Local Housing Experiences and Household Labor Supply*

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ABSTRACT

I examine the effect of local house price experiences on household labor supply using household-level data on labor income and hours worked from 1980. A within-household one-standard-deviation increase in experienced price growth (a weighted average of past price growth in local housing markets) leads to a 1 to 3 percentage points increase in households' real labor income. Results hold when using geographically distant relatives' experienced price growth as an instrument. Effects are similar for homeowners and renters and less pronounced for sophisticated households. Additional analyses reveal a positive relationship between experienced price growth and households' hours worked.

JEL classification: D10, G40, G50, J22, R31.
Keywords: *House Prices; Experienced Price Growth; Labor Income; Hours Worked; Beliefs*

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I. Introduction

Fluctuations in house prices affect household labor supply decisions, typically through home equity effects.[1] For example, the severe housing bust during the Great Recession, which led to many households having negative home equity, caused a fall in household labor supply (Bernstein (2021)). Also, the decline in home values constrained households' search for jobs, reducing their labor supply (Brown and Matsa (2020)). While the home equity effect has been well documented, in this paper, I investigate an equally important question motivated by nascent studies on experience-based decision-making:[2] Do fluctuations in house prices ***experienced*** locally by households determine their labor supply decisions? Thus, using household-level data on labor income and hours worked back to 1980 from the *Panel Study of Income Dynamics (PSID)*, I examine whether experienced price growth (*EXPR*), measured as the weighted average of past price growth in local (i.e., county) housing markets, influence households' labor earnings and hours worked.

Intuitively, the effect of *EXPR* on renters' labor supply, if any, is straightforward and unambiguous. Contrary to home equity effects, which do not affect renters' labor supply (Gopalan et al. (2021)), renters experiencing higher local price growth may work more to meet higher living costs, including rent expenditures and down payment for homes. Theoretically, the effect of *EXPR* on labor supply is ambiguous for homeowners. On the one hand, consistent with higher wealth predicting a decline in household labor supply through the leisure channel (Cesarini, Lindqvist, Notowidigdo, and Östling (2017)), *EXPR* may have a negative relationship with homeowners' labor supply. This is because higher *EXPR* implies optimistic beliefs about future home price gains, which could induce homeowners to work less and consume more leisure. On the other hand, consistent with recent

[1] See, for example, Cunningham and Reed (2013) Bernstein (2021), and Gopalan, Hamilton, Kalda, and Sovich (2021) for evidence on a positive relationship and see, for example, Jacob and Ludwig (2012), Disney and Gathergood (2018) and Li, Li, Lu, and Xie (2020) for evidence on a negative relationship.

[2] See, for example, Malmendier and Nagel (2011, 2016); Armona, Fuster, and Zafar (2019); Kuchler and Zafar (2019) and D'Acunto, Malmendier, Ospina, and Weber (2021)

studies documenting that negative home equity reduces labor supply by either constraining job search and worker mobility or making workers more psychologically distressed, higher *EXPR* may increase homeowners' labor supply by working through these channels oppositely. Given these competing directions and the potential novelty of the effect of *EXPR* on renters' labor supply decisions, understanding how households' labor supply responds to *EXPR* is an empirical question.

Figure 1 visualizes the relationship between *EXPR* and households' real labor income. Each year, I sort households in the PSID into quintiles based on their *EXPR* and calculate, for each *EXPR* quintile, the average real labor income of households. I then plot the average real labor income against *EXPR* quintiles. *EXPR* and households' real labor income have a strong positive relationship. In particular, moving from the lowest to the highest *EXPR* quintile increases households' real labor income by 11.7 percentage points, approximately US$8826.[3] In Appendix A, Figures A1 and A2, I further split the sample into homeowners and renters and examine this relationship. Moving from the lowest to the highest *EXPR* quintile increases homeowners' real labor income by 9.9 percentage points and renters' real labor income by 24.3 percentage points in Figures A1 and A2, respectively. These patterns suggest that experiencing higher local price growth increases households' labor supply, and this direction of effect is similar for both homeowners and renters; however, it is much more pronounced among renters. I formalize this relationship in a panel regression with an array of fixed effects and an extensive set of controls and also exploit the plausibly exogenous variation in the *EXPR* of out-of-county extended families as an instrument.

After controlling for observed household-level and head characteristics, unobserved time-invariant county-level and household-level characteristics, state-level minimum wage, and unobserved state-level time-varying economic conditions, my baseline analyses show a significant positive relationship between *EXPR* and households' labor income. In the

[3] All monetary values in this paper are in 2018 U.S. dollars.

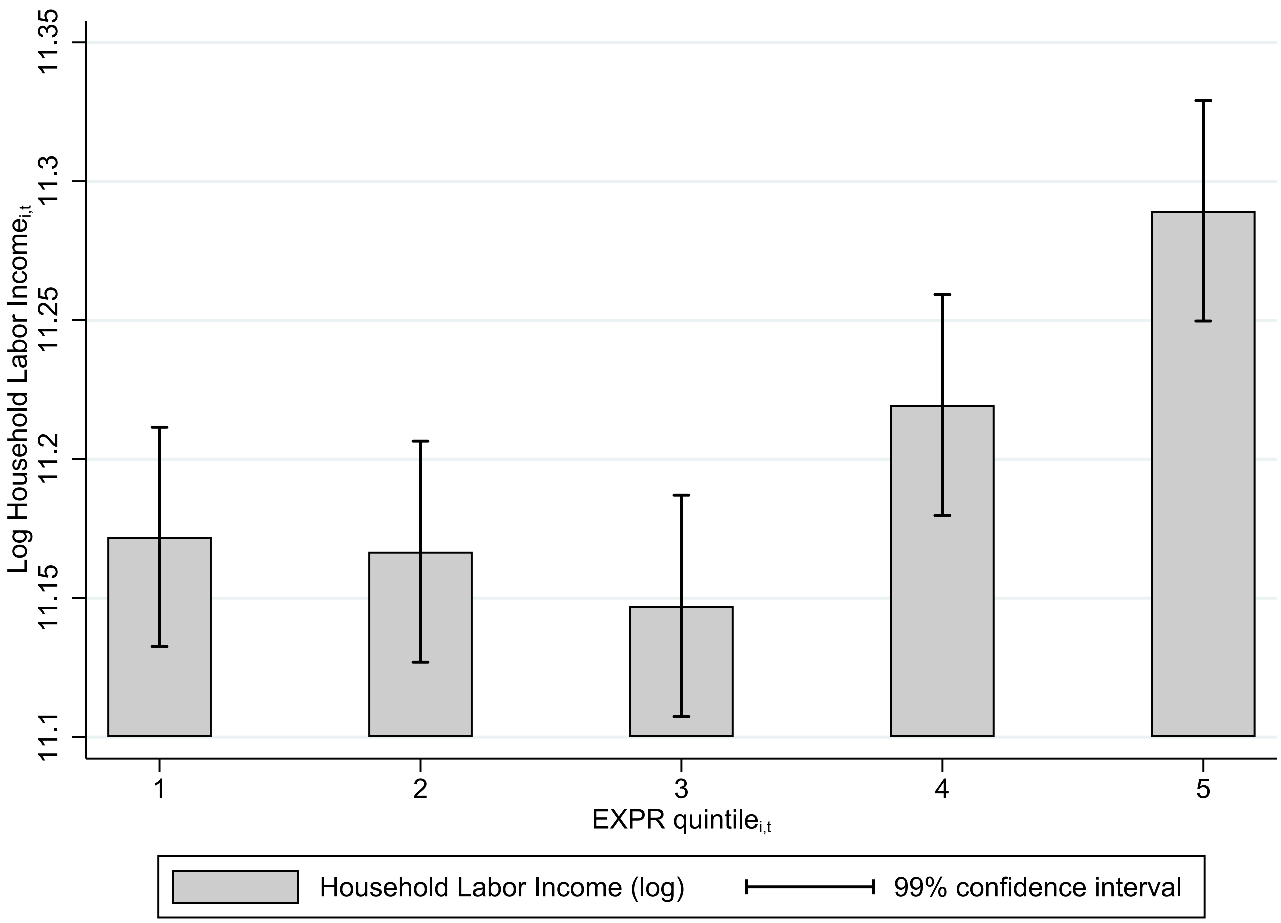


Figure 1. Experienced Price Growth and Household Labor Income The figure plots the average log labor income of households who have experienced different past local house price growth. Each year, I sort households into quintiles based on their experienced price growth (*EXPR*). The figure plots point estimate with a 99% confidence interval.

cross-section of households, a one-standard-deviation increase in *EXPR* is associated with a 6.2 percentage point increase in households' real labor income. Within households over time, a one-standard-deviation increase in *EXPR* is associated with a 1.1 percentage point increase in households' real labor income. These results are robust to an array of checks, such as restricting my sample to only households with prime-age working heads, using only heads' labor income as the dependent variable, and using the full PSID sample with immigrants and applying the PSID core/immigrant family weight.

A concern with the above baseline estimates is that unobserved county-level-time varying factors, such as labor demand, might correlate with both *EXPR* and labor supply, confounding the interpretation of the findings. Moreover, *EXPR* might drive households' labor supply through the home equity effects. To alleviate these concerns, I instrument for the *EXPR* of households with the *EXPR* of extended families in out-of-county housing markets. The out-of-county house price experiences are assumed to be orthogonal to county-level-time varying confounds. In additional tests, I show that the exclusion restriction is plausibly satisfied with my IV, not correlated with future home equity and mortgage borrowing of households. The relevance assumption is that through social interactions with out-of-county family members, the house price experiences of out-of-county families might influence households' expectations about local house prices and, in turn, drive local house price experiences. The resulting estimates from the second-stage IV regression show a significant positive relation between instrumented *EXPR* and households' labor supply. In particular, a cross-sectional one-standard-deviation increase in instrumented *EXPR* is associated with a 9.7 percentage points increase in households' real labor income. In the time series, a within-household one standard deviation increase in instrumented *EXPR* is associated with a 3.2 percentage point increase in households' real labor income.

