Of House and Home-Related Goods: Consumption Spending via the Home Purchase Channel

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Abstract

Home purchases are often associated with home-related spending in categories such as renovations, repairs, furniture, and appliances. We argue that this home purchase-expenditure channel helps to explain the co-movement between housing market and aggregate consumption dynamics. First, using household-level panel data we estimate substantial and persistent increases in home-related expenditures after home purchase. We then build a quantitative heterogeneous agent model with home renovations and mismatch shocks between housing and home-related durables. In simulated housing market expansions and contractions, our home purchase-expenditure channel amplifies aggregate spending dynamics and explains up to 45% of total consumption fluctuations through housing market cycles.

Keywords: Housing, Home purchase, Household spending, Consumption

JEL: D12, E21, E32, E51

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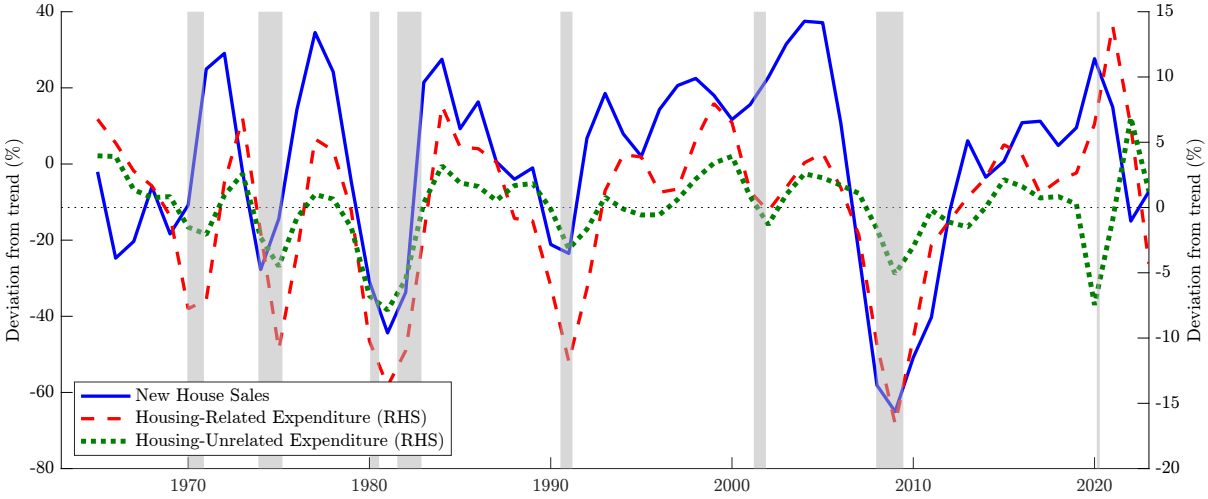
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1. Introduction

The housing market is a key driver of aggregate fluctuations, as spillovers to the broader economy during recent housing market booms and busts have demonstrated. Much of the theoretical and empirical literature links housing market developments to the real economy through consumption spending responses to house prices via wealth and collateral channels (Favilukis et al., 2017b; Justiniano et al., 2019; Kaplan et al., 2020b; Mian et al., 2013; Aladangady, 2017; Graham et al., 2023).

While theoretically and quantitatively important, these channels assume that housing market developments have uniform effects on all types of consumer 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, non-home-related expenditures. These correlations suggest that co-movement between the housing market and aggregate expenditure may be more directly related to home purchase activity. Our goal in this paper is to assess the micro- and macroeconomic implications of this mechanism, which we refer to as the *home purchase-expenditure channel*.

Figure 1: Home Sales and Consumption Expenditures



Notes: All series reported are log-deviations from trends, estimated using Hamilton (2018) filter. NBER recession dates shaded in grey. The correlation between new house sales and housing related expenditure is 0.69, while the correlation with housing unrelated expenditure is 0.28.

Source: Authors' calculations using data from the National Association of Realtors and Bureau of Economic Analysis.

Several categories of household expenditures are closely related to the activities associated with home purchase and sale. For example, a household's current stock of furniture, fixtures, and fittings may not fit in or suit a new residence. After buying a new home, movers are likely to carry out home improvements and purchase furniture and appliances customized to their new dwelling. Further, home sellers may need to conduct maintenance and repairs on their existing home or when selling or purchasing a property. Consistent with these spending patterns, recent empirical studies find that household-level expenditures rise significantly around home transac-

tions (Best et al., 2018; Benmelech et al., 2023). However, the broader spending implications of this home purchase-expenditure channel are understudied. Home-related spending comprises a substantial share of total household expenditure. For example, expenditures on furnishings and durable household equipment—an important component of home-related spending, account for about 8 percent of all consumer goods expenditure and over 22 percent of durable goods expenditure in recent years.[1] Therefore, large movements of home-related spending could have significant spillovers to the broader economy. In the aggregate, a wave of home purchases has the potential to generate sizable increases in home-related expenditures and total consumption.

Our analysis proceeds in two steps. First, we use household-level panel data to study consumer spending around the date 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. Second, we build a heterogeneous agent life-cycle model featuring complementarities between home purchases and home-related spending and simulate a series of housing market boom and bust episodes to investigate the aggregate implications of the home purchase-expenditure channel. Our results suggest that this channel is an important driver of aggregate consumption dynamics over the course of a housing market cycle, distinct from the well-known wealth and collateral channels.

Our first contribution is to present household-level evidence on the relationship between home purchases and home-related expenditures. Our empirical analysis uses the Panel Study of Income Dynamics (PSID) from 2005 to 2021. The PSID reports home-related expenditures (utilities, home repairs, furnishing and equipment, etc.), unrelated expenditures (food, clothing, recreation, etc.), as well as housing tenure and the timing of a home purchase. The latter information enables us to identify renters, first-time home buyers, and repeated home buyers.

Exploiting the panel structure of the data, we use two-way fixed effects regressions to estimate household expenditure responses to home purchase activity for all, first-time, and repeated home buyers. Our regression analysis is akin to an event-study that compares spending pre- and post-home purchase date for households that buy a new home and comparable households that do not. In addition to household and time fixed effects, we also control for observable determinants of both home purchase and spending decisions such as age, family size, income, non-housing financial wealth, and the number of rooms in an existing residence.

Across all home buyers, we find that home-related expenditures increase by around $7,000 after a home purchase, which is an 80 percent increase over pre-home purchase spending in these consumption categories, and represents around 10 percent of median annual total expenditure in the PSID. These results are similar in magnitude to Benmelech et al., 2023, who use both PSID and Consumer Expenditure Survey data from 2001 to 2013. We extend their results by estimating spending responses for first-time and repeat home buyers. Home-related expenditure jumps by $6,000 and $8,000 representing 130 and 70 percent increases over pre-purchase spending for first-time and repeat buyers, respectively. While Benmelech et al. (2023) find that spending responses are transitory, we show that this is only the case for repeat buyers. In contrast, first-time buyers exhibit persistently higher spending up to 4 years after home purchase.

[1] See the National Income and Product Accounts published by the Bureau of Economic Analysis.

We then present several empirical exercises to support a causal interpretation of our results. First, following Benmelech et al., 2023, we study the response of expenditures unrelated to home purchases, such as clothing, food, and other discretionary nondurable goods. If unobservable changes in current or future expected income were driving both home purchase and expenditure decisions then we would expect spending to increase in categories across the board, not just for home-related goods and services. We estimate small and insignificant unrelated spending responses to home purchase for all, first-time, and repeat home buyers.

Second, we estimate spending responses using two carefully selected close control groups. In the first exercise we restrict the analysis to renters who report planning to purchase a home in the near future. We then estimate the spending responses of first-time home buyers within this sample compared to renters who intended to but did not buy. In the second exercise we focus on existing homeowners who plan to purchase a new home, and estimate the spending responses of repeated buyers within this sample compared to homeowners who intended to but did not buy. This approach presents plausible counterfactual spending patterns among households that are similar in their stated intent to purchase a home, but differ by their realized home purchase decisions. In each case, we continue to estimate sizable increases in home-related expenditures with no changes in unrelated spending after home purchases.

Third, we estimate spending responses for two placebo events. We first compare expenditures across renters that moved residence but did not buy a home and renters that did not move at all. We find that moving renters increase home-related expenditure by a statistically significant but economically unimportant $180. This evidence strengthens the interpretation of our baseline results that the increase in home related expenditures is not due to moving residence but rather to home purchase decisions. We then estimate spending responses to vehicle purchase events. It is possible that there is no specific home purchase-expenditure channel and instead changes in unobserved income are associated with home-related spending and nondurable purchases of any kind. Instead, we find that vehicle purchases are associated with a significant increase in unrelated expenditures but no change in home-related spending, reinforcing the interpretation that the rise of home-related expenditures are specific to home purchase activity.

Our second contribution is a quantitative model that is consistent with our household-level empirical evidence and the stylized macroeconomic facts on the home purchase-expenditure channel shown in in Figure 1. We extend a standard heterogeneous agent life-cycle model with housing (Favilukis et al., 2017a; Kaplan et al., 2020a; Garriga et al., 2020) to capture detailed consumption expenditure decisions. Our main innovation is to introduce a distinction between home-related and unrelated goods. Home-related goods include housing maintenance and renovations, as well as spending on new housing-related durables such as furniture and appliances. Additional spending on home-related goods may be triggered by home purchase activity due to home-and-durables mismatch shocks and the costs of renovating an existing home prior to sale. Mismatch shocks represent an unexpected depreciation of existing durables, such as furniture, when they do not fit or are not suitable for the new home. We assume that home renovations prior to sale proxy for neglected repairs and attempts to increase the

probability of selling.

Our 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 repeat home buyers, respectively. As in the data, households do not substantially increase their unrelated spending after buying a home. In addition, there is some persistence in home-related spending among first-time buyers but no persistence in spending among repeat buyers.

We then use the model to simulate a series of partial equilibrium housing market boom and bust episodes to investigate the macroeconomic importance of the home purchase-expenditure channel. First, we present impulse response functions (IRFs) that illustrate the aggregate effects of an isolated negative housing demand shock. We calibrate the demand shock to generate a cyclical decline in home purchases of 60 percent, as observed between 2007 and 2009 during the housing bust. The model produces a 15 percent decline in home-related spending, nearly identical to the decline observed in the data. With unrelated spending little changed, total household spending in the model falls by 1.5 percent, which is one-third of the decline observed in the data. In a modified setting with no home purchase-expenditure channel, the decline in home-related spending is only half as large as in the baseline model and total spending falls by two-thirds of the decline in the baseline model.

