finally, section 7 studies how policies intended to increase homeownership also affect the role of parent wealth and the role of housing illiqiduity.

2 Two-Period Model of Altruism and Housing

This section develops and solves a stylized two-period model with children ("kid") and parents without commitment or cooperation. The model highlights that housing adjustment costs, which make housing illiquid, increases parental transfers. Indeed, poor children with wealthy parents prefer to face adjustment costs on their housing expenditures. Finally, I introduce a commitment technology and show that adjustment costs have ambiguous effects on total welfare.

2.1 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 ($\beta = 1$):

$$u(c_k, h_k) + u(c_k', h_k'). \tag{1}$$

The parent 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 $\eta > 0$

$$\mu(c_p) + \mu(c_p') + \eta \left[u(c_k, h_k) + u(c_k', h_k') \right], \tag{2}$$

where $\mu(c_p)$ maps parent's consumption into utils. Finally, I assume that the kid's utility function satisfies the following conditions:[2]

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

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

[2]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.

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 consumption 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.

2.2 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 χ of 0.4, and a altruism parameter η of 0.3.

2.2.1 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.[3] 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 :

$$V^0_{k'}(x'_k + t'_p, h_k) = u(x'_k + t'_p - h_k, h_k). \tag{3}$$

The kid can equate the marginal benefits of consumption and housing by moving:

$$V^m_{k'}(x'_k + t'_p, h_k) = \max_{h'_k \geq 0} u(x'_k + t'_p - h'_k - \kappa h_k, h'_k). \tag{4}$$

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

$$V'_k(x'_k + t'_p, h_k) = \max \left\{ V^m_{k'}(x'_k + t'_p, h_k), V^0_{k'}(x'_k + t'_p, h_k) \right\}, \tag{5}$$

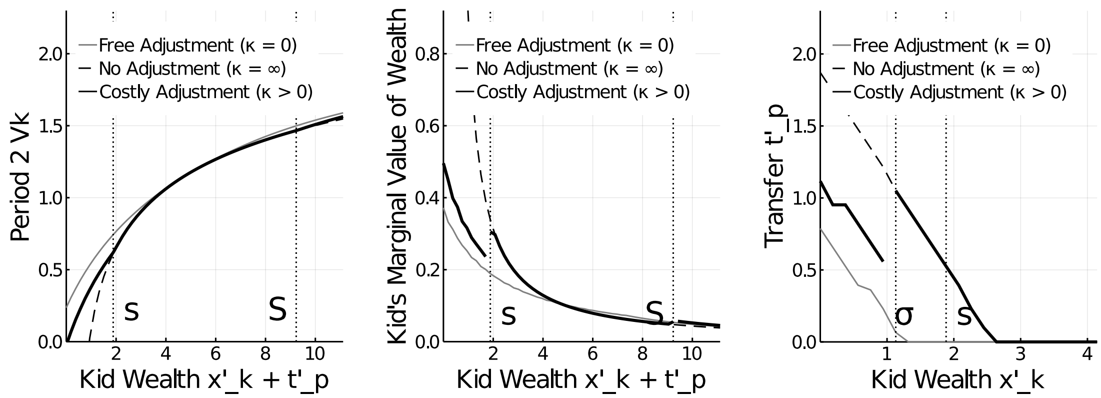
Under assumptions A1 and A2 households follow a strategy where they move only when disposable wealth is outside of two thresholds s, S. The intuition for the thresholds is straightforward. If the kid enters the period with a large house, he must reduce good consumption dramatically to remain in the house. As wealth 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.[4]

[3]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.

[4]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 1: Adjustment Costs and Second Period Outcomes

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



Note: Vertical lines denoted s, S indicate the thresholds for staying in the current sized house, while σ 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 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 $V^m_{k'}(\cdot)$, 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 $V^0_{k'}(\cdot)$. At $s + \varepsilon$ 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 1a, which also shows the cases with free adjustment and infinite adjustment costs. The slope (Figure 1b) 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 kid's marginal value of wealth.

2.2.2 Final Period: Parent

I now show how the adjustment costs affect the parents transfers 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. The parent's problem is

$$V_{p'}(x'_p, x'_k, h_k) = \max_{t'_p \geq 0} \left\{ \mu(x'_p - t'_p) + \eta V'_{k'}(x'_k + t'_p, h_k) \right\}, \tag{6}$$

where we have inserted $V_{k'}(x'_k + t'_p, h_k)$ for $u\left(c'^{*}_k(x'_k + t'_p, h_k), h'^{*}_k(x'_k + t'_p, h_k)\right)$. 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:

$$u'(x'_p - t'_p) = \eta V'_{k'}(x'_k + t'_p, h_k) + \lambda, \tag{7}$$

where λ is the multiplier on the non-negativity of the transfer constraint. From (7) 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 1b) the second period transfer policy t'_p also jumps. Figure 1c 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.[5] Just below σ, the parent does not give enough to keep the kid in his house. At σ, the gift jumps to a level that is at least big enough to keep the kid in his house. Note how makes transfers non-decreasing in kid's second period wealth: Moving from $x'_k = \sigma - \epsilon$ to $x'_k = \sigma + \varepsilon$ ensures the kid will obtain a much larger transfer.

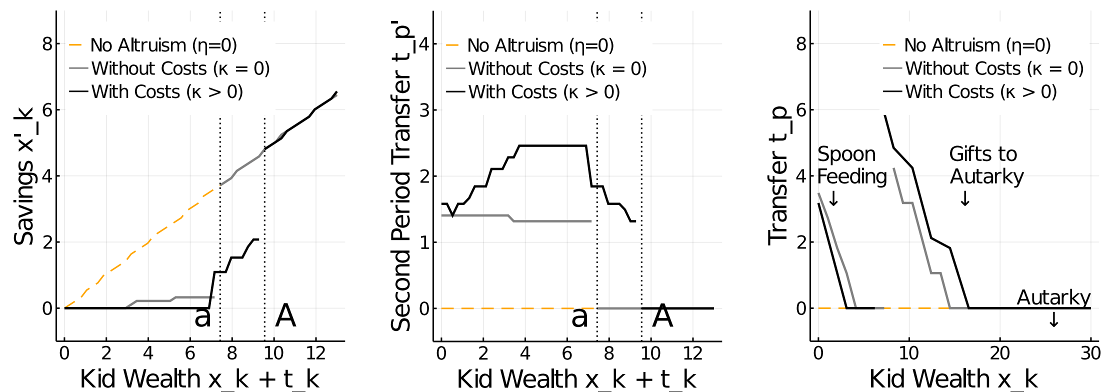
2.2.3 First Period: Kid

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

[5] Note that $x'_k + \sigma$ will generally be larger than s, as in the figure.

Figure 2: The Effect of First-Period Choices

(a) Period 1 Expenses $c_k + h_k$ (b) Period 2 Transfer $t'_p()$ (c) Transfer $t_p(x_p, \bar{x}_k)$



Note: The vertical dashed lines indicate the threshold for where the kid behaves as if in autarky, for the case 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.

and the parent's savings decision. He takes into account how his choices will affect the second-period transfer:[6]

$$V_k(x_k + t_p, x'_p) = \max_{x'_k \geq 0, h_k \geq 0} u(x_k + t_p - x'_k - h_k, h_k) + V_{k'}(x'_k + t'^{*}_p(x'_p, x'_k, h_k), h_k).$$

Figure 2a 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 $\beta = 1/(1 + r) = 1$. 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 2b which shows the second period transfer $t'_p(x'_p, x'_p, h_k)$ that the kid knows he will receive. With altruism but without costs, the second-period transfer is initially flat in cash-

[6]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 (1a), ii) the transfer policy is non-continuous in x'_k (figure 1c) when $0 < \kappa < \infty$ and iii) the transfer policy function has a kink where the non-negativity condition on transfers binds (figure 1c)

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 $x'_k = 0$.[7] 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 wakes up with zero wealth ($x'_k = 0$), he also wakes up with a larger house, so the parent gives yet larger transfers moving the kid towards intra-temporal optimality between housing and goods.[8] The two remaining policy functions c_k and h_k are plotted in the appendix, in Figure A1.

2.2.4 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

$$
\begin{aligned}
V_p(x_p, x_k) = \max_{x'_p \geq 0, t_p \geq 0} \big\{ & \mu(x_p - t_p - x'_p) + \eta u(c^*_k(x'_p, x_k + t_p), h^*_k(x'_p, x_k + t_p)) + \\
& V'_{p'}(x'_p, x'^*_k(x'_p, x_k + t_p), h^*_k(x'_p, x_k + t_p)) \big\} .
\end{aligned} \tag{8}
$$

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

[7] The first-period housing choice is irrelevant in the second period without adjustment costs.

[8] In fact, the increases in gifts are so large that kids prefer an economy with adjustment costs to an economy without (Figure A2a). 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 A.2 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 7.2).

kid's consumption (spoon-feeding).[9] Figure 2c 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.

2.3 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 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 θ denote the Pareto weight on the kid's utility function and $V_c(x_f;\theta)$ denote the family planners value function:

$$\begin{aligned} V_c(x_f;\theta) = \max_{c_k, c_k', c_p, c_p', h_k, h_k'} & \left\{(1-\theta)(\mu(c_p) + \mu(c_p'))+ \right. \\ & \left. [\theta + (1-\theta)\eta](u(c_k,h_k) + u(c_k', h_k'))\right\}, \\ \text{subject to } x_f' &= x_f - c_k - h_k - c_p, \\ 0 &= x_f' - c_k' - h_k' - c_p' - \mathbf{1}_{\{h_k' \neq h_k\}}\kappa h_k, \\ x_f' &\geq 0. \end{aligned} \tag{9}$$

The optimal allocations of consumption and housing for initial family wealth x_f depends on the kid's Pareto weight θ. We can define the kid's indirect utility from

[9] 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.

the commitment problem as

$$V_k^c(x_f;\theta) = u(c_k^c, h_k^c) + u(c_k'^c, h_k'^c), \tag{10}$$

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 discount factors, interest rates, and uncertainty.

