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Monetary Policy and Housing Overvaluation

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ABSTRACT: This paper examines how housing market overvaluation—measured by the price-to-rent ratio and its deviations from long-term trends—affects the transmission of monetary policy. Using U.S. metropolitan-level data and three measures of monetary policy shocks, we find that house prices respond more strongly to policy rate changes in overvalued markets. Examining buyer heterogeneity, we show that investor demand, proxied by non-owner-occupied purchases, declines more sharply after monetary tightening in these markets. These results are consistent with models of extrapolative beliefs and suggest that monetary policy can serve a stabilizing role during housing booms.

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1 Introduction and Literature

A growing body of research suggests that belief overreaction plays a key role in driving excessive asset price fluctuations in housing (Glaeser and Nathanson, 2017; Chodorow-Reich et al., 2024; Bro and Eriksen, 2025; Adam et al., 2025), equity (Bordalo et al., 2024), and credit markets (López-Salido et al., 2017). Much of this literature focuses on how extrapolative expectations, combined with shifting fundamentals, generate the observed patterns in asset prices, like price momentum, reversals, boom-bust cycles, and, in general, deviations from fundamental values.

Building on this foundation, our paper investigates how the degree of house price overvaluation affects the transmission of monetary policy to housing markets. In particular, we ask: is monetary policy more effective in influencing house prices when local housing markets are overvalued? This question is central to debates over whether and how monetary authorities should lean against asset price imbalances (Bernanke and Gertler, 2001; Svensson, 2017). If monetary transmission is state-dependent and more potent during periods of overvaluation, then appropriately calibrated tightening can play a stabilizing role by dampening excessive price growth and mitigating the risk of future corrections. Conversely, excessively loose monetary policy during such periods can substantially amplify housing overvaluations, fueling speculative dynamics, and raising the likelihood of sharp reversals. Understanding if such amplification mechanism is present and quantifying it is thus an important input into the design of optimal monetary policy.

We begin by confirming that elevated price-to-rent ratios (PRRs) have divergent implications for future rent and house price dynamics in U.S. metropolitan areas, based on data for the last 30 years. On one hand, higher PRRs are associated with stronger future rent growth, which is broadly consistent with rational models where prices reflect expectations of rising fundamentals. On the other hand, high PRRs—particularly those driven by short-term deviations from historical trends—predict significantly lower future house price growth. These findings extend earlier evidence reported by Capozza and Seguin (1996); Campbell et al. (2009); Cochrane (2011) to a longer horizon and broader coverage. The observed asymmetry is difficult to reconcile with rational expectations, as it would require implausibly large time-series variation in risk aversion or disaster risk. By contrast, it aligns more naturally with models of extrapolative beliefs, in which investors overreact to recent trends and are subsequently disappointed when prices revert (Glaeser and Nathanson, 2017; Barberis et al., 2018; Bordalo et al., 2024).

We then assess whether the transmission of monetary policy to house prices depends on the degree of local housing overvaluation. To identify the impact of monetary policy, we employ three measures of monetary policy shocks: (i) shocks identified at high-frequency around FOMC announcements from Bauer and Swanson (2023), (ii) narrative-based shocks from Romer and Romer (2004) (updated by Miguel Acosta), and (iii) analysts' policy rate forecast errors from De Stefani and Mano (2025). We use these instruments in an instrumental variable local projections framework to estimate how the dynamic effects of monetary policy rates vary with the degree of house price overvaluation measured by the PRR and its deviation from long-term trends. The panel structure allows for controlling for common variation across U.S. metropolitan statistical areas (MSAs) and unobserved non-varying factors.

Our results show that house prices are significantly more responsive to changes in monetary policy rates in MSAs where housing is overvalued, particularly when overvaluation reflects short-run deviations from long-term trend of PRR estimated in real-time. Concretely, following a 25 basis point policy rate hike, a one-standard deviation higher PRR is associated with an additional 0.7–1 percentage point decline in real house prices after 12 quarters. These state-dependent effects are robust across all three shock measures and persist over time.

We next examine the response of different types of home buyers to monetary policy changes. In high-PRR markets, the share of loans for non-owner-occupied (NOO) home purchases—a proxy for investor demand—declines more following a monetary policy tightening than in low-PRR markets. This result is consistent with the two-agent model of Barberis et al. (2018): investors' fundamental housing demand declines immediately when the risk-free rate rises, depressing house prices, which in turn depress owner-occupied extrapolators' expectations and demand, eventually pushing the price down sufficiently which then prompts the return of fundamental investors to the market. A similar mechanism is present in Glaeser and Nathanson (2017) where naive extrapolators (which we equate with owner-occupied buyers) under-react to fundamental news in the short-term and keep getting surprised by subsequent falls in house prices.

In an extension, we find suggestive evidence that contractionary monetary policy is at least twice as effective in mitigating housing market overvaluation as expansionary monetary policy is in exacerbating it. This is particularly true if considering overvaluation measured in terms of short-run deviations from long-term trends in PRR. When using PRR itself, the difference in the estimated coefficients is not statistically significant, and thus we cannot reject the null hypothesis of symmetric state-dependent effects of monetary policy.

Finally, we perform several robustness checks. We confirm that our main results are not driven by differences in supply elasticity across MSAs, which is an additional mechanism for state-dependent effects of monetary policy. Our baseline results survive a host of checks, including unweighting the regressions, extending the number of control lags, sequentially excluding individual controls, relying on a different measure of rents for the construction of PRR, and using the price-to-income ratio and its deviation from long-term trends as alternative measures of overvaluation.

Literature This paper contributes to three strands of the literature.
First, it adds to the growing body of work on the heterogeneous effects of monetary policy across regional housing markets. Previous studies emphasize the role of housing supply elasticity (Fischer et al., 2021; Cooper et al., 2022; Aastveit and Anundsen, 2022), mortgage market structure, including the prevalence of adjustable-rate contracts (Calza et al., 2013; Corsetti et al., 2022; Pica, 2021; De Stefani and Mano, 2025), and credit constraints (Bosshardt et al., 2024). We contribute to this literature by showing that the transmission of monetary policy is significantly stronger in overvalued housing markets.

Second, we contribute to the literature on the interaction between monetary policy and asset price overvaluation. In rational bubble frameworks (e.g., Galí 2014, 2021), monetary policy may have limited impact in correcting mispricing. In contrast, models with belief-driven overreaction, such as Boehl (2022); Adam et al. (2025), predict stronger transmission when asset prices reflect extrapolative expectations. Our findings support the latter view: overvalued housing markets, particularly those driven by short-term deviations from historical trends which are more likely associated with shifts in sentiment, exhibit significantly greater sensitivity to changes in policy rates.

Lastly, we provide new evidence on the differential response of different types of investors to monetary policy. We find that non-owner-occupied (investor) purchases are more responsive to monetary policy in overvalued areas, consistent with the view that speculative investors amplify housing cycles (Barberis et al., 2018; DeFusco et al., 2022).

The next Section presents the data and the empirical approach, Section 3 presents results, Section 4 explores extensions and robustness checks, and Section 5 concludes.

2 Data and Empirical Approach

2.1 Data

We construct a quarterly panel dataset covering the period from 1994 to 2022 for 190 U.S. metropolitan statistical areas (MSAs).[1] This sample reflects data availability for all our main series (described below) and the exclusion of MSAs with populations under 150,000 as of 1990. The 190 MSAs we kept represented over 76.7% of total U.S. population in 2022 and spanned 46 States.[2] A detailed description of the dataset is provided in Online Appendix A.

[1] MSAs are defined based on the 2019 American Community Survey.
[2] This exclusion drops the 16 least populated MSAs and is not material for any of our main findings.

MSA-level data: We collect monthly house price indices at the MSA-level from Freddie Mac, and aggregate them to the quarterly frequency. To express house prices in levels, we rebase the indices to 2019 and multiply them by the median home value in each MSA based on the 2019 American Community Survey. Rents are constructed from annual county-level series available in the U.S. Department of Housing and Urban Development's Fair Market Rents dataset. These are aggregated to the MSA level using county population as weights and subsequently linearly interpolated to the quarterly frequency. Both house price and rent series are deflated using the national CPI series for urban consumers obtained from the U.S. Bureau of Economic Analysis. We construct the price-to-rent ratio (PRR) by dividing real house prices by annualized real rents (median monthly real rent for a two-bedroom apartment multiplied by 12)[3]. Note that although the sample used in the main analyses covers 1994 onward, we use data for rents and house prices starting in 1983 to construct a backward looking measure of trends in PRR after 1994. Additionally, we construct the price-to-income ratio (PIR) as the ratio between median house prices and MSA-level annual personal income per capita, interpolated to the quarterly frequency.

We derive MSA-level series for home-purchase mortgage originations based on the Home Mortgage Disclosure Act (HMDA) dataset from Neil Bhutta's website.[4] First, we aggregate monthly county-level data on total home-purchase mortgage originations to the MSA and quarter level. To adjust for seasonality, we apply a four-quarter moving average. Second, we aggregate county-level data on the share of owner-occupied (OO) home-purchase mortgage loans, weighting by county-level originations, and interpolate to the quarterly frequency to obtain the non-owner-occupied (NOO) share of home-purchase mortgage originations as one minus the OO share. Third, we compute the volumes of NOO and OO home-purchase mortgage originations by multiplying total originations by the respective shares.

Additionally, we collect a set of MSA-level economic and demographic variables: total employment, population, and the share of young population (20-34 age group). As part of our robustness analysis, we incorporate MSA-level measures of housing supply constraints and control for the interaction of housing supply and monetary policy. Specifically, we use two vintages of the Wharton Residential Land Use Regulation Index (WRLURI) from Gyourko et al. (2008) and Gyourko et al. (2019) as proxies for regulatory constraints on housing supply, and complement them with the housing supply elasticity estimates from Saiz (2010).[5]

[3]For robustness, we also build an alternative PRR measure based on the median real rent of three-bedroom apartments.

[4]Sourced from `https://sites.google.com/site/neilbhutta/data`.

[5]We take the WRLURI measures from Chodorow-Reich et al. (2024) and the Saiz supply elasticities from Aastveit and Anundsen (2022).

Monetary policy shocks (MPS): To identify the impact of monetary policy, we employ three distinct measures of MPS as instruments for the change in the federal funds rate. First, we use the shocks developed by Bauer and Swanson (2023), relying on high-frequency identification of changes in money market interest rate futures within a window of 30 minutes around Federal Open Market Committee (FOMC) announcements.[6] Second, we use the narrative shocks originally built by Romer and Romer (2004) and extended by Miguel Acosta.[7] These shocks isolate the unanticipated component of monetary policy decisions by taking the residual of a regression of the change in the federal funds rate on the Federal Reserve's internal Greenbook forecasts of output and inflation, to isolate changes that do not reflect information available to policymakers at the time. Finally, the third measure is based on analysts' policy rate forecast errors collected from Bloomberg from De Stefani and Mano (2025) and IMF (2024). De Stefani and Mano (2025) follow Checo et al. (2024) in collecting the difference between the actual policy rate decision and the median forecast submitted to Bloomberg by professional analysts up to the day prior to the corresponding announcement.

