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Making the House a Home: The Stimulative Effect of Home Purchases on Consumption and Investment

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We introduce and quantify a new channel through which the housing market affects household spending: the home purchase channel. Households spend on average $8,000 more on home-related durables and home improvements in the 2 years following a home purchase. Expenditures on nondurables and durables unrelated to the home remain unchanged or decrease modestly. The home purchase channel played a substantial role in the Great Recession, accounting for one-third of the decline in spending on home-related durables and home improvements from 2005 to 2010. (*JEL* D12, E21, E22, G50, R21)

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Why do household consumption and the housing market move in tandem through periods of both prosperity and decline? This question has been central to macroeconomic analysis and monetary policymaking in the United States since 2000, as the aggregate economy experienced a dramatic expansion and

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contraction that mirrored the boom and bust in the housing market. Previous studies of this pattern have focused on the role of housing wealth in spurring household consumption through its effects on overall wealth, credit constraints, and employment.[1]

In this paper we propose and provide evidence for a further link between the housing market and household consumption that does not operate directly through house prices. We argue that home purchases, which experienced a boom and bust similar to that of home prices since 2000, stimulate durable consumption by raising demand for goods and services complementary to the home. This relationship follows from two main assumptions. First, owing to search frictions, households cannot find homes that match their specific tastes and stock of durable goods. Buyers therefore tailor their newly purchased home to their preferences by altering the physical structure and by buying new furnishings and appliances. Second, these alterations and purchases are at least in part irreversible. Home renovations and additions, for example, cannot be moved from one residence to the next. Many fixtures, appliances, and furnishings also complement a particular physical space, so are purchased anew after a move. Given these assumptions, aggregate consumption will expand and contract with the number of transactions during housing cycles. This "home purchase channel" is particularly potent in housing downturns, when sales tend to move more strongly with—and react proportionately more than—home prices.

Our primary analysis uses microdata on household spending and building permits to estimate the relationship between home purchases and home-related spending. We analyze expenditures reported by homeowners in the Consumer Expenditure Survey (CE) and Panel Study of Income Dynamics (PSID) between 2001 and 2013. We also analyze home-improvement activity using the building permit history of approximately nine million homes that sold between 2001 and 2013.

A great deal of household spending is tied to the home. Homeowners surveyed in the CE spend an average of $1,370 per year on home durables and $2,660 per year on home improvement and maintenance. This home-related spending constitutes nearly 40% of homeowners' total durable and improvement spending of $10,500 per year.

We use an event-study methodology to estimate the timing and magnitude of spending responses after the purchase of a home. That home values and

[1] Several empirical studies have examined the relationship between consumption and housing wealth, including Case, Quigley, and Shiller (2005, 2013), Campbell and Cocco (2007), Attanasio et al. (2009), Attanasio, Leicester, and Wakefield (2011), Carroll, Otsuka, and Slacalek (2011), Mian, Rao, and Sufi (2013), Kaplan, Mitman, and Violante (2020a), Aladangady (2017), and Guren et al. (2021). Other studies particularly focus on the role of home equity in relaxing credit constraints (such as Hurst and Stafford 2004; Mian and Sufi 2011; Cooper 2013; DeFusco 2018; Cloyne et al. 2019). Mian and Sufi (2014) show that housing wealth effects extend beyond credit and consumption to employment. Finally, theoretical studies by Berger et al. (2018), Boar, Gorea, and Midrigan (2021), Chen, Michaux, and Roussanov (2020), and Kaplan, Mitman, and Violante (2020b) use calibrated models to explore the mechanisms by which housing wealth affects consumption.

home purchases move in tandem complicates the separate identification of home value and home purchase effects in aggregate data.[2] Individual-level data, however, enable an analysis of homebuyers' expenditures precisely around the date of their home purchase. This feature allows us to isolate spending by new homebuyers from spending by existing owners who have experienced a change in housing wealth. The variation in the timing of home purchases further allows for time fixed effects that absorb general business-cycle fluctuations in spending. Lastly, our preferred specification makes use of the panel nature of the CE and PSID by controlling for household fixed effects. These fixed effects narrow the identifying variation to within-household differences in time after home purchase and absorb fixed household-level spending differences that relate, for example, to differences in wealth, income, or stage of life.

We estimate that homebuyers in the CE sample spend $8,230 (measured in US$(2009)) more on home durables and improvements from 3 months before through 2 years after the purchase of a primary residence. This includes $2,450 of additional spending on home-related durables, which amounts to a tripling of spending when added to longer-tenured owners' $1,130 baseline annual spending on home-related durables. Home durables spending increases particularly in the first quarter following a home purchase and remains modestly higher for 6 to 9 months before leveling off at its long-term average by the end of the first year of ownership. Home improvement and maintenance spending also spikes in the first quarter of ownership and then remains elevated for the first year and a half of ownership. Cumulatively, home improvement and maintenance investments more than triple in the first 2 years after the home purchase, increasing by $5,780 relative to longer-tenured owners' average annual investment of $2,460. These estimates pertain to households' purchases of primary residences, for which the CE collects more precise and comprehensive information about property characteristics and expenditures than for additional properties. Households that purchase additional properties also boost home-related spending substantially. The average purchase, whether primary residence, vacation home, or investment property, leads to a $7,750 increase in total home-related spending.

Our analyses of the PSID and building permit data confirm the substantial increase in spending after a home purchase and show minimal, if any, intertemporal substitution from the delay of prepurchase spending. Recent homebuyers in the PSID raise their home-related spending by roughly $10,000 in the 2 years following a purchase. In the prior 2 years, leading up to the purchase, they reduce their spending by a statistically insignificant $940. The incidence of building permits likewise increases significantly, by threefold, just after a home purchase. Leading up to the transaction home sellers, on average, do not reduce their improvement spending. In fact, they obtain building permits

[2] The correlation of home sales and house prices in levels is between 0.75 and 0.85 and in log changes is between 0.4 and 0.5. See Internet Appendix A and Figure OA.1 in the Internet Appendix for details.

at an increasing rate beginning around 9 months before a transaction, perhaps to prepare their properties for sale. We conclude that the new owners' home-related spending is incremental, since it does not merely replace investments that they or the seller would have made prior to the transaction.

The event-study methodology is not immune to omitted variables critiques. For instance, a shock that leads a household to buy a new home, such as a windfall increase in wealth, a job promotion that raises income expectations, or a change in family status (the birth of a child, e.g.), may also increase durable spending even in the absence of a home purchase. One would expect that such omitted variables would cause *systematically* higher spending, even among categories that are unrelated to the home. Yet we find no evidence that recent homebuyers increase their nonhome spending in either the PSID or CE sample. The detailed CE data reveal that only audiovisual goods, which we view as home-related but that the Bureau of Economic Analysis's National Income and Product Accounts (NIPA) classify as recreational, show an increase after home purchase. By contrast, spending on nondurable goods and services, vehicles, computers, and recreational equipment is very similar between first-year and long-tenured owners and modestly lower in the 3 months leading up to a home purchase. These declines are more than offset by the rise in home-related spending, resulting in a substantial increase in total spending around home purchases. The fact that households' additional spending is so tightly associated with the home reinforces our causal interpretation of the main results and suggests household fixed effects are successful in absorbing omitted variables in our main analysis.

One might also wonder whether homebuyers' increase in spending relates to moving rather than to the purchase of a home. We disentangle these effects by using the PSID to contrast renters' and homeowners' spending around moves. Renters' home-related spending increases very modestly when they move, whereas recent homebuyers' spending increases substantially, as noted above. The differential responses indicate that homebuyers' spending is tied to their home purchases rather than their coincident moves.

The relationship between home purchases and spending has proven important in the aggregate, particularly during the Great Recession. Figure 1 shows the time series for home sales (in blue and scaled to the left axis) and for combined home durables, improvement, and maintenance spending (in red and scaled to the right axis) through the Great Recession. Home sales plunged by nearly 50% between 2005 and 2010, from 8.36 million units per year to 4.50 million units per year. Spending on home durables and home improvement and maintenance also declined drastically, falling in real terms by 12% and 28%, respectively, over the same period. These were some of the largest declines in spending across all categories in the Great Recession. Drawing on our event-study estimates for spending after a home purchase (primary, secondary, or rental property) and the decline in home sales from 2005 to 2010, we calculate that the collapse of home purchases led to a roughly $23 billion annual decline in spending and

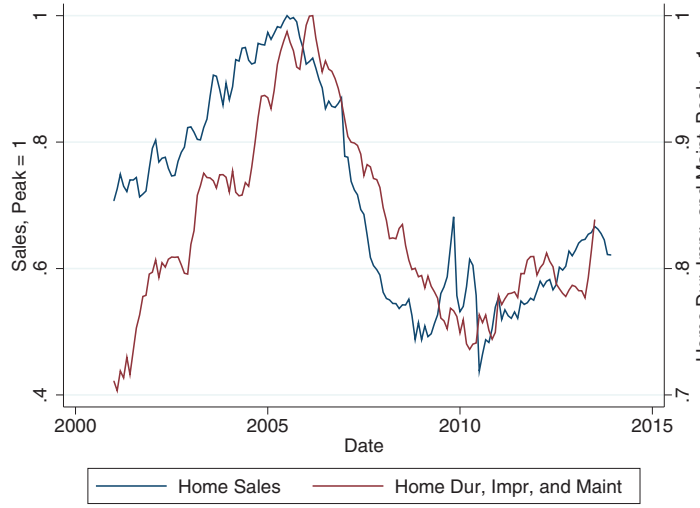

Figure 1
Home sales and home-related spending in the Great Recession
This figure illustrates the time patterns in home sales and home durables, improvements, and maintenance spending between 2001 and 2014. Both series are normalized by their maximum value. Home sales (in blue and scaled to the left axis) are the sum of the National Association of Realtors' existing home sales series and the Census's series of new home sales. A 12-month moving average centered on the indicated date is shown to smooth out seasonality. Home durables, improvement, and maintenance (in red and scaled to the right axis) is the sum of these categories from the Consumer Expenditure Survey aggregated up by the survey weights and normalized to US$(2009) using the category price index.

investment during the Great Recession. This partial equilibrium aggregation excludes spending by suppliers of real estate services who earn income from home purchases and improvements, such as realtors and building contractors. Nevertheless, this channel explains one-third of the decline in spending on home durables and improvements during the housing bust.