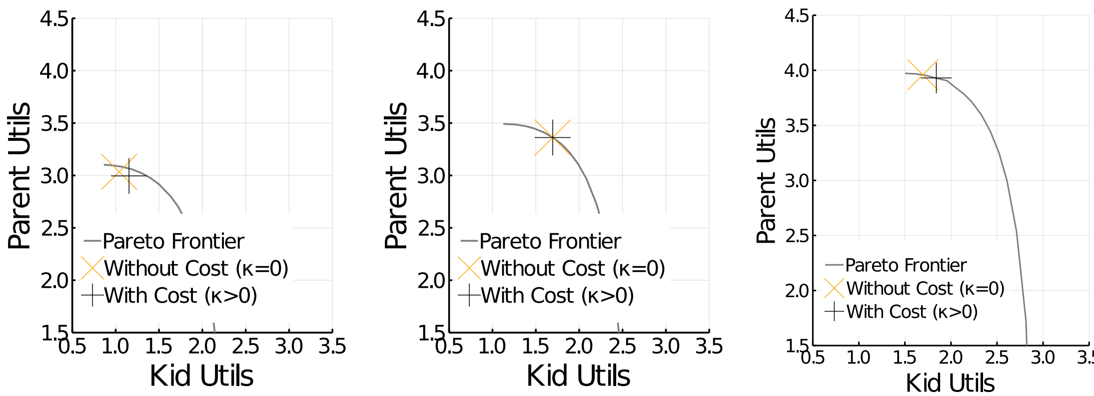
2.3.1 Is Illiquid Housing Welfare Improving?

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 3 plots the Pareto frontier and the no-commitment allocations with and without adjustment costs for a variety of initial allocations.

Figure 3a 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 3b), and the

Figure 3: Illiquid Housing Improves Kid's Welfare

(a) $x_k = 2, x_p = 9$ (b) $x_k = 5, x_p = 9$ (c) $x_k = 5, x_p = 13$



Note: 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.

kid behaves as if in autarky. Thus both no-commitment allocations are identical and on the frontier. Figure 3c 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.[10] I revisit this question in the estimated quantitative model (Section 7.2) and find that (18%) of 25-year old kids prefer their own housing to have adjustment costs, even with uninsurable income risk.

2.3.2 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

[10]In Appendix A.2 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.

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.

3 Data on Transfers, Family, and Housing

Having laid out the theoretical framework for altruism, transfers, and illiquid housing, I now describe the data sets used in the analysis. I first present the estimation sample, taken from 1997-2017 waves of the Panel Study of Income Dynamics (PSID). I also use other two surveys to discuss the time trends in the reliance on parental transfers for down payments. I conclude by presenting reduced-form evidence on the existence of a parental wealth channel on kid's housing outcomes.

3.1 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 kids. Second, it has some information about inter-vivos transfers from parents to kids. Third, it follows households over time so we can observe the transitions from renting to owning.

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 kids 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, except 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 Kids: I use the Parent/Child file from the PSID's 2013 transfer supplement. We can observe each household's 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 kids 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 kids in 2012. There is no identifying information on whether these transfers are gifts or loans, and I treat all as gifts.[11] Since this paper focuses on transfers that are a) related to housing and b) quantitatively meaningful, I set transfers below $500 to $0.[12]

[11]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.

[12]Ignoring small transfers decrease the transfer rate from 32% to 24% and increase the mean transfer from $2,921 to $3,944.

3.2 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 13 and 14 contains 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, 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 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.

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 kids in the top quintile have four times the wealth of parents with kids 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.

3.3 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 the parental transfers for housing has 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-section 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.[13] The results are plotted in the left panel of Figure 4. 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

[13] The data was recorded for owners who bought since 2001 in the 2015 wave and those who bought since 2015 in the 2016 wave.

transfers, while 20-40% received transfers after 2009.

In 2013, 2014, and 2016 the SHED contained a question asking renters why 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, we see that households find the illiquidity associated with owner-occupied housing inconvenient: The second most common answer was that renting was more convenient (26%), followed by planning to move (23%). These answers suggest that the illiquidity of owner-occupied housing is an important friction that keeps households from buying.

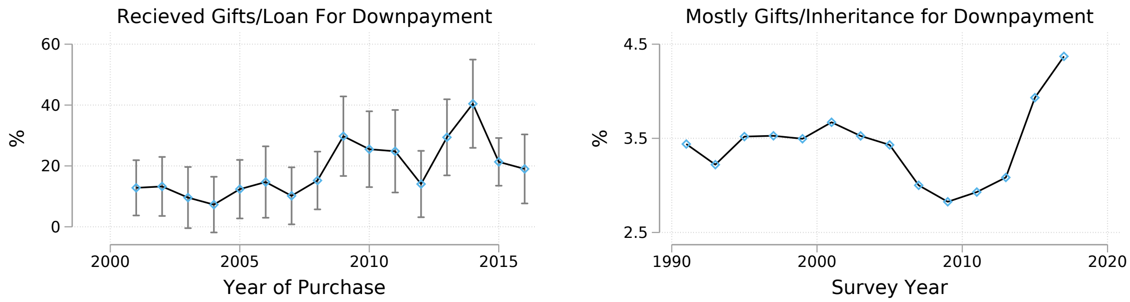
American Housing Survey: I use the AHS to obtain a time series back to 1991. The AHS follows roughly 60,000 housing units over time and asks households in owner-occupied units how they funded the downpayment. We can see that the reliance on parental transfers reached is currently at the highest level (right panel of Figure 4). 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.

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

I now test one prediction of the stylized model: Kids with wealthier parents are less likely to downsize. While the model had no uncertainty, it is straightforward to extend the model to include income risk. The model then predicts that households with poorer parents have to decrease housing consumption more 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

Figure 4: Increased Reliance on Parental Transfers for Down Payments



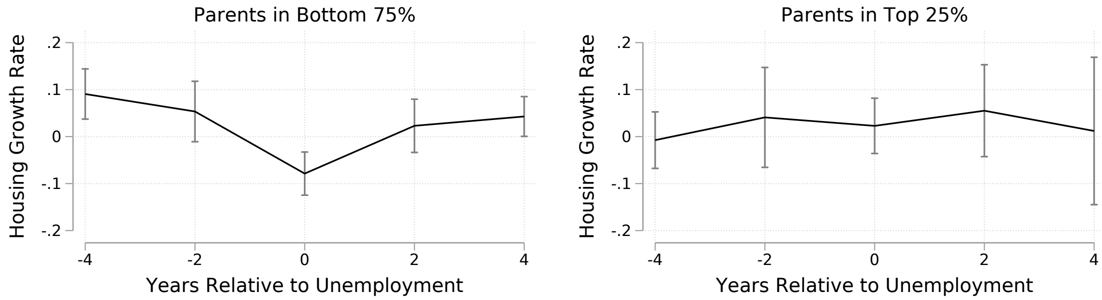
Note: The left panel uses data from the SHED. First-time homeowners are defined as those who did not use proceeds from previous property sales for the downpayment. Bars indicate 95% confidence intervals. The right panel uses data from the public AHS file. First-time homeowners are defined as those with non-missing downpayment information and whose majority of the downpayment did not come from the sale of a previous home.

ages 25 and 45. The consumption value of owner-occupied housing is set to 6% of the market value as in Boar et al. (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.[14] 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 at unemployment by parental wealth to examine whether households with wealthier parents are less likely to downsize. The results are displayed in Figure 5. 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. These results are in line with the stylized model's theoretical predictions, which predicts that households with wealth-

[14]This methodology is inspired by Chetty and Szeidl (2007) who find that housing consumption response 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 B.2, where I also report results separately for renters and owners.

Figure 5: 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 25-45 with exactly one unemployment spell, and without changes in head and/or spouse in the four years before and after unemployment. I replicate this exercise using the simulated panel as part of the external validation checks (Section 5.4).

ier parents have smaller changes in housing expenditures. Moreover, I replicate this event study using the simulated panel from my quantitative model and show that the results are similar (see Section 5.4 and Figure 7).

3.5 Hypotheses II: Parental Wealth Affects House Purchases

We have established 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.

3.5.1 Households With Wealthier Parents Buy Larger Houses

The model implies that households with wealthier parents should buy more expensive 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:

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

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, and race.

Column 1 of Table 1 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 0.072% 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 (0.079%).

3.5.2 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. Since 2009 the percentage of households that are behind on mortgage payments has decreased from 3.8% to 1.8% and 8.6% of the sample have been behind at least once. A key insight of the stylized model is that parental transfers not only relax borrowing constraints but 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.

Table 1: Housing Choices and Parental Wealth

	(1) House Size	(2) Ever Behind	(3) Behind First	(4) Behind RE	(5) Behind FE
Parent					
Wealth (t-2)	0.072***	-0.023**	-0.022**	-0.008*	-0.007
	(0.020)	(0.008)	(0.007)	(0.004)	(0.009)
Child Household					
Net Worth (t-2)	0.079***	-0.014*	-0.017*	-0.008*	-0.002
	(0.016)	(0.007)	(0.006)	(0.003)	(0.004)
Income (t-2)	0.388***	0.001	0.019	-0.001	0.014
	(0.035)	(0.015)	(0.013)	(0.007)	(0.011)
High School=1	0.240***	-0.005	-0.061*	-0.008	0.002
	(0.072)	(0.031)	(0.031)	(0.021)	(0.095)
College =1	0.482***	-0.029	-0.060+	-0.039+	0.010
	(0.083)	(0.035)	(0.035)	(0.022)	(0.103)
White=1	0.070	-0.058*	0.017	-0.001	0.000
	(0.057)	(0.024)	(0.020)	(0.014)	(.)
Family Size	0.097*	0.023	-0.006	0.005	-0.008
	(0.050)	(0.020)	(0.018)	(0.010)	(0.022)
N	884	709	372	2,057	2,057

Note: 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 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.

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 1, 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 by 0.023 percentage points, and is significant at the 1% level. The effect of parental wealth is larger than the effect of kids' net worth but smaller than the effect of kid'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 effect 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 over time 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.