2.2 Empirical Approach

PRR and future growth in rents and house prices. We begin by examining whether the PRR at time t predicts subsequent growth in real rents and house prices. Specifically, we estimate:

$$\Delta_{t+20}\, y_{j,t} = \beta\, PRR_{j,t} + \epsilon_{j,t}, \tag{1}$$

where $\Delta_{t+20}y_{j,t}$ is the log change in real rents (or house prices) in MSA j from quarter t to $t+20$, corresponding to the five-year ahead growth rate. The main explanatory variable is the level of the PRR at time t. Standard errors are clustered at both the MSA and quarter levels. We show the results without MSA fixed effects to avoid potential look-ahead bias, although the broad conclusions from this exercise hold when including them.

Subsequently, we decompose the PRR into two components, a long-run trend and a short-run deviation from trend, to assess which is a stronger predictor of future rent and house price growth. This decomposition can offer insights into the relative role of factors linked to fundamentals versus those linked to sentiment. The trend component is likely influenced by slow-moving factors related to fundamentals, while deviations from trend

[6] We use the unorthogonalized measure of monetary policy shocks, rather than the orthogonalized version that purges the Fed's response to economic data, because the latter suffers from weak first-stage relevance—both in general and especially in our setting. Bauer and Swanson (2022) and Swanson (2024) report first-stage F-statistics of about 2.6 for the orthogonalized shocks, whereas our specification yields an even lower F-statistic of 0.39. This weaker relationship partly reflects the richer set of controls we employ—most notably the inclusion of time fixed effects. We also exclude unscheduled FOMC meetings, which are likely to be endogenous.

[7] Sourced from https://github.com/miguel-acosta/RomerRomer2004.

may be more affected by more rapidly shifting factors related to sentiment, potentially including extrapolations related to recent changes in fundamentals. This motivates assessing the role of temporary deviations of PRR from trend in equation (1), leading to the following modified regression:

$$\Delta_{t+20}\, y_{j,t} = \beta_1\, PRR^T_{j,t} + \beta_2\, PRR^D_{j,t} + \epsilon_{j,t}. \tag{2}$$

The trend component, $PRR^T_{j,t}$, is constructed from the predicted values of a backward-looking rolling regression:

$$PRR_{j,\tau} = MSA_j + Trend_\tau \times MSA_j + \epsilon_{j,\tau},$$

where $\tau \in [t-79, t]$ denotes the 80 quarters (20 years) leading up to quarter t. The regression includes MSA fixed effects (MSA_j) and MSA-specific linear time trend ($Trend_\tau \times MSA_j$). For each quarter t, we estimate this regression using only data for the previous 80 quarters and define the trend component, $PRR^T_{j,t}$, as the predicted value, $\widehat{PRR}_{j,t}$, from the above regression. Note that, differently from our main dataset that starts in 1994 because of the availability of HDMA data, data for MSA-level house prices and rents goes back to 1983. Starting the rolling regressions in 1993 ensures that at least 10 years of data are included. The deviation is then defined as:

$$PRR^D_{j,t} = PRR_{j,t} - PRR^T_{j,t}.$$

Impact of monetary policy on house prices. We next investigate how the transmission of monetary policy to house prices depends on the degree of local housing overvaluation, as measured by the PRR. To this end, we estimate the dynamic response of house prices to changes in monetary policy rates using instrumental variables local projections (LP-IV), following Jordà et al. (2015). We use three alternative measures of monetary policy shocks as instruments, as described in Section 2.1.

Our empirical strategy is designed to address two related hypotheses.

First, we test whether the impact of monetary policy on house prices is amplified in overvalued markets, as measured by the PRR. To assess this, we estimate:

$$\begin{aligned} y_{j,t+h} - y_{j,t-1} = {} & \beta_1^h \widehat{\Delta Rate_t \times PRR_{j,t-1}} + \beta_2^h PRR_{j,t-1} \\ & + \sum_{l=1}^{4} \beta_{\mathbf{3}}^{\mathbf{h}} \mathbf{X}_{j,t-l} + MSA_j^h + \tau_t^h + \epsilon_{j,t+h}, \end{aligned} \tag{3}$$

where $y_{j,t+h} - y_{j,t-1}$ is the cumulative log change in real house prices in MSA j from period $t-1$ to $t+h$. The key explanatory variable of interest, $\widehat{\Delta Rate_t \times PRR_{j,t-1}}$, is the instrumented interaction between the change in the monetary policy rate in quarter t and the lagged price-to-rent ratio, $PRR_{j,t-1}$, which is standardized by its standard deviation over the full sample. The interaction term is instrumented in the first stage of the LP-IV using three alternative monetary policy shocks. The coefficient on this interaction term captures the heterogeneity in the response of house prices as a function of the degree of housing market overvaluation due to changes in policy rates.

The vector $\mathbf{X}_{j,t-l}$ comprises control variables, including four lags of quarterly log changes in house prices, employment, population and the share of young population, as well as four lags of quarterly changes in the share of non-owner-occupied home-purchase loans. Online Appendix A contains detailed definitions of all control variables. Both MSA and quarter fixed effects (MSA_j^h and τ_t^h) are included to absorb time-invariant regional characteristics and aggregate shocks (including changes in the policy rate itself). Standard errors are double-clustered at the MSA and quarter levels. The projection horizon h extends up to 16 quarters ahead. Regressions are weighted by population in 1990.

Second, we test whether the amplification of monetary policy transmission to house prices is associated with the long-run trend in PRR or with short-run deviations from that trend. To do so, we estimate separate regressions for the trend and trend-deviation components of the PRR, following the baseline specification (3):

$$y_{j,t+h} - y_{j,t-1} = \beta_1^{h,i} \widehat{\Delta Rate_t \times PRR_{j,t-1}^i} + \beta_2^{h,i} PRR_{j,t-1}^i + \sum_{l=1}^{4} \beta_{\mathbf{3}}^{\mathbf{h}} \mathbf{X}_{j,t-l} + MSA_j^h + \tau_t^h + \epsilon_{j,t+h}, \quad \text{for } i \in \{T, D\}, \tag{4}$$

where $PRR_{j,t-1}^i = PRR_{j,t-1}^T$ denotes the trend component and $PRR_{j,t-1}^i = PRR_{j,t-1}^D$ denotes the deviation from trend, both as defined earlier in this section. Regressions for the trend and deviation components are estimated separately to preserve the power of the first-stage regression. As a robustness check, we also estimate the specification including both PRR components jointly. To the extent that short-term deviations of PRR from its long-term trend reflect belief-driven overvaluation, a larger estimated coefficient on the interaction between monetary policy and short-term deviations relative to the coefficient on long-term trends suggests that the measured amplification of monetary policy effects is relatively stronger during periods of belief-driven overvaluation. The relative magnitudes and statistical significance of these coefficients thus shed light on the channel that amplifies the effects of monetary policy.

Impact of monetary policy on the composition of buyers. To shed light on the channels through which monetary policy affects house prices contingent on the degree of house price overvaluation, we estimate the same specifications, (3) and (4), using the share of non-owner-occupied home-purchase loans as the dependent variable instead. Non-owner-occupied purchases are more likely to reflect investor demand which arguably could be less prone to non-rational expectations. Several theories predict that relatively more rational investors react more quickly to fundamental shocks, while more naive buyers follow with a lag because of extrapolative expectations (Barberis et al., 2018; Glaeser and Nathanson, 2017), or because of diffused information (Abreu and Brunnermeier, 2002). Therefore, to the extent that investors—proxied by non-owner-occupied purchases—are more experienced participants in the housing market and quicker to react to new information, we expect them to respond more rapidly to changes in monetary policy, particularly in overvalued markets where they anticipate larger house price responses.

3 Main Results

3.1 Relationship between PRR and future growth in rents and house prices

Table 1 shows the effect of PRR and its components on five-year ahead growth in real rents and real house prices. Columns (1) and (2) show estimates of equation (1) and columns (3) and (4) show estimates of equation (2).

Table 1: Effect of PRR on Rent and House Price Growth

	(1) $\Delta_{t+20}Rent$	(2) $\Delta_{t+20}HP$	(3) $\Delta_{t+20}Rent$	(4) $\Delta_{t+20}HP$
PRR	0.008***	-0.020***		
	(0.001)	(0.004)		
Trend PRR			0.007***	-0.017***
			(0.001)	(0.003)
Detrended PRR			0.011***	-0.029***
			(0.001)	(0.005)
Constant	-0.086***	0.357***	-0.068***	0.305***
	(0.011)	(0.044)	(0.014)	(0.036)
Observations	22300	22300	22300	22300

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Columns (1) and (2) report the estimated coefficients from equation (1), capturing the effect of PRR on the five-year ahead growth in real rents and real house prices, respectively. Columns (3) and (4) present the equivalent coefficients from equation (2), where PRR is decomposed into two components, a long-run trend and a short-run deviation from trend.

We find that elevated PRR predicts stronger future rent growth (column 1, $\hat{\beta} = 0.008$) but predicts negative future house price growth (column 2, $\hat{\beta} = -0.02$). These are consistent with prior findings on return predictability in housing markets (Capozza and Seguin, 1996; Campbell et al., 2009; Cochrane, 2011).

Columns (3) and (4) decompose the PRR into its trend component and its deviation from trend. In column (3), both the trend and detrended PRR are positively associated with future rent growth ($\hat{\beta}^T = 0.007$, $\hat{\beta}^D = 0.011$, both significant at the 1 percent level). On the contrary, column (4) shows that house price growth is negatively associated with both the trend component ($\hat{\beta}^T = -0.017$) and the detrended component, which is even larger and also statistically significant ($\hat{\beta}^D = -0.029$).[8]

This pattern of greater quantitative effects of temporary deviations of PRR from trend may point to a role for belief-driven, extrapolative expectations, potentially building on shifts in fundamentals, in line with models where investor optimism fuels temporary price overshooting, followed by a correction (Glaeser and Nathanson, 2017; Bordalo et al., 2024). A fully rational story would require a highly volatile risk aversion parameter or long-term prospects. Concretely, a rational model would generate a high price-to-rent ratio when risk aversion is unusually low. Low risk aversion supports relatively overvalued houses because homeowners discount rents by less. In this class of models, risk aversion is typically counter-cyclical and mean reverts, meaning a high PRR today predicts lower prices tomorrow.

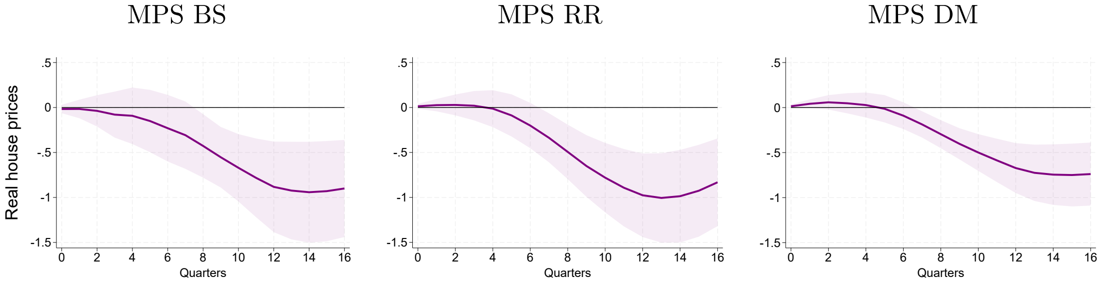
3.2 Impact of monetary policy on house prices

Figure 1 shows the dynamic responses of house prices to a 25bps change in the policy rate, conditional on the extent of house price overvaluation as measured by the PRR, plotting the coefficients $\hat{\beta}_1^h$ from equation (3). The PRR enters the regression as a continuous variable scaled by its standard deviation over the full regression sample, allowing the interaction to be interpreted as the effect per one-standard-deviation increase in PRR. Each panel uses an alternative monetary policy shock: "MPS BS" based on Bauer and Swanson (2023); "MPS RR" based on Romer and Romer (2004); and "MPS DM" based on De Stefani and Mano (2025).

