Z is for Zoning: An Examination of the Heterogeneous Effects of Land-Use Regulation Changes on Housing Prices

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Working Paper

Dedicated to "Shrubman"

Abstract

This paper examines the relationship between changes in land use regulations and housing prices across U.S. municipalities. To measure the change in regulatory intensity, I utilize the Wharton Residential Land Use Regulatory Index (WRLURI) from 2006 and 2018. I regress municipal-level housing price growth, measured as the real percentage change in the FHFA House Price Index matched to the municipal level, on the change in regulatory intensity. I examine how the relationship between regulatory changes and price growth varies with initial vacancy rates, testing whether market tightness moderates the observed association with regulatory restrictions. The results indicate that municipalities experiencing increased regulatory restrictiveness are associated with higher real housing price growth, with this relationship notably stronger in areas initially characterized by low vacancy rates.

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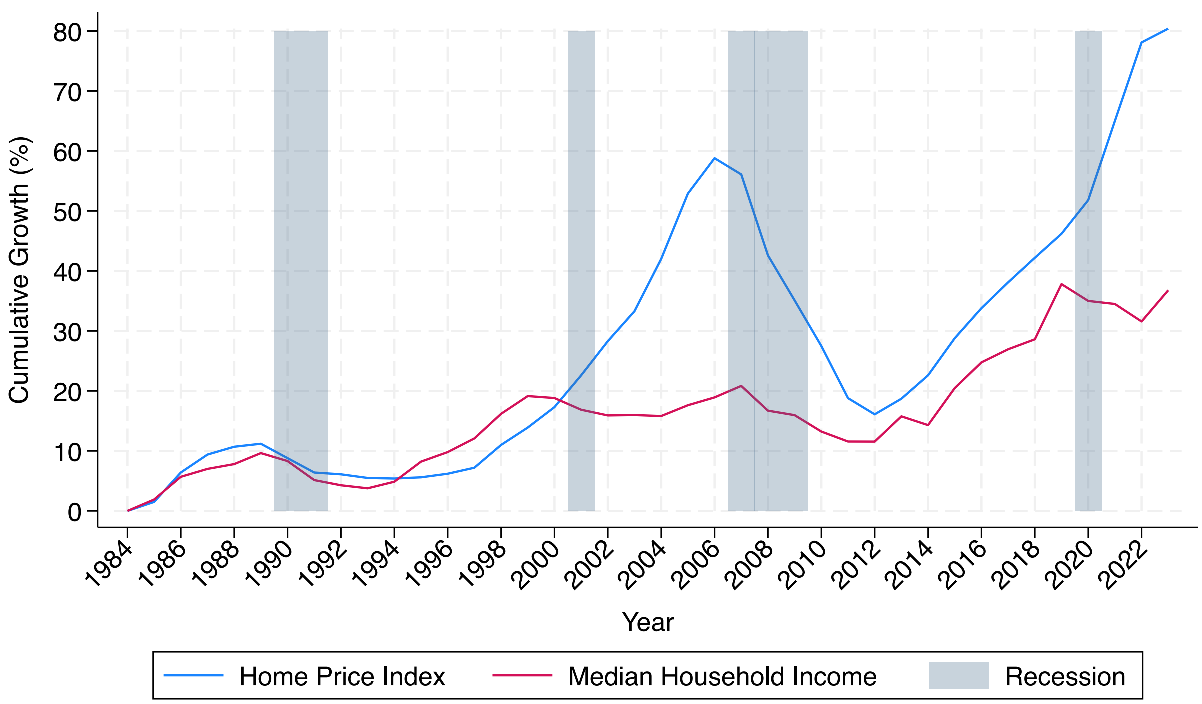
1 Introduction

Understanding housing market dynamics is increasingly critical as homeownership, long regarded as a cornerstone of the American Dream, becomes less attainable for many Americans. From 1984 to 2023, real house prices have climbed dramatically, far outpacing the growth in real median household income (Figure 1.0.0.1). This gap means that many families find it increasingly difficult to afford homeownership or even market-rate rents, as housing costs claim ever-larger shares of their income (Quigley and Raphael [2004]; Albouy et al. [2016]; Hermann and Whitney [2024]). This paper examines how land-use regulations influence housing prices and how this relationship varies according to a municipality's initial vacancy rate.

Figure 1.0.0.1: Real Changes in Housing Prices and Real Median Household Income Growth between 1984 to 2023.



Source: Federal Housing Finance Agency (HPI) and U.S. Census Bureau via FRED, Federal Reserve Bank of St. Louis.

Addressing this question is important because understanding how regulatory changes affect housing affordability is central to effective urban policy and land-use reform. Examining variation by municipal vacancy rate allows me to assess whether increases in land-use restrictiveness have differential effects on housing prices depending on local market tightness. I hypothesize that in tight, low-vacancy markets, where supply constraints are more likely to bind, regulatory increases should translate into larger housing price gains. In contrast, in high-vacancy markets with ample slack, similar regulatory changes should generate much smaller, if any, price responses.

To answer this research question, I construct a measure of changes in regulatory intensity by calculating the first difference of the Wharton Residential Land Use Regulatory Index ($\Delta WRLURI$) between 2006 and 2018 for municipalities, similar to techniques used in previous research on larger levels (Schoof [2021]; Lin [2023]; Oluku and Cheng [2024]). I then regress municipality-level housing price growth, captured as the percentage change in the real FHFA House Price Index, on this regulatory change index. My econometric framework includes demographic, economic, political, and geographic control variables. I incorporate state and regional fixed effects to account for broader market trends, and I cluster standard errors at the county level. I examine heterogeneity in the effect of regulatory changes by interacting the change with each municipality's initial vacancy rate.

