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Of House and Home-Related Goods: The Home Purchase Channel of Expenditure

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Abstract

Home-related spending in categories such as furnishings, renovations, and repairs is tied to housing market activity, with significant implications for aggregate expenditure dynamics. We refer to this relationship as the home purchase channel of expenditure. Using household-level panel data we estimate that home purchases lead to sizable increases in home-related spending, but not to increases in goods and services unrelated to home purchase. These findings are robust to the use of close-control groups and placebo tests. We then build a heterogeneous household model with housing, home renovations, and home-related durables that is calibrated to match our household-level evidence. Model simulations of housing market shocks generate large fluctuations in home-related and total expenditure. We show that the home purchase channel amplifies aggregate expenditure dynamics, with home-related spending accounting for around half of total spending fluctuations over the housing cycle.

Keywords: Housing, Home purchase, Household spending, Housing cycle

JEL: D12, D15, E21, E32, R31

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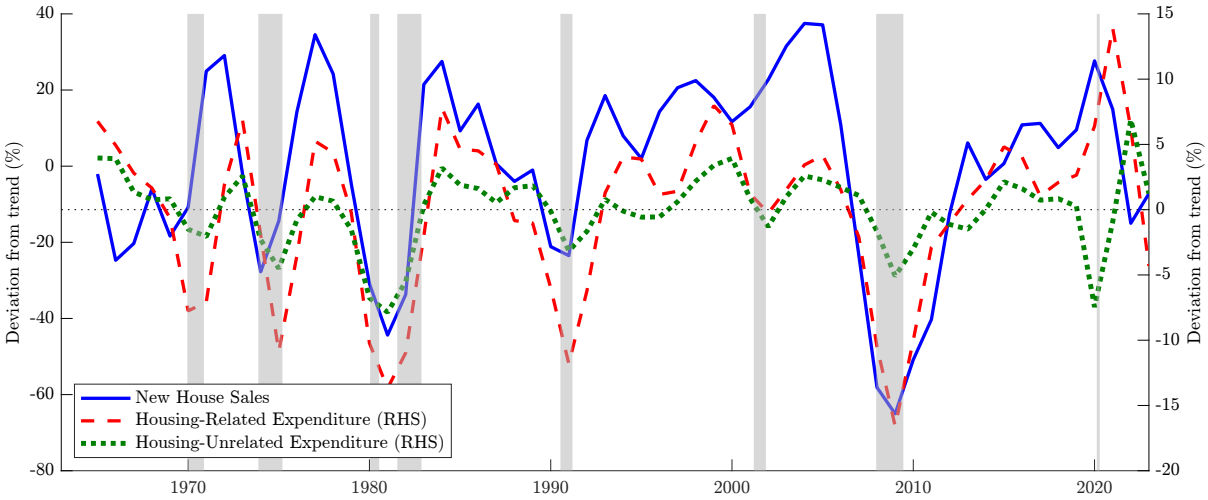
1. Introduction

The housing market is a key driver of aggregate fluctuations, as suggested by the large macroeconomic spillovers observed during recent housing booms and busts. Much of the theoretical and empirical literature links housing market developments to the real economy through consumption spending responses to mortgage credit conditions, housing wealth, and collateral channels.[1] The literature implicitly assumes that these channels have uniform effects across all categories of spending. However, as illustrated in Figure 1, cyclical measures of housing demand are highly correlated with home-related expenditures—such as furniture and major appliances—and are only weakly correlated with other unrelated expenditures. Our goal in this paper is to investigate the microeconomic drivers and macroeconomic implications of this spending co-movement with the housing market, which we refer to as the *home purchase channel of expenditure*.

Figure 1: Home Sales and Household Expenditures



Notes: Annual data reported as log-deviations from trend, estimated using the Hamilton (2018) filter. NBER recession dates shaded in grey. The correlation between new home sales and home-related expenditure is 0.69; the correlation with housing unrelated expenditure is 0.28.
Source: Authors' calculations using data from U.S. Census Bureau et al. (2024) and U.S. Bureau of Economic Analysis (2024b).

Several categories of household expenditures are closely tied to home purchases. For example, new homeowners may carry out home improvements and purchase goods—furniture, fixtures, and fittings—more customized to their new dwelling. Additionally, households may conduct home maintenance and repairs prior to selling their current property. Consistent with these intuitions, recent empirical studies find that home-related expenditures rise substantially around the date of housing transactions (Best et al., 2018; Benmelech et al., 2023).

[1] See, for example, Favilukis et al. (2017), Berger et al. (2017), Justiniano et al. (2019), Kaplan et al. (2020), Mian et al. (2013), Aladangady (2017), and Graham et al. (2023).

However, the broader spending implications of this home purchase channel of expenditure are understudied. Home-related spending comprises a significant share of total consumer spending. For example, furnishings and durable household equipment, an important component of home-related spending, accounts for 23 percent of durable goods and 8 percent of total goods expenditure.[2] Therefore, under the home purchase channel a wave of home purchases could generate large increases in total spending.

We investigate the home purchase channel of expenditure in two stages. First, we use household-level panel data to study spending around the time of home purchase. We estimate sizable increases in home-related expenditures that persist for several years, but find no change in expenditures unrelated to housing. These findings are robust to the use of close-control groups and placebo tests. Second, we build a heterogeneous agent life-cycle model featuring tight links between home purchases and home-related spending. We then use this model to investigate the aggregate implications of the home purchase channel. We find that that this channel is an important driver of aggregate spending dynamics with sizable reallocation and amplification of expenditures over the course of a housing cycle.

Our household-level evidence on the relationship between home purchases and home-related expenditures, is based on data from the Panel Study of Income Dynamics (PSID) between 2005 and 2021. Exploiting the panel structure of the data, we estimate household expenditure responses to home purchase activity controlling for time and household fixed effects as well as a rich set of time-varying household characteristics. Our regression analysis is akin to an event-study that compares spending for buyers around a home purchase to spending for comparable households that do not buy.

Across all home buyers, we find that home-related expenditures increase by an average of $7,000 around the time of home purchase. This is an 80 percent increase over pre-home purchase spending in these categories and represents around 10 percent of median annual total expenditure in the PSID. These findings are similar to the estimates in Benmelech et al. (2023). We extend their analysis by separately estimating spending responses for first-time and repeated home buyers and find that home-related expenditure jumps by $6,000 and $8,000 (or 130 and 70 percent of pre-home purchase spending), respectively. Additionally, we find that the higher home-related spending among first-time buyers persists for up to 4 years after home purchase.

We then present several additional exercises to strengthen the interpretation that our findings are driven by the home purchase channel of expenditure, and not by other factors. First, as in Benmelech et al. (2023), we show that the spending responses to home purchases of unrelated goods (e.g. clothing, food, and other discretionary items) is small and statistically insignificant for both first-time and repeated home buyers. If unobserv-

[2]Shares computed using National Income and Product accounts data from 1990–2024 (U.S. Bureau of Economic Analysis, 2024b).

able changes in current or future expected income were driving spending decisions around home purchase we would expect all spending categories to increase, not just home-related goods and services.

Second, we estimate spending responses using two close-control groups. We compare the responses of first-time home buyers with renters who intended to but did not buy a home, and the response of repeated buyers with homeowners who intended to but did not buy. This approach contrasts spending changes between households that are similar in their home purchase intentions but differ in realized decisions. In each case, we continue to estimate sizable increases in home-related expenditures and no changes in unrelated spending after home purchase relative to respective control groups.

Third, we present the results of two placebo tests. In one test, we compare expenditures of renters that moved across rental residences to renters that did not move at all. We find that moving renters increase home-related spending by a statistically significant but economically small amount ($180). This finding corroborates our claim that the increase in home-related expenditures is due to home purchases and not due to simply moving per se. In another test, we estimate spending responses to vehicle purchases—another major household outlay. In sharp contrast to home purchase events, vehicle purchases are associated with a significant increase in unrelated expenditures but no change in home-related spending, reinforcing our interpretation that the rise of home-related expenditures is specific to home purchase activity.

Our second contribution is to develop a quantitative model that is consistent with our household-level empirical estimates and that generates the substantial co-movement between the housing market and aggregate expenditures illustrated in figure 1. Specifically, we build a heterogeneous household life-cycle model with housing choices and consumption-spending decisions for home-related and unrelated goods and services. In the model, home purchases lead to additional spending in home-related categories because of home-and-durables mismatch shocks and renovations of existing homes prior to sale. Mismatch shocks represent an unexpected depreciation of existing durables, such as furniture, when they either do not fit or are not suitable for a new home. Home renovations proxy for property improvements or spending on neglected maintenance and repairs that may increase the value or probability of selling a home.

The model calibration targets a range of statistics on housing tenure, mortgage debt, and expenditure shares for home-related and unrelated goods. We set parameters governing the size of mismatch shocks and the cost of renovations to reproduce our empirical estimates of home-related expenditure responses for first-time and repeated home buyers, respectively. As in the data, households do not increase unrelated spending after buying a home. Additionally, as in the empirical analysis, the model features some persistence in home-related spending among first-time buyers.

We then use the model to investigate aggregate spending dynamics in response to

housing market shocks. We simulate partial equilibrium model dynamics through a series of housing market bust and boom episodes. For the housing bust exercises, we calibrate a rich set of macroeconomic shocks to replicate the housing market in the aftermath of the Global Financial Crisis (GFC), similar to Kaplan et al. (2020). For the housing boom, we calibrate shocks to replicate the dynamics of the housing market around the COVID-19 pandemic, similar to Gamber et al. (2023). Our simulations include shocks to housing demand, household incomes, mortgage credit conditions, and house prices. These shocks enable us to assess the importance of the home purchase channel of expenditure relative to standard macro-housing channels that emphasize credit conditions and housing wealth effects.

The simulated housing bust generates patterns of aggregate housing demand and spending that are very similar to those observed in the data between 2007 and 2013. In the model, home purchases fall to 60 percent below trend and home-related spending falls by around 12 percent, but unrelated spending changes very little. Overall, total spending falls by around 3 percent, reflecting the substantial decline in home-related categories. While home-related spending represents just 14 percent of total spending in steady state, it accounts for 46 percent of the decline in total spending at the housing market trough. Similarly, our simulated housing boom generates patterns of aggregate housing demand and spending that closely mimic data from 2020 to 2024. In the boom, increases in home-related spending account for roughly 40 percent of the rise in total spending at the housing market peak.

To understand the importance of the home purchase channel of expenditure we compare aggregate dynamics in the model to an alternative model that excludes renovation costs and features only non-durable home-related goods with no home-mismatch shocks. We show that this alternative model generates smaller spending responses to home purchases and muted fluctuations in home-related spending over the housing cycle relative to the baseline model. Further, total expenditure falls by 10 percent less in the bust and rises by 20 percent less in the boom. These results suggest that the home purchase channel generates both reallocation and amplification of expenditures over the housing cycle, above and beyond those implied by standard housing wealth and credit channels alone.

Related Literature

Our paper follows a large literature studying the relationship between household consumption expenditure and housing market fluctuations (see, for example, Mian et al., 2009; Mian et al., 2013; Aladangady, 2017; Favilukis et al., 2017; Garriga et al., 2020; Justiniano et al., 2019; Kovacs et al., 2019; Kaplan et al., 2020; Guren et al., 2021; Graham et al., 2023).

Our empirical work is most closely related to Benmelech et al. (2023). We confirm their findings that home-related spending is strongly tied to home purchase activity.

We also extend and augment their empirical analysis in several ways. First, we show that average spending responses across all home buyers masks heterogeneity in spending across first-time and repeated buyers. Second, we show that while spending responses are transitory for repeat home buyers, home-related spending is very persistent for first-time buyers. Third, we strengthen the interpretation of the home purchase channel of expenditure by drawing on close-control groups and placebo event studies. Finally, we propose a heterogeneous agent model that is consistent with our empirical findings to assess the macroeconomic implications of home purchases on home-related expenditure and aggregate expenditure.

Our paper is also related to Best et al. (2018) who present microeconomic evidence consistent with a complementarity between home purchases and home-related spending using U.K. data. Although the primary focus of Best et al. (2018) is the effect of transaction taxes on home purchase activity, their empirical findings are consistent with the results of our quantitative model on the aggregate co-movement between house purchases, home-related spending, and total household spending.

Our paper provides new insights into the study of aggregate spending dynamics in quantitative heterogeneous agent models. This literature typically studies the relationship between the housing market and household expenditure through housing wealth, collateral, and credit channels (Berger et al., 2017; Kaplan et al., 2020; Garriga et al., 2020; Jones et al., 2022). In contrast, our paper emphasizes a direct link between home purchase activity and home-related spending. In our aggregate dynamic model experiments, we show that these home purchase channels of expenditure account for a substantial share of the fluctuations in aggregate spending across the housing cycle.

We also find that housing demand or preference shocks account for much of the co-movement between home purchase activity and household expenditure. In the boom and bust, our housing demand shocks explain nearly all of the variation in house purchases, most of the variation in home-related spending, and around one-fourth of the movements in total expenditures. These results are consistent with the findings of other studies using quantitative models of the housing market such as Kaplan et al. (2020) for the mid-2000s boom and bust, and Gamber et al. (2023) for the COVID-19 pandemic housing boom.

2. Data

The main data source in our analysis is the Panel Study of Income Dynamics (PSID), a representative longitudinal survey of U.S. households. In addition to demographics, employment, and income, the PSID collects information on household expenditures and housing tenure—key to our analysis. Our sample consists of biennial data from 2005–2021,

and includes all survey waves for which comprehensive expenditure data are available.[3]

We classify PSID expenditure categories into home-related and unrelated spending.[4] Home-related spending comprises utilities, home repair and maintenance, household furnishings and equipment, and home renovations and additions. Unrelated spending consists of food, telephone and internet, transportation, education, child care, clothing and apparel, recreation and entertainment, and trips and vacations.[5] We separately classify mortgage payments, rents, property tax, and homeowner insurance as direct spending on housing services rather than home-related expenditures.

