House Price Expectations and Consumer Spending*

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September 2023

ABSTRACT

House price expectations significantly influence households' consumption decisions. Using experienced price growth (a weighted average of past price growth in local housing markets) as the expectation measure, I find that a one-standard-deviation increase in house price expectations leads to a 2% to 6% increase in real household spending. Results hold when using the experienced price growth of geographically distant relatives as an instrument. I further document no significant difference between the spending propensity of homeowners and renters exposed to the same level of experienced price growth, thus distinguishing the expectations channel from housing wealth and collateral channels.

JEL classification: D12, E32, G50, R31.
Keywords: *House prices; Experienced Price Growth; Consumption; Extrapolative expectations*

* *Job Market Paper.* I thank Zhengyang Xu and Junbo Wang for their constant guidance and support. I also thank Yaxuan Qi, Qianqian Huang, David Yilin Yang, Shan Zhao, James O'Donovan, Will Liu, Xueping Wu, Yue Ma and seminar participants at the City University of Hong Kong for their helpful comments. Some of the data used in this analysis are derived from Restricted Data Files of the Panel Study of Income Dynamics, obtained under special contractual arrangements designed to protect the anonymity of respondents. These data are **not** available from the author. Persons interested in obtaining PSID Restricted Data Files should contact PSIDHelp@umich.edu.

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I. Introduction

House price fluctuations determine household consumption decisions, mainly through the housing wealth and collateral channels.[1] As a result, global business cycles often witness a joint movement of house prices and household consumption. A recent experience was when the dynamics of house prices and household consumption of the G7 economies peaked in the mid-2000s before slumping during the global financial crises (Adam, Kuang, and Marcet (2012)). The extant literature attributes fluctuations in house prices to households' optimism and pessimism about future house price growth.[2] Since expectations play a crucial role in households' choices in the presence of uncertainty, a natural question that arises is, thus, whether house price expectations explain households' consumption decisions.

Recent studies suggest that individuals form expectations from the experiences of past macroeconomic data (Malmendier and Nagel (2011, 2016)). Nascent studies on the housing market support this by showing that households' local house price experiences predict their survey expectations of future house price growth (Armona, Fuster, and Zafar (2019), Kuchler and Zafar (2019)). To introduce the expectations channel as a potential determinant of household consumption, I examine whether households rely on past experiences of local house price growth when making consumption decisions. If there is a significant relationship between past house price experiences and household consumption, it would broaden our understanding of households' financial and economic decisions and also help us understand a macroeconomic phenomenon that standard life-cycle consumption models struggle to explain. In particular, why were consumers sluggish in returning to pre-recession consumption levels after the Great Recession despite rebound-

[1] See, for example, Case, Quigley, and Shiller (2005); Campbell and Cocco (2007); Gan (2010); Mian, Rao, and Sufi (2013); Kaplan, Mitman, and Violante (2020); and Guren, McKay, Nakamura, and Steinsson (2021) for evidence on the housing wealth channel, and Aladangady (2017); Berger, Guerrieri, Lorenzoni, and Vavra (2018); Chen, Michaux, and Roussanov (2020) for evidence on the collateral channel.

[2] Shiller (2007); Piazzesi and Schneider (2009); Adam et al. (2012); Burnside, Eichenbaum, and Rebelo (2016); Glaeser and Nathanson (2017); Kaplan et al. (2020); and DeFusco, Nathanson, and Zwick (2022).

ing balance sheets (Petev, Pistaferri, and Saporta-Eksten (2011))? Do past house price experiences influence households' expectations and, therefore, their consumption decisions? Understanding the economic mechanisms that influence changes in household consumption is crucial for guiding fiscal policymaking.

In this paper, I hypothesize that experienced price growth (*EXPR*), measured as an exponentially weighted average of past price growth in local housing markets, influences household consumption through the expectations channel. Precisely, I show that after controlling for wealth, income, and other determinants of household consumption, households spend significantly more (less) on nondurables and services when they have experienced higher (lower) house price growth in their county of residence. To isolate the expectations channel from the established channels of housing wealth and collateral and other unobserved local time-varying confounds, I leverage plausibly exogenous variations in the *EXPR* of extended family households in geographically distant (i.e., out-of-county) housing markets. I further distinguish the expectations channel by documenting that homeowners' spending propensity is similar to renters with the same level of *EXPR*.

To study the effect of *EXPR* on household consumption over time, I use microdata from the Panel Study of Income Dynamics (PSID). The PSID data is well-suited for this study for several reasons. First, the PSID data has a longitudinal panel dimension that allows me to study the relation between *EXPR* and household consumption while controlling for unobserved differences in household characteristics. Second, the PSID data includes information on wealth, an essential variable in consumption analysis, thus allowing me to directly control for household wealth. Third, the PSID data allows me to explore the effect of *EXPR* on both homeowners and renters. Based on the discussion above, I expect no difference in spending propensity between homeowners and renters with the same *EXPR*. Fourth, the PSID collects information on household location in each survey year; this allows me to compute *EXPR* by combining these data with the local-level house price index produced by Bogin, Doerner, and Larson (2019), which is available at the Federal Housing Finance Agency (FHFA) website.[3] Fifth, the PSID survey follows family members who split off to form their newly economically independent households; thus, I can generate plausibly exogenous variation in *EXPR* using the *EXPR* of extended family households in geographically distant housing markets.

After controlling for household-specific factors, observed local time-varying economic conditions, and unobserved time-invariant household and local characteristics, my baseline analysis reveals a significant positive relationship between *EXPR* and household spending. Cross-sectional analysis reveals that a one-standard-deviation increase in *EXPR* leads to a 6.3 percentage points increase in household spending, corresponding to an average increase of approximately US$2,163 in real annual spending.[4] Time-series analysis reveals that a one-standard-deviation increase in within-household *EXPR* leads to a 1.6 percentage points increase in household spending, corresponding to an average increase of approximately US$536 in real annual spending. These results are robust to an array of checks, such as the inclusion of immigrant households in the sample and applying the PSID core/immigrant family weight, use of alternative local measures of *EXPR* such as *EXPR* constructed with ZIP code and state-level house price index, the inclusion of $region \times year$ fixed effect to control for census–regional time-varying economic conditions, and the use of alternative clustering unit for standard errors. The results are also robust to using only household food expenditure as the consumption measure.

In the baseline analysis, unobserved local time-varying factors such as local income expectations could drive both *EXPR* and household consumption, which might confound the interpretation of the estimates. To alleviate this endogeneity concern, I exploit only the variation in *EXPR* orthogonal to local time-varying confounds. Specifically, I instrument for the *EXPR* of a household with the *EXPR* of its extended family members in

[3] Using house price expectation data from the Survey of Consumer Expectations (SCE), I show that the constructed expectation measure, *EXPR*, significantly and positively comoves with individuals' national house price expectations, consistent with Kuchler and Zafar (2019).

[4] All monetary values are in 2019 U.S. dollars.

geographically distant housing markets. This strategy alleviates the additional concern that the spending decisions of homeowners who reside in high-price growth localities might also be influenced by local house price growth through the wealth or collateral channels. Thus, in additional tests, I show that the exclusion restriction is plausibly satisfied with my IV not affecting household consumption through other channels, such as household wealth or borrowings. Reassuringly, the results from the IV strategy are slightly more substantial than those from the baseline analysis. In particular, a cross-sectional one-standard-deviation increase in instrumented *EXPR* leads to a 7.3 percentage points increase in household spending, corresponding to an average increase of approximately US$2,680 in real annual spending. In the time-series analysis, a within-household one-standard-deviation increase in instrumented *EXPR* leads to a 2.0 percentage points increase in household spending, corresponding to an average increase of approximately US$715 in real annual spending. These results are also robust to using only household food expenditure as an alternative consumption measure and controlling for economic conditions in the counties where the household has extended family members.

Although unlikely, the interpretation of the IV results might be confounded if there is risk sharing, such as joint mortgages, between households and the homeowners within their geographically distant family network. Similarly, suppose households expect to inherit a house from their geographically distant family members. In that case, growth in house prices in the counties of geographically distant family members who are homeowners might influence household consumption through the expected bequest channel. As a result, any confounding effect due to risk-sharing and expected bequests should lead to a stronger relationship between instrumented *EXPR* and consumption for households with homeowners within their geographically distant family network. However, in a robustness check, the effect of instrumented *EXPR* on household spending is not significantly different for households with homeowners in their geographically distant family network. If anything, the effect is more pronounced among households whose geographically distant family members rent. This finding suggests that risk sharing between households and geographically distant family members who own homes and expected bequests cannot explain my findings.

To further rule out alternative explanations for the main results, I examine spending heterogeneity by housing cycle and household characteristics. First, I find no evidence of asymmetry in the effect of *EXPR* on household consumption. Thus, exposure to negative versus positive *EXPR* does not systematically affect household spending. Second, I find no significant difference in the effect of *EXPR* on household consumption between households whose head has some college education and other households. Third, I examine whether the effect of *EXPR* is age-dependent, as suggested by studies on lifetime experience-based learning (Malmendier and Nagel (2011, 2016)), or non-age-dependent, as suggested by studies on extrapolative experience-based learning (Armona et al. (2019), Kuchler and Zafar (2019)). I find no evidence of different spending propensities between young, middle-aged, and older households. This finding suggests that the effect of *EXPR* on household spending is the result of extrapolative expectations.

Finally, I explore whether the effect of *EXPR* on spending differs between homeowners and renters. In addition to the IV approach, the homeownership heterogeneity analysis helps rule out concerns about housing wealth and collateral channels. Unlike renters, homeowners' spending is sensitive to house price growth through the housing wealth and collateral channels. If these channels underlie the effect of *EXPR* on spending, higher *EXPR* should stimulate homeowners' spending but have no effect on renters' spending. However, if the expectations channel underlies the observed effect, higher *EXPR* should stimulate homeowners' spending due to their optimistic beliefs about future house price gains. For renters, however, the direction of the expectations channel is unclear ex-ante. On the one hand, higher *EXPR* renters may anticipate expensive future homeownership and be discouraged from saving towards purchasing a house (i.e., the discouragement effect (Engelhardt (1994))) and would, therefore, have more to spend on current consumption. On the other hand, higher *EXPR* renters may anticipate expensive future homeownership and might decrease their current consumption to finance the purchase of a house before doing so becomes less affordable (i.e., the fear of missing out). My results show that both homeowners and renters significantly increase their spending in response to an increase in *EXPR*, suggesting that house price expectation is the mechanism underlying my findings. These results are robust to using a sample of households who have not recently changed their homeownership status and to using food expenditure as an alternative consumption measure.

Overall, the above findings point to the crucial role of house price expectations in households' consumption decisions, and the effect is economically remarkable for both homeowners and renters. Although a thorough examination of why household consumption would respond to house price expectations is beyond the scope of this paper, for homeowners, the effect can be attributed to optimism or pessimism about future house price gains. For renters, expectations of higher house price growth may discourage them from saving toward home purchases, leaving them with more resources for current consumption. An important question for future research is whether this spending behavior of renters explains the homeownership decline by first-time buyers in U.S. regions with higher price growth (Mabille (2022)).

This paper contributes to two growing strands of the literature. First, it contributes to the strand analyzing the relationship between house prices and household consumption. Research shows that house price growth impacts household consumption through the housing wealth channel (see, for example, Case et al. (2005); Campbell and Cocco (2007); Attanasio, Blow, Hamilton, and Leicester (2009); Gan (2010); Mian et al. (2013); Kaplan et al. (2020); and Guren et al. (2021)) and via the collateral channel (see, for example, Mian and Sufi (2011); Aladangady (2017); Berger et al. (2018); DeFusco (2018); and Cloyne, Huber, Ilzetzki, and Kleven (2019)). However, the slow recovery of household expenditures to pre-recession levels following the Great Recession, despite improvement in households' net worth, income, and employment prospects, challenges these traditional explanations of life-cycle consumption (Petev et al. (2011)). These observations elicit questions about other potential determinants of household consumption. I contribute to the literature by showing that when households are optimistic (pessimistic) about future house price growth due to their recent past house price experiences, they tend to increase (decrease) their spending significantly. The housing wealth and collateral channels affect only homeowners' decisions, but the expectations channel has a similar substantial effect on both homeowners and renters.

Second, this paper contributes to the macro-finance literature on experience effect. Macroeconomic or personal experience with economic variables can influence, for example, risk-taking in the stock markets (Kaustia and Knüpfer (2008); Malmendier and Nagel (2011)), inflation expectations (Malmendier and Nagel (2016)), stock return predictability, and subjective expectation errors (Nagel and Xu (2022)), home price and unemployment expectations (Armona et al. (2019); Kuchler and Zafar (2019); Kindermann, Le Blanc, Piazzesi, and Schneider (2021)), home search behavior (Gargano, Giacoletti, and Jarnecic (2020)), home tenure decisions (Malmendier and Steiny (2018)), and loan pricing decisions (Carvalho, Gao, and Ma (2023)). This paper is related to Malmendier and Shen (2018). Specifically, it shares a focus on the effect of within-household variation in experience on household consumption. In contrast to Malmendier and Shen (2018), who study individuals' lifetime labor market experiences, I focus on households' recent experiences in local housing markets. This allows me to identify experience-based house price expectations' importance in household consumption decisions.

The rest of this paper proceeds as follows. Section II describes the data sources, the construction of the variables, and the summary statistics. Section III presents the identification strategies and the results of the effect of *EXPR* on household consumption. Section IV explores the various patterns of heterogeneity in response to *EXPR*, and Section V concludes the paper.

II. Data and Measurement

I use data from the PSID, the FHFA house price index constructed by Bogin et al. (2019),[5] and the Survey of Consumer Expectations (SCE) administered by the Federal Reserve Bank of New York. My main sample corresponds to the period from 1999 to 2019.