We provide a further point of comparison to the literature on housing wealth and consumption by analyzing aggregate spending at furniture, appliance, and home improvement stores by metropolitan area in the Economic Census. Previous studies have found an elasticity in *nondurable* or *total* spending to housing wealth of between 0.05 and 0.30 (e.g., Case, Quigley, and Shiller 2005, 2012; Attanasio et al. 2009; Mian, Rao, and Sufi 2013; Kaplan, Mitman, and Violante 2020a; Guren et al. 2021). Using variation in housing cycles across metropolitan areas, we jointly estimate the elasticities of *home-related* spending to both home prices and home purchases. Home-related spending moves strongly with home purchases, displaying an elasticity of 0.26 in the housing boom (2002 to 2007) and 0.12 in the subsequent bust (2007 to 2012). By comparison, the elasticity to home prices is 0.29 in the boom and 0.23 in the bust. These price-elasticity estimates are at the high end of the range from previous studies, but are consistent with Mian, Rao, and Sufi (2013), who document a particularly strong response of home-related spending to housing

wealth. In quantifying the total impact of the home purchase and housing wealth channels on home-related spending, one must also consider the size of the "shocks" to home purchases and housing wealth. Notably, the 50% decline in home purchases during the housing bust was five times larger than the 10% decline in housing net worth (Mian, Rao, and Sufi 2013). Nevertheless, the breadth of the housing wealth channel, manifest in spending declines on nonhousing durables, nondurables, and services, resulted in larger changes in aggregate consumption. Still, the home purchase channel is a meaningful driver of *home-related* spending separate from, and complementary to, the housing wealth channel. An implication of our work is that cross-sectional analyses using instruments that project onto both price and sales volume, such as the Saiz (2010) instrument, do not isolate pure housing wealth or collateral effects on consumption.

In addition to this connection to the literature on housing wealth and consumption, our work relates to two recent studies of home ownership and consumption. Sodini et al. (2017) use privatizations of municipal apartment buildings in Sweden to show that exogenous increases in homeownership result in greater household spending of SEK 66,000 ($8,800) in the first 4 years of ownership. Best and Kleven (2018) estimate the impact of housing transaction taxes on the quantity and timing of home purchases in the United Kingdom. Using annual cross-sectional data on U.K. households they estimate that home purchases stimulate consumption, triggering additional spending of £6,400, or $10,700, in the first 2 years of ownership. Our findings largely concur with these studies. We make four main contributions. First, by using panel data with household fixed effects and comparing homeowners and renters, we improve on the empirical identification of Best and Kleven (2018). Second, we validate the household survey findings on home improvements in a large administrative data sample of building permits. Third, relative to Sodini et al. (2017), our detailed consumption data allow us to characterize where new homebuyers increase their spending, thereby providing perspective on the theoretical mechanism linking home purchases and spending. Fourth and finally, by studying a representative sample of home purchases as opposed to a subset of transactions as in Sodini et al. (2017), we are able to quantify and demonstrate the aggregate importance of the home purchase channel.

1. Data and Methodology

We use survey data on household spending from the Consumer Expenditure Interview Survey (CE) and PSID, administrative data on building permits from the data analytics firm BuildFax, and census data on retail sales from the Economic Census.

1.1 Consumer Expenditure Survey

Our primary data source is the CE, which provides monthly panel data on household spending for a random sample of nearly 30,000 households per year.

The data combine measures of household expenditures with information on the characteristics of the home and the timing of its purchase. Survey participants remain in the sample for 1 year and report their expenditures retrospectively through four quarterly interviews. Using the CE's detailed data on the timing, value, and category of expenditures, we construct monthly data on purchases of durable goods and spending on home-related maintenance and improvement projects. Using the reported date of purchase for owned homes, we calculate the number of months since the household acquired its primary residence.

Two limitations of the CE motivate our use of additional data sources. Because households exit the sample upon moving, we observe at most 3 months of expenditures before a move, with premove spending reported retrospectively by the few households that enter the CE sample just after moving into their new residence. The CE also does not record the time elapsed since moving for renters. To provide additional perspective on intertemporal substitution and spending around home moves for renters, we examine the Panel Study of Income Dynamics.

1.2 Panel Study of Income Dynamics

The Panel Study of Income Dynamics (PSID) is a longitudinal survey of roughly 9,000 families that provides information on home ownership, moving, and household spending between 2001 and 2013. In biannual interviews respondents report their spending on large home improvement projects (greater than $10,000 in total cost) as well as home durables and basic home repairs. Though the PSID does not identify home purchases *per se*, we assume that a household is a homebuyer when they move to a new primary residence that they own. We use the PSID data to validate the CE analysis, contrast homebuyers' and renters' spending responses to a household move, and examine intertemporal substitution over multiple years prior to a purchase.

1.3 Building permit data

Our third data source is the BuildFax database of residential building permits. BuildFax gathers property-level histories of permitting activity from city or county agencies, which typically require homeowners or their contractors to obtain building permits before making significant home additions and alterations. The data include the number of permits by type of work—electrical, mechanical, plumbing, or structural—and, in some jurisdictions, an estimate of the job cost submitted by the permit applicant. Our analysis examines single-family homes purchased between 2001 and 2013, which we identify using DataQuick's property deed data and match to BuildFax's permitting records by property address. The permitting jurisdictions in BuildFax's data cover nearly 50% of U.S. homes purchased over this period.

The permit data complement the CE and PSID data in three ways. First, the permit data are built from administrative records that do not rely on households' recall and reporting of past spending within a retrospective survey.

Underreporting of expenditures, particularly for durable goods and by wealthier respondents is common to consumption surveys (Koijen, Van Nieuwerburgh, and Vestman 2015). Second, the permit data cover a wider time window around home purchases, enabling us to study whether a property buyer's improvements merely offset deferred improvements by the property seller. Third, because of the substantially larger sample of home transactions, the permit data provide more statistical power and allow for more precise inferences about heterogeneous effects.

1.4 Economic Census data

Our fourth data source is the U.S. Census Bureau's Economic Census, which measures the annual sales and employment of all businesses every 5 years. The most recent three surveys provide data for 2002, 2007, and 2012, which correspond roughly to the beginning, peak, and trough of the housing cycle. We examine aggregate retail sales by metropolitan area for retailers of home-related goods, including furniture, electronics and appliances, and building supplies. These data are useful for comparing the importance of the home purchase channel to that of the housing wealth channel, for which existing studies typically use regression analysis of aggregate data.

1.5 Sample description and summary statistics

Table 1 presents summary statistics for the CE sample. The sample includes all homeowners surveyed between April 2001 and March 2013. The sample includes 571,871 monthly observations for 60,642 homeowners with nonmissing information on the date of home purchase.

Panel A presents information on household spending, deflated to US$(2009) using the Consumer Price Index (CPI). The average spending on home improvement and maintenance is $222 per month, amounting to $2,660 per year, while the average spending on home durables is $114 per month, or $1,370 per year. Households make home improvement expenditures in about 18% of the months in our sample. They purchase home durables more frequently, in 29% of the household-month observations in the CE sample. The other spending categories of nonhome durables, which are primarily vehicles, and nondurables and services average $536 and $2,643 per month, respectively.

Panel B reports summary statistics on property characteristics, and panel C summarizes household characteristics. The average home is 36 years old, has 3 bedrooms and 2 bathrooms, and was purchased 13 years before the survey date. Two-thirds of the properties have an outstanding mortgage. The average household annual income and financial asset holdings are $77,492 and $62,766, respectively.

Table 2 shows descriptive statistics on expenditures and moving among PSID respondents. Homeowners' annualized spending on home improvements, furnishing and equipment are similar in the PSID and CE samples. Homeowners spend more than renters across all categories, but with disproportionate

Table 1
Summary statistics for homeowners in Consumer Expenditure Survey

A. Household spending	Mean	SD
Spending per month ($)		
Home improvement	222	2,071
Home durables	114	739
Non-home durables	536	3,617
Non-durables and services	2,643	2,199
Likelihood of purchase (per month)		
Any home improvement?	0.18	0.39
Any home durables?	0.29	0.45
Any non-home durables?	0.53	0.50
Any durables or improvement?	0.65	0.48

B. Property characteristics	Mean	SD
Months since purchase	157	154
Purchased past 12 mo? (%)	6.66	24.94
Mortgagor? (%)	66.43	47.22
Months since refinancing	58	69
Refinanced prior 12 mo? (%)	7.18	25.82
Age of home (years)	36	29
Age of home missing?	0.09	0.28
Rooms	6.67	2.06
Bedrooms	3.13	0.90
Bathrooms	1.83	0.74
Central air?	0.70	0.46
Swimming pool?	0.12	0.32
Porch?	0.82	0.38
Off-street parking?	0.83	0.38

C. Household characteristics	Mean	SD
Income/wealth		
Annual income	77,492	68,610
Financial assets	62,766	310,118
Missing assets?	0.11	0.32
Education		
No HS diploma	0.10	0.30
HS diploma	0.25	0.43
Some college	0.29	0.46
College degree	0.22	0.42
Graduate degree	0.14	0.34
Race/ethnicity		
White	0.72	0.45
Black	0.09	0.28
Hispanic	0.14	0.35
Asian	0.04	0.19
Marital status		
Married	0.64	0.48
Widowed	0.10	0.30
Divorced	0.13	0.33
Separated	0.01	0.12
Never married	0.11	0.31
Other		
Age (HH head)	52.57	15.74
Family size	2.66	1.46
Retired? (%)	0.23	0.42

This table presents summary statistics for homeowners interviewed in the Consumer Expenditure Survey between 2001 and 2013. The sample includes 571,871 monthly observations on 60,642 households. The sample excludes homeowners who do not report their date of home purchase.

increases in home-related durable goods and projects. For example, home repair spending is 10 times higher among homeowners than among renters, whereas nonhome spending is only 67% higher. Homeowners also move less often than renters. Only 14% of current homeowners (panel A) moved residences over the prior 2 years, whereas 56% of renters (panel B) did so.