Table 1: Summary Statistics of PSID Households Characteristics

	First-time buyers	Repeated buyers	Renters	Staying owners
Panel (a): Demographics				
Head age	40.4	49.6	45.9	58.7
White (%)	76.8	86.3	63.7	84.7
High school or below (%)	32.2	28.2	49.0	38.6
College or some college (%)	68.7	71.8	51.0	61.4
Married (%)	56.5	70.1	27.3	65.1
Family size	2.5	2.6	2.0	2.4
Number of Households	2,375	2,358	10,144	29,411
Panel (b): Income and expenditure				
Family income	113,933	134,157	53,900	114,777
	(196,200)	(166,164)	(59,278)	(143,043)
Total expenditure	58,676	67,074	33,921	54,644
	(48,521)	(50,032)	(22,583)	(43,374)
Home-related expenditure	12,897	19,489	2,916	10,827
	(39,398)	(47,221)	(4,832)	(24,427)
Utilities	3,285	3,586	1,971	3,813
Repairs and maintenance	3,543	5,583	216	3,281
Furniture	2,669	3,346	613	1,330
Home renovation and addition	3,431	6,973	117	2,413

Notes: The table reports within-group means and standard deviations (in parentheses). Income and expenditures reported in 2021 dollars. Statistics exclude health-related expenditures. For definition of home-related expenditures see Table A.1 in Appendix A.
Source: Author's calculations using PSID survey waves 2005–2021.

[3]The PSID was an annual survey from 1968 to 1997 and biennial thereafter. The PSID has recorded food and housing expenditures in most years since 1968; transportation, utility, health care, and education expenditures since 1999; and expenditures on furniture and appliances, home repairs and maintenance, clothing, trips and vacations, and entertainment were added in 2005. The PSID now covers almost all spending categories in the Consumer Expenditure Survey (CEX), which is widely regarded as the most comprehensive survey of household expenditures. The PSID reports very similar expenditures to the CEX on average and across the life-cycle (Andreski et al., 2014), but tends to under-estimate aggregate expenditure as measured by the National Income and Product Accounts (Battistin, 2003; Passero et al., 2014). For more details about the PSID data, see (Survey Research Center, Institute for Social Research, University of Michigan, Ann Arbor, MI, 2022).

[4]See Table A.1 in Appendix A for a summary.

[5]We exclude health care spending because the PSID reports out-of-pocket rather than total health care expenditure. Additionally, the size of out-of-pocket costs depend on insurance coverage, information on which is not available in the PSID.

The PSID also records current housing tenure and the history of residential moves. For housing tenure, households report whether they rent or own a home. They also report whether they moved residence since the last survey period. We identify first-time home buyers as households that are currently homeowners but were renters in the previous survey period.[6] We identify repeated home buyers as households that remain homeowners across consecutive survey periods but also report moving residence between surveys. We refer to the combination of first and repeated home buyers as all home buyers.

Table 1 presents summary statistics from our PSID sample. We identify nearly 5,000 home buyers in the PSID, representing over 10 percent of our total sample of households. Home buyers are fairly evenly split between first-time and repeated buyers. Panel (a) reports household demographics. Compared to renters, first-time home buyers are younger, more likely to be white, better educated, more likely to be married, and have larger families. Compared to other existing homeowners, repeated home buyers are younger, better educated, and more likely to be married.

Panel (b) reports household incomes and expenditures in 2021 U.S. dollars. Compared to renters, first-time home buyers earn nearly twice as much, spend 70 percent more in total, and spend four times as much in home-related expenditure categories. Compared to existing homeowners that stayed in the same residence, repeated home buyers earn nearly 20 percent more, spend around 25 percent more in total, and spend two times as much in home-related expenditure categories. First-time buyers spend substantially more than renters in all categories of home-related expenditure, while repeated home buyers have higher spending on home repairs, maintenance, furniture, and home renovations, relative to other homeowners.

3. Empirical Analysis

3.1. Regression Specification

To estimate the effect of home purchases on consumption expenditures, we use the following linear regression model:

$$C_{i,t}^{j} = \beta^{j} \mathbb{1}_{H_{i,t}} + \gamma X_{i,t} + \eta_t + a_i + \epsilon_{i,t}, \tag{1}$$

where the dependent variable $C_{i,t}^{j}$ is real dollar expenditures in category j by household i in year t and $\mathbb{1}_{H_{i,t}}$ is an indicator variable that is equal to one if household i purchased a home between the previous survey year $(t-2)$ and current survey year (t) and is zero

[6] Because our PSID sample spans multiple years, households may be included as renters, first-time buyers, repeated buyers, or remaining owners in different years. There are a few renters that were previously homeowners; if such renters purchase a home, we label them as first-time buyers.

otherwise. $X_{i,t}$ is a vector of household controls, including age, race, education, marital status, and working status of household heads, as well as family size, real household income, and the number of rooms in the current residence. Due to the hump-shaped life-cycle profile of expenditures, we control for household head age non-linearly with dummy variables for 10-year age bins. Survey-year fixed effects, η_t, control for common, time-varying influences on household spending, such as business cycles or aggregate house prices; household-level fixed effects, a_i, control for time-invariant unobservable factors that explain differences in average spending across households. Standard errors are clustered at the household level.

With time and household fixed effects, Equation (1) is akin to an event-study regression. The coefficients of interest are β^j, which measure the spending response in category j to a home purchase event relative to a control group of households that do not purchase a home. As home purchases are not assigned randomly across households, β^j are estimated by comparing the consumption responses across several control groups and placebo samples. First, we compare spending responses for home-related and unrelated categories. If home purchase is driven by unobservable shocks that are omitted from the regression model, broad expenditures should respond to some extent. If, instead, it is the purchase of a home that boosts spending on home-related goods and services, then only this category of expenditures should increase. Second, we estimate spending responses across households that are ex-ante similar in their intentions to move but ex-post different in their home purchase decisions. This comparison mitigates concerns that factors driving individual decisions to purchase a home also affect home-related expenditures. Third, to ascertain that it is home purchases rather than relocations that trigger differential spending responses across categories, we compare renters that move to a new residence (but did not purchase a home) to renters that did not move. Fourth, we compare spending responses to vehicle purchases, which may be driven by the same unobserved factors influencing home purchases but should not be specifically associated with an increase in home-related expenditures.

3.2. Baseline Results

Table 2 reports estimates of β^j for various consumption categories j, grouped into home-related and unrelated spending, and across three groups of households: all home buyers versus non-buyers; first-time home buyers versus renters; and repeated home buyers versus existing homeowners. In the analysis, the sample includes only those households that can be linked in at least two consecutive survey waves and have valid home ownership and expenditure information in both waves.

Column (1) in panel (a) shows that home buyers increase home-related spending by \$6,700 on average in response to a home purchase, relative to households who do not buy

Table 2: Home-Related Expenditures after Home Purchases

	(1) Home-related	(2) Renovation	(3) Repair	(4) Furnishing	(5) Utility	(6) Unrelated
Panel (a): All home buyers						
Home purchase ($)	6,708***	2,852***	1,941***	1,757***	159***	-375
	(615)	(394)	(277)	(153)	(31)	(343)
Pre-purchase mean ($)	8,579	1,991	2,025	1,553	3,013	35,147
Observations	54,063	54,063	54,063	54,063	54,063	54,063
R^2	0.295	0.286	0.207	0.267	0.599	0.690
Panel (b): First-time home buyers						
Home purchase ($)	5,686***	1,543***	2,295***	1,183***	666***	572
	(546)	(311)	(239)	(143)	(57)	(456)
Pre-purchase mean ($)	4,348	401	474	1,128	2,344	30,932
Observations	21,660	21,660	21,660	21,660	21,660	21,660
R^2	0.427	0.331	0.413	0.356	0.600	0.697
Panel (c): Repeated home buyers						
Home purchase ($)	8,347***	4,046***	2,282***	2,100***	-81	-982
	(952)	(567)	(474)	(261)	(43)	(552)
Pre-purchase mean ($)	11,873	3,228	3,229	1,884	3,533	38,423
Observations	30,776	30,776	30,776	30,776	30,776	30,776
R^2	0.292	0.311	0.209	0.248	0.565	0.675

Notes: This table reports coefficients from regressions relating expenditures for various consumption categories to home purchase. The dependent variables are expenditures (in 2021 dollars) for various consumption categories. Home purchase is an indicator that takes the value of one if households reported purchasing a home between time $t-2$ and t and zero otherwise. The upper panel compares all home buyers with nonbuyers. The middle panel compares first time home buyers with renters, and the lower panel compares repeated home buyers with homeowners who did not move and did not buy a new home. Each regression includes year and household fixed effects as well as household age, race, education, marital status, and working status of household heads, as well as family size, real household income, the number of rooms in the current residence. Standard errors are clustered at the household level. *, **, and *** indicate that the coefficient is statistically significant at the 95, 99, and 99.9 percent level, respectively.

a home between the previous and the current PSID survey.[7] This dollar spending boost is nearly 80 percent of the average home-related expenditures prior to home purchase. Columns (2)–(5) report responses of the various components of home-related spending. The largest dollar and percentage increases in spending occur in home renovation, but there are also large increases in repairs and furnishings and modest increases in utility spending.

To strengthen the interpretation of our estimates as due to the home purchase channel, column (6) reports estimates of the response of consumer spending not directly related

[7]The sample in this panel comprises all buyers, households renting in both $t-2$ and t, and homeowners who stayed in the same residence in both $t-2$ and t.

to home purchases, such as food, clothing, and entertainment. As shown, the point estimate of β^j in column (6) is statistically indistinguishable from zero, and economically small given the pre-home purchase spending of $35,000 in the unrelated category. The differential response between home-related and unrelated expenditures assuages concerns that the increase in the consumption of home-related goods in our empirical setting reflects other factors than those related to purchasing a home.

Panels (b) and (c) report estimated spending responses for first-time home buyers and repeated home buyers, respectively. In panel (b), the control group includes households who remained renters over two consecutive surveys, whereas in panel (c), the control group consists of households who were homeowners in both survey years but did not move residence. These comparisons test whether the home-purchase channel of expenditure is common across all home purchases, whether occurring for the first time or not.

As shown in column (1) of panel (b), we estimate an increase of around $5,700 in home-related expenditures for first-time-buyers relative to renters. This is a larger increase relative to the pre-purchase average reported in panel (a), reflecting the much lower level of home-related expenses for renters than existing homeowners. The larger spending increase associated with home purchases for first time buyers may also reflect matching frictions in the housing market that lead new homeowners to spend more on improvements and other home-related services in order to customize new homes to their liking. As in panel (a), we estimate that most of the increase in home-related goods for first-time buyers is due to renovation, repair, and furniture expenses. Panel (c) compares the expenditure response of homeowners that purchase a new home (repeated buyers) and homeowners that do not. The estimates suggest that the increase in home related expenses is not confined to first-time home buyers. Expenditures on home-related goods also increase for repeated-buyers and is over 70 percent higher than the average expenditure in home related goods and services.

In column (6) of both panels (b) and (c), we show non-significant responses of spending on goods and services unrelated to home purchase. Additionally, these responses are both small in absolute magnitude and in comparison to pre-purchase spending in this category. Further, table A.2 in Appendix A shows that home-related spending for repeated home buyers increases by a similar amount whether existing homeowners move to relatively bigger or smaller homes. This evidence further suggests that changes in home-related spending are related to home purchase activity itself and not simply a result of spending more when upsizing a home.

Note that the results reported across the three panels of table 2 rely on different treated and control groups and therefore are not directly comparable. However, the signs and magnitudes of our β^j estimates consistently point to large spending responses in housing-related categories for both first-time and repeated home buyers. By and large these estimates are consistent with those of Benmelech et al. (2023), who use data through

2013 and do not distinguish between repeated and first-time home buyers.[8]

3.3. Close-Control Groups

One concern with OLS estimates of equation (1) is that unobserved factors may influence both home purchase and household expenditure decisions. For example, higher expected income may lead households to buy a new home and also increase spending, including on home-related goods and services. To address concerns that the treatment group (home buyers) is selected relative to the control group (non-buyers), we compare the spending responses of home buyers with those that intended to purchase a home but did not. This comparison selects households that are ex-ante similar in their stated moving intentions—which we use as a proxy for intention to purchase a new home—but are different in their ex-post home buying decisions.

The results are reported in table 3. Estimates in columns (1) and (2) are obtained from the comparison of renters that prior to t declared their intention to move residence and that eventually purchased a home in t, with renters that did not purchase a home but reported earlier their intention to move. In columns (3) and (4), the sample consists of existing homeowners that intended to move and purchased a new home with those that did not, despite stating an intention to move.

Consistent with our previous evidence, the estimates in column (1) and (3) suggest a sizable increase in the consumption of home-related goods after a home purchase. Both renters that transition into home ownership and homeowners that purchase a new home spend significantly more in home-related categories than households in the respective control group—those who intended to move but did not buy. Columns (2) and (4) report estimates of the response of goods that are not home-related. In line with the baseline results in table 2, non-durables and other discretionary spending—food and clothing—do not change after home purchases for both first-time and repeated buyers. For each group of home buyers, the estimated coefficients are economically small in magnitude and statistically insignificant.

3.4. Placebo Tests

Two additional concerns may threaten the interpretation of our results as reflecting the home purchase channel of expenditure. First, home-related spending may be triggered by residential moves of any kind and not necessarily by moves associated with buying a new home. While home purchases are much more likely to be associated with renovations

[8]Re-estimating equation (1) on a PSID sample constructed following Benmelech et al. (2023) yields very similar results.

Table 3: Home-Related Expenditures with Close Control Groups

	First-time Buyers (Realized vs. Intended)		Repeated Buyers (Realized vs. Intended)	
	(1) Related	(2) Unrelated	(3) Related	(4) Unrelated
Home purchase	6,547***	95	11,229***	-510
	(764)	(580)	(2,168)	(831)
Household fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes
R^2	0.463	0.693	0.490	0.723
Observations	11,808	11,808	3,530	3,530

Notes: This table reports regression results of the response of home-related and home-unrelated expenditures to home purchases across different samples of households. Columns (1)–(2) compare the differential response of renters that purchased a home with renters that planned to move but did not purchase a new home, and columns (3)–(4) compare the response of homeowners that purchased a new home with homeowners that planned to move but did not purchase a home. Home Purchase is an indicator that takes the value of one if households reported purchasing a home between time t and $t-2$ and zero otherwise. The dependent variables are 2021 dollar expenditures of home-related expenditures (columns (1) and (3)) or home-unrelated expenditures (columns (2) and (4)). Each specification includes year and household fixed effects as well as household age, race, education, marital status, and working status of household heads, as well as family size, real household income, the number of rooms in the current residence. Standard errors are clustered at the household level. *, **, and *** indicate that a coefficient is statistically significant at the 95, 99, and 99.9 percent level, respectively.

and repairs, renters may buy new furniture or appliances as they move across residences. Second, home-related spending may be associated with purchases of any durable goods, not specific to home purchases. The purchase of a new vehicle, for example, may be driven by similar unobserved factors that lead to a new home purchase, and these factors may explain the sudden increase in home-related spending. We address these concerns by conducting two placebo tests.

