The housing channel of intergenerational wealth persistence

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Abstract

We use Norwegian tax data and a life-cycle model with housing to study how wealth transmits from one generation to the next through the housing market. After controlling for a rich set of attributes, households with richer parents are one percentage point (21%) more likely to enter the housing market in a given year and buy homes worth $41,000 (20%) more upon entry. Using international stock market returns as a shift-share instrument supports a causal interpretation of parental wealth on offspring’s housing outcomes. We further document that housing outcomes when young are important determinants of midlife wealth, using plausibly exogenous variation caused by the timing of intra-family deaths. Housing gaps caused purely by parental wealth explain more than 10% of intergenerational wealth persistence. With regard to mechanisms, we find that parents use transfers, home equity withdrawals, co-purchasing and intra-family house sales at discounted prices to support their offspring. Through the lens of our model, house price expectations stand out as a key driver of the housing channel of intergenerational wealth persistence.

Keywords: Housing market, intergenerational wealth, wealth inequality

JEL Codes: D31, E24, G51, R21

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1 Introduction

Wealth tends to persist across generations. And households tend to store their wealth in housing. We therefore ask: to what extent does parental support in the housing market contribute to intergenerational wealth persistence?

To illustrate how important housing can be for wealth accumulation, consider a numerical example using the actual evolution of asset prices in Norway. Imagine investing $100 in either housing or stocks in the early 1990s. Crucially, and in line with the data, the housing investment is initially levered at 0.9, whereas the stock purchase is not. Twenty-five years later, the $100 has grown to $6,000 in the housing market, compared to $4,600 in the stock market (and a mere $1,500 in a deposit account).\(^1\) In this simple example, the owner stays in the home throughout and pays down the mortgage, yielding an average leverage of only 0.26 over the 25 years of our thought experiment. If the household instead re-invests in larger and more expensive housing over time, as young people typically do, the housing return will be substantially higher.

The high return on equity in the housing market applies to everyone – irrespective of parent wealth. Still, substantial barriers to entry means that housing can be important for intergenerational wealth persistence. First, housing is generally indivisible. Second, buying or selling a home entails sizable transaction costs. Third, and perhaps most importantly, lenders apply borrowing constraints, such as loan-to-value and debt-to-income caps, either voluntarily or by regulation. As a result, young people may be constrained from accessing the relatively high returns to equity that the housing market provides. This creates a natural role for affluent parents to support their offspring in the housing market, by accelerating entry and facilitating bigger home investments relative to income. As our numerical example illustrates, the consequences for later-in-life wealth can be large.

In this paper, we use Norwegian tax data merged with housing transaction data from the Land Registry, to study the importance of parental wealth for housing market outcomes and thereby midlife wealth. We also document several mechanisms for how parental support takes place. Thereafter, we build a life-cycle model with housing that can fit the main patterns we observe empirically and use it to assess the importance of house price trajectories and mortgage regulation for the housing channel of intergenerational wealth persistence.

We first document substantial gaps in housing outcomes based on parental wealth. Our baseline wealth measure is simply whether wealth is above or below the year and cohort specific median, although we also consider wealth ranks from 1-100 for robustness. We show

\(^1\)To make the comparison reasonable, we assume that when investing in stocks or deposits, an additional amount equal to the debt servicing costs of the mortgage is re-invested each year. For detailed calculations, see Appendix A.
that households with richer parents are two percentage points (50%) more likely to enter the housing market in a given period, buy homes worth $75 000 (33%) more upon entry, and are 17 percentage points (33%) more likely to be homeowners at age 30. We refer to these differences as "housing gaps", and use them as a starting point for making four distinct contributions to the existing literature.

**Our first main contribution** is to document the impact of parent wealth on housing outcomes, using both a structural mediation analysis and a shift-share instrument for parental wealth. First, we decompose the housing gaps into three components or mediators: a *pure parental wealth component*, an *other parental attributes component* and a *household attributes component*. This is useful, as it allows us to determine not only the relative importance of different attributes and how it has evolved over time, but also determine why certain attributes are important. Specifically, an attribute can be important either if there is a large gap in this attribute, or because the attribute has a large impact on housing outcomes.

Our mediation analysis attributes limited importance to other parent characteristics than wealth. Household attributes on the other hand, are important, and account for roughly half of the observed housing gaps.\(^2\) The remaining half is attributed to parental wealth. This means that, even after accounting for a wide set of parental and household characteristics, we still find that households with richer parents have a 21% higher probability of entering the housing market in a given year, buy homes worth 20% more upon entering the housing market, and are 13% more likely to become homeowners by the age of 30. While the impacts on entry and homeownership rates have been relatively stable over time, the impact on house purchase prices has roughly doubled over the fifteen years of our sample.

If unobservable variables, such as preferences, have direct impacts on housing outcomes, this could bias our results. We therefore exploit plausibly exogenous variation in parent wealth resulting from international stock market returns interacted with lagged stock market exposure in a shift-share analysis. The estimated impact of parental wealth on entry probabilities is quantitatively in line with the pure parental wealth component identified in the mediation analysis, supporting a causal interpretation.

**Our second main contribution** is to document the impact of housing outcomes on midlife wealth, again using both a structural mediation analysis and an instrumental variable approach based on the timing of intra-family deaths. We define intergenerational wealth persistence as the impact of having rich parents on the probability that the household itself will be rich at midlife. This persistence in wealth across generations is then decomposed into

\(^2\)The most important household attributes are the probability of co-habitating, income and education, while location and financial wealth are considerably less important. Co-habitation and education are important mainly because there are large gaps in these variables (channel i)), while income is important mainly via its impact on housing outcomes (channel ii)).
an other parental attributes channel, a household attributes channel, and a housing channel. For the housing channel to be important, two conditions must be satisfied. First, housing outcomes must be highly correlated with parental wealth – as previously documented. Second, housing outcomes must have a substantial impact on wealth accumulation.

We find that households with richer parents are 15 percentage points (35%) more likely to themselves be wealthy at midlife. The combined direct impact of other parental attributes and household attributes can explain only 10-20% of this intergenerational wealth persistence. In contrast, the housing market channel can explain about 25%. Of this, half is due solely to parental wealth, and not to other parental attributes or household attributes. As a result, the pure parental wealth impact on offspring’s housing outcomes can account for 12% of intergenerational wealth persistence.

Again, there might be omitted variables which correlate with housing outcomes, causing our estimates to be biased. To address this, we use variation in the timing of intra-family deaths, and show that entry into the housing market spikes in the year of grandparent death, resulting in a strong first stage. A possible threat to the exclusion restriction is that the timing of grandparent death also affects the timing of financial investments, which could influence midlife wealth. Although we are unable to identify a significant increase in financial assets, we still take several measures to address this by considering only real wealth, controlling for financial asset dynamics over time and excluding households who have any increase in financial assets at the time of grandparent death. Using only variation in age of entry into the housing market caused by the timing of grandparent death provides quantitatively similar results to the mediation analysis, supporting a causal effect of housing outcomes on midlife wealth.

Our third main contribution is to unpack through which mechanisms parental wealth affects housing outcomes. Using an event study around entry into the housing market, we first document a larger increase in liquid wealth for households with richer parents in the 1-2 years leading up to a house purchase. This increase cannot be explained by higher wage income or portfolio re-balancing, and is likely to be driven by (parental) transfers. The pattern is in line with existing literature – see below – documenting the importance of transfers at the time of entry into the housing market. Following Benetton, Kudlyak, and Mondragon (2022), we also find that parental equity extraction is positively correlated with entry in the housing market. We extend their results and document that the importance of this channel varies with parental wealth (also when conditioning on homeownership), as i) households with richer parents are more likely to have parents who extract equity at the time of entry, and ii) the correlation between equity extraction and entry is stronger for those households who have richer parents.
A mechanism which has received little attention in the literature – probably due to data limitations – is that of intra-family real estate sales and purchases. We first show that parents are substantially more likely to buy a house in the year when their adult child enters the housing market, and that a large share of this excess purchase propensity is driven by parent-child co-purchasing. Moreover, the prevalence of co-purchasing differs considerably by parental wealth, with richer parents being almost 60% more likely to co-purchase with their child at the time of entry. We also document that parents are more likely to sell a house in the year when a child enters the housing market. Roughly 2/3 of the excess sale propensity at the time of entry is accounted for by parents selling a house directly to a child. Richer parents are 12% more likely to sell a house at the time of entry than poorer parents, and 8% more likely to sell a house directly to a child. These differences can be explained by a significant reduction in secondary homes among richer parents only.

Co-purchasing a house benefits the household as it relaxes borrowing constraints. However, buying a home directly from ones parents does not necessarily imply an economic benefit. While some intra-family sales are reported as gift-sales, the vast majority are reported as taking place at market value. However, market value is decided upon by a realtor, and can be influenced by the seller. A low price benefits the dynasty as a whole, by reducing taxes on inheritance and capital gains. To evaluate whether parents are selling houses to their children at a (non-reported) discount, we predict market values based on housing characteristics and compare the estimates to the reported sales prices. Our results suggest that parents sell housing directly to their children at a discount of roughly 25%, or $85,000 on average. Hence, discounted intra-family house sales are an important means for parental housing support.\footnote{The effects might be even larger, as parents can purchase and renovate, increasing the market value, before selling to their children, i.e. “reverse flipping”.
}

Our fourth main contribution is to analyze how our results depend on realized and expected house price growth and mortgage market regulation, using a life-cycle model with housing. We do not model parents’ choice of bequests, but instead consider a model where children inherit exogenously. We distinguish between purely monetary transfers and inherited innate characteristics. More precisely, our framework contains three different forms of inheritance. First, a lump sum transfer early in life, second, an annuity which is received as additional income every year, and third, a transfer of increased homeownership preferences. The size of these mechanisms are picked to generate a housing channel of intergenerational wealth persistence in line with the data. Although not targeted, the model also matches the documented housing gaps.

Strong house price growth during the past fifty years is not unique to Norway. In fact,
Knoll, Schularick, and Steger (2017) show that post-war real house price growth in Norway has been exactly equal to the cross-country average, and very similar to that in, for instance, Canada and the UK. Still, other countries – including the US – has seen lower growth in house prices. Our model findings suggest that while realized house price growth has a modest impact on the housing channel, expected house price growth has a substantial impact. Consider first the case in which we only change realized house price growth. Reducing house price growth from the Norwegian level to the US level – implying nearly a halving of the growth rate – reduces the housing channel of intergenerational wealth persistence by just above 20%. If we instead change both realized and expected house price growth, allowing people to adjust their portfolios and leverage in the model, the housing channel of intergenerational wealth persistence falls by more than 70%. This suggests that household behavior in response to house price growth is key to how parental housing support fosters wealth persistence.

Our model can also capture the impact of downpayment requirements on the housing channel of intergenerational wealth persistence. Intuitively, a higher downpayment requirement increases the barriers to entry in the housing market, elevating the importance of parental support. Increasing the downpayment requirement from 10 to 30 percentage points increases the housing channel of intergenerational wealth persistence by almost 20%. While downpayment requirements are intended to make households less vulnerable to adverse shocks, our model results imply that they also lower wealth mobility across generations.

Related literature

Our paper lies in the intersection of three distinct literatures, which together establish i) the persistence of wealth across generations, ii) the importance of parents for child housing market outcomes, and iii) the relevance of housing outcomes for later-in-life wealth. In this paper, we lean on the combined insights of these three literatures, and offer the first decomposition and quantification of the housing channel of intergenerational wealth persistence.

First, several studies have documented that wealthy parents tend to have wealthy children. See for instance Chiteji and Stafford (1999), Charles and Hurst (2003), Boserup, Kopczuk, and Kreiner (2014), Black, Devereux, Lundborg, and Majlesi (2017), Adermon, Lindahl, and Waldenström (2018) and Fagereng, Mogstad, and Rønning (2021). In addition to documenting the correlation between parental wealth and child wealth, much of this liter-

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4To see this, subtract annual average inflation from annual nominal house price growth in Appendix Table A.5, and calculate the cross-country average. Doing so, we find that annual average real house price growth in Norway is 2.3%, which is exactly equal to the cross-country average. The outliers are Japan and France, with very high house price growth (above 4%), and the US, with very low house price growth (0.2%) – see Figure B.1.
nature has focused on differentiating between "nature" and "nurture", typically finding some support for both channels. We contribute by focusing on the housing market as a key driver of wealth persistence across generations. Because the housing market is heavily regulated, policy makers have ample room to affect the share of intergenerational wealth persistence which is working though housing – for instance by changing house price expectations though building regulations or by adjusting mortgage regulation.

Second, a number of papers have shown that parents matter for children’s housing market outcomes. Most of these studies — including Engelhardt and Mayer (1998), Guiso and Jappelli (2002), Luea (2008), Kolodziejczyk and Leth-Petersen (2013), Blickle and Brown (2019), and Brandsaas (2021) – focus on the impact of parental transfers on housing market entry. Relatedly, Benetton, Kudlyak, and Mondragon (2022) study the importance of parental home equity extraction, showing that children are more likely to enter the housing market in years when parents extract equity. Halvorsen and Lindquist (2017), Lee, Myers, Painter, Thunell, and Zissimopoulos (2020) and Bond and Eriksen (2021) document a positive correlation between parental wealth and entry into the housing market, while Daysal, Lovenheim, and Wasser (2022) show that changes to parental housing wealth increases child housing wealth in early adulthood. We contribute by taking a broader approach, focusing not only on parental transfer, but on the causal importance of parental wealth in general. This is crucial, as it allows us to quantify how important housing is for intergenerational wealth persistence. We also document novel mechanisms such as parent-child co-purchasing and direct sales from parent to child at substantially discounted prices.