Next, we simulate IRFs for a general housing market bust. We calibrate macroeconomic shocks to represent features of the mid-2000s housing bust, similar to exercises in the recent literature (Favilukis et al., 2017a; Kaplan et al., 2020a; Garriga et al., 2020). The model is hit with sequences of shocks between 2007 and 2013 including a decline in income, changes in mortgage interest rates, tightening maximum loan-to-value (LTV) ratios, falling house prices, and negative housing demand shocks that generate the observed path of home purchases conditional on other shocks. As in the data home-related expenditure falls by nearly 15 percent below trend in 2009, and remains persistently low until 2015. Unrelated spending temporarily falls by 2 percent in 2009, which is around half of the decline observed in the data. Total spending falls and remains persistently below trend, with the model generating around 75 percent of the decline observed in the data. In a decomposition exercise, we show that the housing demand shocks responsible for the dramatic decline in home purchase activity explain virtually all of the decline in home-related spending and around one-fourth of the decline in total spending. This is in contrast to the housing wealth and collateral channels that explain very little of home-related spending and only a moderate portion of total spending.

Finally, we simulate IRFs for a general housing market boom. We calibrate macroeconomic shocks to represent the COVID-19 pandemic housing boom, similar to the exercise in Gamber et al. (2023). The model is hit with sequences of shocks between 2020 and 2024 including the observed path of income, the initial decline in mortgage interest rates, the rise in house prices, and positive housing demand shocks that generates the observed path of home purchases conditional on other shocks. Home-related spending rises by 10 percent between 2020 and 2022, similar to the cyclical increase observed in the data. Unrelated spending rises in 2022, in

contrast to the decline observed in the data due to the disruptions caused by lockdowns and stay-at-home activity (Gamber et al., 2023). However, the model generates a 3 percent increase in total expenditure in 2022, which is around one-third larger than the increase observed in the data. We show that our home purchase-expenditure channel accounts for most of the increase in home-related spending and substantially boosts total spending over this period. In a decomposition exercise, we again show that housing demand jointly drive the bulk of home purchase activity and home-related spending and account for around one-fourth of the rise in total spending. Again, housing wealth and collateral channels account for very little of the joint movement in home purchase and spending behavior.

Related Literature

Our paper follows a long 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., 2017b; Garriga et al., 2020; Justiniano et al., 2019; Kovacs et al., 2019; Kaplan et al., 2020b; Guren et al., 2021; Graham et al., 2023).

Our empirical work is most closely related to Benmelech et al. (2023), who also use household-level U.S. panel data to estimate home-related spending responses to home purchase activity. Our work extends and augments their analysis in several ways. First, we show that the average spending responses across all home buyers masks heterogeneity in spending responses 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 refine the causal interpretation the home purchase-expenditure channel by drawing on close control groups and placebo event studies.

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 their paper is the effect of transaction taxes on home purchase activity, Best et al. (2018) show that policies directed at the housing market can have large stimulus effects through home-related consumer spending patterns. This is consistent with the results of our quantitative model illustrating the strong aggregate co-movement between house purchases, home-related spending, and total household spending.

Our paper provides new insights to the study of aggregate consumption dynamics in quantitative heterogeneous agent models. This literature typically studies the relationship between the housing market and household expenditures through standard wealth or housing collateral channels (Berger et al., 2018; Kaplan et al., 2020b; Garriga et al., 2020; Jones et al., 2022). In contrast, our paper emphasizes a direct link between home purchase activity and home-related spending. We propose housing-expenditure complementarities due to mismatch between existing home-related durables and new homes as well as required renovations on existing homes at the time of sale. In our aggregate dynamic model experiments, we show that these home purchase-expenditure channels account for substantial fluctuations in aggregate consumption expenditure across the housing cycle and independent of the standard wealth and collateral channels. We also find that housing demand or preference shocks account for much of the co-movement between home purchase activity and household expenditure. This is consistent with

the findings of Kaplan et al. (2020b) regarding the mid-2000s housing boom and bust, and with Gamber et al. (2023) regarding the sources of the COVID-19 pandemic era housing boom.

2. Data

The main data source in our analysis is the Panel Study of Income Dynamics (PSID), which is the longest running longitudinal survey of U.S. households.[2] Our analysis uses all eight waves of the PSID data for which comprehensive expenditure data are available. Our sample period, from 2005 to 2021, encompasses four boom-bust cycles in the U.S. housing market.[3]

The PSID Expenditure Data

The PSID survey covers a wide range of expenditure data for a representative sample of U.S. households over time. Food and housing expenditure have been reported since the survey's inception; transportation, utility, health care, and education expenditure data were added in 1999; beginning in 2005, the PSID started collecting data on furniture and appliance, home repair and maintenance, clothing, trips and vacations, and entertainment expenditures. As a result, the PSID currently covers almost all spending categories in the Consumer Expenditure Survey (CE), which is collected by the Bureau of Labor Statistics (BLS) and is regarded as the most comprehensive survey for household expenditures. Andreski et al. (2014), documents that average statistics derived from the PSID household spending data compare well with those derived from the CE data, with the PSID mean of total household expenditure being consistently within a 5 percent range from the CE estimate through the years. In addition, Andreski et al. (2014) documents that the lifecycle spending profiles estimated using the PSID and CE data are very similar.[4]

Home Ownership and Home Purchases

We use the information in the PSID on home ownership and moving history to infer the timing of home purchases. To identify home buyers, we keep track of households that either reported becoming homeowners in the current survey but were renters in the previous survey, or reported being homeowners but moved residency between two consecutive surveys. We then classify as first-time buyers those who transition from renters to owners, and as repeated buyers homeowners that reported moving.

The appendix table 1 summarizes the PSID spending data that we use in our analysis and that we categorize as home-related and home-unrelated expenditures. We classify utility, home repair and maintenance, furnishings and equipment expenditures as home-related expenditures. By contrast, other spending, such as food, clothing and apparel, and education are not expected to changed significantly after purchasing a home and are thus labeled home-unrelated

[2]Launched in 1968, the PSID data were collected annually through 1997 and biennially afterwards.

[3]According to the National Association of Realtors, the four cycles are: 2005-2007, 2008-2012, 2012-2017, 2017-2022.

[4]While the PSID expenditure data compare favorably with those in the CE, some studies (see, among others, Battistin, 2003; Passero et al., 2014) have shown that the CE survey tends to underestimate aggregated expenditures as measured in the National Income and Product Accounts.

Table 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.

expenditures. Also, mortgage payments, rents, property tax, and homeowner insurance are contractually related to homeownership, and we do not categorize these expenditures as home-related.[5]

For home-related expenditures, the average spending in the PSID is very similar to their counterparts reported in the CE. The PSID appears to underestimate furnishing and equipment spending and to overestimate home repair and improvement spending.[6] On net, however, total spending across these two categories of expenditures are similar between the two surveys.[7]

Summary Statistics

Table 2 presents some summary statistics of demographics, income, and expenditure variables in the PSID data, over the 2005-2021 period, with income and expenditure expressed in

[5]We exclude the health care spending from our analysis because it refers to out-of-pocket expenditures instead of total health care expenditure. The out-of-pocket expenditure depends, in part, on insurance coverage, the information on which is not consistently available in the PSID data.

[6]Because the PSID collects data at a more aggregated level than the CE, it is possible that households report spending on furnishings and equipment in PSID as repair and maintenance.

[7]One feature of the PSID spending data is that the information of different spending categories is collected for different reference periods. For example, furnishings and equipment expenditure and home repair and maintenance expenditure refer to the year before the survey; utility expenditure refer to the survey year, and home renovation and addition expenditure refer to the two years before the survey, which we divide by two to annualize.

Table 2: 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 means and standard deviations (in parenthesis) of household-level data using bi-annual PSID data from 2005 to 2021. First-time buyers are households who were renting in year $t-2$ and owning in year t. Repeated buyers are households who were owning in both $t-2$ and t and had moved between the two years. Total expenditure does not include health-related out-of-pocket expenditures because they have a different reference period in the PSID data. Home-related expenditures include utility, repairment and maintenance, furniture and appliance, and home renovation and addition.

2021 (CPI) dollars. As shown in Panel A, home buyers have, on average, higher education and a larger family size than non-buyers. There are near 5,000 home buyers in our sample, representing over 10 percent of the total numbers of observations (household $\times$ year). Among home buyers, first-time and repeated buyer observations are roughly equally split.

Panel B compares income and expenditure levels for home buyers and nonbuyers. On average, home buyers have higher income and higher expenditures than nonbuyers. In particular, expenditures on home-related goods as a share of total household expenditure for first-time-and-repeated-buyers (22 and 29 percent, respectively) are significantly higher than those of nonbuyers (17 percent). In particular, expenditures on repairs and maintenance, and on furniture and appliances for homebuyers are significantly larger than those of nonbuyers.

3. Empirical Analysis

3.1. Baseline Specifications

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

$$C_{i,t}^{j} = \beta_0 + \beta_1 I_{H_{i,t}} + \beta_2 \Omega_{i,t} + \eta_t + a_i + \epsilon_{i,t} \tag{1}$$

where the dependent variable $C_{i,t}^{j}$ is the real dollar consumption spending of category j by household i in year t, $I_{H_{i,t}}$ is an indicator variable that is equal to one if household i purchased a home between year $t-2$ and t and is zero otherwise, and $\Omega_{i,t}$ denotes a vector of household characteristics to control for the effects of socioeconomic and demographic determinants of personal consumption—it includes age, race, education, marital status, working status of household heads, family size, as well as total family income and household wealth (in \$2021) and the number of rooms of the home residence.

The regression model also includes year and households fixed effects, η_t and a_i, respectively. Year fixed effects account for time-varying factors that are common across all households and that may influence individual housing and spending decisions, such as aggregate house prices, interest rates, and overall economic conditions; households fixed effects control for unobservable household characteristics that are invariant over time and that may be driving expenditure decisions. Standard errors are clustered at the household level to account for time-varying correlation in the error term $\epsilon_{i,t}$, which may reflect other sources of consumption expenditure heterogeneity.

With time and household fixed effects, our regression model is akin to an event-study analysis. The coefficient of interest is β_1, which measures the sensitivity of individual household consumption before and after home purchase relative to a control group of households that do not purchase a home. Home purchases, of course, cannot be assumed to be random events. Therefore, the identification of β_1 rests on the comparison of the consumption responses across several control groups and placebo samples.