Table 3 presents summary statistics for the building permit sample. The permitting sample includes a random 10% sample of all homes with at least one purchase transaction between 2001 and 2013. For each purchase transaction we evaluate permitting activity during a window beginning eight quarters before the transaction and ending eight quarters after the transaction. The sample includes 19,727,786 quarterly observations on 1,287,725 property transactions and 967,904 unique properties. As panel A illustrates, the average property has 0.88 permits during the roughly 4-year window around a transaction. The estimated job cost is populated for nearly 60% of those permits. Excluding observations with missing cost data, the mean total job cost for all property-quarter observations in the data is $749 per quarter. Conditional on property-quarters with positive permit-related expenditure, the mean total job cost is

Table 2
Summary statistics for Panel Study of Income Dynamics

	Mean	SD	N
A. Homeowners			
Household spending ($)			
Home improvements (past 2 years)	5,067	27,109	30,125
Home repairs (past year)	2,891	13,690	22,132
Home furnishings and equipment (past year)	1,402	5,271	22,132
Nonhome goods and services (past year)	30,314	22,420	22,132
Moving			
Moved residence since prior interview (%)	14	35	30,125
B. Renters			
Household spending ($)			
Home improvements (past 2 years)	316	8,661	18,278
Home repairs (past year)	264	2,370	14,171
Home furnishings and equipment (past year)	586	1,871	14,171
Nonhome goods and services (past year)	18,105	14,839	14,171
Moving			
Moved residence since prior interview (%)	56	50	18,278

This table presents summary statistics of homeowners (panel A) and renters (panel B) surveyed in the Panel Study of Income Dynamics between 2001 and 2013. The sample includes 48,403 observations from biannual interviews of 10,358 unique households. We classify homeownership as of the interview date. The survey measures cumulative spending on home improvements over a roughly 2-year period preceding the interview. It measures cumulative spending on home repairs, furnishings, equipment, and nonhome goods and services over a 1-year period preceding the interview. Home improvement spending is available for the full sample period, while spending in other categories is available from 2005 to 2013.

Table 3
Summary statistics for building permits

	Mean	SD
A. Building permits		
Estimated total job cost ($)		
Unconditional, per quarter	749	14,928
Conditional on permit	42,045	103,780
Number of permits, by type (per property)		
Electrical	0.16	1.10
Mechanical	0.10	0.75
Plumbing	0.10	0.78
Structural	0.53	2.64
All	0.88	4.23
B. Property characteristics		
Mortgagor? (%)	72.3	44.7
Age of home (years)	35.8	27.5
Bedrooms	3.2	0.8
Bathrooms	2.1	0.9
Transaction price ($US(2009))	285,526	249,892
Foreclosure or short sale (%)	19.7	39.8
Change in log CBSA-level housing price index in 3 years (%)	19.5	26.9

This table presents summary statistics of building permits and property characteristics for homes sold between 2001 and 2013. The sample includes 19,727,786 property-quarter observations on 1,287,725 transactions and 967,904 unique properties. The source of the permit data in panel A is Buildfax, and the source of the property characteristics in panel B is DataQuick.

$42,045. This high average job cost relative to the CE reflects the fact that building permits are typically necessary for only large home improvements.

Panel B of Table 3 provides summary statistics on home characteristics in the BuildFax sample. The homes are similar in age, number of bedrooms and

number of bathrooms to those in the CE sample, but the BuildFax properties are more likely to be mortgaged. The BuildFax sample selection criterion of having been purchased recently explains this difference. Long tenured owners, who are more likely to have paid down their mortgage balance, are included in the CE sample but excluded from the BuildFax sample, which includes only a 4-year window around purchase transactions.

2. Estimating Home-Related Spending Patterns following Home Purchases

We apply an event-study methodology, using each of the household panel data sets to measure the variation in spending around the date of a home purchase. We begin with a descriptive analysis of the raw data, and then augment the analysis with multivariate regression and other tests aimed at drawing causal inferences about how home purchases affect spending.

2.1 Average consumption and permitting activity by time since purchase

Table 4 describes how households' spending and permit activity vary relative to the date they purchased their primary residence. The average monthly home improvement spending in the first quarter after the home purchase is \$615 compared to the mean of \$209 per month after the first year of ownership. That is, households spend nearly three times more in each of the first 3 months after the home purchase. Moreover, home improvement spending remains elevated in the second quarter after the purchase: spending is \$399 per month, which is nearly twice as large as the average spending beyond the first year of ownership. Spending on home improvement also remains high in the third and fourth quarters after the home purchase, at \$338 and \$297 per month, respectively.

Likewise, household spending on home durables increases dramatically in the first quarter after the purchase of a property. The average monthly spending on home durables in the first 3 months after the home purchase is \$798 per month, compared to a mean \$97 per month after 1 year of ownership, representing eightfold greater spending on home durables. The level of spending on home durables remains higher than the mean throughout the first year after the home purchase. We also find an increase in spending on nonhome durables in the year after the home purchase, but this increase is smaller than those for home improvement or home durables. For example, spending on nonhome durables is \$788 per month in the first quarter after the home purchase, representing an increase of 50% over the \$525 per month spent among households beyond the first year of ownership. Finally, we observe that nondurables and services spending is lower by \$125 to \$185 per month during the first year of home ownership than it is thereafter. This difference represents a 4%–7% decline relative to the \$2,656 average monthly spending on nondurables and services beyond the first year of ownership.

Panel B of Table 4 compares expenditures of PSID homeowners during periods in which they moved primary residences to periods in which they did

Table 4
Household spending and building permit activity following a home purchase

A. Spending after home purchase: Consumer Expenditure Survey

	Average monthly spending ($)			
Quarters since purchase	Home improvement	Home durables	Nonhome durables	Nondurables and services
1	615	798	788	2,531
2	399	265	702	2,473
3	338	178	659	2,486
4	297	158	648	2,502
5+	209	97	525	2,656

B. Spending by homeowners after moving: Panel Study of Income Dynamics

	Average spending ($)			
Moved in prior 2 years?	Home improvement (past 2 years)	Home durables (past year)	Home repairs (past year)	Nonhome goods and services (past year)
Yes	8,887	2,709	3,654	30,614
No	4,485	1,196	2,771	30,185

C. Building permits after home purchase: BuildFax-DataQuick sample

	Building permit activity		
Quarters since purchase	Any permit?	Number of permits	Estimated job cost ($)
1	0.077	0.12	1,292
2	0.057	0.09	1,344
3	0.040	0.06	1,032
4	0.034	0.05	813
5+	0.026	0.04	506

This table summarizes homeowners' spending and building permit activity after they purchase a home. In panel A, we report average monthly spending for homeowners in the Consumer Expenditures Survey between 2001 and 2013. In panel B, we report average biannual or annual spending for homeowners in the Panel Study of Income Dynamics between 2001 and 2013. In panel C, we report the incidence of building permits and the average estimated job cost for home purchases in the BuildFax-DataQuick sample between 2001 and 2013. We measure spending and job cost in real terms, using the CPI-U as price deflator and January 2009 as the base period.

not. Owners that move to a new residence make substantially greater home-related expenditures than do nonmovers. In total, they spend almost twice as much as nonmovers on improvements, home repairs and home durables. By contrast, movers and nonmovers spend roughly the same amount on nonhome goods and services.

In panel C of Table 4, we summarize the building permit activity following home purchases. The fraction of properties with at least one permit is 7.7% in the first quarter following a purchase. The incidence of permits then falls steadily during the first year of ownership and reaches 2.6% among homes that are more than 1 year beyond the purchase date. The estimated total job cost displays a similar pattern, declining from an average of $1,292 in the first quarter following the purchase to $506 per quarter beyond the first year of ownership.

These raw differences in spending around home purchase events are not necessarily caused by the home purchase. They may reflect selection into who purchases rather than spending caused by the home purchase itself. For example, if wealthier households both spend more on nonhome durables and move more often, we would observe similar spending patterns even if durables spending were unaffected by a home purchase. Our empirical strategy aims to address this issue and provide a causal estimate of the spending responses to home purchase.

2.2 An empirical model of spending patterns around home purchases

We now turn to a multivariate analysis of household spending following home purchases. We estimate the following regression model in the CE sample:

$$Spending_{it} = \delta_t + \theta_i + \sum_{m=-3}^{23} \beta_m 1\{Months\ since\ Purchase = m\} + \gamma' X_{it} + \varepsilon_{it}, \quad (1)$$

where the dependent variable is spending by household i in month t. As measures of spending, we consider alternately the level of spending (dollars per month), the log of spending (natural logarithm of 1 + dollar spending), and the incidence of spending (an indicator for spending > 0). Aside from different scaling, the levels specification tends to focus on fitting large expenditures, whereas the log specification puts more weight on small purchases.

The coefficients of interest are fixed effects for each month relative to the time of the home purchase ($\beta_m, m \in [-3, 23]$). These fixed effects measure the household's incremental spending in each of the 3 months before the house purchase as well as the first 24 months of home ownership relative to an excluded category of 2 or more years after purchase. Time since purchase pertains to the household's purchase of its primary residence, for which we can observe and control for the age and physical characteristics of the home. We include these property characteristics in the vector $\mathbf{X}$, which also includes controls for household income and wealth, as well as demographics: household size, the age of the head of household, and indicators for the head of household's marital status, retirement status, race, and education. The model also includes month-by-year fixed effects (δ_t) to control for common variation in spending over time, such as fluctuations through the business cycle. We estimate the model with ordinary least squares using the sample weights provided by the CE. We calculate Huber-White standard errors with observations clustered two ways by year and by state.