Finally, there exists a somewhat smaller literature establishing the importance of housing and mortgage decisions for wealth accumulation over the life cycle. Using Norwegian data, Eggum and Larsen (2021) show that capital gains on housing are important for wealth inequality. Di, Belsky, and Liu (2007) and Turner and Luea (2009) show that homeownership status is important for wealth accumulation using PSID data, while Bach, Calvet, and Sodini (2020) use Swedish tax data and find that housing and mortgage choices taken while young are key determinants of a household’s position in the wealth distribution at retirement. Relatedly, Bernstein and Koudijs (2020) document the "critical importance" of mortgage decisions for household wealth building. We contribute by using plausibly exogenous variation in age of entry caused by the timing of intra-family deaths to quantify the impact on midlife wealth, and by isolating the impact which is working through parent wealth.
2 Data

We use Norwegian administrative data from Statistics Norway, merged with housing transaction data from the Land Registry. The former gives us household balance sheet information, and allows us to link parents and children. The latter gives us accurate information on housing transactions, and allows us to follow the ownership of specific houses over time, through unique housing id’s. In this section we discuss sample selection and the measurement of key variables, and provide some summary statistics of especial interest.

Sample construction We start out with a sample of 3.4 million individuals aged 18 or above, for which we know the identity of their parents. We then keep only the individuals for which we observe parental wealth when the (child) household is 19-21 years old, meaning that both parents are alive and file taxes in Norway.\textsuperscript{5} Because our tax data starts in 1992, this means that the oldest (child) individual included in our sample will be born in 1972. Not surprisingly, this reduces the number of individuals in our sample quite substantially.

We proceed by collapsing the data to the household level. Household identifiers are available since 2004, and this is when we start our sample. Household age and household education are defined as the average value across all (adult) household members. Most other variables – such as income and wealth variables – are defined as the sum across all households members. This includes parental income and wealth variables. The individual house purchase value is defined as the purchase price times the ownership share. The household house purchase value is found by summing over the individual house purchase values. We define parents as living in a big city if at least one household member has parents living in a big city. Collapsing the data to the household level leaves us with 1.5 million households in the period 2004-2017.

Measurement of main variables Our main dependent variables are different housing market outcomes. Prior to 2010, we do not observe housing wealth directly. We therefore define a household as a homeowner if they have real wealth above a minimum level, set to capture the value of the cheapest available housing. From 2010 and onward we observe housing wealth directly, and we define a household as a homeowner if it has above-zero primary housing wealth. Due to the improved measurement post-2010, we restrict some of our analysis to this period. We classify a household as entering the housing market in year $t$ if i) the household purchases a home in year $t$, and ii) the household was not a homeowner

\textsuperscript{5}This implies that we do not restrict the sample to households whose parents are still alive at time $t$, but drop individuals whose parents were not alive when the individual was 19-21 years old.
in year $t - 1$. House purchases, as well as purchase prices, are precisely measured in the housing transaction data.

We use two main measures of parental wealth, both of which capture gross financial wealth, but at different times. First, we construct a time-invariant parental wealth indicator $p^w_{i,20}$, based on the three-year average of parental wealth around the time when the (child) household is 20 years old. $p^w_{i,20} = 1$ if parental wealth for household $i$ is above the year-specific median, and zero otherwise. Second, we construct a time-varying indicator of parental wealth $p^w_{i,t}$, which is equal to one if parental wealth in year $t$ is above the year-specific median.

We also use an indicator of "midlife" net household wealth, based on the sum of financial wealth and real wealth net of debt. As discussed above, the oldest (child) individual in our sample is born in 1972, making him or her 45 years old in 2017 – the last year of our sample. To ensure that we observe midlife wealth for a non-trivial share of our sample, we measure it at age 40-42. Hence, midlife wealth $\bar{w}_i = 1$ if net household wealth in the household’s early 40s is above the year-specific median, and zero otherwise. For robustness purposes, we also measure household and parental wealth by calculating their rank from 1-100 in the wealth distribution, within years and controlling for age effects.

In Section 3.2 we rely on the interaction of stock wealth shares and international stock market returns as an instrument for parent wealth. Specifically, we instrument for $p^w_{i,t}$ using stock-share$_{i,t-1} \times r_t$, in which stock-share$_{i,t-1}$ is measured as the share of non-deposit financial wealth relative to total financial wealth and $r_t$ captures the return on the S&P500 stock market index. For our event study on grandparent death in Section 4.2, we consider the death of any of the grandparents for any of the (adult) members of the household, based on year-of-death data. We constrict the sample to households with exactly one observed grandparent death.

Several control variables are included in the analysis. In terms of household characteristics, we typically control for average household age (when appropriate), total income, financial wealth, education, location and number of adult household members (i.e. co-habitation). Education is measured as the maximum education level obtained for an individual. When collapsing to the household level, we use the average of the individual education measures. Location is measured based on a dummy variable for whether the household currently resides in a big city. In terms of parental characteristics, we typically control for total income, average maximum education obtained, current location and number of children (i.e. number of siblings for the (child) household).

**Summary statistics** Summary statistics for the last year in our sample are provided by parental wealth status in Table 1. When the (child) household is 20 years old, richer
parents have financial wealth of $60,000 per person, compared to only $6,000 for poorer parents. In terms of household characteristics, those with richer parents have about twice as much financial wealth as those with poorer parents. They are also eleven percentage points more likely to be homeowners and earn $5,000 more. Number of siblings do not differ by parental wealth, although the standard deviation is larger for those with poorer parents (not reported).\(^6\) Households with richer parents have somewhat more adult household members, reflecting a higher probability of co-habitating.

<table>
<thead>
<tr>
<th></th>
<th>Full sample</th>
<th>Low parental wealth</th>
<th>High parental wealth</th>
</tr>
</thead>
<tbody>
<tr>
<td>(p^{w20})</td>
<td>0.5</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Parent financial wealth(^{20}) (USD)</td>
<td>32,000</td>
<td>6,000</td>
<td>60,000</td>
</tr>
<tr>
<td>Financial wealth(_t) (USD)</td>
<td>21,000</td>
<td>14,000</td>
<td>27,000</td>
</tr>
<tr>
<td>Homeowner(_t) (%)</td>
<td>47</td>
<td>41</td>
<td>52</td>
</tr>
<tr>
<td>Total income(_t) (USD)</td>
<td>45,000</td>
<td>42,000</td>
<td>47,000</td>
</tr>
<tr>
<td>Max education</td>
<td>4.6</td>
<td>4.3</td>
<td>4.9</td>
</tr>
<tr>
<td>Age</td>
<td>30</td>
<td>30</td>
<td>29</td>
</tr>
<tr>
<td>Household members</td>
<td>1.3</td>
<td>1.2</td>
<td>1.4</td>
</tr>
<tr>
<td>Siblings</td>
<td>1.7</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>N</td>
<td>837,260</td>
<td>474,564</td>
<td>481,399</td>
</tr>
</tbody>
</table>

Table 1: Summary statistics 2017. Average (per capita) values.

Notes: \(p^{w20}=1\) if parental financial wealth at household age 20 is above the year-specific median and zero otherwise, parent financial wealth is measured at household age 20, the homeownership indicator takes a value of one if at least one household member owns housing wealth and zero otherwise, max education\(^7\) is measured as the average across all adult household members, household members include the number of adult household members, siblings is the average number of siblings across all adult household members found by taking the average number of children per parent and subtracting one. All prices are in 2015-values. When converting from NOK to USD we use USDNOK=8.5.

\(^6\)1.7 siblings on average might seem high given the relatively low birth rates in Norway in recent decades. We note that this is for a sample of individuals born between 1972 and 1997, and should not be directly compared to the number of children per women, as i) the numbers reported here are conditional on having at least one child, and ii) half-siblings are also counted.
3 The importance of parental wealth for housing

In this section we document the importance of parental wealth for different housing outcomes, focusing on the probability of entering the housing market in a given year, the purchase price upon entry and homeownership status at age 30. We first use a mediation analysis to statistically decompose the difference in housing outcomes for those with richer versus poorer parents into three distinct channels: a pure parental wealth channel, an other parental attributes channel and a household attributes channel. Second, we use plausibly exogenous variation in parental wealth resulting from international stock market returns to establish a causal impact of parental wealth on housing outcomes.

3.1 Mediation analysis

Mediation analyses is a statistical decomposition, which allows us to decompose a correlation into different components, or mediators. In this section, our outcome of interest is the correlation between housing outcomes and parental wealth. Using a mediation framework, we decompose this correlation into three distinct, observable channels: a pure parental wealth channel, an other parental attributes channel and a household attributes channel.

Framework Let housing outcomes \( h_{i,t} \) depend on parental wealth \( p_{w20}^{i,t} \), other parental attributes \( p_{o}^{i,t} \) and household attributes \( x_{i,t} \), as in equation (1). Other factors which influence housing outcomes, such as macroeconomic conditions, are grouped together in the error term \( \eta_{i,t} \).

\[
h_{i,t} = \beta_0 + \beta_1 p_{w20}^{i,t} + \beta_2 p_{o}^{i,t} + \beta_3 x_{i,t} + \eta_{i,t} \tag{1}
\]

Taking the covariance between housing and parental wealth based on equation (1), and dividing by the variance of parental wealth, we arrive at the following expression

\[
\frac{cov(h_{i,t}, p_{w20}^{i,t})}{var(p_{w20}^{i,t})} = \beta_1 \frac{cov(p_{w20}^{i,t}, p_{w20}^{i,t})}{var(p_{w20}^{i,t})} + \beta_2 \frac{cov(p_{o}^{i,t}, p_{w20}^{i,t})}{var(p_{w20}^{i,t})} + \beta_3 \frac{cov(x_{i,t}, p_{w20}^{i,t})}{var(p_{w20}^{i,t})} + \frac{cov(\eta_{i,t}, p_{w20}^{i,t})}{var(p_{w20}^{i,t})} \tag{2}
\]

Note that the left hand side of equation (2) is simply the regression coefficient from regressing housing \( h_{i,t} \) on parental wealth \( p_{w20}^{i,t} \). This covariance-variance term captures the difference in housing outcomes based on parental wealth, and we refer to this as housing "gaps". The housing gaps can be decomposed into three observable channels. First, the pure
parental wealth channel is simply given by the $\beta_1$-coefficient from equation (1). An unbiased estimate of $\beta_1$ captures the causal impact of parental wealth on housing gaps. Second, the other parental attributes channel consists of two terms. The $\beta_2$ term captures the impact of other parental attributes on housing, while the covariance-variance term captures the correlation between these other parental attributes and parental wealth. This means that for other parental attributes to be important in explaining housing gaps, two conditions must be satisfied. First, other parental estimates must have large impacts on housing. Second, other parental attributes must be highly correlated with parental wealth.

The third term on the right-hand side of equation (1) is the household attributes channel. Again, this consists of two terms: the impact of household attributes on housing and the correlation between these household attributes and parental wealth. As was the case with the other parental attributes channel, two conditions must therefore be met for household attributes to be important. First, household attributes must have a large impact on housing, and, second, household attributes must be highly correlated with parental wealth. The final term in equation (1) is unobservable to us as econometricians. By construction, this term will drop out in our estimation. It is important to keep in mind however, that if $\text{cov}(\eta_{i,t}, p_{i,t}^{w20}) \neq 0$, our $\beta$-estimates will be biased. In Section 3.2 we use plausibly exogenous variation in parental wealth to support a causal interpretation of parental wealth on housing.

In order to decompose the impact of parental wealth on housing market outcomes, we compute the components in equation (2) separately. First, we estimate equation (1) to obtain $\hat{\beta}_1$, $\hat{\beta}_2$, and $\hat{\beta}_3$. Second we regress $p_i^o$ on $p_i^{w20}$ to obtain $\frac{\text{cov}(p_i^o, p_i^{w20})}{\text{var}(p_i^{w20})}$ and regress $x_i$ on $p_i^{w20}$ to obtain $\frac{\text{cov}(x_i, p_i^{w20})}{\text{var}(p_i^{w20})}$. In the presentation of equations (1) and (2) we assumed the variables were scalars. In practice, parental attributes and household attributes are going to be vectors in the upcoming analysis. The extension to the vector case is straightforward, in the sense that all attributes are added separately to equation (1). Specifically, the other parental attributes channel is given by $\sum_{a=2}^{n} \frac{\text{cov}(a_{i,t}, p_{i,t}^{w20})}{\text{var}(p_{i,t}^{w20})}$ and the household attributes channel is given by $\sum_{a=2}^{n} \frac{\text{cov}(x_{i,t}, p_{i,t}^{w20})}{\text{var}(p_{i,t}^{w20})}$.

Measurement We consider three different measures of housing outcomes as our left hand side variable. Specifically let $h_{i,t}$ capture either entry probability, purchase price upon entry, or homeownership at age 30. Entry probabilities are only defined for those not in the housing market (=0) or those entering the housing market in a given year (=1). When considering purchase price upon entry we only include households entering the housing market in the

\[ h_{i,t} = \beta_0 + \beta_1 p_{i,t}^{w20} + \beta_2 a_{i,t} + \ldots + \beta_n p_{i,t}^{w20} + \eta_{i,t} \]

\[ \text{cov}(p_{i,t}^o, p_{i,t}^{w20}) \]

\[ \text{var}(p_{i,t}^{w20}) \]

\[ \text{cov}(x_{i,t}, p_{i,t}^{w20}) \]

\[ \text{var}(p_{i,t}^{w20}) \]
given year. Similarly, for homeownership at age 30 we only include households with an average age of 30 in the given year. For these latter two housing outcomes, the time subscript is redundant, so the housing outcome is simply $h_i$.

