# Density Control, Home Price Appreciation, and Rental Growth in the United States

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## Abstract

*This article examines density control in the top 50 U.S. metropolitan areas using National Longitudinal Land Use Survey (NLLUS) data from 1994, 2003, and 2019. Small- and low-density jurisdictions have typically tightened density controls over this period, while large and populous places have loosened them, accommodating high-density development. Linking these changes to the house price appreciation, we find that greater price appreciation is positively correlated with the relaxing of the density regulation, on the surface a counterintuitive negative relationship. However, in the multifamily sector, we find that the relationship between density control and rent growth is positive: rents are rising faster in areas with tight density controls, consistent with supply constraints. Results also hold in cross-metropolitan area comparisons concerning house appreciation. The different impacts on home prices and the rental sectors may be due to civic engagement differences between homeowners and renters.*

## Introduction

As the housing market recovered from the 2008–2009 financial crisis in the United States, house price appreciation has outpaced household income in many markets. Concurrently, asking rents on market-rate units in major metropolitan areas have taken an increasing share of median household income. Together these trends have contributed to reduced housing affordability. Given the well-documented lack of supply in many markets, many argue that local restriction on new construction is a major obstacle. Given the rising demand driven by employment growth and demographic factors, the limited housing supply will put a premium on the price of residential spaces in single-family neighborhoods and multifamily rental sectors. Hence, we expect high housing prices and apartment rents and faster price appreciation and rental growth. Many initiatives have been put

together to address housing shortages and consequent affordability challenges; not surprisingly, land use regulation is often the target of such efforts.[1]

While such policy rhetoric is heard repeatedly in the mass media and elsewhere, few empirical studies have examined the relationship between zoning strictness and prices, particularly across multiple areas and over a long period. One likely reason is that it is hard to measure land-use regulation quantitatively, not to mention consistently across jurisdictions over time. With about 38,000 local sub-county jurisdictions and over 3000 counties in the United States, local variation is vast.

While the land-use ordinances are hard to summarize and measure collectively, it is possible to focus on a few typical requirements, some of which may be correlated. For example, a jurisdiction that imposes a one-half-acre minimum lot size requirement is unlikely to allow apartment buildings to be built by right. Gyourko, Saiz, and Summers (2008) find that many of the subindexes are highly positively correlated when constructing the Wharton Residential Land Use Regulatory Index (WRLURI). In this article, we focus on two common zoning restrictions to develop a quantitative measure in order to be able to evaluate the association with local housing market prices and rents.

More specifically, we use the responses to questions on local density controls from the National Longitudinal Land Use Survey (NLLUS)[2] to assess how the local regulatory environment has evolved. The 2019 NLLUS data set contains survey responses from about 1,500 jurisdictions with a governmental body responsible for planning and permitting, including cities, towns, and villages. We have three broad observations.

First, we find that over the past 25 years, density control regulations have become more bifurcated. Namely, there has been an increase in the percentage of jurisdictions whose land use is to favor low-density single-family housing and the percentage of those that allow high-density multifamily developments, with those in the middle density reduced substantially. By investigating this issue further, we discover that the small and less populous jurisdictions, most of which already have a tight density requirement, become even more restrictive; these large and populous places, mostly quite accommodating to multifamily development, continue to relax their density control over time.

Second, we find that the empirical correlation is negative, a somewhat surprising result on the relationship to home price appreciation. However, that is consistent with the fact that across the United States, large and populous areas are witnessing fast house price appreciation, and in response to this trend, many places have loosened the density restrictions. On the other hand, when we look at the rent growth across jurisdictions, the traditional supply restriction theory holds up: rents are growing faster in areas with tight density restrictions and slower elsewhere.

Third, when we look at the correlation across metropolitan areas, we again have a negative correlation. This is largely because of the difference in demand-side factors: metropolitan areas

[1] For example, the city of Minneapolis has recently eliminated the restrictive single-family zoning across all residential land parcels in 2019.

[2] For more details on the survey, please see Gallagher, Lo, and Pendall (2019) and the Urban Institute website: https://www.urban.org/policy-centers/metropolitan-housing-and-communities-policy-center/projects/zoning-insights-explore-data-national-longitudinal-land-use-survey.

have responded to the high and rapidly rising housing and rent prices. Because of this pressure, most populous areas feel the need to satisfy the demand for more housing. It is worth noting that this is not a refutation of the supply story, as we illustrate our findings through a simple theory on the demand and supply curve.

Generally, these results are broadly in line with those in the literature. Gyourko and Molloy (2015) provide a review of the effect of housing supply regulation on housing affordability. In general, it finds that regulations restricting the use of land raise average house prices and rents. This is true for our multifamily rent growth and can be reconciled in our demand and supply framework.

The rest of the article is organized as follows. The next section describes the relevant literature and our data. The third section describes how density control regulation has changed over time based on 1994, 2003, and 2019 NLLUS results. The fourth section assesses the linkage of such regulation to home price appreciation and rental growth at the jurisdiction and the metropolitan level. The fifth and final section briefly summarizes and concludes.

# Literature Review and Data

## Related Literature

This study is related to several topics in the literature. The first is the issue of how to measure land use regulation. Ever since zoning laws were first enacted in the United States in the early part of the twentieth century, land use regulation has been controlled by local governments. In part as they rely on the property taxes for funding, local jurisdictions have played a significant role in developing zoning laws, and, over time, have adopted a wide range of measures to manage residential development. This heterogeneity of regulations, while beneficial for the local planning departments, make it challenging to define the degree of land use restrictiveness across jurisdictions. Due to an absence of uniform and comprehensive data sets of land regulation across the United States, researchers often have to conduct their own surveys to document the extent of variations across the nation. There are many studies that focus on a large number of jurisdictions within a particular area, such as Boston in Glaeser, Schuetz, and Ward (2006) and Glaeser and Ward (2009). Other nationwide studies look at data from a select number of jurisdictions across the United States. Well known nationwide studies include the Wharton Residential Land Use Regulation Index (WRLURI) developed by Gyourko, Saiz, and Summers (2008), the updated index in Gyourko, Hartley, and Krimmel (2019), as well as the estimate of the land-use elasticities by Saiz (2010). Puentes, Martin, and Pendall (2006) and Pendall et al. (2018) are two examples of studies that employed the 1994 and 2003 NLLUSs for a national view. Of course, there are some methodological critiques of the survey-based method in the literature, but these national studies are widely quoted in the mass media and public policy discussions. The NLLUS data we use follows the survey-based approach, and its response rate is comparable to the survey instrument used in the creation of WRLURI. Moreover, because of the longitudinal nature of the data, in addition to the cross-section variation, we also have the time-series variations, of particular interest is a subset of jurisdictions that responded to two or more surveys. We understand that because of the heterogeneous nature of local land use regulation, restrictions on development come in many forms such as: minimum lot size, urban growth boundaries, impact fees, and public facility

ordinance, among many others. Hence in this exploration will focus on density control only: both cross-section variation and changes over-time.