Most important, our preferred specification makes use of the panel nature of the CE by controlling for household fixed effects θ_i in addition to the control variables discussed above. These fixed effects narrow the identifying variation to within-household differences in time after purchase and absorb household-level spending differences that are driven by such factors as wealth, income, or stage of life. Our main analysis thus primarily exploits the variation in time-since-purchase for survey participants while they remain at a given residence.

2.3 Home durable spending following home purchase

Figure 2 presents estimates from Regression (1) with a measure of home durables spending as the dependent variable and the full set of control variables.[3] Each panel plots the β_m coefficients with a different dependent variable: panel A uses the logarithm of home durables spending; panel B uses the dollar amount of home durables spending; and panel C uses an indicator for positive home durables spending.

The figures illustrate that home durables spending increases substantially during the year following a home purchase. As shown in panel A, log spending increases by 1.9 log points in the month of a home purchase, 2 log points in the following month, and 1 log points in the second month after the transaction. These log differences equate to proportional increases of 575%, 660%, and 180%, respectively. The logarithm of spending remains elevated, but by smaller amounts, in the second and third quarters after the home purchase. The spending differences are statistically significant at the 5% level through the 7th month following purchase. The estimated spending response reaches zero in the 14th month after purchase. The zero coefficient indicates that the homebuyer's spending is the same as spending by homeowners who are more than 2 years beyond the date of their home purchase.

Panel B shows that the level of home durable spending displays a similar pattern to log spending in the months after a home purchase. Spending increases by \$918 in the month of the purchase, \$787 in the month after the purchase, and \$332 and \$205 in the subsequent two months. These increases are all statistically significant and represent substantial proportional increases above the \$94 of monthly spending typical of longer-tenured owners. Panel C shows that the incidence of home durable spending also rises around home purchases. The propensity to spend on home durables increases by 20% in the month of the transaction and by 25% and 12% in the subsequent 2 months.

Figure 2 also shows that household spending on home durables falls in the 3 months prior to home purchase. For example, panel A shows that the propensity to spend is 18%, 20%, and 15% lower in months −3, −2, and −1 relative to the home purchase, respectively. The spending patterns in these 3 months are consistent with some intertemporal substitution of consumption in which both buyers and sellers in a pending transaction may delay durable goods purchases until the transaction is completed. However, the analysis of dollar spending shows no difference in spending before a home purchase, and the analysis of log spending indicates that spending after the purchase dwarfs the decline before the purchase. In the analysis of log spending, the coefficients imply a cumulative spending difference of +7.51 log points in the 2 years after a purchase, which is 3.5 times as large as the cumulative −2.16 log point decline in the 3 months before the purchase. Cumulatively, the dollar spending on home

[3] We include tables with the regression estimates underlying these figures in the Internet Appendix.

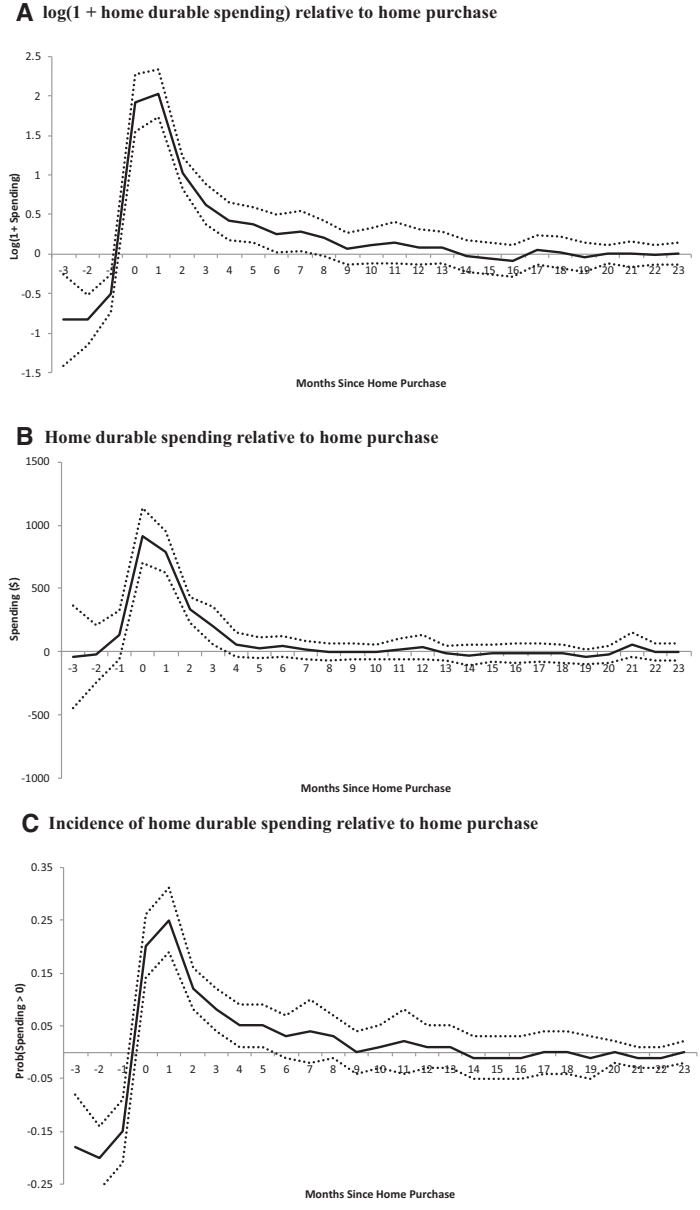

Figure 2
Home durables impulse response to home purchase
The panels show the time pattern in homebuyers' home durable spending from 3 months before to 2 years after their home purchase. In each panel, we plot the coefficient estimates (solid line) and 95% confidence interval bounds (dotted lines) from estimating Equation (1) in the CE sample. Only the functional form of the spending measure varies across the three panels. Each model includes controls for property and household characteristics as well as household and year-by-month fixed effects. We estimate the models by ordinary least squares and two-way cluster observations by state and year-month in calculating standard errors.

durables increases by $2,447 from the 3 months before a home purchase to 2 years after a purchase.

The estimates reported above are conditional on the full set of control variables: household and property characteristics, as well as household fixed effects. In Figure OA.3 in the Internet Appendix, we show how the control variables affect the estimated response of log spending. The inclusion of control variables and household fixed effects does not meaningfully reduce the magnitude of the spike in spending in the quarter of the home purchase. The control variables and household fixed effects do, however, reduce the estimated spending responses for months 3 to 12 following the purchase. Estimates of elevated log spending late in the first year of ownership—reflected in coefficients that average around 0.2 to 0.3 for months 12 to 24 in a baseline specification without controls—decline to small and statistically insignificant differences centered on zero after controlling for household fixed effects. Some of the elevated spending in the first year of ownership evident in the raw data, therefore, is caused by generally higher spending by households that tend to buy homes more frequently rather than by a home purchase *per se*. The household fixed effects eliminate that source of bias in the coefficient estimates.

2.4 Home improvement and maintenance following a home purchase

Figure 3 analyzes homebuyers' spending on home improvement and maintenance around home purchases. Panel A illustrates that log spending peaks 1 month after a home purchase and remains elevated subsequently for more than a year. The post-purchase rise in home improvements is less steep but more persistent than that of home durables. Improvement spending increases by 1 log points, 1.2 log points, and 0.8 log points in the first 3 months of ownership. Thereafter log spending remains elevated until 19 months after the purchase, when it hits zero. Panel B shows that the level of improvement spending also increases following home purchases. In the month of the purchase and the 2 months thereafter, dollar spending increases by $618, $634, and $428, respectively. These increases represent more than a tripling of spending compared to the $205 of monthly improvement spending by owners who purchased more than a year ago. As shown in panel C, the incidence of home improvement spending likewise rises by 14%, 19%, and 13% in quarter of a home purchase and remains elevated for 2 years after the transaction.

In contrast to the findings for home durables, we do not observe intertemporal substitution of improvements from before to after the transaction. The point estimates suggest spending on improvements increases in the 3 months leading up the purchase, though these increases are not statistically significant. In the analysis of dollar spending we observe a large but imprecisely estimated increase in spending 3 months prior to the transaction. Both the large coefficient and the wide confidence interval are explained by the small number of