Baseline specifications show no significant relationship between regulatory changes and housing price growth on average. However, this null result masks substantial heterogeneity across local markets. Using municipal vacancy rates as a measure of market tightness, I show that the price effect of regulatory tightening depends critically on initial market conditions. In low-vacancy markets, increases in $\Delta WRLURI$ are associated with significantly higher price growth, consistent with binding supply constraints. As vacancy rises, however, this positive association declines sharply and eventually turns negative. This pattern suggests reverse causality, due to municipalities facing weak demand and declining prices may adopt stricter land-use regulations in a defensive response by homeowners seeking to preserve property values, rather than regulations causing price declines. Consequently, all results should be interpreted as associational rather than causal.

This paper makes three main contributions to the existing literature. First, it is among the first to explicitly analyze the interaction between changes in local regulatory stringency, captured by the Wharton Residential Land Use Regulatory Index, and initial vacancy share when examining housing price growth. Second, I construct an adjusted $\Delta WRLURI$ index ($\Delta WRLURI^{adjusted}$) that allows for cleaner interpretation and comparability than previous research. Third, this study examines 659 municipalities, enabling granular analysis of local regulatory environments and revealing heterogeneous relationships that are averaged out in state- or metro-level studies.

2 Literature Review

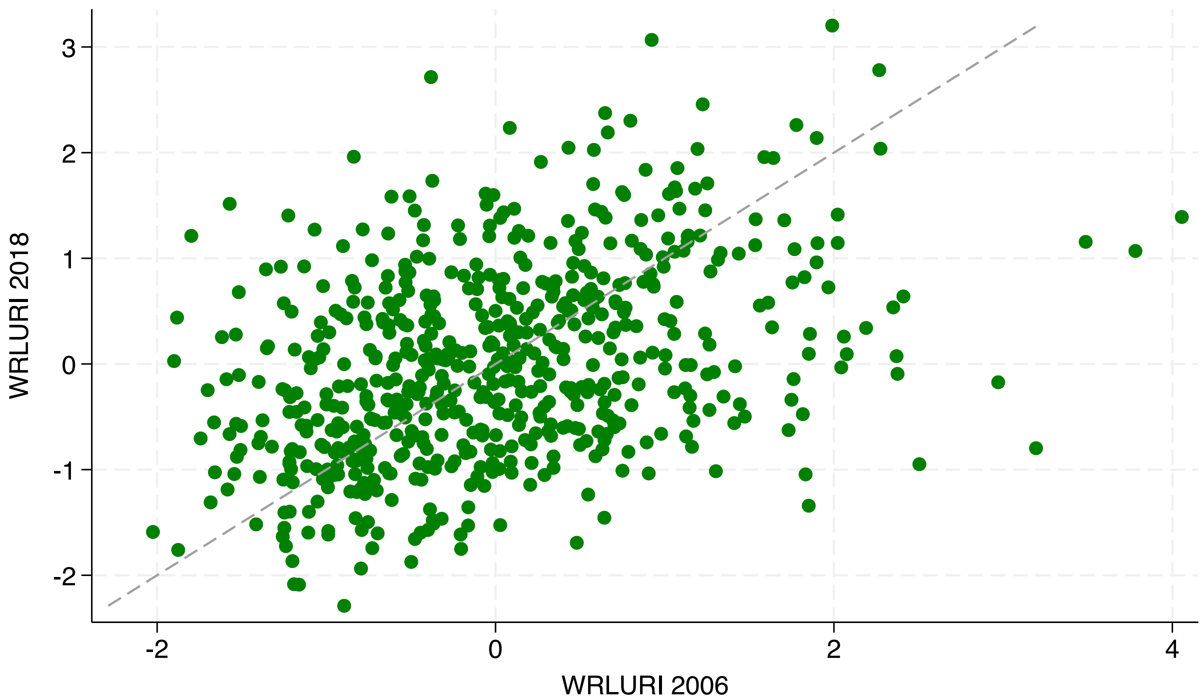
2.1 Land Use Regulatory Impacts on Housing Prices

The current literature has extensively discussed the relationship between land-use regulations and housing prices. For example, Gyourko and Molloy [2015] reviewed numerous studies and conclude that local building codes and land-use regulations tend to reduce housing supply elasticity and raise local housing prices. Quigley and Raphael [2004] showed that cities with stricter land-use regulations had higher housing prices, which reduced housing affordability, effectively imposing a regulatory tax on new development and limiting housing availability.

Early efforts to quantify local regulatory environments include the development of composite indices. The Wharton Residential Land Use Regulatory Index ($WRLURI$) was introduced by Gyourko, Saiz, and Summers (Gyourko et al. [2008]) using a 2005 to 2006 national survey of local governments and summarized the restrictiveness of land-use regulations in over 2,600 municipalities, measuring factors like zoning approval processes, supply restrictions, development fees, and open space requirements. Numerous studies utilizing the $WRLURI$ have documented that areas with higher regulatory index values (more restrictive regimes) tend to have higher housing prices (Gyourko et al. [2008]; Huang and Tang [2012]; Landis and Reina [2021]) and less construction, and that these effects are amplified by geographic constraints (Saiz [2010]). However, one limitation was that such indices were often available for only a single time period, making it difficult to analyze changes over time.

Gyourko, Hartley, and Krimmel (Gyourko et al. [2021]) updated the $WRLURI$ for the late 2010s. The new $WRLURI$ for 2018 was methodologically consistent with the 2006 survey, allowing for comparisons after roughly a decade. They found no evidence that the housing bust during the Great Recession led many jurisdictions to substantially loosen regulations; on the contrary, already highly regulated markets (especially large coastal metropolitan areas) became modestly more restrictive on average, which suggests that regulatory stringency tends to either stay the same or increase slightly over time rather than decrease. Some communities did experience some changes with some adopting slightly less stringent stances and others ratcheting up controls, providing variability that can be analyzed.

