Homeownership and The Bank of Mom and Dad*

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Eirik Eylands Brandsås†

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Abstract

This paper studies the interplay of housing affordability, mortgage requirements, and parental downpayment assistance on housing outcomes. I build and estimate a quantitative model of altruistically linked overlapping generations with housing, where parents can give transfers to adult children. In a counterfactual world without altruistically motivated transfers, the homeownership rate among young (25-44) American households would be 8 percentage points lower. The marginal buyers are mostly low-income households with wealthy parents. The main friction that generates a role for parental wealth is adjustment costs, which make housing illiquid and riskier. Wealthy parents reduce the likelihood that kids must sell after purchase, making ownership more attractive. Finally, I find that tightening mortgage regulation increases intra-generational inequality but decrease inter-generational inequality in housing outcomes.

1 Introduction

This paper argues that transfers from parents who are alive to their adult children (*inter-vivos*) are important for first-time homebuyers. Parental transfers are more important when house prices are high, borrowing and mortgage constraints are tight, and for low-income households. However, a parent's capacity to transfer depends on their wealth, income, and whether they can tap into home equity. Thus young adult household's ability to become homeowners depends not only on their own characteristics but also on their parents'. Homeownership, and it's changing patterns, is a subject of great importance to economists for many reasons. Owner-occupied housing

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†University of Wisconsin-Madison. E-mail: brandsaas@wisc.edu.

represents the largest share of net worth for households in most developed countries. Housing and mortgage markets have multiple frictions. Access to housing and mortgages are limited by requirements such as loan-to-value constraints. Further, many public policies such as tax deductions are designed to encourage homeownership.

I build and calibrate a life-cycle model with overlapping generations, housing markets, and altruistic parents that can give non-negative transfers to their adult kids. I find that the homeownership rate of young American households (25-44) would be 8 percentage points lower, down from 49.5%, without altruistically motivated parental transfers. The possibility of future transfers reduces the downside risk of homeownership, and so households on the margins of buying become owners. Further, parents with kids against borrowing constraints transfer sufficient funds for their kids to become homeowners, as documented empirically (Blickle and Brown, 2019; Lee et al., 2018; Guiso and Jappelli, 2002).

I then show that a tightening of macroprudential policy increases inequality within generations but decreases intergenerational inequality in housing outcomes. When lending is more restrictive households who are close to bu are wealthier and have higher income, increasing inequality in housing outcomes. The increase in wealth and income reduces the probability that these households receiving transfers, decreasing the role of parental wealth in housing outcomes. Second, I show that policies that reduce adjustment costs in housing decrease both within and intergenerational inequality and increase homeownership rates.[1] Interestingly, I find that 8% of kids, all with wealthy parents, actually prefer to face housing adjustment costs. With adjustment costs, kids can commit to overconsumption and intra-temporal misallocation which the parent resolves by increasing transfers, making the kid better off. However, only 1% of parents prefer that their kids face adjustment costs. The kids of these parents have have low income and low wealth, and the adjustment costs increase the parent's ability to dictate their kids' consumption bundles.

In the model, which extends on Boar (2018), parents and their adult children overlap, and make independent economic decisions. Households are heterogeneous in their initial wealth, labor productivity realizations, idiosyncratic house return shocks, and which parent/child are in their family. This generates wide dispersion in wealth and homeownership across both households and dynasties. The model includes borrowing constraints for renters and homeowners, where (potential) homeowners face loan-to-value (LTV) requirements. The fact that households enter the economy when they are young, with low wealth and low income, means that they must save to be able to buy a house even though they may have high future income. However, parent households who are at the life-cycle peak of wealth may choose to transfer money to alleviate the borrowing constraints.

The inclusion of housing into a family altruism framework generates new mech-

[1]While taxes and mandatory fees are only part of adjustment costs, (which also include search costs, mortgage origination fees, realtor fees), there is ample room for policy. Since 2017 first-time buyers in the United Kingdom has received a partial exemption from stamp duties.

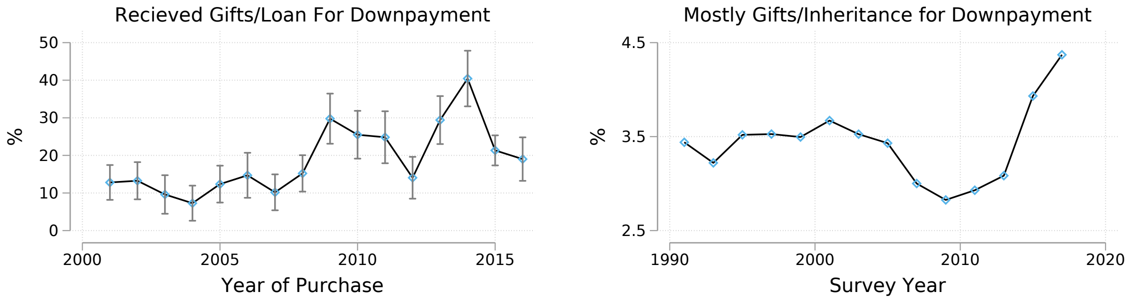
anisms relative to the existing literature (e.g. Altonji et al. (1997); Boar (2018); Barczyk and Kredler (2018); Chu (2020)). Altruistic transfers generally flow to households who face binding borrowing constraints in the absence of transfers. With housing and an LTV borrowing constraint even households with liquid wealth and current savers may face a binding constraint. This new transfer region helps to bring the model closer to the data, where we see parental transfers to kids with non-trivial levels of liquid wealth. In fact, liquidity constraints may affect as many as 82% of homeowners Boar et al. (2020).

Another novel mechanism is the interaction of adjustment costs and transfers. The effect of adjustment costs on risk aversion is well studied (Stokey, 2009; Grossman and Laroque, 1990). Chetty and Szeidl (2007) and Shore and Sinai (2010) build on the theoretical literature and focus on housing. They also test the predictions and find support for the theoretical mechanisms. I extend their theoretical frameworks to include parents and altruistic transfers as in Altonji et al. (1997). Using this stylized two-period model I show that households with wealthy parents are able to use adjustment costs, and the consumption commitments they entail, to take more risk in housing markets and receive larger expected transfers. I find that kid households with wealthy parents may in fact prefer an economy with adjustment costs to one without. Middle-class Parents with high-income kids may also prefer adjustment costs, as it makes it more costly for the kids to overconsume. In the calibrated quantitative model I find that 11% of kids and 7% of parents prefer that the kid household faces adjustment costs.

In the standard altruistic transfer model transfers arise to smooth consumption inter-generationally in response to income realizations. With housing, transfers arise for more reasons. First, they can be used to relax mortgage borrowing constraints. Second, transfers may be motivated by a desire to avoid one's offspring having to sell and pay adjustment costs. Third, the possibility of future transfers provide insurance against house price risk. These effects all increase homeownership rates. However, households know that if they become poor they may receive transfers from their parents, and so they save less. This overconsumption is a result of an implicit decrease in the return on savings. One dollar more of savings decreases the probability of receiving and the size of future transfers. As households build less wealth the likelihood of becoming a homeowner decreases, all else equal. The effect of altruism on housing outcomes is thus ambiguous.

Figure 1 shows the increased reliance on parental transfers in the US over the last three decades for homeowners. The left panel plots the share of US first-time homeowners who received loans or transfers from family and/or friends for the downpayment, by year of purchase. We can see that the fraction was relatively stable at around 8-15% from 2001 to 2008, but then increased to new levels around 15-40%. In the right panel we can see that the fraction of all homeowners who received the *majority* of the downpayment as a gift or inheritance by survey year, going back to 1991. Note that this is a snapshot of all homeowners in each year, and so includes

Figure 1: Time Trends in Transfers and Downpayments



Note: The left panel uses data from the Survey of Household Economic Dynamics. 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 American Housing Survey. 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.

households who bought many decades ago. The fraction was stable at around 3.5% between 1990 to 2005, followed by a quick decrease to 2% in 2009, and a large increase to 4.5% in 2017. Both graphs tell the same story: During the last ten years, the US has seen an unprecedented increase in the role of transfers from family members. Further, the changes cannot be explained only by the boom-bust in house prices in the 2000s, the relaxation and subsequent tightening of mortgage lending standards after 2005 or the low growth of young households' income after the crisis. While this paper focuses on the United States, similar trends, and in fact with even larger changes, are happening in many countries.[2]

1.1 Contributions to the Literature

This paper lies at the intersection of several strands of literature in Macroeconomics, Household Finance, and Finance.

There exists a large literature on macroeconomic models of insurance and transfer between generations within families owing back to Becker and Tomes (1979). The largest strands studies parental investment in their children's human capital and education (e.g. Lee and Seshadri (2019); Daruich (2018)). Another avenue has

[2]Parents contribute more than 50% of the total sum of downpayments in London, and 62% of homeowners under the age of 35 received help from parents or friends (Legal and General, 2019), while the 'Bank of Mum and Dad' is now the fifth-biggest mortgage lender in Australia **?**. Transfers for housing is the main reason for inter-vivos transfers in China, and the percentage of total transfers that were given for housing increased from approximately 30% in 2004 to almost 50% in 2015 (Lan, 2019). In Norway, 50% of all homeowners under the age of 30 received help from their parents (Revold et al., 2018).

been to study transfers from children to parents in retirement, focusing on health and long-term care (e.g. Mommaerts (2016); Barczyk and Kredler (2018)). Finally, using similar models and data, some papers study have focused on the risk-sharing within families, and whether the observed behavior is consistent with cooperative or competitive interactions, and varying forms of commitment (e.g. Altonji et al. (1997); Attanasio et al. (2018); Boar (2018)). In general, the finding is that there is only very limited risk-sharing within families across generations as predicted by the no-commitment model.[3] This paper contributes to this literature on three fronts. First, it is the first paper to my knowledge to include housing and inter-vivos transfers in a quantitative model.[4] Second, this paper's goal is to study transfers to young adults around the ages 25-45, while the previous literature has focused on transfers to adolescent kids or elderly parents. Third, the model studies the role of risky asset choices (housing).

The role of *inter-vivos* transfers on wealth accumulation and inter-generational wealth inequality has received less attention than the effects on specific outcomes such as education. One exception is Gale and Scholz (1994), who find that inter-vivos transfers are the source of at least 20% of private wealth. The closest papers to mine are De Nardi (2004) and Lee and Seshadri (2019). De Nardi (2004) explicitly studies wealth inequality due to end-of-life bequests but omits inter-vivos transfers. She finds that voluntary bequests can help explain persistence in wealth across generations. Lee and Seshadri (2019) study inter-generational transmission through education, but the kid and parent have no interaction after the age of 18. In a richer model De Nardi and Fella (2017) find that bequests are crucial determinants of savings and wealth inequality. The contribution to this literature is two-fold. First, I explicitly model inter-vivos transfers, and unlike Lee and Seshadri (2019) allow these transfers to happen throughout the life-cycle. Second, I include housing and mortgages, which acts both as a motive for transfers from parents and as an asset households use to build wealth.

This paper also contributes to the empirical literature on intra-family transfers, borrowing constraints, and housing choices. Engelhardt and Mayer (1998) finds that receiving households make larger down payments, buy larger houses, and slightly reduces the time spent saving for the purchase in the US. Guiso and Jappelli (2002) find that recipients buy larger houses, but no impact on savings time using Italian survey data. Lee et al. (2018), using US survey data, find that transfers increase the probability of house purchases, controlling for parent characteristics. Furthermore, they find that transfers became more important after the 2008 financial crisis and the tightening credit markets. Blickle and Brown (2019) find large effects of transfers on

[3] It should be noted that the no-commitment model fails the so-called Transfer-Income Derivative test (e.g. Altonji et al. (1997)). However, Chu (2020) shows that this failure is partly a result of misspecification.

[4] Barczyk et al. (2019) allow only retired households to buy instead of rent, and study how this housing decision alters the game between the caregiving child to parents in need of long term care.

the probability of transitioning from renting to owning in Switzerland. Further, they show that the effect is mostly driven the relaxation of the borrowing constraint, not wealth effects.[5] I contribute to this empirical literature by building the first model of endogenous inter-generational transfers and homeownership, and by quantifying the impact of these transfers of life-cycle outcomes. Additionally, using the model we can study outcomes beyond the house tenure decision, and also control for selection and other unobservable characteristics.