The second topic in the literature relevant to this article is the relationship between land-use regulation and housing supply, as discussed for example in Gyourko and Molloy (2015) survey article. Glaeser, Gyourko, and Saks (2005) estimate the gap between housing price and production cost and attribute this gap as a measure of the stringency of the regulatory environment. Similarly, Gyourko and Krimmel (2020) note that zoning tax on vacant land parcels follows a similar fashion, such as the difference between land values on the extensive and intensive margins. There is not much discussion on a measure of regulation with a subsequent estimate of the correlation: partially that is because of the measurement issue discussed previously, so most of the investigations are the indirect inference. Several studies have focused on national housing markets, yet these examinations are mostly cross-sectional and not longitudinal.

The final relevant topic is the political economy underlying the creation and updating of land use controls. Being a homeowner, as is often argued, leads to a positive externality for the community. DiPasquale and Glaeser (1999) argue that homeownership increases social capital and may encourage people to volunteer, get involved in local government, or join civic organizations; they further suggest that areas with more homeowners have lower government spending but spend a large share of the budget on education and highways. Homeownership is, of course, encouraged by federal tax incentives such as the mortgage interest deduction and limitations on capital gains taxes for owner-occupied housing. On the other hand, renters are allegedly less active in local civic life, partly because housing for them is a short-term consumption good only; there is not much long-term wealth effect from the local amenities or disamenities, and renters tend to be highly mobile.

Fischel (2001)'s homevoter hypothesis is to capture this incentive in the formulation of local regulations; and formally Ortalo-Magne and Prat (2014) develop a theoretical model of local residents' impact on zoning. There are certainly negative externalities associated with the indiscriminate mixing of residential, industrial or commercial land use, and zoning ordinances are considered an effective means to mitigate these concerns (Quigley and Rosenthal, 2005). On the other hand, such non-residential land uses can also bring benefits to local residents, through job creation, shopping convenience, etc. Hence local residents may welcome such developments within convenient proximity or some other parts of town, but not in their immediate neighborhood.

## Data Sources

### National Longitudinal Land Use Survey

We assess the local residential land-use regulation using the NLLUS. Pendall (1995) and Puentes, Martin, and Pendall (2006) conducted the first two waves of surveys in 1994 and 2003; in 2019, the Urban Institute, with support from Fannie Mae, conducted the third wave. The survey targets the planning or land-use department within a jurisdiction, a local government agency at the county, city, town, township, or village level within the top 50 metropolitan areas. For each wave, we have between approximately 1,000 to 1,500 valid responses (with a response rate between 58 and 78 percent). While there have been some changes to the survey questionnaires through

time, the zoning and density questions are relatively consistent. We can observe responses at the jurisdiction level and, in some cases, from a group of repeated jurisdictions.

For each of the survey years, we focus on two specific questions regarding density control. The first is about the highest residential density category. In the 2019 NLLUS, the question was asked as follows: "According to your zoning ordinance, what is the maximum number of dwelling units that may be constructed per net acre in your jurisdiction?" There are five choices: (a) Fewer than 4, (b) 4–7, (c) 8–15, (d) 16–30, and (e) More than 30. The smaller the number of allowable units, the tighter the land-use regulation. The two previous surveys contain the same question, with the only difference being that the density category (a) and (b) were collapsed into "less than 8" in 1994.

The second question addresses a hypothetical multifamily project. In the 2019 survey, the question was as follows: "Assume your jurisdiction has a vacant 5-acre parcel. If a developer wanted to build 40 units of 2-story apartments and was flexible with planning, landscaping and building configuration, would there be an existing zoning category that would allow such development?" There are three choices: (a) "No," (b) "Yes; by right," and (c)"Yes; by special permit, PUD [Planned Unit Development] or other special procedure." Choice (b) represents the least restrictive policy toward such development, choice (a) is a strict ban, and choice (c) is a policy in between. The same question also appeared in the 2003 survey but not in the 1994 survey.

### Historical Home Price Indexes from the Federal Housing Finance Agency

The Federal Housing Finance Agency (FHFA) has published repeated sales home price indexes (HPI) at different frequencies. Since we look at land-use regulations at a differing geographic level, we utilize the HPI data in a similar way. The cross-metropolitan area comparison is the easiest as we adopt the indexes for Core-Based Statistical Areas (CBSAs). Similarly, the county-level HPI is also directly available. For smaller geographic units, the linkage is done through the ZIP-Code-level HPI; for the villages or towns, we approximate their jurisdictions as the postal city of the same name, or the postal city where the government buildings are located if the names do not match. For the ZIP-Code-level data, sometimes we can find more than one ZIP Code under the same postal city, in which case we will take the average to find the HPI growth for that jurisdiction. These local FHFA indices are described in Bogin, Doerner, and Larson (2019) and are publicly available on the FHFA website.[3]

### Multifamily Rental Data from CoStar

Our rental data, including asking rent per unit/per square foot and a rental index, are from CoStar Group, a leading commercial property data provider. CoStar has divided each metropolitan area into submarkets, as determined by CoStar in consultation with local real estate experts. For example, the whole Los Angeles area is divided into 30 submarkets. A few places like downtown Los Angeles and Westlake all fall under the jurisdiction of the City of Los Angeles, while a few others like Santa Monica are separate jurisdictions. For large jurisdictions, we aggregate the data from submarkets; for small jurisdictions, the submarket will be roughly the same as the jurisdiction itself. If a submarket spans across two or more smaller jurisdictions, we are not linking it to any

[3] https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index-Datasets.aspx#mpo.

jurisdiction, and they are excluded from the sample. Finally, CoStar metropolitan definitions may not be precisely the same as the official CBSA boundaries, but we treat them interchangeably for cross-metropolitan area comparison.

# Changes in Density Control Regulation From 1994 to 2019

## Density Control Follows Two Distinct Paths

This section examines the landscape of land-use regulations in 1994, 2003, and 2019 through the two density questions specified previously. As in exhibit 1, we see that the nationwide sample points to a gradual yet consistent shift over the years on the maximum residential density question. In the low-density category (fewer than eight units per acre), the percentage of all jurisdictions increases from 17 percent in 1994 to 28.4 percent in 2003 and 34.2 percent in 2019. This means that, overall, more jurisdictions are moving to the low-density category. Similar trends are also observed in many metropolitan areas in our sample. For example, in the New York metropolitan area, an area well above the national average in terms of density control, the corresponding statistics are 26.8 percent in 1994, 37.6 percent in 2003, and then a slight dip to 31.6 percent in 2019. We define the high-density category as those responding with "more than 30 units per acre." The percentage of jurisdictions in this category also increases substantially. In the New York metropolitan area, the statistics show 16.9 percent in 1994, dropping to 12.8 percent in 2003, and then rebounding to 29.5 percent in 2019. For the nationwide sample, there is a similar drop from 1994 to 2003. However, the level of 2019 is comparable to that in 1994, meaning more jurisdictions are allowing the construction of mid- to high-rise residences in 2019 compared to 2003.