4 A Quantitative Model of Family Banking and Housing

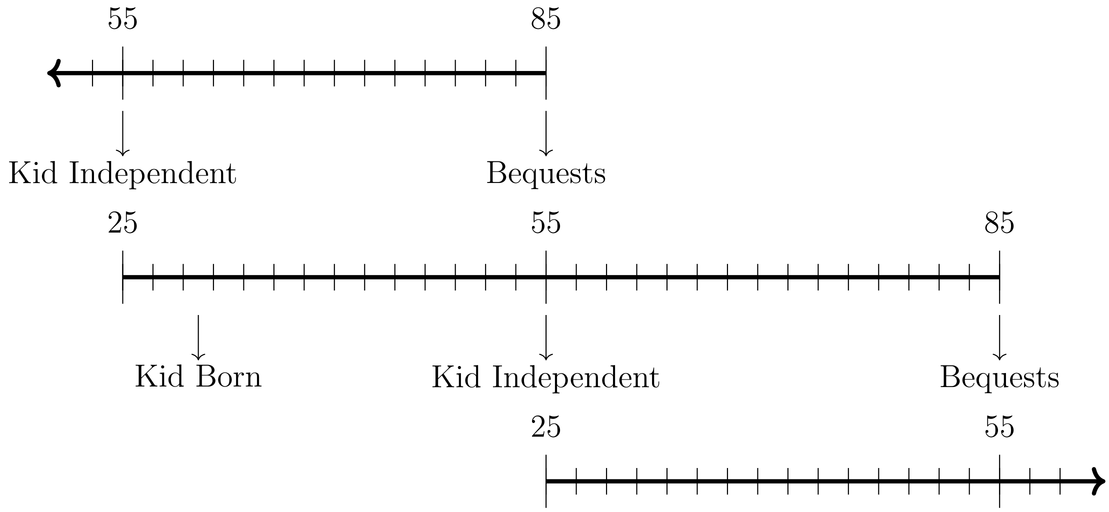
This section describes my life-cycle model of house tenure choices with overlapping generations, idiosyncratic earnings risk, and altruistic inter-vivos transfers from parents to children. The model has two main building blocks. The first is altruism and no commitment. Parents are altruistic towards their children and derive utility from their kid's utility. 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 is the introduction of (illiquid) housing into an altruism model. When housing is liquid, the only interaction with altruism is that parental transfers relax the mortgage borrowing constraints. With illiquid housing, children and parents both get face expenditure commitments. The model also becomes a two-asset model, where both wealth and the portfolio composition 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 you may have to sell after receiving adverse income realizations. However, wealthy parents provide partial insurance against both income losses and may even transfer to ensure that their child can stay in the house and not pay the sales cost.

4.1 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 the economy. The only economic agents in the model are households.

Demographics. Households are economically active from age $a \in \mathcal{A} = \{25, 27, \ldots, 83\}$. A family consists of one adult kid k household (25-53) and a parent p household (55-83). Households die with certainty after age 83. When the parent dies, the kid becomes a parent aged 55, linked with a new adult kid aged 25, and new kids are born when their parents are 30. Each parent-kid pair overlaps for 15 periods with an age gap of 30 years. Only two households are economically active in any dynasty at a time. Figure 6 shows the life cycle of two generations.

Figure 6: Individual's Life Cycle



Altruism. The parent is altruistic towards his in the sense of Barro (1974). The parent places weight η on the utility of the adult kid. At death any wealth left is bequethed to the kid. Altruism to later generations is not explicitly modelled.

Inter-Generational Transfers. The parent can, in every period, transfer a non-negative transfer t_p that the child receives immediately. If transfers and bequests were not allowed the resulting policy functions would be identical to a model without altruism ('autarky').

Labor earnings. Households supply one unit of labor inelastically in each period. Households face a common and deterministic life-cycle earnings l_a. After retirement households receive constant retirement benefits $l_a = l_r \forall a \geq 67$. Households aged 25-53 face persistent idiosyncratic age-dependent productivity shocks $y_{i,a} \in \mathcal{Y}_a = \{y_1, \ldots, y_{N_y}\}$. 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

$$w_{i,a} = l_a y_{i,a} \; \forall a \in \{25, 27, \ldots, 53\}, \tag{11}$$

$$w_{i,a} = l_a \; \forall a \in \{55, 57, \ldots, 83\}. \tag{12}$$

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, and so parental income risk is not a primary concern. However, I perform robustness exercises where I allow for income and health expenditure risk also for parents in D.1

Housing. Households value consumption and housing services. They can obtain housing services from the rental market or the owner-occupied market. In the first market they can rent housing of quantity h_r, and in the latter they can own houses of size h_o. The unit price of housing is p and q is rent-to-price ratio: qph_r. Homeowners pay deprecation δ on their housing. I assume adjustment costs that are proportional to the market value for owner-occupied housing, as in Yang (2009):

$$adj(h_{a+1}, h_a) = \begin{cases} \kappa_b p_t h_{a+1} & \text{if } h_a = h_r \; \& \; h_{a+1} \neq h_r, \\ \kappa_s p_t h_a & \text{if } h_a \neq h_r \; \& \; h_{a+1} = h_r, \\ 0 & \text{if } h_{a+1} = h, \end{cases} \tag{13}$$

where κ_s, κ_b denote the 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 this period. These adjustment costs make housing illiquid.

Financial Market. Households can save in a one-period risk free bond with a return r. Borrowing is allowed against collateral (owner-occupied housing), but must satisfy a loan-to-value (LTV) constraint. Borrowing works like a one-period mortgage that is rolled over every 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

$$r(b) = \begin{cases} r & \text{if } b \geq 0, \\ r + r_a^m & \text{if } b < 0. \end{cases} \tag{14}$$

The borrowing constraints take the following form depending on the house tenure choice:

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

Initial Conditions of the New Young. A household's starting wealth and productivity at age 25 is stochastic and allowed to be correlated with the kid's parents 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.[15]

Preferences. The parent and child have time-separable expected utility preferences over consumption and housing services. Households discount the future at rate β. The per-period utility function is allowed to depend on the house tenure and is age independent and takes the following form for the kid:

$$U_k(c_k, h_k, o_k) = u(c_k, h_k, o_k) = \frac{\left(c^{\xi} s(h, o)^{1-\xi}\right)^{1-\gamma} - 1}{1-\gamma}, \tag{15}$$

where s denotes housing services, γ measures risk aversion, and ξ the expenditure

[15] While this paper abstracts away from early-childhood, education and college investment of parents, these choices affect moments such as initial starting wealth and income, which it is important to match to generate inter-generational correlations in the simulated data in line with empirical evidence.

shares on non-housing consumption. The function $s()$ maps housing qualities and house tenure into values comparable to consumption and takes the following form

$$s(h,o) = \begin{cases} h & \text{if renting } (o=0), \\ \chi h & \text{if owning } (o=1). \end{cases} \tag{16}$$

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

$$U_p(c_p, h_p, o_p, c_k, h_k, o_k) = u(c_p, h_p, o_p) + \eta u(c_k, h_k, o_k) \tag{17}$$

Timing. The productivity state of children is realized first. Families with new kids also draw the initial wealth level of the kid from Θ. Next, the parent chooses his consumption c_p , non-negative inter-vivos gifts t_p, bond position b_p, and housing choice h_p. The kid decides her consumption c_k, housing h_k, and savings b_k choices after observing his parent. The parent moves first to be consistent with mortgage regulation in the US, which requires that gifts are 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 house tenures $h_k \in H = \{h_r, h_o\}, h_p \in H$, the productivity of the child $y_k \in y_a = \{y_1, \ldots, y_{N_y}\}$, and the age of the child $a_k \in A_k \in \{25, 27, \ldots, 53\}$. 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 timing assumption in the model, the child makes choices after the parent makes her choices. The parent's choices affects 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_k determine next-period transfers). At the beginning of the second stage the state space of the child expands to $(x_k, x_p, y_k, h_k, h_p, a_k; t_p, b'_p, h'_p)$. The kid is indifferent between a change in own wealth or transfers, but cares about his disposable wealth after transfers $\tilde{x}_k \equiv x_k + t_p$. Further, since he moves after the parent, the parent's starting wealth and housing x_p, h_p is redundant for the kid, so we can rewrite the state space to be $\mathbf{s}_k = \left(b'_p, h'_p, x_k + t_p, y_k, h_k, h'_p, a_k\right)$. Let $V_k(s_k)$ denote the kid's value function in the second stage.

4.2 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 find consumption, savings, and transfer policies conditional on a housing choice, before picking the housing choice that maximizes utility.

4.2.1 Problem 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 C.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 let primes denote next period variables, and highlight variables affected by strategic considerations.

$$\begin{aligned} V_k(\mathbf{s}_k) = \quad & \max_{c_k, b'_k, h'_k = h_o} u(c_k, h'_k) + \beta \mathbb{E}\left[V_k(\mathbf{s}'_k)\right] \\ & \text{s.t.} \quad b'_k = x_k + t_p + w_k - c_k - ph'_k - adj(h_k, h'_k) \\ & \qquad\quad x'_k = b'_k(1 + r(b'_k)) + ph_k(1 - \delta) \\ & \qquad\quad b_k \geq LTV ph'_k. \end{aligned} \tag{18}$$

$$\text{Where } \mathbf{s}_k = \left(b_p', h_p', x_k + t_p, y_k, h_k, h_p', a_k\right),$$
$$\mathbf{s}_k' = (b_p^*(\mathbf{s}_p'), h_p^*(\mathbf{s}_p'), x_k' + t_p^*(\mathbf{s}_p'), y_k', h_k', a_k + 2).$$

Transfers from parents increases 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 2 the adjustment costs incentives kids to overconsume housing. The kid takes into account how her choices affect the parent's state and 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 solution of the equilibrium stage game. 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:

$$\begin{aligned} V_p(\mathbf{s}_p) = \max_{c_p, b_p, h_p, t_p} \; & u(c_p, h_p) + \eta u\left(c_k^*(\mathbf{s}_k), h_k'^*(\mathbf{s}_k)\right) + \beta \mathbb{E}\left[V_p(\mathbf{s}_p')\right] \\ \text{s.t.} \quad & b_p = x_p + w_p - c_p - t_p - p h_p' - adj(h_p, h_p') \\ & x_p' = b_p'(1 + r(b_p') + p' h_p'(1 - \delta) \\ & t_p \geq 0, b_p' \geq -LTV \times p h_p. \end{aligned} \tag{19}$$

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

The parent moves first and takes into account how its choices will affect the choices of the kid in the second stage. We see that 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 observed an owning kid that will sell his house without transfers. However, the parent can avoid this by transferring sufficient funds to keep this house-rich but cash-poor kid in the house.