Our baseline measure of parental wealth is $p_{w20}^i$, which measures whether average parental financial wealth in the year when the household is aged 19-21 is above or below the year-specific median. This captures parental wealth at the start of adulthood, and does not contain any time variation. However, we also consider contemporaneous parental wealth for robustness purposes. While simply dividing parental wealth based on whether it is above or below the median, gives us a rough measure of parental wealth, we view it as a natural way to split households into two groups in order to facilitate the upcoming graphical depiction. Importantly – and as documented in Figure 1 – housing outcomes are quite linear in parental wealth ranks, suggesting that splitting the sample at the median does not cause us to miss out on important non-linearities. As seen from Figure 1a, the correlation between parental wealth rank and entry probability is virtually linear except for the top and bottom 3-5%. For house purchase price upon entry, the correlation with parental wealth rank is virtually linear except for the top 3% – see Figure 1b. That being said, we also consider other categorizations of parental wealth for robustness purposes, such as parental wealth ranks or simply dollar amounts of wealth.

![Figure 1: Housing outcomes by parental wealth rank](image)

(a) Entry probability  
(b) Purchase price upon entry

Notes: Parental wealth rank is calculated based on the year-specific distribution of parental financial wealth when the child is aged 20. Entry probability takes on a value of 0 for those not in the housing market, and 1 for first-time entrants.

Parental attributes include parent income, education, location and number of children, while household attributes include household income, financial wealth, education, location,
number of adult household members and age (when appropriate). These variables are measured contemporaneously. For instance, we use household income at age 30 when studying homeownership at age 30.

**Housing outcome I: Entry probability** We start by applying the mediation framework using entry into the housing market as our housing outcome $h_{i,t}$. Figure 2 depicts average entry rates for households with above and below median parental wealth over time. Focusing first on the black solid and dashed lines, we see that those with richer parents always have a higher entry probability than those with poorer parents. Note that the average difference is given by the left hand side of equation (2), i.e. $\frac{\text{cov}(h_{i,t}, p_{20}^{w})}{\text{var}(p_{20}^{w})}$ with $h_{i,t} = entry_{i,t}$. In the beginning of our sample, those with richer parents are just above one percentage point more likely to enter the housing market each period. That is, they are almost 50% more likely to enter the housing market than those with poorer parents. By the end of our sample, this difference has increased to two percentage points, or just above 50%.

![Figure 2: Entry probability by parental wealth: decomposed into channels i)-iii) as in equation (2)](image)

Notes: $h_{i,t}$ is an indicator variable for entering the housing market. $p_{20}^{w} = 1$ if average parental financial wealth when household is aged 19-21 is above the year-specific threshold, $p_{i}^{o}$ is parent income, education, location and number of children, $x_{i}$ is hh income, financial wealth, education, location and number of hh members. Sample consists of potential entrants and entrants in the housing market.

The gap between the solid black line and the dashed black line can be decomposed into a pure wealth component, a parent attributes component and a household attributes
component, in accordance with equation (2). The household attributes channel, captured in red, reflects the importance of household income, financial wealth, location, education and number of adult household members. At the start of our sample, the household attributes channel explains roughly 1/3 of the entry probability gap. By the end of our sample, the household attributes channel has grown to roughly 60%.

We further decompose the household attributes channel in Figure B.3 in the appendix. The most important household attribute is the number of adult household members, followed by household education and income, which are of roughly equal importance. This is driven by i) households with richer parents being more likely to co-habit, and having higher income and education, and ii) these attributes being important for entry into the housing market. The increase in the household attributes channel over time is mostly driven by an increase in the importance of education and the number of adult household members. Interestingly, the increasing importance of education is driven entirely by education becoming more important for entry into the housing market (and not because the correlation with parental wealth has changed), while the increasing importance of number of household members is driven entirely by a stronger correlation between parental wealth and the probability of co-habitating, i.e. a higher gap.

In contrast to the household attributes channel, other parental attributes explain very little of the entry gap – see the gray component in Figure 2. That is, the correlation between parental wealth and housing market entry does not seem to be working through other parental characteristics such as parental income, education, location or the number of siblings (i.e. number of children for the parent household). That is not because these other parental attributes are uncorrelated with parental wealth, but because their impact on housing market entry – once parental wealth is controlled for – is limited.

Finally, the pure parental wealth component, captured by the blue area, accounts for more than 45% of the entry gap on average, and 40% in the final year of our sample. That is, by the end of our sample, even when controlling for a rich set of household and other parental characteristics, those with richer parents are still 0.8 percentage points or 21% more likely to enter the housing market in a given year.

The results in Figure 2 are based on a static parental wealth ranking done when the household is 20±1 years old. We have redone the analysis using instead a parental wealth ranking based on parental wealth in year $t-1$. The results – depicted in Figure B.4 – are very similar.

To summarize, the entry probability gap between those with richer and poorer parents has been increasing over time. By the end of our sample, households with richer parents are roughly 50% more likely to enter the housing market in any given period. Controlling for
household attributes and other parental attributes can explain less than 60% of this gap.

**Housing outcome II: House purchase price**  Conditional on entry, another important margin of adjustment is the purchase price. Figure 3 depicts the purchase price upon entry in real USD by parental wealth.\(^{10}\) That is, only households who enter the housing market in the given year are included in the sample.

By the end of our sample, those with richer parents buy homes worth approximately $75,000 more when entering the housing market. This means that those with richer parents buy homes worth 33% more than those with poorer parents upon entry. The purchase price gap has doubled in absolute terms over the time period, and has increased also in percentage terms.

![Figure 3: House purchase price by parental wealth: decomposed into channels i)-iii) as in equation (2)](image)

Notes: \(h_i\) is house purchase price (USD) upon entry. \(p_{i}^{w,20}\) = 1 if average parental financial wealth when household is aged 19-21 is above the year-specific threshold, \(p_{i}^{p}\) is parent income, education, location and number of children, \(x_{i}\) is hh income, financial wealth, education, location and number of adult household members. Sample consists of only households entering the housing market.

Household attributes are somewhat less important in explaining the purchase price gap than the entry gap. By the end of our sample, the household attributes channel can explain about 40% of the purchase price gap, compared to 60% for the entry gap. The number of adult household members is again the most important household attribute – see Figure B.5 in

\(^{10}\)Prices in NOK are first deflated to obtain constant 2015-prices, and are then converted to USD using a constant exchange rate of USDNOK=8.5.
the appendix. It is worth pointing out, however, that this is because we measure house values as the sum of house values across all household members (i.e. the sum of purchase price times the ownership share for all household members). On average, a couple household will own more housing wealth than a single household. Because the probability of co-habitating is larger for those with richer parents, household size becomes an important driver. Household income and education are also important, as was previously the case. Location – which was not important for explaining the entry gap – is more important for explaining the purchase price gap. This is perhaps not surprising, given the large geographical variation in house prices.

Other parental attributes are, as before, not important drivers of the purchase price gap. This leaves a large role for the pure parental wealth gap, which accounts for almost 60% of the observed difference between purchase prices for those with above or below median wealthy parents. That is, even after controlling for a rich set of observables, households with richer parents buy homes worth an additional $40,000 (≈ 20%) when entering the housing market. Note that the pure parental wealth channel has roughly doubled in size over the sample period. Figure B.6 confirms that the results are very similar when using lagged parental wealth at time of entry rather than parental wealth at age 20±1 when constructing the parental wealth rankings.

**Housing outcome III: Homeownership status at 30** Entry probabilities are only available for those who are not in the housing market in \( t-1 \), while house purchase price upon entry is only available for those who we observe entering the housing market. Homeownership rates at a given age, on the other hand, are available for everyone observed, thereby also potentially including households who never enter the housing market. Here we show how homeownership rates at age 30 vary with parental wealth, using only households with an average age of 30 in a given year. The same exercise can of course be done for any other age. As illustrated in Figure B.7, homeownership rate gaps tend to peak at around 30, so we would expect somewhat smaller effects at other ages.

The homeownership rate gap at 30 has increased quite substantially over time, as seen in Figure 4. By the end of our sample, almost 70% of households with richer parents are homeowners, compared to just above 50% of households with poorer parents. This translates into a homeownership rate gap of 17 percentage points or 33%.
In terms of decomposing the homeownership rate gap, the relative sizes of the different components are similar to the entry probability gap – see Figure B.8. The importance of household attributes increases over time, accounting for more than 50% of the homeownership gap by the end of our sample. The relative importance of the different household attributes is however quite different – see Figure B.9. Household income is by far the most important component, leaving a smaller role for the number of adult household members and education. As before, other parental attributes are not quantitatively important. As a result, the pure parental wealth component can account for nearly 50% by the end of the sample. This implies that, after controlling for a rich set of observables, households with richer parents are still about seven percentage points or 13% more likely to be homeowners at age 30 than households with poorer parents.

Another housing outcome, which we have not included here, is leverage. While we do not observe loan-to-value ratios directly, we can approximate them by dividing total debt by the purchase price of the house. Doing so, we find that households with richer parents have somewhat higher leverage than households with poorer parents, and that the leverage gap is almost fully attributed to the pure parental wealth channel. This could reflect higher risk taking by households with richer parents, perhaps due to better parental safety nets, or due
to higher risk tolerance. Alternatively, higher leverage could be the result of richer parents being more likely to act as mortgage guarantors for their (adult) children. In any case, higher leverage contributes to higher return on equity for households with richer parents.

3.2 The causal impact of parental wealth

The previous section showed that, even after controlling for a rich set of parental and household characteristics, parental wealth is an important mediator for housing outcomes. However, there could be omitted variables which influence this relationship, posing a threat to a causal interpretation. For instance, preferences are unobserved to us as econometricians, and could influence housing outcomes directly. If these preferences are correlated with parental wealth, perhaps because preferences are transmitted from one generation to the next, it will impact our $\beta$-estimates from equation (1). In this section we use plausibly exogenous variation in parental wealth caused by a shift-share (Bartik) type instrument, which supports a causal interpretation of the impact of parental wealth on housing outcomes.

To obtain plausibly exogenous variation in parental wealth, we rely on international stock market returns and initial stock market exposure. To measure international stock market returns we use the return on the S&P 500 index, $r_t$. The annual return varies from -24% in 2008 to 18% in 2012, creating non-trivial variation in financial wealth. Parents have different exposure to stock market returns based on their balance sheets, and we use this to obtain cross-sectional variation. Specifically, we calculate the lagged share of parental financial wealth held in stocks, and call this stock-share $s_{i,t-1}$. The stock share has a median value of 0.21 and mean value of 0.30. Our instrument is the interaction between stock shares and international stock market returns – see the first stage in equation (3). We measure parental wealth contemporaneously (in contrast to parental wealth when the household is 20), in order to obtain a sufficiently strong instrument. Note that we do not necessarily require parental stock shares to be exogenous, as we can instead rely on the exogeneity of the international stock market returns for identification. Identification by exogenous ”shifts” rather than ”shares” in shift-share instrument analyses is discussed in detail in Borusyak, Hull, and Jaravel (2022).

$$p_{i,t}^w = \alpha + \beta_1 s_{i,t-1} \times r_t + \beta_2 p_{i,t}^p + \beta_3 x_{i,t} + \epsilon_{i,t} \tag{3}$$

Because stock market returns can be both positive and negative, the shift-share instrument can both increase and decrease parental wealth. Parents who either have large stock holdings, or whose wealth is close to the median, are more likely to have their $p_{i,t}^w$-status change due to the instrument. Once we have the instrumented parental wealth, we use this
to estimate equation (4).

\[ h_{i,t} = \alpha_{IV} + \beta_{1IV} p_{i,t}^w + \beta_{2IV} p_{i,t}^p + \beta_{3IV} x_{i,t} + \epsilon_{i,t}^{IV} \] (4)

The regression results are reported in Table 2. Column 1 reports the OLS results, indicating that a one percentage point increase in the parental wealth indicator increases the entry probability by 1.3 percentage points. The reduced form results are reported in the second column, while the first stage results are reported in the third column. The F-statistic on the first stage is well above 100, suggesting a strong instrument. As seen from the table, a larger interaction term between parental stock wealth and international stock market returns significantly increases both the entry probability and the probability of having richer parents.

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Table 2: IV-analysis: stock market return.

Notes: Entry: \( entry_{i,t} = 1 \) if household \( i \) purchases a house in year \( t \) and did not own housing in year \( t - 1 \), \( entry_{i,t} = 0 \) if household \( i \) did not purchase a house in year \( t \) and did not own housing in year \( t - 1 \). Parental wealth: \( p_{i,t}^w = 1 \) if average parental financial wealth when household is aged 19-21 is above the year-specific threshold, and zero otherwise. Instrument: stock-share is the share of non-deposit financial wealth, \( r_t \) is the annual return on the S&P 500.

Scaling the reduced form results by the first stage results gives the same estimate as the IV-estimate reported in Column 4. It says that a one percentage point increase in parental wealth – resulting from the stock market return measure – increases entry probabilities by 1.9 percentage points. Note that, although the IV-estimate again exceeds the OLS-estimate, the 95% confidence intervals overlap. These results are consistent with a causal interpretation.
of the OLS-estimates.

While we control for household financial wealth, one might worry that households with high parental wealth have a higher stock share themselves, making them more likely to enter the housing market exactly in the years with high stock market returns. In Column 5 we explicitly control for the interaction of (child) household stock market shares and international stock market returns. This increases the estimated impact of parental wealth only slightly and the take-away remains unchanged.