First, we compare consumption expenditures across two broad categories of goods and services: home-related and unrelated expenditures. If it is the purchase of a home that boosts spending on home-related goods and services, then only this category of expenditures should increase. If a home purchase is instead driven by unobservable shocks that are omitted from the econometric model, broad expenditures should respond to some extent. Second, we compare estimates of β_1 for home-related and unrelated goods across households that are ex-ante similar in their intentions to move but ex-post different in their home purchase decisions. This comparison mitigate concerns that factors that drive individual decisions to purchase a home also drive households' desire to boost home-related expenditures. Third, to ascertain that it is home purchase rather than home relocation that triggers a differential response across spending categories, we compare consumption expenditures of renters that move to a new residence but did not purchase a home relative to renters that did not move. Finally, we compare the elasticity of consumption of home-related goods and services in response to vehicle purchases, which may

be driven by the same factors influencing home purchases but should not be associated with an increase in home-related expenditures.

3.2. Baseline Results

Table 3 presents estimates of β_1. Panel A compares the consumption response across various categories of goods and services for home buyers (both first-time and repeated buyers) against other households. The point estimate in column 1 indicates that there is a statistically significant increase in home-related expenses after home purchases: households that purchase a home experience an increase in home-related expenditures that is \$6,700 higher than those of households that do not purchase a home. This estimate is economically large, corresponding to an increase of near 80 percent of the average expenditures of home-related expenses pre-home purchase.

Columns 2 through 5 break down the total expenditure of home-related goods and services across four main categories. The spending boost after a home purchase is large for renovation, repairs, and furnishing expenditure, and modest for utilities.

While the estimates in columns 1 through 5 suggest a direct effect of home-purchase on consumption expenditures, it is possible that other factors, omitted from the baseline regression, could influence both housing and expenditure decisions. To corroborate the casual interpretation of our results, column 6 reports the response of consumer spending not directly related to home purchases, such as food, clothing, entertainment, etc. If changes in the consumption of home-related goods reflected other factors than the home-purchase channel, then expenditures in a broad-set of goods and services, and not just those related to a home, should increase. As shown, the point estimate of β_1 in column 6 is indeed small and statistically indistinguishable from zero, suggesting that a home purchase is not associated with a boost in the consumption of goods that are not home-related.

Panel B of Table 3 report estimates of β_1 when comparing first-time buyers to renters who did not buy a home, while panel C compares homeowners that buy and move into a new home with those that stay in their current residence. This comparison across groups of households is useful, as the demand for home-related expenditures, such as white goods, can be driven by factors that are common across households, regardless of whether they purchase a new home for the first time or not.

As shown in column 1 of Panel B, we estimate an increase of about \$6,000 in home-related expenditures for first-time-buyers relative to renters. This is a larger increase (relative to the pre-purchase average) than the one estimated in Panel A. The larger response reflects a lower level of home related expenses of renters before purchasing a home relative to existing homeowners. This response is consistent with potentially large search and matching frictions in the housing market, leading new homeowners to boost demand for home improvements and other home-related services to customize their new homes to their liking. [8] As in Panel A, we estimate that most of the increase in home-related goods for first-time buyers is due to renovation, repair

[8] Consistent with this interpretation, Appendix Table A.1 shows that home related expenditures increase by roughly an equal amount whether existing homeowners move to a relatively bigger or smaller home.

Table 3: 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 home-related expenditures to home purchase. 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. 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 income, wealth, family size, marital status, race, employment status, and number of rooms. Column (1) is all home-related expenditures of columns (2-5). 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.

and furniture expenses. In column 6, we also estimate a non-significant response of goods and services that are not complementary to the purchase of a new home, strengthening further the causal interpretation of the home-purchase channel to home-related expenditures.

Panel C, repeats the analysis by comparing the expenditure response of homeowners that purchase a new home (repeated buyers) and homeowners that do not. The coefficient estimates across categories of good expenditures indicate 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.

Although the results reported in the three panels of Table 3 rely on different treated and control groups and therefore are not directly comparable, the sign and magnitude of β_1 across specifications point to an economically large consumption response of housing-related goods for first-time and repeated buyers after home purchases. These estimates are by and large consistent with those of Benmelech et al., 2023, who use data through 2013 and do not distinguish between repeated and first-time home buyers.[9]

In the next two subsections we first present evidence strengthening further the casual interpretation of the home purchase-expenditure channel and then study the dynamic responses of consumption expenditures over time to gauge the persistence of this channel and its potential effects for aggregate consumption.

3.3. Extension: Close Control Groups and Placebo Tests

The differential responses in spending patterns across categories of goods and groups of households documented so far suggests a direct effect of the home-purchase channel on consumption expenditures. However, because home ownership is not randomly assigned, it is possible that other factors could influence both housing and expenditure decisions. For example, higher expected income, which is not observed in the PSID data, may lead households to buy a new home and also increase spending broadly, including home-related goods. If this were the case, the boost in home-related expenditures cannot be solely and causally linked to home purchases. [10]

To strengthen the casual interpretation of our results, in this section we look at the differential response of goods categories for home buyers in two "close control" groups and two "placebo" samples. First, we compare the consumption expenditures response among households that purchased a new home with those that intended to purchase one but did not. Second, we estimate the responses when renters move but do not purchase a home and after a vehicle purchase—a big-ticket item that, like housing, requires a significant financial commitment and may therefore affect the consumption of durable and nondurable goods.

The "close control" groups exercise creates a reasonable counterfactual for the consumption expenditures of households that purchase a home. We focus on renters or homeowners that reported their intention to move and later purchased a new home (the treated group), and

[9]Estimating our model on a sample that mimics the one used by Benmelech et al., 2023 yields very similar results.

[10]Some evidence that family income, among other observables, is not a fundamental driver of home purchases and home related expenditure decisions is in Table A.2, where we correlate the decision to purchase a home with future household income. The table shows that the anticipation of higher future salary does not appear to drive the home-consumption expenditure channel. In the three years subsequent to a home purchase, household income is not economically and statistically associated with earlier home purchase decisions.

Table 4: Home-Related Expenditures with Close Control Groups

	First-time Buyers (Realized vs. Intended)		Repeated Buyers (Realized vs. Intended)	
	(1)	(2)	(3)	(4)
	Related	Unrelated	Related	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 function that takes the value of one if households reported purchasing a home between time t and $t-2$ and is zero otherwise. The dependent variables are the values of home-related expenditures (odd-numbered columns) or home-unrelated expenditures (even-numbered columns). Each specification includes year and household fixed effects as well as household income, family size, marital status, employment status, and number of rooms. 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.

compare them with renters or existing homeowners that intended to move but ultimately did not buy a new home (the control group).[11] The comparison of the treated group with households that intended to move but did not purchase a home helps alleviate the concern that home ownership is not randomly assigned in our setting or that the treatment group is selected relative to the control group, for example because households decide to move as they expect higher future income.

Table 4 presents the results from estimating our benchmark specification on two non-overlapping samples of households. The first sample, used for the estimates in column 1 and 2, assigns renters that declared their intention to move and that purchased a home in the treated group, and renters that did not purchase a home but reported their intention to move in the control group. In columns 3 and 4, the sample consists of existing homeowners that intended to move and compares those that purchased a new home (treatment group) with those that did not (control group).

Consistent with our earlier 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 expenses than households in the relevant control group—those who in-

[11] In the PSID data, the intent to move is not equivalent to the intent to purchase a home. However, the two concepts are closely related, especially among households who already own a home.

Table 5: 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. For this placebo sample, Move is an indicator functions that takes the value of one if households reported having moved between time t and $t-2$ and is zero otherwise. Columns (3)–(4) compare the response of households that purchased a new vehicle with those that did not. For this placebo analysis, Vehicle Purchase is an indicator function that takes the value of one if households reported purchasing a home between time t and $t-2$ and is zero otherwise. The dependent variables are the values of home-related expenditures (odd-numbered columns) or home-unrelated expenditures (even-numbered columns). Note that in column (4), home-unrelated expenditures do not include transportation spending. Each specification includes year and household fixed effects as well as household income, family size, marital status, employment status, and number of rooms. 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.

tended to but did not buy and move. Columns 2 and 4 report estimates of the response of goods that are not complementary to a home. In line with the baseline results in Table 3, 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 all numerically small and statistically insignificant.

We further refine the causal interpretation of our baseline results by estimating the response of home-related and unrelated expenditures on two placebo samples. In the first one, we replace the home-purchase dummy $I_{H_{i,t}}$ in equation (1) with an indicator variable that is equal to one if renters move to a new residence but do not purchase a home and is zero if renters do not move. In a second placebo sample, we replace the home-purchase dummy $I_{H_{i,t}}$ with an indicator variable that is equal to one if households (regardless of their home ownership status) have purchased a new car, and is zero otherwise.

The first placebo sample is helpful to ascertain whether purchasing a home rather than just moving to a new home generates a boost in home-related expenditures. While home purchases

may require renovation and remodeling expenses to customize a dwelling to the buyer's needs, renters may also need to buy white goods that fit the new home. Accordingly, moving to a new home may be associated with a positive albeit smaller increase in home-related expenditures relative to home purchases. As shown in column 1 of Table 5 , the boost of home-related expenditures for renters that move residence is indeed positive and statistically significant. However, the size of the estimated coefficient is very small, roughly [3 percent] of the one reported in Panel B of Table 3 for first-time buyers. The magnitude of this response, together with the statistically insignificant response of goods that are not home-related, reported in column 2, reinforces further the casual interpretation of the home-purchase channel for consumer spending.

The assumption underlying the construction of our second placebo sample is that the purchase of a new vehicle may be driven by factors—aggregate or idiosyncratic—that are similar to the decision to purchase a home. Under this assumption, estimates of β_1 for the vehicle purchase dummy should follow the same pattern reported in Table 3. The estimates shown in columns 3 and 4 of Table 5 suggest, however, that this is not the case. Home-related expenditures do not change in response to vehicle purchases. In contrast, expenditures of goods and services unrelated to a home increase significantly in association to the purchase of a car. This differential response across goods categories—the exact opposite of the one documented in Table 3—offer additional evidence in support of the view that purchasing a home generates an expenditure complementarity that stimulates household spending on goods and services that are home related. Potentially, this complementarity has important consequences for the aggregate economy—a topic that is explored in Section 4.