A further concern with the IV strategy is that unobserved shock might drive both households' labor supply and equilibrium house prices in the out-of-county housing markets where the household has family members. For example, suppose the out-of-county extended family members work in the same sector of the economy that features significant geographic clustering. In that case, economic shocks to that sector might influence households' labor supply and aggregate house prices in those sector-exposed counties where the household has family members. To attenuate this concern, I further control for the current economic conditions in the counties where the household's extended family members reside. In particular, I include the average current house price growth across the out-of-county extended family members' counties as an additional control for current economic conditions in the out-of-county extended family members' counties. Reassuringly, the resulting estimates are similar to the main IV results.

Next, I exploit household characteristics to examine which households are more likely to respond to the effect of *EXPR* on labor income and also to rule out alternative interpretations of my findings. First, I examine whether the effect of *EXPR* on labor income differs between homeowners and renters. This analysis also helps to alleviate concerns about the effects of home equity. If home equity effects are the underlying mechanism, we should see the effect of *EXPR* on households' labor income concentrated among homeowners with no effect on renters' labor income. I find that both homeowners and renters more or less similarly increase their labor supply when experiencing higher local price growth. In the cross-section of households, the effect of *EXPR* on labor income is less pronounced among homeowners. However, within the same household over time, I find no significant difference between homeowners' and renters' labor income. These findings suggest that the effect of *EXPR* on households' labor supply is unlikely to be due to the effect of home equity. Also, these findings are inconsistent with the leisure channel, where homeowners are likely to reduce labor supply when experiencing higher local price growth. Second, I examine whether the effect of *EXPR* on households' labor income differs between younger and older households. I find no statistically significant difference between the labor income of older and younger households in response to *EXPR*.

Third, I examine whether the effect of *EXPR* on households' labor income differs for sophisticated and non-sophisticated households. Prior work shows that sophisticated individuals are less likely to be affected by behavioral biases (Braggion, Von Meyerinck, and Schaub (2023)). In housing markets, Kuchler and Zafar (2019) show that college-educated individuals are less likely to extrapolate from local house price experiences when forming expectations about future national price growth. Accordingly, I group households into college-educated and non-college-educated households based on the education level of the household head. Interestingly, the effect of *EXPR* on households' labor income is less pronounced for college-educated households. This finding suggests that the effect of *EXPR* on labor supply is less pronounced for sophisticated households.

Why would higher *EXPR* lead to increased labor income of households? Exploiting households' hours of work data, I find that households work for more hours when experiencing higher local house price growth. In the cross-section of households, a one-standard-deviation increase in *EXPR* leads to a 1.4 to 4.2 percentage points increase in annual hours worked. Within the same household over time, a one-standard-deviation increase in *EXPR* leads to a 0.7 to 1.6 percentage point increase in annual hours worked. These findings suggest that when experiencing higher local price growth, households work for more hours to increase their earnings. The further question is, why would households work for more hours to earn more when experiencing higher local price growth? For homeowners, many potential channels are likely to be at play. Experiencing higher local price growth suggests optimistic beliefs about future home price gains. This may either make homeowners less psychologically distressed and devote more time and energy towards work, boost their entrepreneurial activities, or search more broadly for better job offers. Renters experiencing higher local price growth and expecting growth in future house prices may work more to increase earnings to meet higher living costs, including higher rent payments or downpayment for homes.

This work contributes to the literature on the relationship between the housing markets and households' labor supply. Existing work shows that negative home equity reduces households' labor supply by making workers more psychologically and financially distressed (Bernstein, McQuade, and Townsend (2021)), constraining their geographical mobility (Bernstein (2021), Gopalan et al. (2021)) or job search (Brown and Matsa (2020)). A similar line of work also shows that house price appreciation increases homeowners' entrepreneurship through the collateral effect (Adelino, Schoar, and Severino (2015); Schmalz, Sraer, and Thesmar (2017)).[4] I contribute to the literature by documenting a novel and economically important determinant of household labor supply: experience effects. In particular, experiencing higher local price growth, which suggests optimistic beliefs about future house price gains, increases households' labor supply by either making homeowners less psychologically distressed and causing them to devote more time and energy to work, search for better job offers, or boost their entrepreneurial activities. Additionally, unlike the home equity effect, which influences only homeowners' labor supply decisions, the experience effects impact both homeowners' and renters' labor supply similarly. Renters experiencing higher local price growth and expect growth in future house prices may increase labor supply to meet higher living costs, including rental expenditures and future down payments for homes.

This paper also contributes to the nascent macro-finance literature on experience effects. Personal experiences of macroeconomic variables influence individuals' expectations, including stock return (Malmendier and Nagel (2011)), inflation (Malmendier and Nagel (2016); D'Acunto et al. (2021)), unemployment, and home price expectations (Armona et al. (2019); Kuchler and Zafar (2019); Kindermann, Le Blanc, Piazzesi, and Schneider (2021)). Also, personal experiences of macroeconomic variables influence individuals' intertemporal choices, including stock market participation (Malmendier and Nagel

[4]In contrast, higher housing wealth, either through growth in house prices or housing vouchers, reduces households' labor supply (see, for example, Jacob and Ludwig (2012), Disney and Gathergood (2018) and Li et al. (2020)). This strand of the literature suggests that unexpected gains influence households to consume more leisure and reduce labor supply.

(2011)), home-buying search efforts (Gargano, Giacoletti, and Jarnecic (2023)), home tenure decisions (Malmendier and Wellsjo (2023)), and consumption decisions (Appianin (2023); Malmendier and Shen (2024)). I contribute to this literature by documenting the importance of experience effects in understanding households' labor supply decisions. In particular, I show that experiencing higher local house price growth stimulates homeowners' and renters' labor supply. Understanding the economic mechanisms influencing changes in labor supply is crucial to economic policymaking and evaluation.

The rest of the paper is organized as follows. Section II presents the data, the descriptive statistics, and the measurement of *EXPR*. Section III presents estimates for the effect of *EXPR* on households' labor income. Section IV exploits heterogeneity in household characteristics for the effect of *EXPR* on labor income. Section V discusses the various mechanisms through which *EXPR* influences households' labor income, including the effect of *EXPR* on households' hours worked, and Section VI concludes the paper.

II. Data and Descriptive Statistics

To conduct my empirical analyses, I use survey data from the Panel Study of Income Dynamics (PSID) and house price indices from the Federal Housing Finance Agency (FHFA). My main sample period corresponds to the period from 1980 to 2018.

A. The PSID Data

I use data on labor income, hours worked, residential location, and household characteristics from the PSID. The PSID is a longitudinal survey conducted annually from 1968 to 1997 and biennially thereafter. In subsequent surveys, children from the originally sampled households are followed once they split off to start their new families. The PSID sample consists of a core sample and an immigrant sample.[5] The core sample is those families directly related to the original 1968 sample, and they comprise a nationally representative sample surveyed by the Survey Research Center (SRC sample) and low-income families surveyed by the Census Bureau's Survey of Economic Opportunities (SEO sample). Existing works that rely on the PSID data to study the labor supply households use the SRC sample (see, for example, Blundell, Pistaferri, and Saporta-Eksten (2016)). My main analyses, therefore, use the SRC sample, and as a robustness check, I use the core plus immigrant sample with PSID core/immigrant longitudinal family weight applied.

In every survey year, the PSID collects a lot of head and spouse's labor income information for the preceding year (i.e., the working year), including wages and salaries, bonuses, overtime, tips, commissions, professional practice of trade, market gardening, unincorporated businesses and farms, and any miscellaneous and extra job income. The survey also collects retrospective information on the head and spouse's annual work hours on all jobs, including overtime. Since the FHFA house price growth data starts from 1976, and I require the past four years' growth in house prices before the PSID households' working year to measure their past local house price experiences, I begin to collect the PSID data from the 1981 survey and end at 2019 survey, which applies to the 1980 to 2018 working years.

To measure household labor supply, I compute the sum of the head and spouse's annual labor income (i.e., extensive margin) and hours worked (i.e., intensive margin) in the working year for households whose heads participate in the labor market.[6] To account for potential outliers in the labor income and hours of work data, I winsorize at the 1% and the 99% levels. The labor income is deflated to its 2018 dollars using "all items" Consumer Price Index (CPI) data produced by the Bureau of Labor Statistics (BLS).[7]

[5] In 1997, 1999, and 2017, the PSID added households that immigrated to the U.S. post-1968, constituting the immigrant sample. I add this immigrant sample as a robustness check in Table III.

[6] In my robustness checks, I use only the head's labor income as an alternative measure.

[7] See https://data.bls.gov/cgi-bin/srgate

In addition, I collect demographic information on household heads from the PSID. These demographics include household size and the head's age, marital status, race (white, African-American or Black, or other), sex, employment status, education level, and homeownership status. I also collect information on the household's reported house value and mortgages to control for home equity. Home equity is measured as the house value less any outstanding mortgages.

Finally, I collect information on where the households live every survey year at the county level through a confidential data agreement with the PSID. This geocode data helps to match the PSID households to their county-level house price growth data.

B. *Sample Restrictions and Descriptive Statistics*

My final sample consists of SRC households with working household heads. I focus on households whose heads are between college completion age and near retirement age (i.e., age 24 to 60). In a robustness test, I use an alternative age range by focusing on those whose heads are of prime working age (i.e., age 24 to 54). To alleviate any confounding effect due to households self-selecting into localities with different characteristics, I restrict my sample to those who never moved out of their county of residence while remaining in the sample. Finally, I drop households with missing head demographics.

Table I reports the descriptive statistics of the baseline sample. There are 16598 household-year observations for 2131 unique households across 473 unique counties in the U.S. Panel A of Table I shows that the average household in the sample works for about 3213 hours annually and earns a real labor income of US$ 91825, approximately US$28.6 real average hourly earnings. The average logarithm of hours worked and labor income are 7.986 and 11.198, respectively.