Further, the paper contributes to the literature on changing trends in homeownership rates across the population. Largely, this literature has focused on changes in marriage and aging. Fisher and Gervais (2011) studies the decline of homeownership rates among households aged 25-44 from 1980 to 2005, and find that the main driver has declined marriage rates and further an increase in earnings risk. Chang (2019) quantifies the contribution of changing patterns in marriage and divorce rates and finds that they can explain 29% of the decreased homeownership rates between 1970 and 1995 among single households. She finds that changing patterns in marital transformations had a minor impact on the homeownership rates since the 2000s. Khorunzhina and Miller (2019) study the role of female labor supply and fertility on the decline in homeownership rates due to delayed homeownership. They find that higher female wages led to delays in family formation which leads to later home purchases. Paz-Pardo (2019) studies the role of increased earnings risk for households born in the 1980s relative to those born in the 1940s on the changes in homeownership rates. Finally, Chetty and Szeidl (2007) and Shore and Sinai (2010) find that adjustment costs associated with housing affect household risk aversion. They find, empirically and theoretically, that households become more risk averse to small gambles but less risk averse to large gambles. This paper contributes on four dimensions to this literature. First, it focuses on a later time frame (the 1990s to 2015), after which the change in marital transitions and female labor supply has slowed down. Second, it contributes by studying the interactions of households in different generations in the same family, instead of interactions within a household. Third, I place a larger emphasis on the changes in the borrowing constraints. Many countries have since the financial crisis implemented a wide set of Macro-Prudential policies, of which many directly tightened the access to mortgages. Fourth, I study how adjustment costs affect the transfer decision, and how family resources may eliminate the welfare losses from transaction costs. In fact, in section **??** I show that kids with wealthy parents may even prefer to have adjustment costs.

[5] Halvorsen and Lindquist (2017); Kolodziejczyk and Leth-Petersen (2013) use Norwegian and Danish register data respectively, and find small/no effects of transfers on homeownership. However, these results must be interpreted with caution: While income and wealth are accurately measured in these sources, information on transfers is self-reported, certainly under-reported and largely unverified by the tax authorities.

1.2 Road Map

In section 2 I develop and solve a stylized two-period model of housing and parental transfers. In section 3 I describe the various data sources, sample selection, and discuss summary statistics. From the stylized model I also derive two simple tests on the existence of a parental wealth channel on kid's housing outcomes. Section 4 describes the quantitative model and section 5 discusses the structural estimation. The remainder of the paper is devoted to counterfactual exercises that quantify the role of inter-vivos transfers and parental resources life-cycle outcomes.

2 Two-Period Model of Altruism and Housing

In this section, I develop and solve a stylized two-period model with kids and parents without commitment nor cooperation. The model highlights that housing adjustment costs and housing illiquidity can increase parental transfers. Next, I introduce a commitment technology and solve the resulting family planner problem. Comparing the solutions with and without commitment I find that adjustment costs increase the commitment problem, since they allow kids to create future expenditure commitments that parents will help to pay.

2.1 Model Environment

I now describe the population, preferences, endowments, and technologies in the model. It 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 kids do not discount the future:

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

The parent derive utility over their own goods consumption in both periods but do not consume housing services. In addition they value their kid's utility weighted by the altruism parameter $\eta > 0$

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

Finally, I place to assumption one the kids utility function:[6]

A1: Limits for both goods: The first derivative of u approaches i) infinity at zero, and ii) zero at infinity.

A2: The marginal utility of food is non-decreasing in housing consumption.

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 a bond that does not pay interest ('pillow technology'). There is no borrowing.

Consumption and Housing Markets: Both households can choose any non-negative goods consumption, and kids can consume any non-negative amount of housing services. Consumption 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 to his 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. At the end of the second period both households die.

2.2 Solving the Game

The game is solved by backward induction, and yields a unique solution. The model's intuition is best understood from each household's optimization problems, while the decision rules highlight the strategic effects of altruistic transfers. I solve the model numerically using Cobb-Douglas Preferences with a risk aversion parameter of 2 and expenditure share on housing of 0.3.

2.2.1 Final Period: Kid

I now show how adjustment costs induces kinks in the marginal value of wealth for the kid. In the last period the kid decides how to allocate his resources $(x'_k + t'_p)$

[6] These assumptions allow for a wide class of utility function, 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 at assumption A2 precludes cases where goods and housing are perfect substitutes. Chetty and Szeidl (2007) contains a detailed discussion of the role of these assumption.

between housing and consumption.[7] The decision to move depends on the trade off between having an optimal consumption bundle and the adjustment cost required to reach that bundle. Let $V_{k'}(x'_k + t_p, h_k)$ denote the kid's second period value function. Then

$$V'_k(x'_k + t'_p, h_k) = \max \left\{ V^m_{k'}(x'_k + t'_p, h_k), V^0_{k'}(x'_k + t'_p, h_k) \right\}, \tag{3}$$

where the superscript $m, 0$ denote moving and not moving respectively. Under assumptions A1 and A2 households follow a strategy where they move only when disposable wealth is outside of two thresholsd s, S.

If households do not move, they spend all their disposable wealth on consumption (net of housing):

$$V^0_{k'}(x'_k + t'_p, h_k) = u(x'_k + t'_p - h_k, h_k)), \tag{4}$$

if households do move, they equate marginal benefits of consumption and housing:

$$V^m_{k'}(x'_k + t'_p, h_k) = \max_{h'_k \geq 0} u(x'_k + t'_p - h'_k - \kappa h_k, h'_k). \tag{5}$$

and the first-order condition equates the marginal benefit of increasing housing and goods consumption: $\frac{\partial u(c'^*_k, h'^*_k)}{\partial c'_k} = \frac{\partial u(c'^*_k, h'^*_k)}{\partial h'_k}$, where we use the superscript $*$ to denote optimal policy functions which are functions of the state variables. From the two problems (4), (5) we see that kids are only willing to pay the adjustment cost κ when the non-move allocation is far from the optimal intratemporal allocation. Thus households move if and only if wealth is outside the no-move region (s, S). The intuition for the thresholds is straightforward: If the kid wakes up with a large house, he must reduce food consumption dramatically to remain in the house. The large reduction in utility makes it optimal to pay the adjustment costs and achieve intratemporal optimality. At some point $(x'_k + t'_p = s)$ it is optimal to suffer some violation of intratemporal optimality to save the adjustment costs. A similar mechanism creates the upper limit of the no-move region S.[8]

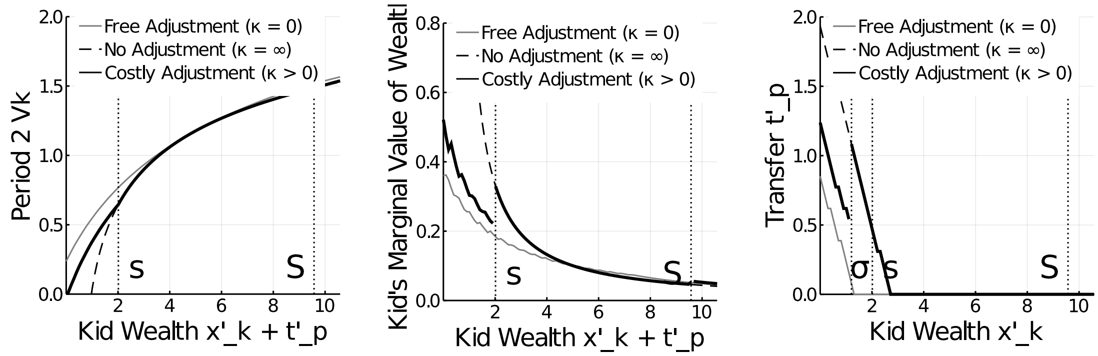
The no-move region (s, S) creates kinks in the kid's value functions. Outside of (s, S) the slope of the value function is given by the envelope theorem applied to $V^m_{k'}(\cdot)$, where households optimally balance housing and consumption. At the point s where households first remain in the house, the slope is given by the envelope theorem applied to $V^0_{k'}(\cdot)$. Here households do not equate marginal benefits of housing and consumption, and so the slope is higher as an increase in wealth move households

[7] 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.

[8] 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 2: Adjustment Costs and Second Period Outcomes

(a) Period 2 Value Fun. $V'_k()$ (b) Period 2 Slope. $\frac{\partial V_{k'}}{\partial(x'_k+t'_p)}$ (c) Period 2 transfer t'_p



Note: Vertical lines denoted s, S denote thresholds for staying in the current sized house. The vertical line denoted σ denotes the level of wealth the kid must bring into the period to stay in the house taking into accounts the gifts he then receives.

towards intratemporal optimality. The value function is plotted in figure 2a, which also shows the cases with free adjustment and infinite adjustment costs. The slope (figure 2a) 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 single 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

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. When the kid's value function is differentiable we obtain that transfers are pinned down by the slope of the kid's value function

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

where λ is the multiplier on the non-negativity of transfer constraints (lemma B.1 contains a detailed derivation). From (7) we see that transfers are weakly decreasing in kid's wealth when the problem is smooth. I solve the decision problem of the child parent numerically when the problem is non-differentiable.

Since the kid's marginal utility jumps at the kinks (figure 2b) the second period transfer policy t'_p also jumps. Figure 2c 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. Just below σ the parent does not give enough to keep the kid the current house. At σ, the gift jumps to a level where the kid remains in the 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

In the first period, the kid's states are disposable wealth and the parent's savings decision. He takes into account how his choices will affect the second-period transfer:

$$V_k(x_k + t_p, x'_p) = \max_{x'_k \geq 0, h_k \geq 0} u(x_k + t_p - x'_k - h_k, h_k) + V_{k'}(x'_k + t'^*(x'_p, x'_k, h_k), h_k). \tag{8}$$

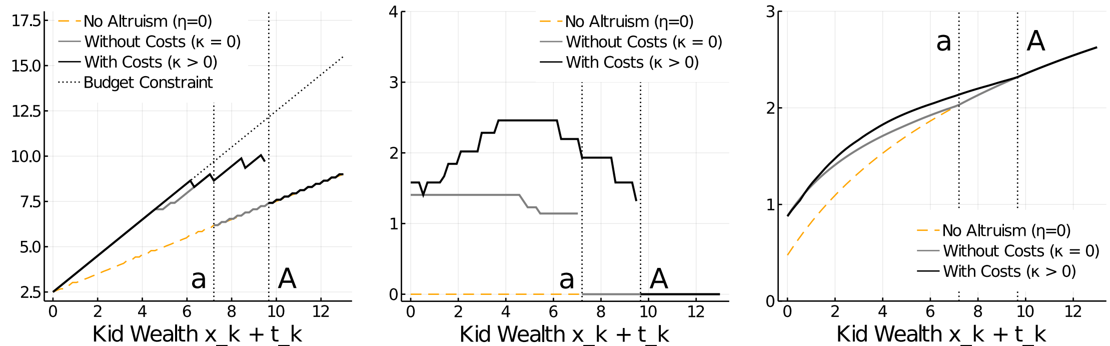
I rely on a numerical solution since both policy functions and the value function has kinks and/or jumps.[9] Adjustment cause make housing illiquid, and the housing choice thus entails an expenditure commitment in the second period.

I now show that adjustment costs increase the incentive to undersave by spending more on illiquid housing. Figure 3 illustrates the solution to the kid's decision problem. The total expenditure in the model without altruism (equivalently when the parent brings no wealth to the second period), without adjustment costs and with adjustment costs is plotted in figure 3a. The straight diagonal line denotes the maximum level of expenditures, which is bounded above by the borrowing constraint. First, relatively poor kids save significantly less with altruism. Then, at some point $x_k = a$, the future transfers are not large enough to make kids overconsume, and the kid's savings policy jumps back to the model without altruism, a 'jump to autarky'. With adjustment costs, the jump to autarky is delayed to $x_k = A$ as kids increase consumption of housing (9). Thus, adjustment costs increase over-consumption. The reason why is revealed in figure 3b, which plots the second period transfer the kid will receive $t'_P(x'_p, x'_k, h'_k)$. Without adjustment costs, the transfer is initially constant since the kid always start the next period in the same state: without any wealth ($x'_k = 0$). At some point, the kid starts saving ('jump to autarky'). In con-

[9]Namely, there are three problems i) adjustment costs induces kinks in V_k (2a), ii) the transfer policy is non-continuous in x'_k (figure 2c) and iii) the transfer policy function has a kink where the non-negativity condition on transfers binds (figure 2c). This jump in transfers is driven by consumption smoothing and is discussed in detail in Chu (2020) and Barczyk and Kredler (2020).