4.3 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 the $\mathcal{S}_p$ the associated Borel-σ 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 $\mathbf{s}_p$, and let Ψ_p denote the corresponding cumulative distribution function. The mass of households for each age is normalized to 1/15. Let $\psi_p(s_p)$ denote the distribution of households after shocks are realized but before choices are made.

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 times the probability of that specific income shock

$$\psi(\mathbf{s}_p') = \int_{\mathbf{s}_p \in \mathcal{S}_p} \mathbf{1}_{\left\{x_p' = x_p'^{*}(\mathbf{s}_p)\right\}} \mathbf{1}_{\left\{h_p' = h_p'^{*}(\mathbf{s}_p)\right\}} \mathbf{1}_{\left\{x_k' = x_k'^{*}(\mathbf{s}_k(\mathbf{s}_p))\right\}} \mathbf{1}_{\left\{h_k' = h_k'^{*}(\mathbf{s}_k(\mathbf{s}_p))\right\}} \times \pi(y_k'|y_k)\, \mathrm{d}\psi(\mathbf{s}_p). \tag{20}$$

Note that $\mathbf{s}_k(\mathbf{s}_p)$ denotes the kid's states after the parent have made their decisions, and is therefore a function of the parent's state and thus also their policies $h_k'^{*}(\mathbf{s}_k(\mathbf{s}_p)) = h_k'^{*}\left(b_p'^{*}(\mathbf{s}_p), h_p'^{*}(\mathbf{s}_p'), x_k' + t_p'^{*}(\mathbf{s}_p'), y_k', h_k', a_k + 2\right)$

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.

$$\psi(\mathbf{s}_p'; a_k = 25) = \int_{\mathbf{s}_p \in \mathcal{S}_p} \mathbf{1}_{\left\{x_p' = x_p^{*}(\mathbf{s}_p) + x_k^{*}(\mathbf{s}_k(\mathbf{s}_p))\right\}} \mathbf{1}_{\left\{h_p' = h_p^{*}(\mathbf{s}_p)\right\}} \mathbf{1}_{\left\{h_k' = h_r\right\}} \times F(x_k', y_k'|x_k, y_k)\, \mathrm{d}\psi(\mathbf{s}_p; a_k = 53), \tag{21}$$

where we limit 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, we define a function $\mathcal{H}$ that operates on the distribution $\psi(\mathbf{s}_p)$ and policy functions and maps it into a new distribution in accordance with equations (20, 21):

$$\psi_{n+1} = \mathcal{H}(\psi_n, g^*), \tag{22}$$

where the subscript denotes the iteration of the distribution. A stationary distribution is then a fixed point of equation (22).

4.4 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 $c_k'^*(\mathbf{s}_k)$, $b_k'^*(\mathbf{s}_k)$, $h_k'^*(\mathbf{s}_k)$ and $c_p'^*(\mathbf{s}_p)$, $b_p'^*(\mathbf{s}_p)$, $h_p'^*(\mathbf{s}_p)$, $t_p'^*(\mathbf{s}_p)$, and a distribution of households $\psi(\mathbf{s}_p)$ such that:[16]

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

4.5 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

[16] In section 6.3 I additionally include endogenous supply of owner-occupied units, where the supply depends on the price p.

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 2 for 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 et al., 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. Imagine a child that would benefit from owning, but he 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 it receives transfers. This channel increase 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 this period will either have low non-housing consumption or will sell his 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. I explore this mechanism in detail in 2, and show that it exists under general conditions.[17]

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 disproportionally 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.

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

5 Parameter Selection

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

[17] While not the focus of this paper, the fact that housing is illiquid may also benefit parents, as they can hold more wealth in illiquid housing, and thus increase the costs of transfers. Barczyk and Kredler (2020) study a similar effect, driven by a preference shifter for owning among retired parents. Homeowning parents increase kid's incentives to provide long-term care so that the parent remains in the house, which the kid eventually inherits.

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.

5.1 Parameters Chosen Independently and Externally

All externally calibrated parameters and values are summarized in Table 2.

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 and shocks. To find the deterministic component, 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 the average income by age on a fifth-order polynomial. I use the predicted values from this regression as the life-cycle income. To find income after retirement l_r, I find the average predicted income for households aged 65 or more, and divide it by the predicted income at age 63. Income for households aged 65 or more is then set be the income at age 63 multiplied by this ratio. Figure A9a displays the data and predicted values.

To find the values for the stochastic productivity shifter for kids $y_{i,a}$, 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 age-dependent transition matrices, plotted in Figure A9c. To find the values $v_{i,a}$ for each tertile, I first 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 A9b.

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 find $N_k^x = 4$ quantiles for wealth and the N_y productivity tertiles for households aged 25. For the parents, I divide them into $N_p^x = 4$ quantiles for each of the $N_v = 3$ 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 et al. (2008). Housing deprecation and maintenance δ is set to 0.05 to match depreciation of existing housing capital as estimated in Harding et al. (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 average LTV ratio at loan origination for prime mortgages from Freddie Mac. The risk free rate is set to be $r^f = 0.04$.

5.2 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 estimated from the PSID using all waves from 1999 to 2017, and are listed in Table 4 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 aid identification of 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

Table 2: Summary of Externally and Independently Estimated Parameter

Parameter		Value	Source
Period Length	–	2 years	PSID Frequency
Rental Price	q	0.10	Standard
Deprecation	δ	0.05	Standard
Risk-free Rate	r^f	0.04	Standard
Expenditure Share Housing	ϕ	0.175	Standard
Rental Size	h_r	1.0	Normalization
Max Loan-to-Value	LTV	0.8	Standard
Initial Distribution	$F(x_{53}, v_{53})$	Fig. A9d	PSID
Deterministic Income	l_a	Fig. A9a	PSID
Productivity shocks for Kids	$y, \Pi(y'\|y)$	Fig. A9b,A9c	PSID
Selling & buying cost	(κ_s, κ_b)	(0.075,0.02)	Yang (2009)

Note: Rental price q, deprecation δ, and the risk free rate r are bi-annualized (two-year values). All moments estimated from the PSID use waves from 1999-2017.

are important for altruism intensity η and the discount factor β: 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 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, and so matching the middle of the wealth distribution is pertinent. The wealth accumulation of young households is decreasing in the altruism intensity as they then receive larger transfers.

I target two moments directly related to housing: the homeownership rate of young households (49.4%) and rent to income for young renters (0.23).[18] 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

[18] Rent-to-income values outside $(0, 1)$ are coded as missing.

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 over house values in the period households are first observed as homeowners. Age at purchase is similarly defined.[19] 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 strongly 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 χ.

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 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 as the two period model highlights the role of future transfers in increasing the relative benefit of owning. Further details about the estimation of transfer moments are in Appendix C.1. These moments are important to ensure that the frequency and magnitude of transfers are correct. The transfer rate pins down the altruism intensity η. The transfer rate around purchase is most informative about the price level, as a too high price level means that homeowners are too wealthy relative to their parents to receive transfers.

[19]LTV's above 1 are coded as missing. We 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.

Table 3: Estimated Parameters

	Parameter	Value	Std. Err.	Ident. Moment
β	Discount Factor	0.925	0.004	Median Wealth (55-74)
η	Altruism	0.457	0.068	Parent Transfers (55-74)
χ	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)

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

5.3 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

$$\hat{\theta} = \arg\min \sum_{j=1}^{8} \frac{(m_j^d - m_j^e)^2}{m_j^e}, \tag{23}$$

where the squared distance of each moment is normalized by its empirical mean. The parameter vector that minimizes the objective (23) is the approximate global optimizer. I use this vector as the starting point for a local optimizer that uses a simplex algorithm to the find the local minimum. In Appendix F.1 I show how this method allows us to easily verify that each parameter is identified and how each moment is affected by the different parameters.

The estimated parameters are reported in Table 3 and are in line with previous literature and their direct empirical counterparts. The main preference parameters β and η are in line with estimates in related papers (e.g., Boar 2018; Daruich 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

Table 4: 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

Note: 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.

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. However, standard theory suggests that one-period bonds without default commands a lower interest rate. The owner-occupied size is 3.12, relative to a rental size normalized to 1. Finally, the price is estimated to be \$81,966 in 2015 dollars per housing unit or \$255,734 for an owner-occupied house. In the PSID the average market value of owner-occupied units among households aged 25-44 is \$232,918.

Table 4 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 transfer moments are also least precisely estimated since they only use data from a single wave of the PSID.

5.3.1 Identification of Parameters

I now provide a brief argument for why at least one moment is informative for each parameter. The arguments are augmented by identification plots in appendix F.1. We know that wealth accumulation is strongly affected by the discount factor β. The transfer rate identifies the strength of altruism η since higher altruism increase transfers. The age of first purchase decreases when the preference shifter χ 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 delays ownership. The model is highly non-linear, and all parameters influence at least one moment.

5.4 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 3.4.

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 gets this ratio right at 2.49. The value of the parental wealth gradient will be one of the main outcomes of interest in counter-factual exercises and positive policy analysis.

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

Table 5: 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
$Prob(NewOwner \vert t_p > \$5000, Controls)$ $-Prob(NewOwner \vert t_p \leq \$5000, Controls)$	(0.03-0.08)	0.07

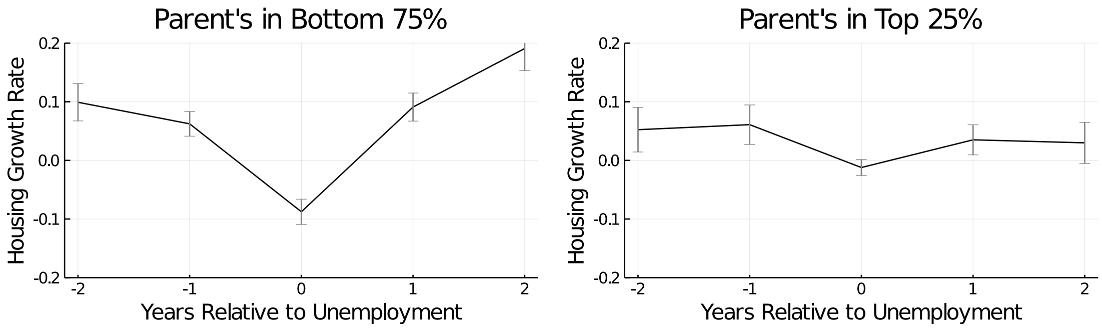
Note: All moments calculated from the 1999-2017 waves of the PSID, using households aged 25-83. Wealth is measured in 1000s of 2015 US Dollars. The last row reports the regression results from Lee et al. (2018) and the simulated panel (see discussion in the main text and section F.3 for details).