Panel B of Table I reports the characteristics of the household. The average household has a net home equity of US$120,850, approximately three members in the household

Table I

Descriptive Statistics—Baseline Sample

This table reports the descriptive statistics of the households in the baseline sample, using the PSID data from 1980 to 2018 and county-level house price data from Bogin, Doerner, and Larson (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 2018 U.S. dollars.

	Mean	Median	SD	P25	P75	N
Panel A: Main Variables						
Labor Income ($1000s)	91.825	83.118	57.371	52.312	117.084	16598
Labor Income (log)	11.198	11.328	0.789	10.865	11.671	16598
Hours Worked (1000s)	3.213	3.290	1.164	2.208	4.062	16598
Hours Worked (log)	7.986	8.099	0.488	7.700	8.309	16598
EXPR (log)	0.100	0.065	0.132	0.024	0.134	16598
Panel B: Household Characteristics						
Home Equity ($1000s)	120.85	77.43	169.10	19.10	160.22	16598
Household Size	3.17	3.00	1.38	2.00	4.00	16598
Age (years)	42.93	43.00	9.57	35.00	51.00	16598
Homeowner	0.84	1.00	0.37	1.00	1.00	16598
College	0.42	0.00	0.49	0.00	1.00	16598
African-American	0.09	0.00	0.29	0.00	0.00	16598
White	0.83	1.00	0.37	1.00	1.00	16598
Male	0.85	1.00	0.36	1.00	1.00	16598
Spouse Participation Rate	0.65	1.00	0.48	0.00	1.00	16598
Spouse Non-participation Rate	0.15	0.00	0.36	0.00	0.00	16598

unit, and a household head aged 43. 84% of these households own their homes. 42% of the household heads have completed college, 83% are white, 9% are African-American or Black, 85% are males, 65% are married to a spouse who participates in the labor market, 15% are married to a spouse who does not participate in the labor market, and the rest are single households.

C. *Experience Measure*

To measure the local house price experiences of the PSID households, I follow the literature on experience-based learning to capture the history of house price growth experienced locally over time by households into one experience variable.[8] I use county-level house price growth data from 1976 to 2018. This house price growth data, constructed by Bogin et al. (2019), is based on a repeat sale and is available at the FHFA.[9] I convert to a real house price growth data using the "all items" annual CPI data.

I match the annual county-level house price growth data to each household in the PSID based on their county of residence codes. In every survey gap year, I assume the household resides in the same county as the subsequent survey year. To calculate *EXPR* in a particular year, I require yearly house price growth data in the household's county over the four prior years. That is, following Kuchler and Zafar (2019), I assume households learn and recall their local house price growth over the past four years. For example, to compute *EXPR* in year $t = 1980$, I require county-level annual house price growth data from 1979 to 1976. This requires that I follow the PSID households from 1976. Thus, from 1976 and subsequent years, I construct an annual household-level panel of county house price growth and compute *EXPR* as the exponentially weighted average of the past 4-year

[8]See Appianin (2023) for similar experience measure.

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

house price growth in the household's county as follows:

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

where ω, the annualized constant gain parameter, ensures that the household remembers the most recent house price growth realizations better than earlier, which aligns with the psychology literature on availability and recency bias (Tversky and Kahneman (1973)). I rely on Malmendier and Nagel (2016) to set the value of this constant gain parameter at $\omega = 0.07$ for annual data. $\Delta hp_{t-s,i}$ denotes the log yearly growth in house price in household i's county in year $t-s$. s represents how long ago the household realized the local house price growth. S denotes the experience horizon, which is the past four years. I weight the local house price growth as shown in equation (1) for $s = 1, \ldots, 4$ and normalize the weight to sum up to 1.

Panel A of Table I reports the descriptive statistics of *EXPR*. The average *EXPR* is 10% and varies substantially, with a cross-sectional standard deviation of 13.2%. *EXPR* also varies considerably within households over time. The standard deviation of the residuals of *EXPR* after absorbing year, county, and household fixed effects (see Appendix A, Figure A3) is 6.7%. Even after additionally absorbing $state \times year$ fixed effects, *EXPR* residuals still vary substantially within a household with a standard deviation of 3.2%.

III. Empirical Strategy and Results

The primary interest of this paper is to examine whether the history of house price growth experienced locally by households affects their labor supply decisions. To conduct this empirical analysis, I first employ an ordinary least squares (OLS) fixed effect specification with an extensive set of household-level and head controls and an array of fixed effects. To address endogeneity concerns, such as local demand factors, that could drive both experienced price growth and households' labor supply, I use an instrumental variable strategy by exploiting the plausibly exogenous variation in the house price experiences of geographically distant families. The results from both approaches show the significant role of local house price experiences in households' labor supply decisions.

A. *Baseline Specification*

To examine the effect of experienced price growth (*EXPR*) on households' labor income, I formally estimate OLS fixed effects specification of the form:

$$y_{i,t} = \alpha + \beta\, EXPR_{i,t} + \gamma X_{i,t} + \tau_t + \eta_c + \delta_i + \kappa_{s\times t} + \epsilon_{i,t} \tag{2}$$

where the dependent variable, $y_{i,t}$, denotes the log real labor income for household i in the working year t. The main explanatory variable, $EXPR_{i,t}$, denotes the exponentially weighted average of the past four-year house price growth in household i's county of residence as calculated in equation (1). $X_{i,t}$ denote a vector of household-level and head characteristics, including inverse hyperbolic sine of home equity, log of head's age, squared age, indicators for household's homeownership status, head's racial status (white, African-American or Black, Others), whether head has some college education, whether the head is a male, and whether the head is married to a spouse that participate in the labor market or not or head is not married. $X_{i,t}$ also includes the log of the current minimum wage applicable to the households' state.

τ_t is a fixed effect for a year, which controls for common time series variation between *EXPR* and households' labor income. η_c is a fixed effect for the county where the household lives. The inclusion of η_c alleviates concerns about unobserved time-invariant characteristics of the county. δ_i is a fixed effect for a household, which allay concerns about unobserved time-invariant characteristics of the household. δ_i also ensures that the estimated results arise from the effect of the within-household variation in *EXPR* on households' labor income. To attenuate concerns about local time-varying factors that drive both *EXPR* and households' labor income, I include $state \times year$ fixed effects to control for time-varying economic conditions at the state level. The primary coefficient of interest is β, which measures the impact of *EXPR* on households' labor income after controlling for common time series variation between *EXPR* and households' labor income, observed household characteristics, unobserved time-invariant characteristics at the household and county level, and state-level time-varying economic conditions.

B. Baseline Results

Table II presents the results for the effect of *EXPR* on households' labor income by estimating various versions of equation (2).[10] In all specifications, I find a significant positive relationship between *EXPR* and households' labor income. Columns (1) and (2) report the cross-sectional results, where column (1) controls for year fixed effects and column (2) additionally controls for household-level and head characteristics and minimum wage applicable to the household's state. The estimated coefficient in column (1) is 0.623, which is significant at the 1% level. The coefficient is reduced to 0.467 in column (2), suggesting that observed household-level and head characteristics and state-level minimum wage explain differences in labor income across households. This estimated coefficient is also significant at the 1% level. Regarding economic magnitude, the coefficient in column (2) implies that a cross-sectional one standard deviation increase in *EXPR* is associated with a 6.2 percentage point increase in real labor income of households. This effect is approximately US$4668 ($= e^{11.260} - e^{11.198}$) increase in real annual labor earnings of households.

Columns (3) and (4) of Table II report the coefficient for the effect of within-household variation in *EXPR* on labor income. Controlling for minimum wage, household and head

[10] Appendix A, Table A1 presents the whole table with coefficients of the control variables.

Table II
Baseline Results

This table reports estimates from equation (2) for the effect of experienced price growth on households' labor income, using 1980–2018 PSID data and county-level house price index from Bogin et al. (2019). The outcome variable is the log of households' real labor income in the working 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 $\omega = 0.070$. Columns (1)-(2) and columns (3)-(4) report estimates in the cross-section and the time series, respectively. Column (1) controls for year fixed effects, and column (2) controls for additional household-level and head characteristics and minimum wage. Column (3) controls for additional fixed effects for county and household, and column (4) controls for additional *state*×*year* fixed effects. The household-level and head controls consist of the inverse hyperbolic sine of home equity, household size, the log of the head's age and squared age and indicators of the head's gender, spouse labor participation and non-participation, racial status, homeownership status, and college attendance status. Standard errors are clustered at the *county*×*year* level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

	Labor Income (log)			
	(1)	(2)	(3)	(4)
EXPR (log)	0.623***	0.467***	0.160***	0.352***
	(0.083)	(0.074)	(0.046)	(0.101)
Effect of 1 SD(pp)	8.2	6.2	1.1	1.1
Observations	16598	16598	16598	16598
Adjusted R^2	0.006	0.387	0.740	0.741
Controls				
Household X'tics		×	×	×
Minimum Wage		×	×	*subsumed*
Fixed Effect				
Year FE	×	×	×	*subsumed*
Household FE			×	×
County FE			×	×
State×Year FE				×

characteristics, and fixed effects for a year, household, and county, column (3) reports an estimated coefficient of 0.160, which is significant at the 1% level. This coefficient implies that a within-household one-standard-deviation increase in *EXPR* (a change of 0.067) is associated with a 1.1 percentage point increase in households' labor income, corresponding to a US$807 ($= e^{11.209} - e^{11.198}$) increase in real annual labor earnings of households. To attenuate concerns about time-varying county-level factors that correlate with *EXPR* and household labor income, in my richest and preferred specification, column (4), I include *state*×*year* fixed effects to control for time-varying factors at the state level. Including *state*×*year* fixed effects also subsumes the year fixed effects and the state-level minimum wage. The resulting estimate shows a coefficient of 0.352, which is significant at the 1% level. This coefficient implies that a within-household one-standard-deviation increase in *EXPR* (a change of 0.032) is associated with a 1.1 percentage point increase in households' labor income, corresponding to a US$807 increase in real annual labor earnings of households. Overall, the baseline results support the hypothesis that households significantly increase their labor supply as they experience higher house price growth in their locality.