A. The PSID Data

Household-level microdata on consumption, wealth, income, residence location, and head-of-household demographics are from the PSID. The PSID is a longitudinal survey conducted annually from 1968 to 1997 and biennially thereafter. The survey follows households in the U.S., and the initial sample comprised about 5,000 household units. In subsequent surveys, children from the households in the initial sample are followed after starting new households. Since 1999, the survey has included household wealth and a substantial amount of information on consumption, such as expenditures on childcare, education, healthcare, housing, transportation, and utilities, in addition to the previous coverage on food expenditure, which comprises about 70% of the items in the Consumer Expenditure Survey (Andreski, Li, Samancioglu, and Schoeni (2014)). As a result, this study uses information from the 1999 to 2019 PSID waves.

I construct a measure of household consumption using the definition given in Blundell, Pistaferri, and Saporta-Eksten (2016) and Berger et al. (2018): the sum of expenditures on food, healthcare, housing, utilities, car maintenance, gasoline, public transportation, education, and childcare. As some of these components of household expenditure may be mechanically related to local house price growth, I confirm that my analyses are robust to using only food expenditure as an alternative consumption measure.

[5] See https://www.fhfa.gov/PolicyProgramsResearch/Research/Pages/wp1601.aspx

Using the definition given in Kaplan, Violante, and Weidner (2014), I construct two separate wealth control variables: liquid and illiquid. Liquid wealth includes the sum of shares of stock in publicly held corporations, mutual funds, and investment trusts and money in checking or savings accounts, money market funds, certificates of deposit, government savings bonds, and treasury bills, net of the value of liquid debt such as credit card charges. Illiquid wealth includes the value of net home equity, other real estate holdings, net vehicles, bonds, life insurance policies, and money in private annuities or individual retirement accounts (IRAs).[6]

I further construct a control variable for household income. The income variable includes the taxable income, transfer income, and social security income of the head, spouse, and other household members. I include income data from the 1997 wave to control for lagged income.

In addition, I obtain demographic data on the household head and annual household location data. The head demographic control variables include household size and the head's age, marital status, race (white, African-American, or other), sex, employment status, education level, and homeownership status. The households' location at the ZIP code and county level is obtained through a confidential data agreement with the PSID. My main analyses use the county-level geocode information to match the PSID households to their county-level house price index.

A.1. Sample Restrictions and Summary Statistics

The final sample consists of the PSID core sample households with heads aged 25 to 75.[7] To reduce measurement errors in the household income and wealth variables, I

[6]Missing values for the consumption expenditure and the wealth subcomponents are set to zero before the summation. Nonpositive values for the liquid and illiquid wealth controls are adjusted by adding the absolute value plus 0.1 before taking logarithm values. In unreported results, I confirm that my analyses are robust to using an inverse hyperbolic sine transformation of the liquid and illiquid wealth controls.

[7]The PSID core sample comprises the Survey Research Center (SRC) national sample and the Census Bureau's Survey of Economic Opportunities (SEO) sample. In 1997, 1999, and 2017, the PSID added post-

follow Kaplan et al. (2014) and Blundell et al. (2016) and drop households with income growth exceeding 500%, income growth falling more than 80%, or income below $100 in a given year, and observations with total wealth exceeding $20 million. I also drop households with missing demographic information. To mitigate potential confounding effects from households that self-select into localities with different characteristics, I restrict my sample to households who did not change their residential location over the past four years, which they are assumed to learn and recall their local house price growth (i.e., the experience horizon).

Table I provides the summary statistics of the baseline sample. The sample includes 33,995 household–year observations for 6,357 unique households. These households reside in 923 unique counties across the 50 U.S. states and the District of Columbia. The variables in monetary terms are presented in 2019 U.S. dollars, and the sample is not weighted.[8] Panel A of Table I shows that the average real annual household consumption is US$40,148, and the average log consumption is 10.412.

Table I, Panel B summarizes the household-level characteristics. The average household in the sample has a real annual income of US$100,820, a real liquid wealth of US$59,980, a real illiquid wealth of US$228,690, and approximately three members.

Table I, Panel C summarizes the characteristics of the household heads. Their average age is about 49 years, 75% own their homes, 57% completed college, 97% are employed, 32% are African American or Black, 60% are white, 66% are married, and 75% are males.

Table I, Panel D summarizes the characteristics of the counties where the households reside. The average county-level unemployment rate and real house price growth are 6% and 4%, respectively.[9]

1968 immigrants to make the sample representative of the U.S. population. The immigrant sample is added to the core sample as a robustness check in Table IV, Columns (1) and (2).

[8]The consumption, income, and wealth values are deflated to their U.S. dollar values in 2019 using the "all items" Consumer Price Index (CPI) data produced by the Bureau of Labor Statistics (BLS). See https://data.bls.gov/cgi-bin/srgate.

[9]County unemployment data are obtained from the BLS: https://www.bls.gov/lau/tables.htm.

Table I
Summary Statistics—Baseline Sample

This table reports the summary statistics of the households in the baseline sample, using the PSID data from 1999 to 2019 and county-level house price data from Bogin et al. (2019). *EXPR* is measured as shown in equation (1). The other variables are discussed in Section II.A. The values are annual and not weighted. The variables presented in monetary terms are in 2019 U.S. dollars.

	Mean	Median	SD	P25	P75	N
Panel A: Main Variables						
Consumption ($1000s)	40.148	33.330	28.834	22.830	48.966	33995
Consumption (log)	10.412	10.414	0.617	10.036	10.799	33995
EXPR (log)	0.041	0.043	0.063	0.005	0.075	33995
Panel B: Household Characteristics						
Household Size	2.84	3.00	1.43	2.00	4.00	33995
Total Income ($1000s)	100.82	78.29	124.52	44.50	125.14	33995
Liquid Wealth ($1000s)	59.98	0.65	341.80	-0.79	19.61	33995
Illiquid Wealth ($1000s)	228.69	88.36	1146.63	15.36	251.50	33995
Total Wealth ($1000s)	288.67	92.39	1258.32	13.71	292.95	33995
Panel C: Head Characteristics						
Age (years)	48.96	49.00	12.41	39.00	58.00	33995
Homeowner	0.75	1.00	0.43	1.00	1.00	33995
College	0.57	1.00	0.49	0.00	1.00	33995
Employed	0.97	1.00	0.18	1.00	1.00	33995
African-American	0.32	0.00	0.47	0.00	1.00	33995
White	0.60	1.00	0.49	0.00	1.00	33995
Married	0.66	1.00	0.47	0.00	1.00	33995
Male	0.75	1.00	0.44	0.00	1.00	33995
Panel D: County Characteristics						
Unemployment (log)	0.06	0.05	0.03	0.04	0.07	33995
Real house price growth (log)	0.04	0.04	0.08	0.00	0.07	33995

B. Measuring House Price Expectations

To measure the house price expectations of households participating in the PSID, I compute *EXPR* following the literature on experience-based expectation formation. I use the historical county-level house price index constructed by Bogin et al. (2019), available on the FHFA website. This index is a repeat sale index and thus captures changes in house prices unrelated to changes in the property's characteristics.[10] I construct an annual household-level panel of county house price growth by linking the households in the PSID to the county-level yearly house price growth corresponding to their county of residence. Due to the biennial nature of the PSID survey since 1997, in every survey gap year, I assume that households reside in the same county as in the subsequent survey year.

To compute *EXPR* in year t, I require annual data on house price growth over the four prior years in the household's county: I assume households learn and recall local house price growth over the past four years, following Kuchler and Zafar (2019). For example, to compute *EXPR* in $t = 1999$, I require data on real house price growth, Δhp, from 1998 to 1995 in each household's county; this requires I include observations starting in 1995. Thus, for 1995 and subsequent years, I observe each household's county of residence and the house price growth associated with that county. Finally, I deflate the house price growth to their real values using the "all items" annual CPI data.

Following the approach in the literature on experiential learning, I capture the four-year history of households' local house price growth realizations in one *EXPR* variable. Malmendier and Nagel (2016) show that if individuals in different birth cohorts learn from their macroeconomic experiences, their average expectations can be approximated by a constant gain learning rule (see, for example, Evans and Honkapohja (2012)). Thus, a constant gain parameter can determine the speed at which the memory of the realized

[10] In my robustness checks, I use ZIP code-level and state-level house price index to compute *EXPR*. The findings are similar to the baseline results.

observation decays. The gain parameter ensures that individuals remember recent observations better than earlier, which aligns with the psychology literature on availability and recency bias (Tversky and Kahneman (1973)). Thus, I compute each household's *EXPR* in year t as the exponentially weighted average of the four prior years' house price growth realizations in her county of residence. Specifically, a household i's house price expectation in year t is measured as $EXPR_{i,t}$, calculated as follows:

$$EXPR_{i,t} = \omega \sum_{s=1}^{S_i} (1-\omega)^s \Delta hp_{t-s,i} \tag{1}$$

where ω is a parameter of the annualized constant gain. I rely on the estimates in Malmendier and Nagel (2016) to set the value of this gain parameter at $\omega = 0.070$ for annual data. $\Delta hp_{t-s,i}$ is the yearly log real house price growth in household i's county in year $t-s$, where s represents how long ago the household realized the house price growth. S_i is the experience horizon of the household: the past four years. I weight a household's county price growth as specified in equation (1) for $s = 1, \ldots, 4$ and normalize the weight to yield a sum of 1.

Table I, Panel A provides summary statistics of *EXPR*. *EXPR* averages at 4.1% and varies substantially among households in the sample, with a cross-sectional standard deviation of 6.3%. Appendix A, Figure A1 further shows that *EXPR* varies substantially even within a given household over time. The standard deviation of the residuals of *EXPR* after absorbing county fixed effects, household fixed effects, and year fixed effects are 3.5%.

Figure 1 additionally plots the time series and cross-sectional variation in the *EXPR* of PSID households living in the four U.S. census regions: North-East, Midwest, South, and West. Figure 1 reveals substantial time-series variation, with the *EXPR* of households in the West reaching a maximum of about 17% during the boom housing market periods and a minimum of approximately -8% during the bust periods. The cross-sectional analysis also reveals substantial variation in *EXPR*, with the *EXPR* of households in the West varying more than that of households in the other three regions.

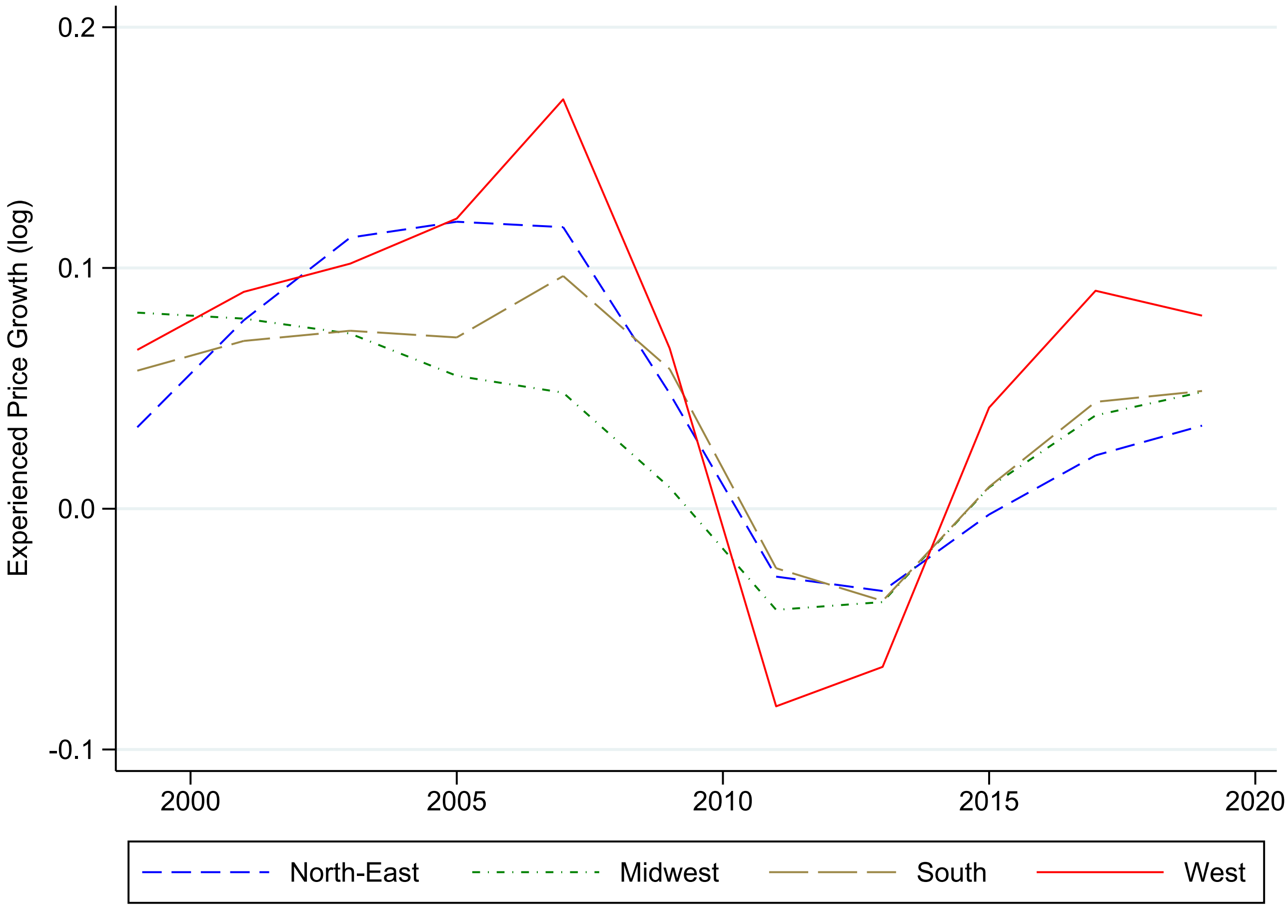


Figure 1. Experienced Price Growth over the Sample Period: The figure shows the experienced price growth (*EXPR*) of PSID households across the four U.S. census regions over the sample period. *EXPR* in year t is measured as the exponentially weighted average of county house price growth during the four prior years.