Across the three alternatives, we find that a higher PRR by 1 standard deviation is associated with a decline in real house prices of about 0.3-0.5 percentage points after 8 quarters and 0.7-1 percentage points after 12-14 quarters following a rise of 25 bps in the policy rate. The effect is delayed and it strengthens over time, remaining statistically significant through the 16-quarter horizon. The shape of the impulse response functions is remarkably similar across all three alternatives, although the estimated magnitude of

[8] Bin scatters confirm the linear relationships estimated in Table 1, see Online Appendix Figures B1 and B2.

Figure 1: Transmission of monetary policy to house prices in percentage points



Notes: This figure shows estimates of equation (3), corresponding to the effect of a 25 basis point change in the policy rate on real house prices, conditional on the level of house price overvaluation as measured by the PRR. The columns show the results using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. The solid line corresponds to $\hat{\beta}_1^h$, while the shaded area denotes the 90% confidence interval using double-clustered standard errors, at the MSA and quarter level. Controls include four lags of (log) changes in real house prices, employment, population, share of young population and the share of non-owner-occupied home-purchase loans. MSA and quarter FE are included.

effects varies slightly.[9]

These results show that the effect of monetary policy on house prices is strongly state-contingent: in markets where the PRR is elevated, house prices are more sensitive to monetary policy. This finding indicates that monetary policy transmission to the housing market is amplified in areas with higher PRR, consistent with the view that local overvaluation or exuberant beliefs heighten the sensitivity of house prices to monetary policy.

3.3 Impact of monetary policy on the composition of buyers

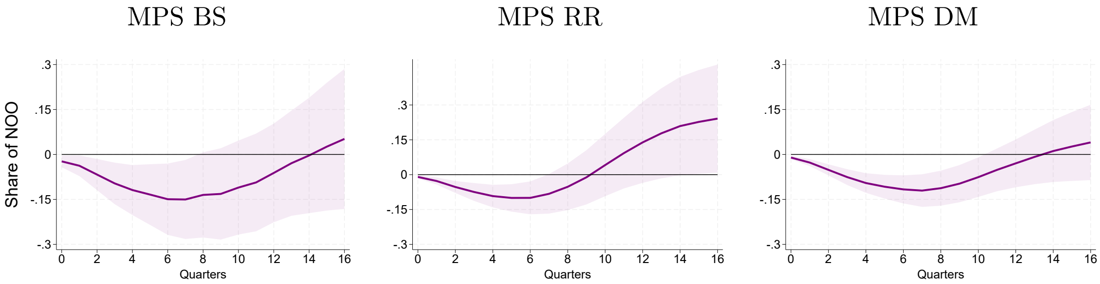
Figure 2 presents the same coefficients of interest as the previous figure, β_1^h from equation (3), now using the share of non-owner-occupied (NOO) home-purchase loan originations as the dependent variable instead of house prices. All other aspects of the empirical setup remain as described above.

Across all specifications, the results indicate that monetary tightening is linked to a larger and more pronounced decline in the share of NOO home-purchase loans originated in MSAs with higher PRR, but unlike the effect on house prices described above, this decline is more temporary and reverts to some extent by quarter 16. The decline is statistically significant after around 4-8 quarters, peaking approximately after 6 quarters at about 0.1-0.15 percentage points, after which it reverses and the share of NOO loans begins to recover.

This relatively quicker exit of NOO buyers from the market following monetary tight-

[9] In the case of real rents, the estimates range between a decline of about 0.2-0.5 percentage points after 8 quarters, but these estimates are only significant for one out of the three shocks. See Online Appendix Figure B3.

Figure 2: Transmission of monetary policy to the share of non-owner-occupied loan originations in percentage points



Notes: This figure shows estimates of equation (3), corresponding to the effect of a 25 basis point change in the policy rate on the share of non-owner-occupied home-purchase loan originations, conditional on the level of house price overvaluation as measured by the PRR. The columns show the results using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. The solid line corresponds to $\hat{\beta}_1^h$, while the shaded area denotes the 90% confidence interval using double-clustered standard errors, at the MSA and quarter level. Controls include four lags of (log) changes in real house prices, employment, population, share of young population and the share of non-owner-occupied home-purchase loans. MSA and quarter FE are included.

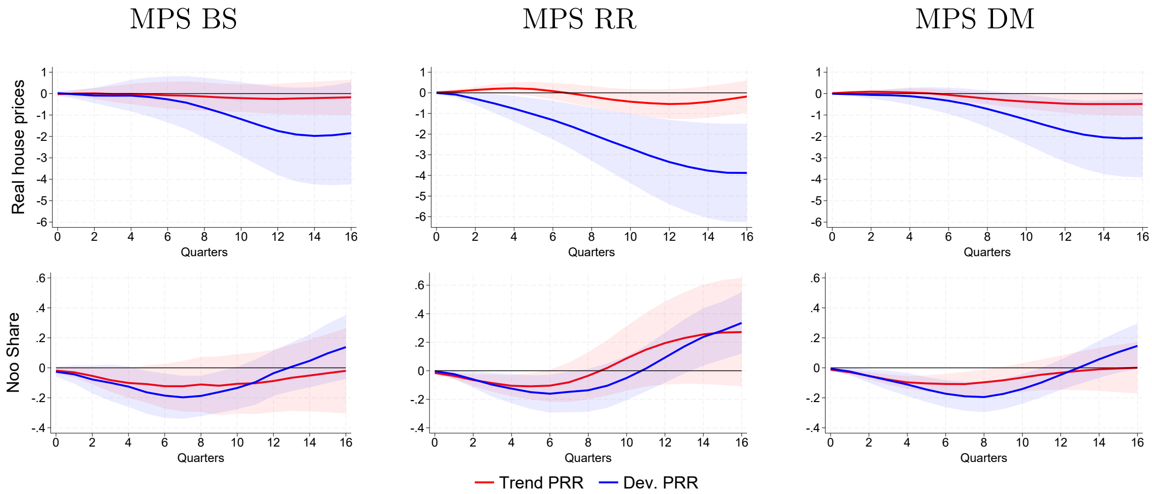
ening that reverts with a re-entry of these buyers when house prices are most depressed is consistent with models in which more sophisticated investors time the market more effectively at the expense of naive extrapolators or less informed buyers (Barberis et al., 2018; Glaeser and Nathanson, 2017; Abreu and Brunnermeier, 2002).

3.4 Trend versus deviations from trend: decomposing the PRR

We now examine whether the amplification of the effects of monetary policy on house prices and on the composition of buyers in overvalued housing markets is due to persistent or temporary rises in overvaluation. The top row of Figure 3 presents the dynamic responses of real house prices to the instrumented interaction term between a change in the policy rate and the PRR trend (red line) or PRR deviation (blue line), respectively, i.e., $\hat{\beta}_1^{h,T}$ and $\hat{\beta}_1^{h,D}$ in equation (4). Both the trend in PRR and the deviation from trend are standardized by the standard deviation of the PRR in the regression sample. Each column corresponds to using as instrument one of the three alternative monetary policy shocks described earlier.

Across all specifications, we find that the amplification effects of overvalued housing markets are mainly driven by temporary departures of PRR from its trend. The estimated coefficients on the interaction between the monetary policy shock and the deviation from PRR trend (blue line) are larger in magnitude and more persistent than the coefficients on the interaction with the trend component (red line), which are largely flat and insignificant. Note that the specification includes MSA and time fixed effects but not MSA-specific time trends, leaving room for differences in long-run overvaluation trends

Figure 3: Decomposing the amplification of the transmission of monetary policy to house prices and NOO share in percentage points



Notes: This figure shows the results from equation (4), corresponding to the effect of a 25 basis point change in the policy rate on real house prices (top row) and NOO share (bottom row), conditional on the level of house price overvaluation as measured by the trend and deviation components of the PRR (defined in Section 2.2). The columns show the results using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. The red solid line corresponds to the trend component of PRR, $\hat{\beta}_1^{h,T}$, while the blue solid line corresponds to the deviation component, $\hat{\beta}_1^{h,D}$. The shaded areas of matching colors indicate the 90% confidence intervals, computed using double-clustered standard errors at the MSA and quarter level. Controls include four lags of (log) changes in real house prices, employment, population, share of young population and the share of non-owner-occupied home-purchase loans. MSA and quarter FE are included.

to, in principle, influence the results. The small and largely insignificant coefficient on the trend component (red line) therefore reflects an empirical result rather than a mechanical consequence of the controls, indicating that such long-run differences are not driving the effects. Instead, the deviation from the PRR trend accounts for most of the amplification: in markets where the PRR is one standard deviation above trend, a 25-basis-point policy rate increase leads to an additional 2–3 percentage point decline in real house prices after 12 quarters.

These findings further support the hypothesis that time-varying shifts in sentiment are likely a key driver of the amplification effects of overvalued housing markets.

The bottom row of Figure 3 presents the estimated coefficients from equation (4), now using the NOO share of home-purchase loan originations as the dependent variable, with each column corresponding to a different monetary policy shock series. Across the three specifications, the NOO share reacts more strongly to monetary policy when interacted with the deviation of overvaluation from trend (blue line) than when interacted with the trend of overvaluation (red line). This result is most evident under the MPS DM shock, where the impact of the interaction with the deviation component consistently lies below that of the trend component. This provides indicative evidence that short-run deviations from trend may be the main driver of the unconditional response reported in Figure 2, even though the difference relative to the trend component is not statistically significant across all monetary policy instruments. Online Appendix B.3 shows that the results are robust when both coefficients are estimated simultaneously.

4 Extensions and Robustness

First, we expand our baseline results to examine the presence of asymmetries in the interaction between monetary policy and overvaluation by splitting the policy rate shocks into contractionary and expansionary. Testing for asymmetries is relevant for thinking about the implications of our results for the conduct of monetary policy. If the amplification effects on transmission of overvalued housing markets are symmetric, this would mean contractionary policy could be a stabilizing force, while loosening would amplify cycles putting a greater premium on fine-tuning the direction of policy when housing markets are overvalued. On the contrary, if effects are asymmetric and stronger for contractionary policy, then the case for policy to counter housing market overvaluation is stronger.