We first estimate spending responses when renters move across residences but do not purchase a home. Specifically, we estimate a modified version of equation (1),

$$C_{i,t}^{j} = \beta^{j} \mathbb{1}_{R_{i,t}} + \gamma X_{i,t} + \eta_t + a_i + \epsilon_{i,t} \tag{2}$$

for a sample of renters only, where $\mathbb{1}_{R_{i,t}}$ is an indicator variable equal to one if a renting household moves to a new residence but does not purchase a home, and is equal to zero otherwise. Table 4 reports our estimates. Column (1) shows a statistically significant boost in home-related expenditures for renters that move residence. However, the size of the estimated coefficient is small compared to the average spending of $2,900 among all renters (see table 1) and especially in comparison to the increase in spending for first-time home buyers of $5,700 (see table 2).

Table 4: Home-Related Expenditures with Placebo Samples

	Moved Renters vs. Staying Renters		Vehicle Buyers vs. Non-Buyers	
	(1)	(2)	(3)	(4)
	Related	Unrelated	Related	Unrelated
Move	177***	-311		
	(62)	(206)		
Vehicle purchase			67	581***
			(203)	(113)
Household fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes
R^2	0.426	0.700	0.291	0.699
Observations	19,589	19,589	56,162	56,162

Notes: This table reports regression results of the response of home-related and home-unrelated expenditures in two placebo samples. Columns (1)–(2) compare renters who moved to another rental property with renters who did not move. Columns (3)–(4) compare the response of households that purchased a new vehicle with those that did not. The dependent variables are the values of home-related expenditures (columns (1) and (3)) or home-unrelated expenditures (columns (2) and (4)). Each specification includes year and household fixed effects as well as household age, race, education, marital status, and working status of household heads, as well as family size, real household income, the number of rooms in the current residence. Standard errors are clustered at the household level. *, **, and *** indicate that a coefficient is statistically significant at the 95, 99, and 99.9 percent level, respectively.

In our second placebo test, we estimate household spending responses following vehicle purchases:

$$C^j_{i,t} = \beta^j \mathbb{1}_{V_{i,t}} + \gamma X_{i,t} + \eta_t + a_i + \epsilon_{i,t} \tag{3}$$

using the full sample of households, where $\mathbb{1}_{V_{i,t}}$ is an indicator variable equal to one if a household purchases a vehicle, and is equal to zero otherwise. The implicit assumption of this test is that the purchase of a new vehicle may be driven by unobserved factors that are similar to the decision to purchase a home. In that case, we would expect to see similar patterns of home-related expenditures following both home and vehicle purchases.

Estimates of equation (3) are reported in columns (3) and (4) of table 4. Home-related expenditures do not change in response to vehicle purchases: the spending change is small in magnitude and statistically indistinguishable from zero. In contrast, the increase in spending on unrelated goods and services is statistically significant, although not large in comparison to average spending in this category (see table 1). The very different spending responses to vehicle purchases and home purchases suggests that home-related spending is not related to all large durables purchases. The results of this and the previous placebo test offer additional support for the home-purchase channel of expenditure.

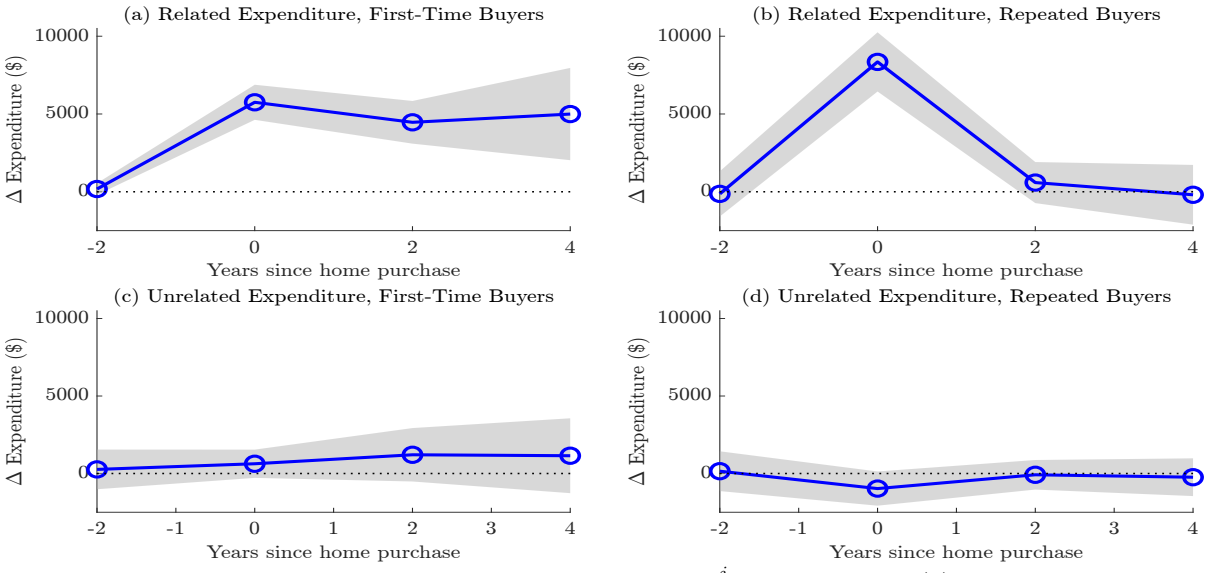
3.5. Dynamic Spending Responses

Do home buyers reduce overall expenditures ahead of home purchases, perhaps in anticipation of higher future home-related expenses associated with the decision to buy a new home? And how persistent is the increase in home-related expenditures following a home purchase? To shed light on these questions, we take advantage of the panel structure of the PSID to estimate spending responses prior to and in the years following a home purchase. Specifically, we modify equation (1) and estimate the following specification:

$$C^j_{i,t+k} = \beta^j_k \mathbb{1}_{H_{i,t}} + \gamma_k X_{i,t} + \eta_t + a_i + \epsilon_{i,t+k} \tag{4}$$

where $k \in \{-2, 0, 2, 4\}$ refers to years relative to the PSID survey year t. Recall that the PSID is reported biennially, so k captures spending in the two years prior, two years after, and four years after home purchase. $C^j_{i,t+k}$ is spending in category j relative to the survey year t, and β^j_k is the category j spending response at $t+k$ to a home purchase at t.

Figure 2: Dynamic Spending Responses to Home Purchase Decisions



Notes: The figure illustrates dynamic spending responses β^j_k from equation (4). Point estimates are drawn as solid lines with circle markers, 95 percent confidence intervals are illustrated by gray bands.
Source: Authors' calculations using data from the Panel Study of Income Dynamics.

We illustrate our estimates of β^j_k in figure 2. Two important findings stand out. First, neither home-related nor unrelated spending decline in the years prior to home purchases, across home buyers. This result suggests that the spending boost of home-related good following home purchase is not preceded by spending cuts in anticipation of a future home purchase.

Second, panel (a) shows that the home-related spending responses of first-time buyers are highly persistent, with increases relative to comparable renters of about $6,000 each

year over the four-year horizon. In contrast, panel (b) shows that the response of home-related expenditures for repeated buyers is much less persistent. Spending increases by \$8,300 in the two years around home purchase, but returns to the same level as non-buyer homeowners thereafter. Panels (c) and (d) show that for both groups of home buyers unrelated spending remains unchanged at all horizons.

A number of factors may lead to a persistent increase in the demand for home-related goods and services following a home purchase. For example, it may take a while for such buyers to figure out what furniture or improvements they want for their new home. First-time buyers also commit to a stream of regular maintenance expenses that they did not undertake as renters. Further, first-time buyers may also be more liquidity constrained, limiting their home-related spending capacity immediately after buying a home.

4. Model

In order to rationalize our empirical results and study the aggregate implications of the home purchase channel of expenditure, we build a heterogeneous household life-cycle model of housing and consumption-spending decisions. The model introduces a distinction between expenditures that are related and unrelated to home purchase activity. We calibrate the model to reproduce our empirical estimates and then employ model simulations to study the co-movement between the housing market and aggregate expenditure dynamics.

4.1. Environment

Demographics and Endowments

Time is discrete, a model period corresponds to two years, and household age is indexed by $j \in [1, \cdots, J]$. Households enter the labor force at $j = 1$ and retire after age $J_{ret} < J$. They receive labor income during working-life, and a pension during retirement. Labor income consists of a deterministic life-cycle component g_j, an idiosyncratic stochastic component y_j, and a component that scales with aggregate income Y. Household income is given by

$$m_j = \begin{cases} g_j \times y_j \times Y, & \text{for } j \leq J_{ret} \\ \omega_m \times g_{J_{ret}} \times y_{J_{ret}} \times Y, & \text{for } j > J_{ret}. \end{cases}$$

Stochastic income during working life follows a log-AR(1) process, $\log y_j = \rho_y \log y_{j-1} + \varepsilon_{y,j}$, with normally distributed innovations $\varepsilon_{y,j} \sim \mathcal{N}(0, \sigma_y)$. At birth, $\log y_1$ is drawn from the stationary distribution of the AR(1) process.

In retirement households receive a fixed fraction ω_m of the income they received in

the final period of their working life. This simplification is a tractable way of modeling the relationship between the size of retirement accounts and recent working-life income.

Housing

Housing services s can be acquired either by renting at the per-unit rental rate P_r, or derived from owner-occupied property purchased at the per-unit house price P_h. For simplicity we assume that the rental rate is set at a fixed rent-to-price ratio, $P_r = \kappa P_h$. Both rental units and owner-occupied houses are chosen from discrete sets $\mathcal{H}_r$ and $\mathcal{H}_o$, respectively.

Existing homeowners face transaction costs associated with selling a property: there is a sales cost f_h representing real estate and legal fees; and renovation and repair costs δ_r associated with preparing their home for sale. Renovation and repair costs include neglected repairs and maintenance that were not carried out during housing tenure, but also home improvements that might be expected to increase the probability of home sale. Both sales and renovation costs are proportional to the value of the home being sold, $P_h h$. Homeowners also face ongoing expenses associated with homeownership: regular maintenance costs δ_h, property taxes τ_h, and property insurance premiums ς_h. Each of these costs is proportional to the value of the house owned.

Durables

In addition to non-durable goods c and housing services s, households consume home-related durable goods d such as furniture and appliances. Each period, households choose durables d', which enters the current utility function and affects the stock of durables available next period.

Durable goods depreciate over time. For renters and homeowners that are not adjusting their housing stock, durables depreciate at a constant rate δ_d. However, the durables depreciation rate for households purchasing a new house may be higher than δ_d. The higher depreciation rate reflects mismatch shocks between the composition of the current stock of durables and the new choice of housing. For example, an existing refrigerator may not fit into the new kitchen, a previous set of curtains does not match the carpet, or a new sofa is required to fill out a larger living room space.

When buying a new home, the durables depreciation rate is given by $\delta_m = \delta_d + \varepsilon_m$, where ε_m is a mismatch shock distributed according to a uniform distribution with support $[0, M]$. The mismatch shock is realized after a household makes the decision to buy a new home but before other decisions, such as the size of house, mortgage borrowing, and consumption. That is, once a household has decided to move they realize their existing durables may be unsuitable for the home they move into.

We denote home-related durables expenditure as the difference between the new choice

of durables d' and the undepreciated stock of existing durables $(1-\delta_d)d$ or $(1-\delta_m)d$, depending on house purchase status.

Liquid Assets

Households have access to a risk-free, liquid asset a. They may save in the asset or use it to borrow against the value of owner-occupied housing. The net return on savings is r, while the net cost of borrowing is $r_b > r$. The interest rate on current assets is given by $r(a) = \mathbb{1}_{a>0}r + \mathbb{1}_{a<0}r_b$.

Mortgage origination is subject to a maximum loan to value (LTV) ratio constraint:

$$a' \geq -\theta P_h h',$$

where θ is the maximum LTV ratio, and $P_h h'$ is the value of the current housing stock.

If not adjusting the housing stock or refinancing a mortgage, a household faces a minimum mortgage repayment requirement. The minimum mortgage repayment is given by the amortization equation

$$\pi_j(a, r_b) = \frac{r_b(1+r_b)^{J+1-j}}{(1+r_b)^{J+1-j}-1}|a|.$$

There is no penalty for choosing to pay more than the minimum repayment. If a mortgage holder does not refinance or prepay the loan, the amortization formula ensures a constant stream of payments in every age from j until J. Given the minimum repayment requirement, a non-adjusting homeowner chooses next period assets to satisfy

$$a' \geq \min\{0, (1+r_b)a + \pi_j(a, r_b)\}.$$

A non-adjusting homeowner that does not currently hold a mortgage faces a no-borrowing constraint $a' \geq 0$.

At age $j = 1$, households may receive bequests in the form of liquid assets. The probability of receiving a bequest is λ_a, and conditional on receipt the bequest is a fraction ω_a of first period income.

Preferences

Per-period utility is defined over non-durable consumption goods c, durable consumption goods d, and housing services s (derived from either renting or owning). The flow utility function is

$$\frac{\left(c_j^{\gamma} d_j^{\chi} s_j^{1-\gamma-\chi}\right)^{1-\sigma}}{1-\sigma} \tag{5}$$

where the parameters γ, χ, and $1-\gamma-\chi$ define the consumption shares of non-durables, home-related durables, and housing services. Risk aversion is governed by the parameter σ, and future utilities are discounted by β.