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 et al., 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 et al. (2018), Tables 7-8. These regressions use a linear probability model to estimate the effect of receiving a transfer over \$5000 on the probability of becoming a homeowner in the PSID and the HRS.[20]. 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.

[20]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 F.3. These results should not be interpreted causally, for example, households may receive transfers specifically because they are buying a house.

Figure 7: 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.

As a final external validation, I show that the model replicates the reduced-form evidence from the event study in Section 3.4 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 7 shows the results. We see that the simulated model matches both the qualitative and quantitative patterns from the empirical sample (Figure 5). Households with non-wealthy parents decrease housing consumption by 7% and 9% in the simulated data and the empirical data, 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.

6 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 (without intergenerational interactions).

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 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. Moreover, I wrap up by showing that the results are not sensitive to an endogenous housing supply for any supply elasticity.

6.1 Results with Constant Prices

Table 11 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, for example 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 driven not by a wealth effect but that homeownership is less attractive without

Table 6: Homeownership Decreases while Wealth Increases Without Altruism

Moment	Data	Altruism $\eta > 0$	No Altruism $\eta = 0$
Targeted Moments			
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
Non-Targeted Moments			
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

transfers. Third, transfers, not intergenerational persistence in productivity, is the main driver behind the correlation between parent wealth and housing outcomes.

6.2 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) income uncertainty. The LTV requirement accounts for 19%, illiquidity for 39%, and income risk for 95% of the effect. The results are reported in Table 12.

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 6% of the homeownership rate when there is no downpayment requirement. The LTV friction accounts for $\frac{0.06}{0.31} = 19\%$ of the parental transfer effect. LTV requirements increase the role of parent wealth since transfers relax borrowing constraints.

Making housing liquid: Housing is liquid when $m_s = m_b = 0.0$. 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. Thus, the illiquidity of housing accounts for 39% 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 and 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 7.2 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. Parental transfers thus account for 1% of the homeownership rate, and uninsurable income risk accounts for 95% of the parental transfer effect in homeownership of the young.

6.3 Endogenous House Prices

In this section, I show that the decrease in homeownership rates without parental transfers remains even when the supply and prices of owner-occupied housing is endogenous. 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.[21]

[21]

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

$$\ln H^S = \alpha_0 + \alpha_1 \ln p, \tag{24}$$

where α_1 is the aggregate elasticity of supply to prices, and H^S denotes the level of supplied housing. Letting $\alpha_1 \to \infty$ yields a perfectly elastic supply function which keeps the prices constant, which is the same experiment as in the main quantitative exercise 11. When $\alpha_1 = 0$, housing supply is inelastic and price must be such that the aggregate homeownership without altruism equals the one with altruism. The benefits of this approach is its transparency and agnosticism on the drivers of housing supply changes. I report results when house prices are perfectly inelastic, perfectly elastic, and one intermediate case with an elasticity of 5.[22]

I calibrate the housing supply elasticity from equation (24) as follows. For each elasticity α_1, I set α_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 3. We can then, for any supply elasticity α_1, find the outcomes when house prices are allowed to adjust. Table 7 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 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

It is also important how rental rates κ 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 et al., 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.

[22] I use twice the long-run elasticity estimated in Aastveit et al. (2020) to allow for more adjustment as I ignore other equilibrium effects.

Table 7: Housing Supply Elasticities Not Important

Moment	Altruism Benchmark	Without Altruism Elastic	Middle	Inelastic
Aggregate Moments				
Supply Elasticity		∞	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
Targeted Moments				
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

experiment, with elastic supply, transfers account for 15 percentage points of the homeownership rate. With inelastic supply, transfers still account 11 percentage points of the homeownership rate.

7 Policy, Illiquidity, and Parental Wealth

7.1 Policies and the Importance of Parental Transfers

Policy 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; Mabille, 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 following procedure. I solve the model with one policy change, where the policy change is only relevant for households aged 25-43.[23] 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.

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 two-period model and 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%.

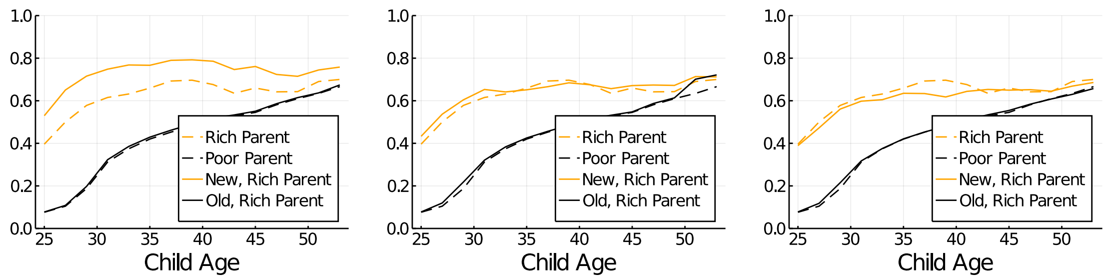
7.1.1 Easier to Buy: Parent Wealth More Important

Table 8 reports all results, while Figure 8 plots the homeownership rates of young households by policy change and parent's wealth. First, increasing the LTV increases homeownership rates among the young by 6pp (12.5%) by increasing LTVs and mortgage debt while decreasing wealth at purchase. However, the parent wealth gradient also increases and parents of owners are now 3.36 times richer than parents of renters. Relaxing the LTV constraint increases homeownership among households

[23] 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.

Figure 8: Effect of Policy Changes on Homeownership by Parent Wealth

(a) Higher LTV (b) Lower Purchase Cost (c) Lower Sales Cost



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

whose parents' wealth was above (below) median wealth of parents by 12 (1) percentage points.

Policies that decrease purchasing costs m_b increases homeownership rates only by 1 percentage points. 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. As a result, the parent wealth gradient is unchanged.

The last column of Table 8 reports the result when the sales cost is decreased (housing is made more liquid) and we see that the homeownership rate decreases. How can it be that reducing a friction on owner-occupied housing decreases the benefits of owning? The effect is driven by selection into ownership: homeownership among kids with wealthy parents decreases by 3 percentage points and the parent wealth gradient falls to 2.27. However, homeownership among households with poor parents increases by 1 percentage point, leading to a net decrease of 1 percentage point.

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

Table 8: Evaluating the Impact of Policies on Parent Wealth Gradient

Moment	Benchmark	LTV 0.85	$m_b = 0.0$	$m_s = 0.055$
Targeted Moments				
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
By Parent Wealth				
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

Note: All experiments start with the stationary distribution. I then use policy functions from the one parameter is changed 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.

credit constraints effectively 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 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.

7.2 Which Households Prefer Adjustment Costs?

We have just seen that sales costs make housing more attractive for some households with wealthy parents. We found a similar result in the two-period model, where the existence of adjustment costs can be welfare improving for poor kids with wealthy parents. However, the stylized model has several unattractive assumptions, namely no income, no income risk, and an unrealistic housing market. I now verify that the same result holds in the quantitative model with these features. First, I take the

Table 9: Household Observables and Support for Keeping Adjustment Cost

	Dislike Costs	Prefer Costs	All
%	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

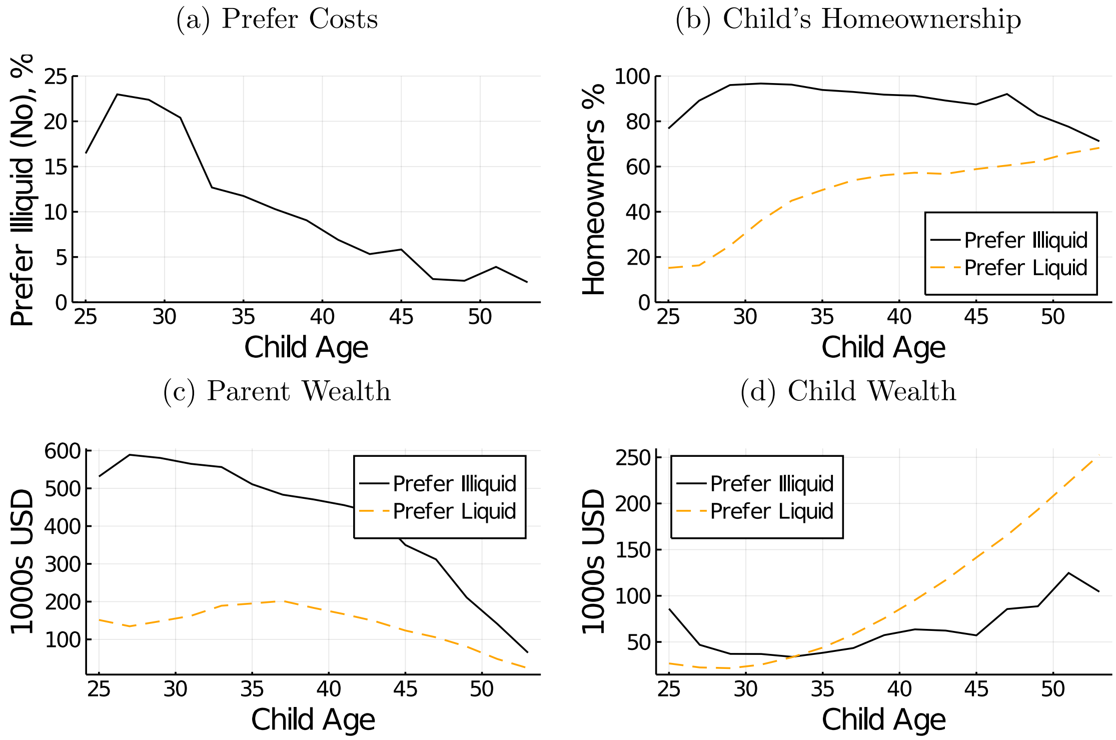
Note: Only includes dynasties where the child household is aged 25-44. Wealth is measured in 1000s of 2015 US Dollars.

benchmark stationary distribution. I then see how many kids prefer that children in their own dynasty do not face sales costs $m_s = 0$ in the future. This hypothetical is thus equivalent to each child answering whether they would prefer that a benevolent agent enters the economy and promises to pay the sales cost for all children in the dynasty forever. Parents always prefer their childrens' housing to be liquid.