To assess the presence of asymmetries, we augment equation (3) to allow for differential effects of monetary policy loosening ($\Delta Rate_t < 0$) and tightening ($\Delta Rate_t > 0$):

$$y_{j,t+h} - y_{j,t-1} = \beta_1^h \widehat{\Delta Rate_t^{exp} \times PRR_{j,t-1}} + \beta_2^h \widehat{\Delta Rate_t^{contr} \times PRR_{j,t-1}} + \beta_3^h PRR_{j,t-1} + \sum_{l=1}^{4} \beta_4^h \mathbf{X}_{j,t-l} + MSA_j^h + \tau_t^h + \epsilon_{j,t+h}. \quad (5)$$

The results in Table 2 suggest several observations. First, when using the MPS BS as an instrument, the first-stage regression yields a very low F-statistic, which precludes testing for asymmetric effects (column 1).[10] Second, when using MPS RR and MPS DM as instruments, the first stage is stronger. In both cases (columns 2 and 3), the estimated effect of contractionary monetary policy is roughly twice as large as that of expansionary policy, suggesting a stronger response of house prices to monetary tightening in overvalued markets.[11] Nonetheless, the difference between the two coefficients is not statistically significant, with p-values of 0.39 and 0.46, respectively. On the other hand, when using short-run deviations from trends in the PRR as a measure of house market overvaluation, there is evidence of much larger asymmetry, with contractionary policy having significant and large effects while expansionary policy has null effects (see Online Appendix Figures

[10] Online Appendix Figure B5 plots the relationship between each MPS measure and changes in the policy rate. For the BS MPS, the relationship flattens for contractionary policy changes, reflecting the weak first-stage. This flattening is not present for the other two measures of MPS.

[11] Since expansionary shocks are coded with a negative sign, a more negative value corresponds to higher prices; thus, the estimated negative coefficient is of the expected sign.

B6 and B7). Taken together, our conclusion is that there is some suggestive evidence of asymmetries, which bolster the case for monetary policy to lean against overvalued housing markets.[12]

Table 2: Extensions and Robustness. Dependent variable: $log(HP_{j,t+12}) - log(HP_{j,t-1})$

	MP Asymmetries			Supply Constr. (WRL 2006)		
	(1) MPS BS	(2) MPS RR	(3) MPS DM	(4) MPS BS	(5) MPS RR	(6) MPS DM
$\Delta \widehat{Rate_t^{exp} \times PRR_{j,t-1}}$	-0.915	-0.721**	-0.544**			
	(0.708)	(0.338)	(0.216)			
$\Delta \widehat{Rate_t^{contr} \times PRR_{j,t-1}}$	-0.773	-1.497**	-1.063*			
	(2.526)	(0.708)	(0.626)			
$\Delta \widehat{Rate_t \times PRR_{j,t-1}}$				-0.809***	-0.897***	-0.570***
				(0.268)	(0.260)	(0.150)
$\Delta \widehat{Rate_t \times WRL2006_j}$				-0.180	-0.222	-0.269**
				(0.217)	(0.210)	(0.132)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Population weights	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,200	17,014	15,165	16,556	16,377	14,598
MSAs	190	190	190	183	183	183
First stage F-stat	12.5|6.9	24.5|17.1	242.0|210.0	7.2	17.0	423.2

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table shows the LP-IV estimates for real house prices, with the horizon fixed at $h = 12$ (three years), using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. In the baseline specification (equation 3), the estimates are -0.88***, -0.98***, and -0.67***, respectively. Columns (1)–(3) examine asymmetric effects of monetary policy by decomposing ΔRate_t into contractionary and expansionary components, following equation (5). $\Delta Rate_t^{exp}$ corresponds to a monetary policy loosening ($\Delta Rate_t < 0$), and $\Delta Rate_t^{contr}$ refers to a tightening ($\Delta Rate_t > 0$). Following equation (6), columns (4)–(6) augment the baseline specification by interacting monetary policy with MSA-level supply constraints from Gyourko et al. (2008) (WRL2006). All regressions control for four lags of (log) changes in real house prices, employment, population, the share of young population, and the share of non-owner-occupied home-purchase loans. MSA and quarter fixed effects are included throughout. Reported F-statistics correspond to the first-stage regressions.

Second, and moving to robustness checks, we show that our baseline results (equation 3) are robust to controlling for housing supply elasticities, which have been shown to significantly shape how monetary policy transmits to housing markets (Aastveit and Anundsen, 2022). Specifically, we consider two commonly used measures of supply constraints: the WRLURI and the Saiz housing supply elasticity. Including the interaction of monetary policy with each measure of supply constraints ensures that the estimated effect of monetary policy interacted with overvaluation is not confounded by differences

[12] We do not find evidence of asymmetric effects on the composition of home buyers, as reported in Columns 7-9 of Online Appendix Table B1.

in local supply. To this end, we modify the baseline specification as follows:

$$y_{j,t+h} - y_{j,t-1} = \beta_1^h \widehat{\Delta Rate_t \times PRR_{j,t-1}} + \beta_2^h \widehat{\Delta Rate_t \times Supply_j} + \beta_3^h PRR_{j,t-1} + \sum_{l=1}^{4} \beta_4^h \mathbf{X}_{j,t-l} + MSA_j^h + \tau_t^h + \epsilon_{j,t+h}, \qquad (6)$$

where $Supply_j$ denotes the supply constraints measure. Columns (4)–(6) in Table 2 show the coefficient β_1^h on real house prices across the different monetary policy shocks for $h = 12$, using the 2006 WRLURI as the measure of supply constraints.[13] In all cases, the coefficient remains negative and significant, and of similar magnitude to the baseline results.[14] Our findings regarding the composition of buyers also remain robust when controlling for housing supply elasticities.[15]

Our baseline results are also robust to how investor activity is measured—specifically, whether it is expressed in relative or absolute terms. Using the volumes of NOO and OO home purchase loan originations, rather than the share, we again find that the estimated impact is stronger for NOO loans (Online Appendix Figure B9). Following a 25 bps increase in the policy rate, non-owner-occupied loan originations decline additionally by 2.5-3 percentage points after six quarters in MSAs with a one-standard-deviation higher PRR, whereas the effect on owner-occupied originations is limited to roughly 1 percentage point.

Our baseline results continue to hold when not weighted by population, when including 8 or 12 lags of the controls, and when sequentially dropping controls to ensure that the results do not hinge on a specific variable (see Online Appendix Tables B4 and B6 for house prices, and B5 and B7 for NOO share). They are also robust to using an alternative PRR measure based on the real rent of three-bedroom instead of two-bedroom apartments (Online Appendix Figures B10 and B11).

Finally, we show that all main results are robust to using the price-to-income ratio (PIR) and its deviation from long-term trends as alternative measures of housing valuation. Similar to when we use price-to-rent ratios, we find that higher PIR and especially its deviations from trend are both associated with higher future rent growth but lower future house price growth (Online Appendix Table B8). We also find that monetary policy has a significantly larger impact on house prices and NOO share in regions with higher PIR, and especially where PIR deviates from its trend (Online Appendix Figures B12,

[13] Online Appendix Figure B8 shows the dynamic impact over four years from equation (6). Results are robust throughout the full period.

[14] Online Appendix Table B2 shows that results are also robust to using the 2018 WRLURI vintage as a measure of supply constraints, and to using the measure of supply elasticity constructed by Saiz.

[15] Appendix Table B3 shows the results controlling for 2006 WRLURI (Columns 1-3), 2018 WRLURI (Columns 4-6) and the Saiz elasticity measure (Columns 7-9).

B13, and B14).

5 Conclusion

Our findings show that monetary policy has stronger effects on house prices in overvalued housing markets, particularly when overvaluation reflects short-term deviations from price-to-rent trends. Investor demand, proxied by non-owner-occupied purchases, also responds more sharply in these markets, amplifying price swings. These effects are robust across multiple identification strategies and are not driven by differences in housing supply restrictiveness. There is suggestive evidence that contractionary monetary policy is at least twice as effective in mitigating housing market overvaluation than expansionary policy is in exacerbating it, particularly when overvaluation is defined by short-run deviations from long-term price-to-rent trends.

These results contribute to the growing literature on extrapolative expectations and belief-driven asset price dynamics. Our findings are consistent with models that embed extrapolative expectations into monetary frameworks and suggest that monetary policy can play a significant role in stabilizing excessive asset price fluctuations.

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Monetary policy and housing overvaluation

Online Appendix

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A Data: Sources and Variable Definitions

This Appendix presents a detailed description of the data comprising the main dataset, along with information on their sources and variable transformations. Two sets of variables are described: the MSA-level quarterly panel dataset and the three measures of monetary policy shocks.

A.1 MSA-level dataset

We construct a quarterly panel dataset covering the period from 1994 to 2022 for 190 U.S. metropolitan statistical areas (MSAs), defined based on the 2019 American Community Survey. This sample reflects data availability for all our main series (described below) and the exclusion of MSAs with populations under 150,000 as of 1990. The 190 MSAs we kept represented over 76.7% of total U.S. population in 2022 and spanned 46 States. Table A1 presents the geographical distribution of the MSAs in our sample by Census division, as well as their share of population and average median house price in 2022.

Table A1: Geographical distribution of MSAs in our sample

Census division	States	MSAs	Pop. share (%)	Avg. HP ($)
East North Central	5	32	13	213,784
East South Central	3	12	4	241,435
Middle Atlantic	3	16	14	270,204
Mountain	6	13	7	433,671
New England	6	12	5	428,702
Pacific	5	31	18	568,718
South Atlantic	7	39	21	300,872
West North Central	7	16	5	232,675
West South Central	4	19	13	216,867
All	46	190	100	315,991

Notes: The table presents the distribution of Metropolitan Statistical Areas (MSAs) in our sample across U.S. Census divisions. It reports the number of states and MSAs in each division, as well as the share of the total population represented by the MSAs in the sample and the average nominal house price as of 2022q4. Average house prices are computed as the mean of the median house price across all MSAs within each division.

The main data series in the dataset and the performed transformations are:

- Real House Prices: We use the monthly MSA-level Freddie Mac House Price Index, sourced from Haver, and aggregate it to the quarterly frequency by taking monthly averages. To express this index in U.S. dollar terms, we scale it by the median home value in each MSA based on the 2019 American Community Survey (ACS). Since CPI data at the MSA or state level are unavailable for our sample, we deflated the nominal house price series using the national CPI for urban consumers, obtained from the U.S. Bureau of Economic Analysis.

- Real Rents: We use the annual county-level Fair Market Rent series from the U.S. Department of Housing and Urban Development, which consist of the dollar value of the 45th percentile (1983-1995) or 40th percentile (1995-present) of monthly rents by housing type (0-4 bedrooms). Following Kermani and Wong (2021), we adjust these values to approximate the median rental price. The county-level series are then aggregated to the MSA level using population-weighted averages. To express rents in real terms, we deflate the series using the national CPI for urban consumers, consistent with the treatment of house prices. These annual series are then linearly interpolated to the quarterly frequency.

- Price-to-Rent Ratio (PRR): The Price-to-Rent Ratio is constructed by combining the real house price and rent series described above. Specifically, it is defined as the ratio of the median house price (in USD) and the annualized median monthly cost of renting a 2-bedroom apartment (12× 2-BD Median Rent).

- Price-to-Income Ratio (PIR): The Price-to-Income Ratio is constructed as the ratio of the median house price (in USD) and the annual personal income per capita. We obtain annual MSA-level series of personal income per capita from the U.S. Bureau of Economic Analysis, and interpolate them to the quarterly frequency.

- Home Mortgage Disclosure Act (HMDA) data: we use four MSA-level series based on the HMDA dataset from Neil Bhutta's website[1]:

  - Mortgage purchase origination: We use monthly county-level home-purchase mortgage origination series and aggregate them to the MSA level by summing across counties, and over quarters. Since the original series are not seasonally adjusted, we apply a 4-quarter moving average to adjust for seasonality.