B.1. Experienced Price Growth and Expectations

Nascent empirical studies on house price expectation formation suggest that individuals extrapolate from their experiences of local house price fluctuations when forming expectations about future national or local house price growth (Armona et al. (2019), Kuchler and Zafar (2019)).[11] The extrapolative experience-based expectation formation is prevalent among both homeowners and renters (Kuchler and Zafar (2019), Kindermann et al. (2021)). Consistent with Kuchler and Zafar (2019), I show that the *EXPR* measure predicts households' national house price expectations. In particular, I show that households who have experienced higher house price growth in their locality than those in other localities remain optimistic about nationwide house price growth. Unlike Kuchler and Zafar (2019), I use publicly accessible house price data and alternative weighting of realized house price growth in computing *EXPR*; therefore, my analysis also verifies their estimate's robustness.

I rely on house price expectations data from the SCE, administered by the Federal Reserve Bank of New York. Since June 2013, the SCE has elicited the national expected percentage growth in U.S. home prices each month. The survey respondents are asked whether they expect the average U.S. home price to increase or decrease over the next 12 months and what percentage growth they expect. To quantitatively predict expectations, I focus on the survey questions that elicit expected percentage changes. I use the most recent observation of each respondent in the survey year. The results are robust to using different observations, such as the second or third-most recent observation reported by respondents in the survey year.

Online Appendix, Table IA.2 reports the summary statistics of the respondents in the SCE. The final sample contains 12,129 observations. The average respondent expects the U.S. national home price to increase 6.28% one year from the survey date. To measure the SCE respondents' *EXPR*, I link respondents to their local house price growth data based on their state of residence codes available in the SCE public release files. I compute *EXPR* as shown in equation (1). The average *EXPR* of respondents is 2%. *EXPR* varies

[11] Theoretical studies on house price expectation formation also elaborate on why expectation formation in the housing market is inconsistent with full rationality but consistent with extrapolation (see, for example, Piazzesi and Schneider (2009), Adam et al. (2012), Burnside et al. (2016), Glaeser and Nathanson (2017), and DeFusco et al. (2022))

substantially, with a cross-sectional standard deviation of about 5%.

To examine the relationship between *EXPR* and respondents' national house price expectations, I estimate the following specification:

$$Expectation_{i,t} = \alpha + \beta\, EXPR_{i,t} + \gamma X_{i,t} + \tau_t + \epsilon_{i,t} \tag{2}$$

where $Expectation_{i,t}$ denotes the one-year ahead expected percentage change in the U.S. national home price as reported by respondents. $EXPR_{i,t}$ denotes the experienced price growth of the respondents. $X_{i,t}$ is a vector of controls consisting of indicators for 11 categories pertaining to the respondent's household income, the logarithm of age, and squared age, as well as indicators of the respondent's gender, marital status, racial status (white, African-American, or other), employment status, homeownership status, and college completion status. τ_t denotes *survey year*×*month* fixed effects.

Table II reports the estimates of the effect of *EXPR* on the one-year-ahead national house price expectations of SCE respondents.[12] Standard errors are clustered at the state level. Column (1) reports the estimate using the most recent observation reported by respondents in the survey year. The estimate yields a coefficient of 12.770, which is economically large and significant at the 1% level. The coefficient implies that a one-standard-deviation increase in *EXPR* increases the respondents' expectations about national house price growth by 0.6 percentage points. The effect is similar to using the second-most recent (see column 2) or third-most recent (see column 3) observations reported by respondents in the survey year.[13] These results suggest that individuals extrapolate from their local house price experience when forming expectations about future national house price growth. This finding helps validate the constructed *EXPR* as a relevant measure of households' house price expectations.

[12] Online Appendix, Table IA.3 presents the results and coefficients of the control variables.
[13] For comparison, Kuchler and Zafar (2019) obtain a similar magnitude of 0.74 percentage points.

Table II

Experienced Price Growth and Expectations

This table reports the estimates of equation (2) for the relation between experienced price growth and national house price expectations, using SCE data and Bogin et al. (2019) state-level house price data. The outcome variable is the expected percentage growth in one-year-ahead national house prices as reported by respondents in survey year t. Columns (1), (2), and (3) report the estimates using the most, second-most, and third-most recent observations, respectively, reported by respondents in the survey year. *EXPR* denotes the four-year exponentially weighted average of overlapping yearly observations of log-real house price growth up to and including year $t-1$ as experienced by respondents in their state of residence, constructed with a weight implied by constant gain learning, with yearly gain ω=0.070. Year×Month fixed effects are included for each survey year and month. The controls include indicators for 11 categories of the respondents' household income, log values of the respondents' age and squared age, and indicators of the respondents' gender, marital status, racial status, employment status, homeownership status, and college completion status. Standard errors are clustered at the state level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

	Expected National House Price Growth (%)		
	Most Recent Obs.	Second-Most Recent Obs.	Third-Most Recent Obs.
	(1)	(2)	(3)
EXPR (log)	12.770***	11.376***	13.181***
	(3.720)	(3.085)	(3.193)
Effect of 1 SD(pp)	0.6	0.6	0.7
Obs.	12129	10025	9077
R^2	0.038	0.042	0.041
Controls	×	×	×
Year × Month FE	×	×	×

III. Empirical Strategy and Results

This paper aims to confirm the hypothesis that house price expectations are a significant determinant of household consumption, using *EXPR* as the expectation measure. To test this hypothesis, I first employ an ordinary least squares (OLS) fixed-effect specification with an array of fixed effects and an extensive set of controls. I next employ an IV strategy by exploiting *EXPR* within the household's geographically distant family network as a source of plausibly exogenous variation in households' *EXPR*. The estimates produced using both strategies confirm my hypothesis.

A. Baseline Specification

To test the hypothesis that *EXPR* influences households' consumption decisions, I estimate the following OLS fixed-effect specification:

$$c_{i,t} = \alpha + \beta\, EXPR_{i,t} + \gamma X_{i,t} + \phi L_{g,t} + \tau_t + \eta_g + \delta_i + \epsilon_{i,t} \tag{3}$$

where the outcome $c_{i,t}$ is the log of household $i's$ real expenditures on nondurables and services in survey year t. The main explanatory variable $EXPR_{i,t}$ represents locally experienced house price growth by household i in its county of residence over the past four years, excluding year t as shown in equation (1). $X_{i,t}$ is a vector of the household-level and head controls, consisting of a log of current and lagged household income, log of current liquid and illiquid household wealth, household size, log of age and squared age of the household head, and indicators of the head's gender, racial status, marital status, employment status, homeownership status, and college attendance status. $L_{g,t}$ denotes a vector of local time-varying factors, consisting of the current county-level unemployment rate and house price growth, to control for county-level time-varying economic conditions that potentially explain household consumption. Controlling for current local house price growth also ameliorates concerns about any mechanical effect between *EXPR* and household consumption.

τ_t represents year fixed effects, η_g represents county fixed effects, and δ_i represents household fixed effects. δ_i removes all time-invariant household characteristics. The inclusion of δ_i also allows me to exploit the time-series variation in *EXPR* within a household. η_g rules out confounding time-invariant characteristics of the county where the household resides, the decision of the household to reside in the county, and county-specific attributes such as local demand factors and the county's economic conditions. τ_t removes common time-series variations in *EXPR* and household consumption. The main coefficient of interest in equation (3) is β, which measures the effect of *EXPR* on household consumption.

A.1. Baseline Results

Table III and Figure 2 present the baseline results for the effect of *EXPR* on household consumption by estimating various versions of equation (3).[14] Standard errors are clustered at the state level.[15] Columns (1) and (2) report estimates in the cross-section. After controlling for year fixed effects, the estimate in column (1) yields a coefficient of 1.642. In column (2), this coefficient is reduced to 1.005 after additionally controlling for observed local time-varying factors and household-level and head characteristics, indicating that local economic conditions and household-specific factors can partially explain differences in consumption behavior. These coefficients are significant at the 1% level and economically large. In terms of economic significance, column (2), for example, implies that a cross-sectional one-standard-deviation increase in *EXPR* is associated with an increase of 6.3 percentage points (6.3 $\times$ 1.005) in household spending, which corresponds

[14]Online Appendix A, Table IA.1 presents the results and coefficients of the control variables.

[15]Table IV, columns (9) to (12) report similar results when standard errors are clustered by county or household. Clustering by county or household, however, yields smaller standard errors.

to an average increase in real annual household spending of approximately US$2,163 ($e^{10.475} - e^{10.412}$).

Table III

Baseline Results

This table reports the estimates of the effect of experienced price growth on household consumption, using PSID data from 1999 to 2019 and the county-level house price index of Bogin et al. (2019). The outcome variable is the log of real expenditures on nondurables and services by household units in survey year t. *EXPR* denotes the four-year exponentially weighted average of overlapping yearly observations of the log-real house price growth up to and including year $t-1$ as experienced by households in their county of residence; this is constructed with a weight implied by constant gain learning, with a yearly gain ω=0.070. Columns (1) and (2) and columns (3) and (4) report estimates in the cross-section and the time series, respectively. Column (1) controls for year fixed effects, and column (2) additionally controls for county-level, household-level, and head characteristics. Column (3) controls for a year, county, and household fixed effects, and column (4) controls for additional county-level, household-level, and head characteristics. The county-level controls include the current local unemployment rate and house price growth. The household-level controls consist of household income, wealth, and household size. Household income includes the log of current and lagged income. Household wealth includes the log of current liquid and illiquid wealth. Nonpositive values for the wealth controls are adjusted by adding the absolute value plus 0.1 before taking the log values. The household-head demographics include the log of the head's age and squared age and indicators of the head's gender, marital status, racial status, employment status, homeownership status, and college attendance status. Standard errors are clustered at the state level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

	Consumption (log)			
	(1)	(2)	(3)	(4)
EXPR (log)	1.642***	1.005***	0.537***	0.454***
	(0.198)	(0.113)	(0.064)	(0.060)
Effect of 1 SD(pp)	10.3	6.3	1.9	1.6
Observations	33995	33995	33995	33995
Adjusted R^2	0.040	0.599	0.762	0.786
Controls				
Household-Level		×		×
Head Demographics		×		×
County-Level		×		×
Fixed Effect				
Year FE	×	×	×	×
County FE			×	×
Household FE			×	×

To alleviate concerns that unobserved heterogeneities might explain the differences in consumer behavior, columns (3) and (4) of Table III and Figure 2 include year, county, and household fixed effects in the specification. These fixed effects absorb common time-series variations between *EXPR* and household consumption and time-invariant county-

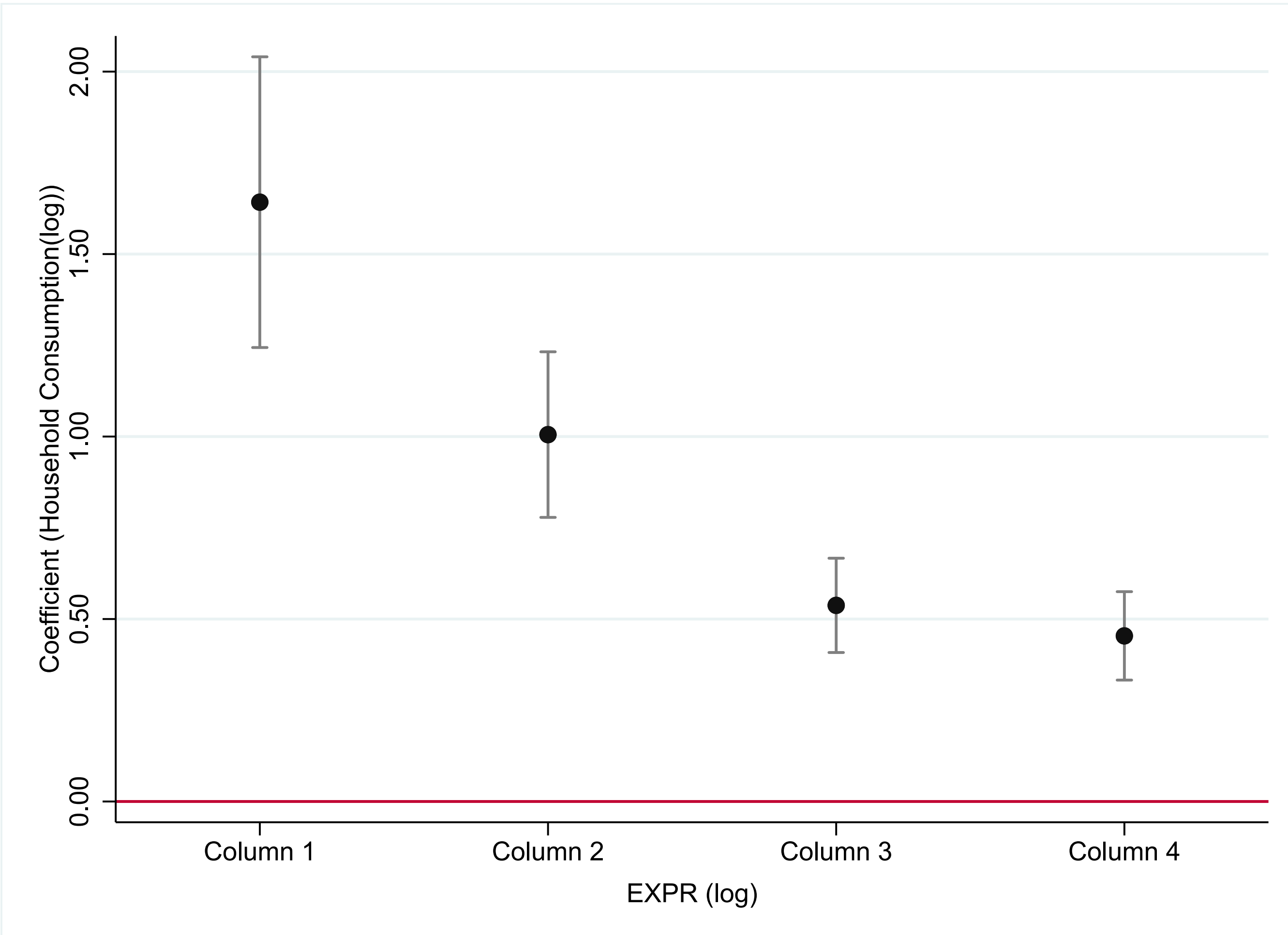


Figure 2. Baseline Results: The graph shows the estimated coefficient with 95% confidence intervals and standard errors clustered at the state level for the relationship between *EXPR* and household consumption. Each column in the graph mirrors the column described in Table III. That is, column (1) controls for year fixed effects, and column (2) controls for additional county-level, household-level, and head characteristics. Column (3) controls for a year, county, and household fixed effects, and column (4) controls for additional county-level, household-level, and head characteristics.

level and household characteristics, respectively. Including only these fixed effects without the observed controls yields an estimated coefficient of 0.537, as shown in column (3). Column (4) presents the results of my strictest specification corresponding to equation (3). The resulting estimate yields a coefficient of 0.454, which is significant at the 1% level. This result implies that a within-household one-standard-deviation increase in *EXPR* (a change of 0.035) is associated with a 1.6 percentage point increase (3.5×0.454) in household spending, which corresponds to an average increase in real annual household spending of approximately US$536 ($e^{10.428} - e^{10.412}$).