Table 9 breaks down the characteristics by whether the child supports the elimination of adjustment costs. First, we can see that 11% of kids prefer to keep sales costs. These kids are slightly richer than those who do not. The most dramatic difference between the two groups is parent wealth: the parent's 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. Even though they are wealthier, they 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 9a 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 9b plots the homeownership rate among households by their liquidity preference. We see that among the young households who prefer illiquidity, almost all are homeowners. Figure 9c plots parent wealth by the child's liquidity

Figure 9: Liquidity Preference over Age



preference. We see that households who prefer illiquidity have wealthy parents and that this relationship is stable over time. Finally, panel 9d 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. Why are they initially wealthier? They can 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) to induce transfers.

8 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 15pp (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 result is robust to parameters and market (in)completeness.

The first contribution of the paper is to study and quantify the role of parent inter-vivos transfers to 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 contributes 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 et al., 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 do not only flow to borrowing constrained households, but also liquidity constrained.

I made several simplifying assumptions to keep the model tractable. Incorporating richer housing dynamics would allow us 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, increasing wealth of parents who own, in turn increasing transfers. 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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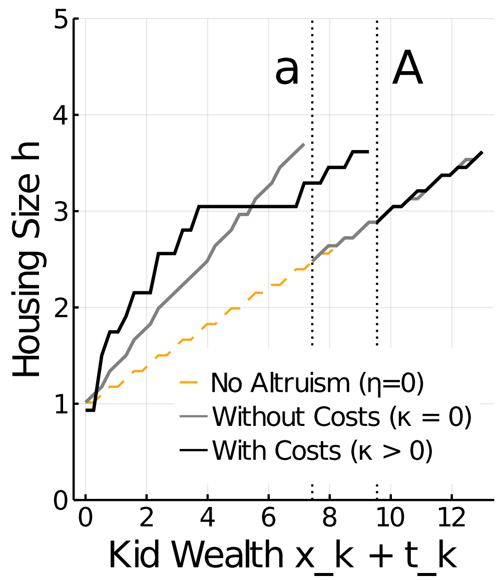
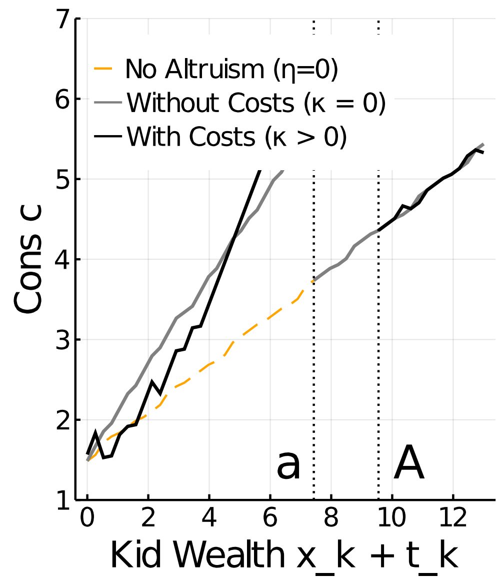
Figure A1: First Period Kid Choices

(a) Period 1 Housing h_k



(b) Period 1 Consumption c_k



Note: 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).

A Details for the Two-Period Model

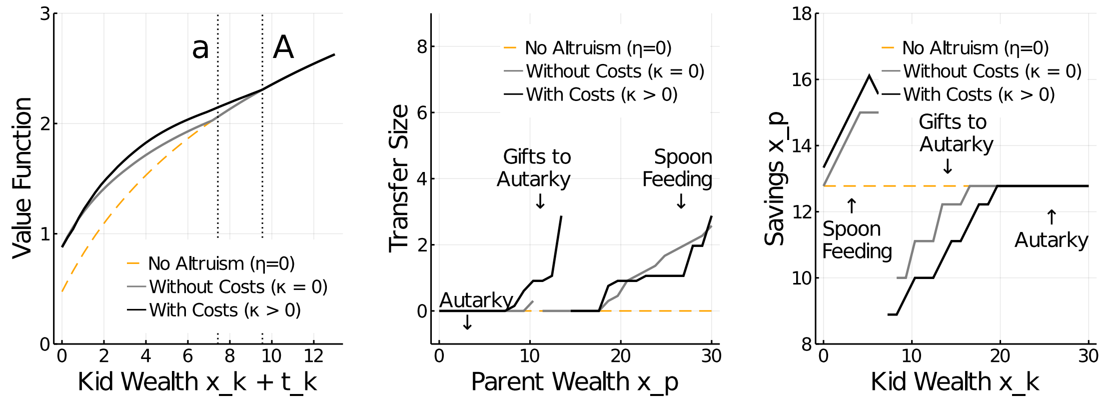
A.1 Full Set of Policy Rules without Commitment

In the first-period problem we saw that the gifts the kid expects to receive can be increasing in cash-on-hand. Figure A2a 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.

Figure 2c 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 A2b. With adjustment costs, spoon-feeding transfers

Figure A2: First Period Parent Choices

(a) Period 1 Value Fun. $V_k()$ (b) Transfer $t_p(\bar{x}_p, x_k)$ (c) Savings $x_p(\bar{x}_p, x_k)$



Note: 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.

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 A2c plots the savings policy, and we see that adjustment costs also have a non-monotone effect on parent's savings.

A.2 Further Details on Welfare Improves of Adjustment Costs

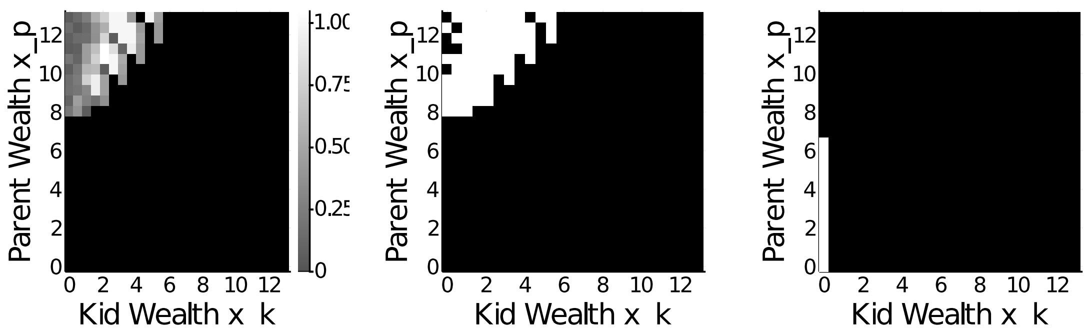
A.2.1 When do Kids Prefer Adjustment Costs?

It turns out that at any initial allocation, lifetime transfers are weakly larger with adjustment costs, as shown in figure A3a. Interestingly, this is true also for regions that generate spoon-feeding transfers (figure 2c) 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

Figure A3: Effect of Adjustment Costs on Life-Time Transfers and Utility

(a) Life-Time Transfers (b) Kids Prefer Costs (c) Parents Prefer Costs



Note: The intensity of the life-time transfer A3a denotes how much larger the transfer is with adjustment costs. Solid black denotes areas where the transfers are identical. In figures A3b,A3c black denotes where the household is indifferent and white where it strictly prefers adjustment costs.

there are no transfers (black areas of figure A3a), 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 A3b 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 A3c.

A.2.2 Are the Results Robust to Parameter Values?

Figure A4 repeats the exercise from the previous section under different parameter values of risk aversion γ, altruism η, and expenditure share on housing ξ. 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 A4a plots the results under the benchmark parameterization. The second panel plots the results with higher risk aversion γ A4e. An increase in risk aversion also increases the desire to smooth, and so parents transfer more to their kids (eq. 7), which increases the region where kids prefer adjustment costs. Next, panel A4f plots the result with higher altruism η. As transfers increase, the region where kids prefer costs grows. Finally, I increase the expenditure share on housing ξ. 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.

Table 10: Variable Definitions in the PSID

Variable	PSID code	Description	Note
Transfer Related			
Wheter Rcved Transfer	ER67962	2/5years, gift/inherit $10,000+	Changing def.
Transfer given	RT13V125	Money/loans/gifts to child in 2012	2013 prnt/chld file
Transfers	RT13V125	Amount given in 2012	2013 prnt/chld file
Other			
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	

B Data Appendix

B.1 Variable Definitions (PSID)

Table 10 lists the most important variable definitions from the 2015 PSID wave.

B.2 Event Study Deails

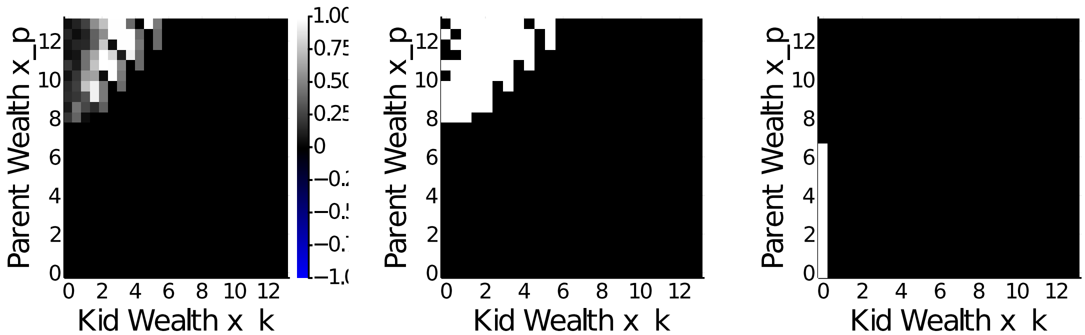
In the end, the sample consists of 2,200 non-missing log growth rates of housing consumption with 974 unique households. Means and standard errors are constructed using family weights.

In figure A5, 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.