Figure 3: Solution to the First Period Kid's Problem

(a) Period 1 Expenses $c_k + h_k$ (b) Period 2 Transfer $t'_p()$ (c) Period 1 Value Fun. $V_k()$



Note: The vertical dashed lines indicates 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).

trast, transfers are increasing in period wealth x_k with adjustment costs. While the kid still wakes up with zero wealth ($x'_k = 0$), he also wakes up with a larger house and so the parent gives yet larger transfers moving the kid towards intra-temporal optimality between housing and goods.

In fact, the increases in gifts are so large that kids prefer an economy with adjustment costs to an economy without (figure 3c). First, note that poor kids always strictly prefer that their parents are altruistic. Second, kids who are somewhat wealthy prefer to have adjustment costs, since this increases the second-period transfer they will receive. Third, once kids jump to autarky altruism has no impact.[10] Interestingly, this result is true and economically significant in the estimated quantitatively model: 8% of all kids prefer to face adjustment costs and are on average willing to pay $ for it. Kids who prefer adjustment costs have wealthy parents, and the adjustment costs increase the transfers they receive. Section 7.1 discusses the quantitative details.

2.2.4 First Period: Parent

The parent must decide how much to save, and the allocation of spending between their own consumption and transfers. The parent takes into account how his transfer t_p increases the kid's cash-on-hand and that the savings decision x'_p affects the

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parent's starting wealth but also the decisions of his kid:

$$V_p(x_p, x_k) = \max_{x'_p \geq 0, t_p \geq 0} \left\{ \nu(x_p - t_p - x'_p) + \eta u(c^*_k(x'_p, x_k + t_p), h_k(x'_p, x_k + t_p)) + \right.$$
$$\left. V_{p'}(x'_p, x'^*_k(x'_p, x_k + t_p), h^*_k(x'_p, x_k + t_p)) \right\} . \tag{9}$$

Again, the problem suffers from multiple kinks and discontinuities, and I rely on numerical solutions.[11]. However, we can use the previous results to provide intuition. First, note that once the kid 'jumps to autarky', the parent's will achieve their constrained efficient outcome, since kids never consume less than the parent will prefer. This provides a strong incentive for parents to provide transfers sufficiently large to push kids into autarky ('gifts to autarky'), as discussed in Chu (2020) . Second, rich parents with kids who are borrowing constrained can directly increase their kid's consumption ('spoon-feeding'), the transfer motive discussed in Altonji et al. (1997)).

Adjustment costs decrease transfers to poor kids (spoon feeding) and increase transfers to relatively wealthy kids (gifts to autarky). Figure 4a plots the parent's transfer decision as the kid's wealth increases. 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 in order to push the kid into autarky.[12] As kid wealth increases transfers go to zero, and kids behave as in autarky. The same pattern holds when a kid's wealth is held constant while varying parental wealth, figure 4b. With adjustment costs, spoon-feeding transfers are generally smaller since the kid buys larger houses to receive a larger transfer in the second period. At the same time, the gifts-to-autarky are generally larger, as the benefits of pushing the kid into self-sufficiency is larger. Finally, figure 4c plots the savings policy, and we see that adjustment costs also have a non-monotone effect on parent's savings.

2.3 What if Kids and Parents Could Commit?

In line with empirical evidence the working assumption of this paper is that households cannot commit (e.g. Attanasio et al. (2018)). However, what would happen if we assumed existence of an commitment technology? Second, can adjustment costs, by creating expenditure commitments, help resolve the commitment problem?

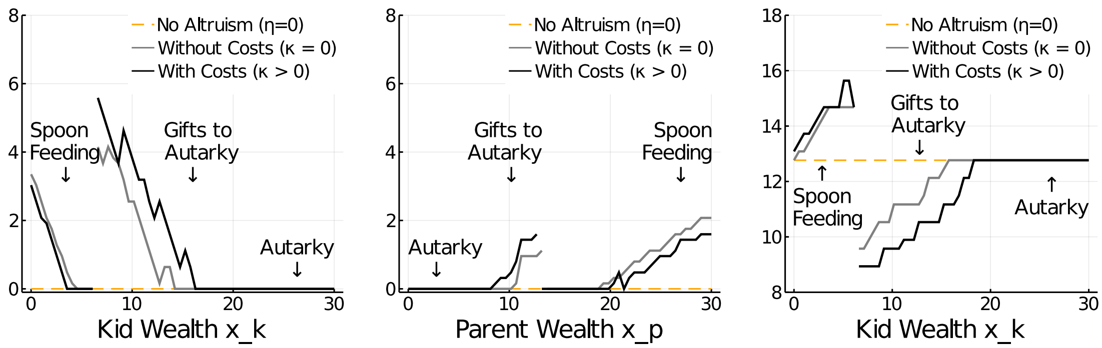
When kids and parents can commit they join forces and solve a family problem, where each households utility receives a Pareto weight at formation. I find the pareto

[11] Namely, both the housing and savings policy of kids have discontinuities, and the continuation value $V_{p'}$ has multiple kinks. Indeed, even if the problem was twice-differentiably and first-order conditions would exist, they would not be necessary for utility maximization (Barczyk and Kredler, 2020)

[12] Barczyk and Kredler (2020) derive necessary and sufficient conditions for the different transfer regimes to exist in a model without housing.

Figure 4: First Period Parent Choices

(a) Transfer $t_p(x_p, \bar{x}_k)$ (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.

weight by a participation constraint. The planner pools all 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:

$$\begin{aligned} V_c(x_f;\theta) = \max_{c_k,c_k',c_p,c_p',h_k,h_k'} & \left\{(1-\theta)\mu u(c_p) + \mu(c_p') + \right. \\ & \left. [\theta + (1-\theta)\eta] u(c_k,h_k) + u(c_k',h_k')\right\}, \\ \text{subject to } x_f' &= x_f - c_k - h_k - c_p, \\ 0 &= x_f' - c_k' - h_k' - c_p - \mathbf{1}_{\{h_k' \neq h_k\}} \kappa h_k, \\ x_f' &\geq 0. \end{aligned} \tag{10}$$

There are several differences to the problem without commitment. First, we cannot observe the timing of transfers (but we can back out lifetime net-transfers). Second, wealth allocations within the family is indeterminate. Third, the only objects that are observable in both models are the allocations of consumption and housing. Fourth, transfers may flow from kids to parents.

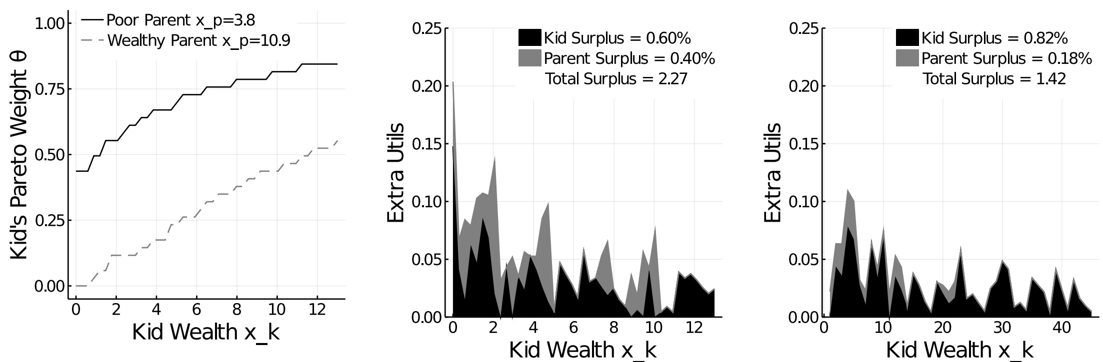
2.3.1 Determinination of Pareto Weights

The optimal allocation for initial family wealth x_f depends on the kid's pareto weight θ. We can define the kid's indirect utility from the commitment problem as

$$V_k^c(x_f,\theta) = u(c_k^c, h_k^c) + u(c_k'^c, h_k'^c), \tag{11}$$

Figure 5: Solution with Commitment

(a) Pareto Weight $\theta(x_p, x_k)$ (b) Commitment Gains, Poor Parent (c) Commitment Gains, Rich Parent



Note: The last two panels plot the kids surplus (black) and the total surplus (gray). The shaded areas thus measure the share of surplus that belongs to either the parent or kid.

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 $V_k^c(x_f, \theta) \geq V_k(x_k + t_p(x_k, x_p), x_p)$. Since any feasible allocation without commitment is feasible with commitment, we immediately have that for any initial endowment of kid and parent wealth there exists at least one $\theta \in [0, 1]$ such that both household would be willing to commit. However, there may be an interval of acceptable pareto weights. I then default to using the lowest pareto weight the kid would be willing to accept for each initial endowment:

$$\theta(x_p, x_k) = \arg\min \left\{\theta \in [0,1] : V_k(x_k + t_p^*(x_p, x_f), x_p) \leq V(x_k + x_f, \theta)\right\}, \qquad (12)$$

The parent is also willing to join the family planner at $\theta(x_k, x_p)$ as it promises the lowest weight on the kid's utility. Since the Pareto weight is pinned down by the outside option kid's pareto weights are increasing in kids endowment and decreasing in parent's endowment, as plotted in figure 5a.

2.3.2 Utility Gains From Commitment

Finally, it is instructive to measure the gains that would be realized if households could commit. The key friction in the altruistic models inspired by the seminal work of Altonji et al. (1997) is the lack of commitment. I summarize the utility gains from commitment by finding how much each household must given in order to be indifferent towards the introduction to a commitment technology. Let

$WTP_k(x_p, x_f) \equiv \arg\min_{s \in \mathbf{R}_+} V_k(x_p, x_k + s) = V_k^c(x_k + x_p, \theta(x_p, x_k))$ how much a kid is willing to pay for a commitment technology, and equivalently for the parent. The total willingness to pay is then:

$$WTP(x_p, x_k) = WTP_k(x_p, x_k) + WTP_p(x_p, x_k). \tag{13}$$

Note that the gain for both households is always weakly positive, and so $WTP(x_p, x_k) \geq 0$

Figures 5b,5c plots the welfare gains for the kids and parents over kid wealth, varying initial parents wealth when there are no adjustment costs $\kappa = 0$. First, as the kid gets wealthier, the overall welfare gain decreases, as there is less room for altruism to play a role. Second, as parent wealth increases the total surplus decreases. Third, the kid's share of the surplus is increasing in parental wealth.

3 Data

This section presents stylized facts about inter-vivos transfers among US households. The main data source will is the Panel Study of Income Dynamics (PSID), which follows a nationally representative sample of US households over time. The survey started in 1968 with approximately 5,000 households which they have since followed, and importantly also includes split-offs (children moving out of the parent households). In 2013 the PSID included additional questions about transfers between generations within a family. Since 1999 the survey has been collected every other year. Up to then, most data were collected annually, but wealth and other financial information were collected only every fifth year. Household characteristics such as age, gender, and education refer to the household head. I replace top coded values with missing. All monetary variables are expressed in thousands of 2016 US dollars.

Matching Parents-Child. To obtain transfer information in the 2013 wave of the survey I use the Parent/Child file. In the file, each household answers questions such as how much they have received in transfers from their children and parents. For some families, the recipient and giver disagree on the amounts. For example, a child may say that it did not receive transfers from a parent household, while the parent household report transfers. I choose to always use the parent's answer for two reasons. First, there may be some stigma about receiving transfers, but less so for giving transfers, so the latter may be a more reliable measure. Second, in the quantitative model in section 4 the parents give transfers to the child. I treat each parent-child pair as separate so that two siblings with the same parent household are treated as two independent households.