4 The housing channel of intergenerational wealth persistence

So far we have documented large housing gaps caused by parental wealth. This is important in itself, as homeownership is generally thought to provide both private and social benefits (Coulson and Li (2013), Sodini et al. (2016)). In this section we focus on the importance of housing for wealth accumulation, quantifying the role of the housing market in driving intergenerational wealth persistence. As in Section 3, we proceed in two steps. First, we use a mediation analysis to statistically decompose intergenerational wealth persistence into different components, and isolate the housing market channel. Second, we use plausibly exogenous variation in housing outcomes caused by the timing of intra-family deaths to estimate the causal impact of housing outcomes on midlife wealth.

4.1 Mediation analysis

In this section we consider the correlation between household wealth and parental wealth and decompose this correlation into four observable channels: a pure parental wealth channel, an other parental attributes channel, a household attributes channel and a housing channel.

**Framework** Let midlife wealth \( \bar{w}_i \) depend on parental wealth when the household is 19-21 \( p_{i20}^w \), other parental attributes at midlife \( \bar{p}_i^o \), household attributes at midlife \( \bar{x}_i \) and housing outcomes \( h_i \) – as in equation (5). Any other variables which affect household wealth are grouped together in the error term \( \epsilon_i \). We first lay out the structural framework, and describe the measurement of the variables further below.

\[
\bar{w}_i = \alpha_0 + \alpha_1 p_{i20}^w + \alpha_2 \bar{p}_i^o + \alpha_3 \bar{x}_i + \alpha_4 h_i + \epsilon_i
\]  

Using equation (5) to express the covariance between \( \bar{w}_i \) and \( p_{i20}^w \), and dividing by the
variance of $p_{i}^{w20}$, we arrive at the expression in equation (6). The left hand side is the correlation between parental wealth and household wealth, and captures our measure of intergenerational wealth persistence. Note that, as before, this is simply the regression coefficient from regressing household wealth on parental wealth.

$$\frac{cov(\bar{w}_i, p_{i}^{w20})}{var(p_{i}^{w20})} = \alpha_1 + \frac{cov(p_{i}^{2w}, p_{i}^{w20})}{var(p_{i}^{w20})} + \alpha_2 + \frac{cov(\bar{x}_i, p_{i}^{w20})}{var(p_{i}^{w20})} + \alpha_4 + \frac{cov(h_i, p_{i}^{w20})}{var(p_{i}^{w20})} + \alpha_3 + \frac{cov(\epsilon_i, p_{i}^{w20})}{var(p_{i}^{w20})} + \alpha_4 + \frac{cov(\eta_i, p_{i}^{w20})}{var(p_{i}^{w20})}$$

(6)

Intergenerational wealth persistence can be decomposed into four distinct, observable channels. First, there is a pure parental wealth channel, captured by the $\alpha_1$ coefficient from equation (5). Second, there is an other parental attributes channel, which as before consists of two terms. First, the impact of other parental attributes on household wealth, $\alpha_2$. Second, the correlation between these other parental attributes and parental wealth. The housing attributes term is symmetrical, again consisting of two terms. First, the impact of household attributes on household wealth, $\alpha_3$. Second, the correlation between these household attributes and parental wealth.

The final observable term in equation (6) is the housing channel. This is given by two terms. First, the impact of housing outcomes on midlife wealth, $\alpha_4$, and second, the correlation between housing outcomes and parental wealth, $\frac{cov(h_i, p_{i}^{w20})}{var(p_{i}^{w20})}$. Note that the latter is equal to the left-hand side of equation (2), i.e. it is the regression coefficient from regressing housing outcomes on parental wealth. If we substitute this term from equation (2), then we can rewrite equation (6) as follows

$$\frac{cov(\bar{w}_i, p_{i}^{w20})}{var(p_{i}^{w20})} = \alpha_1 + \alpha_4 + \frac{cov(p_{i}^{2w}, p_{i}^{w20})}{var(p_{i}^{w20})} + \alpha_2 + \alpha_4 \beta_1 + \frac{cov(\bar{x}_i, p_{i}^{w20})}{var(p_{i}^{w20})} + \alpha_3 + \alpha_4 \beta_3 + \frac{cov(h_i, p_{i}^{w20})}{var(p_{i}^{w20})}$$

(7)

In equation (7) the housing channel has been split into different parts. Intuitively, the housing channel in equation (6) reflected the fact that households with richer parents have better housing outcomes, which increases their midlife wealth. However, households with
richer parents have better housing outcomes for several reasons – explored in detail in Section 3. Part of the housing gap is due to a pure parental wealth effect, but part is due to households with richer parents being different along other observable dimensions.

In equation (7), the part of the housing channel which is due purely to parental wealth is isolated in the term called "housing by parental wealth (pw)", captured by $\alpha_4 \beta_1$. The magnitude of this term reflects the impact of parental wealth on housing ($\beta_1$) and the impact of housing on midlife wealth ($\alpha_4$). The remainder of the housing channel is working through other parental attributes or through household attributes. As a result, the parental attributes channel in equation (7) has been extended to also capture the impact working through the housing market, captured by $\alpha_4 \beta_2$. Similarly, the household attributes channel in equation (7) has been extended to also capture the impact working through the housing market, captured by $\alpha_4 \beta_3$.

In the upcoming analysis we first estimate the $\alpha$-coefficients from equation (5), and the covariance-variance terms. We use these coefficients to compute the terms of intergenerational wealth persistence as specified in equation (6). This gives us the housing channel of intergenerational wealth persistence, i.e. tells us what share of wealth persistence is working through the housing market. Second, we also report the share of the housing channel which is due solely to parental wealth, as specified in equation (7).

**Measurement** Net household wealth at midlife is measured when the household is in its early 40s. Parental wealth is as before measured based on average financial wealth when the household is aged 19-21, but as before, we also consider contemporaneous measures. In our baseline analysis, both household wealth and parental wealth are dummy variables which capture whether wealth holdings are above or below the year-specific median. However, this rough definition of "wealthy" and "non-wealthy" could be problematic if the correlation between household wealth and parental wealth is highly non-linear.

The recent literature on intergenerational wealth persistence often ranks parental wealth and child wealth in their respective distributions (from 1 to 100), and estimates the rank-rank correlation. Findings from this literature suggest that the correlation between ranks is quite well approximated by a linear relationship, see for instance Adermon, Lindahl, and Waldenström (2018) and Fagereng, Mogstad, and Rønning (2021). This is also the case in our sample, as shown in Appendix Figure B.2. Only households with parental wealth in the top 3% have a stronger rank-rank correlation than suggested by the linear approximation. This suggests that the simple division of above/below the median captures the main features of the data. However, we also report results using wealth ranks from 1-100 for robustness purposes.
The mediators "other parental attributes" \( \bar{p}_i \), and household attributes \( \bar{x}_i \) are the same as in Section 3, only now they are measured at midlife. That is, other parental attributes include parent income, education, location and number of children, while household attributes include household income, financial wealth, education, location, number of adult household members and age (when appropriate). Crucially, we also include housing outcomes \( h_i \) as a mediator. We measure housing outcomes in two different ways. First, we consider age of entry in the housing market and purchase price upon entry. These two variables are however only defined for households which we observe entering the housing market. As an alternative, we consider homeownership indicators at ages 27, 30, 33 and 36. The homeownership indicators are available for all households observed at these ages, and thus also capture the extensive margin of potentially not entering the housing market.

**Estimation** We estimate all the components of intergenerational wealth dependence separately, reporting detailed regression results in the appendix, and summarizing the main results here. We first estimate equation (5) to obtain \( \hat{\alpha}_1 \), \( \hat{\alpha}_2 \), \( \hat{\alpha}_3 \) and \( \hat{\alpha}_4 \). The results are reported in the first column of Appendix Table C.6. After obtaining the \( \alpha \)-estimates, we regress \( p_i \), \( x_i \) and \( h_i \) on \( p^{20}_i \), one-by-one, to get the covariance-terms in equation (6). The results are reported in Columns 2-11 of Appendix Table C.6. We then have what we need to calculate the distinct components of intergenerational wealth persistence as specified in equation (6). The components are summarized in Table 3, for two different measures of housing outcomes: i) age of entry and purchase price and ii) homeownership indicators at age 27, 30, 33 and 36.

Starting from the bottom of Table 3, we find that households with above median wealthy parents are 15 percentage points (=35%) more likely to themselves be wealthy at midlife. This is the case both when housing outcomes are age of entry and purchase price in Column 1, and when housing outcomes are homeownership indicators at different ages in Column 2. Note that this number is simply the estimated coefficient from regressing midlife household wealth on parental wealth, i.e. the left hand side of equation (6). We now proceed by decomposing this correlation into different components or mediators.
As seen from the top row of Table 3, the pure parental wealth component accounts for at least 55% of intergenerational wealth persistence. This means that around 40% of the correlation between parental wealth and child wealth can be explained by other observable factors. As seen from the second row, other parental attributes – such as parental income, education, location and number of children – do not account for a large share of the observed intergenerational persistence. Household attributes are somewhat more important, explaining roughly 10% of the correlation between parental wealth and child wealth. Of these, education and co-habitation status are the most important attributes.

Quite strikingly, housing outcomes are substantially more important than both parental attributes and other household attributes in explaining intergenerational wealth persistence – see the second-to-last last row of Table 3. In fact, around 1/4 of the correlation between parental wealth and household wealth is explained by housing outcomes. The housing channel is somewhat larger when using the homeownership-indicators as our housing measure, rather than age of entry and purchase price. This is likely driven by the importance of the extensive margin, as using homeownership-indicators means that we also include households who do not enter the housing market in our sample period.

Finally, we also compute the share of the housing channel which is due solely to parental wealth, and not factors such as other parental attributes or household attributes. That is, we compute the $\alpha_4 \beta_1$ term from equation (7). As seen from the final row in Table 3, this term equals 0.02 and accounts for 11-12% of intergenerational wealth persistence. The
interpretation being that households with richer parents are two percentage points more likely to be rich themselves at midlife, due to them having better housing outcomes as a result of higher parental wealth.

The results so far have been based on whether wealth is above or below the median. In Table C.1 we reproduce the results, only using the rank from 1-100 to capture household wealth and parental wealth. In total, increasing the parental wealth rank by one increases the household wealth rank at midlife by 0.3, which is similar in magnitude to previous findings.\textsuperscript{11} Compared to the results in Table 3, the housing channel becomes slightly more important in the case of age of entry and purchase prices, and slightly less important in the case of homeownership indicators at different ages. On average however, the results are quite similar. With respect to the housing channel due solely to parental wealth, this falls slightly, from just above 10% to just below 10%. Overall, we regard the results as being robust to using a rank-rank measure instead of splitting the sample by the median.

4.2 The causal impact of housing on wealth accumulation

Correctly estimating the housing channel of intergenerational wealth persistence requires an unbiased estimate of the impact of housing on midlife wealth, i.e. coefficient \( \alpha_4 \) from equation (5). In this section we use plausibly exogenous variation in housing resulting from variation in the timing of grandparent death to estimate the causal impact of age of entry in the housing market on midlife wealth. We restrict our sample to households for which we observe exactly one grandparent death in our sample period. This means that all households experience one grandparent death, and we rely on variation in timing only for identification.

The strength of the instrument depends on grandparent death having a non-trivial impact on housing outcomes. To document that this is the case, we estimate an event study around grandparent death, based on equation (8). The outcome variable \( y_{i,t} \) is the probability of entering the housing market, defined for households which either are not in the housing market or are entering the housing market in year \( t \). We define a vector of time dummies for the years prior to and following the death of a grandparent, \( I_{i,t}^k \), with \( k \) denoting the number of years since the grandparent death took place. All \( \beta_k \)-coefficients are relative to \( k = -3 \), which we set as our baseline. \( \delta_t \) captures time fixed effects.

\[
y_{i,t} = \alpha + \delta_t + \sum_{k=-3}^{k=3} \beta_k I_{i,t}^k + \epsilon_{i,t} \tag{8}
\]

\textsuperscript{11}For instance Fagereng et al. (2021) find a rank-rank coefficient of 0.24 (for non-adoptees) using Norwegian data, Adermon et al. (2018) find a rank-rank coefficient of 0.3-0.4 using Swedish data and Pfeffer and Killewald (2015) find a rank-rank coefficient of 0.39 (for ages 35-44) using US PSID data.
Figure 5a illustrates a substantial spike in the probability of entering the housing market exactly in the year of grandparent death. The entry probability increases from around 4.6% to 5.1%, an increase of more than ten percent. As a result, the timing of grandparent death causes variation in age of entry in the housing market. This is further captured by the first stage in equation (9), in which $h_i$ is the age of entry for household $i$. The regression results from the first stage are reported in Appendix Table C.2, and an F-statistic exceeding 300 confirms the strength of the instrument.

$$h_i = \alpha + \beta_{1\text{age-gpd}} + \beta_2 p_i + \beta_3 x_i + \epsilon_i$$  \hspace{1cm} (9)

$$\bar{w}_i = \alpha^{IV} + \beta_{1IV} \hat{h}_i + \beta_2^{IV} p_i + \beta_3^{IV} x_i + \epsilon_i^{IV}$$  \hspace{1cm} (10)

Notes: Regression results from estimating equation (8) with $y_{i,t} = \text{entry probability}_{i,t}$ (left panel) or $y_{i,t} = \text{financial wealth}_{i,t}$ (right panel). When $y_{i,t} = \text{financial wealth}_{i,t}$ we also control for number of household members, which might change as entry probabilities spike. Sample: households who experience exactly one grandparent death in the sample period.