B.1. Robustness

Throughout the analyses, I use the labor income of the household (i.e., head plus spouse labor income) as the main dependent variable. As a robustness test, columns (1) to (3) of Table III use only the heads' labor income as an alternative dependent variable, and the results are more or less similar to the baseline findings.

Moreover, as noted earlier, my main analyses focus on the SRC sample households, following existing literature that uses the PSID data to study household labor supply. As robustness tests, columns (4) to (6) of Table III use the core sample (i.e., the SRC and the SEO sample) plus the immigrant sample and apply the PSID core/immigrant family weight. The results are similar to the baseline findings.

Table III

Robustness

This table reports robustness tests to the baseline analysis for the effect of experienced price growth (*EXPR*) on households' labor income. Columns (1) to (3) use only the household head's labor income as the dependent variable. Columns (4) to (6) use the core plus immigrant sample and apply the PSID core/immigrant longitudinal family weight. Columns (7) to (9) use a sample of households with prime working-age heads. Columns (1), (4), and (7) report the cross-sectional results, controlling for household-level and head characteristics, minimum wage, and year fixed effects. Columns (2), (5), and (8) control for additional fixed effects for county and household and report the impact of within-household variation in *EXPR* on households' labor income. Columns (3), (6), and (9) control for additional *state*×*year* fixed effects. The household-level and head controls consist of the inverse hyperbolic sine of home equity, household size, the log of the head's age and squared age and indicators of the head's gender, spouse labor participation, and non-participation, racial status, homeownership status, and college attendance status. Standard errors are clustered at the *county*×*year* level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

	Labor Income (log)								
	Heads Only			Weighted Sample			Prime-Age Sample		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
EXPR (log)	0.525***	0.201***	0.402***	0.451***	0.169***	0.301***	0.420***	0.148***	0.314***
	(0.082)	(0.057)	(0.125)	(0.071)	(0.042)	(0.087)	(0.075)	(0.046)	(0.107)
Observations	16598	16598	16598	31390	31390	31390	14014	14014	14014
Adjusted R^2	0.189	0.613	0.616	0.408	0.756	0.762	0.403	0.760	0.762
Controls									
Household X'tics	×	×	×	×	×	×	×	×	×
Minimum age	×	×	×	×	×	×	×	×	×
Fixed Effects									
Year FE	×	×	×	×	×	×	×	×	×
Household FE		×	×		×	×		×	×
County FE		×	×		×	×		×	×
State×Year FE			×			×			×

Finally, throughout the analyses, I focus on households whose heads are between college completion age and near retirement age (i.e., age 24 to 60). As a robustness test, Table III, columns (7) to (9) focus on households whose heads are of prime working age (i.e., age 24 to 54). The results are similar to the baseline findings. Jointly, my findings suggest that local house price experiences significantly influence households' labor supply decisions.

C. *Instrumenting for Experienced Price Growth*

So far, my baseline findings support the hypothesis that households who have experienced higher price growth in their county of residence increase their labor supply significantly. The first possible concern with the interpretation of the baseline results is that time-varying county-level factors might drive both *EXPR* and households' labor supply, confounding the interpretation of the estimates. Instrumenting for *EXPR* with an instrument that is unlikely to be correlated with time-varying county-level factors can help alleviate this concern. As a result, I instrument for the *EXPR* of households with the *EXPR* of extended family households living out-of-county (OOC) on the assumption that the exclusion restriction is plausibly satisfied, with the instrument being orthogonal to time-varying factors in the household's county.

To calculate the instrument, I restrict my sample to households whose extended family members reside in other counties. I define extended family members as separate households that belong to the same family (i.e., share the same family identifier). I then calculate the *EXPR* of OOC extended family members as

$$EXPR_{i,t}^{ooc} = \frac{1}{N_i^{ooc}} \sum_{j=1}^{N_i^{ooc}} EXPR_{j,t} \tag{3}$$

where $EXPR^{ooc}$ denote the average house price experiences of household i's extended family members living out-of-county. N_i^{ooc} is the total number of household's out-of-county extendend families. $EXPR_{j,t}$ represents the experienced price growth of out-of-county extended family member j as computed in equation (1).

Appendix A, Table A2 reports the descriptive statistics of the IV estimation sample. The sample comprises 5797 household-year observations for 1036 unique households residing in 400 unique U.S. counties. Panel A reports the descriptive statistics of the main variables. The instrument, $EXPR^{ooc}$, averages 6.4% with a cross-sectional standard deviation of 9.6%. Appendix A, Figure A4 shows that $EXPR^{ooc}$ varies substantially even within households over time. After absorbing fixed effects for a year, county, and household, the standard deviation of the residuals of $EXPR^{ooc}$ is 5.1%.

D. Instrument Validity

To satisfy the relevance assumption, the instrument, $EXPR^{ooc}$, must strongly correlate *EXPR*. According to Shiller (2007), fluctuations in house prices are socially contagious. That is, through social interactions, fluctuations in house prices in geographically distant areas influence individuals' expectations about future house price growth and, in turn, drive individuals' local house price growth. To test this empirically, Bailey, Cao, Kuchler, and Stroebel (2018) shows that individuals extrapolate from their friends' house price experiences when forming expectations about future house price growth and particularly instrument friends' house price experiences with out-of-town friends' house price experiences. In a similar spirit, I expect that through house price expectations, households whose geographically distant family members have experienced higher local price growth will have higher local house price experiences.

To satisfy the exclusion restriction assumption, the instrument, $EXPR^{ooc}$, should not affect households' labor income other than through its effect on *EXPR*. A possible threat to this assumption is that through risk sharing with OOC family members, such as joint mortgages with OOC family members or households using their OOC family members' homes as collateral for loans, $EXPR^{ooc}$ might be correlated with households' home equity or borrowing, which will then affect their labor supply decisions. To alleviate concerns about these threats to identification, I examine whether the instrument is significantly uncorrelated with households' future home equity and mortgage borrowing.

Figure 2 presents the estimated results for the effect of $EXPR^{ooc}$ on one to three years ahead home equity and mortgage borrowings of households, controlling for fixed effects for a year, county, and household. Standard errors are clustered at the county level. Panel A and B of Figure 2 show the estimated coefficients for the effect of $EXPR^{ooc}$ on one-year to three-years ahead home equity and mortgage borrowings of households, respectively, together with 95% confidence intervals. The coefficients are not significantly different from zero, implying that $EXPR^{ooc}$ and future home equity or mortgage borrowings of households are significantly uncorrelated. These findings alleviate the possibility that risk sharing between households and OCC family members is a threat to the identification of the effect of the instrumented *EXPR* on households' labor supply.

E. IV Results

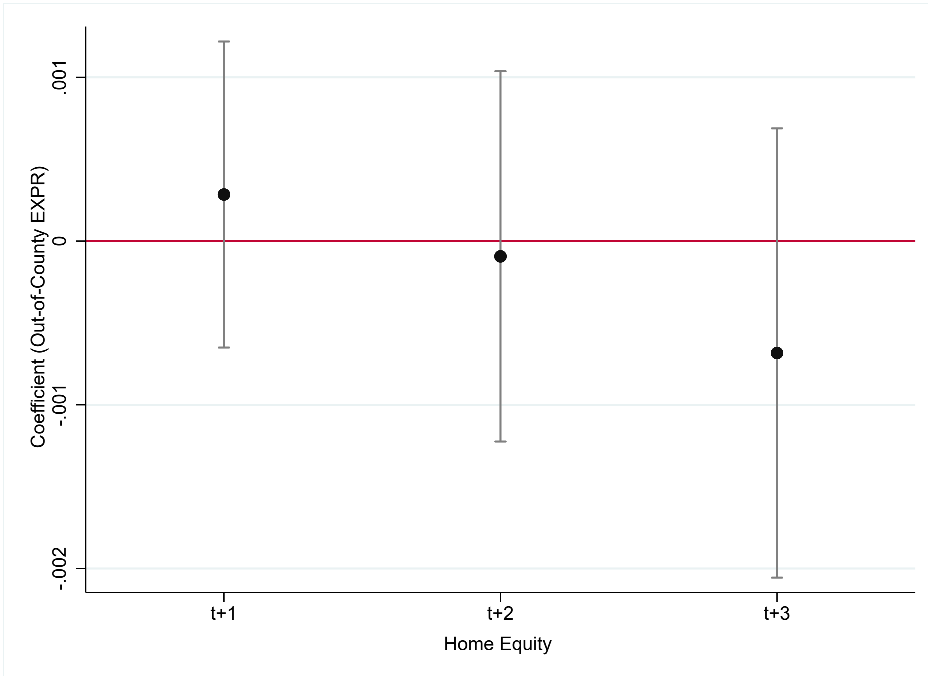
I estimate the effect of instrumented *EXPR* on households' labor income as follows:

$$EXPR_{i,t} = \zeta\, EXPR^{ooc}_{i,t} + \gamma X_{i,t} + \tau_t + \delta_i + \eta_c + v_{i,t} \tag{4}$$

$$y_{i,t} = \beta\, \widehat{EXPR_{i,t}} + \gamma X_{i,t} + \tau_t + \delta_i + \eta_c + \epsilon_{i,t} \tag{5}$$

where $EXPR_{i,t}$ is the endogenous own-county house price experiences of household i in year t and $EXPR^{ooc}_{i,t}$ is the instrument, out-of-county house price experiences of household i's extended families in year t. $\widehat{EXPR_{i,t}}$ is the predicted *EXPR* of household i in year t. All other variables are as defined in the baseline specification, equation (2).