Sample Selection. Throughout this paper the sample includes all households aged 20-85 in the PSID, except the Survey of Economic Opportunity and the Latino sub-samples in order to obtain a representative sample.

3.1 Descriptive Statistics

I now discuss descriptive statistics from the PSID sample in 2013 for households aged 20-44 with a linked parent. Tables 10 and 11 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 $2900 and 32% of households received transfers in the last calendar year. Both groups have similar wealth levels both before and after the transfers. The parents of recipients are much wealthier, with mean and median wealth of 820.28 and 247.3 relative to non-giving parents who had 389.6 and 83.4 respectively. Recipients are more likely to be college-educated, white, and a little younger. Receivers are less likely to be homeowners (34% vs 41%).

If the sample is broken down by marital status we see 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. However, both groups have similar transfer probabilities and transfer sizes. Next, I break the sample down by whether they are renting or owning. Homeowners have 10 times the wealth of renters and also significantly wealthier parents. Owners are slightly less likely to receive transfers (30% vs 37%) but receive similar transfer sizes. Homeowners rarely become renters, while 82% of owners rented two years ago. Further, receivers are more likely to switch from renting to owning: among current owners who did not receive a transfer, 15% were renters in 2011. For receiving homeowners 20% were renters in the previous period.

Next, I break the sample into five age groups from 20-44. We see that household's wealth, income, and homeownership rates increase with age. The transfer probability decreases slowly with age. The most striking fact is that when broken down by age we see that receivers were more likely to switch from renting to owning. For example, for households aged 30-34, we see that 40% of non-receivers and 39% of receivers were homeowners. However, only 10% of owning non-receivers are new homeowners, compared to 18% of owning receivers.

Finally, I break down the sample by wealth quintiles. Within each wealth quintile receivers and non-receivers are largely very similar. However, receivers have slightly lower incomes, significantly wealthier parents, and are less likely to own. We also see the clear inter-generational correlation of wealth: the average parental wealth in the bottom quintile is less 25% less than the average wealth of parents to households in the top quintile.

A short summary is in order. Receivers have significantly richer parents, are less likely to own, but have similar wealth and income as non-receivers. Receiving transfers increases the probability of transitioning from renting to owning, and in particular among households in the prime house-buying age (25-39). Parents wealthy is strongly correlated with the probability of receiving a transfer. In 2012, a third of young households received a transfer, with transfers averaging $2,900 dollars.

3.2 Recent Time Trends in Housing, Borrowing Constraints and Transfers

The previous section establishes a snapshot of young households and the associated transfers in 2012. However, questions about inter-vivos transfers are not included in other waves of the PSID except 1988. To learn more about the role of inter-vivos transfers over the last two decades I also use the Survey of Household Economics and Decisionmaking (SHED) and the American Housing Survey (AHS).

SHED: In order to better understand the financial fragility and health of US households, the Federal Reserve 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. The results are plotted in the left panel of figure 1 in the introduction. The main observation is the large increase in the role of inter-vivos transfers for homeowners since 2001, and how the increase coincides with the aftermath of the great recession, and in particular tightening mortgage standards in the US.

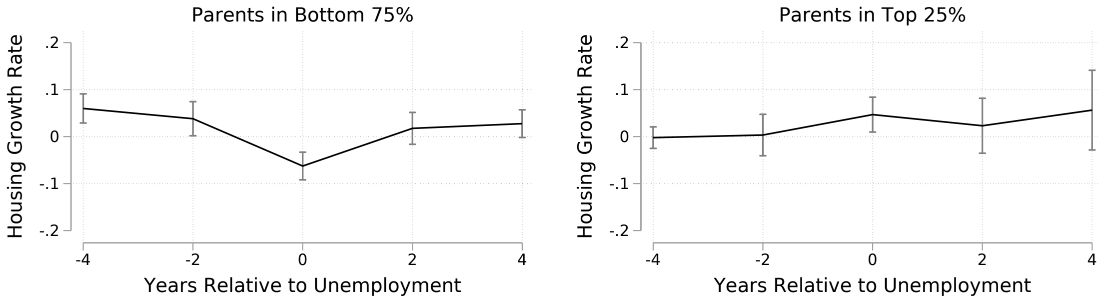
In 2013, 2014 and 2016 it contained a question asking renters why they rent, which I utilize to further gage the role of borrowing constraints. The main barrier to homeownership was borrowing constraints: 57% of US households mentioned that they could not afford a down-payment and/or that they didn't qualify for a mortgage. The second most common answer was that renting was more convenient (26%), followed by planning to move (23%).

AHS: To obtain data going further back than 2001, and to have something to say about magnitudes I use the AHS. The AHS is a sample of roughly 60,000 housing units that are followed over time. For units that are owner-occupied households are asked about the major source of funds for the downpayment. The results are plotted on the right side of 1. It is important to note that the x-axis is survey year, and so each point on the line denoted the share of US homeowners whose downpayment was mostly funded through transfers at any point in time. As a result, we see a relatively flat trend in the '90s, followed by a quick decline in 2005-2008, likely a result of the low downpayment regime in the early 2000s. Finally, we see a dramatic increase in the years after.

3.3 Hypotheses I: Parental Wealth Decrease Probability of Downsizing after Income Losses

In the stylized model we saw that kids with wealthier parents are less likely to downsize in the second period. While the model had no uncertainty it is straightforward to extend the model to include income risk. The model then predicts that income

Figure 6: Event Study: Housing Consumption at Unemployment by Parental Wealth



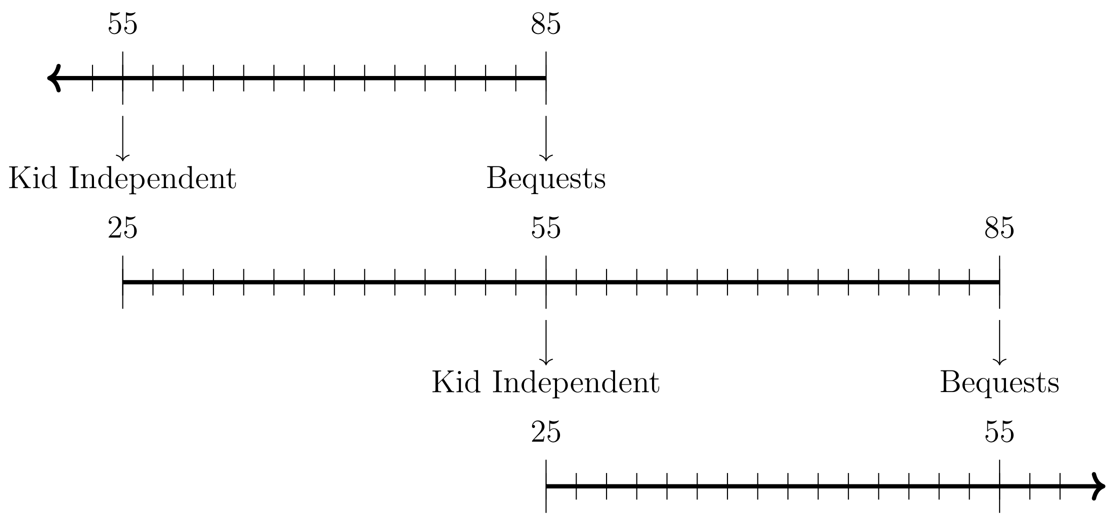
Note: Solid lines are the means and bars denote the 95% confidence interval. Sample consists of households aged 20-65 with exactly one unemployment spell, and without changes in head and/or spouse in the four years before and after unemployment.

losses will lead to larger declines in housing consumption for households with poorer parents. In order to test this hypothesis I perform an event study on the effect of unemployment at housing consumption. The sample is limited to household heads between the ages of 20 and 65 who are unemployed only once in the sample period. The growth rate of housing consumption is set to zero for households who do not move between t and $t-2$. Consumption value of owner-occupied housing is set to 6% of the market value of housing units as in Boar et al. (2020) and for renters it is the yearly rent. For renters who move I find the log difference in rental expenditure and for homeowners the log difference in implied rental rates.[13]

Since the PSID only reports transfers below \$5000 in 2013 I use parental wealth as a proxy for transfers to. I then divide the sample by whether the head's parents were in the top 25% of parental wealth 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 stylized model predicts that households with poor parents have a significant decrease in housing expenditures, while households with wealthy parents have no change or increased housing consumption at unemployment. The results are displayed in 6 and further details are in appendix A.1. Households with parents in the bottom 75% decrease housing consumption growth rates from 4% to -6%, a change that is significant at the 5% level. However, households with parents in the top 25% have no statistically significant decrease in housing consumption growth rates, and in fact they consume more housing at unemployment. This pattern is exactly as predicted by theory.

[13]This methodology is inspired by Chetty and Szeidl (2007) who find that housing consumption response less to unemployment than non-durable consumptiont, as predicted by a model with illiquid housing. Here I focus on showing that parental wealth supports household's consumption of housing.

Figure 7: Overview of Household Problems



Note: The infinite over-lapping generations structure of the model.

4 A Quantitative Model of Family Banking and Housing

In this section I describe a life-cycle model of house tenure choices with idiosyncratic earnings risk, overlapping altruistic households, and inter-vivos transfers from parents to children. The model is estimated to match empirical moments concerning housing, wealth accumulation, and transfers in 1999. In the benchmark model, all prices are exogenous.

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 are born. The only economic agents in the model are households whose life can be divided in two stages as adult kids or parents (to adult children).

Demographics. Households are economically active from age a 25 to 83. A family consists of one adult kid household and a parent household, denoted by the subscripts $_k$ and $_p$. Households die with certainty after age 83. When the parent dies, the kid becomes a parent aged 55, who is linked with a new adult kid aged 25 (i.e. new kids are born when their parents are 30). The structure is constructed such that each parent-kid pair overlaps for 15 periods with an age gap of 30 years, and that in each point in time only two households are economically active in any dynasty. Figure 7 shows the life cycle of two generations.

Altruism. The parent is altruistic towards his kid 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. In any period the parent can 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 $y_{i,a} \in \mathcal{Y}_\dashv = \{y_1, \ldots, y_{N_y}\}$. 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

$$w_{i,a} = l_a y_{i,a} \; \forall a \in \{25, 27, \ldots, 53\}, \tag{14}$$

$$w_{i,a} = l_a \; \forall a \in \{55, 57, \ldots, 83\}. \tag{15}$$

While this dichotomy in labor income risk is chosen to reduce the state space it is largely consistent with data patterns, where large persistent shocks are most common early in working life, while older households mostly smaller shocks (Sanchez and Wellschmied, 2020).[14]

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. The model assumes adjustment costs that are proportional to the market value as in Yang (2009), and take the form

$$adj(h_{a+1}, h_a) = \begin{cases} \kappa_b p_t h_{a+1} + \kappa_s p_t h_a & \text{if } h_{a+1} \neq h \\ 0 & \text{if } h_{a+1} = h, \end{cases} \tag{16}$$

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 mortgage that is costlessy and rolled over every period. The mortgage has an interest rate of $r + r^m_a$,

[14] I perform robustness exercises where I allow for income and health expenditure risk also for parents in D.3

where r^m_a is an age-dependent mortgage premium that depends on age:

$$r^m_a = \begin{cases} r^m_k & \text{if kid,} \\ r^m_k + r^m_p & \text{if parent .} \end{cases}$$

This age-dichotomy is included for two reasons. First, older households are typically homeowners and can borrow against their home equity using reverse mortgages or home equity loans/lines of credits, and these loans have higher interest rates than mortgages. Second, quantitatively, with a one-period mortgage as in this model, a higher borrowing rate is required to discourage older and retired households from borrowing too much at older ages . Since the mortgage premium is positive households will never simultaneously hold both a mortgage and save in the risk free bond. Let b denote the net position in bonds. The interest rate households face is

$$r(b) = \begin{cases} r & \text{if } b \geq 0, \\ r + r^m_a & \text{if } b < 0. \end{cases} \tag{17}$$

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:

$$U_k(c_k, h_k, o_k) = u(c_k, h_k, o_k) = \frac{\left(c^\xi s(h,o)^{1-\xi}\right)^{1-\gamma} - 1}{1-\gamma}, \tag{18}$$

where s denotes housing services, γ measures risk aversion, and ξ the expenditure shares on non-housing consumption. The function $s()$ maps housing qualities and

[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.

house tenure into values comparable to consumption and takes the following form

$$s(h,o) = \begin{cases} h & \text{if renting } (o=0), \\ \chi h & \text{if owning } (o=1). \end{cases} \tag{19}$$

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

$$U_p(c_p, h_p, o_p, c_k, h_k, o_k) = u(c_p, h_p, o_p) + \eta u(c_k, h_k, o_k) \tag{20}$$

Timing. First the productivity state of children is drawn. Families were the parent was 83 also draw the initial wealth level of the new kid from. Next, the parent chooses his consumption c_p , non-negative inter-vivos gifts g_p, his savings decision b_p, and his housing choice h_p. After observing these choices the kid decides her consumption c_k, housing choice h_k , and savings b_k. The parent is chosen to move first as this largely is consistent with mortgage regulation in the US, which requires that gifts are deposited before mortgages are approved. Choosing one household to moves first simplifies the solution of the model but does not guarantee uniqueness of the resulting Markov-perfect equilibrium (MPE).[16]

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 productivity of the child $y_k \in y_a = \{y_1, \ldots, y_{N_y}\}$, the kid and parent's house tenure $h_k \in \{h_r, h_o\}, h_p \in \{h_r, h_o\}$, and the age of the kid $a_k \in \{25, 27, \ldots, 53\}$. The value function of the parent is denoted by $V_p(s_p)$ where $\mathbf{s_p} \equiv (x_k, x_p, y_k, h_k, h_p, a_k)$.