  - Non-owner-occupied share of home-purchase loans (NOO share): We use the annual owner-occupied share of home-purchase loans (OO share) at the county level, aggregate it to the MSA level using originations-weighted averages, and interpolate the series to quarterly frequency. We then compute the NOO share as (1− OO Share).

  - Volume of non-owner-occupied share of home-purchase loans (NOO volume): We compute this as the product of total mortgage purchases originations and the NOO share.

[1] https://sites.google.com/site/neilbhutta/data

  - Volume of owner-occupied share of home-purchase loans (OO volume): We compute this analogously as the product of total mortgage purchase originations and the OO Share.

- Employment: We use monthly county-level employment data from the U.S. Bureau of Labor Statistics. To construct quarterly series, we take the value from the last month of each quarter. We aggregate the county-level data to the MSA level by summing across countries and apply a 4-quarter moving average to adjust for seasonality.

- Population: We use annual MSA level population data from the Census Bureau (retrieved from Haver), supplemented by data from Chodorow-Reich et al. (2024). We linearly interpolate the series to obtain quarterly values.

- Share of young population: We use annual data at the MSA level on population by age group from the Census Bureau (retrieved from Haver). We compute the share of young population as the sum of population aged 20-34 divided by the total population for each MSA. The data is linearly interpolated from the annual to the quarterly frequency.

- Wharton Regulatory Index: As part of our robustness exercises, we use two vintages of the Wharton Residential Land Use Regulation Index from Gyourko et al. (2008) and Gyourko et al. (2019), as a measure of housing supply constraints. Although the original indices are constructed at the county level, we obtain the MSA-level series from Chodorow-Reich et al. (2024).

- Saiz elasticity: We source housing supply elasticities at the MSA level from Aastveit and Anundsen (2022).

A.2 Monetary Policy measures

- Policy interest rate: Monthly policy rates are retrieved from FRED. The quarterly change in the fed funds rate is computed as the sum of the corresponding monthly changes.

- Monetary Policy Shocks (MPS): We use three measures of MPS that follow different methodologies:

  - "MPS BS" from Bauer and Swanson (2023): These shocks are identified using a high-frequency event-study approach that measures market reactions within a 30-minute window around scheduled FOMC announcements. The shocks are constructed as the first principal component of changes in interest rate futures for contracts covering the next four quarters, capturing revisions in the expected path of short-term interest rates. We include only observations from scheduled meetings, and construct quarterly values by summing monthly shocks within each quarter. The authors provide two versions of the MPS series: series before and after purging of information effects. We use the former because the series purged of information effects exhibits a weak first stage in our LP-IV setting.

– "MPS RR" from Romer and Romer (2004): extended by Miguel Acosta.[2] These series follow a narrative identification approach that isolates the unanticipated component of monetary policy decisions. The change in the federal funds rate is regressed on the Fed's internal Greenbook forecasts of output and inflation, which reflect the information available to policymakers at the time of the rate decision. The residuals from this regression, representing policy changes not explained by expected macroeconomic conditions, are treated as monetary policy shocks. We construct quarterly values by summing the monthly shocks within each quarter.

– "MPS DM" from De Stefani and Mano (2025): These shocks are conceptually close to high-frequency deviations, and are measured as the difference between policy rate decisions and analysts' policy rate forecasts made prior to rate decisions, building on Checo et al. (2024) and IMF (2024). The shock is defined as the difference between the actual rate decision and the median forecast submitted by professional analysts to Bloomberg up to the day prior to the corresponding announcement. This approach captures the unexpected component of policy decisions as perceived by market participants. We aggregate the monthly shocks by summing them within each quarter.

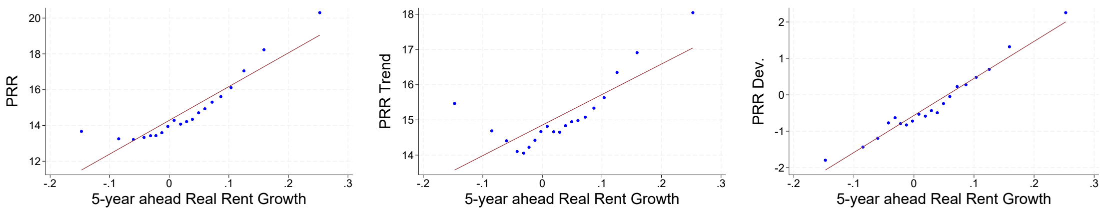
[2] Sourced from `https://github.com/miguel-acosta/RomerRomer2004.`

B Additional Tables and Figures

B.1 Scatterplots PRR vs. Future HP growth

Figure B1: PRR vs. future growth in Real Rents

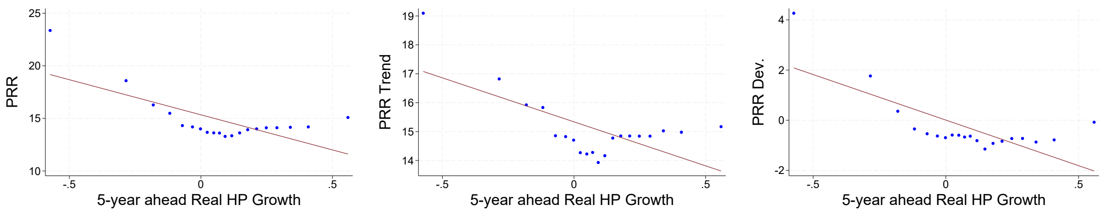
PRR | PRR Trend | PRR Deviations



Notes: The binscatters show the relationship between 5-year ahead growth in real rents and PRR, the trend component of PRR, and the deviations from trend, respectively, as defined in section 2.2.

Figure B2: PRR vs. future growth in Real House Prices

PRR | PRR Trend | PRR Deviations

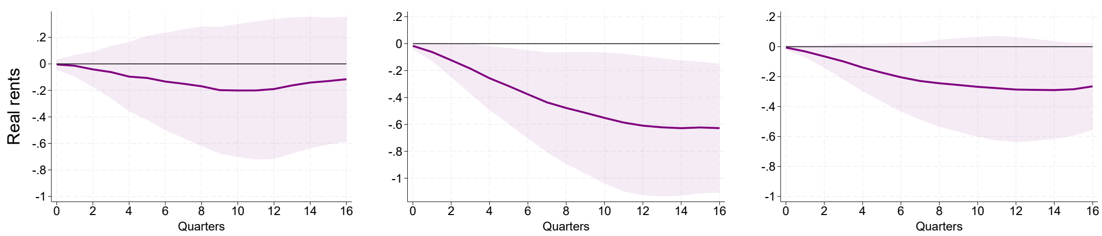


Notes: The binscatters show the relationship between 5-year ahead growth in real house prices and PRR, the trend component of PRR, and the deviations from trend, respectively, as defined in section 2.2.

B.2 LP-IV results: Rents

Figure B3: Transmission of monetary policy to real rents in percentage points

MPS BS | MPS RR | MPS DM



Notes: This figure shows estimates of equation (3), corresponding to the effect of a 25 basis point change in the policy rate on real rents, conditional on the level of house price overvaluation as measured by the PRR. The columns show the results using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. The solid line corresponds to $\hat{\beta}_1^h$, while the shaded area denotes the 90% confidence interval using double-clustered standard errors, at the MSA and quarter level. Controls include four lags of (log) changes in real house prices, real rents, employment, population, share of young population and the share of non-owner-occupied home-purchase loans. MSA and quarter FE are included.

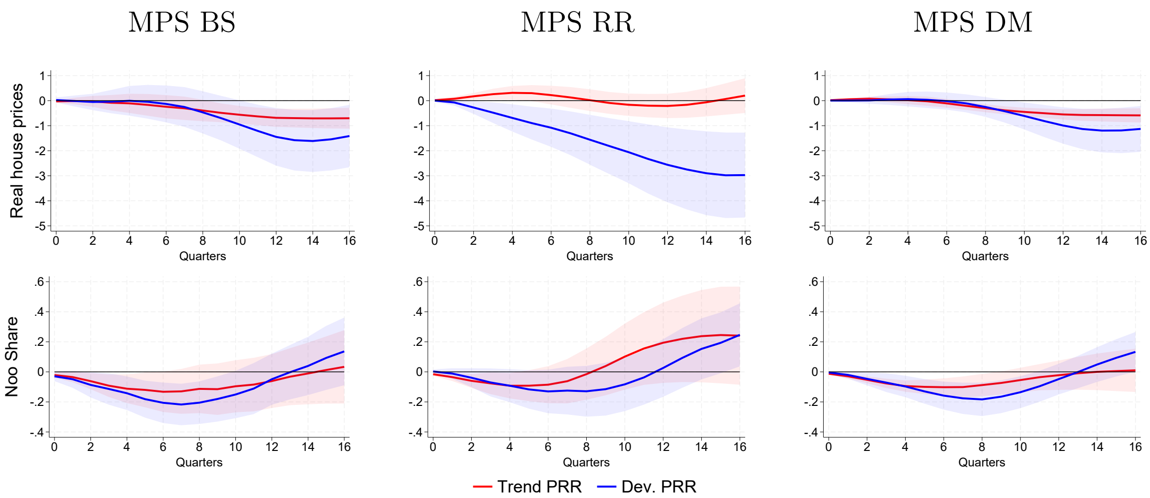
B.3 Trend vs. Deviation: joint estimation

In a similar spirit to equation (4), we estimate jointly the impact of PRR trend and PRR deviation from trend components in a LP-IV setup, through the following specification:

$$y_{j,t+h} - y_{j,t-1} = \beta_1^{h,T}\widehat{\Delta Rate_t \times PRR_{j,t-1}^T} + \beta_1^{h,D}\widehat{\Delta Rate_t \times PRR_{j,t-1}^D} + \beta_2^h PRR_{j,t-1}^T + \beta_3^h PRR_{j,t-1}^D + \sum_{l=1}^{4} \beta_\mathbf{3}^\mathbf{h} \mathbf{X}_{j,t-l} + MSA_j^h + \tau_t^h + \epsilon_{j,t+h}. \quad (7)$$

Figure B4 shows the results for house prices (top row) and NOO share (bottom row) from the joint estimation:

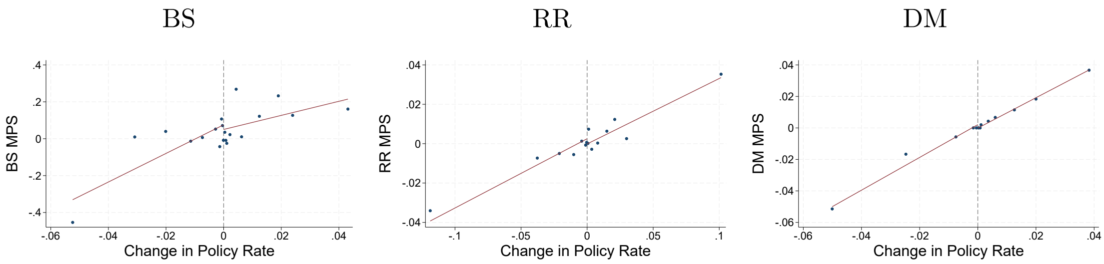
Figure B4: Decomposing the amplification of the transmission of monetary policy to house prices and NOO share in percentage points



Notes: This figure shows the results from equation (7), corresponding to the effect of a 25 basis point change in the policy rate on real house prices (top row) and NOO share (bottom row), conditional on the level of house price overvaluation as measured by the trend and deviation components of the PRR (defined in Section 2.2). The columns show the results using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. The red solid line corresponds to the trend component of PRR, $\hat{\beta}_1^{h,T}$, while the blue solid line corresponds to the deviation component, $\hat{\beta}_1^{h,D}$. The shaded areas of matching colors indicate the 90% confidence intervals, computed using double-clustered standard errors at the MSA and quarter level. Controls include four lags of (log) changes in real house prices, employment, population, share of young population and the share of non-owner-occupied home-purchase loans. MSA and quarter FE are included.