Panel A: Household Home Equity



Panel B: Household Mortgage Borrowing

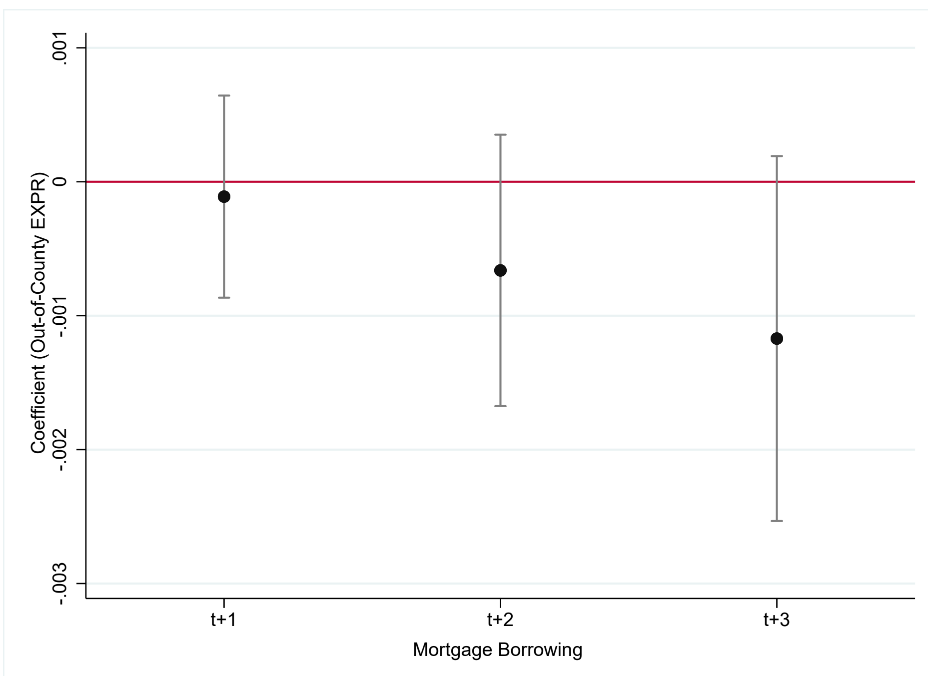


Figure 2. Instrument Validity: The figures present the results of a validity test of the exclusion restriction. Panel A plots the estimated coefficient of the instrument, Out-of-county *EXPR* ($EXPR^{ooc}$), on households' home equity in years $t+1$, $t+2$, and $t+3$ after controlling for year, county, and household fixed effects. Home equity is computed as the reported house value minus outstanding mortgages, to which I then apply inverse hyperbolic sine transformation. Panel B plots the estimated coefficient of $EXPR^{ooc}$ on households' mortgage borrowing in years $t+1$, $t+2$, 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 county level.

Table IV reports my IV results for the effect of *EXPR* on households' labor income. Columns (1)-(3) present the results for various versions of the first-stage regression where the endogenous *EXPR* is regressed on the instrument, $EXPR^{ooc}$. Controlling for observed household-level and head characteristics, state-level minimum wage, and various fixed effects for a year, county, and household, column 2, which mirrors equation (4), reports an estimated coefficient of 0.455, significant at the 1% level. This result suggests that $EXPR^{ooc}$ significantly correlates with *EXPR*. The instrument also passes the weak instrument identification test, with Kleibergen-Paap *rk* Wald *F*-statistic equals 73.4, significant at the 1% level. The estimated coefficient reduces slightly to 0.499 after additionally controlling for economic conditions in the OOC family members' counties by adding the average of current house price growth across the OOC family members' counties as a control variable. These findings suggest that the instrument, $EXPR^{ooc}$, satisfies the relevance assumption and passes the weak instrument identification test.

Columns (4)-(6) of Table IV present the second-stage results by estimating various versions of equation (5). The IV estimates are slightly more substantial than the OLS estimates in the baseline. Controlling for household-level and head characteristics, minimum wage, and fixed effects for a year, column 4 reports the cross-sectional results, with an estimated coefficient of 1.011, which is significant at the 1% level. This result implies that a cross-sectional one standard deviation increase in instrumented *EXPR* is associated with a 9.7 percentage point increase in households' labor income, approximately US$8224 ($= e^{11.396} - e^{11.299}$) increase in real annual labor income of households. Column 5 mirrors equation (5), which controls for household-level and head characteristics, minimum wage, and fixed effects for a year, county, and household. The estimated coefficient is 0.631, which is significant at the 5% level. This result implies that a within-household one-standard-deviation in instrumented *EXPR* (a change of 0.051) is associated with a 3.2 percentage point increase in households' labor income, approximately US$2625 ($= e^{11.331} - e^{11.299}$) increase in the household's real annual labor income.

Table IV

IV Results

This table reports estimates for the effect of instrumented experienced price growth on households' labor income, using 1980–2018 PSID data and county-level house price index from Bogin et al. (2019). The outcome variable is the log of households' real labor income in the working 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 $\omega = 0.070$. $EXPR$ is instrumented with $EXPR^{ooc}$, which denotes the average $EXPR$ of out-of-county extended family households. Columns (1)-(3) report results from estimating various versions of the first-stage equation (4), and columns (4)-(6) report the corresponding results from estimating the various versions of the second-stage equation (5). Columns (1) and (4) report the cross-sectional results after controlling for household-level and head characteristics, minimum wage, and a fixed effect for a year. Columns (2) and (5) report estimates in the time series after controlling for additional fixed effects for a household and county. Columns (3) and (6) additionally control for economic conditions in the out-of-county (OOC) extended family households' counties by controlling for average house price growth across the OOC extended family members' counties. The household-level and head controls consist of the inverse hyperbolic sine of home equity, household size, the log of the head's age and squared age and indicators of the head's gender, spouse labor participation and non-participation, racial status, homeownership status, and college attendance status. K-P F-stat. is the Kleibergen-Paap rk Wald F statistic for weak identification test. Standard errors are clustered at the county level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

	First Stage			Second Stage		
	EXPR			Labor Income (log)		
	(1)	(2)	(3)	(4)	(5)	(6)
IV: EXPR^{ooc}	0.467***	0.455***	0.449***			
	(0.045)	(0.053)	(0.052)			
EXPR (log)				1.011***	0.631**	0.612**
				(0.389)	(0.297)	(0.289)
Effect of 1 SD(pp)				9.7	3.2	3.1
Observations	5797	5797	5797	5797	5797	5797
Adjusted R^2	0.006	0.387	0.387			
K-P F-stat.				105.7	73.4	73.6
<u>Controls</u>						
Household X'tics	×	×	×	×	×	×
Minimum Wage	×	×	×	×	×	×
OOC-Level			×			×
<u>Fixed Effect</u>						
Year FE	×	×	×	×	×	×
Household FE		×	×		×	×
County FE		×	×		×	×

A possible concern with the above IV results is that unobserved shocks could drive both households' labor income and aggregate house prices in the counties of geographically distant family members. For example, suppose households and their family members work in the same sector of the economy that features significant geographic clustering. In that case, shocks to that sector might influence households' labor supply and aggregate house prices in the distant counties where the family members reside. To attenuate this concern, column (6) of Table IV additionally controls for economic conditions in the counties where the geographically distant family members live. In particular, after further controlling for the average current house price growth across the counties of the OOC family members, column (6) of Table IV reports an estimated coefficient of 0.612, significant at the 5% level. This result implies that a within-household one-standard-deviation increase in instrumented *EXPR* is associated with a 3.1 percentage point increase in households' labor income, which translates to an average increase in real annual household labor income of approximately US$2542 ($= e^{11.330} - e^{11.299}$). Overall, my results show that households significantly increase their labor supply as they experience higher house price growth in their locality.

IV. Heterogeneity

This section exploits heterogeneity in household characteristics such as homeownership status, age cohort, and education level of household heads to provide insight into the factors likely to explain the differences in labor supply across households in response to *EXPR* and also rule out alternative explanations to my main findings.

A. *Homeownership Heterogeneity*

In this section, I examine whether the effect of *EXPR* on households' labor income differs between homeowners and renters. This exercise also helps rule out concerns about home equity effects, which might confound the interpretation of my main findings as resulting from experience effects. In particular, recent studies suggest that growth in house prices influences homeowners' labor supply through home equity effects. For example, Gopalan et al. (2021) finds that a decline in house prices, which causes homeowners to have negative home equity, reduces homeowners' labor income and finds no effect among renters. If home equity effects are the underlying mechanism, the effect of *EXPR* on labor income should be concentrated among only homeowners with no effect on renters' labor income. However, suppose *EXPR* captures experience effects. In that case, since both homeowners and renters experience the local house price growth realizations, we should see the effect of *EXPR* on labor income to be more or less similar for homeowners and renters. To investigate these conjectures, I augment the baseline specification with an interaction term between *EXPR* and an indicator for homeownership and estimate the following regression:

$$\begin{aligned} y_{i,t} &= \alpha + \beta\, EXPR_{i,t} + \beta_{owner}\,(EXPR_{i,t} \times \mathbb{1}_{i,owner}) + \varphi \mathbb{1}_{i,owner} + \dots \\ &\quad \dots + \gamma X_{i,t} + \tau_t + \eta_c + \delta_i + \kappa_{s\times t} + \epsilon_{i,t} \end{aligned} \tag{6}$$

where $\mathbb{1}_{i,owner}$ is an indicator variable that equals one if the household is a homeowner and zero if the household rents. The coefficient of the interaction term, β_{owner}, captures the differential effect of *EXPR* on homeowners' labor income, and the coefficient β captures the direct impact on renters.