**Exhibit 1**

Distribution of Maximum Density in 1994, 2003, and 2019 (1 of 2)

| | 1994 | | 2003 | | 2019 | |
|---|---|---|---|---|---|---|
| | NObs | Percent | NObs | Percent | NObs | Percent |
| *(a) All Jurisdictions* | | | | | | |
| 1) Fewer than 4 | 190 | 17.0% | 253 | 15.1% | 293 | 19.9% |
| 2) 4–7 | | | 223 | 13.3% | 211 | 14.3% |
| 3) 8–15 | 264 | 23.6% | 445 | 26.6% | 300 | 20.4% |
| 4) 16–30 | 369 | 33.0% | 422 | 25.2% | 294 | 19.9% |
| 5) More than 30 | 296 | 26.5% | 333 | 19.9% | 376 | 25.5% |
| Total | 1,119 | 100.0% | 1,676 | 100.0% | 1,474 | 100.0% |
| *(b) Three-Wave Repeated Sample* | | | | | | |
| 1) Fewer than 4 | 57 | 15.0% | 18 | 4.7% | 39 | 10.3% |
| 2) 4–7 | | | 37 | 9.8% | 44 | 11.6% |
| 3) 8–15 | 84 | 22.2% | 99 | 26.1% | 72 | 19.0% |
| 4) 16–30 | 122 | 32.2% | 126 | 33.2% | 87 | 23.0% |
| 5) More than 30 | 116 | 30.6% | 99 | 26.1% | 137 | 36.1% |
| Total | 379 | 100.0% | 379 | 100.0% | 379 | 100.0% |

**Exhibit 1**

Distribution of Maximum Density in 1994, 2003, and 2019 (2 of 2)

| | 1994 | | 2003 | | 2019 | |
|---|---|---|---|---|---|---|
| | NObs | Percent | NObs | Percent | NObs | Percent |
| *(c) Repeated Sample Between 1994 and 2003* | | | | | | |
| 1) Fewer than 4 | 104 | 15.3% | 47 | 6.9% | | |
| 2) 4–7 | | | 70 | 10.3% | | |
| 3) 8–15 | 150 | 22.1% | 159 | 23.4% | | |
| 4) 16–30 | 224 | 33.0% | 214 | 31.5% | | |
| 5) More than 30 | 201 | 29.6% | 189 | 27.8% | | |
| Total | 679 | 100.0% | 679 | 100.0% | | |
| *(d) Repeated Sample Between 2003 and 2019* | | | | | | |
| 1) Fewer than 4 | | | 103 | 12.0% | 157 | 18.3% |
| 2) 4–7 | | | 94 | 11.0% | 114 | 13.3% |
| 3) 8–15 | | | 235 | 27.4% | 168 | 19.6% |
| 4) 16–30 | | | 248 | 28.9% | 176 | 20.5% |
| 5) More than 30 | | | 178 | 20.7% | 243 | 28.3% |
| Total | | | 858 | 100.0% | 858 | 100.0% |
| *(e) Repeated Sample Between 1994 and 2019* | | | | | | |
| 1) Fewer than 4 | 85 | 15.3% | | | 61 | 11.0% |
| 2) 4–7 | | | | | 68 | 12.2% |
| 3) 8–15 | 128 | 23.0% | | | 104 | 18.7% |
| 4) 16–30 | 184 | 33.1% | | | 126 | 22.7% |
| 5) More than 30 | 159 | 28.6% | | | 197 | 35.4% |
| Total | 556 | 100.0% | | | 556 | 100.0% |

*NObs = Number of responding jurisdictions.*

*Note: Numbers may not add to 100 percent due to rounding.*

*Source: Authors' calculation based on National Longitudinal Land Use Survey data*

To control for variation in the responding jurisdictions, it is better to look at these changes through the repeated sample over time. Among the approximately 1,500 jurisdictions, about 400 have responded in each of the 3 survey years. Within this matched group, the low-density percentage is 15 percent in 1994, stays relatively flat at 14.5 percent in 2003, and then increases to 21.9 percent in 2019. The fraction allowing the highest density had evolved from 30.6 percent in 1994 to 26.1 percent in 2003 and 36.1 percent in 2019. We can also observe changes over two survey waves, which increases the sample size substantially. We have 679 jurisdictions that responded both in 1994 and 2003, from which we find the low-density category increased from 15.3 percent in 1994 to 17.2 percent in 2003, with a slight drop high-density category. From 2003 to 2019, among the 858 matched jurisdictions, the increase in both categories is more pronounced: from 23 to 31.6 percent in the low-density category[4] and from 20.7 to 28.3 percent in the high-density category. The repeated sample between 1994 and 2019 with 556 jurisdictions shows a similar pattern.

[4] We also see the increase in "less than 4" category (from 12.0 to 18.3 percent) and in "4–7" category (from 11.0 to 13.3 percent).

As jurisdictions migrate to either the low- or high- density category, the number of jurisdictions in the middle (those allowing 8–30 units per acre) has consistently declined over the years. In aggregate, this category declines from 56.6 percent in 1994 to 51.8 percent in 2003 and 40.3 percent in 2019. In the matched sample, the corresponding statistics are 54.4 percent in 1994, 59.3 percent in 2003, and 42.0 percent in 2019. Within the matched pair between 2003 and 2019, we see the biggest decline in the middle-density category: from over 60 percent in 2003 to around 40 percent now, a 20-percent decline over 16 years.

We compare the responses to a hypothetical multifamily project in exhibit 2 to provide a second perspective. Recall that the three choices are "Not allowed" on the restrictive side, "By permit" in the middle, and "By right" on the permissive side. In 2019, only 14.7 percent of the jurisdictions would ban such development, while about 40.8 percent would allow them by right, with the remaining 44.5 percent requiring a special permitting process. Between 2003 and 2019, from both the total and the matched sample, we see two consistent patterns: first, there is a universal decline in the share of "Not allowed," and second, the percentage of "By right" stays almost the same. There is a corresponding increase in the portion of "By permit." These patterns point to a somewhat[5] improved environment for multifamily construction in 2019 compared to 2003.