At the end of life, households leave bequests of any remaining networth w, which is the resale value of any owned housing less mortgage balances, positive liquid asset balances, and any remaining durables after constant depreciation δ_d. The warm-glow bequest function is defined as

$$v(w) = \psi \frac{w^{1-\sigma}}{1-\sigma},$$

where ψ governs the strength of the bequest motive (see De Nardi, 2004).

Household Spending Categories

Home-related and unrelated expenditures in the model follow the expenditure categories in our empirical analysis. Unrelated expenditure is simply non-durables c. Home-related expenditure combines regular housing maintenance expenditures, spending on home-related durables goods, and spending on renovation of existing houses. All other housing-related costs—such as rents, mortgage payments, taxes, and insurance—are considered direct expenditures on housing services.

Related expenditures for renters (R), non-adjusting homeowners (N), and adjusting homeowners (A) are given by

$$\begin{aligned}
related_R =& \max\{0, d' - (1-\delta_d)d\} + \delta_r P_h h \\
related_N =& \delta_h P_h h + \max\{0, d' - (1-\delta_d)d\} \\
related_A =& \delta_h P_h h' + \max\{0, d' - (1-\delta_m)d\} + \delta_r P_h h.
\end{aligned}$$

Renters and non-adjusting homeowners face a constant durables depreciation rate δ_d but adjusters face the stochastic depreciation rate δ_m due to mismatch shocks. As in our empirical analysis, we only record spending on durables and ignore reductions in the durables stock. Both renters and adjusting homeowners pay for renovations on previously owned houses h that are sold in the current period.

Household Decision Problems

Each period a household may choose to rent (R), adjust its housing stock (A), or continue as a homeowner without adjusting the housing stock (N). Households enter a period at age j with liquid assets a, housing stock h, durables d, and idiosyncratic income y. The start-of-period state vector is $\mathbf{z} = [a, h, d, y]$, where d is prior to depreciation.

A renting household chooses housing services s, non-durables c, and durables d', and

liquid assets a'.[9] It solves the following problem:

$$
\begin{aligned}
V_j^R(\mathbf{z}) = \max_{c,d',s,a'} \quad & u(c,d',s) + \beta \mathbb{E}_{y',\varepsilon_m}\left[V_{j+1}(\mathbf{z}')\right] \\
\text{s.t.} \quad & c + d' + a' + P_r s = m_j + (1+r(a))a + (1-f_h-\delta_r)P_h h + (1-\delta_d)d \\
& s \in \mathcal{H}_r \\
& a' \geq 0 \\
& h' = 0
\end{aligned} \tag{6}
$$

where expectations over future values, $\mathbb{E}_{y',\varepsilon_m}\left[V_{j+1}(\mathbf{z}')\right]$, are taken with respect to the evolution of idiosyncratic income y' and the distribution of durables mismatch shocks ε_m. If a house was previously owned, it is sold and any outstanding debt is repaid from the proceeds.

An adjusting household chooses the housing stock h', non-durables, durables, and may save or borrow using the liquid asset a'. It solves the problem:

$$
\begin{aligned}
V_j^A(\mathbf{z}) = \max_{c,d',a',h'} \; & u(c,d',h') + \beta \mathbb{E}_{y',\varepsilon_m}\left(V_{j+1}(\mathbf{z}')\right) \\
\text{s.t.} \quad & c + d' + a' + (1+\delta_h+\tau_h+\varsigma_h)P_h h' = m_j + (1+r(a))a + (1-f_s-\delta_r)P_h h + (1-\delta_m)d \\
& a' \geq -\theta P_h h' \\
& h' \in \mathcal{H}_o
\end{aligned} \tag{7}
$$

Adjusters receive the proceeds of selling existing housing, $P_h h$, less sales and renovation costs f_s and δ_r, and repayment of any outstanding mortgage balances. Since purchasing a new house induces a mismatch shock at the beginning of the period, the home-related durables depreciation rate is higher than the constant depreciation rate faced by non-adjusting households $\delta_m \geq \delta_m$.

A non-adjusting homeowner chooses non-durables, durables, and may save in the liquid asset or continue with mortgage payments. It solves the problem:

$$
\begin{aligned}
V_j^N(\mathbf{z}) = \max_{c,d',a'} \quad & u(c,d',h) + \beta \mathbb{E}_{y',\varepsilon_m}\left[V_{j+1}(\mathbf{z}')\right] \\
\text{s.t.} \quad & c + d' + a' + (\delta_h+\tau_h+\varsigma_h)P_h h = m_j + (1+r(a))a + (1-\delta_d)d \\
& a' \geq \min\{0, (1+r_b)a + \pi_j(a,r_b)\} \\
& h' = h
\end{aligned} \tag{8}
$$

Non-adjusting homeowners with a mortgage pay at least the minimum repayment $\pi_j(a,r_b)$.

[9] To solve household value function problems with multiple continuous choice variables, we adapt the two-step solution method discussed in Druedahl (2021). See Appendix B.1 for further details.

Discrete Decisions and Housing Preference Shocks

At the start of each period, households make discrete decisions over renting (R), adjusting (A), and not adjusting (N). Prior to this decision, households face both common housing preference shifters and idiosyncratic housing preference shocks. The housing preference shifters are denoted μ_i for $i \in \{R, A, N\}$, and can make homeownership relatively more desirable for all households regardless of economic circumstances. In the steady state $\mu_i = 0$ for all $i \in \{R, A, N\}$. In Section 5 we simulate aggregate housing demand shocks by varying μ_A.

Idiosyncratic housing preference shocks also change the relative desirability of homeownership, independent of current income and wealth. These shocks represent unexpected changes in the suitability of a current residence. For example, households face changes in housing needs due to various life events, or they may wish to move in order to be closer to family, work, or other amenities. Rather than explicitly modelling these factors, we assume that idiosyncratic preference shocks follow a Gumbel (or Type 1 Extreme Value) distribution with dispersion parameter σ_h (see McFadden, 1978). The discrete decision problem of a household is

$$V_j(\mathbf{z}) = \max_{i \in \{R,A,N\}} \left\{ V_j^i(\mathbf{z}) + \mu_i + \sigma_h \varepsilon_i \right\},$$

where V^i represent the values of the household decision problems above. And the probability that a household chooses one of the discrete options $i \in \{R, N, A\}$ is

$$\Pr(i|\mathbf{z}) = \exp\left(\frac{V_j^i(\mathbf{z}) + \mu_i}{\sigma_h}\right) \times \left[\sum_{i \in \{R,A,N\}} \exp\left(\frac{V_j^i(\mathbf{z}) + \mu_i}{\sigma_h}\right)\right]^{-1}$$

4.2. Calibration

Externally Calibrated Parameters

Table 5: Model Parameters

Description	Parameter	Value	Source
Panel (a): Externally calibrated parameters			
Model periods		2	Authors' choice
Retirement period	J_{ret}	22	Authors' choice
Final period	J	29	Authors' choice
Risk aversion	σ	2	Standard
Housing maintenance/depreciation rate	δ_h	0.030	Harding et al. (2007)
Durables depreciation rate	δ_d	0.201	BEA, 2005–2019
Fraction receiving bequests	λ_a	0.777	SCF, 2013
Bequest size-to-income	ω_a	0.075	SCF, 2013
Retirement replacement rate	ω_m	0.494	OECD, 2019
Std. dev. income shocks	σ_y	0.167	French (2005)
Persistence income shocks	ρ_y	0.955	French (2005)
Risk-free interest rate	r	0.010	FRB, 2005–2019
Mortgage interest rate	r_b	0.027	Freddie Mac, 2005–2019
Property tax	τ_h	0.020	Diaz et al. (2010)
Property insurance	ς_h	0.010	Karlman et al. (2021)
Housing sales cost	f_s	0.070	Gruber et al. (2003)
Mortgage origination cost	f_b	0.006	Freddie Mac, 2005–2019
Maximum LTV ratio	θ	0.800	Greenwald (2018)
Spacing of house sizes	Δ_h	10.300	SCF, 2013
Panel (b): Internally calibrated parameters			
Discount factor (annualized)	β	0.853	SMM
Desirability of bequests	ψ	157.397	SMM
Home-related durables goods preference	χ	0.611	SMM
Unrelated goods preference	γ	0.028	SMM
Rent-to-price ratio	κ	0.334	SMM
Minimum house size	$\underline{h}$	0.737	SMM
Dispersion of housing preference shocks	σ_h	0.214	SMM
Maximum durables mismatch shock	M	0.533	SMM
Renovation cost	δ_r	0.034	SMM

Notes: All parameters reported at annualized rates.

We first choose a subset of parameters following external sources, as reported in table 5 panel (a). One model period is two years. Households start working at age 24, retire at 66 ($J_{ret} = 21$), and live until 80 ($J = 29$). The risk aversion parameter is $\sigma = 2$. We compute the bequest parameters using data in the 2013 wave of the Survey of Consumer Finances (SCF) (Board of Governors of the Federal Reserve System, 2019): λ_a is the fraction of households aged 20–25 with non-negative liquid wealth, and ω_a is the ratio of positive liquid wealth to after-tax, per-capita income conditional on non-negative wealth. The retirement income replacement rate ω_m is from OECD (2019). We set the parameters of the earnings process σ_y and , ρ_y following annual estimates in French (2005), adjusting for the two-year model period.

The deterministic life-cycle income profile g_j is computed from real, after-tax income per-capita from the 2004–2019 waves of the SCF.[10] Our sample is households aged 24 to 66 earning at least \$500 per year. Federal income tax thresholds and tax rates are from the Congressional Budget Office (2019). We estimate g_j by regressing log-income on cohort fixed effects and a fourth-order polynomial in age. Aggregate income Y is set to 1 in the steady state.

The risk-free rate r is set to the real yield on 10-year Treasury bonds adjusted for CPI inflation (Board of Governors of the Federal Reserve System, 2024; U.S. Bureau of Labor Statistics, 2024), and r_b is the real 30-year mortgage interest rate (Freddie Mac, 2024a). The mortgage origination cost f_b is computed from mortgage origination fees and discount points (Freddie Mac, 2024b). Each of r, r_b, and f_b is computed as the average of data from 2005 to 2019. The proportional cost of selling a home f_s is from Gruber et al. (2003), the property tax rate τ_h is from Diaz et al. (2010), and the housing insurance cost ς_h is from Karlman et al. (2021). The maximum LTV ratio is set to $\theta = 0.8$ (see Greenwald, 2018). Housing maintenance costs δ_h are due to Harding et al. (2007).

We calculate the usual annual depreciation rate on durables δ_d as the dollar value of current-cost depreciation on consumer durable goods divided by the current-cost net stock of consumer durable goods using 2005–2019 data (U.S. Bureau of Economic Analysis, 2022a).

We set the size of the housing choice sets $N_h = |\mathcal{H}_o| = |\mathcal{H}_r| = 5$. The house sizes in $\mathcal{H}_o$ are log-spaced at intervals of $\log(\Delta_h)/N_h$, where Δ_h is the ratio of largest to smallest house sizes in $\mathcal{H}_o$ and is computed from the 90^{th} and 10^{th} percentiles of the house size distribution in the 2013 SCF. The elements $\mathcal{H}_r$ are spaced like $\mathcal{H}_o$, and we assume that the largest element in $\mathcal{H}_r$ corresponds to the smallest element in $\mathcal{H}_o$.[11]

[10] See figure B.1 panel (a) in Appendix B.

[11] Kaplan et al. (2020) justify the same restriction on owner occupied and rental house sizes by providing evidence that the the highest value rentals tend to be no larger than the lowest value owner-occupied homes.

Internally Calibrated Parameters

We calibrate the parameters $\{\beta, \psi, \chi, \gamma, \sigma_h, \kappa, \underline{h}, M, \delta_r\}$ using a Simulated Method of Moments (SMM) algorithm. The chosen parameters are reported in table 5 panel (b).

The discount factor β and the strength of the warm-glow bequest motive ψ jointly target the median household networth-to-income ratio and the median LTV ratio among mortgagors. This choice of parameters helps to produce high LTV ratios of households when young and the significant accumulation of networth over the life-cycle. Figure B.1 in Appendix B.2 shows that the model captures these joint life-cycle dynamics well.

The preference parameters γ and χ for unrelated consumption and home-related durables consumption, respectively, target average unrelated and home-related expenditure shares in the 2005–2019 waves of the PSID. The rent-to-price ratio κ and minimum house size $\underline{h}$ jointly determine the overall and under-40 homeownership rates as reported in the 2013 SCF. We set the dispersion of the idiosyncratic preference shocks σ_h to match the homeowner moving rate. Ngai et al. (2024) report that around 2.5 percent of single-family houses in the US are listed for sale per quarter, which suggests approximately 10 percent of existing homeowners move every year.

We set the upper bound on durables mismatch shocks M and the cost of renovations δ_r to target our estimates of the home-related expenditure responses to home purchases, reported in panel (b) and (c) of table 2. In the model we simulate a panel of 3000 households and run the same panel regressions as in our empirical analysis, which includes household-level fixed effects and controls for 10-year household age bins, income, house size, and unemployment (see equation (1)).[12] For comparison of model and empirical estimates, we scale all regression coefficients by average pre-home purchase expenditures in the relevant spending categories (see table 2). Our calibrated values of M and δ_r imply that annual durable depreciation rates conditional on home purchase are between 20 and 85 percent, and that around 3 percent of home sales revenues are spent on renovations prior to sale.

4.3. Model Fit

Overall, our calibration produces a reasonable fit to both targeted and untargeted statistics in the data, as shown in table 6. Importantly, panel (a) shows that the model closely matches the observed responses of home-related spending for both first-time and repeat home buyers. The model also provides a reasonable fit to homeownership rates, moving rates of homeowners, expenditure shares, as well as wealth and debt positions. Untargeted statistics are reported in panel (b), where we show that the model reproduces the non-response of unrelated spending among repeat home buyers but somewhat

[12] We proxy unemployment in the model with a dummy variable for households whose idiosyncratic income state falls in the bottom 10 percent of realizations.

overstates the increase in unrelated expenditure among first-time buyers.

Figure B.1 in Appendix B.2 compares the life-cycle profiles of income, homeownership, mortgage LTV ratios, and networth-to-income in both model and data. Additionally, figure B.2 illustrates homeownership rates and home-related spending shares across the income distribution in the model and data. Overall, the model does a good job of reproducing these cross-sectional patterns in the data.