Figure 2.1.0.1: The relationship between the 2006 and 2018 WRLURI.



Note: Each dot represents a municipality's standardized WRLURI value in 2006 (x-axis) and 2018 (y-axis). The dashed line is the 45-degree line, indicating no change in relative regulatory restrictiveness between years. Points above the line represent municipalities that became relatively more restrictive over time, while points below indicate those becoming relatively less restrictive.

2.2 Housing Supply Framework

A large literature emphasizes the durable-stock nature of housing and the presence of a kinked or piecewise supply schedule, where the vertical portion reflects the existing stock of housing. Because housing is durable and new construction takes time, supply is effectively fixed in the short run, creating a vertical segment where price adjusts to clear the market among existing units [e.g., Glaeser and Gyourko, 2005, Saiz, 2010, Paciorek, 2013].

Let the total physical housing stock be denoted by H. For any market price P, households demand $Q^d(P)$ units of housing, where $Q^d(P)$ is downward sloping. Following Saiz [2010] and Paciorek [2013], let c denote the minimum construction cost. When $P < c$, builders do not add new units, and supply is vertical at H. When $P \geq c$, new construction becomes profitable and the supply schedule becomes upward sloping:

$$S_0(P) = \begin{cases} H, & \text{if } P < c, \\ H + s(P - c), & \text{if } P \geq c, \end{cases}$$

where $s > 0$ is the slope parameter governing the responsiveness of new supply to prices.

Regulations affect both parameters through distinct channels, as documented in Gyourko and Molloy [2014] and Quigley and Raphael [2004]. First, regulatory restrictiveness raises marginal construction costs through impact fees (or proffers in Virginia). Let τ denote the regulatory burden so that costs become $c+\tau$. Second, regulations reduce the responsiveness of new construction, by increasing procedural and physical constraints (approval delays, density restrictions, open space requirements, ect.) that limit developers' ability to respond to price signals, lowering elasticity and causing s to increase. The regulated supply curve is therefore:

$$S_\tau(P) = \begin{cases} H, & \text{if } P < c + \tau, \\ H + s(\tau)\,(P - c - \tau), & \text{if } P \geq c + \tau. \end{cases}$$

High-vacancy markets (slack demand). When $Q^d(P) = H$, the equilibrium lies strictly on the vertical portion of supply. Because the upward cost shift and reduced elasticity occur only on the elastic portion, regulation is non-binding:

$$\frac{\partial P}{\partial \tau} = 0, \qquad \frac{\partial Q^d}{\partial \tau} = 0.$$

Low-vacancy markets (tight demand). When $Q^d(P) > H$, demand is sufficiently strong that equilibrium lies above the kink, regulatory increases are fully binding. The upward shift in costs raises prices, with a more inelastic supply amplifying this effect:

$$\frac{\partial P}{\partial \tau} > 0, \qquad \frac{\partial Q^d}{\partial \tau} < 0.$$

Thus, vacancy rate empirically indexes where a market sits relative to the kink of the supply curve: high-vacancy markets lie on the vertical region with excess supply, where regulations are non-binding, while low-vacancy markets lie on the upward-sloping region where demand pressure makes regulations binding [Gyourko and Molloy, 2014]. Figure 2.2.0.1 shows the two markets impacted by increases in land-use regulations with different levels of market tightness.

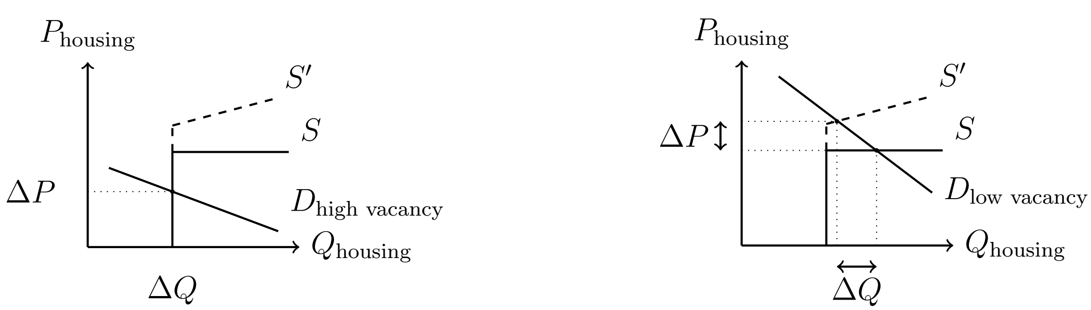
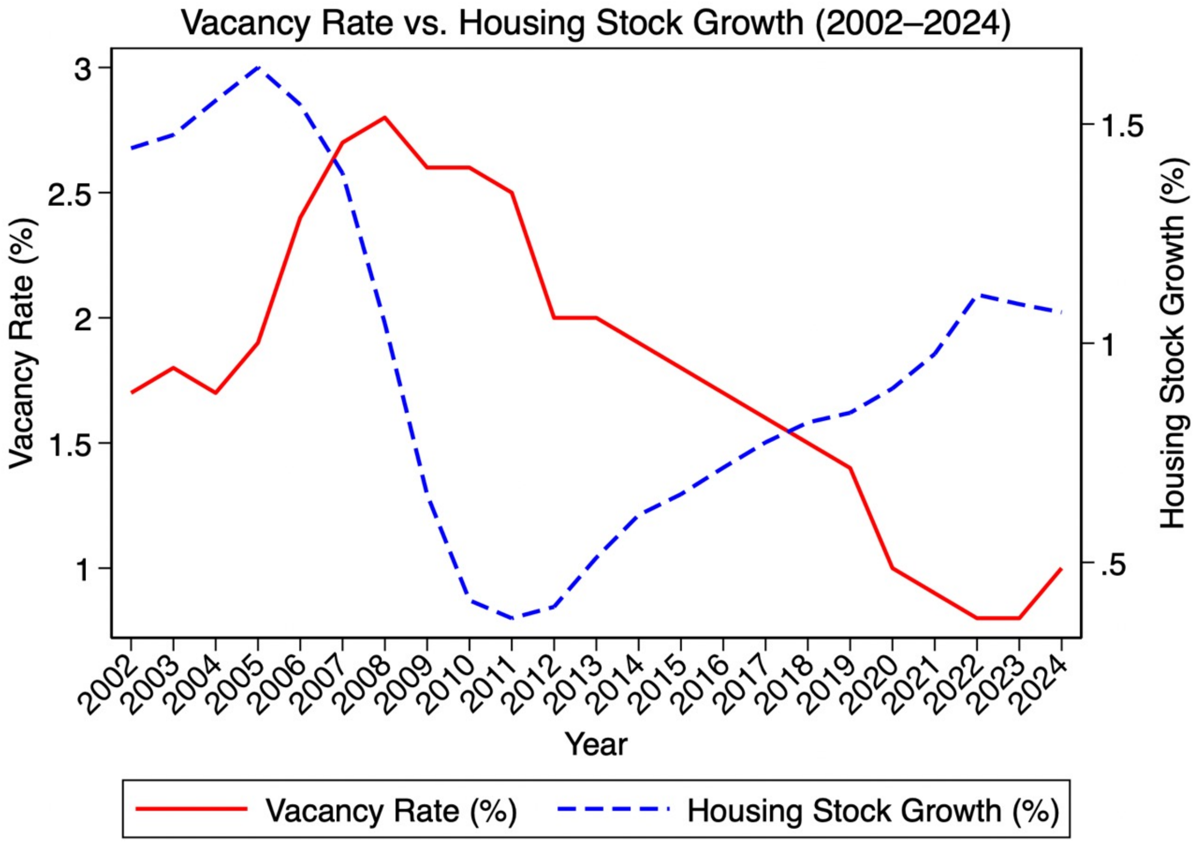