**Exhibit 2**

Distribution of Multifamily Project Approval in 2003 and 2019

| | 2003 | | 2019 | |
|---|---|---|---|---|
| | **NObs** | **Percent** | **NObs** | **Percent** |
| *(a) All Jurisdictions* | | | | |
| 0) Not Allowed | 342 | 20.1% | 228 | 14.7% |
| 1) By Right | 701 | 41.1% | 635 | 40.8% |
| 2) By Permit | 662 | 38.8% | 692 | 44.5% |
| Total | 1,705 | 100.0% | 1,555 | 100.0% |
| *(b) Repeated Sample* | | | | |
| 0) Not Allowed | 161 | 17.5% | 124 | 13.5% |
| 1) By Right | 379 | 41.2% | 387 | 42.0% |
| 2) By Permit | 381 | 41.4% | 410 | 44.5% |
| Total | 921 | 100.0% | 921 | 100.0% |

*NObs = Number of responding jurisdictions.*
*Note: Numbers may not add to 100 percent due to rounding.*
*Source: Authors' calculation based on National Longitudinal Land Use Survey data*

We note that the single-family residential density and multifamily questions are positively correlated, as is shown in exhibit 3 for the 2019 survey year. The overall distribution in 2019 is roughly equal in the low-, mid-, and high-density categories, with slightly more for the mid-density category at 40.3 percent. However, if we look at these jurisdictions that ban such development outright, their residential density is very low: 79.2 percent belong to the low-density

[5] However, we do not know whether the new permitting process will be costly, either in terms of direct financial cost or time.

category,[6] while only 4.2 percent of them belong to the high-density category. In contrast, among these least restrictive jurisdictions, 39.1 percent allow the highest density ("more than 30 units"), and another 25.5 percent in the "16–30" category.

**Exhibit 3**

Correlation Between Maximum Density and Multifamily Project in 2019

*(a) Distribution of Maximum Density by Multifamily Project Approval*

| | Multifamily Project Approval | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0) Not Allowed | | 1) By Right | | 2) By Permit | | Overall | |
| | NObs. | Percent | NObs. | Percent | NObs. | Percent | NObs. | Percent |
| 1) Fewer than 4 | 122 | 56.5% | 33 | 5.5% | 127 | 20.1% | 282 | 19.5% |
| 2) 4–7 | 49 | 22.7% | 62 | 10.3% | 97 | 15.3% | 208 | 14.4% |
| 3) 8–15 | 27 | 12.5% | 118 | 19.6% | 150 | 23.7% | 295 | 20.4% |
| 4) 16–30 | 9 | 4.2% | 153 | 25.5% | 127 | 20.1% | 289 | 19.9% |
| 5) More than 30 | 9 | 4.2% | 235 | 39.1% | 131 | 20.7% | 375 | 25.9% |
| Total | 216 | 100.0% | 601 | 100.0% | 632 | 100.0% | 1,449 | 100.0% |

*(b) Distribution of Multifamily Project Approval by Maximum Density*

| Maximum Density | Multifamily Project Approval | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0) Not Allowed | | 1) By Right | | 2) By Permit | | Total | |
| | NObs. | Percent | NObs. | Percent | NObs. | Percent | NObs. | Percent |
| 1) Fewer than 4 | 122 | 43.3% | 33 | 11.7% | 127 | 45.0% | 282 | 100.0% |
| 2) 4–7 | 49 | 23.6% | 62 | 29.8% | 97 | 46.6% | 208 | 100.0% |
| 3) 8–15 | 27 | 9.2% | 118 | 40.0% | 150 | 50.8% | 295 | 100.0% |
| 4) 16–30 | 9 | 3.1% | 153 | 52.9% | 127 | 43.9% | 289 | 100.0% |
| 5) more than 30 | 9 | 2.4% | 235 | 62.7% | 131 | 34.9% | 375 | 100.0% |
| Total | 216 | 14.9% | 601 | 41.5% | 632 | 43.6% | 1,449 | 100.0% |

*NObs = Number of responding jurisdictions.*
*Note: Numbers may not add to 100 percent due to rounding.*
*Source: Authors' calculation based on National Longitudinal Land Use Survey data*

Now looking at the other side, these high-density jurisdictions are rarely likely to ban the project (2.4 percent) and are, on the contrary, more likely to require no permit (62.7 percent). Finally, as Pendall (2020) points out, for jurisdictions that adopt a low-density mode, while their "Not allowed" rate is very high at 43.3 percent, there is still a 45-percent chance to have the project go through the permit process, and 11.7 percent to not require any approval. According to this, whether the project can be approved by right or be banned seems to be a more precise classification criterion than residential density.

The sharp drop in housing prices that preceded the global financial crisis of 2008 is, in general, considered to have been caused by a combination of demand and supply factors. Arguably too much new construction occurred in places with less restrictive zoning rules, such as Las Vegas and

[6] We have over 56.5 percent in the "fewer than 4" category, with another 22.7 percent in the "4–7" category.

Phoenix. Price declines later led to large increases in foreclosures. While removing their ban on multifamily development, these jurisdictions may also decide to tighten their residential density for single-family homes. In other places, with not much new supply, the pre-crisis credit expansion just led to ever-higher house prices. These places may have since taken steps to be more welcoming to new home construction or higher density uses of existing parcels.

## Differences by Jurisdictions Population Size

Over time, we see a shift to both the low- and high-density zoning categories, with the middle-density portion shrinking sharply as a result. But it is not clear what kind of jurisdiction is driving these changes. In exhibit 4, we look at the distribution in 2019 by the jurisdiction population. The overall sample is roughly equally distributed among the low-, mid-, and high-density types; however, that aggregate hides what is true for each sub-sample. If we focus on the less populous jurisdictions (defined as those with a population smaller than 20,000), 53.6 percent are in the low-density category, while only 10.6 percent are the high-density type. On the other hand, for those with a population greater than 100,000, the pattern reverses: only 16.3 percent fall in the low-density category, but 55 percent are in the high-density category. In fact, even among this populous group, the distribution is more skewed toward high-density as we divide the sample even further into the top 23 major metropolitan cities, the other 95 cities, and the 84 counties. The percentages of high density among them are 87, 74.7, and 23.8 percent, respectively.

**Exhibit 4**

Distribution of Maximum Density by Jurisdiction Population in 2019

| Maximum Density | Jurisdiction Population | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | a) <20,000 | | b) 20,000–49,999 | | c) 50,000–99,999 | | d) >100,000 | |
| | NObs. | Percent | NObs. | Percent | NObs. | Percent | NObs. | Percent |
| 1) Fewer than 4 | 194 | 32.5% | 63 | 13.0% | 15 | 7.9% | 21 | 10.4% |
| 2) 4–7 | 120 | 20.1% | 62 | 12.8% | 17 | 8.9% | 12 | 5.9% |
| 3) 8–15 | 130 | 21.8% | 122 | 25.2% | 28 | 14.7% | 20 | 9.9% |
| 4) 16–30 | 90 | 15.1% | 114 | 23.5% | 52 | 27.4% | 38 | 18.8% |
| 5) More than 30 | 63 | 10.6% | 124 | 25.6% | 78 | 41.1% | 111 | 55.0% |
| Total | 597 | 100.0% | 485 | 100.0% | 190 | 100.0% | 202 | 100.0% |

*NObs = Number of responding jurisdictions"*

*Note: Numbers may not add to 100 percent due to rounding.*

*Source: Authors' calculation based on National Longitudinal Land Use Survey data*

We can also break down the changes in allowable density by population of the governing jurisdiction. In that case, the shift to low-density takes place in jurisdictions with a population of less than 50,000, while the migration to the other extreme occurs in the more populous jurisdictions. In exhibit 5, from 2003 to 2019, we see that among the less populous jurisdictions, while there is still bifurcation on both the low and high density, most of the changes is in the low-density category, from 39.5 percent in 2003 to 53.2 percent in 2019. For those with more than 100,000 population, that is a completely different story: the percentage allowing the highest-

density development drifted further up from 49.7 percent in 2003 to 58.0 percent in 2019. If we examine allowed density changes over other periods and changes in response to the multifamily question, we once again see the differing change pattern by population size.