Once we have the instrumented age of entry in the housing market, we estimate the impact on midlife wealth according to the second stage in equation (10). The exclusion restriction says that the timing of grandparent death should only affect midlife wealth through the age of entry in the housing market. However, if the timing of grandparent death causes variation in other types of investments as well, this could be a concern. Specifically, the death of a grandparent could cause an increase in financial wealth due to inheritance. If so, the timing of grandparent death could cause variation in the accumulated return on this investment, potentially invalidating our instrument.
Figure 5b depicts the same event study as in equation (8), using financial wealth as the dependent variable. There is no statistically significant increase in financial wealth in the year of grandparent death, rather there appears to be a positive trend. Even if the increase is not significant, we still take several measures to ensure that financial investments are not biasing our results. First, we redo the estimation using household real wealth rather than household net wealth, as we expect the impact of financial investments to matter more for net wealth than for real wealth. Second, we directly control for the time profile of financial investments, and third, we exclude all households who increase financial wealth at the time of grandparent death from the sample.

Our baseline estimates are reported in the first row of Table 4. We consider three different measures of household net wealth: above/below the median in Columns 1-2, the rank from 1-100 in Columns 3-4 and the USD value in Columns 5-6. Using first the above/below median definition of high household wealth, the instrumented impact of age of entry is negative at -0.01, and significant only at the ten percent level, as seen from Column 1. This implies that entering the housing market one year later reduces your probability of being rich at midlife by one percentage points. If we instead use the wealth ranking in Column 3, the negative impact of instrumented age of entry increases in statistical significance. The coefficient estimates says that entering the housing market one year later reduces ones wealth rank at midlife by 1.4. Using midlife wealth in USD provides a similar picture. The instrumented age of entry has a negative and significant impact on midlife wealth, as seen from Column 5. Entering the housing market one year later reduces midlife wealth by roughly $15,000.\textsuperscript{12} The IV-estimates are not statistically different from the OLS-estimates for any of the three wealth measures.

The second row of Table 4 reports the same coefficients, using real wealth rather than household wealth. In this case, the above/below median wealth measure is significant at the one percent level, and says that entering the housing market one year later reduces the probability of having above median wealth at midlife by 1.7 percentage points. The impacts on wealth ranks in Columns 2-4 are similar as before, while the instrumented impact of age on entry on real wealth is somewhat lower than on financial wealth, though not significantly so. All in all, the results are similar.

\textsuperscript{12}While this estimate might seem large, a simple sanity check suggests that it is not unreasonable. The average house price is around $200,000 and the annual real house price increase exceeds 5%. This suggests an average yearly return of more than $10,000.
<table>
<thead>
<tr>
<th>Net wealth</th>
<th>$\bar{w} = {0, 1}$</th>
<th>$\bar{w}$-rank</th>
<th>$\bar{w}$ in USD</th>
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<tbody>
<tr>
<td>Age of entry</td>
<td>IV OLS</td>
<td>IV OLS</td>
<td>IV OLS</td>
</tr>
<tr>
<td></td>
<td>-0.011* (0.0064)</td>
<td>-1.42*** (0.489)</td>
<td>-15,507** (6,111)</td>
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<tr>
<td></td>
<td>-0.012*** (0.0013)</td>
<td>-1.44*** (0.100)</td>
<td>-6,557*** (1,246)</td>
</tr>
<tr>
<td>Real wealth</td>
<td>IV OLS</td>
<td>IV OLS</td>
<td>IV OLS</td>
</tr>
<tr>
<td></td>
<td>-0.017*** (0.0062)</td>
<td>-1.23*** (0.380)</td>
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<td>-1.40*** (0.0778)</td>
<td>-8,267*** (517)</td>
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</table>

Table 4: The impact of age of entry on midlife wealth.

Notes: Regression results from estimating equation (10). The dependent variable is household wealth at midlife, measured as: above/below median net wealth, net wealth rank from 1-100, net wealth in USD, above/below median real wealth, real wealth rank from 1-100, real wealth in USD. Control variables include parental income, location, education, number of children, household income, location, education and number of (adult) household members. Sample: households who experience exactly one grandparent death in sample period.

Could the results in Table 4 be biased by an increase in financial wealth caused by the timing of grandparent death? First, we note that the increase in financial wealth in the year of grandparent death is seven times smaller than the increase in real wealth and not statistically significant - see Appendix Table C.3. Still, we do two additional exercises to ensure that we are correctly isolating the impact of age of entry on wealth. First, we control for financial wealth holdings at different ages to capture the dynamic profile of financial wealth. Second, we exclude households with increases in financial wealth at the time of grandparent death from the sample.

In principle we can control for financial wealth at all ages. However, our sample size is already severely reduced, as only households who i) have exactly one grandparent death in the sample period, ii) enter the housing market during the sample period and iii) are observed at midlife are included in the regression. Conditioning on financial wealth at very young ages leaves us with few observations, and so we control for financial wealth at 30, 35 and 40. The results are reported in Table C.5, and are roughly similar to what we had before. In general, the IV-estimates increase in absolute magnitude, except for when the outcome is whether real wealth is above or below the median (i.e. the first column of the second row).

The results from excluding households who increase financial wealth at time $t = 0$ from the sample are reported in Appendix Table C.4 and are quite similar to the baseline. As
such, we view our results as robust to leaving out households which increase financial wealth in response to grandparent death.

5 How does parental support in the housing market take place?

So far, we have documented the importance of parental wealth for housing outcomes, and how this contributes to intergenerational wealth persistence. In this section we explore the mechanisms for why parental wealth matters. In line with previous literature, we find support of financial transfers and parental equity extraction positively affecting entry rates, and further show that these effects are larger for those with richer parents. In addition, we provide novel evidence on co-purchasing, as well as direct sales from parent to child at heavily discounted prices.

5.1 Financial transfers

Several papers have documented that transfers are important for entry into the housing market. While it seems plausible that more affluent parents are both more likely to provide transfers and provide larger transfer conditional on doing so, few papers study how transfer vary with parental wealth. We provide evidence consistent with the importance of transfers, and document that the magnitudes are larger for those with richer parents.

Figure 6 depicts the results from an event study on the evolution of bank deposits around a house purchase by parental wealth. In the year prior to the house purchase, bank deposits increase substantially for both groups. This increase is reversed in the year of purchase, suggesting that the additional bank deposits are being used as downpayment to buy a house. Households with richer parents increase bank deposits by roughly $12,000, while households with poorer parents increase bank deposits by roughly $7,000. However, in percent relative to each group’s deposit holdings, the increase is comparable.

13The large increase in bank deposits prior to a purchase is consistent with the results in Aastveit, Juelsrud, and Wold (2022), but there we do not condition on parental wealth.
Figure 6: Bank deposits (USD). Event study around housing market entry (t=0)

Notes: Entry: $entry_{i,t} = 1$ if household $i$ purchases a house in year $t$ and did not own housing in year $t−1$, $entry_{i,t} = 0$ if household $i$ did not purchase a house in year $t$ and did not own housing in year $t−1$. Parental wealth: $p_{t}^{w} = 1$ if average parental financial wealth when household is aged 19-21 is above the year-specific threshold, and zero otherwise.

The increase in deposits could result from lower consumption, portfolio rebalancing or increased income. While we do not observe consumption in the tax data, we note that the increase is probably too large to be due solely to reduced consumption. Another possibility is that households reduce their holdings of other financial assets or real wealth, i.e. portfolio rebalancing. However, we do not see any evidence of this in the data. As a result, much of the observed increase in bank deposits is likely the result of higher income. We do not observe substantial increases in wage income or capital income. While we do see some increase in total income, it is not enough to explain the increase in bank deposits, and it is similar across parental wealth groups. There is, however, reason to believe that transfer income – which should be included in total income – is poorly measured in our data, as it is self-reported (in contrast to other balance sheet items), and only formally required if exceeding NOK 100,000 ($\approx$12,000). We therefore find it likely that transfers play an important role in explaining the observed pattern in Figure 6.

5.2 Parental equity extraction

Benetton, Kudlyak, and Mondragon (2022) show that households are more likely to enter the

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\(^{14}\)Even if the transfer does exceed NOK 100,000 it is no longer taxed. This could in principle lead to more reporting as there is no tax-motive for failing to report the transfer. However, it could also lead to less reporting, as it might be viewed as less important to do so.
housing market in a year when parents extract home equity. We find evidence of a similar
effect in the Norwegian data. Moreover, we show that the importance of this channel differs
between those with richer vs. poorer parents - also when conditioning on homeownership.
Hence the home equity channel represents another mechanism for why households with richer
parents have higher entry probabilities.

We define a parental equity extraction as an increase in debt which exceeds 10% and
$2,000, compared to 5% and $1,000 in Benetton, Kudlyak, and Mondragon (2022). Due to
higher house price levels in Norway than in the US – and because we observe total debt rater
than only mortgage debt – we require slightly larger increases in debt in order to classify
it as an equity extraction. We use the static definition of wealthy parents, i.e. we consider
parental wealth at the time when the household is 20 years old.

At the time of entry into the housing market, we find higher frequencies of equity ex-
traction for richer parents. Specifically, 33% of parents with above median wealth extract
equity in the year of entry, compared to 26% of parents with below median wealth. This
difference is not driven by homeownership. Conditioning on parents being homeowners has
virtually no effect on the reported figures.

We follow Benetton, Kudlyak, and Mondragon (2022) and regress entry on parental
equity extraction. In the year of a parental equity extraction, the entry probability into the
housing market is 1.0-1.5 percentage points (=22-43%) higher – see Columns 1-3 of Table
5. This effect is larger in absolute size than the one identified by Benetton, Kudlyak, and
Mondragon (2022), but smaller in percentage terms, as our baseline entry probability is
higher. Overall we view the correlation as being roughly similar in magnitude.

Interestingly, the correlation between parental equity extraction and entry into the hous-
ing market is larger for those with richer parents. This is illustrated in Columns 3-6, where
we interact equity extraction with having richer parents at age 20. When including con-
trol variables and household fixed effects, we find that entry probabilities are 0.8 percent-
age points higher when poorer parents extract equity, compared to 0.8+0.5=1.3 percentage
points higher when richer parents extract equity.
Table 5: Parental equity extraction.

<table>
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</table>

Notes: Entry: entry_{i,t} = 1 if household i purchases a house in year t and did not own housing in year t − 1, entry_{i,t} = 0 if household i household i did not purchase a house in year t and did not own housing in year t − 1. Equity extraction: Equity_{i,t} = 1 if parents increase debt by at least 10% and $2,000, and zero otherwise. Parental wealth: p_{w}^i = 1 if average parental financial wealth when household is aged 19-21 is above the year-specific threshold, and zero otherwise.

We conclude that parental equity extraction is likely to be one channel that explains why households with richer parents have higher entry probabilities, as i) richer parents are more likely to extract equity, and ii) the equity extraction of richer parents is associated with larger increases in entry probabilities.

5.3 Intra-family sales and purchases

Figure 7a depicts the share of parents who buy a house around the time when a child enters the housing market, by parental wealth. In years when a child is not entering the housing market, around four percent of parents buy a house. In the year when the child enters the housing market this share is roughly seven percent. Parental purchases at time of entry are only slightly higher for richer parents than for poorer ones. Using unique housing id’s, we can further infer whether parents are buying a house with their child. This is represented by the lighter shaded part of the bars in Figure 7a. For richer parents, about half of the excess purchase mass at the year of entry is explained by parent-child co-purchasing, which compares to roughly 1/3 for parents with below median wealth. This implies that richer parents are almost 60% more likely to co-purchase a house with their child at the time of entry than poorer parents.
Figure 7: Intra-family sales and purchases by parental wealth.

Notes: Share of first-time buyer parents who sell a house (to their child) and buy a house (with their child) around the child household’s entry into the housing market (time $t = 0$) – for households with $p_{w} = 1$ (panel a) and $p_{w} = 0$ (panel b).

Figure 7b depicts the share of parents selling a house around the time when a child enters the housing market. In non-entry years, roughly six percent of parents sell a house. This compares to almost ten percent in the year of entry for those with above median wealth, and just above eight percent for those with below median wealth. In general, richer parents are 12% more likely to sell a house in the year of entry. Around 2/3 of the excess mass in parental sales at the time of child entry into the housing market is explained by parents selling a house directly to their child, as captured by the lighter shaded parts of the bars in Figure 7b. Richer parents are 8% more likely to sell a house directly to their child in the year of entry.

Co-purchasing a house with one’s parents is economically beneficial when it relaxes borrowing constraints. Buying a house from one’s parents is however only economically beneficial if this is done at a price below the market value of the house. If this is the case, the transaction should be marked as a full or partly gift-sale in the tax records. As it turns out, 97% of all transactions are reported as taking place at market value, and this share does not vary by parental wealth. However, anecdotal evidence suggests that there is room to influence the official market value, which is decided upon by a Realtor. We therefore restrict our sample to the 97% of transactions reportedly taking place at market value, and investigate whether

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15 If the household expects to inherit its parental wealth anyway, one could argue that this simply implies a reshuffling of dynasty wealth. However, given that the household is likely to be constrained by the downpayment requirement, such an early-in-life transfer is probably preferable. Moreover, a lower sales price implies lower capital gain taxes, which represents an economic gain to the parents/dynasty.
intra-family sales take place at a discount.