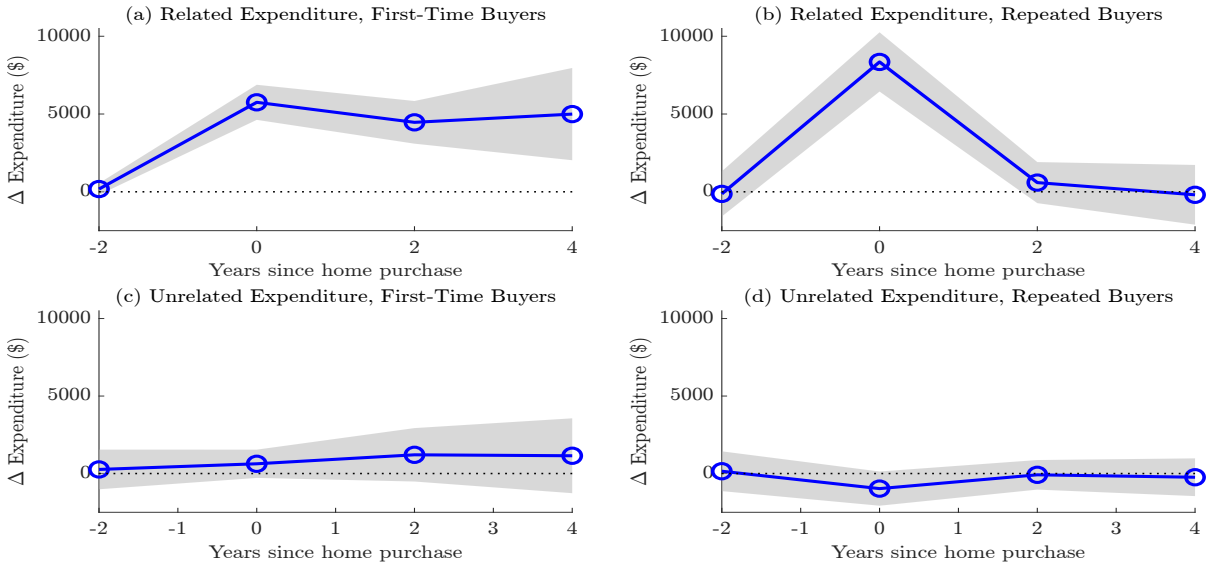
3.4. Dynamic Responses

How persistent is the boost of home-related expenditures following a home purchase? And do home buyers reduce overall consumption expenditures ahead of home purchases in anticipation of higher home-related expenses associated to the decision to move home? To shed light on these two questions, we take advantage of the panel structure of the PSID data and estimate expenditure dynamics beyond the years immediately before and after the home purchase. Specifically, for households that purchase a home between $t-2$ and t, we extend the baseline regression model to estimate consumption expenditure collected in the PSID data two years before, $t-4$, and two and four years after the home purchase ($t+2$ and $t+4$, respectively) relative to the corresponding control group of households. This extension allows us to evaluate whether the spending boost associated with moving to a new home lasts beyond the first year following the home purchase, and whether it is preceded by a reduction in consumer spending in the years leading to the purchase.

Figure 2 summarizes the results. For each group of home buyers (first-time and repeated buyers) the figure plots the estimated coefficients (together with the 95 percent confidence bands) of the consumption response of home-related and unrelated expenditures when the timing of the home purchase is normalized at $t=0$.

Two important findings stand out. First, the home-purchase channel of consumption ex-

Figure 2: Dynamic Spending Responses to Home Purchase Decisions



Notes:

Source: Authors' calculations using data from the Panel Study of Income Dynamics.

penditures appears to be persistent for first-time buyers. In Panel A, the spending boost of home-related consumption extends well beyond the year immediately following the home purchase, and tapers off only after six years. Home related expenditures for these buyers increase, relative to comparable renters, by about $6,000 each year over the four-year horizon, which is equivalent to over a 100 percent increase of the pre-purchase mean. In contrast, the consumption response of housing related expenditures for repeated buyers (Panel B) is much less persistent—it increases by about $8,300 (or 70 percent of the pre-purchase mean) in the two years after purchasing a home, but it returns to the same level of non-buyers thereafter. For both groups of home buyers, the response of goods and services that are not home-related (Panel C and D) remains unchanged at any horizon. For this category of goods, the expenditure response is not statistically different from zero at conventional significance levels before and after a home purchase.

The second important finding in Figure 2 is that neither home-related nor home-unrelated spending decline in the years prior to the home purchase, suggesting that the post-purchase spending boost was not offset by anticipatory spending cut ahead of a future home purchase. In other words, the boost of home-related expenses after a home purchase does not seem to reflect pent-up demand; instead it points to a direct and sizable effect of home transactions on home-related expenditures, as most of these goods and services complement the purchase of a new home.

There are a number of reasons why a home purchase may be followed by a persistent increase in the demand of home-related goods and services. While households may prefer to buy most of their durable goods at once when they move to a new home to save on transactions costs, most of these goods depreciate over time and imply a multi-year commitment to pay for maintenance and replacement costs. In addition, new homeowners may decide to postpone remodeling projects

and home improvements expenses for a few years after a home purchase, especially if their balance sheets are stretched. Thus, while housing transactions can have a direct and immediate effect on home-related purchases, this effect can also persist over time when homeowners opt to delay customizing their new homes.

Building on the evidence presented so far, the next section introduces a macroeconomic model to study the aggregate implications of the home purchase channel for the distribution of consumption expenditures in response to shocks that stimulate the demand for housing, and how its strength varies over time.

4. Model

In order to rationalize our empirical results and study the aggregate implications of the home purchase-expenditure channel, we build a heterogeneous agents life-cycle model of housing and consumption decisions. In contrast to other models in the literature, we distinguish between consumption that is related to home purchases and consumption that is unrelated. We then incorporate two novel mechanisms to account for the complementarity between home-related spending and home purchases observed in our empirical work. Finally, we use the model to study the joint dynamics of the housing market and aggregate expenditures in order to quantify the importance of the home-related expenditure channel.

4.1. Environment

Demographics

Time is discrete, a model period corresponds to two years, and households live for a finite number of periods. Household age is indexed by $j \in [1, \cdots, J]$. Households earn labor income throughout their working life and retire after age $J_{ret} < J$.

Endowments

Households 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, 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 y_j during working life follows a log-AR(1) process, $\log y_j = \rho_y \log y_{j-1} + \varepsilon_{y,j}$, with innovations $\varepsilon_{y,j}$ drawn from a normal distribution $\mathcal{N}(0, \sigma_y)$. At age $j = 1$, stochastic income is drawn from the stationary distribution of the AR(1) process for $\log y_j$.

During retirement households receive a fixed fraction ω_m of the deterministic and stochastic components of income that they received in the final period of their working life. Conditioning on final working-age income 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 by renting at the per-unit rental rate P_r or by owning 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.

Homeowners face transaction costs associated with selling a property. First, there is a sales cost f_h representing real estate and legal fees. Second, households face renovation and repair costs δ_r associated with preparing their home for sale. This includes neglected repairs and maintenance that were not carried out during housing tenure, but also renovations 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 face additional ongoing expenses associated with homeownership. Each period homeowners pay maintenance costs δ_h, property taxes τ_h, and property insurance premiums ς_i. Each cost is proportional to the value of the house owned.

Consistent with our empirical work in Sections 2 and 3, we treat maintenance costs $\delta_h P_h h$ and renovation and repairs at time of sale $\delta_r P_h h$ as part of home-related expenditure. All other costs of homeownership are considered direct expenditures on housing services.

Durables

In addition to non-durable goods c and housing services s, households consume durable goods d. Each period, households choose a new stock of durables d', which enters the current utility function and affects the stock of durables available in the 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 may reflect 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, or a bigger sofa is required to fill out a larger living room space.

When buying a new home, the durables depreciation rate is given by $\overline{\delta}_d = \delta_d + \varepsilon_d$, where ε_d is a shock distributed according to a uniform distribution with support $[0, D]$. The mismatch shock ε_d 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. For example, once a household has decided to move they realize their existing furniture will be unsuitable for whatever new home they might move into. Importantly, the decision to move house is made prior to the particular mismatch shock and durables depreciation that might induce additional durables expenditure.

We denote durables expenditure as the difference between the new choice of durables d' and the depreciated stock of existing durables $\delta_d d$ or $\overline{\delta}_d d$, 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. Renters cannot borrow. When saving, the asset provides net return r, but when borrowing the asset accrues interest at rate $r_b > r$. We write the current interest rate on assets as $r(a) = \mathbb{1}_{a>0} r + \mathbb{1}_{a<0} r_b$.

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 follows the constant amortization equation

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

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 homeowner chooses next period assets to satisfy

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

A homeowner that does not hold a mortgage, i.e. $a \geq 0$, faces a standard no-borrowing constraint $a' \geq 0$. A homeowner with a mortgage must repay at least $\pi_j(a, r_b)$, but there is no penalty for choosing to pay more than the minimum.

At age $j = 1$, households may receive bequests in the form of liquid assets. The probability of receiving a bequest is π_a. Conditional on receiving a bequest, we assume that a young household receives liquid assets equal to a fraction ω_a of their first period income.

Preferences

Per-period utility is defined over non-durable consumption goods c, durable consumption goods d, and housing services s. The flow utility function is

$$\frac{\left(c_j^{\chi} d_j^{\gamma} s_j^{1-\chi-\gamma}\right)^{1-\sigma}}{1-\sigma} \tag{2}$$

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

At the end of life, households leave bequests of any remaining networth w.[12] Networth consists of the resale value of any owned housing, positive liquid asset balances, negative liquid

[12]Many other macroeconomic models of housing introduce bequest motives to match homeownership rates later in life as well as the observed dispersion in household wealth. See Kaplan et al. (2020a) and Favilukis et al. (2017b).

asset balances (i.e. mortgages), and any remaining durables after constant depreciation δ_d. Following De Nardi (2004), 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.

Household Decision Problems

Each period a household may rent (R), adjust its housing stock (A), or continue to own but not adjust housing (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 household that rents housing services, s, consumes non-durable, c, and durable goods, d, and saves in liquid assets, a, solving the following problem:

$$\begin{aligned} V_j^R(\mathbf{z}) = \max_{c,d',s,a'} \quad & u(c,d',s) + \beta \mathbb{E}_{y',\varepsilon_d}\left[V_{j+1}(\mathbf{z}')\right] \\ \text{s.t.} \quad & c + d' + a' + P_r s = m_j + (1+r(a))a + (1-f_h-\delta_r)P_h h + (1-\delta_d)d \\ & s \in \mathcal{H}_r \\ & a' \geq 0 \\ & h' = 0 \end{aligned} \tag{3}$$

where expectations over future values, $\mathbb{E}_{y',\varepsilon_d}\left[V_{j+1}(\mathbf{z}')\right]$, are taken with respect to the evolution of idiosyncratic income y' and the distribution of durables mismatch shocks ε_d. If a house was previously owned, it is sold and any outstanding debt is repaid from the proceeds. At the end of the period, renting households carry forward no housing assets or mortgage debt. Durables depreciate at the constant rate δ_d.