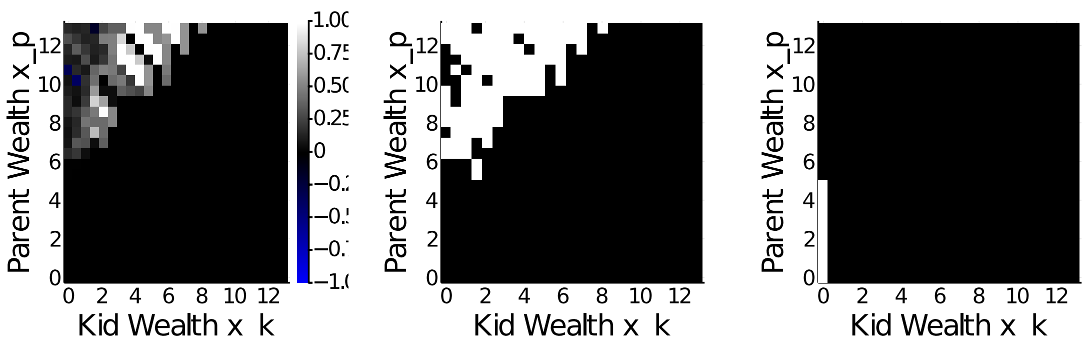
Figure A4: Stylized Model: Sensitivity Parameter Values

(a) Benchmark: $\gamma = 1.2, \eta = 0.5, \xi = 0.4$

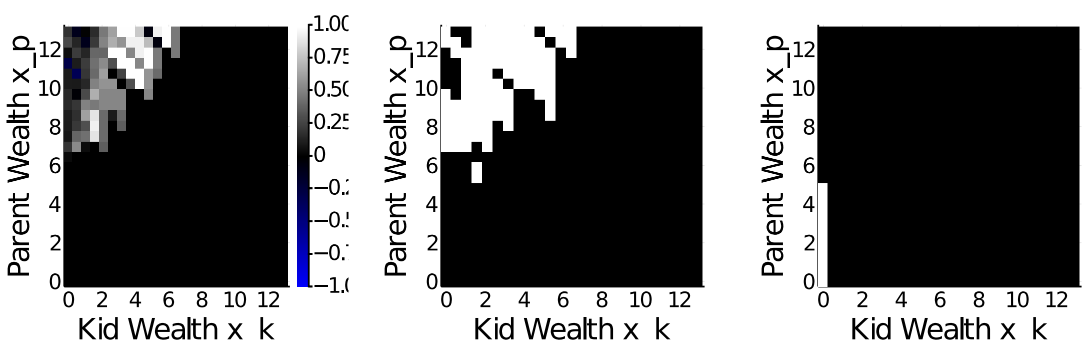
(b) Life-Time Transfers (c) Kids Prefer Costs (d) Parents Prefer Costs



(e) Higer Risk Aversion $\boldsymbol{\gamma = 1.5}, \eta = 0.5, \xi = 0.4$



(f) Lower Altruism $\gamma = 1.2, \boldsymbol{\eta = 0.6}, \xi = 0.4$



(g) Lower Weight on Housing $\gamma = 1.2, \eta = 0.5, \boldsymbol{\xi = 0.5}$

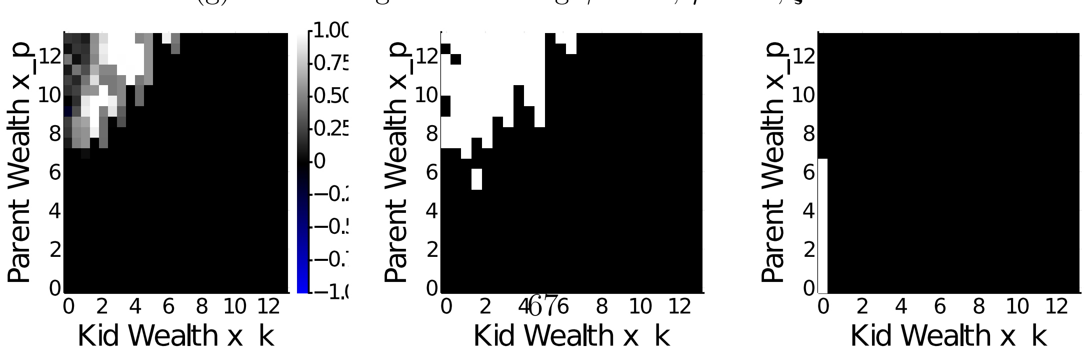
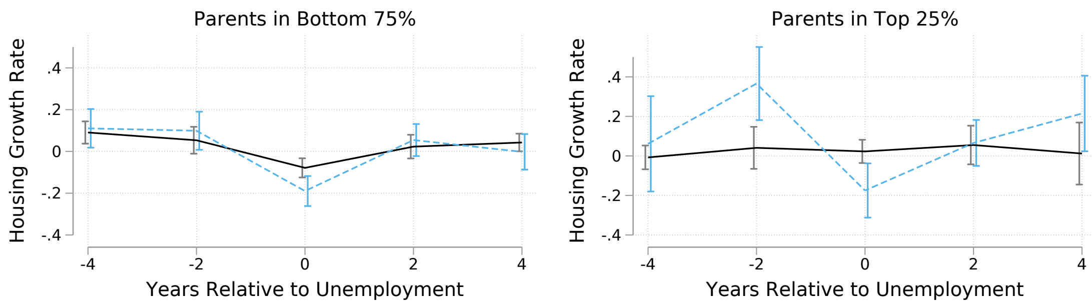
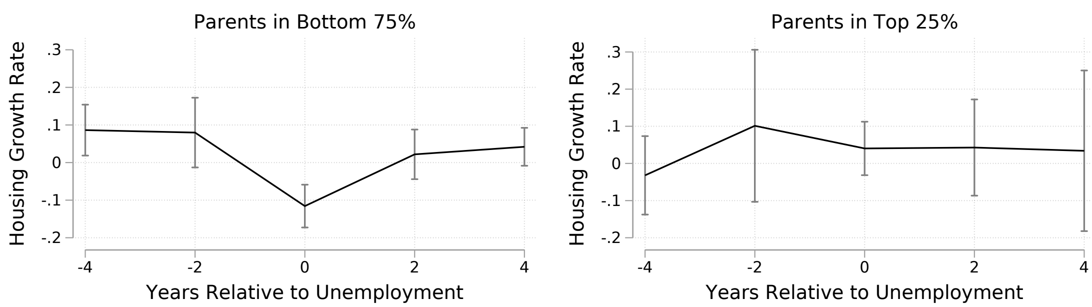


Figure A5: Event Study: Housing Consumption at Unemployment by Parental Wealth

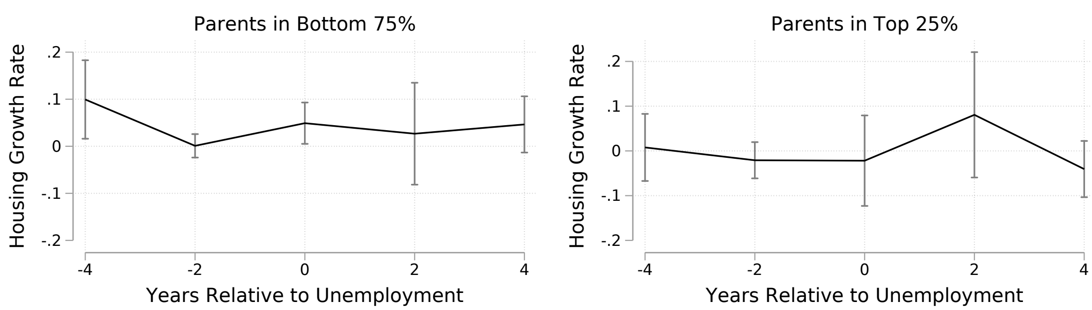
(a) Renters and Owners: Housing and Food Consumption



(b) Renters



(c) Owners



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.

C Quantitative Model Details

C.1 Calculation of Transfer Moments

The 2013 wave of the PSID includes a more detailed transfer module that I use to calculate transfer moments.[24] However, this question only includes information 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.[25]

C.2 Complete set of Decision Problems

C.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 κph instead of the market value ph, iii) households bring no housing wealth to next period, and iv) the borrowing constraint becomes a no-borrowing constrant. The kid's problem becomes

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

[24] 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 inheritance.

[25] 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.

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

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

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

where $k, 53$ and $p, 53$ denotes the variables associated with old kid (new parent) and the 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.

C.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 θ 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:

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

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.

D Robustness Exercises

D.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:

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

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 et al., 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 A6a. The shock is transitory, and the PDF $\Pi(\nu)$ takes the value 1/3 for any outcome.

The results are reported in table 11. 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.

D.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

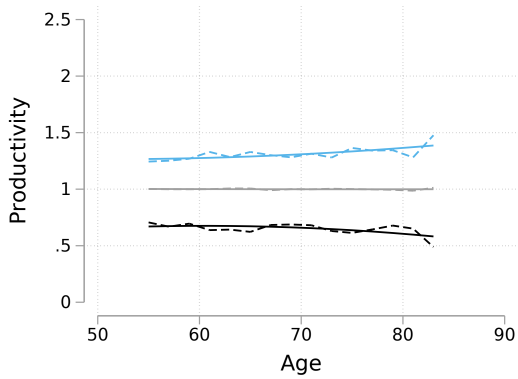
$$\Pi(z'|z) = \begin{bmatrix} 0.90 & 0.10 & 0.00 \\ 0.02 & 0.96 & 0.02 \\ 0.00 & 0.25 & 0.75 \end{bmatrix}. \tag{25}$$

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 3. 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 11. We see that the introductino 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.

Figure A6: Calibration of Robustness Exercises

(a) Income Productivity $\nu_{i,a}$



Note: 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 11: Results Robust to Old-Age Risk and Uncertain House Prices

		Benchmark		Old Risk		Price Risk	
Moment	Data	$\eta > 0$	$\eta = 0$	$\eta > 0$	$\eta = 0$	$\eta > 0$	$\eta = 0$
Targeted Moments							
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
Non-Targeted Moments							
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

E Numerical Solution Algorithm

E.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 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.

F Estimation

F.1 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 23). 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.