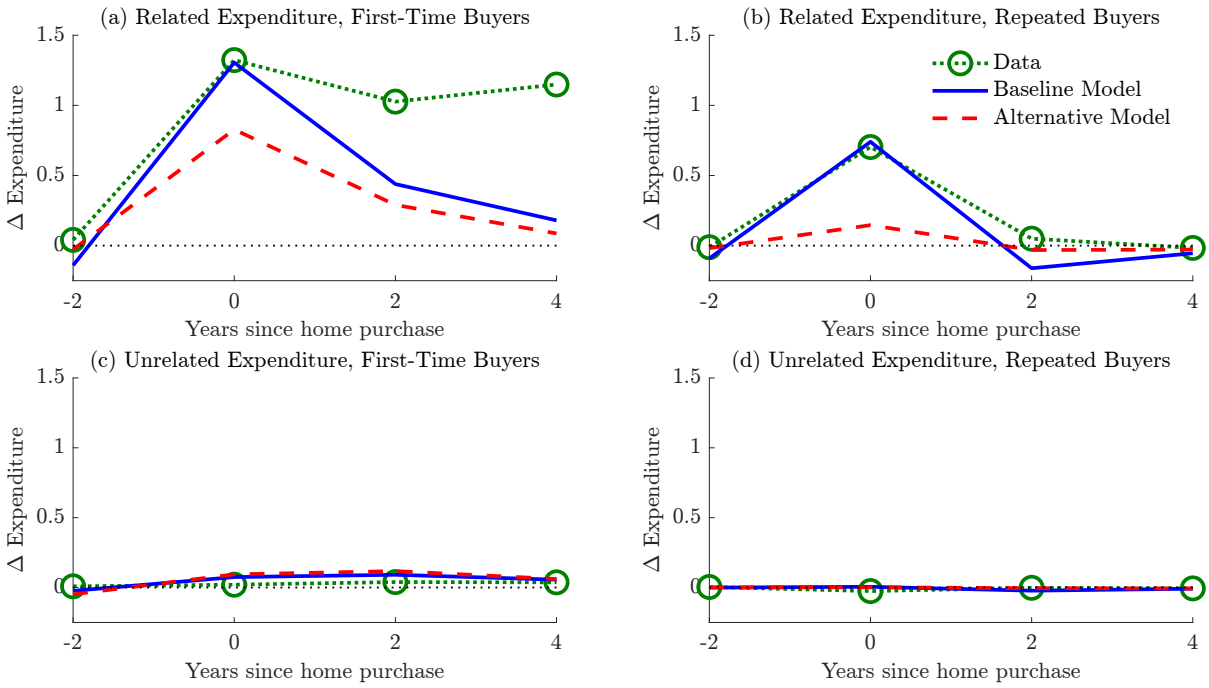
Table 6: Calibrated Model Fit

Description	Target	Model	Source
Panel (a): Targeted moments			
Median networth-to-income	0.691	0.756	SCF, 2013
Median LTV ratio, mortgagors	0.659	0.605	SCF, 2013
Home-related expenditure share, owners	0.157	0.127	PSID, 2005–2019
Unrelated expenditure share, owners	0.594	0.681	PSID, 2005–2019
Homeownership rate	0.652	0.672	SCF, 2013
Homeownership rate, $j \leq 40$	0.430	0.424	SCF, 2013
Homeowner moving rate (annualized)	0.100	0.110	Ngai et al. (2024)
Δ Related expenditure, first-time buyers	1.308	1.306	PSID, 2005–2019
Δ Related expenditure, repeat buyers	0.703	0.740	PSID, 2005–2019
Panel (b): Untargeted moments			
Δ Unrelated expenditure, first-time buyers	0.018	0.075	PSID, 2005–2019
Δ Unrelated expenditure, repeat buyers	-0.026	0.005	PSID, 2005–2019
Home-related expenditure share, renters	0.085	0.044	PSID, 2005–2019
Unrelated expenditure share, renters	0.600	0.678	PSID, 2005–2019
Median House value-to-income, owners	2.967	2.501	SCF, 2013
Fraction with mortgage, owners	0.659	0.721	SCF, 2013
Median mortgage-to-income, mortgagors	1.798	1.069	SCF, 2013

In figure 3 we compare the dynamics of household spending around the date of home purchase in the model and data. As above, we use simulated model data and estimate equation (4) to parallel our empirical dynamic estimates. For comparison with our model, dashed lines with circle markers illustrate scaled empirical estimates from figure 2 using pre-home purchase mean expenditures reported in table 2. Our baseline model estimates are illustrated with solid blue lines. All four panels of figure 3 show that households do not adjust spending in advance of home purchase. Spending responses at the date of home purchase (i.e. time zero) are very similar in the data and model, as a result of our calibration strategy. Panel (a) shows that home-related expenditure among first-

time home-buyers is moderately persistent in the model, but less persistent than in the data. Panel (b) shows that for repeated buyers home-related expenditure is essentially transitory in both model and data, with spending returning to baseline in the period following home purchase. Panels (c) and (d) show no changes in unrelated expenditure over time in both model and data, and for both types of buyers.

Figure 3: Expenditure Responses to House Purchases Over Time



Notes: Δ Expenditure is the dollar-valued change in spending scaled by average pre-home purchase expenditure. Spending responses in the data are taken from our empirical results in figure 2.
Source: Authors' calculations including data from the Panel Study of Income Dynamics.

In figure 3 we also report spending responses for an alternative model (red dashed lines) where we turn off renovation costs at date of home sale ($\delta_r = 0$), and we make the home-related good d non-durable and no longer subject to mismatch shocks ($\delta_d = 1, M = 0$). This alternative model is similar to standard heterogeneous agents models of the housing market that do not feature the home purchase channel of expenditure (see Berger et al., 2017; Favilukis et al., 2017; Kaplan et al., 2020; Garriga et al., 2020; Guren et al., 2021). Home-related spending then simplifies to $related = \delta_h P_h h' + d'$, where $h' = 0$ for renters and $h' = h$ for non-adjusters. In the absence of these home purchase channels of expenditure, home-related spending responses for first-time and repeated buyers are 40 and 80 percent smaller than the baseline model responses, respectively. Thus, our home purchase channels substantially amplify home-related spending in relation to home purchase activity.

5. Aggregate Spending Dynamics

In this section, we use the model to study aggregate spending dynamics in response to housing market shocks. We focus on two distinct housing market episodes: the housing bust post GFC (see Kaplan et al., 2020; Favilukis et al., 2017; Garriga et al., 2020), and the housing boom post COVID-19 pandemic (see Gamber et al., 2023). Following Berger et al. (2015) we model partial equilibrium dynamics, which abstract from the feedback to house prices, interest rates, and incomes. A partial equilibrium analysis allows us to study more empirically realistic macroeconomic shocks and model dynamics than in a general equilibrium setting.

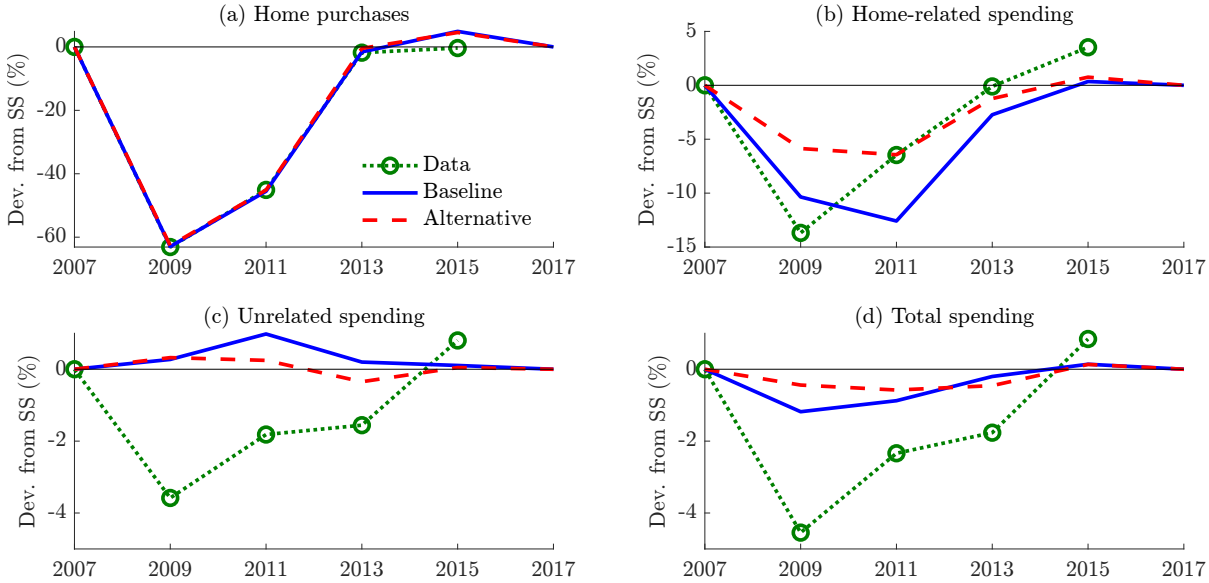
For each episode, we first study model dynamics in response to housing demand shocks only. These exercises are closest in spirit to the empirical analysis of Section 3.2, with housing preference shocks driving both home purchases and household spending. We then study a broader set of shocks calibrated to match observed changes in home purchases, incomes, interest rates, mortgage borrowing constraints, and house prices during the GFC housing bust and the post pandemic housing boom.[13] This broader calibration exercise allows us to compare aggregate spending dynamics under the home purchase channel with standard channels of macro-housing models, such as mortgage credit conditions and housing wealth effects.

5.1. Housing Demand Shocks

For the housing bust exercise, we study model dynamics in response to housing demand shocks alone by calibrating a sequence of negative housing preference shocks $\mu_{A,t}$ to replicate the observed decline in home purchases from 2007 to 2013. Figure 4 plots the model IRFs. Our baseline model, like the data, shows a sharp contraction in home purchases, which then recovers gradually (panel (a)).

[13]To match cyclical fluctuations in the data we take annual observations from 1975 to 2024, estimate deviations from a Hamilton-filtered trend (Hamilton, 2018), and compute two-year averages of these deviations to be consistent with our two-year model period. See Appendix B.3 for details and an illustration of the data.

Figure 4: IRFs During a Housing Market Bust with Housing Demand Shocks Only



Notes: Data series are two-year averages of deviations from an annual Hamilton (2018) filtered trend. Panel (d) reports total non-housing spending.
Source: Authors' calculations using data from U.S. Census Bureau et al. (2024), U.S. Bureau of Economic Analysis (2024b), and U.S. Bureau of Labor Statistics (2024).

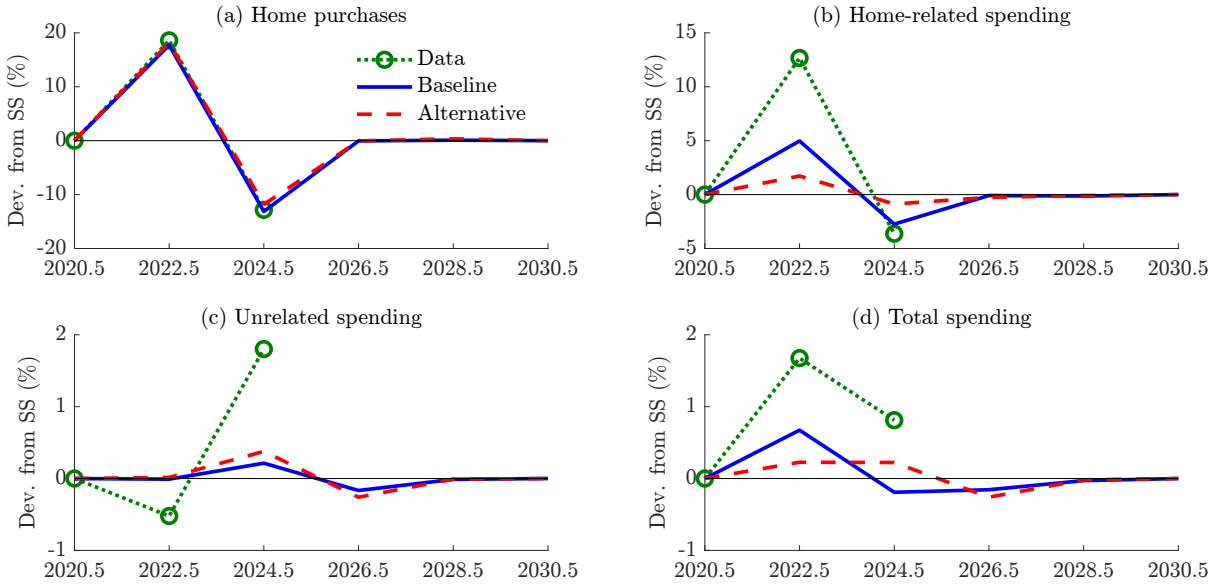
The sharp decline in home purchases is transmitted to household spending. In the model, home-related expenditure falls by 11 percent in 2009, declines further in 2011, and then recovers slowly (panel (b)). This response is similar to what is observed in the data, which shows a 15 percent drop in home-related spending on impact followed by a rebound. In contrast, unrelated spending is largely unmoved by the housing demand shocks (panel (c)). In the data, unrelated spending falls by around 4 percent, indicating that other macroeconomic forces—such as income or credit shocks—likely contributed to the broader contraction during this period. We return to this point in the full shock calibration exercise discussed below. Although total spending falls by only one-fourth of the decline observed in the data (panel (d)), the decline is entirely driven by home-related spending.

The strong co-movement between home purchases and home-related spending illustrates our primary model mechanisms. The drop in housing demand results in fewer home buyers. These missing home buyers would have carried out home maintenance and renovations and would have replenished their stocks of home-related durables following mismatch with their new homes. But in the absence of home purchases, these expenditures do not take place and home-related spending falls rapidly. Because the housing demand shocks do not affect unrelated spending, total household expenditure also declines as a result of the home purchase channel of expenditure.