**Exhibit 5**

Changes in Maximum Density Between 2003 and 2019 by Jurisdiction Population

| Maximum Density | Jurisdiction Population | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | a) <20,000 | | | | b) 20,000–49,999 | | | |
| | 2003 | | 2019 | | 2003 | | 2019 | |
| | NObs. | Percent | NObs. | Percent | NObs. | Percent | NObs. | Percent |
| 1) Fewer than 4 | 75 | 26.0% | 103 | 35.6% | 15 | 5.2% | 32 | 11.1% |
| 2) 4–7 | 39 | 13.5% | 51 | 17.6% | 41 | 14.2% | 40 | 13.8% |
| 3) 8–15 | 81 | 28.0% | 58 | 20.1% | 104 | 36.0% | 76 | 26.3% |
| 4) 16–30 | 69 | 23.9% | 48 | 16.6% | 90 | 31.1% | 70 | 24.2% |
| 5) More than 30 | 25 | 8.7% | 29 | 10.0% | 39 | 13.5% | 71 | 24.6% |
| Total | 289 | 100.0% | 289 | 100.0% | 289 | 100.0% | 289 | 100.0% |
| | c) 50,000–99,999 | | | | d) >100,000 | | | |
| | 2003 | | 2019 | | 2003 | | 2019 | |
| | NObs. | Percent | NObs. | Percent | NObs. | Percent | NObs. | Percent |
| 1) Fewer than 4 | 6 | 4.9% | 8 | 6.5% | 7 | 4.5% | 14 | 8.9% |
| 2) 4–7 | 5 | 4.1% | 15 | 12.2% | 9 | 5.7% | 8 | 5.1% |
| 3) 8–15 | 27 | 22.0% | 16 | 13.0% | 23 | 14.6% | 18 | 11.5% |
| 4) 16–30 | 49 | 39.8% | 32 | 26.0% | 40 | 25.5% | 26 | 16.6% |
| 5) More than 30 | 36 | 29.3% | 52 | 42.3% | 78 | 49.7% | 91 | 58.0% |
| Total | 123 | 100.0% | 123 | 100.0% | 157 | 100.0% | 157 | 100.0% |

*NObs = "Number of responding jurisdictions."*
*Note: Numbers may not add to 100 percent due to rounding.*
*Source: Authors' calculation based on National Longitudinal Land Use Survey data*

Other factors, such as employment growth or foreclosure experience in the crisis period, may be relevant, but we believe the underlying overall pattern remains. Land-use regulations are polarized: smaller and less populous jurisdictions that already have tight controls are restricting their density more, while more populous ones, many of which are already allowing high-density construction, are loosening density restrictions even further.

## Metropolitan-Level Summary Shows Gradual Yet Consistent Changes

Now we attempt to aggregate jurisdictions to the metropolitan area based on some admittedly arbitrary rules. If a top 50 metropolitan area has enough responses, which we define as more than 10 responding jurisdictions, we aggregate those to characterize the metropolitan area. We do this in each survey year, and this process produces some rather surprising results.

For the 1994 survey, we classify the metropolitan areas according to their average allowable density. A metropolitan area is labeled as "Accommodating" if the percentage of "more than 30 units per acre" is at least 50 percent, "Moderate" if the share of "less than 8 units per acre" is less than 10 percent, "Somewhat Restrictive" if between 10 and 20 percent, and "Very Restrictive" if more than 20 percent. The ranking is presented in exhibit 6. In 1994, five metropolitan areas were in the "Accommodating" category: Denver, Seattle, San Jose, San Francisco, and Washington. More than 50 percent of jurisdictions in these metropolitan areas allow a density of more than 30 units per acre. Coastal areas, including Los Angeles, San Diego, and Miami, belong to the "Moderate" category. On the other hand, the "Somewhat restrictive" and "Very restrictive" categories include older Northeast metropolitan areas (Boston, Philadelphia, and New York) and mid-sized metropolitans in the Midwest region (Kansas City, Chicago, and Pittsburgh).

**Exhibit 6**

Classification of Metropolitan Area-Level Density Control in 1994, 2003, and 2019

| Category | List of Metropolitan Areas |
|---|---|
| ***1994*** | |
| *Accommodating* | *Denver, Seattle, San Jose, San Francisco, Washington* |
| Moderate | Dallas, San Diego, Tampa, Minneapolis, Cincinnati, Miami, Los Angeles, Riverside, Phoenix |
| *Somewhat Restrictive* | *Kansas City, Detroit, Chicago* |
| Very Restrictive | St. Louis, Atlanta, New York, Philadelphia, Pittsburgh, Milwaukee, Cleveland, Bridgeport, Boston, Akron |
| ***2003*** | |
| *Accommodating* | *Dallas, Seattle, Indianapolis, Miami, Washington, Denver, Portland, Detroit* |
| Moderate | Salt Lake City, San Francisco, Los Angeles |
| *Somewhat Restrictive* | *Chicago, Cincinnati, Kansas City, Pittsburgh, Minneapolis, St. Louis* |
| Very Restrictive | Rochester, Grand Rapids, Buffalo, Columbus, New Haven, Atlanta, Cleveland, Milwaukee, Philadelphia, New York, Boston, Hartford |
| **2019** | |
| *Accommodating* | *Seattle, Portland, Washington, Kansas City, Miami, Denver* |
| Moderate | Los Angeles, Dallas, San Francisco, Pittsburgh, Chicago |
| *Somewhat Restrictive* | *Minneapolis, St. Louis, Columbus, Grand Rapids, Cleveland, Detroit, Milwaukee, Cincinnati, Providence* |
| Very Restrictive | Atlanta, New York, Hartford, Philadelphia, Boston |

*Note: In each category, the order reflects the ranking, from the least to the most restrictive.*
*Source: Authors' calculation based on National Longitudinal Land Use Survey data*

For the 2003 and 2019 surveys, we focus on the response to the multifamily projects.[7] A metropolitan area is "Accommodating" if the share of "By right" is at least 50 percent, "Moderate" if the share of "No" is less than 10 percent, "Somewhat restrictive" if between 10 and 20 percent, and "Very restrictive" if more than the 20 percent. In 2003, there were several metropolitan areas that

[7] This classification is broadly in line with that of Pendall (2020), although he does not explain his criteria explicitly.

relaxed their density requirements and moved to the "Accommodating" category, including Dallas, Indianapolis, and Detroit. On the other hand, the list for the "Very Restrictive" category grows much longer.