Figure 2.2.0.1: Two-panel diagram showing how a regulatory-induced shift from S to a higher and more inelastic S' generates no change in prices or quantities in high-vacancy markets (left), but induces higher prices ($\Delta P > 0$) and lower quantities ($\Delta Q < 0$) in low-vacancy markets (right).

An important caveat is that regulations themselves are endogenous to local political economy. The Homevoter Hypothesis (Fischel [2001]) argues that homeowners whose wealth is tied to property values have strong incentives to support restrictive land-use policies. This suggests regulations may tighten in response to price pressures rather than exogenously causing them, complicating causal identification. This endogeneity concern is addressed further in subsection 4.3.

Despite these insights, the literature has been limited by reliance on cross-sectional comparisons, which cannot distinguish whether regulations drive prices or emerge in response to market conditions. This paper takes a different approach by analyzing regulatory changes between 2006 and 2018 and testing whether their relationship with housing price growth varies with initial vacancy rates, directly examining whether supply constraints bind differentially across tight and slack markets.

Figure 3.4.0.1: Vacancy Rate and Housing Stock Growth over time.



Source: U.S. Census Bureau and U.S. Department of Housing and Urban Development via FRED, Federal Reserve Bank of St. Louis.

4 Empirical Framework

4.1 Baseline Specification

This paper employs a first-difference OLS regression approach to estimate the impact of changes in land-use regulations on housing price changes between 2006 and 2018. The primary regression specification is:

$$\%\Delta HPI_i = \beta_0 + \beta_1 \Delta WRLURI_i + (\%\Delta X_i)'\beta_2 + Z_i^{(2006)\prime}\gamma + \mu_s + \epsilon_i$$

For municipality i, $\%\Delta HPI_i$ denotes the percent change in real housing prices from 2006 to 2018, measured by aggregating Census tract-level values to the municipal level using the housing stock as the weight. $\Delta WRLURI_i$ is the change in the Wharton Residential Land Use Regulatory Index over the same period, using either the adjusted or unadjusted version of the index. The vector $\%\Delta X_i$ contains demographic and economic controls measured as percent changes, such as population and income growth, which capture dynamic local demand conditions. $Z_i^{(2006)}$ denotes a set of initial municipal characteristics in 2006, including median household income, baseline population, and homeowner share. I include state and regional (Census Division) fixed effects, μ_s, and standard errors are clustered at the county level to account for spatial correlation in housing markets and regulatory environments within counties.

The coefficient of interest, β_1, measures how a one-unit increase in $\Delta WRLURI$ affects the percent change in real house prices, holding all other factors constant. Because the $WRLURI$ index is standardized, a one-unit change corresponds approximately to a one-standard-deviation increase in regulatory restrictiveness. A positive β_1 would indicate that stricter land-use regulation is associated with faster house-price growth. This interpretation is consistent with the hypothesis that more restrictive regulation constrains housing supply and increases prices.

However, establishing a causal interpretation of β_1 is complicated by the potential endogeneity of land-use regulations. Homeowners whose wealth is concentrated in their homes have strong incentives to support regulations that protect or enhance property values (Fischel [2001]). This creates reverse causality in that, rather than regulations exogenously affecting prices, price concerns may drive regulatory adoption. I discuss these identification challenges in detail in subsection 4.3.

Counties within the same state or region share common economic and institutional environments. State fixed effects absorb state-specific influences, such as statewide economic conditions, housing market dynamics, or policy frameworks that affect all municipalities within a given state (e.g., Dillon Rule versus Home Rule systems). Regional fixed effects capture broader market trends, such as long-run declines in housing demand in Rust Belt regions following reductions in manufacturing employment. By including these fixed effects, the identification of β_1 relies on within-state or within-region variation in changes in land-use regulation and subsequent housing price growth.