Overall, the baseline results support the hypothesis that households increase their spending as they experience increased price growth in their local housing market, and this effect is economically meaningful.[16]

A.2. Robustness of the Baseline Results

Table IV establishes the robustness of the baseline findings. First, the results are robust to the use of the combined PSID core and immigrant samples and application of the core/immigrant family weight while additionally controlling for census–region time-varying economic conditions by including *region*×*year* fixed effects in equation (3) (see columns (1) and (2)). Second, the results are robust to using alternative local levels of *EXPR*, such as *EXPR* in the household's ZIP code (columns (3) and (4)) or state (columns (7) and (8)) of residence, while controlling for census–region time-varying economic conditions. Third, the baseline results are robust to including *region*×*year* fixed effects in equation (3) (see columns (5) and(6)). Fourth, the baseline results are robust to the use of alternative standard error clustering units, such as clustering by county (columns (9) and (10)) or by household (columns (11) and (12)) rather than by state. Clustering by county or household yields coefficients similar to the baseline analysis but with smaller standard

[16] The economic magnitude is comparable to the findings in the literature on the effect of labor market experience on household consumption. In particular, Malmendier and Shen (2018) estimate an economic magnitude in the range of $344 to $708.

Table IV

Robustness

This table reports robustness tests to the baseline analysis for the effect of *EXPR* on household consumption. Columns (1) and (2) present the results for the weighted sample by applying the PSID core/immigrant longitudinal family weight. Columns (3) and (4) present the results for using *EXPR* constructed with ZIP code-level house price index. Columns (5) and (6) replicate the baseline results with additional control for census-regional time-varying economic conditions, region×year fixed effects, in column (6). Columns (7) and (8) present the results for using *EXPR* constructed with state-level house price index. Columns (9) and (10) and columns (11) and (12) replicate the baseline results with standard errors clustered at the county level and household level, respectively. Odd columns report estimates in the cross-section where the controls consist of year fixed effects, household-level, and head characteristics. Even columns report estimates for the strictest specification. The controls include current local house price growth, household-level and household-head characteristics, and the various fixed effects for a year, locality, household, and region×year. Household-level controls consist of household income, household wealth, and household size. Household income includes the log of current and lagged income. Household wealth consists of the log of current liquid and illiquid wealth. Nonpositive values of wealth controls are adjusted by adding the absolute value of the minimum plus 0.1 before taking logs. Household-head controls include the log of the head's age and squared age and indicators of the head's gender, marital status, racial status, employment status, homeownership status, and college attendance status. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

	Consumption (log)											
	Weighted Sample		ZIP code EXPR		County EXPR		State EXPR		Cluster by County		Cluster by HH	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
EXPR (log)	1.061***	0.397***	1.038***	0.394***	1.005***	0.412***	1.140***	0.529***	1.005***	0.454***	1.005***	0.454***
	(0.107)	(0.088)	(0.106)	(0.080)	(0.113)	(0.068)	(0.100)	(0.071)	(0.075)	(0.064)	(0.061)	(0.053)
Effect of 1 SD(pp)	7.0	1.2	7.2	1.3	6.3	1.3	6.5	1.3	6.3	1.6	6.3	1.6
Observations	36728	36728	25134	25134	33995	33995	38031	38031	33995	33995	33995	33995
Adjusted R^2	0.611	0.799	0.604	0.806	0.599	0.786	0.591	0.776	0.599	0.783	0.599	0.783
Controls												
Household-Level	×	×	×	×	×	×	×	×	×	×	×	×
Head Demographics	×	×	×	×	×	×	×	×	×	×	×	×
Local-Level	×	×	×	×	×	×	×	×	×	×	×	×
Fixed Effect												
Year FE	×	×	×	×	×	×	×	×	×	×	×	×
Locality FE		×		×		×		×		×		×
Household FE		×		×		×		×		×		×
Region × Year FE		×		×		×		×				

errors and higher t-statistics. Finally, as some of the expenditure components might be mechanically related to local house price growth, Appendix A, Table A3 confirms that the baseline results are robust to using only household food expenditure as the consumption measure.

B. Instrumenting for Experienced Price Growth

The first concern regarding the OLS fixed-effect estimation of equation (3) involves the possibility of *EXPR* being endogenous to local time-varying factors that also impact household consumption. Including county fixed effects and observed county-level time-varying controls in the specification should dispel concerns that time-invariant local characteristics and local time-varying shocks might drive both *EXPR* and household consumption. Despite these controls, unobserved local time-varying confounders, such as shocks to local income expectations and productivity, may remain causes for concern. A second concern is that the baseline finding may be confounded if the spending decisions of homeowners in counties with higher house price growth, who thus have a higher *EXPR* than other heads, are also influenced by increased wealth or the relaxation of collateral constraints.

To alleviate these concerns, I leverage a plausibly exogenous variation in *EXPR* arising from the *EXPR* of the household's extended family members in geographically distant (i.e., out-of-county (OOC)) housing markets.[17] To calculate the instrument, I first restrict the baseline sample to households whose extended family members reside in other counties. *Extended family members* are economically independent households sharing familial ties (i.e., not members within a particular household unit). I then calculate the average *EXPR* within the OOC extended family network as follows:

[17] This IV strategy is similar in spirit to Bailey, Cao, Kuchler, and Stroebel (2018), who instrument friends' house price experiences with the house price experiences of out-of-town friends. The validity of this IV approach is also confirmed in Bailey, Dávila, Kuchler, and Stroebel (2019).

$$EXPR_{i,t}^{ooc} = \frac{1}{N_i^{ooc}} \sum_{j=1}^{N_i^{ooc}} EXPR_{j,t} \tag{4}$$

where $EXPR_{i,t}^{ooc}$ denotes the $EXPR$ of household $i's$ OOC extended family network in year t. N_i^{ooc} is the total number of $i's$ OOC extended family members. $EXPR_{j,t}$ is the $EXPR$ of extended family household j at year t as calculated in equation (1).

To simplify exposition, Appendix A, Table A1 provides the summary statistics for the IV estimation sample. The sample comprises 20,019 household-year observations and 4,270 unique households. The households belong to 976 unique extended families and reside in 854 unique counties across 50 U.S. states. The average household spends $42,339 annually on real nondurables and services and has an average log consumption of 10.474. The average household unit includes approximately three members and has about three OOC extended family members. $EXPR^{ooc}$ averages at 3.8%, with a cross-sectional standard deviation of 6.0%. Appendix A, Figure A2 further shows that the $EXPR^{ooc}$ varies substantially over time, even within a given household. After absorbing county, household, and year fixed effects, the standard deviation of the $EXPR^{ooc}$ residuals is 3.1%.

B.1. Instrument Validity

The instrument $EXPR^{ooc}$ satisfies the relevance assumption if it is well correlated with $EXPR$. As shown in the literature, individuals form house price expectations via extrapolation from their (out-of-town) peers' house price experience (Bailey et al. (2018), Bailey et al. (2019)). Therefore, I expect households with greater $EXPR^{ooc}$ to have higher expectations about future house price growth.

The exclusion restriction requires that for the instrument $EXPR^{ooc}$ to be valid, it must influence household consumption only through its effect on the household's $EXPR$. Thus, $EXPR^{ooc}$ should not affect households' consumption beyond its effect on house price expectations. A potential threat to identification is the possible correlation of $EXPR^{ooc}$ with household wealth or borrowing due to risk sharing among family members, which may influence household consumption. Suppose, for example, households use their OOC family members' homes as collateral for loans or apply for joint mortgages. In this case, households may have a higher borrowing capacity to finance spending when house prices increase in the counties of their OOC family members. To address these threats to identification, I examine whether $EXPR^{ooc}$ is correlated with households' wealth or borrowing.

Figure 3 presents the results on whether $EXPR^{ooc}$ is correlated with households' wealth or borrowing. Panel A reports the estimated results of the effect of $EXPR^{ooc}$ on the inverse hyperbolic sine of household wealth in one lagged survey year and one to three future survey years. For all specifications, the estimated results are statistically insignificant, suggesting a lack of a significant relationship between the instrument and past and future household wealth. Panel B reports similar insignificant findings regarding the relationship between $EXPR^{ooc}$ and the inverse hyperbolic sine of past and future household borrowing.[18] Taken together, these results suggest that the $EXPR^{ooc}$ is a valid instrument.

B.2. IV Results

To examine the effect of instrumented $EXPR$ on household consumption, I estimate the following two-stage least squares (2SLS) regression:

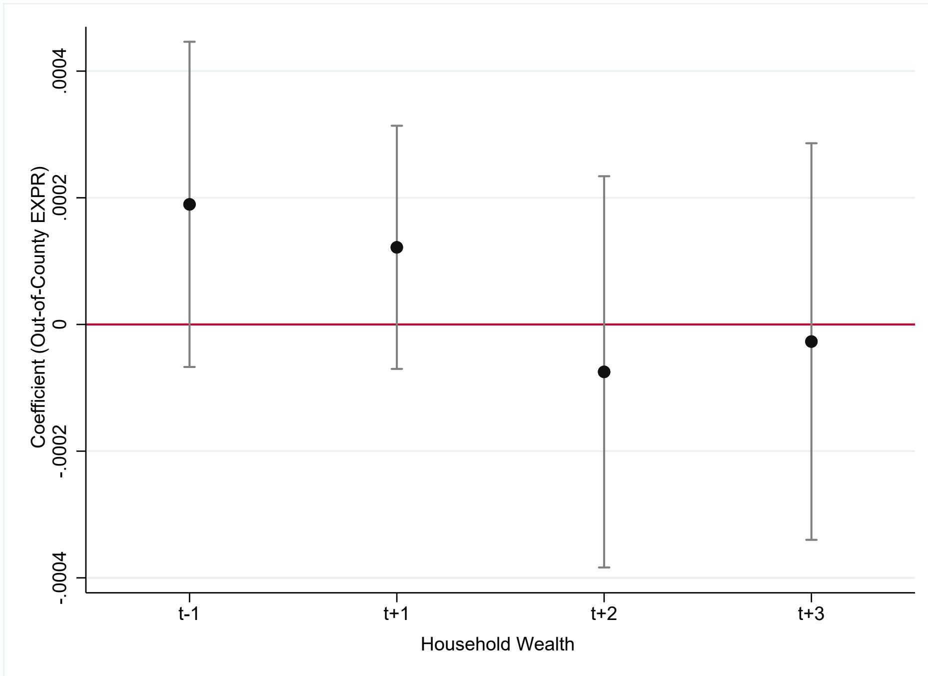
$$EXPR_{i,t} = \zeta\, EXPR^{ooc}_{i,t} + \gamma X_{i,t} + \phi L_{g,t} + \tau_t + \eta_g + \delta_i + v_{i,t} \quad (5)$$

$$c_{i,t} = \beta\, \widehat{EXPR_{i,t}} + \gamma X_{i,t} + \phi L_{g,t} + \tau_t + \eta_g + \delta_i + \epsilon_{i,t} \quad (6)$$

where $EXPR^{ooc}_{i,t}$ in the first-stage equation (5) denote the $EXPR$ within household $i's$ OOC extended family network in year t. $\widehat{EXPR_{i,t}}$ in the second-stage equation (6) denote the predicted $EXPR$ of household i in year t. Other variables in equations (5) and (6) are as defined above in equation (3) except for the inclusion of the total number of household's

[18] Household borrowing consists of mortgages and other debt like credit card debt.