In 2019, the "Accommodating" metropolitan areas again declined to only six metropolitan areas, consisting of Seattle, Portland, Washington, Kansas City, Miami, and Denver. Each metropolitan area has more than 50 percent of the jurisdictions that allow the hypothetical multifamily development by right. Not surprisingly, these metropolitan areas[8] also see their share of "No" as less than 10 percent and their high-density share more than 50 percent. The metropolitan areas that belong to the "Very Restrictive" category are Boston, Philadelphia, Hartford, New York, and Atlanta. However, Atlanta and Philadelphia have seen some polarizations: while their share of "No" is more than 20 percent, they also have the "By right" percentage as high as 48 percent. Most of the big metropolitan areas like Los Angeles, Dallas, Chicago, and San Francisco, belong to the "Moderate" category, in that they have around 40 percent of their jurisdictions being "by right" or "by permit," leaving the share of "No" to be less than 10 percent. Again the "Somewhat Restrictive" category contains most big metropolitan areas in the Midwest region.

Across all survey years, we would conclude the following: (a) Seattle, Denver, and Washington are consistently in the "Accommodating" category; (b) New York, Philadelphia, Boston, and Atlanta remain in the "Very restrictive" category; (c) Los Angeles stays in the "Moderate" category; (d) San Francisco and San Jose gradually move from "Accommodating" to "Moderate" category, while Chicago moves in the opposite direction: from "Somewhat Restrictive" in 1994, to "Moderate" in 2019; most of the medium-sized metropolitan areas are moving from "Very restrictive" to "Somewhat restrictive," indicating that a change in attitude toward loosening the high-density development regulations.

Recognizing the admittedly arbitrary aggregation methods, we also experiment with a ranking based on the population-weighted response. In that case, the ranking would be more dominated by the populous urban core rather than smaller suburban cities. Here are the significant changes in 2019: (1) Portland and Kansas City would then be categorized as being "Very Restrictive," as opposed to "Accommodating"; (2) Philadelphia would then be categorized as "Very Accommodating"; (3) most of the restrictive places would be in the Midwest region, (4) big coastal metropolitan areas would now be between moderate and somewhat restrictive, reflecting a very high share of "By Permit" and a low share of the other two responses.

## Correlation of Land Density Control, Home Price Appreciation, and Rent Growth

### Does Tight Density Control Correlate with Rapid Home Price Appreciation?

From the HPI, we can calculate home price appreciation over the years. We want to link this with the land regulation measure developed previously, which is a supply-side factor. However, it is challenging to include the demand-side elements: metropolitan areas will have different industry

[8] Kansas City may be characterized as a borderline case, as only 28 percent of its jurisdictions allow more than 30 units per acre.

bases and different demand-side dynamics.[9] Accordingly, we run the jurisdiction-level regressions for each major metropolitan area and for the United States. The within-metropolitan regression assumes that the broader demand-side employment or income effect will be similar across jurisdictions within the metropolitan area. Jurisdictions face the same high-level demand factors, and thus the only element differentiating them from each other is individual density control policies.

Of course, specific factors play a role in the housing market across jurisdictions. Like New York City, the typical urban core has seen faster price appreciation that could be attributed to both the land use restrictiveness and the demand-side amenity factors. For example, people might want to live in a good school district or reduce their commute time. We include a dummy indicating whether the jurisdiction is an urban core city to account for this effect. By a similar token, jurisdiction population size may be an influencing factor, too. Populous places may have more amenities like good public schools, cultural institutions, or attractive employment opportunities, so the demand is more robust than a smaller exurban jurisdiction. Finally, we use the nominal index because that factor is common[10] across jurisdictions over the same date range and will be captured in the intercept.

We begin by analyzing the relationship between house price appreciation and the level of land use restrictiveness. Exhibit 7 displays our main results, where the variable of interest is the average annual HPI appreciation between 2003 and 2019. For the regulation measure, we include the zoning density category in 2003 and the change variable between 2003 and 2019. For control variables, we add the jurisdiction population category and whether the jurisdiction is an urban core. We report the regression results for eight populous metropolitan areas and the nationwide regressions, such as aggregating all reporting jurisdictions.

**Exhibit 7**

Regression of Annual House Price Appreciation (2003-2019) on Land Use Restrictiveness (1 of 2)

| Variables | (1) N.Y. | (2) L.A. | (3) Chicago | (4) Dallas | (5) D.C. | (6) Seattle | (7) Boston | (8) S.F. | (9) U.S. |
|---|---|---|---|---|---|---|---|---|---|
| **Density in 2003** | | | | | | | | | |
| 1.) Fewer than 4 | -0.98*** | | 0.09 | -0.34 | | | -0.31 | | -0.95*** |
| | (0.31) | | (0.24) | (0.53) | | | (0.27) | | (0.11) |
| 2.) 4–7 | -0.77*** | -2.01*** | -0.04 | -0.94* | -1.17 | -0.45 | -0.21 | | -1.01*** |
| | (0.28) | (0.65) | (0.21) | (0.53) | (1.01) | (0.82) | (0.27) | | (0.11) |
| 3.) 8–15 | -0.72*** | -0.99*** | -0.08 | -0.29 | -1.47*** | -0.49 | 0.03 | -1.45** | -0.87*** |
| | (0.25) | (0.37) | (0.17) | (0.35) | (0.48) | (0.50) | (0.27) | (0.61) | (0.09) |
| 4.) 16–30 | -0.35 | -0.27 | -0.02 | -0.25 | -1.28*** | -0.14 | 0.29 | -0.93*** | -0.11 |
| | (0.29) | (0.17) | (0.21) | (0.31) | (0.42) | (0.32) | (0.30) | (0.25) | (0.09) |
| 5.) More than 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

[9] We do not think that will be solved by including local employment or household income growth.

[10] It should be a minor factor that some jurisdictions may have experienced slightly higher inflation than others, especially within the same metropolitan areas.

**Exhibit 7**

Regression of Annual House Price Appreciation (2003-2019) on Land Use Restrictiveness (2 of 2)