4.2 Modeling Heterogeneous Effects with Vacancy Rate

The baseline specification in subsection 4.1 assumes that regulatory changes have uniform effects across all municipalities. However, the kinked supply curve framework in subsection 2.2 predicts that supply constraints should bind more tightly in markets where demand is high relative to existing supply. To test this prediction, I examine whether the effect of regulatory changes on price growth varies with initial market tightness.

I measure market tightness using the vacancy rate in 2006. The vacancy rate directly reflects where demand sits relative to the existing housing stock: low vacancy indicates tight markets where regulations are more likely to bind, while high vacancy indicates slack markets with excess supply. I estimate the following model:

$$\begin{aligned} \%\Delta HPI_i = \beta_0 + \beta_1 \Delta WRLURI_i + \beta_2 (\Delta WRLURI_i \times Vacancy_i) \\ + \beta_3 Vacancy_i + (\%\Delta X_i)'\beta_4 + Z_i^{(2006)\prime}\gamma + \mu_s + \epsilon_i. \end{aligned} \tag{1}$$

Here, $Vacancy_i$ denotes the share of housing units classified as vacant in 2006 for municipality i. The interaction term $\Delta WRLURI_i \times Vacancy_i$ allows the price effect of regulatory tightening to vary with market tightness. The total marginal effect of regulatory tightening is:

$$\frac{\partial (\%\Delta HPI_i)}{\partial (\Delta WRLURI_i)} = \beta_1 + \beta_2 \cdot Vacancy_i.$$

A negative and significant β_2 would indicate that the positive effect of regulatory tightening on housing prices diminishes as vacancy increases, consistent with the idea that supply constraints bind more in tight (low-vacancy) markets. In contrast, a near-zero or insignificant β_2 would suggest that vacancy does not meaningfully moderate the capitalization of regulatory changes into housing prices.

I include the main effect of $Vacancy_i$ through β_3, which captures any direct relationship between initial vacancy and subsequent house price changes. This ensures that the interpretation of the interaction coefficient β_2 reflects the differential impact of $\Delta WRLURI_i$ across markets with varying tightness, rather than confounding this relationship with baseline differences in market conditions.

The model also includes demographic and economic control variables measured as percent changes, $(\%\Delta X_i)$, initial municipal characteristics $Z_i^{(2006)}$, and state and regional fixed effects μ_s. This specification provides a direct test of the hypothesis that regulatory changes exert larger effects in tighter housing markets. If supply restrictions matter most where demand pressure is high, and housing availability is limited, I expect β_2 to be negative.

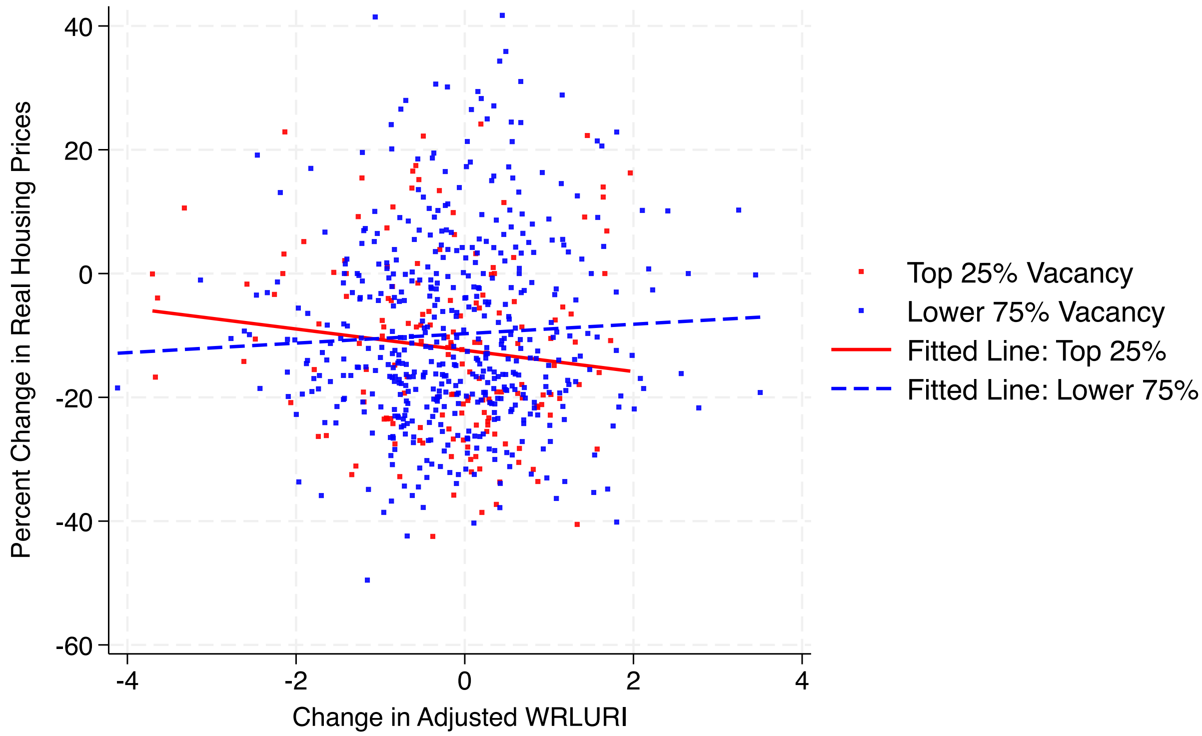
4.3 Identification Challenges

A central identification challenge in estimating the causal effect of regulatory stringency on housing prices is the inherent endogeneity of land-use regulation. Regulations are not imposed randomly but emerge from political processes shaped by local economic conditions, homeowner preferences, and housing market dynamics. This leads to reverse causality.