Panel A: Household Wealth



Panel B: Household Borrowing

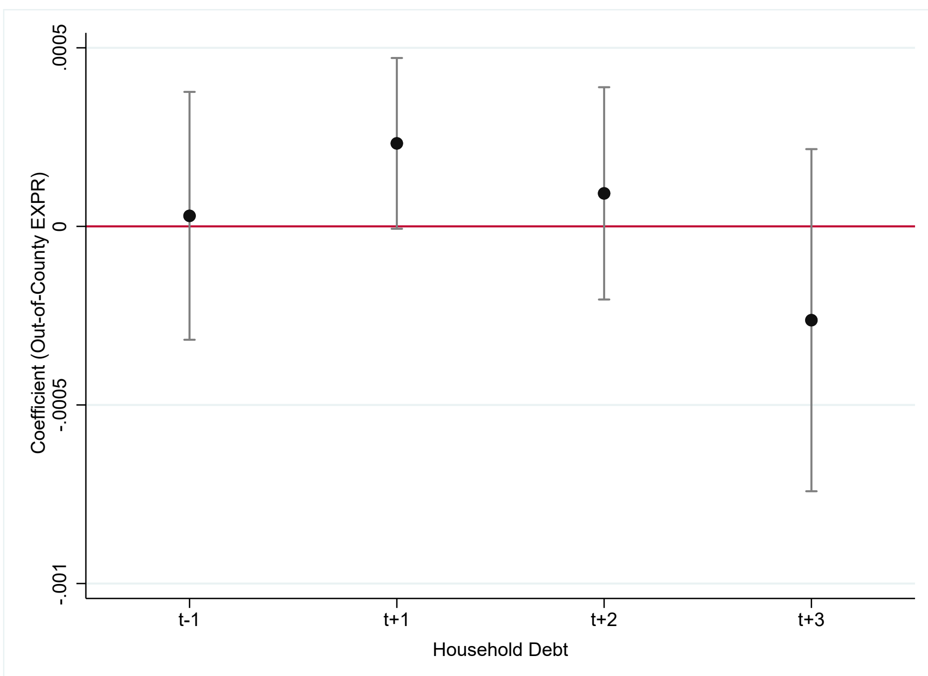


Figure 3. Instrument Validity: The figures present the results of a validity test of the exclusion restriction. Panel A plots the estimated coefficient of the instrument, Out-of-county *EXPR* ($EXPR^{ooc}$), on household wealth in years $t-1$, $t+1$, $t+2$, and $t+3$ after controlling for year, county, and household fixed effects. Panel B plots the estimated coefficient of $EXPR^{ooc}$ on household borrowing at years $t-1$, $t+1$, $t+2$, and $t+3$ after controlling for year, county, and household fixed effects. The 95% confidence intervals are shown, and standard errors are clustered at the state level.

OOC family members as an additional control in $X_{i,t}$. Here, the estimated β is the IV estimate of the effect of *EXPR* on household consumption.

A possible concern with interpreting the IV estimate of β relates to unobserved shocks that drive both household consumption and equilibrium house prices in OOC housing markets where the household has family members. Suppose, for example, some households have family members working in the same sector of the economy that features significant geographic clustering. In that case, shocks to that economic sector might influence household consumption and move aggregate house prices in those sector-exposed OOC housing markets where the household has family members. To ameliorate this concern, in my strictest specification, I additionally control for the average unemployment rate and average house price growth in the OOC housing markets where the household has family members.[19]

Table V reports the IV estimates for the effect of *EXPR* on household consumption. Columns (1-4) present the first-stage results obtained by estimating various versions of equation (5). These results show that a household's *EXPR* and the *EXPR* of its OOC family network are largely and positively correlated, which aligns with the relevance condition necessary for identification. For example, my strictest specification (see column (4)) reports an estimated coefficient of 0.490, which is economically large and significant at the 1% level. The instrument also passes the standard weak instrument identification test, with Kleibergen-Paap *rk* Wald *F*-statistic equals 219.1, which is significant at the 1% level.

Columns (5-8) of Table V report the second-stage results for the effect of instrumented *EXPR* on household consumption, obtained by estimating various versions of equation (6). Columns (5-6) present the cross-sectional results. Column (6), for example, includes controls for observed county-level time-varying, household-level, and head characteristics and year fixed effects. The resulting IV estimate yields a coefficient of 1.214, which is

[19] I do this in all my strictest specifications of the IV strategy in the paper.

Table V

IV Results

This table reports the estimates of the effect of instrumented *EXPR* on household consumption using the 1999–2019 PSID data and county-level house price data from Bogin et al. (2019). The outcome variable is the log of household units' real expenditure on nondurables and services in survey year t. *EXPR* denotes a four-year, exponentially weighted average of overlapping yearly observations of log-real house price growth, up to and including year $t-1$, as experienced by households in their county of residence; this is constructed with the weight implied by constant gain learning, with a yearly gain ω=0.070. The instrument $EXPR^{ooc}$ denotes *EXPR* within the household's OOC family network. Columns (1)–(4) and (5)–(8) report the results of various versions of the first-stage equation (5) and the corresponding second-stage equation (6), respectively. In the cross-sectional estimations, I control for year fixed effects in columns (1) and (5) and additionally control for county-level, household-level, and head characteristics in columns (2) and (6). In the time-series estimations, I control for various year, county, and household fixed effects in columns (3) and (7) and additionally control for county-level, household-level, OOC-level, and head characteristics in columns (4) and (8). The county-level controls are the current unemployment rate and real house price growth. OOC-level controls consist of the average unemployment rate and house price growth of the counties where the OOC family members reside. The household-level controls are the household's income, wealth, household size, and extended family network size. Household income includes the log of current and lagged total income. Household wealth includes the log of current liquid and illiquid wealth. Nonpositive values for the wealth controls are adjusted by adding the absolute value of the minimum plus 0.1 before taking the logs. The household-head demographics include the log of the head's age and squared age and indicators of the head's gender, marital status, racial status, employment status, homeownership status, and college attendance status. K-P F-stat. denotes the Kleibergen-Paap *rk* Wald F statistic for weak instrument identification test. Standard errors are clustered at the state level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

	First Stage				Second Stage			
	EXPR				Consumption			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IV: $EXPR^{ooc}$	0.512***	0.450***	0.518***	0.490***				
	(0.038)	(0.034)	(0.045)	(0.033)				
EXPR					2.308***	1.214***	0.648***	0.637***
					(0.505)	(0.260)	(0.151)	(0.168)
Effect of 1 SD(pp)					13.8	7.3	2.0	2.0
Observations	20019	20019	20019	20019	20019	20019	20019	20019
Adjusted R^2	0.660	0.697	0.704	0.736				
K-P F-stat.					184.9	180.1	130.9	219.1
Controls								
Household-Level		×		×		×		×
Head Demographics		×		×		×		×
County-Level		×		×		×		×
OOC-Level				×				×
Fixed Effect								
Year FE	×	×	×	×	×	×	×	×
County FE			×	×			×	×
Household FE			×	×			×	×

significant at the 1% level. This result implies that, in the cross-section, a one-standard-deviation increase in instrumented *EXPR* is associated with an increase of 7.3 percentage points (6.0×1.214) in household spending, which corresponds to an average increase in real annual household spending of approximately US$2,680 ($e^{10.547} - e^{10.474}$).

Columns (7) and (8) of Table V report the IV results for the within-household specifications. Column (8) presents the result obtained with the strictest specification, corresponding to equation (6) plus additional controls for the average unemployment rate and average house price growth in the counties where the household has family members. The estimate yields a coefficient of 0.637, which is significant at the 1% level. This result implies that a within-household one-standard-deviation increase in instrumented *EXPR* (a change of 0.031) is associated with an increase in real spending of 2.0 percentage points (3.1×0.637), which corresponds to an average increase in real annual household spending of approximately US$715 ($e^{10.494} - e^{10.474}$).

Overall, the IV strategy yields similar or slightly more substantial results than the OLS fixed-effect estimation. Appendix A, Table A4 confirms that the IV results are robust to using only food consumption as a measure of household consumption. Jointly, my findings support the hypothesis that *EXPR* determines households' consumption decisions.

B.3. Robustness of the IV Results

A possible concern with the IV results is that when there is risk sharing, such as joint mortgages between a household and homeowners in its OOC family network, house price growth in these OOC family members' counties could influence household consumption directly through the housing wealth or collateral channel. Similarly, when a household expects to inherit a house from the homeowners in its OOC family network, house price growth in OOC family members' counties could influence the household's consumption directly through the expected bequest channel. The IV approach addresses the risk-sharing concern by showing that the instrument $EXPR^{ooc}$ is not correlated with past and future household wealth or borrowing (see Section III.B.1). To further address this concern, together with the bequest concern, I examine whether there is a significant difference in spending propensity between a household with and without a homeowner within its OOC family network. To do this, I assign a bequest dummy variable, $\mathbb{1}_{i,bequest}$, that equals one for households with at least one OOC family member as a homeowner and zero otherwise. I then augment the 2SLS specification equations (5) and (6) with an interaction between $\mathbb{1}_{i,bequest}$ and $EXPR^{ooc}_{i,t}$, and $\mathbb{1}_{i,bequest}$ and $\widehat{EXPR_{i,t}}$, respectively.

Table VI, columns (1) and (2) report the first stage IV results for the direct *EXPR* effect and its interaction with $\mathbb{1}_{i,bequest}$, respectively. The instruments are relevant and pass the weak instrument identification test, with a Kleibergen-Paap *rk* Wald *F* statistic of 113.7, which is significant at the 1% level. Column (3) presents the second stage IV results. The coefficient of *EXPR* shows the direct effect of instrumented *EXPR* on the consumption of households whose OOC family members rent. This coefficient is significant at the 1% level, suggesting that the effect of instrumented *EXPR* on household consumption is significant for households whose geographically distant family members are renters. The estimated coefficient of the interaction term in column (3) is negative and statistically insignificant, indicating no evidence of a significant difference in the propensity to spend between households with and without a homeowner within their OOC family network. If anything, the negative coefficient of the interaction term suggests that the effect of instrumented *EXPR* on spending is more substantial for households whose OOC family members rent. In a robustness test in which I use only household food expenditure as an alternative consumption measure (see Appendix A, Table A5), the results show that the effect of instrumented *EXPR* on household consumption is more substantial for households whose OOC family members rent. Jointly, these findings suggest that any confounding effect due to risk sharing and expected bequest cannot explain my findings. The findings also reinforce that the house price expectations channel is the mechanism

Table VI

Risk-Sharing and Bequest Motive

This table reports the results of robustness tests of the IV estimations in which the effect of instrumented *EXPR* on household consumption is allowed to vary by the homeownership status of the OOC extended family households. I report two first stages: column (1) presents the direct effect of *EXPR*, and column (2) presents its interaction with an indicator of bequest-motive households. Column (3) reports the second stage, where the outcome variable is the log of real expenditure on nondurables and services by household units in the PSID survey year t. Controls consist of county-level, household-level, OOC-level, and head characteristics. Fixed effects consist of year, county, and household fixed effects. The county-level controls are the current unemployment rate and real house price growth. The household-level controls are the household's income, wealth, household size, and OOC family network size. OOC-level controls consist of the average unemployment rate and house price growth of the counties where the OOC family members reside. Household income includes the log of current and lagged total income. Household wealth includes the log of current liquid and illiquid wealth. Nonpositive values for the wealth controls are adjusted by adding the absolute value of the minimum plus 0.1 before taking the logs. The household-head demographics include the log of the head's age and squared age and indicators of the head's gender, marital status, racial status, employment status, homeownership status, and college attendance status. K-P F-stat. denotes the Kleibergen-Paap *rk* Wald F statistic for weak instrument identification test. Standard errors are clustered at the state level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$..

	First Stage		Second Stage
	EXPR	$\text{EXPR}\times\mathbb{1}_{i,bequest}$	Consumption
	(1)	(2)	(3)
IV: EXPR^{ooc}	0.497***	-0.268***	
	(0.051)	(0.038)	
IV: $\text{EXPR}^{ooc}\times\mathbb{1}_{bequest}$	-0.008	0.793***	
	(0.037)	(0.048)	
EXPR			0.690***
			(0.201)
$\text{EXPR}\times\mathbb{1}_{bequest}$			-0.066
			(0.179)
Observations	20019	20019	20019
K-P F-stat.			113.7
<u>Controls</u>			
Household-Level	×	×	×
Head Demographics	×	×	×
County-Level	×	×	×
OOC-Level	×	×	×
<u>Fixed Effects</u>			
Year FE	×	×	×
County FE	×	×	×
Household FE	×	×	×

underlying the experience effect.

IV. Heterogeneity

Having established the significant role of *EXPR* in household consumption decisions, I next exploit heterogeneity in household characteristics and housing cycle to provide insights into whether these factors are more likely to explain my findings and also rule out alternative explanations. The granularity of the PSID data allows me to investigate characteristics such as the head of household's education level, age, and homeownership status. The exercises here shed light on the models of expectation formation that best explain the households' consumption behavior. In particular, models of lifetime experience-based expectation formation predict that the effect of *EXPR* decreases with age (Malmendier and Nagel (2011, 2016)). However, models of extrapolative experience-based expectation formation predict that differences in the extent of the *EXPR* effect are not age-dependent (Armona et al. (2019), Kuchler and Zafar (2019)). The exercises here also help distinguish the expectations channel from the housing wealth and collateral channels by examining the effect of *EXPR* on homeowners' and renters' spending.

A. Education

Recent evidence suggests heterogeneity in house price expectation formation exists across education levels of households. For example, Armona et al. (2019) find college-educated individuals to be more likely than others to update their local house price expectations in response to local house price experience. However, Kuchler and Zafar (2019) find that non-college-educated individuals are more likely to extrapolate from local house price experiences when forming expectations about aggregate house price growth. In this section, I examine whether the effect of *EXPR* on households' consumption differs significantly by education level. I assign a dummy variable that equals one for households whose head has some college education and zero otherwise and augment the baseline specification with an interaction between the college dummy and *EXPR* as follows:

$$\begin{aligned} c_{i,t} &= \alpha + \beta\, EXPR_{i,t} + \beta_{college} \left(EXPR_{i,t} \times \mathbb{1}_{i,college} \right) + \varphi \mathbb{1}_{i,college} + \ldots \\ &\quad \cdots + \gamma X_{i,t} + \phi L_{g,t} + \tau_t + \eta_g + \delta_i + \epsilon_{i,t} \end{aligned} \tag{7}$$

where $\mathbb{1}_{i,college}$ is a dummy variable that equals one for households whose head has some college education and zero otherwise. The coefficient on the interaction term, $\beta_{college}$, measures college-educated households' differential response to the effect of *EXPR*. The estimated β measures the direct impact of *EXPR* on non-college households' spending.

Table VII reports the results obtained under the strictest specification, corresponding to equation (7). Column (1) shows the augmented-OLS fixed-effect specification results. In the IV version of this augmented model, I report two first stages: column (2) presents the direct effect of *EXPR*, and column (3) presents its interaction with $\mathbb{1}_{i,college}$. The instruments are relevant and pass the weak instrument identification test, with a Kleibergen-Paap *rk* Wald *F* statistic of 109.0, which is significant at the 1% level. Column (4) presents the second-stage IV results. The estimated coefficient of the interaction term in columns (1) and (4) are positive but not statistically significant, indicating evidence of no differential spending propensity between households whose heads have and have no college education. This finding suggests that the education level of households does not explain the effect of *EXPR* on household consumption.