The model mechanisms are further highlighted by comparing these responses with those of an alternative model specification, which excludes renovation costs, has only

non-durable home-related goods, and features no home-related goods mismatch shocks (i.e. $\delta_r = 0$, $\delta_d = 1$, and $M = 0$).[14] The declines in both home-related spending and total spending in the alternative model are only half as large as in the baseline model. These much muted responses suggest that the home purchase channel of expenditure in our baseline model substantially amplifies aggregate spending dynamics in response to housing preference shocks.

Figure 5: IRFs During a Housing Market Boom with Housing Demand Shocks Only



Notes: Data series are two-year averages of deviations from an annual Hamilton (2018) filtered trend. Panel (d) reports total non-housing spending.
Source: Authors' calculations using data from U.S. Census Bureau et al. (2024), U.S. Bureau of Economic Analysis (2024b), and U.S. Bureau of Labor Statistics (2024).

We repeat this exercise for the post-pandemic housing boom, by calibrating a sequence of positive housing preference shocks $\mu_{A,t}$ to match the increase in home purchases observed between mid-2020 and mid-2024. As shown in Figure 5, home purchases rise sharply on impact (panel (a). This increase triggers a 5 percent rise in home-related spending, roughly one-third of the increase observed in the data (panel (b)). Although unrelated spending remains flat—in contrast with the small decline in the data—total spending rises by around 0.75 percent, which is nearly half of the increase observed in the data (panels (c) and (d)).[15] As in the housing bust exercise, the change in total spending is entirely driven by changes in home-related spending.

The contrast between the baseline and alternative models again highlights the centrality of the home purchase channel. During the housing boom, the baseline model generates

[14]For this exercise we also calibrate the preference shocks $\mu_{A,t}$ to reproduce the observed path of home purchases. See panel (a).

[15]Our simple housing demand shock does not capture the temporary restrictions on non-durable consumption induced by COVID-19 lockdowns that were likely a major driver of the decline in unrelated spending during this period. See, for example, Gamber et al. (2023).

increases in both home-related and total spending that are nearly 3 times larger than in the alternative model that does not feature renovations, home-related durables, or mismatch shocks. Unrelated spending remains unaffected in both versions of the model, underscoring that the amplification in household expenditures is specific to the home-purchase channel.

Altogether, these exercises show that exogenous shocks to housing demand can generate substantial movement in home-related and aggregate spending, even in the absence of shocks to incomes, house prices, and mortgage credit. As unrelated spending remains largely unaffected, the macroeconomic consequences of housing demand shocks operate solely through the home purchase channel of expenditure. This channel provides a plausible microfoundation for the amplification of total spending dynamics, the co-movement between home purchases and home-related spending, and the reallocation of household expenditure across categories over the course of the housing cycle.

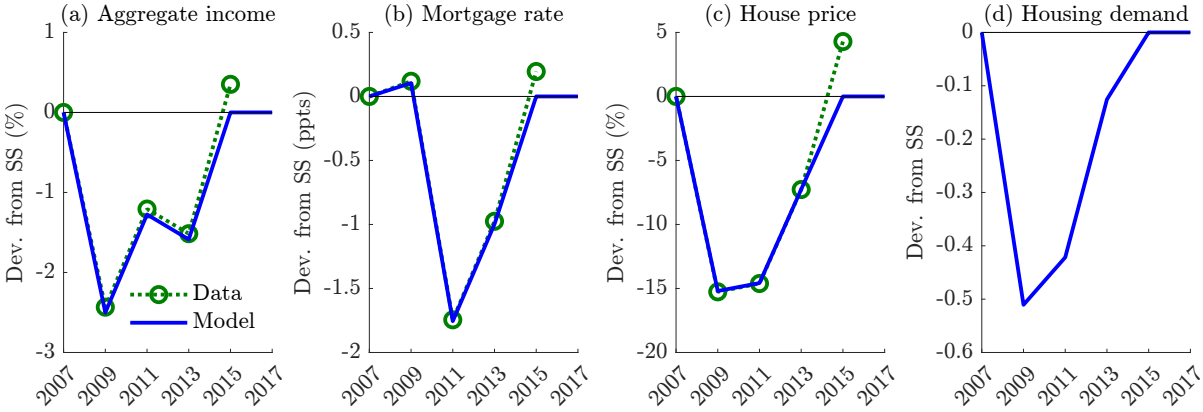
5.2. Broad Housing Market Bust

Next we study model dynamics under a broader set of macroeconomic shocks that characterize the housing bust during the GFC. This exercise incorporates a sequence of shocks to LTV ratios, household incomes, mortgage interest rates, house prices, and housing preferences. The goal is to account for the co-movement of housing market activity and household spending observed between 2007 and 2013.

We assume that the maximum LTV ratio ω_t drops from 80 to 70 percent for the duration of the bust, consistent with tightening credit standards over this period (see Greenwald, 2018). At the same time, we set the shocks to income Y_t, interest rates $r_{b,t}$, and house prices $P_{h,t}$ based on the cyclical components of the data (see Figure 6).[16] The housing preference shocks $\mu_{A,t}$ are calibrated to match the observed path of home purchases over the period. Figure 6 illustrates these shocks.

[16]For more detail on the construction of these shocks see Appendix B.3.

Figure 6: Housing Market Bust Shocks

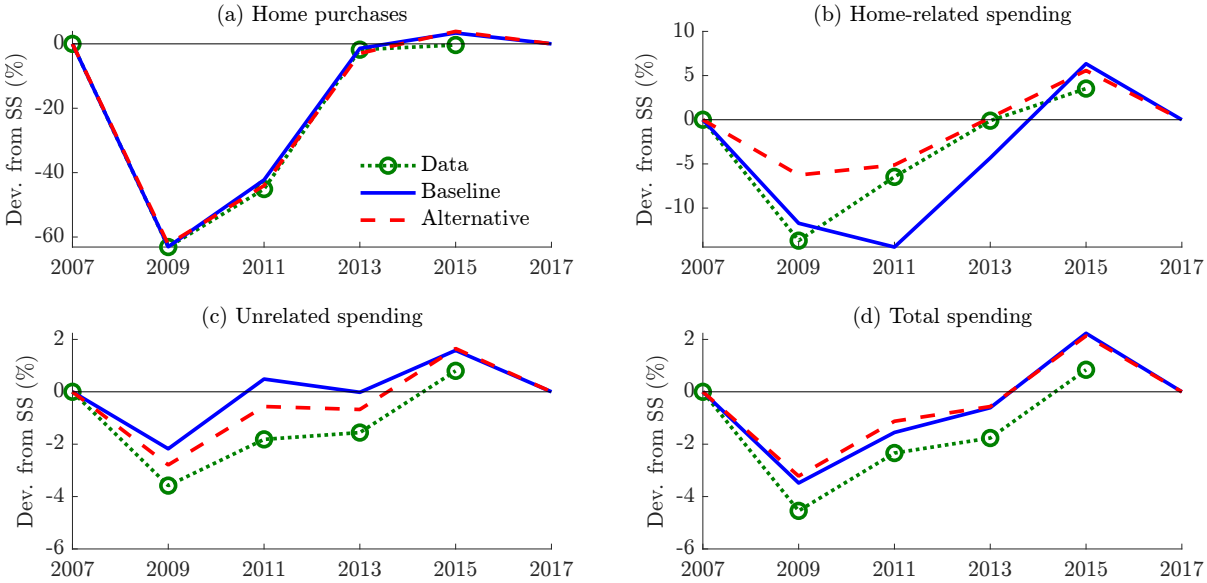


Notes: Panel (a) shows housing demand shocks calibrated to match the path of home purchases. Shocks in panels (b)–(d) are two-year averages of deviations from an annual Hamilton (2018) filtered trend using data from 1975 to 2024. Evolution of the maximum LTV ratio is not shown.
Source: Authors' calculations using data from U.S. Bureau of Economic Analysis (2024a), Freddie Mac (2024a), S&P Dow Jones Indices LLC (2024), and U.S. Bureau of Labor Statistics (2024).

Figure 7 illustrates the IRFs. As in our simple exercises in Section 5.1, the model reproduces the sharp contraction in home purchases observed in the data (panel (a)). And, again, these changes in housing market activity act as the key transmission channel for broader household spending patterns. Home-related spending falls by 12 percent on impact, close to the 14 percent decline in the data (panel (b)). This is a larger and more persistent decline than generated by the effect of housing demand shocks alone. The deeper trough reflects the added impact of tighter credit conditions and lower incomes on home-related spending directly as well as through lower home purchase activity.

Unrelated spending falls by about 2 percent in our housing bust exercise, which is around half of the decline in the data (panel (c)). While Section 5.1 showed that unrelated spending is unaffected by housing demand shocks, the decline here is driven by tighter mortgage credit conditions, lower household incomes, and housing wealth effects through falling house prices. Nevertheless, the fall in unrelated spending remains much smaller than the decline in home-related spending. As a result, the contraction in total spending of around 3 percent on impact (panel (d))—roughly 75 percent of the decline observed in the data— is disproportionately driven by home-related spending due to the home purchase channel.

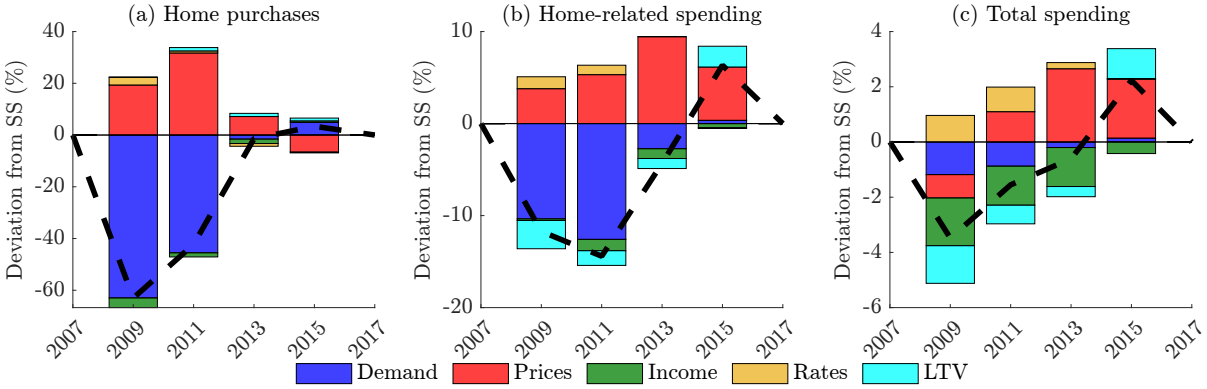
Figure 7: IRFs During a Housing Market Bust



Notes: Data series are two-year averages of deviations from an annual Hamilton (2018) filtered trend. Panel (d) reports total non-housing spending.
Source: Authors' calculations using data from U.S. Census Bureau et al. (2024), U.S. Bureau of Economic Analysis (2024b), and U.S. Bureau of Labor Statistics (2024).

As shown in the figure, the alternative model generates less than half of the decline in home-related spending seen in the baseline model. It also produces a slightly larger decrease in unrelated spending, so that total spending falls by nearly as much as in the baseline model. Although the amplification of aggregate expenditure is smaller in this exercise than in the experiment with housing demand shocks alone, we still find that the home purchase channel of expenditure results in nearly 10 percent larger fluctuations in spending than in the alternative model. Additionally, the model responses suggest that the home purchase channel meaningfully alters the composition of spending over the housing cycle, with a larger share of total spending accounted for by home-related expenditures in the baseline model relative to the alternative specification. We return to this point in Section 5.4.

Figure 8: IRF Shock Decomposition During a Housing Market Bust



Notes: The effect of isolated shocks to housing demand, house prices, incomes, interest rates, and LTV ratios may not sum to the total effect of the housing bust.

To identify the contributions of each shock during the housing bust, we conduct a decomposition of the model IRFs (Figure 8). We find that the decline in home purchases is predominantly driven by the housing preference shock, but is partially offset by the positive effect of falling house prices (panel (a)). This finding is consistent with Kaplan et al. (2020), who attribute much of the mid-2000s housing boom and bust to changing expectations about future housing demand. The housing preference shock also accounts for the bulk of the fall in home-related spending, with lower house prices and mortgage rates only modestly dampening the decline (panel (b)). Additionally, the changes in housing demand explain roughly one-fourth of the contraction in total expenditure, with falling incomes, tighter credit conditions, and declining house prices contributing to the remainder.

Overall, we find that our broad set of macroeconomic shocks can jointly explain the strong co-movement between housing market activity and aggregate spending. During a housing bust, the home purchase channel of expenditure reallocates spending away from home-related goods and services and amplifies the downturn in aggregate expenditures. Our decomposition exercise shows that much of this variation in household spending is driven by housing demand shocks. Other macroeconomic shocks, such as to incomes, mortgage credit, and house prices, play a supporting role but have proportional impacts on home-related and unrelated expenditures.

5.3. Broad Housing Market Boom

We now study model dynamics under a broad set of macroeconomic shocks representing the post-pandemic housing boom. Similar to the housing bust exercise, we incorporate a sequence of shocks to household incomes, mortgage interest rates, house

prices, and housing preferences.[17] The paths of the income, mortgage rate, and house price shocks shown in Figure 9 follow the cyclical components of the respective data series from mid-2020 to mid-2024. We then calibrate a sequence of positive housing preference shocks $\mu_{A,t}$ to match the observed rise in home purchases over this period. Our exercise is similar in spirit to Gamber et al. (2023), although our housing preference shock is more general than their stay-at-home shock.[18]

Figure 9: Housing Market Boom Shocks

Notes: Data series are two-year averages of deviations from an annual Hamilton (2018) filtered trend.
Source: Authors" calculations using data from U.S. Bureau of Economic Analysis (2024a), Freddie Mac (2024a), S&P Dow Jones Indices LLC (2024), and U.S. Bureau of Labor Statistics (2024).

Figure 10 illustrates the IRFs. The model reproduces the surge in home purchases observed in the data (panel (a)). It also generates a pronounced increase in home-related spending of about 10 percent on impact, close to the 13 percent increase observed in the data (panel (b)). This spending response is around twice as large as the response to housing demand shocks alone, reflecting higher household incomes, lower mortgage rates, and the wealth effects of higher house prices. These changes also affect unrelated spending, which rises by a small amount in the model (panel (c)).[19] As a result, total expenditure rises by 3 percent, somewhat larger than the 2 percent increase in the data (panel (d)). Nevertheless, the model continues to generate a sharp distinction between the changes in home-related and unrelated spending in response to macroeconomic and housing market shocks. The changing composition of total spending over the housing boom illustrates, once again, the centrality of the home purchase channel of expenditure.