Homeowners whose wealth is concentrated in their homes have strong incentives to support regulations that protect or enhance property values (Fischel [2001]). Rather than regulations exogenously affecting prices, price concerns may drive regulatory adoption. Municipalities experiencing rapid price appreciation may adopt restrictive zoning to preserve neighborhood character and limit density, while those facing decline may tighten regulations in an attempt to stabilize prices.

Figure 4.3.0.1 illustrates these challenges empirically. When municipalities are split into high-vacancy (top quartile) and low-vacancy (bottom quartiles) markets, the relationship between $\Delta WRLURI^{adjusted}$ and $\%\Delta HPI$ differs starkly. In tight, low-vacancy markets, the slope is positive, consistent with the standard expectation that stricter regulations constrain supply and raise prices. In slack, high-vacancy markets, however, the slope is negative, suggesting that increases in regulatory stringency are associated with *declining* prices.

Figure 4.3.0.1: Real Change in Housing Prices and Change in Adjusted WRLURI.



Note: Real Change in Housing Prices and Change in Adjusted WRLURI. Higher-vacancy municipalities (top quartile) are shown in red, and lower-vacancy municipalities are shown in blue, with linear fitted lines for each group.

This negative relationship is almost certainly not causal. Instead, it likely reflects regulatory responses to deteriorating local economic conditions. Municipalities experiencing population loss, weak demand, or economic distress may adopt more stringent land-use controls in an effort to attract higher-income residents or prevent further decline, even as prices continue to fall due to underlying demand weakness. In other words, regulation is endogenous to local market conditions. In my sample, I found a weak correlation of -0.08 between the initial vacancy rate and changes in real home prices, supporting this conclusion.

These opposing relationships mechanically pull the average effect toward zero. This helps explain why, in the baseline specifications in Table 5.1.0.1, the coefficient on $\Delta WRLURI^{adjusted}$ is statistically insignificant. The insignificant average masks substantial heterogeneity: regulations appear to raise prices in tight markets but are adopted in response to falling prices in slack markets.

Ideally, I would address this endogeneity using an instrumental variable that isolates exogenous variation in regulatory changes. For example, Hilber and Vermeulen [2012] exploit shifts in the political control of local councils in England as an instrument for changes in planning restrictiveness, arguing that these shifts are exogenous and that political parties have distinct stances on land-use regulation. Unfortunately, such an approach is not feasible in the U.S. context. National parties do not take strong or consistent positions on local zoning, and land-use decisions are shaped by planning boards, developers, and homeowner groups whose preferences do not map neatly onto partisan politics. Moreover, any political variable correlated with regulatory change is likely also correlated with local economic conditions, violating the exclusion restriction.

Without a credible instrument, all interpretations of my regressions remain associational rather than causal. The interaction analysis in subsection 5.2 exploits variation in initial market tightness to reveal how the *association* between regulatory changes and price growth varies systematically across contexts. This approach does not solve the endogeneity problem, but it does provide insight into the conditions under which regulatory changes coincide with price increases.

Future research should prioritize identifying sources of exogenous variation in local land-use policy, such as state-level reforms, legal mandates, or quasi-experimental policy changes, to establish causal estimates. Additionally, future waves of the $WRLURI$ survey would enable difference-in-differences designs with testable parallel trends assumptions, providing a clearer path to causal identification than the current two-period panel allows.

5 Results

5.1 Baseline Estimates

Table 5.1.0.1 presents baseline regressions estimating the effects of regulatory changes on real housing price growth at the municipal level. I report results using both the original $\Delta WRLURI$ (columns 1-3) and my adjusted measure $\Delta WRLURI^{adjusted}$ (columns 4-6). Column 1 shows a positive and marginally significant coefficient on the original $\Delta WRLURI$, indicating that a one-standard-deviation increase in relative land-use regulatory restrictiveness is associated with approximately 0.911 percentage point higher real housing price growth. However, this relationship becomes statistically insignificant once state fixed effects (Column 2) or regional fixed effects (Column 3) are introduced. This is consistent with regulatory changes being heavily influenced by state-level policies and regional trends, which absorb much of the cross-municipal variation once these broader patterns are controlled for. Columns 4-6 replicate this analysis using $\Delta WRLURI^{adjusted}$, which measures actual changes in regulatory levels rather than relative changes. Here, the coefficients are smaller in magnitude (0.240 to -0.202) and statistically insignificant across all specifications.

Control variables such as population growth, median income growth, vacancy rates, and unemployment rates behave as expected, indicating our model is capturing local market conditions. Full regression outputs can be found in Appendix Tables 7.2.0.2 and 7.2.0.3. Overall, these baseline results indicate that changes in land-use regulation between 2006 and 2018 exert, at best, a weak and inconsistent average effect on municipal housing price growth. The loss of significance with fixed effects suggests that much of the apparent relationship reflects broader state or regional factors rather than independent municipal-level regulatory impacts. These modest average estimates, however, likely mask substantial heterogeneity across local market conditions. In the following section, I investigate this heterogeneity by examining how regulatory effects vary with initial vacancy rates.