B. *Asymmetric Effect*

I next examine whether housing market cycles can explain the relationship between *EXPR* and household consumption. Specifically, I investigate whether the effect of *EXPR*

Table VII

Education Heterogeneity

This table reports the results of equation (7), which allows the effect of *EXPR* on household consumption to vary by the education level of the household head. Column (1) reports an OLS fixed-effect strategy estimate. Columns (2)-(4) report the IV version, where columns (2) and (3) present the first-stage results, and column (4) present the second-stage results. Controls consist of county-level, household-level, OOC-level, and head characteristics. Fixed effects consist of year, county, and household fixed effects. The county-level controls are the current unemployment rate and real house price growth. The household-level controls are the household's income, wealth, household size, and OOC family network size. OOC-level controls consist of the average unemployment rate and house price growth of the counties where the OOC family members reside. Household income includes the log of current and lagged total income. Household wealth includes the log of current liquid and illiquid wealth. Nonpositive values for the wealth controls are adjusted by adding the absolute value of the minimum plus 0.1 before taking the logs. The household-head demographics include the log of the head's age and squared age and indicators of the head's gender, marital status, racial status, employment status, homeownership status, and college attendance status. K-P F-stat. denotes the Kleibergen-Paap *rk* Wald F statistic for weak instrument identification test. Standard errors are clustered at the state level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$..

	OLS Fixed Effect	First Stage		Second Stage
	Consumption	EXPR	$\text{EXPR}\times\mathbb{1}_{college}$	Consumption
	(1)	(2)	(3)	(4)
EXPR	0.427***			0.582***
	(0.085)			(0.202)
$\text{EXPR}\times\mathbb{1}_{college}$	0.044			0.085
	(0.069)			(0.130)
IV: EXPR^{ooc}		0.476***	-0.209***	
		(0.039)	(0.030)	
IV: $\text{EXPR}^{ooc}\times\mathbb{1}_{college}$		0.023	0.808***	
		(0.023)	(0.050)	
Observations	33995	20019	20019	20019
Adjusted R^2	0.786			
K-P F-stat.				109.0
Controls				
Household-Level	×	×	×	×
Head Demographics	×	×	×	×
County-Level	×	×	×	×
OOC-Level		×	×	×
Fixed Effects				
Year FE	×	×	×	×
County FE	×	×	×	×
Household FE	×	×	×	×

on household spending is stronger when households have experienced falling house prices than when they have experienced rising house prices. I assign a dummy variable that equals one for households whose *EXPR* is negative in a particular year and zero otherwise and augment the baseline specification with an interaction between the negative *EXPR* dummy and *EXPR* as follows:

$$\begin{aligned} c_{i,t} &= \alpha + \beta\, EXPR_{i,t} + \beta_{EXPR<0}\left(EXPR_{i,t} \times \mathbb{1}_{i,EXPR<0}\right) + \varphi \mathbb{1}_{i,EXPR<0} + \dots \\ &\quad \dots + \gamma X_{i,t} + \phi L_{g,t} + \tau_t + \eta_g + \delta_i + \epsilon_{i,t} \end{aligned} \tag{8}$$

where $\mathbb{1}_{i,EXPR<0}$ is a dummy variable that equals one for households who have experienced negative *EXPR* and zero otherwise. $\beta_{EXPR<0}$ measures the differential effect of *EXPR* on household consumption when *EXPR* is negative, and β measures the direct impact of positive *EXPR* household consumption.

Table VIII reports the results obtained from the strictest specification, corresponding to equation (8). Column (1) shows the results of the OLS fixed-effect strategy. In the IV strategy version of this augmented model, I report two first stages: column (2) presents the direct effect of *EXPR*, and column (3) presents its interaction with $\mathbb{1}_{i,EXPR<0}$. The instruments are relevant and pass the weak instrument identification test, with a Kleibergen–Paap *rk* Wald *F* statistic of 25.0, which is significant at the 1% level. Column (4) presents the second-stage IV results. The estimated coefficients of the interaction terms in columns (1) and (4) are negative and positive, respectively, but not statistically significant, suggesting no statistically significant evidence of boom-bust asymmetry in the effect of *EXPR* on household consumption. The finding is consistent with Aladangady (2017) and Guren et al. (2021), who also find evidence of no boom-bust asymmetry in the sensitivity of household consumption to house price growth.

Table VIII

Asymmetric Effect

This table reports the results of equation (8), which allows the effect of *EXPR* on household consumption to vary by households' exposure to negative *EXPR*. Column (1) reports an OLS fixed-effect strategy estimate. Columns (2)-(4) report the IV version, where columns (2) and (3) present the first-stage results, and column (4) present the second-stage results. Controls consist of county-level, household-level, OOC-level, and head characteristics. Fixed effects consist of year, county, and household fixed effects. The county-level controls are the current unemployment rate and real house price growth. The household-level controls are the household's income, wealth, household size, and OOC family network size. OOC-level controls consist of the average unemployment rate and house price growth of the counties where the OOC family members reside. Household income includes the log of current and lagged total income. Household wealth includes the log of current liquid and illiquid wealth. Nonpositive values for the wealth controls are adjusted by adding the absolute value of the minimum plus 0.1 before taking the logs. The household-head demographics include the log of the head's age and squared age and indicators of the head's gender, marital status, racial status, employment status, homeownership status, and college attendance status, and an indicator for negative *EXPR*. K-P *F*-stat. denotes the Kleibergen-Paap *rk* Wald *F* statistic for weak instrument identification test. Standard errors are clustered at the state level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$..

	OLS Fixed Effect	First Stage		Second Stage
	Consumption	EXPR	EXPR$\times\mathbb{1}_{(EXPR<0)}$	Consumption
	(1)	(2)	(3)	(4)
EXPR	0.497***			0.630***
	(0.088)			(0.191)
EXPR$\times\mathbb{1}_{(EXPR<0)}$	-0.168			0.080
	(0.263)			(0.460)
IV: EXPR^{ooc}		0.466***	0.015	
		(0.040)	(0.010)	
IV: EXPR$^{ooc}\times\mathbb{1}_{(EXPR<0)}$		-0.036	0.354***	
		(0.062)	(0.055)	
Observations	33995	20019	20019	20019
Adjusted R^2	0.786			
K-P F-stat.				25.0
<u>Controls</u>				
Household-Level	×	×	×	×
Head Demographics	×	×	×	×
County-Level	×	×	×	×
OOC-Level		×	×	×
<u>Fixed Effects</u>				
Year FE	×	×	×	×
County FE	×	×	×	×
Household FE	×	×	×	×

C. Age Cohort

I examine whether households in different life-cycle stages exhibit heterogeneity in their consumption responses to *EXPR*. Models of lifetime experience learning suggest that the younger cohort would respond more strongly to the effect of *EXPR* than their older counterparts (Malmendier and Nagel (2011, 2016)). However, extrapolative experience learning suggests that the effect of *EXPR* is not age-dependent (Armona et al. (2019); Kuchler and Zafar (2019)). Accordingly, I group the households into three cohorts—young, middle-aged, and older—based on the current age of the household head. Young, middle-aged, and older households are, respectively, those whose heads are younger than 40, 40–59, and older than 59. I then investigate which cohorts are likely to rely on their *EXPR* when making spending decisions by augmenting the baseline specification with interactions between a dummy variable for middle-aged households and *EXPR* and between a dummy variable for older households and *EXPR* as follows:

$$\begin{aligned} c_{i,t} &= \alpha + \beta\, EXPR_{i,t} + \beta_{mid}\,(EXPR_{i,t} \times \mathbb{1}_{i,mid}) + \beta_{old}\,(EXPR_{i,t} \times \mathbb{1}_{i,old}) + \dots \\ &\quad \dots + \varphi \mathbb{1}_{i,mid} + \kappa \mathbb{1}_{i,old} + \gamma X_{i,t} + \phi L_{g,t} + \tau_t + \eta_g + \delta_i + \epsilon_{i,t} \end{aligned} \tag{9}$$

where $\mathbb{1}_{i,mid}$ and $\mathbb{1}_{i,old}$ are dummy variables that equal one for middle-aged $(40 \leq Age \leq 59)$ and older $(60 \leq Age \leq 75)$ households, respectively, and zero otherwise. β_{mid} and β_{old} measure the differential responses of middle-aged and older households' consumption to *EXPR*, respectively. The estimated β measures the direct effect of *EXPR* on young households.

Table IX reports the results obtained under the strictest specification, corresponding to equation (9). Column (1) shows the results of the augmented-OLS fixed-effect strategy. In the IV strategy version of this augmented model, I report three first stages: column (2) presents the direct *EXPR* effect, column (3) shows its interaction with $\mathbb{1}_{i,mid}$, and column (4) presents its interaction with $\mathbb{1}_{i,old}$. The instruments are relevant and pass the

Table IX

Age Cohort Heterogeneity

This table reports the results of equation (9), which allows the effect of *EXPR* on household consumption to vary by the age cohort of the household head. Column (1) reports an OLS fixed-effect strategy estimate. Columns (2)-(5) report the IV version, where columns (2), (3) and (4) present the first-stage results, and column (5) present the second-stage results. Controls consist of county-level, household-level, OOC-level, and head characteristics. Fixed effects consist of year, county, and household fixed effects. The county-level controls are the current unemployment rate and real house price growth. The household-level controls are the household's income, wealth, household size, and OOC family network size. OOC-level controls consist of the average unemployment rate and house price growth of the counties where the OOC family members reside. Household income includes the log of current and lagged total income. Household wealth includes the log of current liquid and illiquid wealth. Nonpositive values for the wealth controls are adjusted by adding the absolute value of the minimum plus 0.1 before taking the logs. The household-head demographics include the log of the head's age and squared age and indicators of the head's gender, marital status, racial status, employment status, homeownership status, and college attendance status. K-P *F*-stat. denotes the Kleibergen-Paap *rk* Wald *F* statistic for weak instrument identification test. Standard errors are clustered at the state level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$..

	OLS Fixed Effect	First Stage			Second Stage
	Consumption	EXPR	EXPR$\times\mathbb{1}_{i,mid}$	EXPR$\times\mathbb{1}_{i,old}$	Consumption
	(1)	(2)	(3)	(4)	(5)
EXPR	0.449***				0.604***
	(0.078)				(0.188)
EXPR$\times\mathbb{1}_{i,mid}$	-0.003				0.059
	(0.081)				(0.152)
EXPR$\times\mathbb{1}_{i,old}$	0.022				-0.010
	(0.102)				(0.201)
IV: EXPR^{ooc}		0.472***	-0.181***	-0.064***	
		(0.037)	(0.028)	(0.012)	
IV:EXPR$^{ooc}\times\mathbb{1}_{i,mid}$		0.025	0.802***	0.006	
		(0.021)	(0.053)	(0.004)	
IV: EXPR$^{ooc}\times\mathbb{1}_{i,old}$		0.019	0.012	0.792***	
		(0.027)	(0.008)	(0.054)	
Observations	33995	20019	20019	20019	20019
Adjusted R^2	0.786				
K-P F-stat.					73.7
Controls					
Household-Level	×	×	×	×	×
Head Demographics	×	×	×	×	×
County-Level	×	×	×	×	×
OOC-Level		×	×	×	×
Fixed Effects					
Year FE	×	×	×	×	×
County FE	×	×	×	×	×
Household FE	×	×	×	×	×

weak instrument identification test, with a Kleibergen–Paap *rk* Wald *F* statistic of 73.7, which is significant at the 1% level. Column (5) presents the second stage IV results. The coefficients of the interaction terms in columns (1) and (5) are not statistically significant, suggesting evidence of no significant difference in spending propensity between younger and older households. The results are consistent with the evidence in the literature on extrapolative experience-based learning, which suggests that individuals in different life-cycle stages do not exhibit heterogeneity in their responses to *EXPR*.

D. *Homeownership Effects*

Finally, I examine the effect of *EXPR* on the spending decisions of both homeowners and renters. This analysis also helps disentangle the expectations channel from the housing wealth and collateral channels. Unlike that of renters, the consumption of homeowners is affected by house price growth through the housing wealth and collateral channels. Consistent with these differential effects, Berger et al. (2018) find that homeowners have a significant consumption response to house price growth but observe no response among renters. Gan (2010) shows that household consumption is responsive to housing wealth; in particular, a more substantial response is observed among owners with multiple houses than among others. Aladangady (2017) shows that a rise in home values leads to increased spending by homeowners, with a more substantial response among borrowing-constrained homeowners than among others.

If the housing wealth and collateral channels are the mechanisms underlying the experience effect, they should amplify homeowners' consumption in response to *EXPR* but have no effect on renters' spending. In contrast, if extrapolative expectations are the underlying mechanism, *EXPR* should stimulate homeowners' spending, as a higher level of *EXPR* suggests optimism about future house price gains. For renters, the direction of the influence of increased house price expectations on consumption behavior is unclear ex-ante. An increase in *EXPR* should increase renters' spending if increased expectations about future house price growth discourage them from saving toward future home purchases (i.e., the "discouragement effect" (Engelhardt (1994))). Alternatively, renters who have experienced higher *EXPR* and expect an increase in house price growth might decrease their spending to finance home purchases before houses become too expensive (i.e., "fear of missing out"). To conduct this ownership heterogeneity analysis, I augment the baseline specification with an interaction term between a dummy variable for homeownership and *EXPR* as follows:

$$\begin{aligned} c_{i,t} &= \alpha + \beta\, EXPR_{i,t} + \beta_{owner}\,(EXPR_{i,t} \times \mathbb{1}_{i,owner}) + \varphi \mathbb{1}_{i,owner} + \dots \\ &\quad \dots + \gamma X_{i,t} + \phi L_{g,t} + \tau_t + \eta_g + \delta_i + \epsilon_{i,t} \end{aligned} \tag{10}$$

where $\mathbb{1}_{i,owner}$ is a dummy variable that equals one if the household head is a homeowner and zero if the household head is a renter. The coefficient of the interaction term β_{owner} measures homeowners' differential consumption response to *EXPR*, while β measures the direct response of renters.