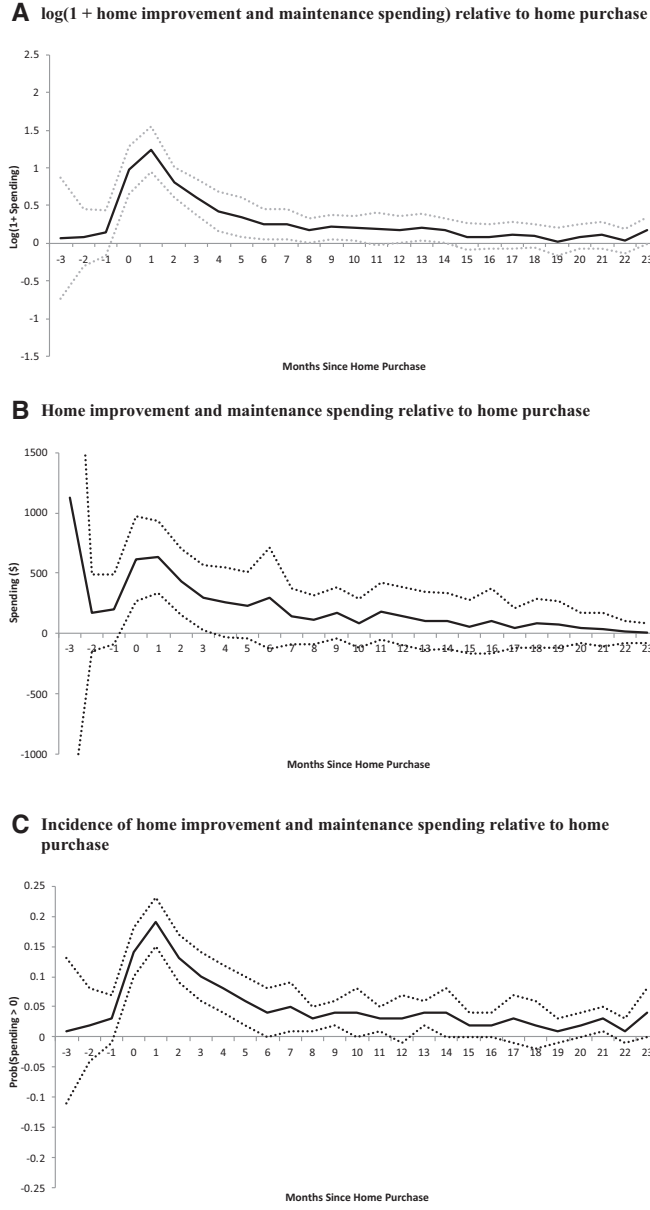

Figure 3
Home improvement and maintenance impulse response to home purchase
The panels show the time pattern in homebuyers' home improvement and maintenance spending from 3 months before to 2 years after their home purchase. In each panel, we plot the coefficient estimates (solid line) and 95% confidence interval bounds (dotted lines) from estimating Equation (1) in the CE sample. Only the functional form of the spending measure varies across the three panels. Each model includes controls for property and household characteristics as well as household and year-by-month fixed effects. We estimate each model by ordinary least squares and two-way cluster observations by state and year-month in calculating standard errors.

transactions for which we observe data 3 months before the transaction.[4] Within that small subsample estimation precision is low and a single large improvement expenditure exerts more influence on the estimated coefficient. Summing up the marginal spending responses for 3 months before a home purchase through 24 months after the purchase, we estimate a total spending increase of $5,784 on home improvements and maintenance.

2.5 Home-related spending around moves: Homebuyers versus renters

An important question about the foregoing results is whether homebuyers' spending responses are prompted by moving residences or by the home purchase. The answer to this question matters for understanding the aggregate implications of an increase in home purchases. For example, during a period of high transaction volume but constant mobility, the incremental home purchases of former renters will only raise aggregate spending if home purchases, rather than moves, induce extra spending.

We estimate the following model separately for homeowners and renters in the PSID sample:

$$Spending_{it} = \delta_t + \theta_i + \beta 1\{Moved\ Residences\ Since\ Prior\ Interview\} + \gamma' X_{it} + \varepsilon_{it}. \quad (2)$$

The dependent variable is the prior 12- or 24-month spending reported in the year t interview.[5] In lieu of the month-since-purchase fixed effects of Equation (1), we include an indicator for whether the household moved residences during the roughly 2-year period between the current (year t) interview and the prior interview. Similar to the analysis of the CE data, we control for household and time fixed effects (θ_i and δ_t) as well as household and property characteristics (X_{it}). For the estimation, we use PSID longitudinal sample weights to obtain nationally representative estimates and we cluster observations by state of residence and year in calculating standard errors.

The estimation results in Table 5 show that homebuyers increase their spending substantially on both durables and improvements when they move whereas renters only increase their spending modestly on durables and do not spend on improvements when they move. Homebuyers spend, on average, roughly $10,000 more on home-related durables and improvements during a 2-year window with a move compared to periods without. This additional spending comprises $6,227 on home improvements, $1,916 on home repairs and maintenance, and $1,924 on home furnishings, equipment, and appliances.

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[4] Based on the CE sample design, only the small number of households who happened to purchase their home in the month they enter the CE sample report their spending for the 3 months prior to purchase. This group is about one-twentieth of the number of homeowners for whom we observe spending at longer tenures of ownership.

[5] All spending is reported biannually in the PSID, but the category of home improvements has a 24-month reporting horizon, whereas home durables and home repairs have only 12-month horizons. Home durables and home repairs are also available for a shorter time period, from 2005 to 2013 compared to 2001 to 2013 for home improvements.

Table 5
Household spending by homebuyers and renters that move (PSID)

	Home improvement	Home repair and maintenance	Home furnishings, equipment, and appliances	Nonhome expenditures
A. Homebuyers				
Moved residences?	6,227***	1,916*	1,924***	−421
	(1364)	(741)	(309)	(746)
N	29,316	21,125	21,125	21,125
R^2	.33	.27	.28	.72
Control variables				
Property characteristics?	Y	Y	Y	Y
HH characteristics?	Y	Y	Y	Y
HH fixed effects?	Y	Y	Y	Y
Year fixed effects?	Y	Y	Y	Y
B. Renters				
Moved residences?	42	98	238**	292
	(148)	(77)	(61)	(427)
N	17,145	13,008	13,008	13,008
R^2	.64	.40	.38	.69
Control variables				
Property characteristics?	Y	Y	Y	Y
HH characteristics?	Y	Y	Y	Y
HH fixed effects?	Y	Y	Y	Y
Year fixed effects?	Y	Y	Y	Y

This table presents regression analysis of home-related spending by homebuyers and renters in the Panel Study of Income Dynamics (PSID) between 2001 and 2013. We regress real spending (measured in US$(2009)) on control variables and an indicator for whether the household moved residences during the prior 2-year period. The control variables are year fixed effects, household fixed effects, the number of rooms in the residence, log household income, log household size, household wealth (transformed by inverse hyperbolic sine), and indicators for the marital status, retirement status, education and race of the household head. Home improvement spending is measured over the 2-year period prior to the household interview, while the remaining home-related spending is measured over a 1-year period prior to the interview. We estimate the model using ordinary least squares and double-cluster observations by the state of residence and year in the calculation of standard errors. $*p < .1$; $**p < .05$; $***p < .01$.

Renters, by contrast, only increase their home-related spending by $378 when they move. Their move-related spending is concentrated in home furnishings, equipment, and appliances, on which they spend an additional $238. Regardless of whether they have moved, renters spend relatively little on home improvements and home repairs, which are covered by landlords.

Within the PSID sample we also investigate intertemporal substitution over a longer horizon. We find only modest reductions in housing and nonhousing spending in the 2 years leading up to a household move, as shown in Table OA.6 in the Internet Appendix.

The magnitudes of homebuyers' spending responses in the PSID and CE are broadly similar, though total spending is somewhat higher in the PSID. The cumulative 2-year spending response for primary home purchases in the CE is $8,231, which is made up of spending on improvements and maintenance ($5,784) and spending on home durables ($2,447). Homebuyers in the CE therefore increase their home durable spending by more than homebuyers in the PSID, but increase their home improvements and maintenance spending by less than homebuyers in the PSID.

2.6 Permitting activity around home purchases

We use the following model to estimate how building permits change in the 2 years leading up to and following a home purchase:

$$Permits_{pt} = \delta_t + \theta_p + \sum_{q=-8}^{8} \beta_q 1\{Quarters\ Since\ Purchase = q\} + \gamma' X_{pt} + \varepsilon_{pt}. \quad (3)$$

The unit of observation in this analysis is the property p in a quarter t. An important feature of the permitting data is that we can observe permitting in the years before a transaction, so we are able to expand the time-relative-to-purchase dummies to include each of the eight quarters before the home purchase. We measure permitting activity alternately as the total estimated job cost (per quarter), the log of the estimated job cost (natural logarithm of 1 + job cost), and the incidence of a permit (per quarter). As control variables, we include quarter-by-year fixed effects (δ_t), property fixed effects (θ_p), and indicators for a property foreclosure within 1 year prior to the sale and for incidence of prior building permits up to 1 year prior to the sale date. We estimate the model by ordinary least squares and two-way cluster observations by year-quarter and state.

Figure 4 displays the estimation results. Each measure of permitting activity shows an increase in permitting activity following a home purchase. Panel A shows an increase of 0.22 log points in permit total job cost during the quarter in which a home is purchased, or an increase of 25% in permit cost. The estimated job cost is also 0.16 and 0.08 log points higher in the first and second quarters after the purchase, representing proportional increases of 17% and 8%, respectively. Panel B shows that the total job cost increases by $731, on average, during the quarter of the home purchase and by $820 in the first quarter after the purchase. In the second and the third quarters after the purchase, the average job cost remains elevated by $534 and $331, respectively. Cumulatively, the permit cost rises by $2,650 in the 2 years following a purchase. Finally, in panel C we find that the likelihood of having a permit increases by 5% during the quarter of the home purchase, followed by a 3% increase in the first quarter after the purchase and 1.4% and 1% increases, respectively, in the second and third quarters after the purchase.

Interestingly, permit job costs also increase *before* the purchase, suggesting that home sellers invest meaningfully in their homes before selling. For instance, the estimates displayed in Figure 4.B show an increase in activity beginning four quarters before a sale. Cumulatively, the permit cost increases by $485 in the 2 years before the transaction, which is nearly one-fifth of the $2,650 following the transaction. This pattern reveals that sellers, on average, do not intertemporally substitute by deferring maintenance on their old home before purchasing a new home and investing in it. It also suggests that, if anything, our estimate of home improvement and maintenance in the CE is an underestimate because it does not fully account for upgrades made to sell a prior home before the purchase that we observe.