Table 5.1.0.1: Effect of $\Delta WRLURI$ on %ΔHPI at the Municipal Level

	(1)	(2)	(3)	(4)	(5)	(6)
	$\%\Delta HPI$	$\%\Delta HPI$	$\%\Delta HPI$	$\%\Delta HPI$	$\%\Delta HPI$	$\%\Delta HPI$
$\Delta WRLURI$ (original)	0.911*	0.077	0.161			
	(0.550)	(0.484)	(0.526)			
$\Delta WRLURI^{adjusted}$				0.240	-0.020	-0.202
				(0.502)	(0.385)	(0.455)
Socioeconomic Controls	X	X	X	X	X	X
Area Ruggedness Scale	X	X	X	X	X	X
State Fixed Effects		X			X	
Regional Fixed Effects			X			X
Observations	613	613	613	656	656	656
Adjusted R^2	0.217	0.605	0.371	0.204	0.600	0.374

Standard errors in parentheses. X indicates inclusion of the corresponding set of controls or fixed effects. Full regression results, including coefficients for all controls, are reported in Appendix Tables 7.2.0.2 and 7.2.0.3.

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

5.2 Heterogeneous Effects by Market Tightness

The baseline results in subsection 5.1 reveal modest and often insignificant average associations between regulatory changes and housing price growth. This pattern suggests that the relationship between land-use regulation and prices may vary across different local market conditions. To investigate this heterogeneity, I estimate specifications that interact $\Delta WRLURI$ with the municipal vacancy rate in 2006, which serves as a measure of initial market tightness.

Table 5.2.0.1 presents these interaction results. Across all specifications, the interaction term between $\Delta WRLURI$ and the vacancy rate is negative and statistically significant. Using the original $\Delta WRLURI$ (columns 1–3), the significant interaction coefficient ranges from -0.106 to -0.095. With the adjusted index (columns 4–6), the interaction coefficients are similar in magnitude (-0.115 to -0.108).

The positive association between regulatory tightening and price growth declines sharply as initial vacancy increases. Consider column 5, which includes state fixed effects and uses $\Delta WRLURI^{adjusted}$. The main effect of 0.981 indicates that in a hypothetical municipality with zero vacancy, a one-standard-deviation increase in regulatory stringency is associated with a 0.98 percentage point increase in real housing prices. However, this association diminishes by 0.108 percentage points for each additional percentage point of vacancy. At a vacancy rate of 9% (roughly the sample mean), the marginal association falls to

$$0.981 - (0.108 \times 9) = 0.009,$$

essentially zero.

For municipalities with vacancy rates above 9%, the total effect becomes negative, indicating that in these slack markets, regulatory increases are associated with declining rather than rising prices. This pattern is consistent with the reverse-causality mechanism discussed in subsection 4.3. Distressed municipalities facing weak demand and falling prices may see existing homeowners, whose wealth is tied to property values, push for stricter land-use regulations in an attempt to preserve neighborhood character, exclude lower-income residents, or signal exclusivity, even as prices continue to fall due to underlying economic weakness.

This pattern aligns closely with the theoretical framework outlined in subsection 2.2, which predicts that supply constraints should bind more tightly in markets where demand is strong relative to existing stock. In tight, low-vacancy markets, additional regulatory restrictions are more likely to constrain new development that would otherwise occur, allowing these regulations to capitalize into prices. In slack, high-vacancy markets, sufficient housing stock exists to accommodate demand, even if new construction faces additional hurdles, so regulatory changes exhibit minimal price effects.

Notably, once the interaction term is included, the main effect of $\Delta WRLURI$ becomes positive and significant (with one exception) even with state or regional fixed effects. This contrasts sharply with the baseline results in Table 5.2.0.1, where the main effect was consistently insignificant. The emergence of significance reflects the fact that the interaction model separately identifies the regulatory association at low vacancy (captured by the main effect) from how that association varies with market slack (captured by the interaction). Without the interaction, the average effect aggregates across tight and slack markets, obscuring the underlying relationship.

The interaction results prove robust across alternative fixed effect specifications. Columns 1, 2, and 3 (and their counterparts 4, 5, and 6) show consistent interaction coefficients regardless of whether no fixed effects, state fixed effects, or regional fixed effects are used. This consistency strengthens confidence that the heterogeneity captured by vacancy rate reflects systematic differences in market conditions rather than artifacts of model specification. Full regression outputs can be found in Appendix Tables 7.2.0.4 and 7.2.0.5.

Overall, regulatory changes are strongly associated with price growth in low-vacancy markets but show negligible to negative relationships in high-vacancy markets. The average total effect observed in subsection 5.1 masks this substantial heterogeneity. While these associations do not establish causality, as discussed in subsection 2.2, they are economically meaningful and align with theoretical predictions about how supply constraints operate differently across market conditions. This finding underscores the importance of considering local housing market tightness when evaluating the potential consequences of land-use policy changes.

Table 5.2.0.1: Effect of $\Delta WRLURI \times Vacancy$ on %ΔHPI at the Municipal Level

	(1)	(2)	(3)	(4)	(5)	(6)
	$\%\Delta HPI$	$\%\Delta HPI$	$\%\Delta HPI$	$\%\Delta HPI$	$\%\Delta HPI$	$\%\Delta HPI$
$\Delta WRLURI$ (original)	2.076***	1.074**	1.194**			
	(0.683)	(0.542)	(0.604)			
$\Delta WRLURI \times Vacancy$	-0.106***	-0.095***	-0.096**			
	(0.036)	(0.031)	(0.041)			
$\Delta WRLURI^{adjusted}$				1.327*	0.981*	0.840
				(0.697)	(0.592)	(0.634)
$\Delta WRLURI^{adjusted} \times Vacancy$				-0.115*	-0.108**	-0.110*
				(0.060)	(0.051)	(0.065)
Socioeconomic Controls	X	X	X	X	X	X
Area Ruggedness Scale	X	X	X	X	X	X
State Fixed Effects		X			X	
Regional Fixed Effects			X			X
Observations	613	613	613	656	656	656
Adjusted R^2	0.222	0.609	0.374	0.207	0.603	0.376

Standard errors in parentheses. X indicates inclusion of the corresponding set of controls or fixed effects. Full regression results, including coefficients for all controls, are reported in Appendix Tables 7.2.0.4 and 7.2.0.5

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

6 Conclusion

This paper investigates how changes in local land-use regulations between 2006 and 2018 relate to municipal housing price growth, using a first-difference empirical framework. By constructing an adjusted version of the Wharton Residential Land Use Regulatory Index, I ensure comparability across survey years and obtain a cleaner measure of regulatory change. My econometric framework includes demographic, economic, political, and geographic control variables. I incorporate state and regional fixed effects to account for broader market trends, and I cluster standard errors at the county level. This approach examines how within-municipality regulatory shifts coincide with subsequent changes in real housing prices.