Due to the timing assumption in the model, the child makes choices after the parent announces his choices. The parent's choices affects the set of feasible choices (transfers t_p increases cash-on-hand x_k) as well as 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 kid expands to $(x_k, x_p, y_k, h_k, a_k; t_p, b'_p, h'_p)$. The kid is indifferent between a change in own wealth or transfers, but cares about his 2nd stage wealth $\tilde{x}_k \equiv x_k + t_p$. Further, since he moves after the parent, the parent's starting wealth x_p is redundant for the kid, so we can rewrite the state space to be $\mathbf{s_k} = \left(\tilde{x}_k, b'_p, y_k, h_k, h'_p, a_k\right)$. 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. Figure 7 graphically describes the choices and demographic structures of the model. Each household's decision problem is divided into a discrete owning/renting choice. For each housing choice households find optimal

[16] Computational experiments however indicate that it is unique

consumption, savings and transfer policies, and then maximize over the housing choices.

4.2.1 Problem of the Young-Old Pair

I now show the decision problems of the old and young households, conditional on choosing to own. The problems conditional on renting are in appendix C.2. The problems in the special case at the transition between kid-parent are relegated to appendix C.3.

Kids - Second Stage: The kid chooses consumption, savings and housing. I let primes denote next period variables, and highlight variables that are directly affected by altruism.

$$
\begin{aligned}
V_k(\mathbf{s_k}) = \quad & \max_{c_k, b'_k, h'_k = h_o} u(c_k, h'_k) + \beta \mathbb{E}\left[V_k(\mathbf{s'_k})\right] \\
& \text{s.t.} \quad b'_k = x_k + t_p + w_k - c_k - ph'_k - adj(h_k, h'_k) \\
& \qquad\quad x'_k = b'_k(1 + r(b'_k)) + p'h'_k(1-\delta) \\
& \qquad\quad b_k \geq LTV ph'_k. \\
& \text{Where } \mathbf{s_k} = (x_k + t_p, b'_p, h_k, h'_p, y_k, a_k, z), \\
& \qquad\quad \mathbf{s'_k} = (x'_k + t^*_p(\mathbf{s'_p}), b^*_p(\mathbf{s'_p}), y'_k, h'_k, h^*_p(\mathbf{s'_p}), a_k + 2).
\end{aligned}
\tag{21}
$$

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. From this expression we see that a transfer from parents to kids primary effect is to increase cash-on-hand. In particular, this relaxes the LTV constraint to make buying more likely and selling less likely. The kid takes into account how her choices affects the parent's state and next-period choices. Finally, let $x^*(\mathbf{s_k}; z')$ denote the stochastic policy function of next-period wealth that also depends on the aggregate state for homeowners.

Parents - First Stage: The parent chooses consumption, savings, housing and the transfer. Since the parent household chooses first, it takes into account how its choices will affect the choices of the kid in the second stage.

$$
\begin{aligned}
V_p(\mathbf{s_p}) = & \max_{c_p, b_p, h_p, t_p} u(c_p, h_p) + \eta u\left(c^*_k(\mathbf{s_k}), h^*_k(\mathbf{s_k})\right) + \beta \mathbb{E}\left[V_p(\mathbf{s'_p})\right] \\
& \text{s.t.} \quad b_p = x_p + w_p - c_p - t_p - ph'_p - adj(h_p, h'_p) \\
& \qquad\quad x'_p = b'_p(1 + r(b'_p) + p'h'_p(1-\delta) \\
& \qquad\quad t_p \geq 0, b'_p \geq -LTV \times ph_p. \\
& \text{Where } \mathbf{s_p} = (x_k, x_p, v_k, h_k, h_p, a_k, z_k), \\
& \qquad\quad \mathbf{s'_p} = (x'^*_k(\mathbf{s_k}; p'), x'_p, y'_k, h'_k(\mathbf{s_k}), h'_p, a_k + 2, z'), \\
& \qquad\quad \mathbf{s_k} = (x_k + t_p, b'_p, h_k, h'_p, y_k, a_k, z).
\end{aligned}
\tag{22}
$$

4.3 Equilibrium Definition

A steady-state equilibrium, which is also Markov Perfect, is a collection of value functions, policy functions, ...

4.3.1 Measures of Households

I now turn to define formally the measures of households. The state space of a parent household is $S_p = X_k \times X_p \times Y_k \times H_k \times H_p \times A_k$, while the space of the kid household is $S_k = X_k \times B_p \times H_p \times Y_k \times H_k \times H_p \times A_k$, with s_p, s_k denoting generic elements therein. Let $\mathcal{S}_p$ denote the Borel-σ algebra with typical subset $\mathcal{S}_p = \mathcal{X}_k \times \mathcal{X}_p \times \mathcal{Y}_k \times \mathcal{H}_k \times \mathcal{H}_p \times \mathcal{A}_k$. The definition of $\mathcal{S}_k$ is identically defined, and I omit further definitions for the kid for conciseness. Let $f_p(\mathbf{s}_p)$ be a probability measure over $(S_p, \mathcal{S}_p)$, so that $f(s_p)$ denote the measure of households with state s_p, and let F_p denote the corresponding cumulative distribution function. The mass of households for each age is normalized to 1/15. Note that $f_p(s_p)$ denote the distribution of households after shocks are realized but before choices are made.

Law of Motion for Parents 57-83: The mass of households with state $\mathbf{s}_p$ is just the mass of families that choose policies for housing and savings such that they can end up in that state, times the probability of that realization of house price shocks and income shocks:

$$\begin{aligned} f_a(\mathbf{s}'_p) = \int_{\mathbf{s}_p \in \mathcal{S}_p} & \mathbf{1}_{\left\{x'_p = x^*_p(\mathbf{s}_p)\right\}} \mathbf{1}_{\left\{h'_p = h^*_p(\mathbf{s}_p)\right\}} \mathbf{1}_{\left\{x'_k = x^*_k(\mathbf{s}_k(\mathbf{s}_p))\right\}} \mathbf{1}_{\left\{h'_k = h^*_k(\mathbf{s}_k(\mathbf{s}_p))\right\}} \times \\ & \pi(y'_k|y_k)\pi(z'|z)\,\mathrm{d}f_{a-2}(\mathbf{s}_p). \end{aligned} \tag{23}$$

Note that the kid's state $\mathbf{s_k}(\mathbf{s_p})$ denotes the kid's states after the parent have made their decisions, and is therefor a function of the parent's state. And where we use $x^*_p(\mathbf{s}_p) = b^*_p(\mathbf{s}_p)(1 + r(b^*_p(\mathbf{s}_p))) + h^*_p(\mathbf{s}_p)o^*_p(\mathbf{s}_p)$, that is the next-period wealth of the parent.

Law of Motion for Parents 55: In this special case, the distribution will depend on the choices of the new parent, the now deceased parent and the stochastic initial conditions of the new kid. Note that s_p only denotes the subset of the state-space where $a_p = 83$.

$$\begin{aligned} f_{25}(\mathbf{s}'_p) = \int_{\mathbf{s}_p \in \mathcal{S}_p} & \mathbf{1}_{\left\{x'_p = x^*_p(\mathbf{s}_p) + x^*_k(\mathbf{s}_k(\mathbf{s}_p))\right\}} \mathbf{1}_{\left\{h'_p = h^*_p(\mathbf{s}_p)\right\}} \mathbf{1}_{\left\{h'_k = h_r\right\}} \times \\ & F(x'_k, y'_k|x_k, y_k)\,\mathrm{d}f_{53}(\mathbf{s}_p). \end{aligned} \tag{24}$$

Note how the initial wealth and productivty of the child depends on x_k, y_k, that is the wealth and productivity of the new parent at age 53. Further, all kids start out as renters and the wealth of the new parent is his own wealth plus any bequests.

Finally, we define a function $\mathcal{H}$ that operates one on distribution $f(\mathbf{s}_p)$ and policy functions $g(\mathbf{s_p})$ and maps it into a new distribution in accordance with equations (23, 24):

$$f_{n+1} = \mathcal{H}(f_n, g^*), \tag{25}$$

where the subscript denotes the iteration of the distribution. A stationary distribution is then a fixed point of equation (25).[17]

4.3.2 Model With Commitment

In section 2.3 I showed how the stylized model changes with commitment. I now turn to briefly discussing how the quantitative model changes with commitment. First, with commitment households solve a family planner problem where θ denotes the Pareto weight on the kid. Second, they pool all wealth $x_f = x_k + x_p$. I assume that a house belonging to one household cannot costlessy be transferred to the other. The states of the family planner is:

$$\mathbf{s}_f = (x_f, v_k, h_k, h'_k, a_k; \theta). \tag{26}$$

and the family problem becomes, conditional on both households entering as and remaining as renters:

$$\begin{aligned} V_f(\mathbf{s}_f) = \max_{c_k, c_p, h'_k = h_r, h_k = h_r, x'_f; \theta} &(1-\theta)\left[u(c_p, h_k) + \eta u(c_k, h_k)\right] + \theta u(c_k, h_k) + \beta \mathbb{E} V_f(\mathbf{s}'_f), \\ \text{subject to } & x'_f = x_f + w_k + w_p - c_k - c_p - \kappa h_k - \kappa h_p, \\ & x'_f \geq 0, c_k \geq 0, c_p \geq 0. \end{aligned}$$

We can see that the family problem is much simpler, with fewer states, fewer choices, and without strategic considerations. The decision problem at the final period of a parent's life is in appendix C.4 Finally, in order to compare the commitment allocation to the no-commitment allocation we must take a stand on the Pareto weights. First, I use participation constraints for both households, where the outside option is to not use the commitment technology. There exists at least one Pareto weight acceptable to both parties since the no-commitment allocation is feasible. For further details, I refer to section 2.3 for more details.

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 follow a standard two-step estimation procedure. In the first step I estimate param-

[17] Computational experiments indicate that there is a unique stationary distribution

eters 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).

All parameters and moments estimated in this paper use 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. All calculations use family weights.

5.1 Parameters Chosen Independently and Externally From the Model

All externally calibrated parameters and values are summarized in table 1.