F.2 Identification

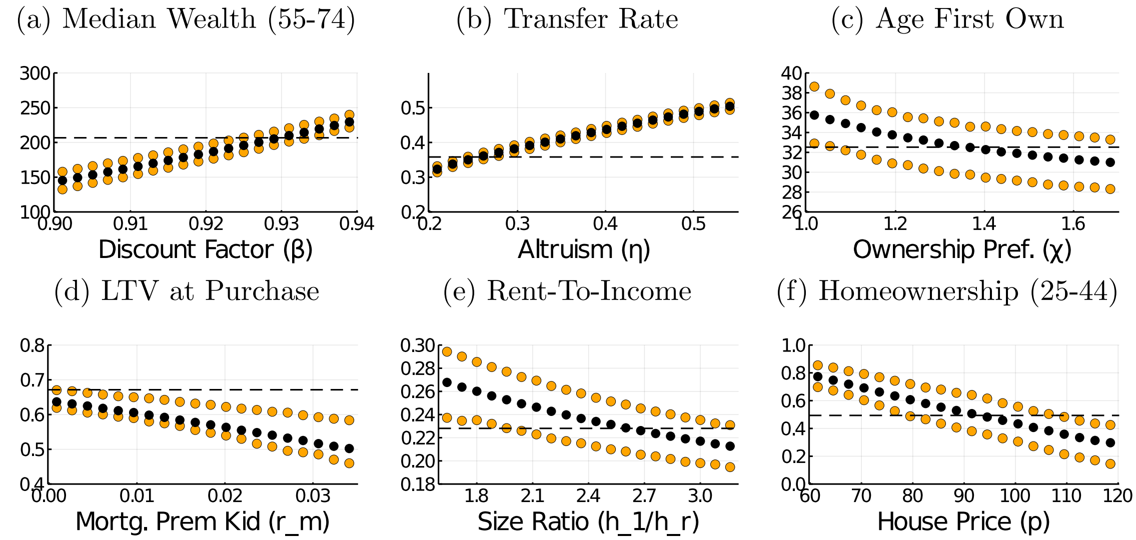
The global optimization procedure lends itself to verifying identification. After solving the model for N_s parameter vectors and finding the simulated moments, one can do the following procedure for all moments and parameters. First, pick a parameter, say β, and divide it into 20 quantiles. Within each quantile of β, 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 β. We can then show how the transfer rate depends on β, by plotting the percentiles within each quantile of β. One can think of this procedure as taking the (numerical) partial derivative of the transfer rate with respect to β, 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 A7 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 β in figure A7a. In figure A7b, we see that the transfer rate is very informative about the altruism intensity parameter η. We can see that ownership preference shifter χ 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 η affects all moments (figure A8). First, median wealth is initially strongly decreasing altruism as households decrease savings to receive more transfers. Altruism also slightly decreases the wealth of 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.

Figure A7: Identification of parameters



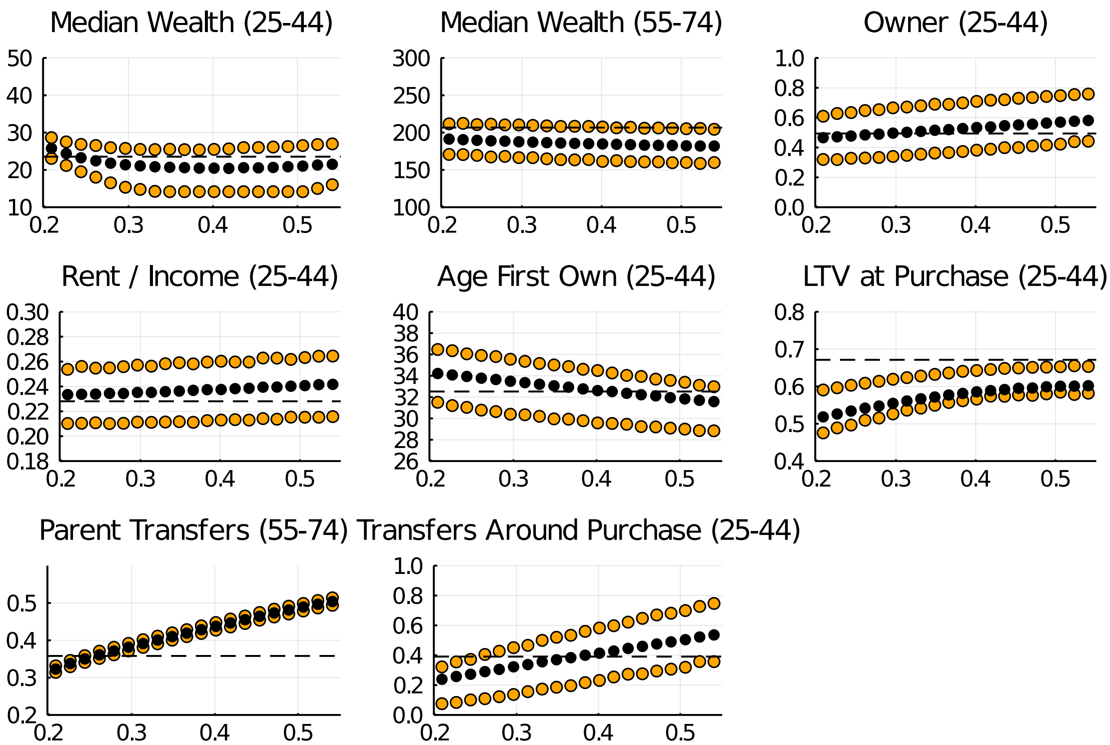
Note: Dashed line is the moment's empirical value. Yellow and black dots denote the 25th, 50th, and 75th percentile of the empirical moment for each quantile of the parameter, keeping the distribution of other parameters constant.

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

F.3 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

Figure A8: Identification of Altruism η



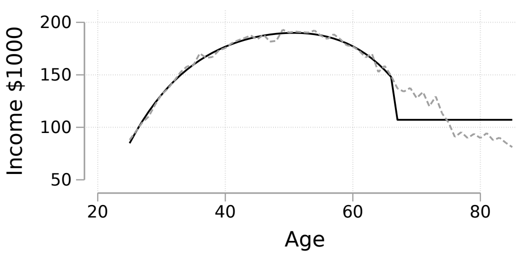
Note: Dashed line is the moment's empirical value. Yellow and black dots denote the 25th, 50th, and 75th percentile of the empirical moment for each quantile of the parameter, keeping the distribution of other parameters constant. The x-axis denotes values of η and the y-axis the moment.

(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'.

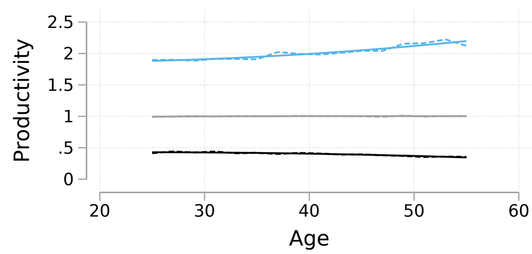
G Supplementary Figures and Tables

Figure A9: Calibrated Income Process

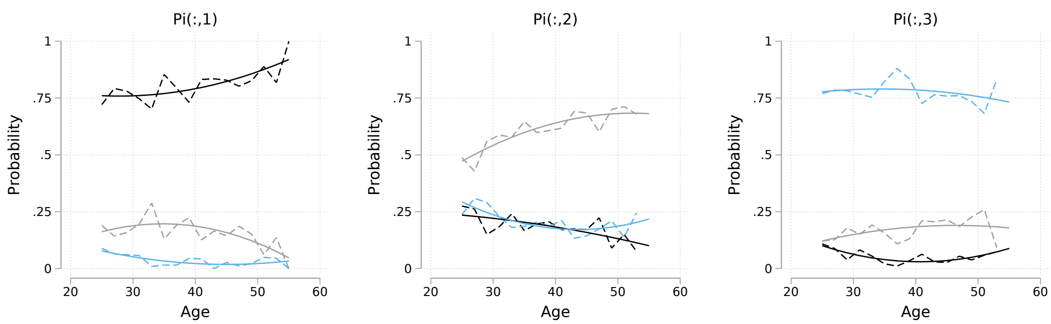
(a) Deterministic Income Profile y_a



(b) Productivity Shifter $y_{i,a}$

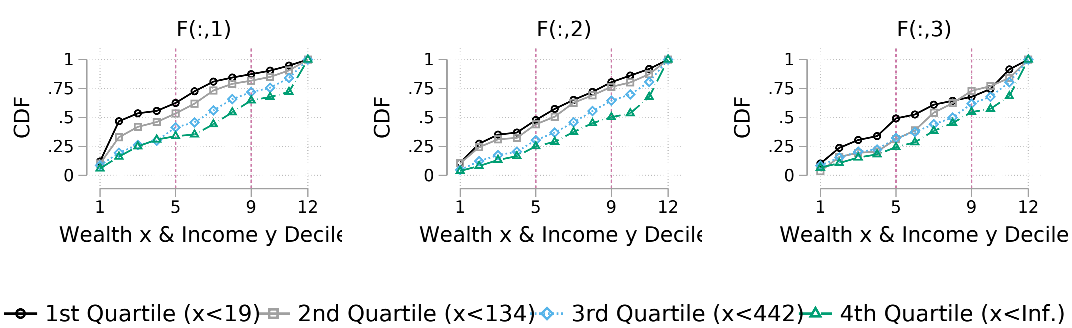


(c) Age-State Dependent Transition Probabilities $\Pi(y_{i,a+2}|y_{i,a})$



Note: 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}



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

Table 12: Effects of Risk and Borrowing Constraints on Homeownership

	Benchmark		No LTV		Liquid Housing		No Income Risk	
Moment	Altr	No Altr	Altr	No Altr	Altr	No Altr	Altr	No Altr
Targeted Moments								
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
Non-Targeted Moments								
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

Note: Results using the *bench*mark model (4), 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 13: Descriptive Statistics (Means), Households Aged 20-44

Demographics	Population		Single		Married		Renter		Owner	
Receiver	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
Age	25-28		29-32		33-36		37-40		41-44	
Receiver	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
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	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

Note: Data from the PSID Transfer, Individual, and Family modules. Weighted using family weights. Dollar values in 1000s 2016 USD.

Table 14: Descriptive Statistics (Median), Households Aged 20-44

Demographics	Population		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

Note: Data from the PSID Transfer, Individual, and Family modules. Weighted using family weights. Dollar values in 1000s 2016 USD.