The baseline results reveal that regulatory tightening has, on average, only modest and statistically insignificant associations with housing price growth. Once state or regional fixed effects are included, these associations largely disappear. This pattern suggests that, while many municipalities did change their regulatory environments between 2006 and 2018, those changes, on average, do not exhibit strong or uniform relationships with changes in local housing prices after accounting for broader statewide or regional forces that shape market conditions.

By interacting regulatory changes with initial vacancy rates, I show that market tightness plays a central role in shaping how regulatory shifts are capitalized into housing prices. In low-vacancy, tight markets, where housing supply is more likely to be constrained, greater regulatory restrictiveness is associated with significantly higher housing price growth. In contrast, in high-vacancy markets, the association becomes negligible or even negative, consistent with reverse causality arising from endogenous policy-response mechanisms. Regulations bind only where demand pressures are strong relative to existing stock.

While these findings offer important descriptive insights, they do not establish causal effects. Regulatory changes are inherently endogenous to local political and economic conditions, and the United States lacks the type of exogenous political shifts used as instruments in related studies of land-use policy abroad. Future research should prioritize identifying quasi-experimental or institutional sources of regulatory variation, such as state-level reforms, judicial mandates, or administrative shocks, to credibly estimate causal impacts. Neverhtheless, the results presented here underscore the importance of accounting for housing market tightness when evaluating land-use policies and suggest that regulatory reforms will have the strongest price effects in markets where supply constraints already bind tightly.

References

David Albouy, Gabriel Ehrlich, and Yingyi Liu. Housing Demand, Cost-of-Living Inequality, and the Affordability Crisis. Working Paper 22816, National Bureau of Economic Research, 2016. URL https://doi.org/10.3386/w22816.

William A. Fischel. *The Homevoter Hypothesis: How Home Values Influence Local Government Taxation, School Finance, and Land-Use Policies.* Harvard University Press, Cambridge, MA, 2001. URL https://doi.org/10.2307/j.ctv1p6hp64. Accessed 18 Oct. 2025.

Edward L. Glaeser and Joseph Gyourko. Urban decline and durable housing. *Journal of Political Economy*, 113(2):345–375, 2005. ISSN 00223808, 1537534X. URL http://www.jstor.org/stable/10.1086/427465.

Joseph Gyourko and Raven Molloy. Regulation and housing supply. Working Paper 20536, National Bureau of Economic Research, October 2014. URL http://www.nber.org/papers/w20536.

Joseph Gyourko and Raven Molloy. Regulation and housing supply. In Gilles Duranton, J. V. Henderson, and William C. Strange, editors, *Handbook of Regional and Urban Economics*, volume 5, pages 1289–1337. Elsevier, 2015.

Joseph Gyourko, Albert Saiz, and Anita Summers. A new measure of the local regulatory environment for housing markets: The wharton residential land use regulatory index. *Urban Studies*, 45(3):693–729, 2008.

Joseph Gyourko, Jonathan S. Hartley, and Jacob Krimmel. The local residential land use regulatory environment across u.s. housing markets: Evidence from a new wharton index. *Journal of Urban Economics*, 124, 2021.

Alexander Hermann and Peyton Whitney. Home Price-to-Income Ratio Reaches Record High. Blog post, Joint Center for Housing Studies, Harvard University, January 2024. URL https://www.jchs.harvard.edu/blog/home-price-income-ratio-reaches-record-high-0.

Christian A. L. Hilber and Wouter Vermeulen. The impact of supply constraints on house prices in england. SERC Discussion Papers 0119, Centre for Economic Performance, LSE, Sep 2012. URL https://ideas.repec.org/p/cep/sercdp/0119.html.

Haifang Huang and Yao Tang. Residential land use regulation and the us housing. *Journal of Urban Economics*, 71:93–99, 05 2012. doi: 10.1016/j.jue.2011.08.001.

John Landis and Vincent Reina. Do restrictive land use regulations make housing more expensive everywhere ? *Economic Development Quarterly*, 35:089124242110435, 10 2021. doi: 10.1177/08912424211043500.

Chuanhao Lin. New results on the effects of regulation: Gun control and land use planning. Master's thesis, The George Washington University, 2023.

Uche Oluku and Shaoming Cheng. A mediation analysis of the relationship between land use regulation stringency and employment dynamics. *Journal of Urban Affairs*, 2024.

Andrew Paciorek. Supply constraints and housing market dynamics. *Journal of Urban Economics*, 77:11–26, 2013. ISSN 0094-1190. doi: https://doi.org/10.1016/j.jue.2013.04.001. URL https://www.sciencedirect.com/science/article/pii/S009411901300034X.

John M. Quigley and Steven Raphael. Is Housing Unaffordable? Why Isn't It More Affordable? *Journal of Economic Perspectives*, 18(1):191–214, 2004.

Albert Saiz. The geographic determinants of housing supply. *The Quarterly Journal of Economics*, 125(3):1253–1296, 2010.

John Schoof. Residential land use regulation and chronic disease disparities by income level. Master's thesis, University of Washington, 2021.