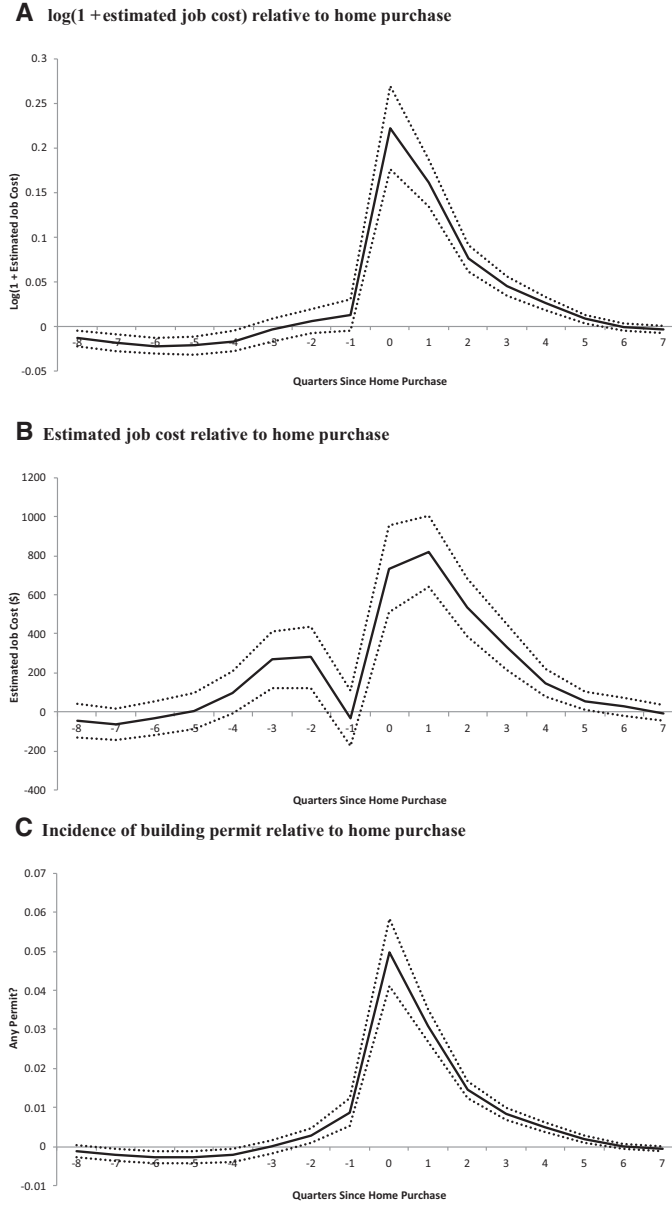

Figure 4
Building permit impulse response to home purchase
The panels show the time pattern in homebuyers' building permitting activity from 2 years before to 2 years after their home purchase. In each panel, we plot the coefficient estimates (solid line) and 95% confidence interval bounds (dotted lines) from estimating Equation (3) in the BuildFax-DataQuick sample. The dependent variable is the estimated cost of building permits, in logs or levels, in the first two panels and an indicator for any building permit in the third panel. Each model includes controls for property characteristics, as well as property and year-by-quarter fixed effects. We estimate each model by ordinary least squares and two-way cluster observations by CBSA and year-quarter in calculating standard errors.

A comparison of the BuildFax and CE estimates reveals a disproportionate rise in the probability of high-cost improvements around home purchases. In particular, the CE analysis shows that the probability of making any improvement roughly doubles in the quarter after a home purchase: it increases by roughly 15 percentage points (see Figure 4.C) relative to a baseline probability of 18% for longer-tenured owners. By contrast, the probability of permitted improvements, which typically involve higher expenditures, triples in quarter of after a home purchase. That is, the probability of having a permitted job jumps by 5 percentage points (see Figure 4.C) from a baseline of 2.6% for longer-tenured owners to 7.6% for new owners in the quarter following their home purchase. The CE data corroborate this finding, as the incidence of large improvement expenditures (above $10,000) likewise rises disproportionately—by fivefold—in the quarter after a home purchase (see Figure OA.4 in the Internet Appendix). Since large projects may be more likely to be capitalized in the value of the housing stock, this may indicate a channel by which housing market busts have a longer-lasting impact on the physical quality of the housing stock.

The permit data overall corroborate the results from the CE. Although we do not wish to take a strong stand on aggregate dollar values given that not all home improvements require a permit, the general time pattern is highly consistent with what we see in the CE, and a 2-year look-back produces no evidence consistent with intertemporal substitution.

2.7 Causality and robustness

The results so far suggest that households increase their spending on home durables, improvement, and maintenance when they purchase a house. The evidence sheds light on the link between the housing market and consumption through a transaction channel rather than a price channel. However, it is important to explore more deeply whether these effects are causal or whether unobserved heterogeneity at the household level is driving the results.

Our regressions control for household income and wealth and various demographics: household size and head of household age, marital status, retirement status, race, and education. Our results are robust to the inclusion of household fixed effects, which absorb fixed differences in expenditures during the year that the household appears in the data. By including household fixed effects, we exploit the exact timing of spending rather than relying on a coarse comparison between households that recently purchased a home and those that did not. To clarify this point, it is helpful to consider the example of elderly homeowners, who tend to stay in the same home and to keep their current household appliances. A model without controls or household fixed effects would find higher spending on durables in each month during the first year of ownership, since the elderly spend at a low rate and are disproportionately represented in the excluded category: owners who purchased more than 1 year ago. Omitting age from the model causes an upward bias in the spending

coefficients across the board in each of the first 12 months after purchase. Controlling for age or, more flexibly, absorbing unobserved heterogeneity with a household fixed effect resolves this problem.

It is still possible, however, that unobserved shocks that coincide with (and may potentially drive) home purchase cause increased spending precisely in the first few months after the purchase. These potential omitted variables may include (1) unobserved financial or housing wealth that permits higher spending; (2) an increase in permanent income that may result in an increased propensity to consume; and (3) an increase in family size that requires greater spending on durables and may also cause the household to move. It also may be easier to borrow the amount needed for additional home-related expenses with the mortgage.

Next, we consider a series of placebo tests to alleviate concerns that our results are driven by omitted factors unrelated to the home purchase. To test whether omitted variables are driving our results, we investigate whether household spending in categories unrelated to home purchase display the same patterns as spending on home durables and home improvement and maintenance. Using information provided in the CE, we study spending on nonhome durables, and nondurable goods and services.

Figure 5 shows spending patterns for nonhome durable goods and nondurable goods and services. In each panel, we plot the time-since-purchase fixed effects in Equation (1), with log spending or dollar spending as the dependent variable. The figure shows modest declines in log spending in these categories. We find a very modest response of spending on nonhome durables. Similarly, our analysis of spending in the PSID shows a small and statistically insignificant reduction in nonhome spending following a household move (see Table 5). If any wealth, income, or household size shocks coincided with home purchases and caused short-run increases in spending, one would expect them also to boost nonhousing spending. Instead, we find much a larger response of home-related spending in both the CE and PSID samples. The PSID panel structure allows further analysis 2-year period prior to the home purchase. We find no evidence that spending adjusts upward in advance of the home purchase (see Table OA.6 in the Internet Appendix). We should also note here that nonhome durables and nondurables spending are not insensitive to income and wealth; the coefficients on those controls show the expected relationship. The failure to find a nonhousing and nondurable spending response thus does not result from any general inelasticity of these spending categories to income and wealth.

One other reason a home purchase may be important in causing home-related durable spending relates to transactions costs. Eberly (1994) shows that households follow an (S, s) adjustment model when they face income uncertainty and transactions costs in reducing their stock of automobiles. In addition to income uncertainty, households also face uncertainty about the minimum length of ownership or tenancy at their current residence. A home purchase likely reduces that uncertainty, triggering a narrowing of (S, s) bounds

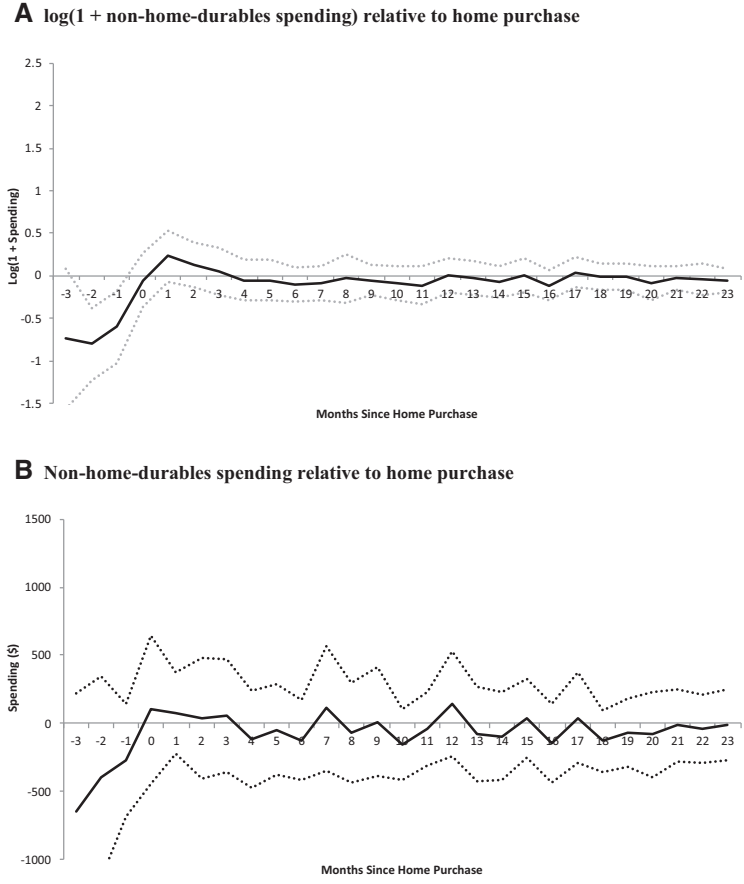

Figure 5
Nonhome durables and nondurables and services responses to home purchase
The panels show the time pattern in homebuyers' spending on non-home durables (panels A and B) and nondurables and services (panels C and D) from 3 months before to 2 years after their home purchase. In each panel, we plot the coefficient estimates (solid line) and 95% confidence interval bounds (dotted lines) from estimating Equation (1) in the CE sample. Each model includes controls for property and household characteristics as well as household and year-by-month fixed effects. We estimate each model by ordinary least squares and two-way cluster observations by state and year-month in calculating standard errors.

and the purchase of home durables and improvements for which the household had latent demand. Under this model of home-related spending, the home purchase might be triggered by another event, like a wealth shock, but still give rise to substantial home-related spending coincident with the purchase.