| Variables | (1) N.Y. | (2) L.A. | (3) Chicago | (4) Dallas | (5) D.C. | (6) Seattle | (7) Boston | (8) S.F. | (9) U.S. |
|---|---|---|---|---|---|---|---|---|---|
| **Density Change** | | | | | | | | | |
| 1.) Increase | -0.60** | 0.19 | -0.17 | 0.10 | 0.55 | -0.03 | 0.33 | -0.02 | 0.18** |
| | (0.25) | (0.26) | (0.19) | (0.23) | (0.52) | (0.35) | (0.20) | (0.43) | (0.09) |
| 2.) Stay the same | -0.40* | -0.15 | 0.09 | -0.00 | 0.06 | -0.36 | 0.34** | -0.21 | 0.13* |
| | (0.21) | (0.17) | (0.16) | (0.19) | (0.44) | (0.32) | (0.15) | (0.25) | (0.07) |
| 3.) Decrease | 0.29 | 0.50* | -0.15 | -0.03 | 0.10 | -0.56 | -0.24 | -0.41 | -0.13 |
| | (0.31) | (0.29) | (0.23) | (0.21) | (0.59) | (0.45) | (0.19) | (0.59) | (0.09) |
| 4.) No match | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Population** | | | | | | | | | |
| a.) <20,000 | -0.28 | 0.60* | -0.11 | -0.01 | 0.62 | -0.57 | -1.75*** | 0.44 | -0.79*** |
| | (0.29) | (0.30) | (0.22) | (0.32) | (0.57) | (0.49) | (0.50) | (0.48) | (0.09) |
| b.) 20,000-49,999 | -0.24 | 0.15 | 0.02 | 0.29 | -0.01 | -0.08 | -1.35*** | 0.38 | -0.57*** |
| | (0.28) | (0.19) | (0.21) | (0.21) | (0.55) | (0.30) | (0.49) | (0.32) | (0.09) |
| c.) 50,000-99,999 | -0.20 | 0.43** | 0.22 | -0.06 | -0.60 | -0.03 | -0.50 | 0.09 | -0.20* |
| | (0.33) | (0.20) | (0.31) | (0.23) | (0.48) | (0.30) | (0.51) | (0.29) | (0.10) |
| d.) >100,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Urban core | | 2.03*** | 0.88 | 0.28 | 0.77 | | | 1.00 | 0.36 |
| | | (0.59) | (0.66) | (0.52) | (0.66) | | | (0.60) | (0.24) |
| Constant | 3.18*** | 4.56*** | 1.04*** | 3.71*** | 3.75*** | 4.80*** | 3.72*** | 4.27*** | 3.29*** |
| | (0.31) | (0.17) | (0.26) | (0.30) | (0.44) | (0.27) | (0.43) | (0.24) | (0.09) |
| Observations | 105 | 64 | 110 | 34 | 28 | 31 | 100 | 55 | 1,578 |
| R-Square | 0.261 | 0.397 | 0.075 | 0.254 | 0.516 | 0.313 | 0.446 | 0.331 | 0.243 |

*Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.*
*Sources: Authors' calculation based on National Longitudinal Land Use Survey and FHFA data*

The regression density category benchmark is "more than 30 units per acre," so the reported coefficients are relative to that benchmark. For most[11] within-metropolitan areas and the national regression, the coefficients on the density category are negative and follow a monotonic pattern. These negative coefficients show that the lower the density category is, the more restrictive the land-use control is, and the slower the HPI appreciation. To put this surprising finding in another way, it means that tighter density regulation is associated with a lower HPI appreciation. This is especially true for the tightest category, "fewer than four units per acre," as well as the next category, "4–7." For example, in the New York metropolitan area, a coefficient of -0.98 means that with other things equal, compared to a 3.2-percent annual HPI appreciation in the most permissive density category, jurisdictions with the lowest density category of "fewer than 4" are seeing a 2.2-percent appreciation, or 1 percentage point lower. This is the annual difference, which translates to a difference between 70 and 44.6 percent in total cumulative appreciation between 2003 and 2019.

[11] The regression using Chicago metropolitan area data has a very low adjusted R-square and seems to be an outlier.

In Los Angeles, the tightest category is "4–7," and it shows a very large impact of -2.01 percent between this density and the permissive category. Again, that means a cumulative appreciation of 113.5 percent in the category of "30 units per acre" versus 53.5 percent in the category of "4–7" over the past 17 years. In the Washington, D.C., and San Francisco metropolitan areas, where the regression sample does not include any low-density jurisdiction, the effect from the middle density is also significantly negative.

The national sample shows quantitatively similar and more robust results that resemble that of the New York metropolitan area. The negative sign in each of the four density categories is preserved and follows a monotonic pattern. The only difference is that now the density "16–30" is not very distinguishable from the benchmark density, reflecting that the two categories may not differ so much for most jurisdictions from a national perspective. Again, these annual differences will be translated to a very large gap in cumulative appreciation between 2003 and 2019.

Turning to the impact of the change in regulation, the results are less clear. There are four categories: increase in regulation (such as allowable density declines), stay the same, decrease in regulation, or cannot compare (jurisdictions that appear in one of the survey years but not both). The mixed results may come from the small sample size in the metropolitan-level regression, where the change in regulation is only defined for less than one-half of the sample. So for the national regression, the coefficients on the decrease in regulation, as well as the "stay the same" category, are positive and significant. In contrast, the coefficient on the increase in regulation is negative, but not significant. So if we use "stay the same" as the benchmark, then the quantitative results will be a small positive coefficient (0.05) for "decrease in regulation" and a relatively large negative coefficient (0.26) for "increase in regulation." That is to say, if regulation decreases, then we expect a faster HPI growth. Simultaneously, if one jurisdiction tightens the density control, it will be associated with a lower HPI growth.

It is reassuring to find that coefficients on the two control variables are what were expected. On the urban core dummy, all show large and positive coefficients, indicating that these urban jurisdictions do experience a faster HPI appreciation than suburban towns. For population size, nationwide as well as within most[12] metropolitan areas, we see a clear monotonic relationship: the smaller the jurisdiction, the slower the HPI appreciation. One exception is the Los Angeles metropolitan area, where the smaller and less populous jurisdictions are seeing a rapid HPI appreciation; that may be due to the unique geography in Los Angeles, where there are a few small towns carved out from or near the urban core, such as Beverly Hills and Santa Monica.

## Does Tight Density Control Correlate With Rental Price Growth?

Land-use regulation is not limited to the density of single-family units, of course. How do these restrictions affect multifamily rents? Exhibit 8 presents our findings, where the dependent variable is the annual average growth in asking rent between 2003 and 2019.

[12] For some metropolitan areas like New York, because the City is the only one that has a population more than 100,000 in the sample, the dummy variable is collinear with the benchmark population category, so it is omitted from the estimation.