B.4 Scatterplots: asymmetries of MPS

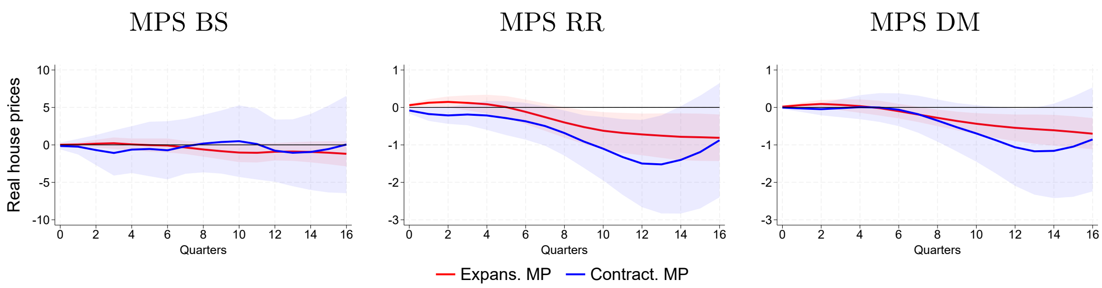
Figure B5: Asymmetries in the correlation between changes in policy rate and MPS



Notes: The binscatters show the relationship between changes in the policy rate and the MPS series introduced in Section 2.1: BS, RR and DM, respectively. Separate linear fits are estimated for expansionary (negative) and contractionary (positive) monetary policy changes. For BS shocks, the slope flattens in the contractionary case, consistent with the weaker first-stage identification reported in Table 2. No slope breaks are observed for RR and DM shocks.

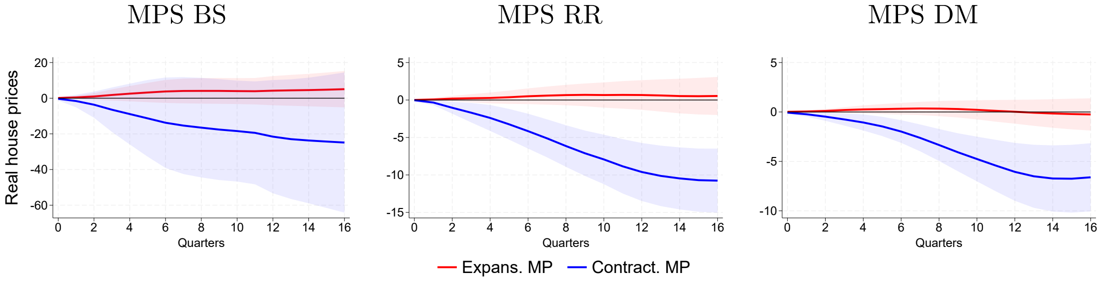
B.5 Asymmetric effect of Monetary Policy on house prices

Figure B6: Asymmetric effects of Monetary Policy (PRR)



Notes: This figure shows asymmetric effects of monetary policy by decomposing ΔRate_t into contractionary (blue) and expansionary (red) components, following equation (5), corresponding to the effect of a 25 basis point change in the policy rate on real house prices, conditional on the level of house price overvaluation as measured by the PRR. The columns show the results using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. The red solid line corresponds to $\hat{\beta}_1^h$ and the blue solid line to $\hat{\beta}_2^h$, while the shaded areas denote the 90% confidence interval using double-clustered standard errors, at the MSA and quarter level. Controls include four lags of (log) changes in real house prices, employment, population, share of young population and the share of non-owner-occupied home-purchase loans. MSA and quarter FE are included.

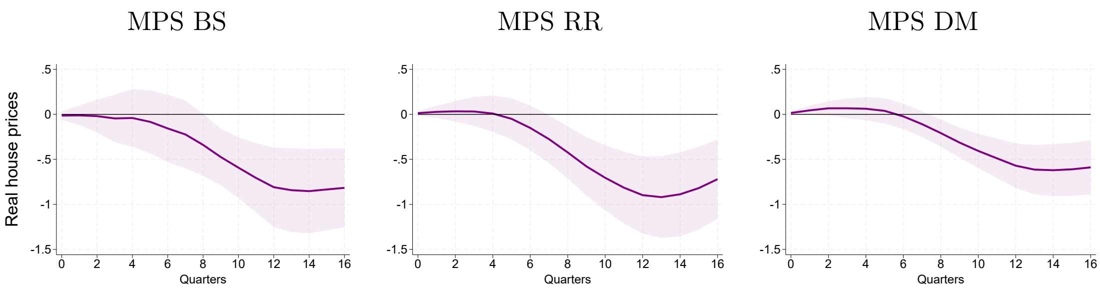
Figure B7: Asymmetric effects of Monetary Policy (PRR deviation from trend)



Notes: This figure shows asymmetric effects of monetary policy by decomposing ΔRate_t into contractionary (blue) and expansionary (red) components, following equation (5), corresponding to the effect of a 25 basis point change in the policy rate on real house prices, conditional on the level of house price overvaluation as measured by the PRR deviation from trend. The columns show the results using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. The red solid line corresponds to $\hat{\beta}_1^h$ and the blue solid line to $\hat{\beta}_2^h$, while the shaded areas denote the 90% confidence interval using double-clustered standard errors, at the MSA and quarter level. Controls include four lags of (log) changes in real house prices, employment, population, share of young population and the share of non-owner-occupied home-purchase loans. MSA and quarter FE are included.

B.6 LP-IV results: Controlling for supply elasticities

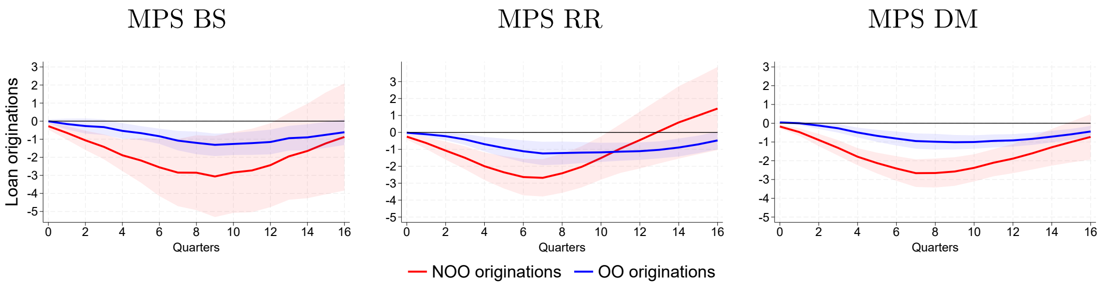
Figure B8: Transmission of monetary policy to house prices in percentage points, controlling for supply constraints (WRLURI 2006)



Notes: This figure shows estimates of equation (6), corresponding to the effect of a 25 basis point change in the policy rate on real house prices, conditional on the level of house price overvaluation as measured by the PRR, controlling for supply constraints (WRLURI 2006). The columns show the results using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. The solid line corresponds to $\hat{\beta}_1^h$, while the shaded area denotes the 90% confidence interval using double-clustered standard errors, at the MSA and quarter level. Controls include four lags of (log) changes in real house prices, employment, population, share of young population and the share of non-owner-occupied home-purchase loans. MSA and quarter FE are included.

B.7 LP-IV Results: NOO and OO origination volumes

Figure B9: Transmission of monetary policy to non-owner-occupied and owner-occupied home-purchase mortgage originations in percentage points



Notes: This figure shows estimates of equation (3), corresponding to the effect of a 25 basis point change in the policy rate on non-owner-occupied (red line) and owner-occupied home-purchase mortgage originations (blue line), conditional on the level of house price overvaluation as measured by the PRR. The columns show the results using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. The solid line corresponds to $\hat{\beta}_1^h$, while the shaded area denotes the 90% confidence interval using double-clustered standard errors, at the MSA and quarter level. Controls include four lags of (log) changes in real house prices, employment, population, share of young population and the corresponding measure of loan originations. MSA and quarter FE are included.

B.8 Additional robustness

Table B1: Extensions and Robustness. Dependent variable: $log(NooShare_{j,t+6}) - log(NooShare_{j,t-1})$

	Baseline			Supply Constr. (WRL 2006)			MP Asymmetries		
	(1) MPS BS	(2) MPS RR	(3) MPS DM	(4) MPS BS	(5) MPS RR	(6) MPS DM	(7) MPS BS	(8) MPS RR	(9) MPS DM
$\Delta\widehat{Rate_t \times PRR}_{j,t-1}$	-0.149**	-0.100**	-0.117***	-0.135*	-0.081*	-0.101***			
	(0.072)	(0.043)	(0.028)	(0.080)	(0.046)	(0.030)			
$\Delta\widehat{Rate_t \times WRL}2006_j$				-0.036	-0.051**	-0.039**			
				(0.025)	(0.024)	(0.018)			
$\Delta\widehat{Rate_t^{exp} \times PRR}_{j,t-1}$							-0.181	-0.100	-0.036
							(0.203)	(0.061)	(0.037)
$\Delta\widehat{Rate_t^{contr} \times PRR}_{j,t-1}$							-0.046	-0.100	-0.295***
							(0.814)	(0.117)	(0.088)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population weights	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,200	17,014	15,165	16,556	16,377	14,598	17,200	17,014	17,065
MSAs	190	190	190	183	183	183	190	190	190
First stage F-stat	8.3	39.8	577.7	7.2	17.0	423.2	12.5|6.9	24.5|17.1	233.6|209.9

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Columns (1)–(3) report estimates from equation (3) for the share of non-owner-occupied home-purchase mortgage loan originations, with the horizon fixed at $h = 6$ (one and a half years), using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. Following equation (6), columns (4)–(6) augment the baseline specification by interacting monetary policy with MSA-level supply constraints from Gyourko et al. (2008) (WRL2006). Columns (7)–(9) examine asymmetric effects of monetary policy by decomposing ΔRate_t into contractionary and expansionary components, following equation (5). $\Delta Rate_t^{exp}$ corresponds to a monetary policy loosening ($\Delta Rate_t < 0$), and $\Delta Rate_t^{contr}$ refers to a tightening ($\Delta Rate_t > 0$). All regressions control for four lags of (log) changes in real house prices, employment, population, the share of young population, and the share of non-owner-occupied home-purchase loans. MSA and quarter fixed effects are included throughout. Reported F-statistics correspond to the first-stage regressions.