An household that adjusts its housing stock, consumes non-durable and durable goods, purchases a new home, and saves or takes a new mortgage subject to the LTV constraint. This household solves the problem:

$$\begin{aligned} V_j^A(\mathbf{z}) = \max_{c,d',a',h'} \quad & u(c,d',h') + \beta \mathbb{E}_{y',\varepsilon_d}\left(V_{j+1}(\mathbf{z}')\right) \\ \text{s.t.} \quad & c + d' + a' + (1+\delta_h+\tau_h+\varsigma_i)P_h h' = m_j + (1+r(a))a + (1-f_s-\delta_r)P_h h + (1-\overline{\delta}_d)d \\ & a' \geq -\theta P_h h' \\ & h' \in \mathcal{H}_o \end{aligned} \tag{4}$$

Homeowners pay for maintenance costs, δ_h, taxes, τ_h, and insurance, ς_i, all of which are proportional to the value of their new house $P_h h'$. Adjusters receive the proceeds of selling existing housing, $P_h h$, less sales and renovation costs, f_s, δ_r, and repayment of prior mortgage balances. As the purchase of a new house induces a durables mismatch shock at the beginning of the period, the durable depreciation rate $\overline{\delta}_d$ for households purchasing a new house is higher than the constant depreciation rate δ_d of those that are not adjusting their housing stock.

The value function of non-adjusting homeowner is given by

$$V_j^N(\mathbf{z}) = \max_{c,d',a'} \quad u(c,d',h) + \beta \mathbb{E}_{y',\varepsilon_d}\left[V_{j+1}(\mathbf{z}')\right] \tag{5}$$

$$\text{s.t.} \quad c + d' + a' + (\delta_h + \tau_h + \varsigma_i)P_h h = m_j + (1 + r(a))a + (1 - \delta_d)d$$

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

$$h' = h$$

These households consumes non-durable and durable goods, enjoys housing services generated by an existing house, and either saves or repays an existing mortgage. Homeowners pay for maintenance, taxes, and insurance proportional to the value of their existing house. Non-adjusters with a mortgage are required to make the minimum repayment $\pi_j(a, r_b)$, and durables depreciate at the constant rate δ_d.

Note to solve the household value function problems with multiple continuous variables, we use a modified version of the two-step solution methods discussed in Druedahl (2021).

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 $i \in \{R, A, N\}$. These shifters can make homeownership relatively more desirable for all households, regardless of economic circumstances. In the steady state of the model we set $\mu_i = 0$ for all $i \in \{R, A, N\}$. But we then use changes in μ_i as the source of housing demand shocks, which are studied in the experiment conducted in Section 5.

The idiosyncratic housing preference shocks also change the relative desirability of homeownership, independent of an individual household's 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 life events such as marriage, the arrival of children, divorce, or death. Or they may wish to move in order to be closer to family, work, or other amenities. Rather than explicitly modelling these events, we assume that households receive random preference shocks to the value of renting, remaining in an existing home, and moving to a new home. We assume these shocks are distributed according to a Type 1 Extreme Value distribution with dispersion parameter σ_h.[13] Therefore, the probability that a household chooses one of the housing options $i \in \{R, N, A\}$ is

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

and the discrete decision problem of a household is given by

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

where V^i represent the values of the individual decision problems, μ_i are the common preference shifters, and ε_i are the idiosyncratic preference shocks.

[13] See McFadden (1978).

4.2. Calibration

We calibrate the parameters of the model to capture observed statistics on household income, wealth, homeownership, and the consumption expenditure patterns estimated in Section 3.

We first set a number of parameters according to external sources, and then calibrate a set of parameters internally using a Simulated Method of Moments (SMM) algorithm. Table 6 reports our model parameters. Table 7 reports both statistics targeted in our SMM calibration and a range of untargeted statistics to assess the model fit.

Externally Calibrated Parameters

Panel (a) of Table 6 reports our externally calibrated parameters. Households start working at age 24, retire at 66, and live until 80. Because one model period corresponds to two years, we set $J_{ret} = 21$ and $J = 29$. The risk aversion parameter is set to a standard value $\sigma = 2$.

We compute the initial wealth parameters π_a and ω_a using data in the 2013 wave of the Survey of Consumer Finances (SCF) (Board of Governors of the Federal Reserve System, 2013). We compute $\pi_a = 0,777$ as the fraction of households aged 20–25 with non-negative liquid wealth, and calculate $\omega_a = 0.075$ as the ratio of positive liquid wealth to after-tax, per-capita income. The retirement income replacement rate $\omega_m = 0,494$ is taken from OECD (2019). The standard deviation $\sigma_y = 0.167$ and persistence $\rho_y = 0.955$ of the stochastic component of earnings is taken from estimates by French (2005).

We compute the deterministic life-cycle income profile g_j using real, after-tax income per-capita from the 2004–2019 waves of the SCF (Board of Governors of the Federal Reserve System, 2019). We restrict the sample to households aged 24 to 66 and who earn at least \$500 per year. We take federal income tax thresholds and tax rates for single and married households from Congressional Budget Office (2019). We construct the life-cycle profile by regressing log-income on cohort fixed effects and a fourth-order polynomial in age. [14]

The real annual risk-free interest rate r is 1% to match the yield on 10-year Treasury bonds adjusted for CPI inflation, using data from 2005 to 2019 (Board of Governors of the Federal Reserve System, 2024; U.S. Bureau of Labor Statistics, 2024). The real annual mortgage interest rate r_b is 2.7% to match the real rate on 30-year mortgages over the same period (Freddie Mac, 2024a). The proportional cost of originating a mortgage f_b is 0.6%, consistent with the average size of mortgage origination fees and discount points from 2005 to 2019 (Freddie Mac, 2024b). We take the proportional cost of selling a home f_s from Gruber et al. (2003), the property tax rate τ_h from Diaz et al. (2010), and the proportional housing insurance cost ς_i from Karlman et al. (2021). The maximum LTV ratio for mortgage borrowing is set to $\theta = 0.8$, similar to the median value of originated mortgages in Greenwald (2018). Housing maintenance costs $\delta_h = 0.03$ are set to match the housing depreciation rate reported by Harding et al. (2007).

We set the annual depreciation rate on durables goods for non-adjusting households δ_d to 0.2. This rate is calculated 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

[14] Aggregate income Y is set to 1 in the initial steady state.

Table 6: Model Parameters

Description	Parameter	Value	Source
Panel (a): Externally calibrated parameters			
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	π_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_i	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
Dispersion of housing preference shocks	σ_h	0.214	SMM
Rent-to-price ratio	κ	0.334	SMM
Minimum house size	$\underline{h}$	0.737	SMM
Maximum durables depreciation shock	D	0.533	SMM
Renovation cost	δ_r	0.034	SMM

Notes: All parameters reported at annualized rates.

from the (U.S. Bureau of Economic Analysis, 2022a; U.S. Bureau of Economic Analysis, 2022b).

The choice sets for rental housing $\mathcal{H}_r$ and owner-occupied housing $\mathcal{H}_o$ are restricted to $N_h = 5$ elements each. Since rental houses are typically smaller than owner-occupied houses, we assume that the largest element in $\mathcal{H}_r$ corresponds to the smallest element in $\mathcal{H}_o$. We set the ratio Δ_h of largest to smallest house sizes in $\mathcal{H}_o$ to match the ratio of house values at

the 90^{th} and 10^{th} percentiles of the house size distribution, as reported in the 2013 SCF. The housing options in $\mathcal{H}_o$ are log-spaced with step sizes of $\log(\Delta_h)/N_h$ between each of the N_h elements. The elements of $\mathcal{H}_r$ are spaced in the same way, with the maximum rental size in $\mathcal{H}_r$ corresponding to the minimum grid size in $\mathcal{H}_o$.[15]

Internally Calibrated Parameters

We use a SMM algorithm to choose the parameters $\{\beta, \psi, \chi, \gamma, \sigma_h, \kappa, \underline{h}, D, \delta_r\}$. Panel (b) of Table 6 reports these internally calibrated parameters.

The discount factor $\beta = 0.853$ and the strength of the bequest motive $\psi = 157$ are jointly chosen to match the median net worth-to-income ratio for households and the median LTV ratio among homeowners with a mortgage (**scf2010**). While the discount factor governs the overall desirability of debt versus wealth, the bequest motive determines wealth accumulation later in life. Together, our choice of these parameters helps to produce high LTV ratios of households when young and the significant accumulation of net worth over the life-cycle. In Appendix **??**, Figure **??** illustrates that the model captures these joint life-cycle dynamics.

The preference parameters $\chi = 0.611$ and $\gamma = 0.028$ over unrelated and home-related durables consumption are chosen to match the expenditures shares of unrelated and home-related consumption, using data from the 2005–2019 waves of the PSID (Survey Research Center, Institute for Social Research, University of Michigan, Ann Arbor, MI, 2022). The rent-to-price ratio $\kappa = 0.334$ and minimum house size $\underline{h} = 0.737$ jointly determine the overall homeownership rate and the ownership rate for households under 40 (**scf2010**). We set the dispersion of the idiosyncratic preference shocks $\sigma_h = 0.214$ to match the rate at which existing homeowners move house. Ngai et al. (2024) show that around 2.5 percent of single-family houses in the US are listed for sale per quarter on average from 2007 to 2019. This suggests that approximately 10 percent of existing homeowners move every year, which the model matches very well.

We set the parameters governing the durables depreciation shocks and the cost of renovations to target home-related expenditure responses to home purchase. The upper bound on home-related durables depreciation shocks $D = 0.533$ targets the home-related expenditure response of first-time home buyers, and the cost of renovations prior to home sale $\delta_r = 0.034$ targets the home-related expenditure response of repeat home buyers. Observations on these spending responses are drawn from our event study regressions in Section 3. Note that for comparison between our model and empirical results, we scale all regression coefficients in both model and data by average pre-home purchase expenditures in the relevant spending categories. Pre-home purchase average expenditures in the data are reported in Table 3 below each of the regression coefficient estimates. The calibrated value of D implies that annual depreciation rates of durables conditional on home purchase are between 20 and 85 percent. And the calibrated value of δ_r implies that home sellers spend around 3 percent of revenue from home sale on renovation and repairs prior to sale.