Table V reports the results for the differential effect of *EXPR* on homeowners' labor income. Columns (1) and (2) report the OLS results. Columns (3) and (4) report the second stage IV results by augmenting the main IV specifications (equations (4) and (5)) with

Table V

Homeownership Heterogeneity

This table reports the estimates from equation (6), allowing the effect of experienced price growth (*EXPR*) on households' labor income to vary by homeownership status. Columns (1) and (2) report results for augmenting the baseline OLS specification with an interaction term between *EXPR* and an indicator for whether the household is a homeowner. Columns (3) and (4) report the second-stage results for the IV version of this augmented model. Columns (1) and (3) report the cross-sectional results, controlling for household-level and head characteristics, minimum wage, and year fixed effects. Column 2 reports the strictest OLS specification results, controlling for household-level and head characteristics, minimum wage, and fixed effects for a year, county, household, and $state \times year$. Column 4 reports results from the strictest IV specification, controlling for household-level and head characteristics, minimum wage, average house price growth across the out-of-county extended family members' counties, and fixed effects for a year, county, and household. The household-level and head controls consist of the inverse hyperbolic sine of home equity, household size, the log of the head's age and squared age and indicators of the head's gender, spouse labor participation, and non-participation, racial status (white, African-American, or Other), and college attendance status. K-P F-stat. is the Kleibergen-Paap rk Wald F statistic for weak identification test. Standard errors are clustered at the $county \times year$ level in the OLS specification and at the county level in the IV specification. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

	Labor Income (log)			
	OLS Fixed Effects		IV: Second Stage	
	(1)	(2)	(3)	(4)
EXPR (log)	0.834***	0.459***	1.796***	0.711
	(0.123)	(0.134)	(0.496)	(0.493)
EXPR $\times \mathbb{1}_{i,owner}$	-0.443***	-0.130	-0.930**	-0.110
	(0.113)	(0.091)	(0.382)	(0.418)
Observations	16598	16598	5797	5797
Adjusted R^2	0.388	0.741		
K-P F-stat.			54.3	34.7
<u>Controls</u>				
Household X'tics	×	×	×	×
Minimum Wage	×	*subsumed*	×	×
OOC-Level				×
<u>Fixed Effect</u>				
Year FE	×	*subsumed*	×	×
Household FE		×		×
County FE		×		×
State×Year FE		×		

interactions between $EXPR$ and $\mathbb{1}_{i,owner}$. Columns (1) and (3) report the cross-sectional results, and columns (2) and (4) report the results from the strictest specifications. In all specifications, the coefficient of the interaction term is negative, suggesting that, if anything, the effect of $EXPR$ on labor income is less pronounced among homeowners. The interaction term coefficient is statistically significant in the cross-section and insignificant within the same household over time. These results imply that within households over time, the effect of $EXPR$ on labor income is similar for homeowners and renters but less pronounced among homeowners in the cross-section. Overall, my findings suggest that the impact of $EXPR$ on labor supply is more or less identical for homeowners and renters. This finding helps rule out the effects of home equity as a potential explanation for my main findings.

B. Age Cohort Heterogeneity

Next, I examine whether the effect of $EXPR$ on households' labor income differs between young and older households. Studies on lifetime experience-based learning would suggest that the impact of $EXPR$ on labor income should be more pronounced among younger households (see, for example, Malmendier and Nagel (2011, 2016)). In contrast, studies on extrapolative experience-based learning would suggest no significant difference between the impact of $EXPR$ on younger and older households' labor income (see, for example, Armona et al. (2019); Kuchler and Zafar (2019)). To investigate which experience learning model underlies my main findings, I augment the baseline specification with an interaction term between $EXPR$ and an indicator for middle-aged and older households and estimate the following regression:

$$\begin{aligned} y_{i,t} &= \alpha + \beta\, EXPR_{i,t} + \beta_{mid}\,(EXPR_{i,t} \times \mathbb{1}_{i,mid}) + \beta_{old}\,(EXPR_{i,t} \times \mathbb{1}_{i,old}) + \ldots \\ &\quad \cdots + \varphi \mathbb{1}_{i,mid} + \phi \mathbb{1}_{i,old} + \gamma X_{i,t} + \tau_t + \eta_c + \delta_i + \kappa_{s\times t} + \epsilon_{i,t} \end{aligned} \tag{7}$$

where $\mathbb{1}_{i,mid}$ and $\mathbb{1}_{i,old}$ are indicator variables that equal one for middle-aged $(40 \leq Age \leq 54)$ and older $(55 \leq Age \leq 60)$ households, respectively, and zero otherwise. The coefficient of the interaction terms, β_{mid} and β_{old}, capture the differential effect of *EXPR* on middle-aged and older households' labor income, respectively, and the coefficient β captures the direct impact on younger households.

Table VI reports the results for the differential effect of *EXPR* on middle-aged and older households' labor income. Columns (1) and (2) report the OLS results. Columns (3) and (4) report the second stage IV results by augmenting the main IV specifications (equations (4) and (5)) with interactions between *EXPR* and $\mathbb{1}_{i,mid}$, and *EXPR* and $\mathbb{1}_{i,old}$. In the cross-section of households, the coefficients of the interaction terms are not statistically significant in the OLS specification (see column (1)) and marginally significant for older households in the IV specification (see column (3)). Within the same household over time, the coefficient of the interaction terms is statistically significant for older households in the OLS specification (see column (2)) and not statistically significant in the IV specification (see column (4)). Jointly, these findings suggest no statistically significant difference in labor supply between younger and older households in response to *EXPR*.

C. *Education Heterogeneity*

Finally, I examine the differential effect of *EXPR* on the labor supply of households whose head has some college education. In experience-based expectation formation, existing work suggests that college-educated individuals are less prone to cognitive biases and, therefore, extrapolate relatively less from past local house price experiences when forming expectations about national house price growth (see Kuchler and Zafar (2019)). In contrast, Armona et al. (2019) show that college-educated individuals are more likely to update their local house expectations in response to past local house price experiences. In intertemporal decision-making, Braggion et al. (2023) find that sophisticated investors

Table VI

Age Cohort Heterogeneity

This table reports estimates from equation (7), allowing the effect of experienced price growth (*EXPR*) on households' labor income to vary by age cohort. Columns (1) and (2) report results for augmenting the baseline OLS specification with an interaction term between *EXPR* and an indicator for whether the head is middle-aged or old. Columns (3) and (4) report the second-stage results for the IV version of this augmented model. Columns (1) and (3) report the cross-sectional results, controlling for household-level and head characteristics, minimum wage, and year fixed effects. Column 2 reports results from the strictest OLS specification, controlling for household-level and head characteristics, minimum wage, and fixed effects for a year, county, household, and $state \times year$. Column 4 reports results from the strictest IV specification, controlling for household-level and head characteristics, minimum wage, average house price growth across the out-of-county extended family members' counties, and fixed effects for a year, county, and household. The household-level and head controls consist of the inverse hyperbolic sine of home equity, household size and indicators of the head's gender, spouse labor participation, and non-participation, racial status (white, African-American, or Other), homeownership status, and college attendance status. K-P F-stat. is the Kleibergen-Paap *rk* Wald F statistic for weak identification test. Standard errors are clustered at the $county \times year$ level in the OLS specification and at the county level in the IV specification. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

	Labor Income (log)			
	OLS Fixed Effects		IV: Second Stage	
	(1)	(2)	(3)	(4)
EXPR (log)	0.525***	0.273**	0.889**	0.399
	(0.080)	(0.112)	(0.392)	(0.277)
EXPR $\times \mathbb{1}_{i,mid}$	0.016	0.110	0.013	0.455
	(0.075)	(0.068)	(0.305)	(0.355)
EXPR $\times \mathbb{1}_{i,old}$	0.072	0.383***	0.852*	0.368
	(0.123)	(0.123)	(0.473)	(0.473)
Observations	16598	16598	5797	5797
Adjusted R^2	0.380	0.737		
K-P F-stat.			35.8	25.4
<u>Controls</u>				
Household X'tics	×	×	×	×
Minimum Wage	×	*subsumed*	×	×
OOC-Level				×
<u>Fixed Effect</u>				
Year FE	×	*subsumed*	×	×
Household FE		×		×
County FE		×		×
State×Year FE		×		

are less likely to rely on local inflation experiences in portfolio allocation decisions. In this section, I examine the differences in labor supply decisions between sophisticated and less-sophisticated households in response to *EXPR*. I assign an indicator variable that equals one to a sophisticated household if the household head has some college education and zero otherwise. I then augment the baseline OLS specification with an interaction term between *EXPR* and indicator for sophisticated households:

$$\begin{aligned} y_{i,t} &= \alpha + \beta\, EXPR_{i,t} + \beta_{college}\left(EXPR_{i,t} \times \mathbb{1}_{i,college}\right) + \varphi \mathbb{1}_{i,college} + \dots \\ &\quad \dots + \gamma X_{i,t} + \tau_t + \eta_c + \delta_i + \kappa_{s\times t} + \epsilon_{i,t} \end{aligned} \tag{8}$$

where $\mathbb{1}_{i,college}$ is an indicator variable that equals one if the household head has some college education and zero otherwise. The coefficient of the interaction term, $\beta_{college}$, captures the differential effect of *EXPR* on sophisticated households' labor income, and the coefficient β captures the direct impact on non-sophisticated households.

Table VII reports the results for the differential effect of *EXPR* on sophisticated households' labor income. Columns (1) and (2) report the OLS results. Columns (3) and (4) report the second stage IV results by augmenting the main IV specifications (equations (4) and (5)) with interactions between *EXPR* and $\mathbb{1}_{i,college}$. In all specifications, the coefficient $\beta_{college}$ is negative and statistically significant at the 5% level. These results suggest that the effect of *EXPR* on labor income is less pronounced among sophisticated households.

V. Potential Mechanism

This paper so far establishes that experiencing higher local house price growth leads to increased labor earnings of households, even within the same household over time. What explains this finding? In this section, I investigate and discuss the possible mechanisms through which higher *EXPR* could lead to increased labor income of households.