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

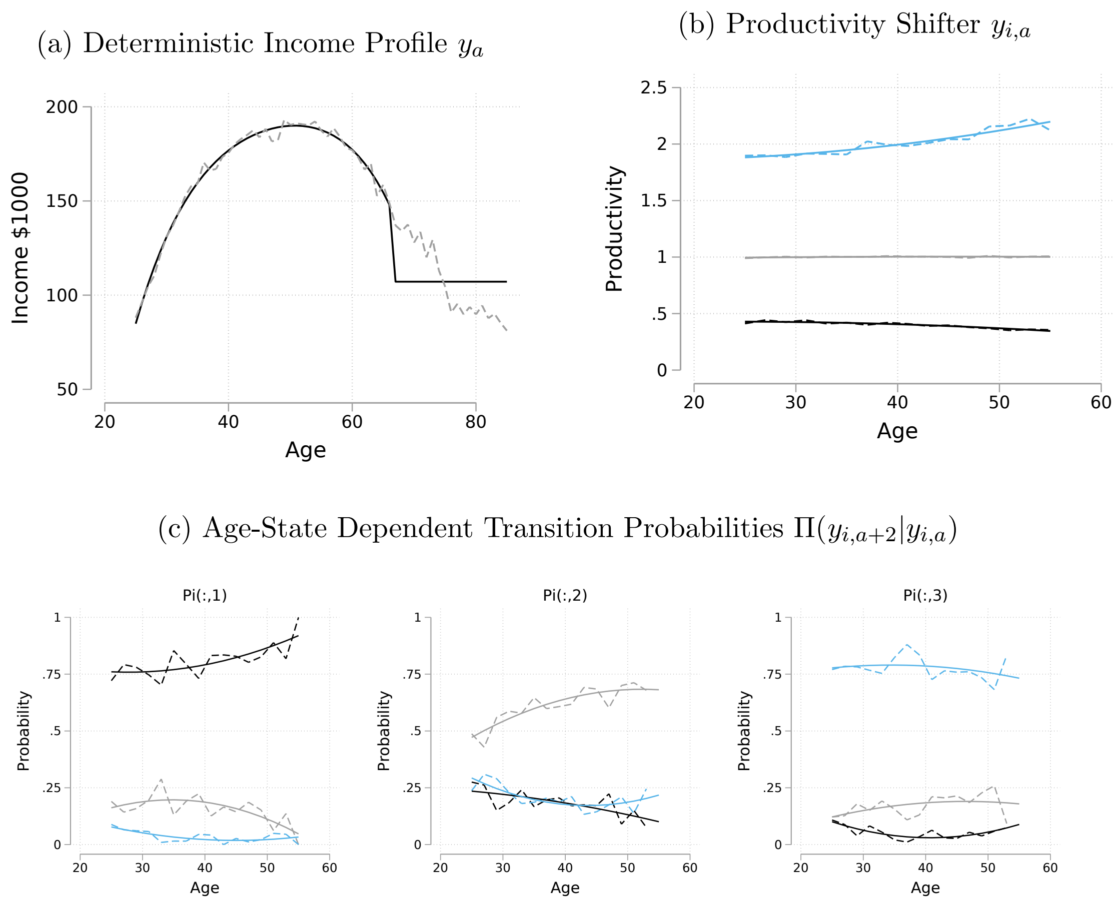
Income Process. The income processes consists of a deterministic life-cycle component and shocks. For kid households the shocks are persistent, while the shocks are transitory for older households. To find the deterministic component I first find the weighted averages of household income, by age and year. I then weight each year equally to obtain the life-cycle profile. I then regress the average income over age on a fifth-order polynomial. I use the predicted values from this regression as the life-cycle income. To find income after retirement, 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 8a displays the data and the predicted values.

Next, to find the values for the stochastic productivity shifter I first set $N_v = 3$ to obtain a three-state Markov Chain. The sample is divided into age specific income tertiles. For each age and tertile I then find the probability of moving to all tertiles in the next age group. This gives the age-dependent transition matrix, figure 8c. To find the values for each tertiles I first normalize the income of each household by the median income within each age group, and then find the median income within each tertile, figure 8b.

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 first find $N_k^x = 4$ quantiles for wealth and the $N_v = 3$ quantiles of productivity for households aged 25. For the parents, I divide them into $N_p^x = 4$ quantiles for each of the $N_v = 3$ productivity quantiles they are in.

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 0.05 to match depreciation of existing housing capital as estimated in Harding et al. (2007). The values for the transaction costs are taken from Yang (2009) and set to $m_s, m_b = 0.075, 0.02$.

Figure 8: Calibrated Income Process



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.

Table 1: Summary of Externally and Independently Estimated Paramete

Parameter		Value	Source
Period Length	n/a	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
Parent Mortgage Prem.	r_p^m	0.02	Standard
Max Loan-to-Value	LTV	0.85	Standard
Initial Distribution	$F(x_{53}, v_{53})$	fig. ?	PSID
Deterministic Income	l_a	fig. 8a	PSID
Productivity shocks for Kids	$y, \Pi(y'\|y)$	fig. 8b,8c	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 not annualized. All moments estimated from the PSID use waves from 1999-2017.

Financial Parameters. I set $LTV = 0.85$, based on the 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 Internal Calibration

The remaining parameters $\theta = (\beta, \gamma, \eta, \chi, r^m, p, h_o)$ are chosen to minimize the distance between N 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 3 along with the model simulated moments. I now detail how each moment is estimated in the data, and a heuristic explanation of why the moment aids identification of some parameters.

For each moment, I aggregate (e.g. the mean or median) over age bins and years. I then aggregate over all years to remove year effects and give each year equal weight. Next, I average the moments over ages and years in the relevant age group, in order to find the moment for the targeted age group.

I target the median wealth of young (23.5) and old (206.7) 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, and so targeting the mean will make typical households too rich. Second, parental transfers for housing are most important for dynasties who are neither very poor or very rich, and so matching the middle of the wealth distribution is pertinent. Section D.5 reports results when parameters are chosen to match mean wealth instead of medians.

I target three moments directly related to housing: the homeownership rate of young households (49.4%), average house value to wealth for young homeowners (2.32) and rent to income for young renters (0.20). The young homeownership rate is a crucial moment to match for this paper. Matching the average ratio of house values to wealth and the rent-to-income renters ensures that renters and homeowners have similar balance sheets in the model and the data.

Next, I target three moments related to the timing of first purchase: average wealth (33.4), average LTV (0.71), and average age (32.5) when households become first-time homeowners. Wealth at purchase is defined as wealth in the period before households become first-time owners. LTV at purchase is defined as the mortgage over house values in the period households become first-time homeowners. Age at purchase is the age at which households are first observed as owners.[18] It is important to match these moments so that the rent-to-own transition happens while households are young and have low wealth for parental transfers to be quantitatively important.

Finally, I target three moments related to transfers: the average transfer rate to young kids (35.8%), the transfer size over parental wealth (0.034), and transfer rate around young households first-time purchases (42.1%). These moments are all calculated 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 would increase the transfer rate significantly. For transfers around first-time home purchases I include transfers given in the period before, during, and after purchase. The period before purchase is counted as parents may give transfers intended to for later purchases or to help kids save for a downpayment while renting. Further details about the estimation of transfer moments are in appendix C.1. I include transfers after purchase as the two period model highlights the role of future transfers in increasing the relative benefit of owning. These moments are important to ensure that the frequency and magnitude of transfers are correct.

5.3 Model Fit

The estimation of the remaining parameters 7 parameters θ are estimated by simulated method of moments (SMM). I first draw a large set of quasi-random parameter vectors from a Sobol sequence, creating a 7-dimensional hypercube where parameters are distributed uniformly random and over a 'large' support. The model fit is defined as the squared distance between the 11 simulated moments m^s and the empirical moments m^e:

$$\hat{\theta} = \arg\min \sum_{j=1}^{11} \frac{(m_j^d - m_j^e)^2}{m_j^e}, \tag{27}$$

where the squared distance of each moment is normalized by its empirical mean.

[18]For households who enter the sample as homeowners we cannot observe time of purchase. To be consistent with the model such households who enter at age 25 or 26 have age-at-purchase be 25, while the others are missing.

Table 2: Estimated Parameters

	Parameter	Value	Most Informative Moments
β	Discount Factor	0.919	Wealth kids and parents
η	Altruism	0.273	Transfer Frequencies
γ	Risk Aversion	2.164	Transfers & LTV at purchase
χ	Ownership Pref.	1.202	Age at purchase, Homeownership Rate
r_m	Mortgage Premium	0.016	Mortgage/Income, LTV at purchase
h_o	Owner-Occupied Size	2.581	Homeownership Rate, Transfer Buyers
p	Price	65.118	Rent/Income, Age at Purchase

Note: Standard Errors coming in next version of the draft.

The estimated parameters are reported in table 2, and are in line with previous literature and empirical estimates. The main preference parameters β, γ, 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 a house gains 20% more housing services by owning relative to renting, and is relatively small (e.g. Corbae and Quintin (2015); Chang (2019); Fisher and Gervais (2011), but this parameter is sensitive to the specifics of the rental and housing markets. The mortgage premium r_m is estimated to be 0.016, or 0.008 per annum. However, the mortgage market in the model is highly stylized relative to its real-world counterpart. Namely, there is no default in the model which would drive down the required mortgage premium banks charge. Finally, the owner-occupied size is 2.56, relative to a rental size normalized to 1. Among young households in the PSID, the median rental unit has 3 rooms (excl bathrooms) while the median owner-occupied house has 7 rooms (excl bathrooms), which yields a similar size ratio (2.33). Finally, the price is estimated to be \$75,684 in 2015 dollars per housing unit or \$193.751 for the owner-occupied house. In the PSID the average and median owner-occupied units have market values of \$232,918 and \$182.048.

The model fits the data well, table 3. It matches wealth, the homeownership rates, rent-to-income, and mortgage-to-income very precisely. It misses the age of purchase by 8 months. It overpredicts the two-year transfer rate slightly (36% vs 39%) and underpredicts the transfers around purchase somewhat (42% to 37%). The moment the model misses the most is the LTV at purchase.

5.4 External Validity

As a validation exercise I show that the model matches non-targeted aggregate moments and also moments that relates to the behavior of individual households.

Table 3: Targeted Moments

Moment	Data	Model
Median Wealth (25-44)	23.54	23.55
Median Wealth (55-74)	206.67	205.74
Homeowner (25-44)	0.49	0.50
Rent / Income (25-44)	0.20	0.20
Mortgage / Income (25-44)	1.21	1.21
Age First Own (25-44)	32.53	33.22
LTV at purchase (25-44)	0.71	0.58
Parent Transfers (55-74)	0.36	0.39
Transfers Around Purchase (%) (25-44)	0.42	0.37
Sum Squared Distances		0.47

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.

Table 4 shows a list of non-targeted moments calculated from the PSID. First, I find that 37% of households are 'hand-to-mouth', using the definition from Boar et al. (2020) (low net worth and/or low-liquid wealth). In the model simulation 40% of households are hand-to-mouth, where hand-to-mouth is defined as having liquid wealth less than 2 weeks of earnings.[19] The model overshoots the wealth at purchase by $15,000, likely due to the somewhat high minimum downpayment $LTV = 0.8$ requirement. Next, the homeownership rate across all households in the model is 73% and in 75% in the data, which is very close.

The last row reports the effect of receiving larger transfers on the probability of becoming homeowners, controlling for a set of observables. In particular, I replicate the regression from Lee et al. (2018), Tables 7-8. These regressions estimate with a linear probability model the effect of receiving a transfer over $5000 in the PSID and the HRS, controlling for a set of observerable characteristics.[20] The last row of table 4 reports the results, and we can see that the regressions from the simulated panel in the model is inside the empirical interval.

6 Homeownership Rates Without Transfers?

What would the homeownership rate be without transfers? How does transfers affect the selection of homeowners? In this section I answer these and other questions. To

[19]

[20] Similar regressions are also used in Engelhardt and Mayer (1998); Guiso and Jappelli (2002); Blickle and Brown (2019), who find roughly similar magnitudes.

Table 4: Non-Targeted Moments

Moment	Data	Model
Hand to Mouth (%) (25-44)	0.37	0.40
Wealth at Purchase (25-44)	33.36	48.12
Owner (%) (25-83)	0.75	0.73
$Prob(NewOwner \mid t_p > \$5000, Controls)$ $-Prob(NewOwner \mid t_p \geq \$5000, Controls)$	(0.03-0.08)	0.07

Note:

do so I simulate the model under the same parameters, but set $\eta = 0$ in order to eliminate transfers and bequests. As discussed the model then becomes a standard life-cycle housing model.