2.8 Heterogeneity

The large sample and richness of the building permit data allow us to explore heterogeneity in the home purchase channel and provide more insight on how

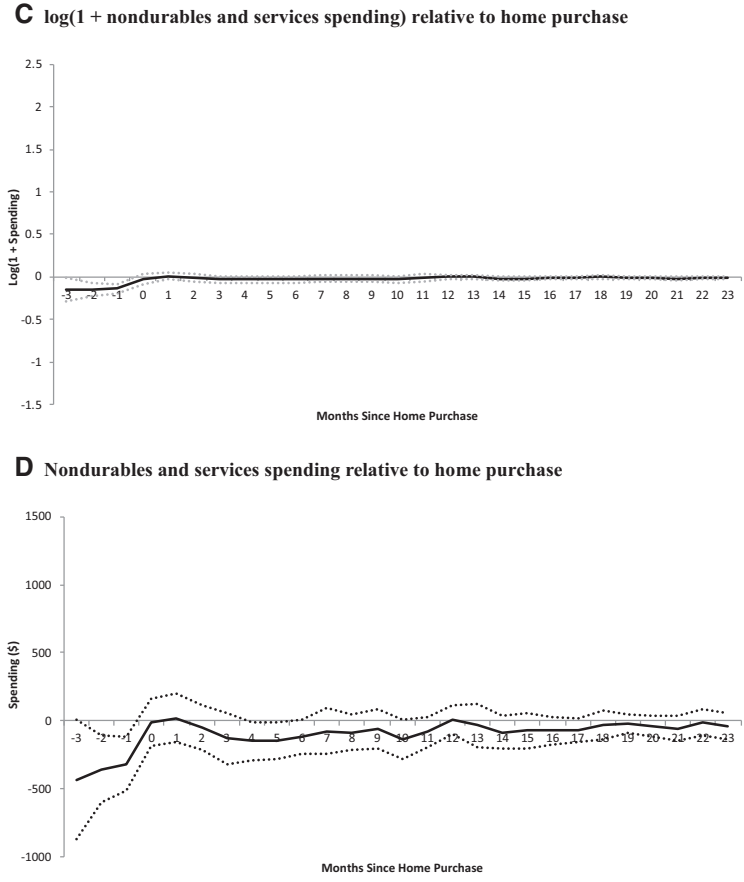

Figure 5
(Continued)

it operates. We examine how the strength of the home purchase channel varies through the housing cycle. In particular, we reestimate Equation (3) but interact the indicator for quarters since purchase with (1) an indicator for whether the transaction is a foreclosure or short sale, (2) an indicator for whether the transaction occurred during the housing bust (2007–2013), and (3) an indicator for whether house prices in the property's ZIP code have risen or fallen in the 3 years prior to the transaction. We include all interactions in a single model to disentangle the differences in the home purchase channel over time, by foreclosure status and by recent housing market performance.

In summary, the permit data seem to indicate that houses sold in the housing bust have more and larger permitting activity immediately after sale but less before the sale and several quarters after the sale. The cumulative

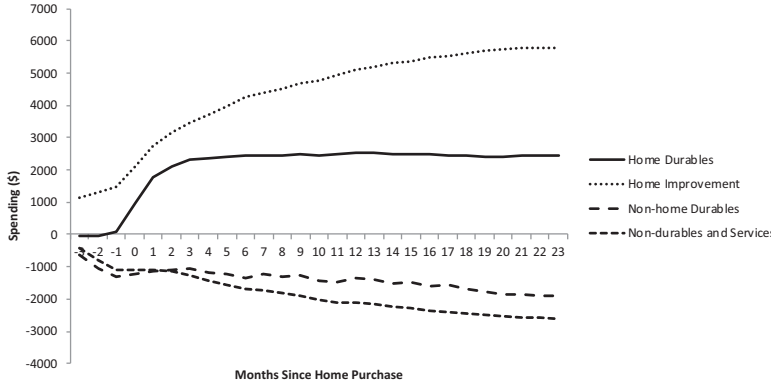

Figure 6
Cumulative spending relative to home purchase
The figure plots homebuyers' estimated cumulative spending relative to the month of their home purchase. We calculate cumulative spending by adding the monthly spending responses estimated from Equation (1) and reported in Figures 2 (panel B), 3 (panel B), 5 (panel B), and 5 (panel D).

dollar spending is somewhat larger in the boom, though not significantly so. Heterogeneity over time thus does not dramatically alter the overall strength of the home purchase channel. We find modest differences in spending responses for homes purchased out of foreclosure and following declining home prices. The spending patterns for distressed transactions are consistent with distressed sellers underinvesting, perhaps due to the agency conflict created by debt overhang (Melzer 2017), and the subsequent buyers taking up some of those deferred investments. We present and discuss these estimates in greater detail in the Internet Appendix.

2.9 Summary of the cumulative effect of home purchases on spending

Figure 6 summarizes the overall results by showing the cumulative impulse responses of spending to home purchases. As discussed above, the increases in spending on home durables and home improvement and maintenance following purchase significantly exceed the declines in spending on nonhousing categories. Cumulatively, the increase in home-related spending from 3 months before purchase until 2 years after is $8,230, which is made up of spending on home improvements ($5,780) and on home durables ($2,450). The cumulative decline in nonhousing spending is $4,530, split nearly equally between spending reductions of $2,620 on nondurables and services and $1,910 on nonhome durables. Net spending therefore increases by an average of $3,700 per home purchase.

3. The Aggregate Effect of the Home Purchase Channel from 2000 to 2011

In this section, we assess how much the home purchase channel contributed to changes in consumption in the housing boom from 2001 to 2005 and the ensuing

bust from 2005 to 2011. To do so, we compare the change in consumption that one would predict by multiplying the change in home sales by our preferred estimates of the effect of a home purchase on consumption in each category to the actual change in consumption in that category in the CE. This provides a simple, partial equilibrium accounting, similar to the literature on housing wealth effects, that assesses how much of the observed change in consumption can be accounted for by the home purchase channel.[6]

To create the national time series for consumption and home improvement and maintenance, we aggregate the CE expenditures using the provided sample weights. We do not use NIPA aggregates because of the difficulty in measuring expenditures on home maintenance, repair, and improvements, which NIPA splits among residential investment, "other services" in personal consumption and "imputed rent" in personal consumption. We deflate subcategories of durable consumption by their subcategory CPI deflator and subcategories of improvement and maintenance by their NIPA deflator.[7] For home sales, we use non-seasonally-adjusted data on existing home sales for the entire U.S. from the National Association of Realtors together with monthly, non-seasonally-adjusted data on sales of new homes from the Census Bureau. We multiply the monthly time series by our preferred estimates of average dollar spending in the 3 months before purchase, the month of purchase, and each of the following 24 months and then aggregate the implied time series to the annual level. In this calculation we use our estimates of spending responses to all home purchases, not just the purchase of primary residences. Because we did not find significant differences for the boom and bust in dollars spending in the heterogeneity analysis, we use our baseline estimates for this calculation. Next, we take differences between 2001 or 2002 and 2005 for the boom as well as from 2005 to 2008–2011 for the bust. We then divide this change by the actual change in the aggregate consumption time series for the same category created using the CE microdata and weights, which gives us the percentage of the aggregate change explained by the home purchase channel. We use 2005 as our base year since home sales peaked in 2005.

The results in Table 6 show that the home purchase channel explains a meaningful portion of the rise and decline in home-related spending in the 2000s. Column 1 of Table 6 shows that the home purchase channel accounted

[6] One may worry that our effects overstate the aggregate consumption change because some durables consumption is canceled out in the aggregate by sales of durables. However, the CE asks whether households have received "money from the sale of household furnishings, equipment, clothing, jewelry, pets, or other belongings" over the prior 12 months, and we find no evidence that this income increases around a home purchase. We thus conclude that our estimates do not overstate the aggregate change in consumption.

[7] The use of category-specific deflators affects the estimated change in aggregate real spending on home durables, because those goods experienced meaningful price deflation between 2001 and 2010, in contrast to modest overall price inflation in the CPI-U and the NIPA deflator for home improvements. As a result, the category-specific deflator implies a larger aggregate increase in real spending on home durables in the boom and a smaller aggregate decrease in real spending in the bust. Using category-specific deflators has little to no impact on the estimated impact of home purchases on spending.

Table 6
Aggregate effect of home purchase channel in Great Recession

	Home durables (%)	Home improvements and maintenance (%)	Nonhome durables (%)	Total durables, improvements, and maintenance (%)
2001–2005	7.8	19.4	0.3	7.9
2002–2005	8.0	25.6	0.5	10.1
2005–2008	37.2	43.1	0.3	17.2
2005–2009	21.5	33.5	0.8	16.4
2005–2010	30.7	31.5	0.2	13.5
2005–2011	36.2	33.7	0.6	16.2

Each cell reflects the fraction of the total change in a consumption category for a given time period explained by the home purchase channel, computed by multiplying the change in home sales for the time period by our preferred estimate of the dollar amount of consumption associated with a home purchase. For the preferred estimate and the consumption time series used in the denominator, the CE data are deflated by a category-level deflator from the CPI (for durables) or NIPA (for home improvements as well as maintenance, which does not have its own deflator). This is done at the monthly level and aggregated to the annual level. Each column reflects a consumption category, while each row reflects the time period over which changes are computed. The data on the total change in a consumption category for a given time period are aggregates computed with the CE data using CE sample weights. The sales series is created by combining National Association of Realtors (NAR) data on existing home sales with Census data on sales of new single-family homes, both taken from FRED (note that the NAR data are no longer on FRED but can be obtained from the NAR).

for about 7.8% to 8.0% of the growth in spending on home durables during the boom. During the subsequent bust, the home purchase channel contributed 21.5% to 37.2% of the decline in spending on home durables. Column 2 shows a similarly large effect on home improvements and maintenance spending. The home purchase channel accounted for 19.4% to 25.6% of the spending growth in the boom and 31.5% to 43.1% of the spending decline in the bust. The impact of the home purchase channel was more meaningful in the bust for two reasons. First, home sales fell more in the bust than they rose in the boom. Second, home durables consumption and, to a lesser extent, improvements grew by more in the boom than it shrank in the bust, so the denominator is bigger in the boom than the bust. Said otherwise, the home purchase effect during that period was relatively less important than other consumption drivers, such as changes in income, wealth, and credit availability.