Table B2: Supply elasticities. Dependent variable: $log(HP_{j,t+12}) - log(HP_{j,t-1})$

	Supply Constr. (WRL 2006)			Supply Constr. (WRL 2018)			Supply Elast. (Saiz)		
	(1) MPS BS	(2) MPS RR	(3) MPS DM	(4) MPS BS	(5) MPS RR	(6) MPS DM	(7) MPS BS	(8) MPS RR	(9) MPS DM
$\Delta \widehat{Rate_t \times PRR_{j,t-1}}$	-0.809***	-0.897***	-0.570***	-0.821***	-0.975***	-0.616***	-0.721***	-0.817***	-0.508***
	(0.268)	(0.260)	(0.150)	(0.294)	(0.283)	(0.163)	(0.219)	(0.224)	(0.130)
$\Delta Rate_t \widehat{\times WRL}2006_j$	-0.180	-0.222	-0.269**						
	(0.217)	(0.210)	(0.132)						
$\Delta Rate_t \widehat{\times WRL}2018_j$				-0.150	-0.021	-0.160			
				(0.261)	(0.292)	(0.125)			
$\Delta Rate_t \widehat{\times Saiz}Elast_j$							0.260	0.246	0.296*
							(0.292)	(0.289)	(0.171)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population weights	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16,556	16,377	14,598	15,884	15,712	14,003	15,332	15,166	13,517
MSAs	183	183	183	175	175	175	169	169	169
First stage F-stat	7.2	17.0	423.2	7.3	18.1	422.7	7.2	18.3	381.9

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table shows the LP-IV estimates for real house prices, with the horizon fixed at $h = 12$ (three years), using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. Following equation (6), columns (1)–(3) augment the baseline specification by interacting monetary policy with MSA-level supply constraints from Gyourko et al. (2008) (WRL2006). Columns (4)–(6) and (7)–(9) test the robustness of this interaction using alternative measures of supply constraints from Gyourko et al. (2019) (WRL2018) and supply elasticities from Saiz (2010), respectively. All regressions control for four lags of (log) changes in real house prices, employment, population, the share of young population, and the share of non-owner-occupied home-purchase loans. MSA and quarter fixed effects are included throughout. Reported F-statistics correspond to the first-stage regressions.

Table B3: Supply elasticities. Dependent variable: $log(NooShare_{j,t+6}) - log(NooShare_{j,t-1})$

	Supply Constr. (WRL 2006)			Supply Constr. (WRL 2018)			Supply Elast. (Saiz)		
	(1) MPS BS	(2) MPS RR	(3) MPS DM	(4) MPS BS	(5) MPS RR	(6) MPS DM	(7) MPS BS	(8) MPS RR	(9) MPS DM
$\Delta \widehat{Rate_t \times PRR_{j,t-1}}$	-0.135*	-0.081*	-0.101***	-0.165*	-0.111**	-0.126***	-0.159*	-0.090	-0.123***
	(0.080)	(0.046)	(0.030)	(0.086)	(0.048)	(0.032)	(0.090)	(0.058)	(0.037)
$\Delta \widehat{Rate_t \times WRL2006_j}$	-0.036	-0.051**	-0.039**						
	(0.025)	(0.024)	(0.018)						
$\Delta \widehat{Rate_t \times WRL2018_j}$				0.027	0.016	0.011			
				(0.040)	(0.025)	(0.018)			
$\Delta \widehat{Rate_t \times SaizElast_j}$							-0.022	0.022	-0.018
							(0.049)	(0.041)	(0.029)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population weights	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16,556	16,377	14,598	15,884	15,712	14,003	15,332	15,166	13,517
MSAs	183	183	183	175	175	175	169	169	169
First stage F-stat	7.2	17.0	423.2	7.3	18.1	422.7	7.2	18.3	381.9

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table shows the LP-IV estimates for the share of non-owner-occupied home-purchase mortgage loan originations, with the horizon fixed at $h = 6$ (one and a half years), using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. Following equation (6), columns (1)–(3) augment the baseline specification by interacting monetary policy with MSA-level supply constraints from Gyourko et al. (2008) (WRL2006). Columns (4)–(6) and (7)–(9) test the robustness of this interaction using alternative measures of supply constraints from Gyourko et al. (2019) (WRL2018) and supply elasticities from Saiz (2010), respectively. All regressions control for four lags of (log) changes in real house prices, employment, population, the share of young population, and the share of non-owner-occupied home-purchase loans. MSA and quarter fixed effects are included throughout. Reported F-statistics correspond to the first-stage regressions.

Table B4: Robustness. Dependent variable: $log(HP_{j,t+12}) - log(HP_{j,t-1})$

	Not weighted			Controls: 8 lags			Controls: 12 lags		
	(1) MPS BS	(2) MPS RR	(3) MPS DM	(4) MPS BS	(5) MPS RR	(6) MPS DM	(7) MPS BS	(8) MPS RR	(9) MPS DM
$\Delta \widehat{Rate_t \times PRR_{j,t-1}}$	-0.937**	-1.269***	-0.694***	-0.854***	-0.956***	-0.701***	-0.854***	-0.974***	-0.751***
	(0.391)	(0.379)	(0.198)	(0.292)	(0.265)	(0.168)	(0.300)	(0.269)	(0.181)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population weights	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,200	17,014	15,165	16,440	16,254	15,145	15,680	15,494	15,125
MSAs	190	190	190	190	190	190	190	190	190
First stage F-stat	8.4	41.8	542.0	8.6	41.9	609.5	8.8	43.4	611.4

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table shows the LP-IV estimates for real house prices, with the horizon fixed at $h = 12$ (three years), using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. In the baseline specification (equation 3), the estimates are -0.88***, -0.98***, and -0.67***, respectively. Columns (1)–(3) report estimates for the unweighted regressions. Columns (4)–(6) include 8 lags of each control, while Columns (7)–(9) include 12 lags. All regressions control for at least four lags of (log) changes in real house prices, employment, population, the share of young population, and the share of non-owner-occupied home-purchase loans. MSA and quarter fixed effects are included throughout. Reported F-statistics correspond to the first-stage regressions.

Table B5: Robustness. Dependent variable: $log(NooShare_{j,t+6}) - log(NooShare_{j,t-1})$

	Not weighted			Controls: 8 lags			Controls: 12 lags		
	(1) MPS BS	(2) MPS RR	(3) MPS DM	(4) MPS BS	(5) MPS RR	(6) MPS DM	(7) MPS BS	(8) MPS RR	(9) MPS DM
$\Delta \widehat{Rate_t \times PRR}_{j,t-1}$	-0.120*	-0.070*	-0.092***	-0.142*	-0.069	-0.110***	-0.132*	-0.060	-0.115***
	(0.069)	(0.041)	(0.029)	(0.073)	(0.045)	(0.029)	(0.072)	(0.045)	(0.029)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population weights	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,200	17,014	15,165	16,440	16,254	15,145	15,680	15,494	15,125
MSAs	190	190	190	190	190	190	190	190	190
First stage F-stat	8.4	41.8	542.0	8.6	41.9	609.5	8.8	43.4	611.4

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table shows the LP-IV estimates for the share of non-owner-occupied home-purchase mortgage loan originations, with the horizon fixed at $h = 6$ (one and a half years), using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. In the baseline specification (equation 3), the estimates are -0.149**, -0.100**, and -0.117***, respectively. Columns (1)–(3) report estimates for the unweighted regressions. Columns (4)–(6) include 8 lags of each control, while Columns (7)–(9) include 12 lags. All regressions control for at least four lags of (log) changes in real house prices, employment, population, the share of young population, and the share of non-owner-occupied home-purchase loans. MSA and quarter fixed effects are included throughout. Reported F-statistics correspond to the first-stage regressions.

Table B6: Additional robustness (exclude controls). Dependent variable: $log(HP_{j,t+12}) - log(HP_{j,t-1})$

	Excl. Noo share			Excl. Empl			Excl. Pop			Excl. Frac. Young		
	(1) MPS BS	(2) MPS RR	(3) MPS DM	(4) MPS BS	(5) MPS RR	(6) MPS DM	(7) MPS BS	(8) MPS RR	(9) MPS DM	(10) MPS BS	(11) MPS RR	(12) MPS DM
$\widehat{\Delta Rate_t \times PRR_{j,t-1}}$	-0.896***	-1.057***	-0.713***	-0.889***	-0.985***	-0.685***	-0.886***	-0.976***	-0.673***	-0.961***	-1.117***	-0.758***
	(0.305)	(0.295)	(0.175)	(0.304)	(0.285)	(0.165)	(0.305)	(0.282)	(0.168)	(0.352)	(0.319)	(0.186)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population weights	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,940	17,754	15,165	17,200	17,014	15,165	17,200	17,014	15,165	17,480	17,290	15,390
MSAs	190	190	190	190	190	190	190	190	190	190	190	190
First stage F-stat	8.0	40.1	568.2	8.3	39.8	575.6	8.3	39.8	577.0	8.1	41.8	572.1

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table shows the LP-IV estimates for real house prices, with the horizon fixed at $h = 12$ (three years), using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. In the baseline specification (equation 3), the estimates are -0.88***, -0.98***, and -0.67***, respectively. Columns (1)–(3) report estimates excluding changes in the NOO share as a control; Columns (4)–(6) exclude (log) changes in employment; Columns (7)–(9) exclude (log) changes in population; and Columns (10)–(12) exclude (log) changes in the share of young population. All regressions control for four lags of (log) changes in real house prices, employment, population, the fraction of young population, and the share of non-owner-occupied home-purchase loans, aside from the excluded one. MSA and quarter fixed effects are included throughout. Reported F-statistics correspond to the first-stage regressions.

Table B7: Additional robustness (exclude controls). Dependent variable: $log(NooShare_{j,t+6}) - log(NooShare_{j,t-1})$

	Excl. Noo share			Excl. Empl			Excl. Pop			Excl. Frac. Young		
	(1) MPS BS	(2) MPS RR	(3) MPS DM	(4) MPS BS	(5) MPS RR	(6) MPS DM	(7) MPS BS	(8) MPS RR	(9) MPS DM	(10) MPS BS	(11) MPS RR	(12) MPS DM
$\widehat{\Delta Rate_t \times PRR_{j,t-1}}$	-0.156*	-0.141***	-0.149***	-0.150**	-0.104**	-0.120***	-0.150**	-0.100**	-0.117***	-0.133*	-0.092**	-0.107***
	(0.081)	(0.043)	(0.032)	(0.072)	(0.044)	(0.029)	(0.072)	(0.043)	(0.029)	(0.078)	(0.042)	(0.029)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population weights	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,940	17,754	15,165	17,200	17,014	15,165	17,200	17,014	15,165	17,480	17,290	15,390
MSAs	190	190	190	190	190	190	190	190	190	190	190	190
First stage F-stat	8.0	40.1	568.2	8.3	39.8	575.6	8.3	39.8	577.0	8.1	41.8	572.1

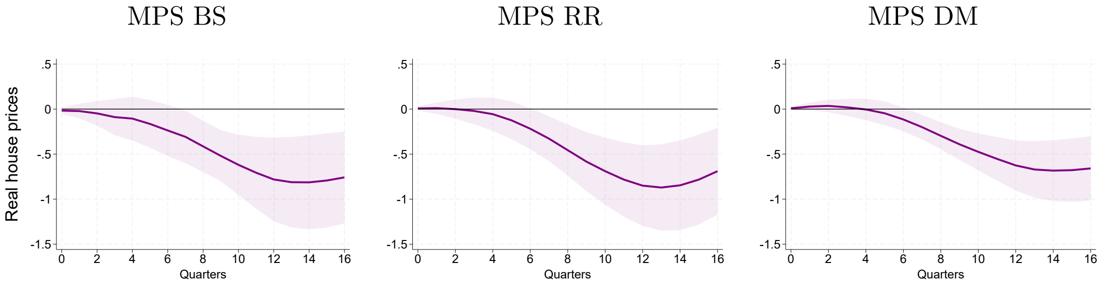
Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table shows the LP-IV estimates for the share of non-owner-occupied home-purchase mortgage loan originations, with the horizon fixed at $h = 6$ (one and a half years), using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. In the baseline specification (equation 3), the estimates are -0.149**, -0.100**, and -0.117***, respectively. Columns (1)–(3) report estimates excluding changes in the NOO share as a control; Columns (4)–(6) exclude (log) changes in employment; Columns (7)–(9) exclude (log) changes in population; and Columns (10)–(12) exclude (log) changes in the share of young. All regressions control for four lags of (log) changes in real house prices, employment, population, the share of young population, and the share of non-owner-occupied home-purchase loans, aside from the excluded one. MSA and quarter fixed effects are included throughout. Reported F-statistics correspond to the first-stage regressions.