Importantly, I assume that the supply of housing is perfectly elastic (i.e. that the house price does not change). While this assumption is prima facie incorrect, keeping prices constant allows me to cleanly decompose the various mechanisms that change the homeownership rates with and without transfers. I wrap up with showing how the results change once the housing supply is endogenous and we allow for partial equilibrium effects, and discuss why endogenous prices are quantitatively unimportant.

6.1 Results with Constant Prices

Table 5 reports how the moments change without altruism and transfer. Homeownership rates go down by 8 pp. from 50, a decrease of 16%. This is a large decrease; from the peak of the housing boom in the 2000s to the low in 2013, the US homeownership rate went down by the same amount. What drives this large decrease in homeownership rates for young households?

First, the median wealth for young households actually increases without altruism by 48% as the overconsumption motive is removed. As homeownership rates go down, the average age at first purchase also increases, from 33 to 35. The change is driven by changes in the threshold where owning becomes more attractive than renting: i) The mortgage-to-income ratio decreases significantly, from 1.21 to 0.64, ii) the LTV at purchase decreases from 0.58 to 0.45, and iii) wealth at purchase increase from 48 to 58. Indeed, the fraction of households who are hand-to-mouth also decreases from 0.4 to .28. In order to understand why homeownership declines so much without altruism, we must understand why households' willingness to buy goes does down, holding wealth constant.

In order to understand why households without altruism require higher wealth to prefer owning, I solve the model under different thee different regimes: i) increases the LTV requirement from 0.8 to 0.9, ii) making housing liquid by removing adjustment

Table 5: Homeownership Decreases while Wealth Increases Without Altruism

Moment	Data	Altruism $\eta > 0$	No Altruism $\eta = 0$
Targeted Moments			
Median Wealth (25-44)	23.54	23.56	34.82
Median Wealth (55-74)	206.67	205.74	201.67
Owner (%) (25-44)	0.49	0.50	0.42
Rent / Income (25-44)	0.20	0.20	0.20
Mortgage / Income (25-44)	1.21	1.21	0.64
Age First Own (25-44)	32.53	33.22	35.07
LTV at purchase (25-44)	0.71	0.58	0.45
Parent Transfers (%) (55-74)	0.36	0.39	0.00
Transfers Around Purchase (%) (25-44)	0.42	0.37	0.00
Non-Targeted Moments			
Hand to Mouth (%) (25-44)		40.28	28.83
Wealth at Purchase (25-44)	33.36	48.12	58.19
Owner (%) (25-83)	0.73	0.75	0.73

Note:

costs from housing ($m_s = m_b = 0$), and iii) removing income risk. The results are reported in table 6, and we see that with altruism adjustment costs do not matter for aggregate homeownership rates.

Increase in LTV: Allowing smaller down payments. When the LTV increases the homeownership goes up 20 percentage points without altruism. This increase is driven by higher LTV at purchase, higher mortgage balances, and lower wealth at purchase. Secondly, with higher LTVs, the transfer rate around ownership also increases from 37 to 51%. Without altruism, the LTV does not move the homeownership rate. From table 3 this is not surprising: without altruism households are far away from the borrowing constraint and so relaxing cannot increase homeownership by a significant amount.

Removing adjustment costs: Making housing liquid. With altruism the removal of adjustment costs does not significantly increase homeownership rates. This is because without adjustment cost both parental transfers and savings of the young decrease, which offsets the lowering thresholds to buy (e.g. LTV at purchase and wealth at purchase). Given the focus of this paper on adjustment costs, this may seem a surprising result. However, without altruism adjustment costs play a crucial role: the removal of adjustment costs increases adjustment costs by 11 percentage points! The removal of adjustment costs, without altruism, lowers the threshold to buy as it removes the largest risk of ownership for households: the risk of having to sell the house and pay adjustment costs as a response to bad income realizations. With altruism this concern is limited as discussed in detail in the two-period stylized model (section 2): If you buy a house, receive bad income shocks, your parents are likely to bail you out so that the child obtains intertemporal optimality and doesn't have to pay the sale cost.

Removing Income Uncertainty: In life cycle models with uninsurable income risk it is well known that this substantial friction has large welfare implications. I now quantify how much income risk plays suppresses homeownership rates and whether altruism alleviates this effect. Indeed, the removal of income risk increases homeownership rates significantly. With altruism, we observe an 8pp increase, and without altruism a 17 percentage points. The effect of income risk is larger without altruism as parental transfers provide partial insurance against negative income shocks.

Table 6: Effects of Risk and Borrowing Constraints on Homeownership

Moment	Bench	LTV 0.9	No Cost	Inc Cer.	Bench	LTV 0.9	No Cost	Inc Cer.
Targeted Moments								
Median Wealth (25-44)	23.56	14.16	20.90	22.92	34.82	34.84	35.94	22.83
Median Wealth (55-74)	205.74	194.52	196.58	177.97	201.67	200.29	196.43	166.42
Owner (%) (25-44)	0.50	0.70	0.51	0.58	0.42	0.42	0.53	0.57
Rent / Income (25-44)	0.20	0.23	0.21	0.12	0.20	0.20	0.22	0.12
Mortgage / Income (25-44)	1.21	2.03	1.05	1.60	0.64	0.63	0.80	1.60
Age First Own (25-44)	33.22	30.29	31.27	32.52	35.07	35.11	31.35	32.68
LTV at purchase (25-44)	0.58	0.68	0.63	0.71	0.45	0.45	0.59	0.71
Parent Transfers (%) (55-74)	0.39	0.39	0.37	0.06	0.00	0.00	0.00	0.00
Transfers Around Purchase (%) (25-44)	0.37	0.51	0.38	0.01	0.00	0.00	0.00	0.00
Non-Targeted Moments								
Hand to Mouth (%) (25-44)	40.28	61.22	41.93	58.22	28.83	28.90	40.69	57.36
Wealth at Purchase (25-44)	48.12	41.16	43.30	40.24	58.19	58.19	46.25	38.27
Owner (%) (25-83)	0.75	0.89	0.72	0.85	0.73	0.78	0.74	0.84

Note: Results using the *bench*mark model (3), with a higher *LTV* of 0.9 instead of 0.8, without adjustment *costs* $m_s = m_b = 0$, and with *inc*ome *cer*tainty. All other parameters and prices are constant.

6.2 Endogenous House Prices

In this section I close the house market by introducing an exogenous reduced-form housing supply equation

$$\ln H^S = \alpha_0 + \alpha_1 \ln p, \tag{28}$$

where α_1 is the aggregate elasticity of supply to prices, and H^S denote the supplied level of supplied housing. As shown in Greenwald and Guren (2020) the way one closes the housing market has large impacts on how changes in demand and credit conditions affect aggregate homeownership rates. How rental rates κ are determined are also important, especially for determining whether households can be stuck with so high rent prices that it is hard to save enough for a downpayment ('rental traps').[21] However, from table 5 we see that the aggregate homeownership rates are similar with and without altruism, so allowing prices to adjust can have at most a limited role.

I calibrate the housing supply elasticity (28) as follows. First, I define α_0 to be such that housing supply would equal housing demand in the benchmark model with altruism for any elasticity α_1, that is: $\alpha_0(\alpha_1) = \ln(H^d) - \alpha_1 \ln p$, where p is estimated price from 2. We can then solve the model without altruism for any supply elasticity α_1 and find the outcomes when house prices are allowed to adjust. Note that $\alpha_1 \to \infty$ yields a perfectly elastic supply function which keeps the prices constant which is the same experiment as in the main quantitative exercise 5. When $\alpha_1 = 0$ housing supply is inelastic and price must be such that the aggregate homeownership without altruism equals the one with altruism, that is 75%. This begs the question: what is the right elasticity to use? Aastveit et al. (2020) estimate long-run elasticities ranging between 1.5-2.5. I report results for when the elasticity is somewhat larger in order to allow for more adjustment as I ignore other equilibrium adjustments. 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, as expected given the small difference in the overall homeownership rate with and without altruism. The house price only falls by 2.8% in the extreme case with perfectly elastic supply. None of the moments are sensitive to supply elasticity.

[21] The degree of segmentation between the rental market and housing market is usually modeled in either extreme. Either there is full segmentation (e.g. Favilukis and Van Nieuwerburgh (2017); Justiniano et al. (2019)), where 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 (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.

Table 7: Housing Supply Elasticities Not Important

Moment	Altruism Benchmark	Without Altruism Inelastic	Middle	Elastic
Aggregate Moments				
Supply Elasticity		∞	5.00	0.00
House Price	25.23	25.34	26.09	24.28
Owner (%) (25-83)	0.75	0.73	0.72	0.75
Targeted Moments				
Median Wealth (25-44)	23.56	34.74	35.78	35.42
Median Wealth (55-74)	205.74	204.43	202.38	207.37
Owner (%) (25-44)	0.50	0.41	0.41	0.44
Rent / Income (25-44)	0.20	0.20	0.20	0.19
Mortgage / Income (25-44)	1.21	0.63	0.66	0.62
Age First Own (25-44)	33.22	35.26	35.37	34.52
LTV at purchase (25-44)	0.58	0.44	0.46	0.46
Parent Transfers (%) (55-74)	0.39	0.00	0.00	0.00
Transfers Around Purchase (%) (25-44)	0.37	0.00	0.00	0.00

Note:

7 Housing and Commitment

[...Draft: Results coming soon to this section...]

- Further discussion of why adjustment costs and illiquid housing worsens the commitment problem between kids and parents (section 2.3 contains details for the two-period model)
- How the willingness to pay for commitment changes as we remove frictions

7.1 Which Households Prefer Adjustment Costs?

In the two-period model we found that the existence of adjustment costs can be welfare improving for poor kids with wealthy parents. I now turn to this result in the quantitative model. First, I take the benchmark stationary distribution. I then see how many dynasties that prefer that their own dynasty does not face adjustment costs in the future.

Table 8 breaks down the characteristics by whether the kid/parent/both households in a family supports the elimination of adjustment costs. First, we can see that kids that do not support removal of adjustment costs are marginally poorer but that their parents have more than twice the median wealth and they are more

Table 8: Household Observables and Support for Keeping Adjustment Cost

	Kid		Parent		Both	
	No	Yes	No	Yes	No	Yes
Age	35.48	29.77	35.08	27.83	35	28.12
Kid Wealth	26.72	23.37	25.96	3.87	25.81	4.17
Parent Wealth	170.37	435.57	187.17	607.46	190.19	759.58
Kid Ownership Rate	0.53	0.62	0.54	0.20	0.54	0.47
Kid Productivity	1.98	1.85	1.98	1.22	1.97	1.94
Transfer Rate	0.34	0.62	0.36	0.93	0.37	0.84
Transfer Size	4.14	11.21	4.47	28.08	4.72	30.51
Share of Households	0.92	0.08	0.99	0.01	1	0

Note:

likely to be homeowners . These kid households are poor and young, with low liquid wealth and high propensities to consume. These kids are also more likely to receive transfers and they get large transfers. In total 8% of kids desire to keep adjustment costs. Almost no parents prefer their kids to face adjustment costs. The 1% who do, are very wealthy and have poor kids with low income. In effect: Kids who prefer to face adjustment costs use the adjustment costs to receive larger transfers from their parents.

8 Conclusion

In this paper, I investigate the role of inter-vivos transfers from parents to their kids on young adults' housing decisions. I focus mainly on two frictions that are affected by policy: i) the minimum downpayment and ii) adjustment costs (sale and purchase costs).

This paper's first contribution is to document that young US households are increasingly dependent on parental transfers, and the fraction of first-time homebuyers who received down payment assistance from their parents has increased from 10% to 30% in the last two decades. I confirm the literature finding that these transfers are strongly associated with increases in the probability of becoming homeowners. The increase in the reliance on parental transfers for first-time homebuyers and decreasing housing affordability creates the backdrop for my study.

The second contribution is to build a quantitative model of altruism and housing choices that can replicate observed life-cycle wealth accumulation and housing decisions and aggregate and reduced-form empirical transfer patterns. The model is rich and can be used to answer a broad set of important questions relating to the intergenerational transmission of wealth, the role of altruism in life-cycle savings, and housing outcomes.