To evaluate whether parents sell housing to their children at a discounted value, we predict house purchase prices based on square meters, number of rooms, number of bathrooms, municipality and year of purchase – as in equation (11). These variables have a large number of missing observations, leaving us with a sample of almost 99,000 entries into the housing market for which we have all the housing characteristics. Of these transactions, 3,300 are sales from a parent to a child. The intra-family sales are left out of the sample when estimating equation (11). The regression results are reported in Table C.7 in the appendix.

\[ hprice_{i,t} = \alpha + \beta_1 \text{sqm}_{i,t} + \beta_2 \text{rooms} + \beta_3 \text{bathrooms} + \delta_k \text{municipality}_k + \delta_t \text{year}_t + \epsilon_{i,t} \] (11)

Using the coefficients from estimating equation (11), we calculate the difference between actual purchase prices and predicted purchase prices for all transactions in our sample. For the intra-family sales, the average purchase price is $87,000 less than predicted, which implies a 25% discount. This compares to an average of roughly zero for other sales, suggesting sizable discounts for intra-family sales.

To make sure that the large estimated discount for parental sales is not a statistical fluke, we do a simple exercise in which we redo the calculations for a random sample of transactions. Specifically, we draw 1,000 random samples of 3,300 transactions, to match the size of our intra-family sales sample. For each sample we re-estimate equation (11) without the given sample, using the results to predict purchase prices for all transactions. We then calculate the residual house price for the sample in question. Doing this 1,000 times gives us the smooth distribution in Figure 8. On average, residual house prices are close to zero, and virtually all mass lies between -$20,000 and $20,00. This is in stark contrast to the residual for intra-family sales, which is seven times as large – captured by the dashed, red line to the left in Figure 8. We thus conclude, that parents are indeed selling houses to their children at substantial discounts.
Figure 8: Estimated house sale discounts (USD).

Notes: The residual house price is the difference between the listed purchase price and the estimated market value. The dashed line captures the residual house price when parents sell to their children. The distribution captures the residual house price for 1,000 random simulation exercises.

Figure 9: Event study: parental secondary housing wealth (USD).

Notes: Entry: $entry_{i,t} = 1$ if household $i$ purchases a house in year $t$ and did not own housing in year $t-1$, $entry_{i,t} = 0$ if household $i$ did not purchase a house in year $t$ and did not own housing in year $t-1$. Parental wealth: $p_{i}^{\alpha} = 1$ if average parental financial wealth when household is aged 19-21 is above the year-specific threshold, and zero otherwise.

In principle, parents could be selling either their primary house or their secondary house to their child. The housing transaction data does not separate between primary and sec-
ondary housing. However, using the tax data, we can study how parental primary and secondary housing wealth evolves around the time of entry. A simple event study confirms that, perhaps not surprisingly, parents seem to be selling their secondary housing at the time of entry – see Figure 9. The decline in secondary housing wealth is driven entirely by richer parents. A similar event study on primary parental housing does not indicate any decline.

Before moving on to the model, we briefly summarize our results. First, we have documented substantial housing gaps between those with richer vs. poorer parents, and decomposed these gaps into a pure parental wealth channel, an other parental attributes channel and a household attributes channel. Instrumenting parental wealth a shift-share IV based on international stock market returns support a causal impact of parental wealth on housing market outcomes. Second, we have seen that the housing channel can account for roughly 1/4 of total intergenerational wealth persistence, and that half of this is driven purely by parental wealth. An instrumental variable approach based on the timing of intra-family deaths supports a causal interpretation of the impact of housing on midlife wealth. Finally, in terms of mechanisms, we find support for financial transfers, parental equity withdrawal, co-purchasing, as well as direct sales from parent to child at substantially discounted prices.

6 Model

We now describe the life-cycle model with housing we use to study the sensitivity of our results to house price growth and the effects of borrowing constraints in the mortgage market. In the model, parental transfers are exogenous and take the form of an initial cash transfer, an annual cash transfer or inherited preferences for homeownership.

6.1 Model set-up

We first describe the model without parental support in Sections 6.1.1 and 6.1.2. In Section 6.1.3, we add parental support to the model.

6.1.1 Environment

Demographics A household is born at age $T^s$, retires at age $T^r$, and dies at age $T^d$. Each period constitutes one year, and we do not consider mortality risk or bequest motives for the (child) household.
Preferences  The expected lifetime utility of a household is given by

\[
\mathbb{E} \left[ \sum_{a=T^s}^{T^d} \beta^a u(c_a, h_a, s_a) \right],
\]

(12)

where \( \beta > 0 \) is the discount factor, \( c > 0 \) is non-housing consumption, \( h \in H(s) \subset \mathbb{R}^2 \) is housing consumption, and \( s \in \{0, 1\} \) is the ownership status and equals 0 for renters and 1 for owners. The expectation \( \mathbb{E} \) is taken over sequences of idiosyncratic shocks that we specify below. In what follows, we omit the dependence of variables on age \( a \) except in cases where its omission is misleading.

We assume that households have CRRA-preferences, where consumption and housing is aggregated with a Cobb-Douglas aggregator

\[
u(c, h, s) = \frac{(c^{1-\eta} h^\eta \chi(s))^{1-\gamma}}{1-\gamma},
\]

(13)

where \( 0 < \eta < 1 \) is the weight on housing, \( \gamma \) denotes the risk aversion parameter, and \( \chi(s) \) the homeownership premium. We set the ownership premium equal to 1 for renters and \( 1+\chi \) for owners.

Endowments  Households are endowed with an uncertain labor income stream during working age

\[
\log y_{i,a} = f(a) + \nu_{i,a} + \varepsilon_{i,a}, a = T^s, \ldots, T^r.
\]

(14)

We let \( f(a) \) denote the deterministic component. \( \nu \) is a persistent productivity shock, and \( \varepsilon \sim N(0, \sigma_\varepsilon^2) \) a transitory shock. The persistent shock follows an AR(1) process

\[
\nu_{i,a} = \rho \nu_{i,a-1} + u_{i,a},
\]

(15)

where \( \rho \) is the persistence parameter and \( u \sim N(0, \sigma_u^2) \).

In retirement, income is constant and equal to a fixed proportion \( \phi_{ret} \) of the household’s income in the last period of working life \( (a = T^r) \)

\[
\log(y_{i,a}) = \log(\phi_{ret}) + f(a = T^r) + \nu_{i,T^r}, a = T^r + 1, \ldots, T^d.
\]

(16)

Moreover, households are endowed with an initial level of net worth \( x_{T^r}^s \).
Housing Market  In the model, the market value of a house is linear in house size $h$. The per unit house price follow a stochastic process with drift $\mu_h$ and volatility $\epsilon^h$

$$\log(p_{a+1}) = \log(p_a) + \epsilon_{a+1}^h, \epsilon \sim \mathcal{N}(\mu_h, \sigma_h^2).$$  

(17)

The rental price is assumed to be a constant fraction $\kappa$ of the market value $ph$.

Households have the option between renting $s = 0$ or owning $s = 1$ in order to consume housing services. Houses are characterized by their sizes, which belong to discrete finite sets $\mathcal{H}(s)$, which depend on the ownership status.

Buying and selling owner-occupied housing entails adjustment costs that are proportional to the market value of the house and we denote these proportional costs by $m_b$ and $m_s$, respectively. We let $tc(p, s, h, s', h')$ denote the total adjustment cost. For example, a current renter ($s = 0$) living in a rental unit of size $h$ who buys ($s' = 1$) house $h'$ when the price is $p$ is $tc(p, 0, h, 1, h') = (1 + m_b)ph'$. Moreover, homeowners must pay depreciation $\delta$, e.g., maintenance and taxes.

Financial Market  All households can save in a one-period risk-free bond with a return $r_f$. Borrowing against collateral (owner-occupied housing) is allowed, but households must satisfy a loan-to-value (LTV) and a loan-to-income (LTI) constraint. We model borrowing as a one-period mortgage that is rolled over each period. The mortgage has an interest rate of $r + r_m$, where $r_m \geq 0$ is the mortgage premium.

Since the mortgage premium is positive, households will never simultaneously hold both a mortgage and save in the risk-free bond. We let $b$ denote the net position in bonds. The effective interest rate is

$$r(b) = \begin{cases} r_f & \text{if } b \geq 0, \\ r_f + r_m & \text{if } b < 0. \end{cases}$$

(18)

6.1.2 Household optimization

We now outline the decision problem for households with non-wealthy parents. For readability, we recast the model to a recursive form and denote one-period-ahead variables with primes ' instead of $a + 1$.

Budget Equation  All households choose consumption $c$ and their net bond position $b$. Renters pay rent while homeowners keep the house on the balance sheet. Changing housing status incurs adjustment costs. For a household with wealth $x$ and income $y$ the budget
equation is
\[ x + y = c + b + tc(p, s, h, s', h') + (1 - s')\kappa ph' + s'ph'. \] (19)

**Evolution of Wealth**  
Next-period wealth is given by the net position in bonds and the market value of owner-occupied housing net of depreciation
\[ x' = b(1 + r(b)) + s'p'h'(s' - \delta). \] (20)

**Decision Problems**  
Effectively, there are five discrete choices in the model. Current renters choose to rent or own. Current owners choose to rent, continue to own the same house, or change the house size. Renters who keep renting and owners who stay in the same house do not incur transactions costs. All other transitions do entail transaction costs.

A household solves
\[ V(x, h, s, \nu, p, a) = \max_{c, h', b', s'} \{u(c, h') + \beta \mathbb{E}[V(x', h', s', \nu; , p', a + 1)]\}, \] (21)

subject to
\[ c > 0, \] (22)
\[ s' \in \{0, 1\}, \] (23)
\[ h' \in H(s'), \] (24)
\[ b' \geq -LTV ph's', \] (25)
\[ \frac{b'}{y} \geq -LTI s', \] (26)

and the budget constraint and the law of motion (equations (19) and (20)). The constraints ensure that the household must choose to rent or own (equation (23)), that the feasible set of housing options depend on whether the household rents or buys (equation (24)), and that renters cannot borrow at all while current and new owners are bound by the LTV and LTI constraints (equations (25) and (26)).

**6.1.3 Modelling parental support**

To match the distinction between wealthy and non-wealthy parents that we used in our empirics, exactly half of the households in our model are assumed to have wealthy parents. Parental support is exogenous in the model and takes the form of an initial transfer, an annual transfer, or a higher preference for homeownership. This is consistent with the literature on
intergenerational wealth persistence, which has found support both of monetary support and persistence in preferences/norms.

**Initial transfer**  The first form of parental support that we study is an initial one-time transfer, a cash endowment that households hold at the beginning of adulthood, $\tau_{PW}$. For households with non-wealthy parents this parameter is set to zero. In this case the income process from equation (14) instead becomes

$$y_{i,a} = \exp(f(a) + \nu_{i,a} + \varepsilon_{i,a}) + \tau_{PW}, \quad a = T^s, T^s + 1, \ldots, T^s + 20.$$  

(27)

**Annual transfer**  Our second form of parental support is instead an annual transfer, $\tau_{PW}$, every year from $t = T^s$ to $t = T^s + 20$. As before, this parameter is set to zero for households with non-wealthy parents. In this case the income process from equation (14) instead becomes

$$y_{i,a} = \exp(f(a) + \nu_{i,a} + \varepsilon_{i,a}) + \tau_{PW}, \quad a = T^s, T^s + 1, \ldots, T^s + 20.$$  

(28)

**Homeownership preference**  Finally, we also consider the possibility that parents matter not through their financial transfers, but rather through inherited preferences. Specifically, we assume that households with wealthy parents have an additional benefit from owning a house, such that the housing preference in equation (13) becomes $\chi + \chi_{PW}$. The parameter $\chi_{PW}$ is set to zero for those with non-wealthy parents.

### 6.2 Parameterization

Our parameterization strategy consists of three steps. First, we fix the external parameters, i.e. parameters we can set without relying on model dynamics and that are common across all types of households. These parameters are set to match the Norwegian economy when relevant, in order to match our empirical results. Second, we fix internal parameters, i.e. parameters used to match homeownership and financial wealth at different ages. We do this by matching moments for households with below-median wealthy parents. Third, we pick the parental support parameters to match the housing channel of intergenerational wealth persistence as documented in Section 4. All model parameters are reported in Table 6.\textsuperscript{16}

\textsuperscript{16}Numerical parameters such as grid sizes are discussed in Appendix D.1
6.2.1 External Calibration

Adjustment costs In Norway, home buyers pay a transaction tax (‘document fee’) of 2.5% of the purchase price. We therefore set $m_b = 0.025$. The main cost of selling is the real estate agent commission, which averages 2% (Yao et al., 2015). We therefore set the cost to be $m_s = 0.020$, which captures that sellers usually pay for advertisement, sales insurance, and other costs associated with home sales.

Income Process For the stochastic component we use the parameter values from Fagereng et al. (2017). They estimate $\sigma^2_\nu = 0.012$, $\sigma^2_\varepsilon = 0.023$, and $\phi_{ret} = 0.842$. We report their estimated income profile $f(a)$ in Figure D.1d. Their estimates do not account for any correlations between parental wealth and income, however. We adjust the income profile $f(a)$ by the income gap between households with poor parents and the average income of all households in our data. Figure D.1d plots the results. For simplicity, we assume that income risk does not depend on parental wealth.\textsuperscript{17}

Housing Parameters To find the growth rate and volatility of house prices we use existing home price indices. We deflate the nominal index by median household income, after tax, since income is stationary in the model. We then use the observed mean growth and standard deviation to set $\mu_h = 0.0288$ and standard deviation $\sigma_h = 0.0468$. Figure D.1b plots the time trends of nominal, real, and income deflated house prices in Norway, as well as the mean growth rates and standard deviations.

We calibrate house sizes to match the 5th, 25th, 50th, and 75th percentile of square footage of residential units, which corresponds to 44, 77, 100, and 143, respectively. We normalize the smallest unit to have a size of 1. We assume that the two smallest units can be rented, so that $\mathcal{H}(0) = [1.0, 1.75]$. We then assume that only the 3 largest units can be owned, such that $\mathcal{H}(1) = [1.75, 2.27, 3.25]$.