[15] Kaplan et al. (2020a) 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.

To compute expenditure responses to home purchase in our model, we simulate a panel of 3000 households and run the same panel regressions as in our empirical regressions in Equation (1) of Section 3. As in our empirical analysis, the model-based regressions include household-level fixed effects and controls for 10-year household age bins, income, networth, house size, and unemployment. We proxy unemployment in the model as and indicator variable for households whose idiosyncratic income state falls in the bottom 10 percent of realizations. We estimate expenditure responses around the date of house purchase for all home buyers, first-time buyers, and repeat buyers. We measure unrelated and home-related expenditures in the model the same way as in our empirical analysis: unrelated expenditure is consumption of non-durables c; related expenditure combines housing maintenance expenditures, spending on home-related durables goods, and spending on renovation and repairs of existing houses for sale. Related expenditures for renters, non-adjusting homeowners, and adjusting homeowners are given by

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

Renters and non-adjusting homeowners face a constant durables depreciation rate δ_d but adjusters face mismatch shocks and the stochastic depreciation rate $\overline{\delta}_d$, and both renters and adjusting homeowners may pay for renovations on a previously owned house h that was sold this period. Note that only spending on durables is counted toward related consumption expenditure. If a household reduces its stock of durables this is not considered negative spending, consistent with our empirical analysis.

4.3. Model Fit

Table 7 compares model-produced statistics to those in the data. Overall, our calibration fits both targeted and untargeted statistics well. Importantly, the targeted statistics in Panel (a) show that the model closely matches the observed responses of home-related expenditures of both first-time and repeat home buyers. In addition, the model does a good job at reproducing 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 overstates the increase in unrelated expenditure among first-time buyers.

In Appendix **??**, Figure **??** compares the life-cycle profiles of income, homeownership, mortgage LTV ratios, and networth-to-income in both model and data. Figure **??** 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 the cross-sectional patterns observed in the data.

In Figure 3 we compare the dynamics of household spending around the date of home purchase in the model and data. Observations in the data are taken from our dynamic estimates reported in Figure 2 in Section 3.4. All four panels of Figure 3 show that households do not

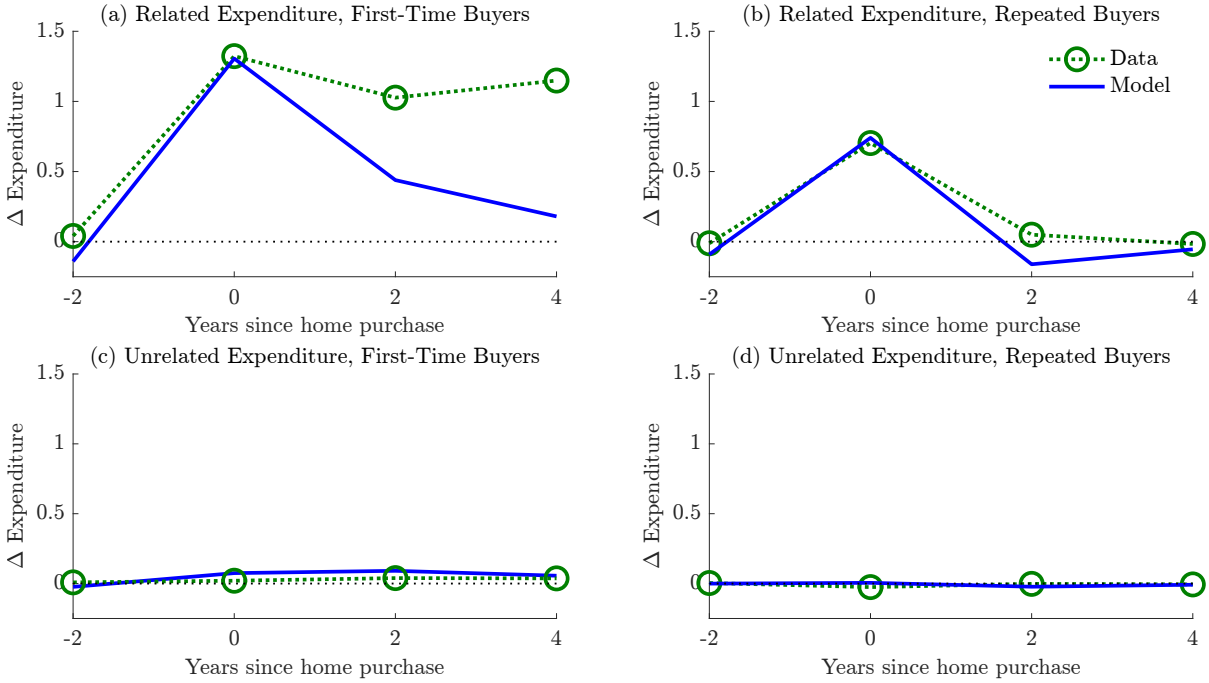
Table 7: Calibrated Model Fit

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			
Home-related expenditure share, renters	0.085	0.044	PSID, 2005–2019
Unrelated expenditure share, renters	0.600	0.678	PSID, 2005–2019
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
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

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 intended under 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. For repeated buyers, Panel (b) shows that home-related expenditure is essentially transitory in both model and data, with spending returning to baseline values in the period following the time of 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.

In the period of home purchase, durable mismatch shocks induce significant additional spending in order to replenish the stock of home-related durables. In addition, because new home purchases are typically associated with larger homes (especially for rent-to-own transitions), home maintenance expenditures become persistently higher than they were prior to home purchase. Taken together, these mechanisms generate (in both the model and the data) significant increases in home related expenditures following a home purchase decision.

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.

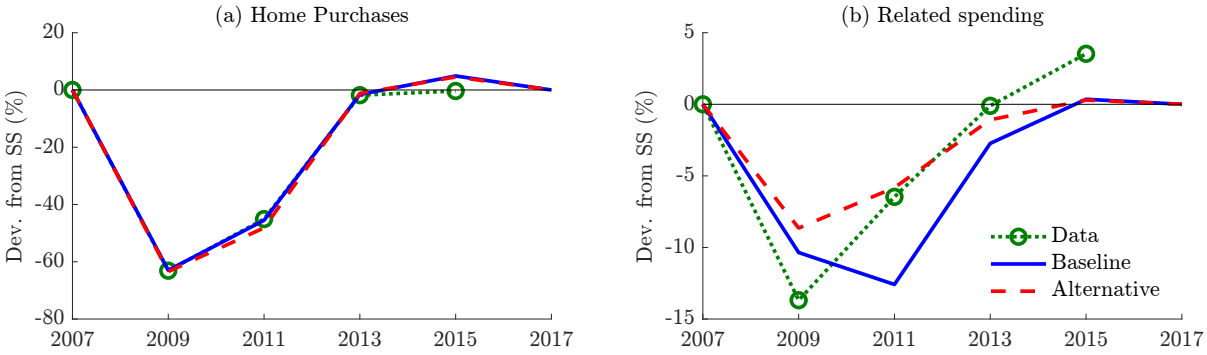
5. Housing Market Fluctuations and Aggregate Spending Dynamics

We now use the model to study the aggregate dynamics of consumption in response to housing market shocks. Like Berger et al. (2015) we conduct partial equilibrium analyses because this allows us to explore spending responses to more empirically realistic macroeconomic dynamics than would be possible in a general equilibrium setting. We conduct two sets of experiments. First, we study model responses to shocks during a housing market bust such as the Great Recession of the mid-2000s (see Kaplan et al., 2020a; Favilukis et al., 2017a; Garriga et al., 2018). Second, we study model responses to shocks during a housing market boom such as during the COVID-19 pandemic (see Gamber et al., 2023). For each experiment, we first study the effect of transitory housing demand shocks calibrated to match the substantial changes in home purchases observed during each episode. We then study the effect of a broader set of shocks calibrated to match observed changes in home purchases, incomes, interest rates, mortgage borrowing constraints, and house prices. In each experiment we make use of 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).

5.1. Housing Market Bust

We begin with a simple exercise that characterizes the decline in housing demand observed during the Great Recession of the mid-2000s. Model dynamics are simulated conditional on negative housing demand shocks only, where we calibrate a sequence of preference parameters $\mu_{A,t}$ to match the cyclical pattern of home purchases over this period. We assume this housing bust episode begins in 2007 and ends in 2013. Given our two-year model period, the housing demand shocks shocks occur in 2007–2009, 2009–2011, and 2011–2013.

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



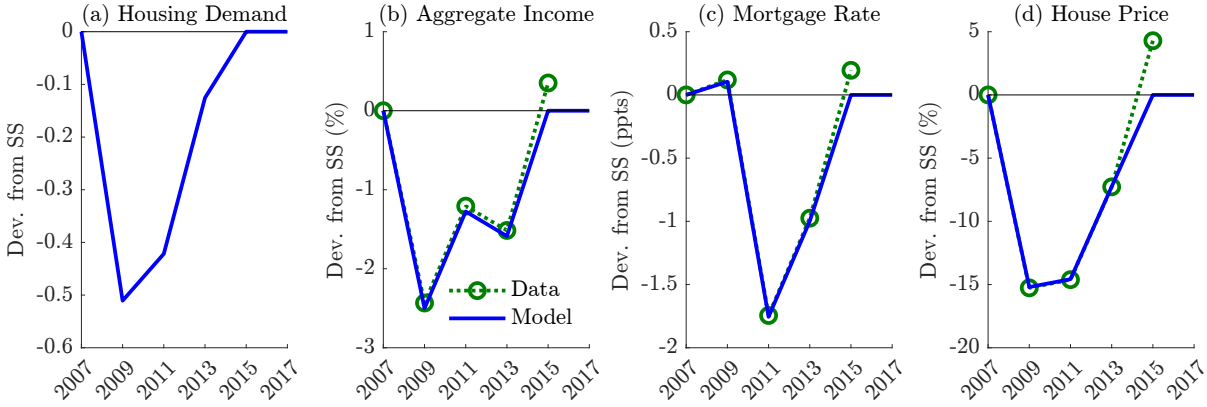
Notes: Data series are two-year averages of deviations from an annual Hamilton (2018) filtered trend.