Note that the baseline model generates an increase in home-related spending that is twice as large as the alternative model. This difference is entirely due to the home pur-

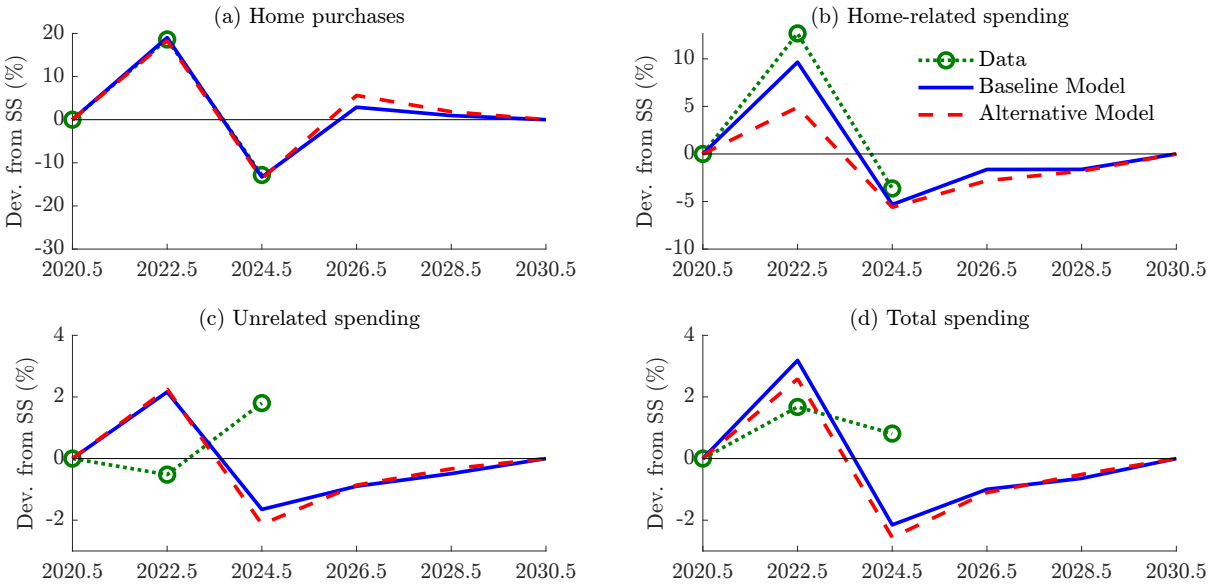
[17]Differently from the housing bust exercise, we do not adjust mortgage LTV ratios, as we are not aware of any evidence that mortgage credit standards changed during or after the pandemic.

[18]Diamond et al. (2022) also build a model to study housing markets during the pandemic, but they primarily focus on the effects of monetary and fiscal policies at this time.

[19]The discrepancy with unrelated spending in the data likely reflects the absence of pandemic-specific factors in our model such as lockdowns and mobility restrictions, which depressed particular categories of non-durable consumption over this period (see Gamber et al., 2023).

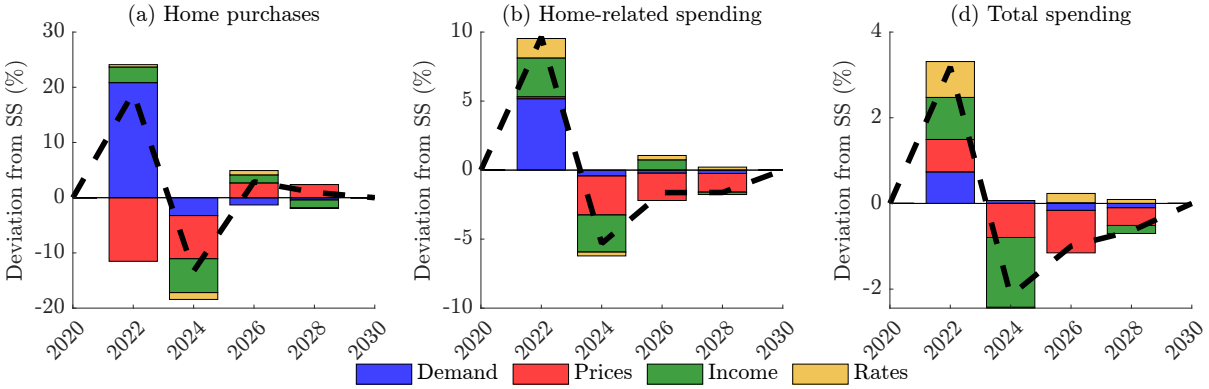
chase channel. Although unrelated spending is the same across models, the total spending response is 1 percentage point or around 25 percent larger in the baseline model. Thus, the home purchase channel results in both reallocation and amplification of spending during a housing boom.

Figure 10: IRFs During a Housing Market Boom



Notes: Data series are two-year averages of deviations from an annual Hamilton (2018) filtered trend. Panel (d) reports total non-housing spending.
Source: Authors" calculations using data from U.S. Census Bureau et al. (2024), U.S. Bureau of Economic Analysis (2024b), and U.S. Bureau of Labor Statistics (2024).

Figure 11: IRF Shock Decomposition During a Housing Market Boom



Notes: Effect of shocks to housing demand, house prices, incomes, interest rates, and LTV ratios may not sum to the total effect of the housing bust.

The shock decomposition exercise in figure 11 illustrates the effects of each of the shocks during the housing boom. As in the housing bust exercise, home purchase activity is primarily driven by housing preference shocks, with rising house prices partially dampening this effect. This result is consistent with Gamber et al. (2023), who attribute

Table 7: Contributions to Aggregate Non-Housing Spending

		Home-Related		
	Unrelated	Total	Durables	Main. & Reno.
Panel (a): Steady State Spending Shares				
Baseline model	0.86	0.14	0.06	0.08
Panel (b): Spending Contributions in Housing Bust				
Baseline model	0.54	0.46	0.16	0.30
	(0.23)	(0.77)	(0.46)	(0.32)
Alternative model	0.76	0.24	0.14	0.10
	(0.73)	(0.27)	(0.28)	(-0.01)
Panel (c): Spending Contributions in Housing Boom				
Baseline model	0.59	0.41	0.30	0.11
	(0.67)	(0.33)	(0.07)	(0.26)
Alternative model	0.77	0.23	0.30	-0.07
	(0.69)	(0.31)	(0.10)	(0.21)

Notes: Table reports contributions of spending deviations from steady state in each category to aggregate (non-housing) spending deviations. First values for each model are taken from the housing market trough or peak. Values in parentheses are averages computed along the IRFs path.

nearly half of the boom in housing demand to stay-at-home shocks during the pandemic. The housing preference shock also accounts for around half of the rise in home-related spending, with higher incomes and lower mortgage rates contributing the remainder. For total spending, the contributions are more evenly distributed: about one-fourth of the rise is due to housing demand, while the remainder is explained by higher incomes, lower interest rates, and rising house prices. Thus, our model and the mechanism therein can generate a large increase in aggregate expenditure over and above the one generated by standard macro-housing channels such as credit conditions and housing wealth effects.

5.4. Contributions to Aggregate Spending Dynamics

We conclude our analysis with an assessment of the contribution of the home purchase channel to aggregate spending dynamics over the housing cycle. In table 7, panel (a) shows steady state spending shares. The other two panels report the share of total spending deviations from steady state, ΔC, due to spending deviations in category x: $\frac{\Delta x}{\Delta C}$. The first row of each panel reports spending shares at either trough (panel (b)) or peak (panel (c)), while values in parentheses are the averages of spending growth shares taken along the entire IRFs.

Panel (a) reports that home-related spending comprises just 14 percent of total household expenditure in steady state. However, as shown in panel (b), during the post GFC housing bust, home-related spending accounts for 46 percent of the decline in total spend-

ing at the trough, and 77 percent on average over the entire period. At the trough this decline is mostly due to the fall in maintenance and renovation expenditures. To highlight the importance of these effects we also report the share implied by the alternative model, which excludes renovation costs, has only non-durable home-related goods, and features no home-related goods mismatch shocks. In this alternative model the contribution of home-related spending is reduced to 24 percent of total spending at the housing market trough, and just 27 percent on average. A similar pattern arises during the post Covid housing boom. Panel (c) shows that in the housing boom, home-related spending accounts for 41 percent of the rise in total spending at the peak, and 33 percent on average over the entire period. Again, the alternative model attributes much smaller shares to this category of expenditure: 23 and 31 percent at peak and on average, respectively.

These results highlight the central role of the home purchase channel in aggregate spending dynamics. While home-related spending is a modest share of total spending in steady state, it accounts for a disproportionately large share of spending during a housing boom or bust. By comparing baseline and alternative models, our results suggest that the home purchase channel of expenditure nearly doubles the contribution of home-related spending at peaks and troughs.

6. Conclusion

This paper studies the micro- and macroeconomic implications of the home purchase channel of expenditure. This is a mechanism through which housing transactions lead to additional spending on home renovations, home maintenance, and home-related durables. We show that the home purchase channel accounts for much of the co-movement between aggregate spending and the housing market.

At the micro-level, we estimate that households spend on average $7,000 more on home-related goods and services in the year around home purchases. We interpret this spending increase as related to the home purchase channel of expenditure, as spending in other good categories do not change following home purchases. This interpretation of the results is bolstered by several robustness tests that include close-control groups and placebo tests.

At the macro-level, we develop a heterogeneous household life-cycle model with housing and expenditure choices to study aggregate spending dynamics over the housing cycle. Model simulations of housing market shocks generate sizable fluctuations in home-related spending, which accounts for 40 to 75 percent of total spending variability during housing booms and busts. Additionally, we show that the home purchase channel significantly amplifies aggregate spending dynamics over the course of the housing cycle.

Overall, our results suggest that the home purchase channel of expenditure is an important driver of home-related and total expenditure at both the household and ag-

gregate level. This channel operates over and above the standard housing wealth and collateral channels previously explored in the literature. Because home renovations and other home-related expenditures often require financing, our analysis suggests that conditions in broad credit markets may amplify the effect of housing market shocks through the home purchase channel of expenditures. In addition, embedding the home purchase channel in a general equilibrium framework could shed further light on the broader macroeconomic consequences of housing market volatility.

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ONLINE APPENDIX

A. Empirical Analysis

Table A.1: Summary of PSID Home-Related and Home-Unrelated Expenditure Data

Expenditure category	Expenditure element
Home-related	Utility
	Home repair and maintenance
	Household furnishings and equipment
	Home improvements and addition
Home-unrelated	Food
	Telephone and Internet
	Transportation
	Education
	Child care
	Clothing and apparel
	Recreation and Entertainment
	Trips and vacations

Notes: This table reports classification of household spending data in PSID that are related or unrelated to a home purchase. These data have been collected consistently from the 2005 PSID data. Besides the expenditure data listed in the data, the PSID collects information on mortgage payments, rents, property tax, and home insurance expenditures. In addition, the PSID collects data on health care-related expenditures of the two years prior to the survey. However, these data are not used in the analysis of this paper.

Table A.2: Home-Related Expenditures after Home Purchases among Repeated Home Buyers

	(1) Home-related	(2) Renovation	(3) Repair	(4) Furnishing	(5) Utility	(6) Unrelated
Up-sizing	9855***	4680***	2480***	2548***	-46	-498
	(1433)	(917)	(691)	(261)	(60)	(545)
Down-sizing	8148***	4149***	2109**	2031***	-183***	-174
	(1648)	(793)	(844)	(590)	(65)	(739)
Pre-purchase mean ($)	11,793	2,693	3,414	1,771	3,923	35,960
N	29,957	30,776	29,957	29,957	29,957	29,957
R-squared	0.291	0.311	0.205	0.247	0.572	0.694

Notes: This table reports coefficients from regressions relating home-related expenditures to repeated home purchases. The dependent variables are various types of home-related expenditures (in 2021 dollars). Home purchase is an indicator function that takes the value of one if households reported purchasing a home between time $t-2$ and t and is zero otherwise. Each regression includes year and household fixed effects as well as household income, wealth, family size, marital status, race, employment status, and number of rooms. Up-sizing is equal to one if the home moved into had more rooms than the previous home and zero otherwise. Down-sizing is equal to one if the home moved into had fewer rooms than the previous home and zero otherwise. Homeowners that did not move are in the control group and homeowners that moved into houses with an equal number of rooms are excluded from the estimation. Column (1) is all home-related expenditures. Column 2 is the annualized expenditure on major home renovations and additions, column (3) is the expenditures on home repairs and maintenance, column (4) is the spending on furnishings, equipment, textiles, and appliances, and column (5) is the spending on utilities. In addition, column (6) is the home-unrelated expenditures. Standard errors are clustered at the household level. *, **, and *** indicate that the coefficient is statistically significant at the 95, 99, and 99.9 percent level, respectively.

B. Model

B.1. Computational Details

We solve the model on a discretized state space. The state variables are $\mathbf{s} = [j, a, h, d, y]$, where j is current age, a is liquid assets, h is the current stock of housing, d is the current stock of housing-related durables goods, and y is the idiosyncratic income state.

Minimum and maximum household ages are 24 and 80, respectively. Since model ages correspond to 2-year periods, there are $N_j = 29$ model ages.

We set the number of liquid asset grid points to $N_a = 60$. Asset grid points are divided evenly between negative values and positive values corresponding to mortgages and savings, respectively. The minimum and maximum size asset grid points are $[\underline{a}, \overline{a}] = [-\theta P_h \overline{h}, 5 \times \max_j(g_j) \max(y)]$. The minimum is set to the largest possible mortgage size, at the maximum LTV ratio for the largest house. The maximum is set to 5 times the largest income during working life, where g_j is the deterministic life-cycle component of income, y is the idiosyncratic component of income, and $\max(y)$ is the maximum realization of the discretized AR(1) process for y. We set the asset grid points according to polynomial distribution schemes within the negative and positive parts of the asset space. This results in grid points most densely clustered around zero in both the negative and positive parts of the space.