Table X reports the results obtained under the strictest specification, corresponding to equation (10). Column (1) shows the result of the augmented-OLS fixed effect strategy. In the IV version of this augmented model, I report two first stages: column (2) presents the direct effect of *EXPR*, and column (3) presents its interaction with $\mathbb{1}_{i,owner}$. The instruments are relevant and pass the weak instrument identification test, with a Kleibergen–Paap *rk* Wald *F* statistic of 113.0, which is significant at the 1% level. Column (4) presents the second stage IV results. The coefficients of the interaction terms in columns (1) and (4) of Table X are positive and negative, respectively, and not statistically significant, indicating that owners and renters do not exhibit a significant difference in spending in response to *EXPR*. Appendix A, Table A6 further shows that the results are robust to using household food consumption as an alternative dependent variable. However, the negative coeffi-

Table X

Homeownership Effects

This table reports the results of equation (10), which allows the effect of *EXPR* on household consumption to vary by homeownership status. Column (1) reports an OLS fixed-effect strategy estimate. Columns (2)-(4) report the IV version, where columns (2) and (3) present the first-stage results, and column (4) present the second-stage results. Controls consist of county-level, household-level, OOC-level, and head characteristics. Fixed effects consist of year, county, and household fixed effects. The county-level controls are the current unemployment rate and real house price growth. The household-level controls are the household's income, wealth, household size, and OOC family network size. OOC-level controls consist of the average unemployment rate and house price growth of the counties where the OOC family members reside. Household income includes the log of current and lagged total income. Household wealth includes the log of current liquid and illiquid wealth. Nonpositive values for the wealth controls are adjusted by adding the absolute value of the minimum plus 0.1 before taking the logs. The household-head demographics include the log of the head's age and squared age and indicators of the head's gender, marital status, racial status, employment status, homeownership status, and college attendance status. K-P F-stat. denotes the Kleibergen-Paap *rk* Wald F statistic for weak instrument identification test. Standard errors are clustered at the state level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$..

	OLS Fixed Effect	First Stage		Second Stage
	Consumption	EXPR	EXPR$\times\mathbb{1}_{i,owner}$	Consumption
	(1)	(2)	(3)	(4)
EXPR	0.412***			0.664***
	(0.105)			(0.222)
EXPR$\times\mathbb{1}_{i,owner}$	0.054			-0.036
	(0.116)			(0.138)
IV: EXPR^{ooc}		0.505***	-0.239***	
		(0.044)	(0.032)	
IV: EXPR$^{ooc}\times\mathbb{1}_{i,owner}$		-0.018	0.787***	
		(0.022)	(0.045)	
Observations	33995	20019	20019	20019
Adjusted R^2	0.786			
K-P F-stat.				113.0
Controls				
Household-Level	×	×	×	×
Head Demographics	×	×	×	×
County-Level	×	×	×	×
OOC-Level		×	×	×
Fixed Effects				
Year FE	×	×	×	×
County FE	×	×	×	×
Household FE	×	×	×	×

cient of the interaction terms in Table A6, columns (1) and (4) suggests a more substantial consumption response to *EXPR* among renters than among owners, although this result is not statistically significant in column (4). Jointly, these findings suggest that the effect of *EXPR* on household consumption is unlikely to occur through the housing wealth and collateral channels but rather through extrapolative expectations.

A concern regarding the homeownership heterogeneity results is related to households recently changing ownership status. To ameliorate such concerns, Appendix A, Table A2 shows that the results are robust to excluding households who changed their ownership status over the experience horizon.

E. Discussion

Why would experience-based house price expectations influence household consumption decisions? Although a thorough investigation of this question is beyond the scope of this paper, a plausible explanation is that for homeowners, higher house price expectations imply higher expectations about their future house price gains. In response to their optimism (pessimism) about future house price growth, homeowners would increase (decrease) their current spending.

For renters, as stated previously, higher house price expectations may reduce their willingness to save toward purchasing a home, leaving them with more resources to spend on current consumption. This behavior is evident in the literature as exemplified by Engelhardt (1994), who finds that renters respond to an increase in house price growth by reducing their savings toward a down payment on a house. An opposing argument suggests that due to the "fear of missing out," an increase in expectations about future house price growth would induce renters to decrease their current spending to finance the purchase of a house before house prices become less affordable. However, recent evidence indicates a statistically insignificant effect of an increase in *EXPR* on renters' home search behavior (Gargano et al. (2020)). Mabille (2022) also provides evidence of a decline in home purchases by first-time buyers in U.S. regions with high price growth. Therefore, my finding that an increase in *EXPR* also stimulates renters' consumption is likely attributable to the negative effect of witnessing an increase in local house price growth on renters' willingness to save toward a house purchase, leaving them with more resources to spend on current consumption.

V. Conclusion

House price expectations are a significant determinant of households' consumption decisions. Using a sample of U.S. households in the PSID from 1999 to 2019 and a geocode dataset that links these households to their local housing markets, this paper documents a significant positive relationship between house price expectations and consumer spending. In particular, households increase their real spending on nondurables and services by 1.6 to 6.3 percentage points when they have experienced increased price growth in their local housing markets. The effect of local house price experiences on owners' and renters' spending is similarly substantial, indicating that the expectations channel is unlikely to be confounded by the housing wealth or collateral channels.

My baseline analyses rely on both within- and across-household variations in *EXPR* and employing an OLS fixed effect strategy with an extensive set of controls. To alleviate concerns about local time-varying confounders and the possibility that the direct housing wealth or collateral channels confound my interpretation of the estimates, I exploit the plausibly exogenous variation in *EXPR* of a household's extended family members in geographically distant housing markets. The IV estimates are slightly more substantial than the baseline findings.

The granularity of the PSID data also allows me to examine spending heterogeneity across household characteristics and housing cycles. Importantly, however, the effect of *EXPR* on household spending is neither due to differences in the education level of households, boom-bust asymmetry in local housing markets, nor cohort-specific differences. Although identifying the aggregate implications of the house price expectations channel is beyond the scope of this paper, my findings suggest that it plays a potentially significant role in determining aggregate demand.

Appendix A.

A1. Summary Statistics of the IV Estimation

Table A1

Summary Statistics—IV Estimation

This table reports the summary statistics of the households in the IV estimation sample, using the 1999 to 2019 PSID data and county-level house price data from Bogin et al. (2019). *EXPR* and $EXPR^{ooc}$ is constructed as shown in equations (1) and (4), respectively. The other variables are discussed in Section II.A. The values are annual and not weighted. The variables presented in monetary terms are in 2019 U.S. dollars.

	Mean	Median	SD	P25	P75	N
Panel A: Main Variables						
Consumption ($1000s)	42.339	35.709	28.159	24.322	51.912	20019
Consumption (log)	10.474	10.483	0.606	10.099	10.857	20019
EXPR (log)	0.038	0.039	0.062	0.002	0.071	20019
$EXPR^{ooc}$ (log)	0.038	0.041	0.060	0.002	0.071	20019
Panel B: Household Characteristics						
Household Size	2.87	3.00	1.43	2.00	4.00	20019
OOC Family Members	3.37	3.00	2.34	2.00	4.00	20019
Total Income ($1000s)	109.82	85.52	137.92	50.01	134.40	20019
Liquid Wealth ($1000s)	67.24	1.20	371.94	-0.90	24.66	20019
Illiquid Wealth ($1000s)	238.43	96.57	1425.26	19.45	272.77	20019
Total Wealth ($1000s)	305.67	101.77	1527.11	17.47	322.00	20019
Panel C: Head Characteristics						
Age (years)	48.36	48.00	12.26	38.00	58.00	20019
Homeowner	0.77	1.00	0.42	1.00	1.00	20019
College	0.61	1.00	0.49	0.00	1.00	20019
Employed	0.97	1.00	0.17	1.00	1.00	20019
African-American	0.27	0.00	0.44	0.00	1.00	20019
White	0.66	1.00	0.47	0.00	1.00	20019
Married	0.70	1.00	0.46	0.00	1.00	20019
Male	0.78	1.00	0.41	1.00	1.00	20019
Panel D: County Characteristics						
Unemployment (log)	0.06	0.05	0.03	0.04	0.07	20019
Real house price growth (log)	0.03	0.04	0.07	0.00	0.07	20019

A.2 Using a Sample of Households that do not change Ownership Status

Table A2

Homeownership Effects: Same Ownership Status over the Experience Horizon

This table replicates Table X, in which the effect of *EXPR* on household consumption is allowed to vary by homeownership status. Here, I restrict the baseline and IV estimation sample to households that did not change their ownership status over the experience horizon. All other information is as noted in Table X. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

	OLS Fixed Effect	First Stage		Second Stage
	Consumption	EXPR	EXPR$\times\mathbb{1}_{i,owner}$	Consumption
	(1)	(2)	(3)	(4)
EXPR	0.439***			0.659***
	(0.107)			(0.245)
EXPR$\times\mathbb{1}_{i,owner}$	0.037			-0.010
	(0.120)			(0.159)
IV: EXPR^{ooc}		0.510***	-0.238***	
		(0.046)	(0.031)	
IV: EXPR$^{ooc}\times\mathbb{1}_{i,owner}$		-0.019	0.787***	
		(0.024)	(0.047)	
Observations	32112	18933	18933	18933
Adjusted R^2	0.792			
K-P F-stat.				108.7
Controls				
Household-Level	×	×	×	×
Head Demographics	×	×	×	×
County-Level	×	×	×	×
OOC-Level		×	×	×
Fixed Effects				
Year FE	×	×	×	×
County FE	×	×	×	×
Household FE	×	×	×	×

A.3 Using an Alternative Dependent Variable: Food Consumption

Table A3

Replication of Table III: Baseline Results

This table replicates Table III, which analyzes the effect of *EXPR* on household consumption. Here, the outcome variable is the log of real expenditure on food consumed by household units in survey year t. All other information is as noted in Table III. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

	Food Consumption (log)			
	(1)	(2)	(3)	(4)
EXPR (log)	0.771***	0.437***	0.314***	0.255***
	(0.139)	(0.097)	(0.073)	(0.080)
Effect of 1 SD(pp)	4.9	2.8	1.1	0.9
Observations	33842	33842	33842	33842
Adjusted R^2	0.003	0.366	0.590	0.617
Controls				
Household-Level		×		×
Head Demographics		×		×
County-Level		×		×
Fixed Effects				
Year FE	×	×	×	×
County FE			×	×
Household FE			×	×

Table A4

Replication of Table V: IV Results

This table replicates Table V, which analyzes the effect of instrumented *EXPR* on household consumption. Here, the outcome variable is the log of real expenditure on food consumed by household units in survey year t. All other information is as noted in Table V. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

	First Stage				Second Stage			
	EXPR				Food Consumption			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IV: EXPR^{ooc}	0.512***	0.451***	0.519***	0.491***				
	(0.038)	(0.034)	(0.046)	(0.033)				
EXPR					1.406***	0.692**	0.635**	0.545*
					(0.373)	(0.275)	(0.243)	(0.288)
Effect of 1 SD(pp)					8.4	4.2	2.0	1.7
Observations	19930	19930	19930	19930	19930	19930	19930	19930
Adjusted R^2	0.660	0.698	0.704	0.735				
K-P F-stat.					178.2	174.3	128.0	215.8
<u>Controls</u>								
Household-Level		×		×		×		×
Head Demographics		×		×		×		×
County-Level		×		×		×		×
OOC-Level				×				×
<u>Fixed Effects</u>								
Year FE	×	×	×	×	×	×	×	×
County FE			×	×			×	×
Household FE			×	×			×	×

Table A5

Replication of Table VI: Risk-Sharing and Bequest Motive

This table replicates Table VI, in which the effect of instrumented *EXPR* on household consumption is allowed to vary by the homeownership status of the OOC extended family households. Here, the outcome variable is the log of real expenditure on food consumed by household units in survey year t. All other information is as noted in Table VI. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

	First Stage		Second Stage
	EXPR	EXPR$\times\mathbb{1}_{i,bequest}$	Food Consumption
	(1)	(2)	(3)
IV: EXPR^{ooc}	0.498***	-0.269***	
	(0.051)	(0.038)	
IV: EXPR^{ooc} $\times\mathbb{1}_{bequest}$	-0.008	0.794***	
	(0.037)	(0.048)	
EXPR			1.020***
			(0.295)
EXPR $\times\mathbb{1}_{bequest}$			-0.584***
			(0.186)
Observations	19930	19930	19930
K-P F-stat.			112.2
Controls			
Household-Level	×	×	×
Head Demographics	×	×	×
County-Level	×	×	×
OOC-Level	×	×	×
Fixed Effects			
Year FE	×	×	×
County FE	×	×	×
Household FE	×	×	×

Table A6

Replication of Table X: Homeownership Effects

This table replicates Table X, in which the effect of *EXPR* on household consumption is allowed to vary by homeownership status. Here, the outcome variable is the log of real expenditure on food consumed by household units in survey year t. All other information is as noted in Table X. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

	OLS Fixed Effect	First Stage		Second Stage
	Food Consumption	EXPR	EXPR$\times\mathbb{1}_{i,owner}$	Food Consumption
	(1)	(2)	(3)	(4)
EXPR	0.459***			0.786**
	(0.103)			(0.346)
EXPR$\times\mathbb{1}_{i,owner}$	-0.267**			-0.313
	(0.119)			(0.226)
IV: EXPR^{ooc}		0.506***	-0.239***	
		(0.045)	(0.031)	
IV: EXPR$^{ooc}\times\mathbb{1}_{i,owner}$		-0.020	0.787***	
		(0.022)	(0.045)	
Observations	33842	19930	19930	19930
Adjusted R^2	0.617			
K-P F-stat.				111.4
Controls				
Household-Level	×	×	×	×
Head Demographics	×	×	×	×
County-Level	×	×	×	×
OOC-Level		×	×	×
Fixed Effects				
Year FE	×	×	×	×
County FE	×	×	×	×
Household FE	×	×	×	×