We estimate rent-to-price ratios $\kappa$ in Norway in two steps. First, we use statistics on yearly rent, per square meter, by rooms in the unit and price per square meter, by type (single-family, small multifamily, and multifamily). We then divide the rent per square meter for units with 5 rooms by the single-family square meter price, the 4 room rental price by the small multi-family price, and the 3 and 2 rooms prices by the multifamily price. In the years we have data, 2012-2022, the ratios are relatively stable. We set $\kappa$ equal to 0.044, the average rent-to-price ratios of these four units series over all years, see Figure D.1e.\textsuperscript{18}

\textsuperscript{17}Fagereng et al. (2017) find that income risk is almost independent of education. Since education is strongly correlated with parental wealth, this suggests that any difference based on parental wealth is limited in size.

\textsuperscript{18}For similar models calibrated to the United States, a standard value is 0.05, based on Davis et al. (2008).
**Preference Parameters**  We set the preference weight on housing $\eta$ to 0.35, roughly equal to the average for households aged 27-45 in Yao et al. (2015). We set the risk aversion parameter $\gamma$ to 2.0, a standard value in life-cycle models.

**Initial Conditions**  To find a household’s initial financial wealth, we draw from the empirical distribution of households with non-wealthy parents, estimated non-parametrically (see Figure D.1c). We sort the net worth of households aged 20-23 with non-wealthy parents and divide them into 10 equally sized bins by gross financial wealth. Households are randomly allocated to bins and receive an initial endowment equal to the average of their bin.

We draw the household’s initial productivity shock from the stationary distribution implied by equation (15). All households start as renters, but are allowed to choose to become homeowners in the first period.

Households draw the initial house price $p_s$ from a uniform distribution. We calibrate the mean of the initial price in the following way. In the early 1990s, the average market value of a ‘starter home’, was about 3.5 times the average household income. Using our calibrated income process, the average income for households aged 20-80 is NOK 449,000 and so we set the average initial price 89.78 for one unit of housing, so that the price of the smallest owner-occupied unit is 3.5 times the average income (NOK 1,571,000). The edges of the distribution is set at $\pm 20\%$, so that $p_s \sim U[0.8 \times 89.78, 1.2 \times 89.78]$.

**Remaining External Parameters**  We set most of the remaining parameters following Yao et al. (2015). The risk-free rate $r_f$ is 0.016, the maximum leverage $d$ is 0.9, the maximum debt-to-income level is 5.0, and housing depreciation $\delta$ is 0.02. We set the mortgage premium $r^m$ to 0.039, the average spread since 1990, similar to what is found in Erard (2014).

### 6.2.2 Internal Calibration

In the second step we choose the remaining preference parameters to match life-cycle moments on wealth and homeownership for households with non-wealthy parents. Specifically, we set the discount factor $\beta$ and the utility shifter for homeownership $\chi$ by targeting the homeownership rate and financial wealth at each age between 20 and 45. The moments are calculated as the average across our sample of households with non-wealthy parents. Figure 10 shows the empirical moments along with the corresponding model-implied moments for wealth and homeownership for households aged 20-40. We see that the calibrated model is

---

Our somewhat lower estimate could be driven by difference in tax regulation—rental income in duplexes are tax exempt if the owner lives in one unit—and other institutional differences.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Source</th>
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<tr>
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</tr>
<tr>
<td>$\sigma^2_{\nu}$</td>
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<td>Fagereng et al. (2017)</td>
</tr>
<tr>
<td>$\sigma^2_{\nu}$</td>
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<td>Fagereng et al. (2017)</td>
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<tr>
<td>$n/a$</td>
<td></td>
<td>Fig. D.1c</td>
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<tr>
<td>$T^r$</td>
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<tr>
<td>$T^d$</td>
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</tr>
<tr>
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<td>$\gamma$</td>
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<tr>
<td>$\chi$</td>
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<tr>
<td>$\tau^{PW}$</td>
<td>2.6</td>
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<tr>
<td>$\chi^{PW}$</td>
<td>0.028</td>
<td>Internal estimation (6.2.3)</td>
</tr>
</tbody>
</table>

Table 6: Calibrated Parameter Values

43
able to match the empirical moments quite well, although it over-predicts homeownership at older ages somewhat.

Figure 10: Model Fit

6.2.3 Calibrating parental parameters

Finally, we choose our parental parameters, $\tau^{PW}$, $\tau^{PW}$ and $\chi^{PW}$ to match the housing channel of intergenerational wealth persistence from Table 3, Column 1, in Section ???. To do this, we perform the exact same calculations on model data as we did on the actual data. That is, we estimate the components in equation (6), and calculate the housing channel as $\hat{\alpha}_{4} \frac{\text{cov}(h_{i}, p_{i}^{w20})}{\text{var}(p_{i}^{w20})}$, where $\bar{w}_{i}$ equals one if the household has above median midlife wealth (i.e. early 40s), $p_{i}^{w20}$ equals one if the household has wealthy parents, $\bar{x}_{i}$ includes dummies for the persistent and transitory income shocks as well as the price level at age 43, and $h_{i}$ includes age of first purchase and the purchase value. There is no need to control for other parental attributes, as these do not exist in the model.

We pick the parental parameters so that the housing channel in the model exactly matches the housing channel in the data, i.e. the 0.03 number from Column 1 of Table 3. The interpretation being that households with richer parents are three percentage points more likely to themselves be rich at midlife, due to housing outcomes.

6.3 Results

In this section we first show to what extent our model is able to match the non-targeted housing gaps between those with richer and poorer parents. Second, we evaluate how the housing channel of intergenerational wealth persistence varies with house price growth and downpayment requirements.
Matching the non-targeted ownership gap  Because we have three different strategies to capture parental support, we also have three implied homeownership gaps between those with richer and poorer parents. These are illustrated in Figure 11. The black, solid line captures the homeownership gap in the data, after removing the impact of household attributes and other parental attributes.

Parental support through early-in-life transfer results in the poorest fit with regard to homeownership gaps. Not only is the model gap substantially smaller than that observed in the data, it also has the wrong life-cycle profile, as the ownership gap peaks too early in life. The annual transfer does a better job, and matches the size of the ownership gap in the data well. However, the timing is a little bit off, with the housing gap from the model lagging that of the data with roughly five years. Modelling parental support as a preference shifter, however, provides a homeownership gap very close to that observed in the data. Not only is the size of the gap correct, the timing of the model is also just 1-2 years behind that in the data.

Figure 11: Homeownership rate gaps by age in model and data.

Notes: This figure shows the gap in homeownership between low and high parental wealth households in the data, as well as in the model for different parametrizations. "Transfer" refers to the housing gap in the model when we have used annual transfers, i.e. $\tau^{PW}$, to match the housing channel of intergenerational wealth persistence. "Initial Wealth" refers to the housing gap in the model when we have used initial wealth, i.e. $\tau^{T}$, to match the housing channel of intergenerational wealth persistence. Finally, "Ownership Preferences" refers to the housing gap in the model when we have used the ownership preference, i.e. $\chi^{PW}$, to match the housing channel of intergenerational wealth persistence.

The effect of house price growth  Next, we use our model to understand how the housing channel of intergenerational wealth persistence varies with house price growth. Specifically, we change average house price growth to $\mu = 0.015$, the estimated value in Cocco (2005)
for the United States – almost halving price growth from its level in our sample, namely 0.0288. For the results reported here, parental support comes as an annual transfer. We pick this form of parental wealth as it is an easy to interpret, monetary form of support – with sound empirical support. In addition, it matches the non-targeted housing gap quite well, as discussed above. The results are very similar if we model parental support as an initial transfer or as an increased ownership preference instead.

We do two experiments. First, we keep policy functions unchanged, and only alter realized house price growth. This does not give households the opportunity to adjust their behavior in response to the change in house prices, and can be interpreted to capture the impact of unanticipated lower house price growth. Second, we change average house price growth, and re-solve the model to obtain new policy functions. In this case, households are allowed to adjust their behavior, and both realized and expected house prices change.

The results are illustrated in Figure 12. When house price growth is nearly halved – but expectations are left unchanged – the housing channel of intergenerational wealth persistence falls by a moderate 20%. However, when expectations are allowed to adjust, the effect is much larger, reducing the housing channel of intergenerational wealth persistence by roughly 70%. This suggests that it is not price growth alone that makes the housing channel important, but the combination of price growth together with households' response to it. In anticipation of higher price growth, everyone would like to invest in housing early in life, but will be limited by borrowing constraints. The transfer from parents allow young households to invest earlier, which then in turn yields higher wealth later in life due to the high realized price growth.

The effect of mortgage regulation Finally, we use the model to quantify the impact of downpayment requirements on the effect of parental wealth on children's wealth and housing outcomes. Our policy experiment is motivated by the clear link between LTV requirements and parental housing support (e.g., Blickle and Brown (2019)) and a growing understanding of the unintended consequences of LTV regulation (e.g., Aastveit, Juelsrud, and Wold (2022)).

We consider a scenario where the LTV requirement changes from 90% to 70%. A tightening of the LTV constraint of this magnitude leads to a 16% increase in the housing channel. This suggests that tighter LTV constraints can amplify intergenerational wealth persistence considerably.\textsuperscript{19} The intuition here is that tighter mortgage regulation increases the barriers to entry in the housing market, creating a larger role for the support of affluent

\textsuperscript{19}This finding is consistent with evidence from Brandsaas (2021), who uses a more complicated model calibrated to the United States and finds similar results.
parents.

Figure 12: The housing channel of intergenerational wealth persistence

Notes: The figure shows the housing channel of intergenerational wealth persistence as defined in equation (6). In the low HP growth scenarios, we set the mean growth to $\mu = 0.015$. In the "unexpected" scenario, households assume that the house price process is unchanged. In the "expected" scenario, households internalize the change in house price growth. Lower LTV refers to a scenario where we assume an LTV constraint of 0.7 instead of 0.9.

In sum, the results in this section illustrate that the housing channel of intergenerational wealth persistence depends on both house price growth and LTV restrictions. In the former case, the impact is substantially larger if households internalize the lower house price growth, highlighting the importance of expected house price growth.

7 Conclusion

We have documented large gaps in housing outcomes by parental wealth. Roughly half of these gaps can be explained by household attributes, while other observable parental attributes play a minor role. Even after controlling for a rich set of variables, we still find that households with richer parents have a 21% higher entry probability, buy homes worth 20% more when entering the housing market, and are 13% more likely to become homeowners by age 30. Using plausibly exogenous variation in parental wealth resulting from international stock market returns support a causal impact of parental wealth.

Using a structural mediation framework, we find that housing outcomes is an important driver of wealth persistence across generations. In fact, $1/4$ of the intergenerational wealth persistence in our data is attributed to housing outcomes. Half of this effect is due purely to parental wealth, and not other parental attributes or housing attributes. As a result, 12% of
the persistence in wealth across generations is due to higher parental wealth directly leading to better housing outcomes and thus higher midlife wealth. In terms of mechanisms, we document support for traditional transfers, parental equity withdrawal, co-purchasing and direct sales from parent to child at substantial price discounts.

Our results are based on Norwegian data for the past decades, a period with relatively high house price growth. A natural question is how our results would change with lower house price growth. To get a sense of this we built a life-cycle model with housing, showing that while lower realized house price growth reduces the housing channel of intergenerational wealth persistence somewhat, what really matters is house price expectations. Understanding peoples expectations for house price growth going forward is therefore key for determining how large the housing channel of intergenerational wealth persistence will be in the future.
References


A Simple example: investing in housing vs. stocks

In this appendix we provide some simple calculations meant to illustrate housing market returns in different countries. We make two main points. First, housing market returns have been especially high in Norway compared to other countries. Second, with realistic assumptions about leverage, the housing market is found to outperform the stock market for all countries considered here.

Figure A.1 depicts nominal house price indices for different countries\textsuperscript{20}, as well as a nominal stock price index, here captured by the NASDAQ. Two points are worth highlighting. First, the stock market index has grown faster than house prices in all countries considered. Second, house price growth has been higher in Norway than in the other countries considered, i.e. the US, the UK and Sweden.

![Price indices for housing (by country) and stocks.](image)

Simply looking at price indices ignores the important role of leverage. The average household is highly leveraged when investing in housing, and not leveraged when investing in stocks. To capture the importance of leverage we do some simple calculations. Specifically, we compare the following two investments:

1. Invest $100 in 1992 as a downpayment on a house worth $1,000, implying an initial leverage of 0.9. Pay an annual interest rate on the mortgage, and pay down 1/25 of the mortgage each year over the next 25 years.

2. Invest $100 in stocks in 1992, at zero leverage. Each year, invest an additional amount equal to the interest rate cost in 1.

\textsuperscript{20}The Norwegian house price index is from Statistics Norway, the US house price index is the S&P/Case-Shiller U.S. National Home Price Index from FRED, while the house price indexes from Sweden and the UK are from the OECD.
Figure A.2 depicts equity from investment 1. in different countries, and equity from investment 2. Note that the Norwegian housing market now outperforms the stock market. This is due to an average leverage ratio of 0.26 in the housing market, which is below the average observed leverage ratio in the data. For the other countries in the sample, the stock market still outperforms the housing market.

Are there realistic assumptions which can make the housing market outperform the stock market in other countries as well? Yes, for instance, consider changing the investment strategy in 1. so that mortgage is re-financed every ten years. Specifically, we assume an initial leverage ratio of 0.8, allowing for an initial gross housing investment of $500. Every ten years (i.e. in 2002 and 2012), we let housing wealth and debt adjust so that the leverage is again 0.8. Of course, this also implies higher mortgage payments, so that the additional stock market investments under strategy 2 also adjusts. Given this alternative investment strategy, which increases the average leverage to roughly 0.5, the return on the housing investment exceeds the return in the stock market for all countries in the sample – see Table A.1.