Figure 4 illustrates IRFs to our sequence of housing preference shocks. Panel (a) shows that the shocks generate a sharp decline in aggregate home purchases followed by a slow return to trend (solid blue line). By construction, the model replicates the pattern of home purchases observed in the data (green circle markers). Panel (b) illustrates the response of home-related spending which falls by 11 percent in 2009, falls further in 2011, and returns to trend thereafter. The model generated IRF is close to the pattern of home-related spending in the data, which falls by nearly 15 percent in 2009 but begins a slow recovery in 2011. We also consider the IRFs of an alternative model in which we turn off durables mismatch shocks and renovation costs (red dashed lines). We also calibrate the common preference shock μ_A in these experiments to reproduce the path of home purchases between 2007 and 2013 (see Panel (a)). Panel (b) shows that home-related spending is less sensitive to the housing demand shocks than our baseline model, falling by just 8 percent in 2009 and beginning its recovery to trend from 2011.

Next we study the model's aggregate dynamics under a broader set of shocks characterizing the housing market bust. We now use a combination of shocks that affect housing demand, mortgage LTV ratios, household incomes, mortgage interest rates, and house prices. We assume that the maximum LTV ratio falls from 80 percent to 70 percent for the duration of the bust (see Greenwald, 2018). The shocks to income, interest rates, and house prices are illustrated in Figure 5. Conditional on these shocks, we then calibrate the path of the housing preference shocks $\mu_{A,t}$ to match the path of home purchases from 2007 to 2013.

Figure 6 illustrates IRFs to our combined sequence of shocks during the housing market bust. As in the previous experiment, Panel (a) shows that model generates a sharp decline

Figure 5: 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).

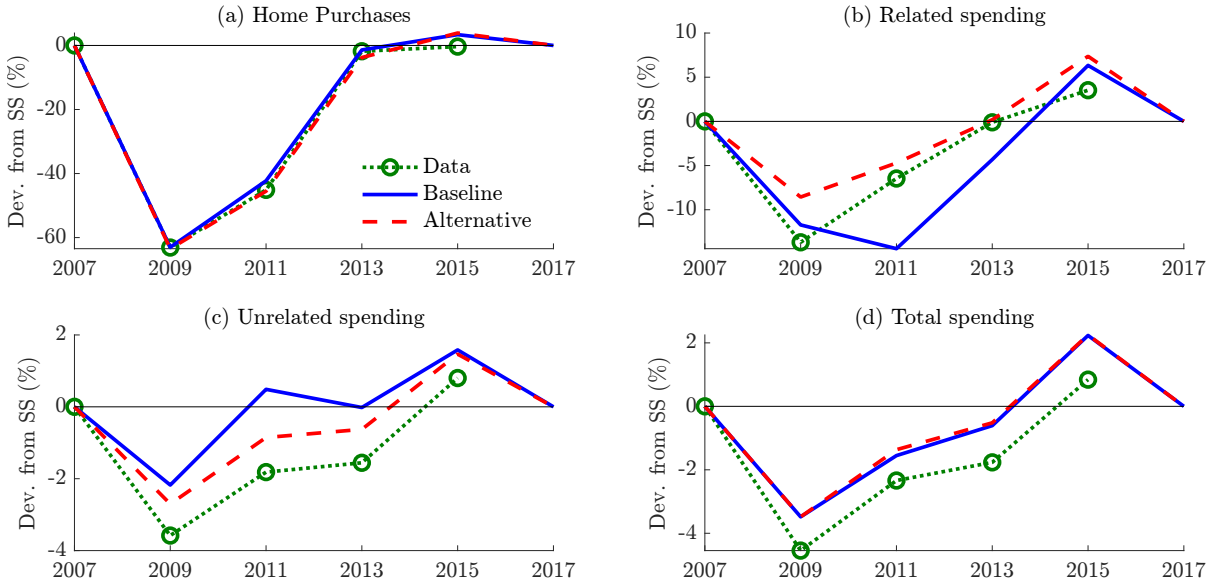
in aggregate home purchases followed by a slow return to trend. Again, the close fit to the data is a result of our calibration strategy. Panel (b) shows that the decline in home-related spending on impact is even closer to the data than our previous experiment, although the model still displays too much persistence in related spending relative to the data. On impact, home-related spending declines by nearly 15 percent, as in the data.

Home-related spending (Panel (f)) falls by nearly 15 percent in 2007–2009 in both data and baseline model. Related spending remains low in the model in 2009-2011 and then slowly returns to its pre-shock value, somewhat slower than what is observed in the data. Panel (g) shows that unrelated spending in the model falls by around 2 percent, about half of the decline in the data. Panel (h) shows that the decline in total spending in the baseline model is about 75 percent of the decline in the data, with a persistently slow return to steady state in both model and data.

Figure 6 also illustrates the IRFs to the same housing bust experiment for two alternative models, one in which there are no mismatch shocks for housing-related durable goods (red lines) and one in which there are no mismatch shocks and no renovation costs associated with moving to a new home (yellow lines) . Panels (e)–(f) show that while home purchases declines by the same amount across all models (by design of our calibration strategy), the two alternative models produce smaller declines in home-related spending, and somewhat faster recoveries over the course of the shock relative to the baseline model. The decline in unrelated and total spending is also slightly more pronounced in the alternative models over the course of the bust than in the baseline model.

Figure 7 reports the contribution of each shock to the IRFs of the endogenous variables in the baseline model (denoted by the dashed black lines). Panel (a) shows that the decline in home purchases is mostly driven by the housing demand shock, and the changes in house prices that moderately offset the housing collapse. This result is consistent with (Kaplan et al.,

Figure 6: IRFs During a Housing Market Bust

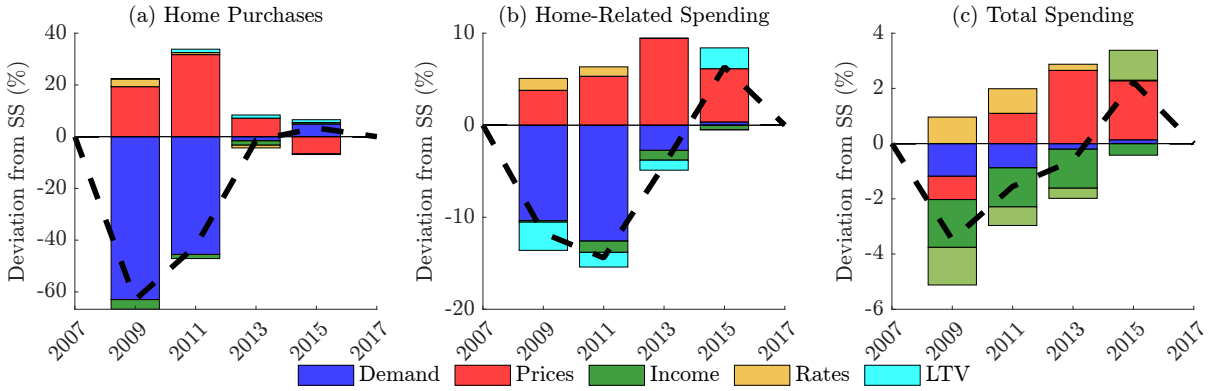


Notes: Data series are two-year averages of deviations from an annual Hamilton (2018) filtered trend.

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).

2020b) who find that housing demand shocks explain most of the housing boom. All the other shocks play a fairly negligible role in explaining the response of home purchases. Panel (b) shows that the decline in home-related spending is also mostly driven by the housing demand shock, which dominates the effect of lower house prices on additional spending. In contrast, panel (c) and panel (d) show that housing demand shocks have a smaller impact on the dynamic response of unrelated spending and total spending, explaining at most one-fourth of the decline in total spending during the bust. Common shocks to the housing market explain much of the strong co-movement between home purchase activity, home-related spending, and total spending. Moreover, the weaker co-movement between home purchases and unrelated spending is not driven by the primary factors determining the housing bust itself.

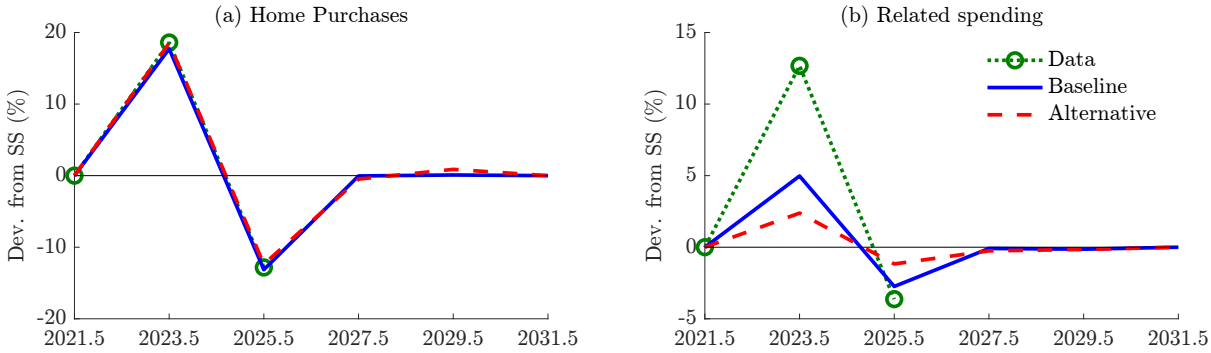
Figure 7: IRF Shock Decomposition During a Housing Market Bust



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.

5.2. Housing Market Boom

Figure 8: IRFs During a Housing Market Boom with Demand Shocks Only

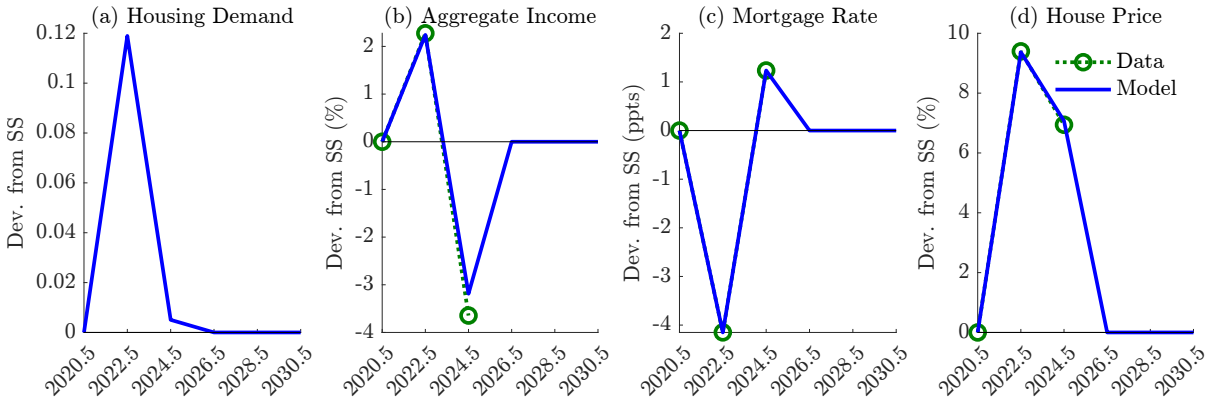


Notes: Data series are two-year averages of deviations from an annual Hamilton (2018) filtered trend.