Table VII

Education Heterogeneity

This table reports estimates from equation (8), allowing the effect of experienced price growth (*EXPR*) on households' labor income to vary by college attendance status. Columns (1) and (2) report results for augmenting the baseline OLS specification with an interaction term between *EXPR* and an indicator for whether the head has some college education. Columns (3) and (4) report the second-stage results for the IV version of this augmented model. Columns (1) and (3) report the cross-sectional results, controlling for household-level and head characteristics, minimum wage, and year fixed effects. Column 2 reports the strictest OLS specification results, controlling for household-level and head characteristics, minimum wage, and fixed effects for a year, county, household, and *state*×*year*. Column 4 reports results from the strictest IV specification, controlling for household-level and head characteristics, minimum wage, average house price growth across the out-of-county extended family members' counties, and fixed effects for a year, county, and household. The household-level and head controls consist of the inverse hyperbolic sine of home equity, household size, the log of the head's age and squared age and indicators of the head's gender, spouse labor participation, and non-participation, racial status (white, African-American, or Other), and homeownership status. K-P F-stat. is the Kleibergen-Paap rk Wald F statistic for weak identification test. Standard errors are clustered at the *county*×*year* level in the OLS specification and at the county level in the IV specification. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

	Labor Income (log)			
	OLS Fixed Effects		IV: Second Stage	
	(1)	(2)	(3)	(4)
EXPR (log)	0.618***	0.435***	1.229***	0.832**
	(0.081)	(0.101)	(0.425)	(0.323)
EXPR $\times \mathbb{1}_{i,college}$	-0.259***	-0.245***	-0.677**	-0.651**
	(0.075)	(0.065)	(0.319)	(0.286)
Observations	16598	16598	5797	5797
Adjusted R^2	0.385	0.742		
K-P F-stat.			56.5	39.8
<u>Controls</u>				
Household X'tics	×	×	×	×
Minimum Wage	×	*subsumed*	×	×
OOC-Level				×
<u>Fixed Effect</u>				
Year FE	×	*subsumed*	×	×
Household FE		×		×
County FE		×		×
State×Year FE		×		

A. Hours Worked

I analyze the effect of *EXPR* on the intensive margin of households' labor supply: hours worked. In particular, I examine whether the increase in labor earnings of households when experiencing higher local price growth is due to households working for more hours. I estimate the baseline OLS specification, equation (2), and the IV specification, equations (4) and (5), where the dependent variable is now the log of hours worked by the household.

Table VIII reports the estimated results for the effect of *EXPR* on households' hours worked. Columns (1) and (2) report the results from the OLS specification, and columns (3) and (4) report the results from the second-stage IV specifications. Controlling for household-level and head characteristics, minimum wage, and year fixed effects, column (1) reports a coefficient of 0.108, significant at the 1% level. This result implies that a cross-sectional one-standard-deviation increase in *EXPR* is associated with a 1.4 percentage point increase in hours worked, corresponding to a 41-hour ($= e^{8.000} - e^{7.986}$) increase in annual hours worked by the household. In the IV version, column (3) reports a coefficient of 0.437, though significant at the 10% level. This result implies that a cross-sectional one-standard deviation in instrumented *EXPR* is associated with a 4.2 percentage points increase in hours worked, corresponding to a 133-hour ($= e^{8.078} - e^{8.036}$) increase in annual hours worked by the household.

Controlling for household-level and head characteristics, minimum wage, and fixed effects for a year, county, household, and $state \times year$, Table VIII, column (2) reports an OLS estimate of 0.215, which is significant at the 1% level. This result implies that a within-household one-standard-deviation increase in *EXPR* (a change of 0.032) is associated with a 0.7 percentage point increase in hours worked, corresponding to a 21-hour ($= e^{7.993} - e^{7.986}$) increase in annual hours worked by the household. In the IV version, column (4) reports a coefficient of 0.308, though significant at the 10% level. This result implies that

Table VIII

Experienced Price Growth and Hours Worked

This table reports estimates for the effect of experienced price growth on households' hours worked, using 1980–2018 PSID data and county-level house price index from Bogin et al. (2019). The outcome variable is the log of households' hours worked in the working 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 $\omega = 0.070$. Columns (1)-(2) report estimates from the OLS specification, equation (2). Columns (3)-(4) report estimates from the second-stage IV specification, equation (5), where $EXPR$ is instrumented with $EXPR$ of out-of-county extended families, $EXPR^{ooc}$. Controlling for household-level and head characteristics, minimum wage, and fixed effects for a year, columns (1) and (3) report estimates in the cross-section. Column (2) reports estimates in the time series for the OLS specification after controlling for additional fixed effects for county, household, and $state \times year$. Column (4) reports estimates in the time series for the IV specification after controlling for household-level and head characteristics, minimum wage, average house price growth across the counties of the out-of-county (OOC) extended families, and fixed effect for a year, county, and household. The household-level and head controls consist of the inverse hyperbolic sine of home equity, household size, the log of the head's age and squared age and indicators of the head's gender, spouse labor participation and non-participation, racial status, homeownership status, and college attendance status. K-P F-stat. is the Kleibergen-Paap rk Wald F statistic for weak identification test. Standard errors are clustered at the $county \times year$ level in the OLS specification and at the county level in the IV specification. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

	Hours Worked (log)			
	OLS Fixed Effects		IV: Second Stage	
	(1)	(2)	(3)	(4)
EXPR (log)	0.108***	0.215***	0.437*	0.308*
	(0.037)	(0.071)	(0.231)	(0.181)
Effect of 1 SD(pp)	1.4	0.7	4.2	1.6
Observations	16598	16598	5797	5797
Adjusted R^2	0.455	0.673		
K-P F-stat.			105.7	73.6
<u>Controls</u>				
Household X'tics	×	×	×	×
Minimum Wage	×	*subsumed*	×	×
OOC-Level				×
<u>Fixed Effect</u>				
Year FE	×	*subsumed*	×	×
Household FE		×		×
County FE		×		×
State×Year FE		×		

a within-household one-standard-deviation increase in instrumented *EXPR* (a change of 0.051) is associated with a 1.6 percentage point increase in hours worked, corresponding to a 50-hour ($= e^{8.052} - e^{8.036}$) increase in annual hours worked by the household. Overall, my findings suggest that households work for more hours when experiencing higher price growth in their local housing markets.

B. *Further Discussion*

The further question that arises is, why would households work more hours to earn more income when experiencing higher local price growth? Recent studies suggest that personal experiences of higher local price growth increase individuals' expectations about future local and national house price growth (Armona et al. (2019); Kuchler and Zafar (2019)). Homeowners' optimistic beliefs about future house price gains could improve their health or make them feel better psychologically and devote more time and energy to work, ultimately leading to higher earnings for employed homeowners or higher business income for self-employed homeowners. In fact, existing works show that house price appreciation improves homeowners' health (Fichera and Gathergood (2016)) and entrepreneurial outcomes (Adelino et al. (2015); Schmalz et al. (2017)). Also, based on evidence that housing market distress constrained homeowners' job search and settling for lower-level positions near their homes (Brown and Matsa (2020)), experiencing higher local house price growth may stimulate homeowners to search broadly for more or better jobs to earn more.

For renters, experiencing higher house price growth and expecting higher future price growth would mean working more to meet the higher future cost of living, including a down payment for homes and rent expenditures. Higher local house price experiences would, therefore, stimulate renters' labor supply.

VI. Conclusion

House price fluctuations play a determining role in households' labor supply decisions. Existing work has documented how housing market distress could dampen households' labor supply through negative home equity. In this paper, I document an equally important determinant of household labor supply: experienced local house price fluctuations significantly influence household labor supply decisions. Even within the same household over time, a one standard deviation increase in experienced price growth leads to a 1 to 3 percentage points increase in households' labor income, corresponding to an average increase in annual labor earnings of US$807 to US$2625.

Exploiting household characteristics, I find no significant difference in labor earnings between homeowners and renters exposed to the same local house price experiences. This finding suggests that the effect of experienced price growth on labor supply is not likely to be due to home equity effects. Moreover, consistent with existing literature suggesting that sophisticated individuals are less prone to behavioral biases, the impact of experienced price growth on labor earnings is less pronounced for sophisticated households.

Exploring the various mechanisms, I find that households work for more hours when experiencing higher local price growth. Within the same household over time, the effect of one standard deviation increase in experienced price growth on households' hours worked is about 1 to 2 percentage points, corresponding to about 21 to 50 hours increase in annual hours worked. Experiencing higher local price growth, which leads to higher expectations about future house price growth, may make homeowners less psychologically distressed and devote more time and energy to work or search more broadly for better job offers. Experiencing higher local price growth may also boost homeowners' entrepreneurial activities. Renters may also work more to meet higher future costs of living, including higher rent payments and downpayment for homes when experiencing higher local price growth.

Overall, this paper provides a novel channel through which the housing market could influence household labor supply decisions. More broadly, my findings highlight the importance of personal experiences in understanding households' labor supply decisions.

Appendix A.

A1. Full Baseline Results

Table A1

Full Baseline Results

This table presents the full baseline results for the relationship between *EXPR* and households' labor income, as shown in Table II of the main paper.

	Labor Income (log)			
	(1)	(2)	(3)	(4)
EXPR (log)	0.623***	0.467***	0.160***	0.352***
	(0.083)	(0.074)	(0.046)	(0.101)
<u>Household-Level Controls</u>				
Home equity		0.014***	-0.000	-0.000
		(0.002)	(0.002)	(0.002)
Household size		-0.046***	-0.038***	-0.038***
		(0.005)	(0.006)	(0.006)
Age (log)		1.756***	-1.752	-1.729
		(0.112)	(1.107)	(1.204)
Age (squared)		-0.001***	-0.002***	-0.002***
		(0.000)	(0.000)	(0.000)
Sex dummy		0.365***	-0.095	-0.146
		(0.033)	(0.191)	(0.212)
Spouse participation dummy		0.647***	0.405***	0.416***
		(0.031)	(0.037)	(0.040)
Spouse non-participation dummy		0.299***	0.149***	0.159***
		(0.034)	(0.039)	(0.043)
College dummy		0.354***	-0.021	-0.019
		(0.011)	(0.016)	(0.016)
White dummy		0.033*		
		(0.017)		
Black dummy		-0.102***		
		(0.026)		
Homeowner dummy		0.199***	0.075***	0.064**
		(0.027)	(0.026)	(0.027)
Minimum wage (log)		0.591***	0.222***	
		(0.072)	(0.070)	
Constant	11.136***	3.533***	20.322***	20.638***
	(0.011)	(0.370)	(4.750)	(5.167)
Observations	16598	16598	16598	16598
Adjusted R^2	0.006	0.387	0.740	0.741
Year FE	×	×	×	*subsumed*
Household FE			×	×
County FE			×	×
State×Year FE				×

A2. *Descriptive Statistics of IV Sample*

Table A2

Descriptive Statistics—IV Sample

The table reports descriptive statistics of households in the IV estimation sample, using the PSID data from 1980 to 2018 and county-level house price data from Bogin et al. (2019). Experienced price growth ($EXPR$) is measured as shown in equation (1). Out-of-county experienced price growth measure ($EXPR^{ooc}$) is discussed in Section III.C. The other variables are discussed in Section II.A. Values are annual and are not weighted. The variables presented in monetary terms are in 2018 U.S. dollars.