We set the number of housing grid points to $N_h = 6$. The first housing grid point is equal to 0, corresponding to renters with no prior housing. The minimum non-zero house size is given by $\underline{h}$ which is set via model calibration, as discussed in Section 4.2 of the paper. Housing grid points are distributed according to a constant log-spacing rule where Δ_h is the spacing size parameter, which is calibrated as discussed in Section 4.2. This means that the maximum housing grid point $\overline{h}$ is determined endogenously during calibration as it depends on both $\underline{h}$ and Δ_h.

We set the number of home-related durable goods grid points to $N_d = 40$. The minimum and maximum size durables grid points are $[\underline{d}, \overline{d}] = [0, 2 \times \max_j(g_j) \max(y)]$. The minimum is set to zero and the maximum is set to 2 times the largest income during working life. We set the durables grid points according to a polynomial distribution scheme, which results in grid points most densely clustered around zero.

We discretize the AR(1) idiosyncratic productivity process following the Rouwenhorst (1995) method. We set the number of grid points for approximation to $N_y = 7$. Thus, in total the state space contains $N_j \times N_a \times N_h \times N_d \times N_y = 3,046,218$ grid points.

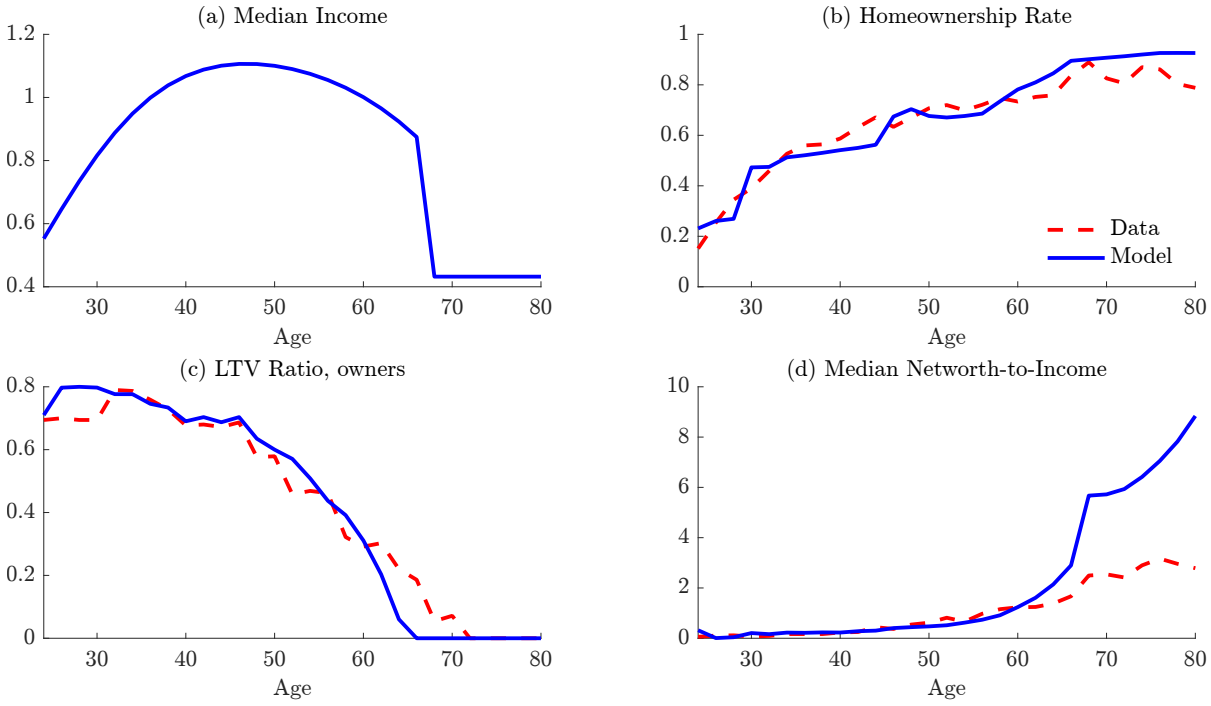
The household decision problems (4), (5), and (6) are solved by backwards iteration on the value function. Each problem includes 3 continuous choice variables: consumption, liquid assets, and durables goods. We address this computational difficulty by adapting the two-step solution method discussed in Druedahl (2021). For each of the household problems (4), (5), and (6) we first solve a version of the problem assuming that households

hold their durables stock d fixed. This produces conditional choices for consumption and liquid assets. We then solve a version of the problem taking the consumption and asset choice functions as given, optimizing the choice of durables d', while updating the initial the asset state a to account for the change in budget constraints implied by the change in durables stock.

B.2. Model Fit

Figure B.1 illustrates the life-cycle profiles of income, homeownership, LTV ratios, and networth-to-income. In each panel, we compare the model to SCF data from 2013. Household income follows a hump-shaped profile followed by a sharp decline during retirement. The homeownership rate rises over the life-cycle and plateaus in retirement at a little over 80 percent. The average LTV ratio is declining with age. Young home buyers borrow at or close to the maximum LTV ratio θ and then repay mortgage principle over the remainder of their working lives. Finally, networth-to-income closely tracks the data until retirement, at which point the sharp fall in model incomes dramatically raises the ratio networth ratio.

Figure B.1: Life-Cycle Profiles in Model and Data



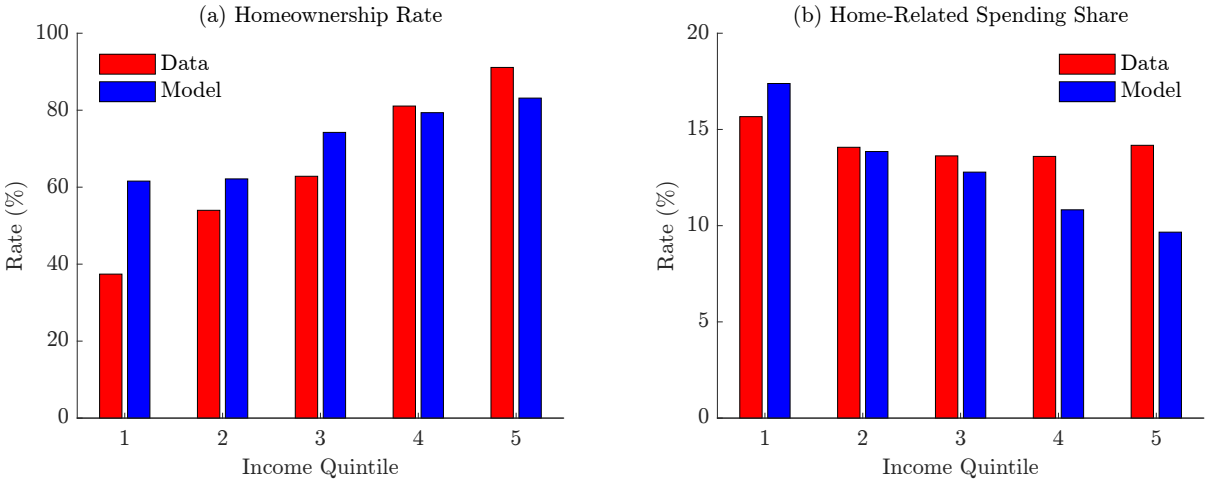
Source: Authors' calculation using the Survey of Consumer Finances.

Figure B.2 reports homeownership rates and home-related consumption expenditure shares across the household income distribution in both the model and data.[20] Panel

[20]See Board of Governors of the Federal Reserve System (2019) and Survey Research Center, Institute for Social Research, University of Michigan (2021).

(a) shows that the homeownership rate is generally rising with household income. The model overstates ownership among the lowest income households due to the presence of low-earning but high-ownership retirees. Panel (b) shows that while home-related spending is relatively flat across the income distribution in the data, it is declining with income in the model.

Figure B.2: Homeownership and Spending by Income in Model and Data



Source: Authors' calculation using the PSID and the Survey of Consumer Finances.

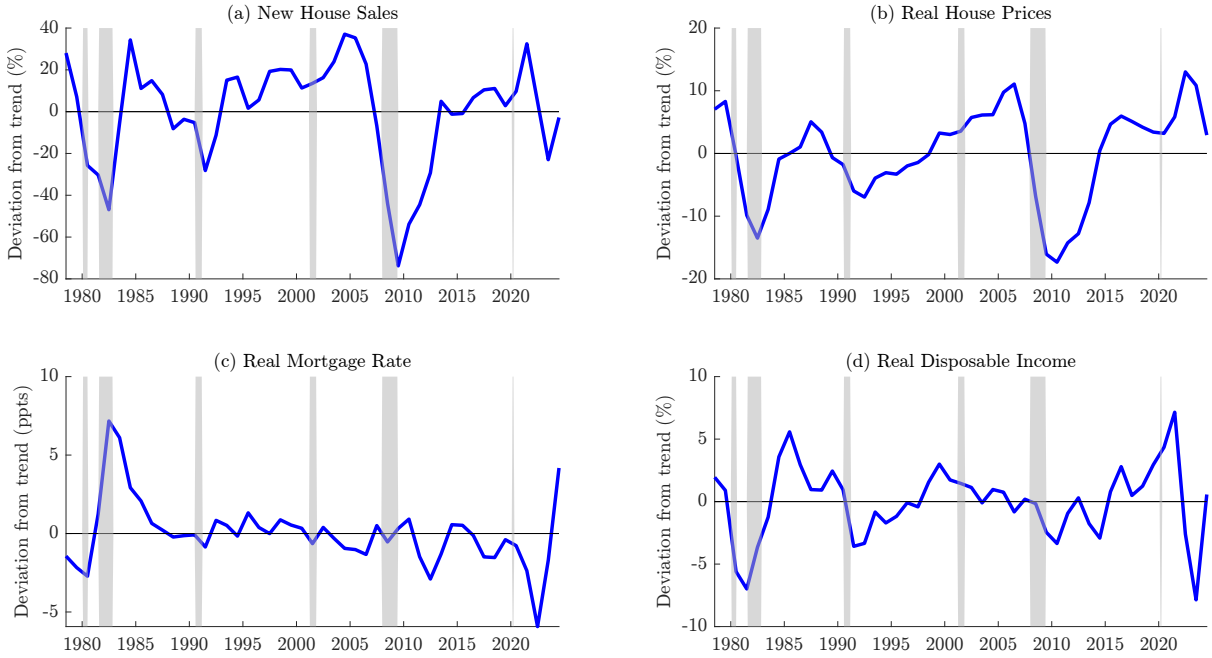
B.3. Data used in Housing Market Dynamics Experiments

In Section 5, we simulate the model in response to housing market shocks in order to study aggregate spending dynamics. We simulate the model in response to calibrated shocks to observable data on house sales, real house prices, real mortgage interest rates, and real household income. To do this, we take annual data from 1975 to 2024, estimate deviations from a Hamilton-filtered trend, and compute two-year averages of these cyclical deviations to be consistent with our two-year model period (Hamilton, 2018). We also compare model outputs to real home-related spending, real unrelated spending, and real total spending. We show the detrended data in figures B.3 and B.4 below. The specific data series we use are:

- New one family houses sold in the U.S. (U.S. Census Bureau et al., 2024)
- All-Transactions house price index for the U.S. (U.S. Federal Housing Finance Agency, 2024)
- 30-Year fixed rate mortgage average in the U.S. (Freddie Mac, 2024a)
- Disposable personal income per capita for the U.S. (U.S. Bureau of Economic Analysis, 2022b)

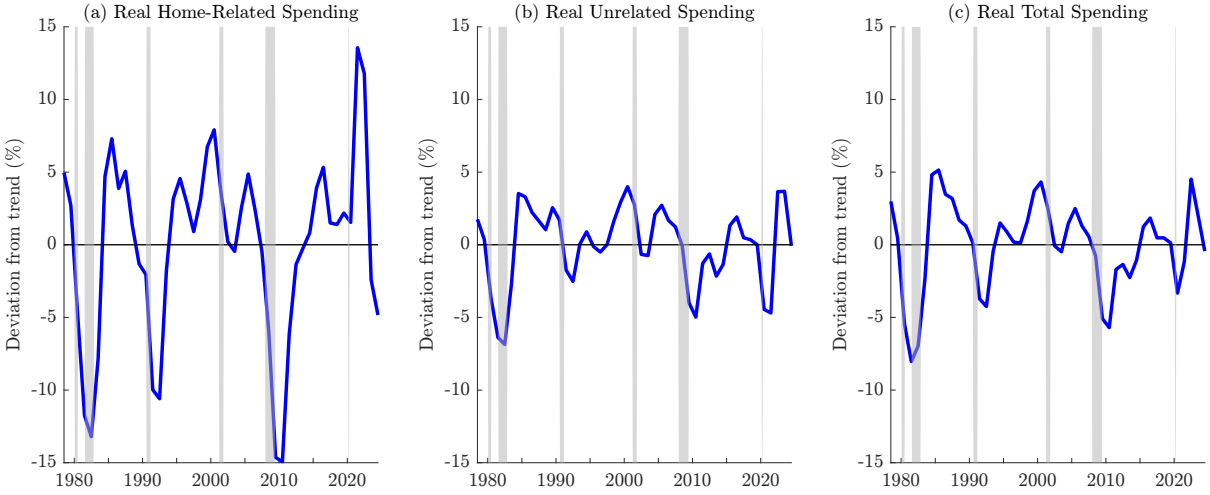
- Home-related spending is: furnishings, household equipment, and routine household maintenance (U.S. Bureau of Economic Analysis, 2024b)
- Unrelated spending is: nondurable goods plus services less housing and utilities (U.S. Bureau of Economic Analysis, 2024b)
- Total spending (U.S. Bureau of Economic Analysis, 2024b)
- Consumer Price Index for all urban consumers and all items in U.S., city average (U.S. Bureau of Labor Statistics, 2024)

Figure B.3: Cyclical Components of Data used to Calibrate Model Shocks



Source: Authors' calculations using the data from BEA, BLS, Census, FHFA, Freddie Mac.

Figure B.4: Cyclical Components of Spending Data



Source: Authors' calculations using the data from BEA, BLS.