The above calculations ignore the riskiness of the investment. While the stock market has the highest realized return, is also has a substantially higher volatility. Table A.1 reports Sharpe ratios for the different housing markets and the stock market. Again, the Norwegian housing market stands out by offering the lowest volatility and the highest Sharpe ratio. The Sharpe ratio for housing investments in similar to that in the stock market in the UK and Sweden. In the US, the stock market provides a higher Sharpe ratio than the housing market.
### Table A.1: Investing in housing vs. stocks.

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<th>Norway</th>
<th>US</th>
<th>Portland-US</th>
<th>Sweden</th>
<th>UK</th>
<th>Stocks</th>
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<td>Equity</td>
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<td>2,500</td>
<td>3,500</td>
<td>3,600</td>
<td>3,400</td>
<td>4,600</td>
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<tr>
<td>Avg. leverage</td>
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<td>0.29</td>
<td>0.39</td>
<td>0.35</td>
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<tr>
<td>Avg. price growth (nominal, %)</td>
<td>7.5</td>
<td>3.9</td>
<td>5.4</td>
<td>5.5</td>
<td>5.2</td>
<td>12</td>
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<tr>
<td>Standard deviation (nominal, %)</td>
<td>4.3</td>
<td>5.8</td>
<td>6.9</td>
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<td>Sharpe ratio (nominal)</td>
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<td>0.5</td>
<td>0.6</td>
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<td>0.5</td>
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**With re-leveraging:**

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<td>-</td>
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<tr>
<td>Average leverage</td>
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<td>0.49</td>
<td>0.57</td>
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</table>

Notes: The upper panel compares the return from investment strategy 1. and 2. as described in the text. The Sharpe ratio is calculated assuming a risk-free return of 2%. The lower panel ("With re-leveraging") assumes an initial LTV-ratio of 0.8, and a refinancing back to 0.8 leverage every ten years.
B Additional figures

Figure B.1: Average real annual house price growth from Online Appendix Table A.5 in Knoll, Schularick, and Steger (2017) (%) post-Wold War II.

Figure B.2: Household wealth ranking in early 40s by parental financial wealth ranking when child is 19-21.

Notes: Household wealth in early 40s is ranked from 1-100 based on the year-specific distribution after removing age effects by regressing wealth on age and age squared. Parental financial wealth when the (child) household is 20 years is ranked from 1-100 based on the year-specific distribution.
Figure B.3: Entry probability by parental wealth: the household attributes channel

Notes: $h_{i,t}$ is an indicator variable for entering the housing market. $p_{i,t}^{w_{20}} = 1$ if average parental financial wealth when household is aged 19-21 is above the year-specific threshold, $p_i^w$ is parent income, education, location and number of children, $x_i$ is hh income, financial wealth, education, location and number of hh members. Sample consists of potential entrants and entrants in the housing market.

Figure B.4: Entry probability by parental wealth: decomposed into channels i)-iii) as in equation (2)

Notes: $h_{i,t}$ is an indicator variable for entering the housing market. $p_{i,t-1}^{w_{t-1}} = 1$ if average parental financial wealth in year $t-1$ is above the year-specific threshold, $p_i^w$ is parent income, education, location and number of children, $x_i$ is hh income, financial wealth, education, location and number of hh members. Sample consists of potential entrants and entrants in the housing market.
Figure B.5: Purchase price by parental wealth: the household attributes channel

Notes: $h_i$ is the purchase price upon entering the housing market. $p_{i,t-1}^{\text{pw}} = 1$ if average parental financial wealth in year $t-1$ is above the year-specific threshold, $p_{i,t}^{\rho}$ is parent income, education, location and number of children, $x_i$ is hh income, financial wealth, education, location and number of hh members. Sample consists of households entering the housing market.

Figure B.6: Purchase price by parental wealth: decomposed into channels i)-iii) as in equation (2)

Notes: $h_i$ is the purchase price upon entering the housing market. $p_{i,t-1}^{\text{pw}} = 1$ if average parental financial wealth in year $t-1$ is above the year-specific threshold, $p_{i,t}^{\rho}$ is parent income, education, location and number of children, $x_i$ is hh income, financial wealth, education, location and number of hh members. Sample consists of households entering housing market.
Figure B.7: Homeownership over the life cycle

Notes: Households are divided into two groups; those whose parents have below median financial wealth in the year the household is 20 (Low FW) and those whose parents have above median financial wealth in the year the household is 20 (High FW). The homeownership gap is defined as the difference in homeownership rates between these two groups. Because not all cohorts are observed at all ages, the homeownership gap for different cohorts is depicted for different age intervals.

Figure B.8: Homeownership at 30 by parental wealth: decomposed into channels i)-iii) as in equation (2)

Notes: $h_i$ is the purchase price upon entering the housing market. $p_{i,t-1}^{\text{pw}} = 1$ if average parental financial wealth in year $t-1$ is above the year-specific threshold, $p_i^p$ is parent income, education, location and number of children, $x_i$ is hh income, financial wealth, education, location and number of hh members. Sample consists of 30-year olds.
Figure B.9: Homeownership at 30 by parental wealth: the household attributes channel (2)

Notes: \( h_i \) is the purchase price upon entering the housing market. \( p_{i20}^{w} = 1 \) if average parental financial wealth when household is aged 19-21 is above the year-specific threshold, \( p_{i}^{p} \) is parent income, education, location and number of children, \( x_{i} \) is hh income, financial wealth, education, location and number of hh members. Sample consists of 30-year olds the housing market.

### C Additional tables

<table>
<thead>
<tr>
<th>Intergenerational wealth components</th>
<th>Housing market measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age of entry &amp; Purchase price</td>
</tr>
<tr>
<td>Parental wealth</td>
<td>0.19 (63%)</td>
</tr>
<tr>
<td>Parental attributes</td>
<td>0.01 (3%)</td>
</tr>
<tr>
<td>Household attributes</td>
<td>0.03 (10%)</td>
</tr>
<tr>
<td>Housing</td>
<td>0.07 (25%)</td>
</tr>
<tr>
<td>Housing by parental wealth</td>
<td>0.03 (9%)</td>
</tr>
<tr>
<td>Sum</td>
<td>0.30 (100%)</td>
</tr>
</tbody>
</table>

Table C.1: Rank-rank. Components of intergenerational wealth persistence as defined in equation (6).

Notes: Parental wealth is the rank from 1-100 based on average financial wage when the household is 19-21. Household wealth is the rank from 1-100 based on midlife net wealth. Parental attributes are education, income, location and number of children Household attributes are education, income, location and number of adult household members. Housing market measures are either age of entry and purchase price upon entry (1st column) or homeownership indicators at age 27, 30, 33 and 36 (2nd column).
### Table C.2: First stage: impact of age of grandparent death (Age GP-death) on age of entry in the housing market.

<table>
<thead>
<tr>
<th>Age of entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age GP-death _i</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Controls</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>7,069</td>
</tr>
</tbody>
</table>

Notes: Regression results from estimating equation (9). The F-statistic for the significance of age of grandparent death is 308. Control variables include parent income, education, location and number of children, as well as household income, financial wealth, education, location and number of household members. Control variables are measured in ones early 40s. Sample: households experiencing exactly one grandparent death in sample period.

### Table C.3: Change in balance sheet items (USD) in year of grandparent death.

<table>
<thead>
<tr>
<th>Real wealth</th>
<th>Primary housing</th>
<th>Financial wealth</th>
</tr>
</thead>
<tbody>
<tr>
<td>GP-death = 1</td>
<td>23,682***</td>
<td>20,384***</td>
</tr>
<tr>
<td></td>
<td>(451)</td>
<td>(440)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1,719)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Controls</th>
<th>Yes</th>
<th>Yes</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>3,540,472</td>
<td>3,540,472</td>
<td>5,495,885</td>
</tr>
</tbody>
</table>

Notes: Regression results from estimating equation (8) with \( y_{it} \) = real wealth, primary housing wealth or financial wealth. The coefficients capture the value at time \( t = 0 \) relative to time \( t = -1 \). Control variables are number of adult household members. Sample: households experiencing exactly one grandparent death in sample period.
<table>
<thead>
<tr>
<th>Net wealth</th>
<th>( \bar{w} = {0, 1} )</th>
<th>( \bar{w}\text{-rank} )</th>
<th>( \bar{w} \text{ in USD} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of entry</td>
<td>IV OLS</td>
<td>IV OLS</td>
<td>IV OLS</td>
</tr>
<tr>
<td>Age of entry</td>
<td>-0.011</td>
<td>-0.014***</td>
<td>-1.94***</td>
</tr>
<tr>
<td></td>
<td>(0.0096)</td>
<td>(0.0022)</td>
<td>(0.702)</td>
</tr>
<tr>
<td>Real wealth</td>
<td>IV OLS</td>
<td>IV OLS</td>
<td>IV OLS</td>
</tr>
<tr>
<td>Age of entry</td>
<td>-0.0079</td>
<td>-0.016***</td>
<td>-1.52***</td>
</tr>
<tr>
<td></td>
<td>(0.0088)</td>
<td>(0.0020)</td>
<td>(0.551)</td>
</tr>
<tr>
<td>Controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>N</td>
<td>2,580</td>
<td>2,580</td>
<td>2,580</td>
</tr>
</tbody>
</table>

Table C.4: The impact of age of entry on midlife wealth. Excluding those with increase in financial wealth at time of grandparent death.

Notes: This Table reproduces Table 4 except households which increase financial wealth from \( t = -1 \) to \( t = 0 \) are excluded from the sample.

<table>
<thead>
<tr>
<th>Net wealth</th>
<th>( \bar{w} = {0, 1} )</th>
<th>( \bar{w}\text{-rank} )</th>
<th>( \bar{w} \text{ in USD} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of entry</td>
<td>IV OLS</td>
<td>IV OLS</td>
<td>IV OLS</td>
</tr>
<tr>
<td>Age of entry</td>
<td>-0.037</td>
<td>-0.011***</td>
<td>-4.46***</td>
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<tr>
<td></td>
<td>(0.0246)</td>
<td>(0.0018)</td>
<td>(1.95)</td>
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<tr>
<td>Real wealth</td>
<td>IV OLS</td>
<td>IV OLS</td>
<td>IV OLS</td>
</tr>
<tr>
<td>Age of entry</td>
<td>-0.0200</td>
<td>-0.017***</td>
<td>-3.02**</td>
</tr>
<tr>
<td></td>
<td>(0.0229)</td>
<td>(0.0017)</td>
<td>(1.42)</td>
</tr>
<tr>
<td>Controls</td>
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<td>Yes</td>
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<tr>
<td>N</td>
<td>4,113</td>
<td>4,113</td>
<td>4,113</td>
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</table>

Table C.5: The impact of age of entry on midlife wealth. Controlling for financial wealth at 30, 35 and 40.

Notes: This Table reproduces Table 4 except three extra control variables are added: financial wealth at age 30, financial wealth at age 35 and financial wealth at age 40.
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<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
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<tbody>
<tr>
<td>$x_{20}$</td>
<td>0.0723***</td>
<td>0.0356***</td>
<td>43627.9***</td>
<td>0.115***</td>
<td>-0.433***</td>
<td>0.268***</td>
<td>93206.2***</td>
<td>20926.9***</td>
<td>0.150***</td>
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<td></td>
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<tr>
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<td></td>
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</tr>
</tbody>
</table>

Table C.6: Regression results from estimating equation (5) (Col.1) and the covariance-terms in equation (6) (Col.2-11).
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Square meters</strong></td>
<td>1,557***</td>
</tr>
<tr>
<td></td>
<td>(15)</td>
</tr>
<tr>
<td><strong>Number of rooms</strong></td>
<td>12,417***</td>
</tr>
<tr>
<td></td>
<td>(473)</td>
</tr>
<tr>
<td><strong>Number of bathrooms</strong></td>
<td>39,587***</td>
</tr>
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<td>(1,549)</td>
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<tr>
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</tr>
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<tr>
<td><strong>Year FE</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>R^2</strong></td>
<td>0.28</td>
</tr>
</tbody>
</table>

Table C.7: Predicting house prices (USD) based on equation (11).

Notes: Estimates from regressing the house purchase price on household attributes. Sample: only houses reportedly sold at market value and excluding sales from parent to child.

## D Model Appendix

### D.1 Numerical Details

The problem is solved backwards, by first solving the value function of a retiree at age $T$, when death is certain. For each discrete choice, we solve for optimal consumption choice using Brent’s root-finding algorithm. The optimal policy is then given by the discrete choice, and it’s associated consumption choice, that maximizes utility. This process is repeated backwards, until age $a = T^*$.

The persistent income shock is discretized following Rouwenhorst (1995), while other shocks are discretized on equal probability basis. That is, for $n$ grid points, the probably of each outcome is $1/n$ and the values of the shock at each grid point is equal to the midpoints of the $n - 1$ quantiles of the underlying distribution.

The persistent income shock $\nu$ follows a 4-state Markov chain process, and the transitory income shock is discretized to 2states, while The house price shock has discretized to 5states. The net worth $x$ and price $p$ grids are both unevenly spaced, with higher density for lower values with 63and 7grid points, respectively. For values not the grids we use linear interpolation.
The model is solved in Julia 1.8.5, and in addition to standard packages we use Interpolations.jl v0.14.7 and Optim v1.7.4 for interpolation and optimization routines.

Figure D.1: Calibration Figures