	Mean	Median	SD	P25	P75	N
Panel A: Main Variables						
Labor Income ($1000s)	100.608	91.751	63.491	57.311	127.579	5797
Labor Income (log)	11.299	11.427	0.759	10.956	11.756	5797
Hours Worked (1000s)	3.355	3.475	1.159	2.400	4.160	5797
Hours Worked (log)	8.036	8.153	0.468	7.783	8.333	5797
EXPR (log)	0.063	0.049	0.095	0.010	0.093	5797
EXPR^{ooc} (log)	0.064	0.049	0.096	0.010	0.096	5797
Panel B: Household Characteristics						
Home Equity ($1000s)	122.55	75.89	186.93	18.68	159.11	5797
Household Size	3.23	3.00	1.42	2.00	4.00	5797
Age (years)	41.84	41.00	9.47	34.00	50.00	5797
Homeowner	0.85	1.00	0.36	1.00	1.00	5797
College	0.53	1.00	0.50	0.00	1.00	5797
African-American	0.04	0.00	0.20	0.00	0.00	5797
White	0.89	1.00	0.31	1.00	1.00	5797
Male	0.88	1.00	0.32	1.00	1.00	5797
Spouse Participation Rate	0.69	1.00	0.46	0.00	1.00	5797
Spouse Non-participation Rate	0.12	0.00	0.33	0.00	0.00	5797

A.3 FIGURES

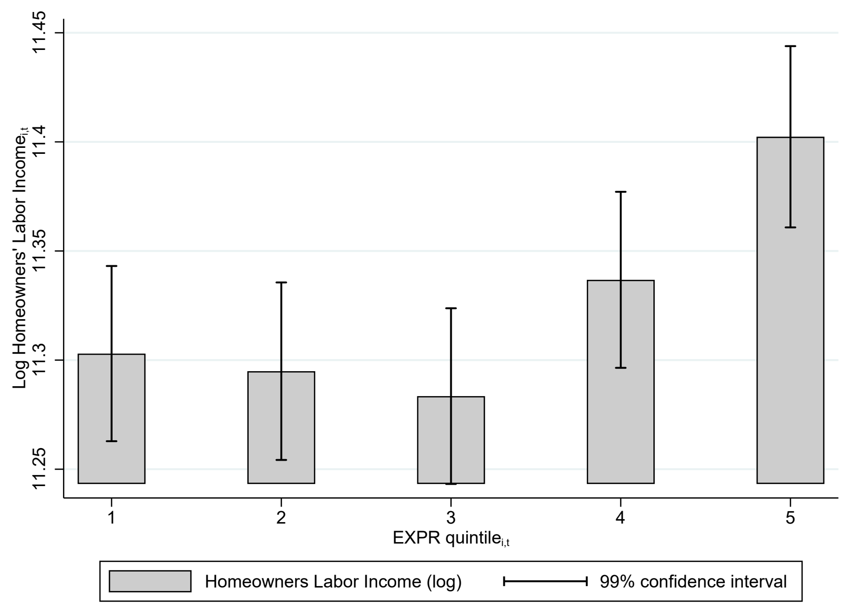


Figure A1. Experienced Price Growth and Homeowners Labor Income: The figure plots the average log labor income of homeowners who have experienced different past local house price growth. Each year, I sort homeowners into quintiles based on their *EXPR*. The figure plots point estimate with a 99% confidence interval.

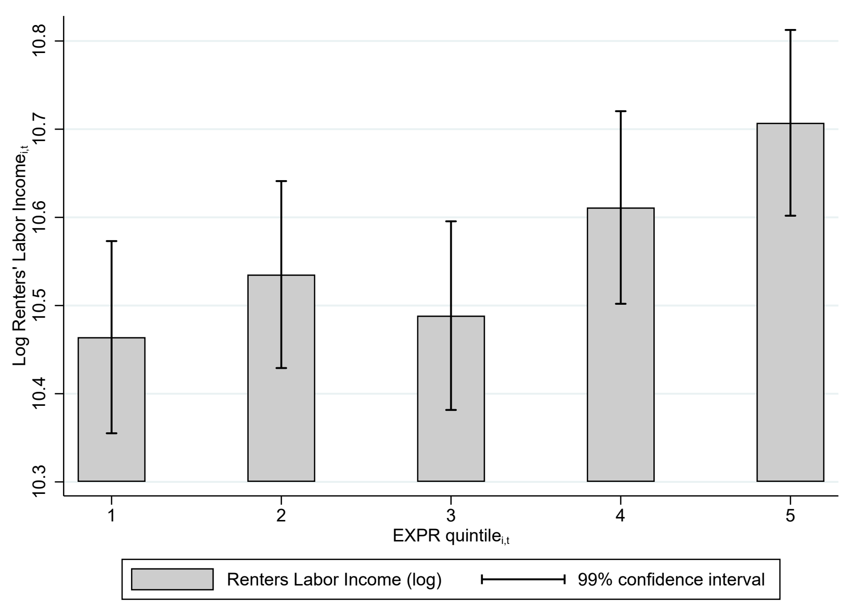


Figure A2. Experienced Price Growth and Renters Labor Income: The figure plots the average log labor income of renters who have experienced different past local house price growth. Each year, I sort renters into quintiles based on their *EXPR*. The figure plots point estimate with a 99% confidence interval.

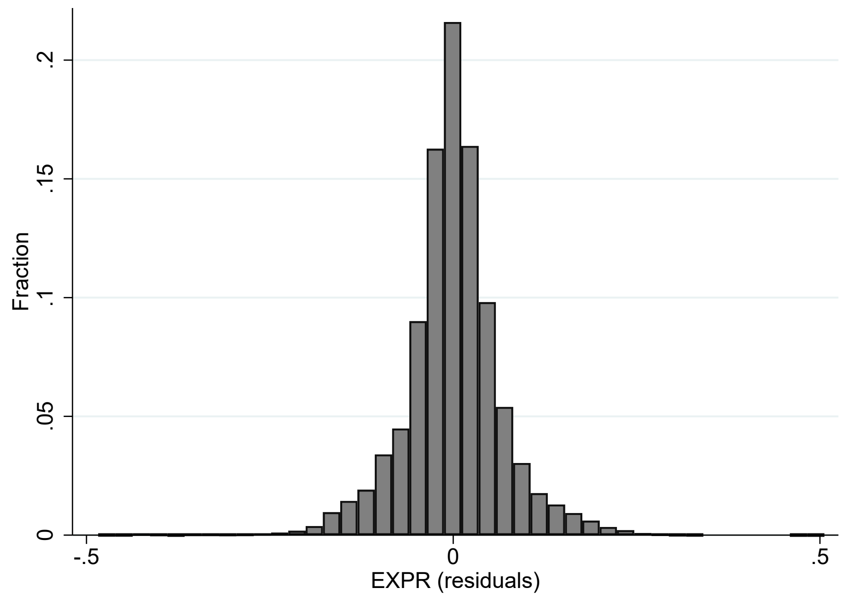


Figure A3. Distribution of Experienced Price Growth: The figure plots the sample distribution of residualized experienced price growth of households after absorbing year fixed effects, household fixed effects and county fixed effects.

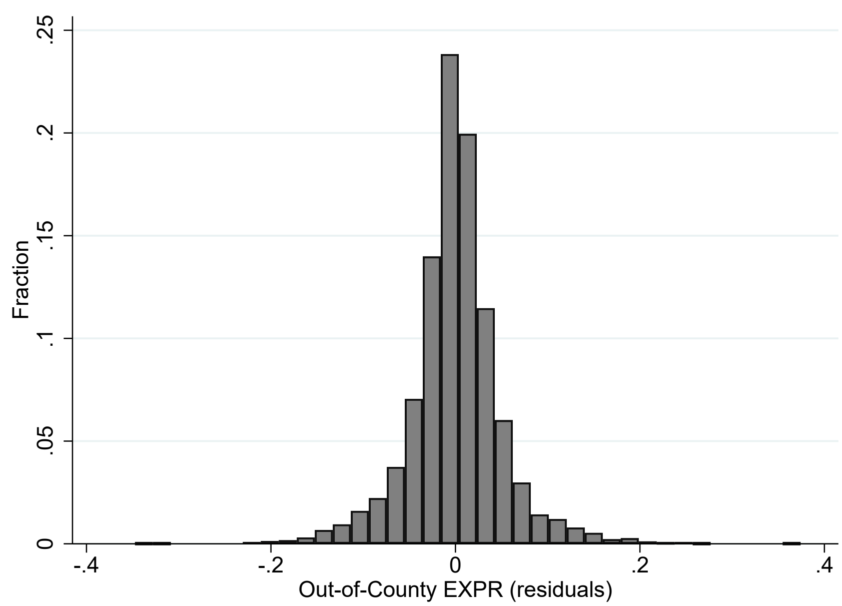


Figure A4. Distribution of Out-of-County Experienced Price Growth: The figure plots the sample distribution of residualized out-of-county experienced price growth of households after absorbing year fixed effects, household fixed effects, and county fixed effects.

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