The categories of spending affected by the home purchase channel are only part of overall durables and home improvement spending. Column 3 of Table 6 shows that the home purchase channel has minimal effect on nonhome durables spending. Column 4 shows the overall effect on total durables plus home improvements and maintenance. In the boom, the aggregate effect on total durables and improvements was 7.9% to 10.1% when spending on maintenance and improvements is added. In the bust, the effect was 13.5% to 17.2%. Note that these figures are likely underestimates for the impact of home transactions on maintenance and improvements spending, because the CE design precludes us from accounting for improvements made by sellers in order to market and sell their house.

To provide a sense of the magnitude of the aggregate effect of the home purchase channel, we calculate the lost spending attributable to declining home sales between 2005 and 2010. The average home purchase, whether

owner-occupied, second home or investment property, triggers net spending of $7,866 on durables, home improvement, and maintenance from 3 months before purchase to 2 years after purchase.[8] Relative to 2005, the rate of home sales declined by an average of 2.92 million units per year between 2006 and 2010. This implies an annual decline in spending of approximately $23 billion, or approximately 0.15% of gross domestic product (GDP). As a yardstick for comparison, Mian, Rao, and Sufi (2013) find that home equity fell by $5.6 trillion from 2006 to 2009 and find a marginal propensity to consume (MPC) metric out of housing wealth of 5.4%, implying a total decline in consumption of $302.4 billion, with $128.8 billion accounted for by autos, $89.6 billion by nondurables, and $61.6 billion by nonauto durables. In annual averages, their estimates imply a total decline in consumption of $100.8 billion and a non-auto-durable decline of $20.5 billion. Our annual effect of $23 billion is thus as large as wealth effect for nonauto durables. The housing wealth channel therefore has a broader and larger impact on overall consumption, but the home purchase channel is of similar importance for *home-related* spending.

4. Comparing the Effects of Home Purchases and Home Values on Consumption Using City-Level Spending

To benchmark the home purchase channel relative to the more-widely-studied housing wealth effect channel, we carry out an analysis of aggregate, city-level spending and home purchases and compare the responses of spending to house prices and house purchases. We use data on retail sales from the Economic Census, which collects the annual sales of all businesses every 5 years. The most recent three surveys provide data for 2002, 2007, and 2012. These dates correspond roughly to the beginning, peak, and trough of the housing cycle. We focus on sales in home-related goods, which include sales by furniture, electronics and appliances, and building supplies stores.

We measure the elasticity of spending to both home purchases and home values at the CBSA level over these 5-year horizons. To parse the separate effects of home purchases and home values, we estimate multivariate regressions that rely on variation in housing cycles across CBSAs to separately identify the effects of home purchases and home values.

Our methodology is similar to the ordinary least squares (OLS) regressions in Mian, Rao, and Sufi (2013), who measure the elasticity of spending to housing wealth at the county level over a 3-year horizon (2006 to 2009). We estimate elasticities over 5-year horizons using the following model:

$$\Delta(log\ Spending)_{ct} = \alpha + \beta\,\Delta log(Home\ Purchases)_{ct-1} + \gamma\,\Delta Log(Home\ Price\ Index)_{ct-1} + \delta_t + \varepsilon_{ct}, \qquad (4)$$

[8] The incremental spending on a newly purchased home is slightly smaller for vacation and investment properties than for owner-occupied homes. Thus, the incremental spending of $7,866 on the average purchase is slightly less than incremental spending of $8,230 on the purchase of a primary residence.

Table 7
Elasticities of home-related retail spending to home purchases and home prices

	Dependent variable: Δ *log (Home-related retail spending)*	
Time period:	2002–2007	2007–2012
Δ *log (home purchases)*	0.26***	0.12***
	(0.06)	(0.02)
Δ *log (home price index)*	0.29***	0.23***
	(0.03)	(0.04)
Year fixed effects?	Y	Y
N	246	267
R^2	.44	.28

This table reports jointly estimated elasticities of home-related spending to home purchases and home prices. The spending data come from the 2002, 2007, and 2012 Economic Censuses, which report annual retail spending at all home improvement and home furnishing stores within a metropolitan area. The data on home purchases and home prices, which are also at the metropolitan area level, come from CoreLogic. We measure real spending and real home prices in 2012 dollars, using the CPI-U as the price deflator. We estimate the model with ordinary least squares, weighted by population, and cluster observations by metropolitan area when calculating standard errors, which are reported in parentheses. ***$p < .01$.

where the dependent variable is the 5-year change in log annual retail sales in CBSA c as of year t. We use data from CoreLogic to measure the annual volume of home purchases and the year-end CoreLogic home price index for prices. We compute these measures for the year $t-1$, to examine spending that occurs subsequent to the changes in home purchases and home prices. Similar to the dependent variable, we take 5-year changes in log home purchases and the log home price index. The coefficients β and γ therefore measure the elasticities of spending on home purchases and home prices, respectively, and are separately identified by differences in the time series patterns of purchases and prices. We include year fixed effects (δ_t) to absorb changes in spending common to all metropolitan areas over each 5-year period. We estimate the model using ordinary least squares with population weights and clustering by metropolitan area for the calculation of standard errors. Our estimation sample includes an observation for 246 CBSAs with the requisite spending and housing data in 2007 and 267 CBSAs with the requisite data in 2012.

The model estimates, reported in Table 7, show significant positive elasticities of home-related spending to both home purchases and home prices. In the housing boom, between 2002 and 2007, the elasticities of spending to home purchases and home prices are 0.26 ($p < .01$) and 0.29 ($p < .01$), respectively. In the subsequent housing bust, between 2007 and 2012, the elasticities of spending to home purchases and home prices decline somewhat to 0.12 ($p < .01$) and 0.23 ($p < .01$), respectively. Our estimates for the elasticity of spending to home prices are slightly high relative to the range of 0.13 to 0.26 implied by Mian, Rao, and Sufi (2013).[9] This difference makes sense because their

[9] Berger et al. (2018) calculate this range of elasticities after rescaling the reported elasticity of spending to housing net worth shocks into an elasticity of spending to home price changes.

analysis considers all consumption expenditures whereas ours examines home-related spending on which households spend disproportionately when housing wealth increases.[10] In quantifying the total impact of the home purchase and housing wealth channels, one must consider also the size of the "shock" to purchases and housing wealth. The 50% decline in home purchases during the housing bust (Figure 1) was five times larger than the 10% decline in housing net worth (Mian, Rao, and Sufi 2013) during that time. In summary, our aggregate elasticity estimates provide complementary evidence that helps to benchmark the strength of the home purchase channel relative to the more-studied housing wealth effect and underscore our main conclusion that the home purchase channel is important and complementary to housing wealth effects.

5. Conclusion

This paper describes and quantifies a new channel for the causal relationship between housing markets and spending: the home purchase channel. In the months before and in the year following a home purchase, households spend roughly $8,000 on home-related durable goods, improvements, and repairs. Our main analysis relies on an event-study design that includes household-level fixed effects, so that all identification comes from a variation within households before and after a home purchase. To address concerns that the spending is caused by an event that triggers a home purchase rather than the home purchase itself, we show that there is no related increase for nonhome spending. Indeed, nonhome spending declines modestly but offsets only a portion of the home-related spending induced by home purchases.

The home purchase channel played a quantitatively sizable role in the Great Recession and a more modest role in the prior housing boom. It accounted for one-third of the decline in spending on home durable goods, home improvements and home maintenance during the Great Recession. A back-of-the-envelope calculation implies that the home purchase channel accounted for a $23 billion, or about 0.2% of GDP, decline in spending per year in the Great Recession. This decline is equivalent to the roughly $20 billion decline in non-auto-durable spending due to the decline in housing wealth during the Great Recession. Relative to the housing wealth channel that has been the focus of recent literature (e.g., Mian, Rao, and Sufi 2013), the home purchase channel is of similar importance to home-related spending but of smaller importance to overall spending.

Beyond understanding the mechanisms connecting the housing market and spending in the Great Recession, our estimates are of relevance to

[10] Mian, Rao, and Sufi (2013, figure IV of their paper) report separate marginal propensities to consume (MPC) out of housing wealth. The category "other durables," which includes purchases at furniture, home appliance, and home center stores, accounts for one-fifth of the MPC out of housing wealth. The fact that this share of MPC far exceeds homeowners' expenditure shares in these categories (generally less than 10%) implies an above-average elasticity of home-related spending to housing wealth.

policymakers. Monetary policy can substantially affect housing transaction volume through mortgage interest rates. Our estimates are a crucial input for monetary policymakers who wish to understand the effect of home purchases on consumption and residential investment. In addition, our figures are a crucial input into the cost-benefit analysis for fiscal policymakers interested in pursuing policies designed to stimulate home sales, such as the new homebuyer tax credit in the Great Recession (Berger, Turner, and Zwick 2020). Moreover, local policies that affect home transactions, such as transactions taxes, may have significant effects on local spending on durables and remodeling even in the absence of home price changes.

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