A.4 FIGURES

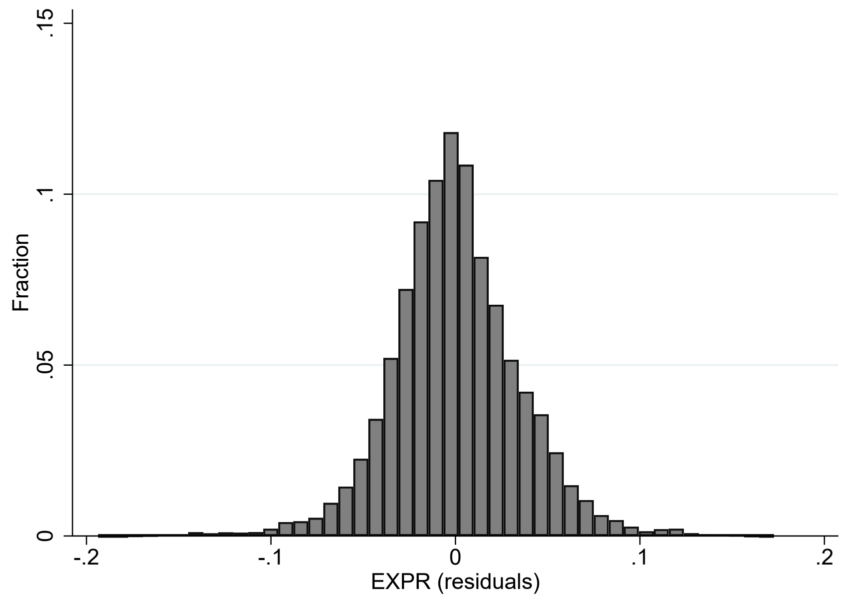


Figure A1. Distribution of Experienced Price Growth: This figure plots the sample distribution of residualized *EXPR* of households after absorbing county fixed effects, household fixed effects, and year fixed effects.

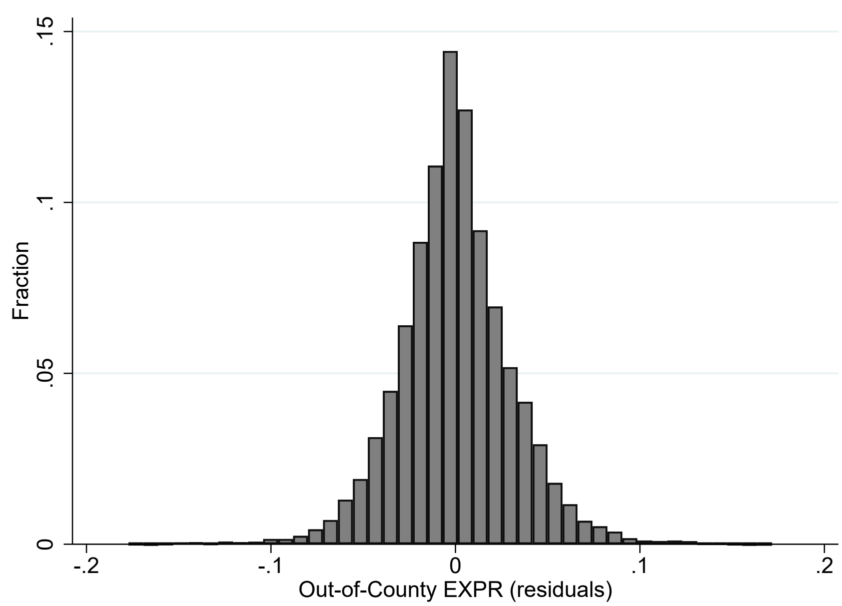


Figure A2. Distribution of Out-of-County Experienced Price Growth: This figure plots the sample distribution of residualized $EXPR^{ooc}$ after absorbing county fixed effects, household fixed effects, and year fixed effects.

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Online Appendix to "House Price Expectations and Consumer Spending"*

A. Note

This online appendix provides additional tables and figures for the main paper.

- Online Appendix A presents the full table for the baseline results.
- Online Appendix B presents additional information and summary statistics of the SCE data and the full table for the relationship between experienced price growth (EXPR) and house price expectations.

*Benjamin Appianin, Online Appendix to "House Price Expectations and Consumer Spending," *Job Market Paper*, Department of Economics and Finance, City University of Hong Kong, 83 Tat Chee Avenue, Kowloon Tong, Hong Kong, e-mail:bappianin2-c@my.cityu.edu.hk.

Table IA.1: Baseline Full Results

This table presents the baseline results, TABLE III, and coefficients of the control variables.

	Consumption (log)			
	(1)	(2)	(3)	(4)
EXPR (log)	1.658***	1.009***	0.572***	0.486***
	(0.198)	(0.116)	(0.061)	(0.058)
Household-Level Controls				
Current income (log)		0.269***		0.131***
		(0.007)		(0.008)
Lagged income (log)		0.184***		0.049***
		(0.008)		(0.006)
Liquid wealth (log)		0.002***		0.000
		(0.001)		(0.000)
Illiquid wealth (log)		0.023***		0.016***
		(0.001)		(0.001)
Household size		0.065***		0.056***
		(0.004)		(0.005)
Head Demographics				
Age (log)		-0.021		1.221**
		(0.058)		(0.477)
Age squared		0.000		-0.000
		(0.000)		(0.000)
Homeowner dummy		-0.049***		-0.018
		(0.013)		(0.018)
Employment dummy		0.048**		0.073***
		(0.019)		(0.014)
Gender dummy		-0.090***		
		(0.014)		
Marital dummy		0.097***		0.248**
		(0.020)		(0.093)
College dummy		0.099***		-0.024
		(0.009)		(0.023)
White dummy		0.030		
		(0.026)		
Black dummy		-0.041*		
		(0.025)		
County-Level Controls				
Unemployment (log)		-0.238		0.006
		(0.564)		(0.250)
House price growth (log)		0.177***		-0.087
		(0.056)		(0.056)
Constant	10.329***	4.865***	10.373***	3.321
	(0.033)	(0.167)	(0.002)	(2.167)
Observations	34792	34792	34792	34792
Adjusted R^2	0.038	0.611	0.766	0.790
Year FE	×	×	×	×
County FE			×	×
Household FE			×	×

B. *SCE Data: Experienced Price Growth and Expectations*

To estimate the relationship between EXPR and expected national house price growth, I use expectation data from the Survey of Consumer Expectation (SCE) administered by the Federal Reserve Bank of New York. Each month from June 2013, the SCE elicits the expected percentage growth in national home prices. The respondents are asked whether they expect the U.S. national average home price to increase or decrease over the next 12 months and by what percentage growth. The exact wording of these survey questions are as follows:

- Next we would like you to think about home prices nationwide. Over the next 12 months, what do you expect will happen to the average home price nationwide? Over the next 12 months, I expect the average home price to ...
  1. increase by 0% or more
  2. decrease by 0% or more
- By about what percent do you expect the average home price to [increase/decrease as in previous question]? Please give your best guess.
  1. Over the next 12 months, I expect the average home price to [increase/decrease as in previous question] by — %

Figure IA.1 show the distribution of one-year-ahead expected percentage growth in national home price as reported by respondents in the sample. Table IA.2 and IA.3 provide the summary statistics and the full table of the estimated results for the relationship between EXPR and house price expectations, respectively, as explained in Section II.C of the main paper.

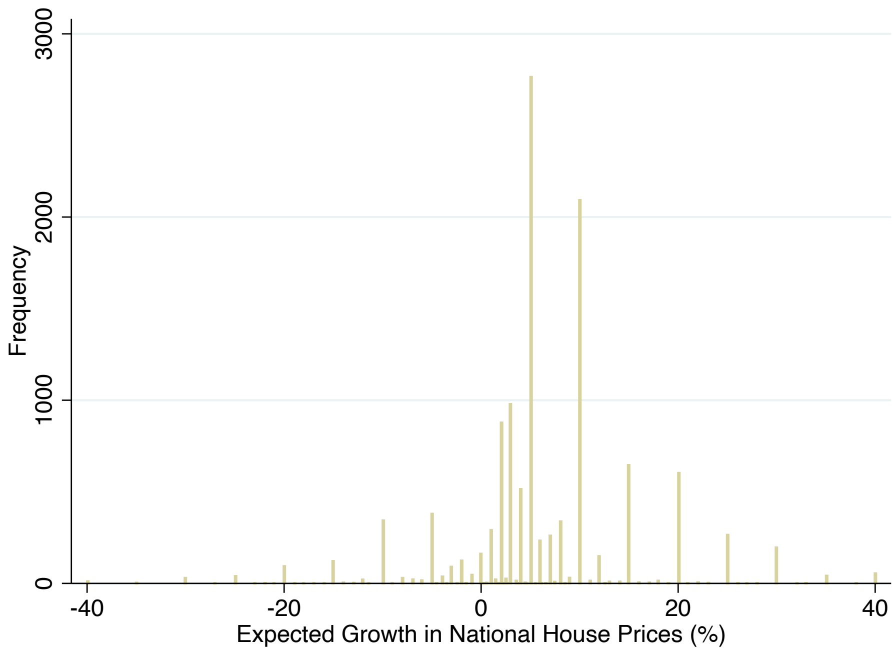

Figure IA.1. Distribution of Expected National House Price Growth: This figure plot the one-year ahead point forecast of U.S. national house price growth as reported by respondents in the sample. Following Kuchler et al. (2022), I drop responses with absolute values in excess of 40%.

Table IA.2: Summary statistics - SCE

This table reports summary statistics of respondents in the SCE, and the EXPR of respondents constructed using Bogin, Doerner, and Larson (2019) state-level house price data as discussed in Section II.B and II.B.1 of the main paper. The SCE data are further discussed in Online Appendix B. The values are annual and not weighted.

	Mean	Median	SD	P25	P75	N
Panel A: Main Variables						
Expected house price growth (%)	6.28	5.00	9.02	3.00	10.00	12129
EXPR (log)	0.02	0.02	0.05	-0.02	0.05	12129
Panel B: Household Characteristics						
Total Income ($1000s)	84.34	67.50	57.66	45.00	125.00	12129
Age (years)	49.83	50.00	13.49	38.00	61.00	12129
Years in current state	35.20	35.00	18.54	20.00	50.00	12129
Homeowner	0.76	1.00	0.43	1.00	1.00	12129
Employed	0.96	1.00	0.20	1.00	1.00	12129
White	0.84	1.00	0.36	1.00	1.00	12129
Black	0.09	0.00	0.28	0.00	0.00	12129
Married	0.68	1.00	0.47	0.00	1.00	12129
Male	0.52	1.00	0.50	0.00	1.00	12129
College	0.53	1.00	0.50	0.00	1.00	12129

Table IA.3: Experienced Price Growth and Expectations

This table presents the full results for the relationship between EXPR and national house price expectations, as shown in Table II of the main paper.

	Expected National House Price Growth (%)		
	Most Recent Obs.	Second Most Recent Obs.	Third Most Recent Obs.
	(1)	(2)	(3)
EXPR	12.770***	11.376***	13.181***
	(3.720)	(3.085)	(3.193)
Age (log)	2.055*	-0.520	-0.526
	(1.066)	(1.224)	(1.096)
Age squared	-0.000	0.000*	0.000*
	(0.000)	(0.000)	(0.000)
Homeowner dummy	-1.126***	-0.576**	-0.474**
	(0.279)	(0.268)	(0.227)
Employment dummy	-0.234	0.859	0.070
	(0.668)	(0.677)	(0.557)
Male dummy	-1.125***	-0.943***	-0.862***
	(0.132)	(0.120)	(0.166)
Marital dummy	0.491**	0.280	-0.002
	(0.231)	(0.177)	(0.208)
College dummy	-0.899***	-0.896***	-0.644***
	(0.195)	(0.165)	(0.151)
White dummy	-0.645**	-0.359	-0.433*
	(0.288)	(0.324)	(0.242)
Black dummy	0.481	1.346***	0.696
	(0.491)	(0.464)	(0.448)
Income cat. 2	-0.967	-1.790*	0.127
	(0.964)	(0.893)	(0.741)
Income cat. 3	-0.444	-1.478*	-0.187
	(0.734)	(0.792)	(0.783)
Income cat. 4	-1.074	-1.306*	-0.541
	(0.796)	(0.733)	(0.761)
Income cat. 5	-1.328	-2.129***	-0.563
	(0.882)	(0.770)	(0.753)
Income cat. 6	-1.444*	-1.971**	-0.986
	(0.812)	(0.771)	(0.724)
Income cat. 7	-1.867**	-2.374***	-1.025
	(0.784)	(0.825)	(0.796)
Income cat. 8	-2.034***	-2.360***	-0.957
	(0.757)	(0.736)	(0.784)
Income cat. 9	-2.145***	-2.670***	-1.283*
	(0.797)	(0.727)	(0.756)
Income cat. 10	-2.873***	-3.146***	-1.659**
	(0.810)	(0.721)	(0.757)
Income cat. 11	-3.206***	-3.240***	-2.222**
	(0.735)	(0.804)	(0.875)
Constant	2.257	9.159**	8.301**
	(3.499)	(3.976)	(3.854)
Observations	12129	10025	9077
R^2	0.038	0.042	0.041
Year × Month FE	×	×	×

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Bogin, Alexander, William Doerner, and William Larson, 2019, Local house price dynamics: New indices and stylized facts, *Real Estate Economics* 47, 365–398.

Kuchler, Theresa, Monika Piazzesi, and Johannes Stroebel, 2022, Housing market expectations, Technical report, National Bureau of Economic Research.