Finally, we study a broad-based housing market boom similar to the one observed during the COVID-19 pandemic. As in Gamber et al. (2023), we feed the model with shocks to household income, mortgage interest rates, house prices, and a housing preference shock. The shocks are calibrated to data observed in the aftermath of the Covid-19 outbreak, starting in June 2020. Given our two-year model period, we observe shocks to income, mortgage rates, and house prices for the periods 2020-2022 and 2022-2024. Conditional on these observables, we infer the housing preference shock by matching the path of home purchase from 2020 to 2024. Panels (a)–(d) of Figure 10 illustrate the shocks: the data are illustrated with green circle markers, while the shocks that feed the baseline and the alternative models are drawn with blue, red, and yellow lines, respectively.

Panels (e)–(h) of Figure 10 report the IRFs of home purchases, home-related spending, unrelated spending, and total spending over the course of the housing boom. As required by our calibration strategy, the housing boom causes home purchases (Panel (e)) to surge by 20 percent in the first period of the shock before falling to 10 percent below its steady state value

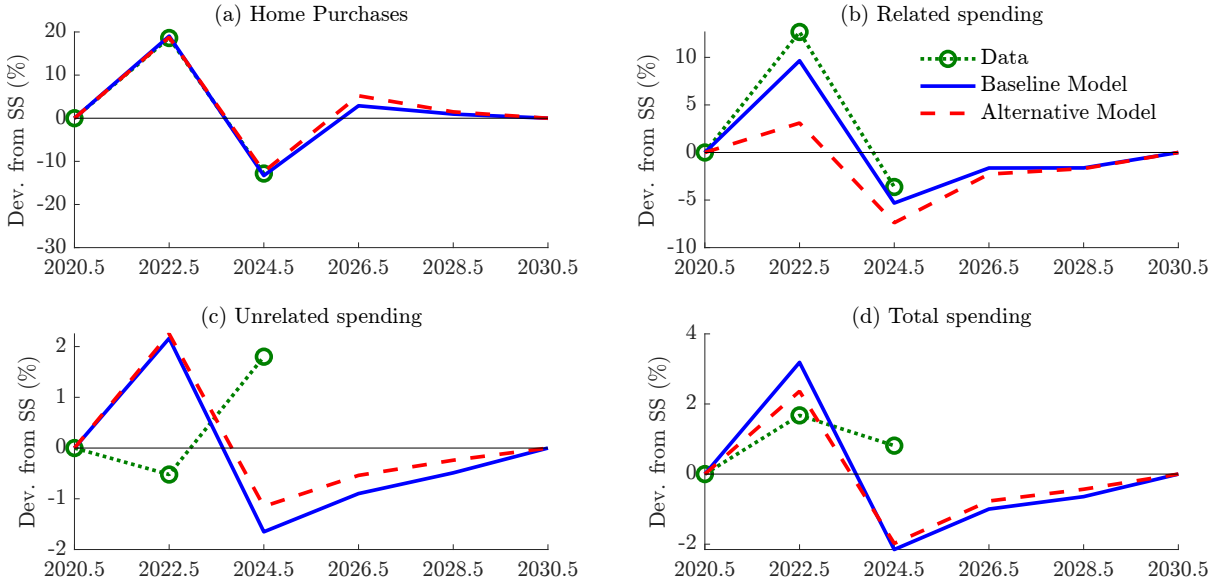
Figure 9: COVID-19 Pandemic Boom Shocks



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: Model IRFs to Housing Boom Shocks



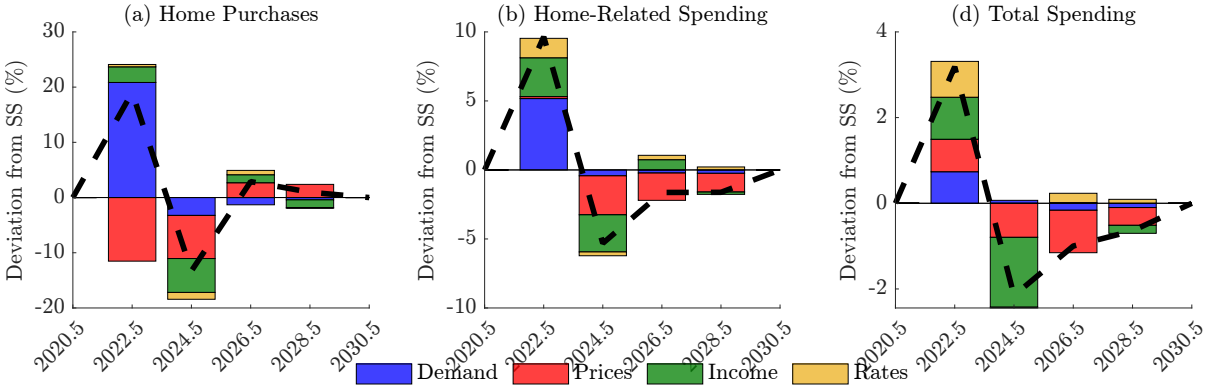
Notes: Data series are two-year averages of deviations from an annual Hamilton (2018) filtered trend.

Source: Authors" calculations using data from U.S. Census Bureau et al. (2024), U.S. Bureau of Economic Analysis (2024b), and U.S. Bureau of Labor Statistics (2024).

in the second period. Panel (f) shows that home-related spending rises by around 10 percent in the baseline model, similar to the increase observed in the data over this period. Unrelated spending (Panel (g)) also rises in the model rises by 2 percent, in contrast to what is observed in the data following the Covid-19 shock (Gamber et al., 2023). Finally, Panel (h) reports the IRFs for total spending, which rises on impact 2 percent more than observed in the data. Unlike in the data, unrelated (and total spending) in the model decline in the 2022-2024 period on the back of falling household income, rising mortgage interest rates, declining house demand, and falling house prices.

Figure 10 also reports the IRFs of this housing boom experiment for two alternative models featuring either no mismatch shocks (dashed red lines) or no mismatch and no renovation costs (dotted yellow lines). While our calibration strategy requires that the response of home purchases (Panel (e)) are the same in all models, Panel (f) shows that these alternative models produce much smaller increases in home-related spending and total spending during the boom, especially when both mismatch shocks and renovation costs are switched off.

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.

Figure 11 conducts a housing boom decomposition exercise. The black dashed lines denote the IRFs of the endogenous variables in our baseline model. We then regenerate the model IRFs under each sequence of shocks in turn: housing demand shocks, household income shocks, mortgage rate shocks, and house price shocks. A shown in Panel (a), the boom in home purchases is primarily driven by the housing demand shock, and while house prices moderately dampens the house purchase boom, household incomes somewhat amplify it. This result is consistent with (Gamber et al., 2023), who find that stay-at-home shocks during the pandemic account for nearly half of the overall housing boom during this period. Panel (b) shows that the boom in home-related spending is largely driven by the housing demand shock, with household income playing a secondary role, while Panel (c) shows that housing demand shocks have almost no impact on the path of unrelated spending. However, as shown in Panel (d) the 2020-2022 boom in total spending can be attributed equally to housing demand, income, rates, and house prices shocks. Thus, common shocks to the housing market appear to be responsible for the strong co-movement between home purchase activity, home-related spending, and total spending. In contrast, the much weaker co-movement between home purchases and unrelated spending is somewhat incidental, and not necessarily driven by the primary factors determining the housing boom itself.

5.3. Contributions to Aggregate Spending Dynamics

Finally, we investigate the contributions of our home purchase-expenditure mechanism to aggregate spending dynamics during housing market bust and boom episodes.

Table 8: Contributions to Aggregate Spending

	Durables	Maintenance and Renovations	Total Home-Related	Unrelated
Panel (a): Spending Contributions in Housing Bust				
Baseline model	0.16	0.30	0.46	0.54
Alternative model	0.24	0.08	0.33	0.67
Panel (b): Spending Contributions in Housing Boom				
Baseline model	0.30	0.11	0.41	0.59
Alternative model	0.26	-0.08	0.17	0.83
Panel (c): Steady State Spending Shares				
Baseline	0.06	0.08	0.14	0.86

Notes: Table reports contributions of growth in each consumption category to aggregate consumption growth. Contributions computed as total change in consumption category divided by total change in aggregate consumption. Contributions are computed at the housing market trough and peak for each experiment, respectively.

6. Conclusion

In this paper we provide micro- and macroeconomic assessments of the transmission of housing market shocks to the broader economy via the home purchase-expenditure channel—that is, the additional spending on home-related goods and services that is necessary for homeowners to customize homes to their own tastes.

At the micro-level, we estimate that households typically spend $7,000 on home-related goods and services in the year around purchasing a home, with large and persistent effects for first-time home buyers. We attribute this spending increase directly to home ownership, as spending on other categories of goods does not change following home purchases, and home-related spending remains unchanged in a counterfactual setting in which households with relocation plans do not buy a home, or after purchasing a vehicle.

In aggregate, the home purchase-expenditure channel has important implications for consumption dynamics. Using a heterogeneous agent life-cycle model consistent with our micro-level evidence, we find that home-related expenditures account for a significant share, 65 percent, of the increase in total spending during a simulated housing boom scenario that is comparable to the one that prevailed in the aftermath of the Covid-19 pandemic outbreak.

Overall, our analysis adds to the literature relating housing market cycles to the real economy, highlighting a novel mechanism through which the housing market influences individual consumer spending decisions and aggregate expenditure. It also informs the debate about the potential risks to aggregate activity associated with monetary and fiscal policies aimed at softening or strengthening the housing market.

There are several directions in which our analysis can be expanded. How does the home purchase-expenditure channel vary with household balance sheet conditions and access to credit? Is this channel asymmetric over the housing and credit cycles? What are the welfare cost for homeowners that overlooked the additional spending needs associated with purchasing a new home?

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