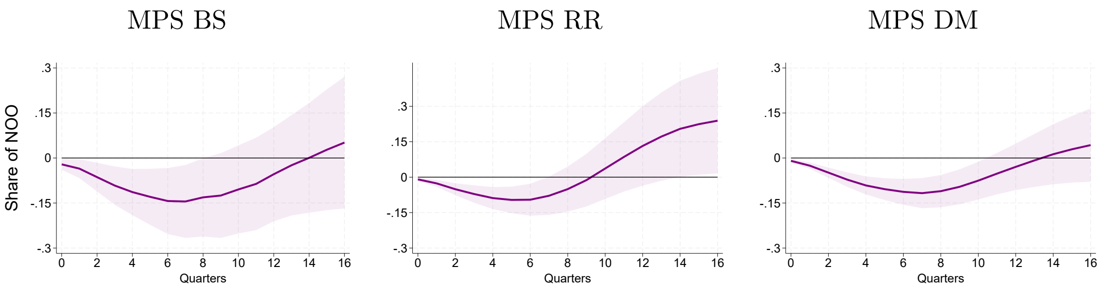
B.9 LP-IV results: alternative PRR measure (3-BD)

Figure B10: Transmission of monetary policy to real house prices in percentage points (PRR using rents for 3-BD)



Notes: This figure shows estimates of equation (3), corresponding to the effect of a 25 basis point change in the policy rate on real house prices, conditional on the level of house price overvaluation as measured by the PRR (built using rents for 3-bedroom houses). The columns show the results using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. The solid line corresponds to $\hat{\beta}_1^h$, while the shaded area denotes the 90% confidence interval using double-clustered standard errors, at the MSA and quarter level. Controls include four lags of (log) changes in real house prices, employment, population, fraction of young population and the share of non-owner-occupied home-purchase loans. MSA and quarter FE are included.

Figure B11: Transmission of monetary policy to the share of non-owner-occupied home-purchase mortgage originations in percentage points (PRR using rents for 3-BD)



Notes: This figure shows estimates of equation (3), corresponding to the effect of a 25 basis point change in the policy rate on the share of non-owner-occupied home-purchase loan originations, conditional on the level of house price overvaluation as measured by the PRR (built using rents for 3-bedroom houses). The columns show the results using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. The solid line corresponds to $\hat{\beta}_1^h$, while the shaded area denotes the 90% confidence interval using double-clustered standard errors, at the MSA and quarter level. Controls include four lags of (log) changes in real house prices, employment, population, fraction of young population and the share of non-owner-occupied home-purchase loans. MSA and quarter FE are included.

B.10 Main results using PIR as an alternative measure of overvaluation

Table B8: Effect of PIR on Rent and House Price Growth

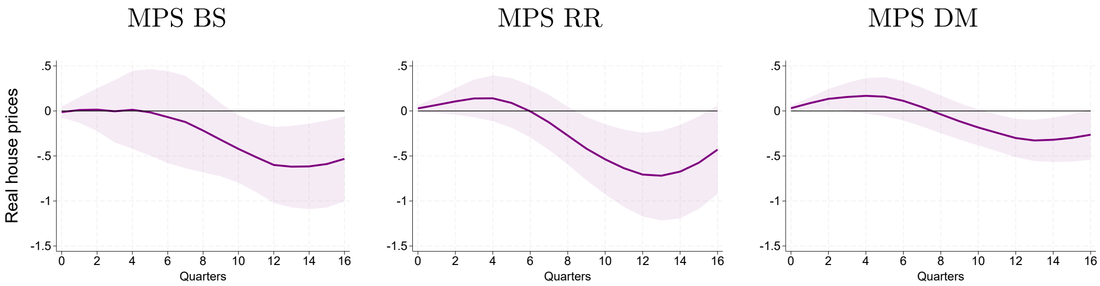
	(1) $\Delta_{t+20}Rent$	(2) $\Delta_{t+20}HP$	(3) $\Delta_{t+20}Rent$	(4) $\Delta_{t+20}HP$
PIR	0.011***	-0.032***		
	(0.001)	(0.009)		
PIR Trend			0.009***	-0.021***
			(0.002)	(0.006)
PIR Detrended			0.024***	-0.117***
			(0.005)	(0.015)
Constant	-0.014**	0.204***	-0.008	0.163***
	(0.007)	(0.030)	(0.008)	(0.020)
Observations	22300	22300	22300	22300

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

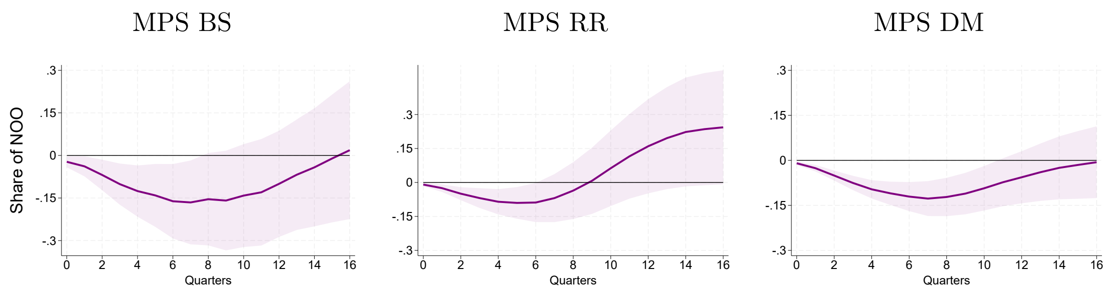
Notes: Using PIR instead of PRR, columns (1) and (2) report the estimated coefficients from equation (1), capturing the effect of PIR on the five-year ahead growth in real rents and real house prices, respectively. Columns (3) and (4) present the equivalent coefficients from equation (2), where PIR is decomposed into two components, a long-run trend and a short-run deviation from trend.

Figure B12: Transmission of monetary policy to house prices in percentage points (PIR)



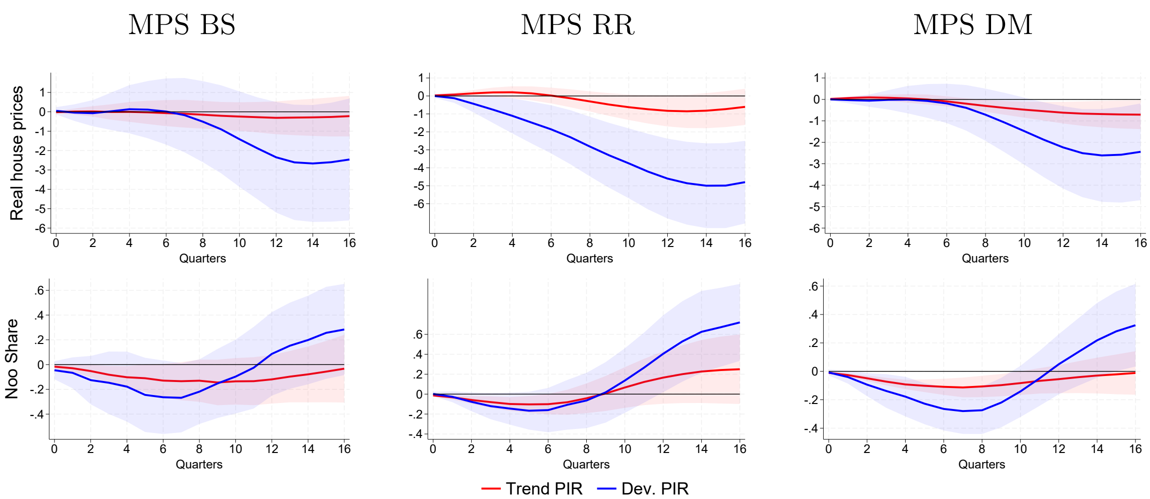
Notes: This figure shows estimates of equation (3), corresponding to the effect of a 25 basis point change in the policy rate on real house prices, conditional on the level of house price overvaluation as measured by the PIR. The columns show the results using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. The solid line corresponds to $\hat{\beta}_1^h$, while the shaded area denotes the 90% confidence interval using double-clustered standard errors, at the MSA and quarter level. Controls include four lags of (log) changes in real house prices, employment, population, share of young population and the share of non-owner-occupied home-purchase loans. MSA and quarter FE are included.

Figure B13: Transmission of monetary policy to the share of loan origination by non-owner-occupied buyers in percentage points (PIR)



Notes: This figure shows estimates of equation (3), corresponding to the effect of a 25 basis point change in the policy rate on the share of non-owner-occupied home-purchase loan originations, conditional on the level of house price overvaluation as measured by the PIR. The columns show the results using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. The solid line corresponds to $\hat{\beta}_1^h$, while the shaded area denotes the 90% confidence interval using double-clustered standard errors, at the MSA and quarter level. Controls include four lags of (log) changes in real house prices, employment, population, share of young population and the share of non-owner-occupied home-purchase loans. MSA and quarter FE are included.

Figure B14: Decomposing the amplification of the transmission of monetary policy to house prices and NOO share in percentage points (PIR)



Notes: This figure shows the results from equation (4), corresponding to the effect of a 25 basis point change in the policy rate on real house prices (top row) and NOO share (bottom row), conditional on the level of house price overvaluation as measured by the trend and deviation components of the PIR (built using the same methodology as the one defined in Section 2.2 for PRR). The columns show the results using MPS BS, MPS RR, and MPS DM, respectively, as instruments for the policy rate. The red solid line corresponds to the trend component of PIR, $\hat{\beta}_1^{h,T}$, while the blue solid line corresponds to the deviation component, $\hat{\beta}_1^{h,D}$. The shaded areas of matching colors indicate the 90% confidence intervals, computed using double-clustered standard errors at the MSA and quarter level. Controls include four lags of (log) changes in real house prices, employment, population, share of young population and the share of non-owner-occupied home-purchase loans. MSA and quarter FE are included.

PUBLICATIONS

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