After estimating the model and verifying that the model matches targeted and non-targeted moments, I turn to counterfactual exercises. I first show that the homeownership rate in the US would be 8 percentage points lower without transfers. This decrease is larger than the difference between peak and bottom homeownership rates among the young since the 1990s to today.

The illiquidity of housing is a significant factor in keeping households with poor parents from owning without transfers. Households worry about buying a house with a large mortgage, then receiving poor income shocks such that they are unable to repay the mortgage and most liquidate the house. There is room for policy to affect this channel: In the US, the typical total broker fee is 6%, while it is 2.0% in Canada and around 1-2.5% in most Western European countries.

In a second experiment, I study how the impact of mortgage lending standards varies by both and own parental wealth. I find that tighter regulation decreases the inter-generational correlation of economic outcomes. This is points to an important consequence of macroprudential policies and possible inequity concerns. I also study how purchase and selling costs affect inter-generational transmission. I find that higher costs increase inequality both within and across generations. Interestingly, I find that 8% of young households prefer to face adjustment costs, as they can use them to credibly overconsume, and in return receive higher transfers.

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A Data Appendix

A.1 Event Study Details

... [Draft: TBD] ...

A.2 Variable Definitions (PSID)

Table 9 lists the most important variable definitions from the 2015 PSID wave.

Table 9: Variable Definitions

Variable	PSID code	Description	Note
Transfer Related			
Wheter Received Transfer	ER67962	Last two/five years, received gift/inheritance >$10,000	Changing definitions
Transfer given	RT13V125	In 2012, did you give any money, loans or gifts to chld/par	2013 Parent/Child File
Other			
Income	ER65349	Total Household Income	
House Value	ER60031	Reported market value of unit and land	
Food Delivered Expenditure	ER71488		
Food at Home Expenditure	ER71490		
Cost of Food Eaten Out	ER66804		

B Details for the Two-Period Model

Lemma B.1 (Kid's Marginal Value of Wealth Pins Down Transfers Without Adjustment *Assume that $\kappa = \infty$, so that the kid cannot adjust his housing. The kid's second period is then twice continuously differentiable, and $\lim_{(x'_k + t'_p) \to 0} \frac{\partial V_{k'}}{\partial (x'_k + t'_p)} = \infty$. The parent's problem (6) is then well defined and the first order condition for transfers is*

$$u'(x'_p - t'_p) = \eta V'_{k'}(x'_k + t'_p, h_k) + \lambda, \tag{29}$$

where λ denotes the multiplier on the non-negativity of transfers. When the multiplier is not binding (and by the Envelope theorem) we have $u'(x'_p - t'_p) = u'(x'_k + t'_p - h_k, h_k)$. This identity causes the kid to undersave: second period transfers are weakly decreasing in kid's second period disposable wealth. Note that there are two ways for the kid to undersave: he can bring too much housing into the period or bring less liquid wealth.

B.1 Sensitivity to Parameters

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.[22] 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.[23] Section D.1 performs a robustness exercise to various biennialization schemes.

[22] 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.

[23] 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.

C.2 Decision Problem Conditional on Choosing to Rent

C.3 Decision Problems at Age 53 and 83

.

C.4 Decision Problems at Age 53 and 83 With Commitment

The family planners discounts the expected future (namely initial conditions of the kid and the resulting new pareto weights), and places weight $\theta + (1-\theta)\eta$ on the future,

$$\begin{aligned}
V_f(\mathbf{s}_f; a_k = 53) = \max_{c_k, c_p, h_k' = h_r, h_k = h_r, x_f'; \theta} & (1-\theta)\left[u(c_p, h_k) + \eta u(c_k, h_k)\right] + \theta u(c_k, h_k) + \\
& (\theta + (1-\theta)\eta)\beta \mathbb{E} V_f(\mathbf{s}_f'; a_k = 25), \\
\text{subject to } & x_f' = (1 + r^f)(x_f + w_k + w_p - c_k - c_p - \kappa h_k - \kappa h_p), \\
& x_f' \geq 0, c_k \geq 0, c_p \geq 0.
\end{aligned}$$

D Robustness Exercises

D.1 Transfer Moments

D.2 Housing Sizes

D.3 Parental Income Risk

D.4 Aggregate and/or Idiosyncratic Price Risk

D.5 Targeting Mean Wealth Instead of Median

E Numerical Solution Algorithm

E.1 Numerical Details

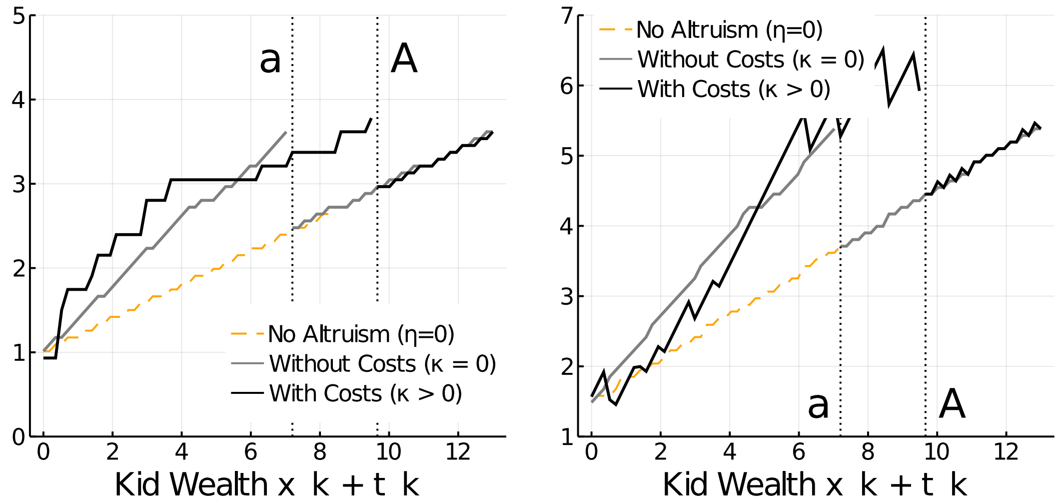
I now briefly discuss some details in the numerical solution of the model. Due to the non-convex nature of the decision problems, occasionally binding constraints and discrete nature of housing I use grid search as a slow, but robust approximate solution algorithm.

E.2 Computational Packages

The program solution is written in Julia v1.5.0 In additional to a relative standard set of packages the numerical solution relies on the `interpolations.jl` package for

Figure 9: First Period Kid Choices

(a) Period 1 Housing h_k (b) Period 1 Consumption c_k



Note:

numerical interpolation routines.

E.3 Interpolation, Gifts, Discrete Choices and Borrowing Constraints

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 much smoother, and do not display large jumps. 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's makes this choice. The probability is the interpolated policy discrete choice function, which is discrete $\{0, 1\}$, 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.

F Supplementary Figures and Tables

Table 10: 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	2.90	0.00	2.69	0.00	3.20	0.00	2.85	0.00	3.01
Wealth	75.85	81.96	31.89	37.57	123.69	144.05	13.92	25.31	163.40	193.22
Wealth Parent	389.59	820.28	311.29	836.94	475.03	796.95	225.77	776.22	621.89	906.18
Income	70.64	65.90	46.12	41.51	97.34	100.01	44.67	46.10	107.36	104.77
College	0.33	0.45	0.33	0.43	0.33	0.47	0.26	0.39	0.43	0.56
White	0.73	0.80	0.64	0.75	0.82	0.87	0.66	0.75	0.83	0.90
Owner	0.41	0.34	0.22	0.16	0.63	0.59	0.00	0.00	1.00	1.00
Owner t-2	0.41	0.34	0.21	0.15	0.63	0.59	0.06	0.05	0.85	0.80
Age	32.98	31.54	31.45	29.93	34.64	33.78	30.87	29.74	35.95	35.08
Observations	2399	1142	1169	588	1230	554	1518	771	881	371
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	2.79	0.00	2.96	0.00	3.08	0.00	3.19	0.00	2.30
Wealth	17.73	13.38	35.05	37.66	44.14	84.49	96.12	141.05	167.66	162.48
Wealth Parent	210.52	633.79	356.03	1060.72	360.17	774.52	344.79	622.69	596.63	776.06
Income	44.53	24.48	46.04	49.10	66.58	73.67	84.84	93.27	102.12	93.96
College	0.20	0.27	0.32	0.51	0.36	0.50	0.33	0.44	0.39	0.41
White	0.67	0.67	0.67	0.78	0.73	0.79	0.78	0.86	0.77	0.90
Owner	0.14	0.04	0.20	0.19	0.40	0.39	0.55	0.56	0.67	0.58
Owner t-2	0.17	0.02	0.15	0.14	0.36	0.32	0.53	0.55	0.66	0.54
Age	22.51	22.45	27.04	26.94	31.90	32.00	36.87	37.01	42.18	42.04
Observations	301	180	610	346	632	286	487	199	369	131
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	2.06	0.00	1.77	0.00	2.33	0.00	3.72	0.00	4.01
Wealth	-56.34	-43.75	-0.95	-0.95	6.61	6.66	34.81	34.50	324.81	348.14
Wealth Parent	218.47	361.19	90.88	192.16	196.39	470.63	337.04	901.34	937.34	1776.57
Income	59.15	47.01	30.12	26.16	42.62	43.24	67.64	70.74	133.26	118.20
College	0.47	0.50	0.13	0.13	0.15	0.29	0.35	0.52	0.51	0.63
White	0.75	0.75	0.55	0.57	0.70	0.80	0.75	0.88	0.85	0.89
Owner	0.29	0.15	0.06	0.08	0.14	0.11	0.56	0.40	0.85	0.78
Owner t-2	0.30	0.13	0.10	0.09	0.16	0.16	0.52	0.37	0.79	0.70
Age	32.53	30.50	31.03	28.87	31.15	30.16	32.74	31.80	36.38	34.77
Observations	448	260	495	186	477	236	491	227	488	233

Note: Data from the PSID Transfer, Individual, and Family modules. Weighted using family weights. Dollar values in 1000s 2016 USD. To do: Here I should denote statistically significant differences.

Table 11: 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	1.02	0.00	0.92	0.00	1.02	0.00	1.02	0.00	1.02
Wealth	9.16	9.67	3.05	4.07	32.56	37.64	1.63	2.54	62.06	81.39
Wealth Parent	83.43	274.30	54.58	198.40	122.09	350.20	31.54	165.84	211.62	422.03
Income	53.52	50.37	33.58	32.42	81.80	78.34	34.62	34.90	89.53	83.43
College	0.00	0.00	0.00	0.00	0.00	0.00	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	31.00	31.00	28.00	35.00	34.00	30.00	28.00	36.00	35.00
Observations	2399	1142	1169	588	1230	554	1518	771	881	371
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	0.81	0.00	1.02	0.00	1.02	0.00	1.02	0.00	0.66
Wealth	3.10	1.93	5.39	6.10	6.10	12.21	17.30	40.19	39.68	42.73
Wealth Parent	25.44	84.45	57.38	189.24	92.59	297.60	90.75	337.79	139.39	388.45
Income	25.64	18.33	39.73	40.70	52.66	58.20	70.10	76.51	89.53	69.59
College	0.00	0.00	0.00	1.00	0.00	0.00	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	23.00	23.00	27.00	27.00	32.00	32.00	37.00	37.00	42.00	42.00
Observations	301	180	610	346	632	286	487	199	369	131
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	0.92	0.00	0.61	0.00	1.02	0.00	0.61	0.00	1.02
Wealth	-31.95	-26.66	0.00	0.00	6.10	6.10	32.56	31.46	169.91	160.75
Wealth Parent	67.66	144.47	10.17	61.05	28.49	162.79	115.99	336.77	320.49	628.77
Income	49.58	34.00	23.40	15.45	33.82	35.49	62.69	61.10	112.96	100.50
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	29.00	30.00	27.00	30.00	28.00	32.00	32.00	37.00	35.00
Observations	448	260	495	186	477	236	491	227	488	233

Note: Data from the PSID Transfer, Individual, and Family modules. Weighted using family weights. Dollar values in 1000s 2016 USD. To do: Here I should include parental wealth and also whether the differences are statistically significant.