**Exhibit 8**

Regression of Rent Growth from 2003 to 2009

| Variables | (1) N.Y. | (2) L.A. | (3) Chicago | (4) D.C. | (5) Seattle | (6) Boston | (7) S.F. | (8) U.S. |
|---|---|---|---|---|---|---|---|---|
| **Density in 2003** | | | | | | | | |
| 1.) Fewer than 4 | | | -0.726 | | | 0.683 | 0.796 | -0.113 |
| | | | (1.096) | | | (1.165) | (0.863) | (0.444) |
| 2.) 4–7 | 1.52** | | | -0.109 | | -0.345 | | 0.685* |
| | (0.24) | | | (0.980) | | (1.165) | | (0.380) |
| 3.) 8–15 | 1.12** | | 0.540 | 0.324 | | -0.247 | | 0.197 |
| | (0.19) | | (1.096) | (0.574) | | (0.881) | | (0.248) |
| 4.) 16–30 | 1.01* | 0.543 | 0.258 | -0.0416 | 0.482 | 0.696 | 0.406 | 0.334 |
| | (0.24) | (0.415) | (1.387) | (0.450) | (0.672) | (0.881) | (0.343) | (0.237) |
| 5.) More than 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Population** | | | | | | | | |
| a) <20,000 | | | | -0.269 | | | -0.968 | -0.554 |
| | | | | (0.866) | | | (0.581) | (0.408) |
| b) 20,000–49,999 | -0.66 | -0.437 | -0.609 | 0.321 | -0.206 | 0.534 | -0.600 | -0.373 |
| | (0.35) | (0.634) | (1.387) | (0.513) | (1.008) | (1.079) | (0.468) | (0.239) |
| c) 50,000–99,999 | -0.00 | -0.644 | | -0.573 | -0.352 | -0.307 | -0.317 | -0.0969 |
| | (0.19) | (0.479) | | (0.475) | (0.724) | (0.763) | (0.435) | (0.228) |
| d) >100,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Urban Core | 0.49 | 0.299 | | -0.0228 | | -0.301 | -1.462** | -0.138 |
| | (0.27) | (0.634) | | (0.856) | | (0.763) | (0.638) | (0.402) |
| Constant | 1.70** | 3.570*** | 2.453** | 1.964*** | 5.030*** | 3.006** | 3.908*** | 3.309*** |
| | (0.17) | (0.240) | (0.981) | (0.328) | (0.515) | (0.440) | (0.369) | (0.175) |
| Observations | 9 | 13 | 11 | 21 | 15 | 10 | 31 | 196 |
| R-Square | 0.97 | 0.419 | 0.384 | 0.197 | 0.063 | 0.737 | 0.246 | 0.041 |

*Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.*

*Sources: Authors' calculation based on National Longitudinal Land Use Survey and CoStar data*

Enough rental data are needed for CoStar to define a submarket; hence many small and less populous jurisdictions are not in the sample. Therefore, most within-metropolitan-area regressions suffer from a small sample size. In this case, we can look at the national regression, where the coefficients on each density category are positive, indicating faster rental growth. For example, compared to the benchmark density category of "more than 30 units per acre," jurisdictions in the "4-7" category see their rents growing at 3.98 percent rather than 3.3 percent in the benchmark category. Over the 16 years between 2003 and 2019, that means that rent in the less dense jurisdictions is growing at 94.5 percent cumulatively, as compared to 73.9 percent in the reference density category. This gap is not as large as that reflected in home price appreciation,[13] but it is still economically meaningful.

[13] In addition to the flow of housing service as measured in rents, home price appreciation also reflects its value as an investment good.

While this result differs from the HPI appreciation story discussed previously, it is consistent with a supply-side story. The interpretation is that in areas of low residential density, the inventory and potential new addition to the inventory will be limited, giving landlords greater market power to raise rents over time. We should note again, however, that less populous jurisdictions are excluded from the data. Overall, these confirm that the key determinant of rent cost is the supply of apartments for rent, which in turn relies heavily on the local land-use ordinance.

## What Can We Learn From The Cross-Metropolitan Area Comparison?

The previous jurisdiction-level story is interesting as it clearly depicts the local density control and the housing market performance. Yet, metropolitan areas are often the focus of many policy discussions, so it is natural to see if the story can be carried to an aggregate level. To do this, we rely on the classification of metropolitan areas in each of the three survey years as in exhibit 6. We look at HPI appreciation, rent growth, and rent in dollars per unit on housing market indicators. We look at a 9-year average around it for each survey year, an annual average between, and an accumulative appreciation 10-years prior.

First, for home price appreciation, the impact of regulation points to a similar message as in the jurisdiction-level result: the more restrictive a metropolitan area is, the lower is the rate at which its housing appreciates. This is particularly true in the long run. For example, under the 1994 classification, there is not a clear pattern on the HPI 5 years before or after 1994, nor between 1989 and 1999; the pattern begins to emerge around 2003, or the period between 1999 and 2008; and finally, it becomes very clear when we look at 5 years before 2019. And the pattern is that the "Accommodating" and "Moderate" metropolitan areas are experiencing higher HPI appreciation than metropolitan areas in the two restrictive categories. For instance, using the HPI appreciation between 2015 and 2019 as an example, "Accommodating" metropolitan areas are seeing an annual appreciation of 7.08 percent, compared to 6.47 percent among "Moderate" metropolitan areas, 4.99 percent among "Somewhat Restrictive" metropolitan areas, and 3.96 percent among "Very Restrictive" metropolitan areas (exhibit 9).

Alternatively, across the three survey years, the impact of the regulatory environment in 1994 is somewhat apparent over the period from 1994 to 2003, but more so over the longer period from 2003 to 2019. Lastly, the cumulative HPI appreciation during the 10-year period between 2010 and 2019 is 42.0 percent among "Accommodating" metropolitan areas, as compared to 5.58 percent among "Very Restrictive" metropolitan areas, and anywhere between 10 and 25 percent for these metropolitan areas that are either "Moderate," or "Somewhat Restrictive." If we examine the classification in 2003 and 2019, we see a similar although smaller difference in HPI appreciation, because we have a short time horizon to look at its impact. The overall conclusion is that density restrictions do matter; they have a cumulative effect that can be large, especially in the long run.

**Exhibit 9**

Average Home Price Index Appreciation by Metropolitan Area Regulation Tightness

| | Range | Accommodating | Moderate | Somewhat Restrictive | Very Restrictive | Overall |
|---|---|---|---|---|---|---|
| **(a) By Metropolitan Classification in 1994** | | | | | | |
| **Around the survey year** | 1990–1998 | 3.06 | 1.86 | 3.80 | 2.28 | 2.66 |
| | 1999–2007 | 8.81 | 8.49 | 4.13 | 5.50 | 6.17 |
| | 2015–2019 | 7.08 | 6.47 | 4.99 | 3.96 | 5.27 |
| **Between the survey year** | 1994–2003 | 6.26 | 5.01 | 5.01 | 4.55 | 4.13 |
| | 2003–2019 | 3.90 | 3.38 | 1.18 | 1.70 | 2.60 |
| | 1994–2019 | 4.81 | 3.87 | 2.58 | 2.69 | 3.12 |
| **Prior to the survey year** | 1985–1994* | 71.06 | 34.87 | 56.15 | 61.75 | 46.57 |
| | 1994–2003* | 79.34 | 53.06 | 62.60 | 53.09 | 47.72 |
| | 2010–2019* | 41.99 | 25.35 | 10.11 | 5.58 | 14.85 |
| **(b) By Metropolitan Classification in 2003** | | | | | | |
| **Around the survey year** | 1990–1998 | 4.08 | 2.92 | 3.15 | 1.35 | 2.66 |
| | 1999–2007 | 6.27 | 9.53 | 4.75 | 5.44 | 6.17 |
| | 2015–2019 | 6.90 | 6.95 | 4.44 | 4.27 | 5.27 |
| **Between the survey year** | 1994–2003 | 5.04 | 5.74 | 4.49 | 3.98 | 4.13 |
| | 2003–2019 | 3.16 | 4.27 | 1.70 | 2.00 | 2.60 |
| | 1994–2019 | 3.86 | 4.77 | 2.71 | 2.66 | 3.12 |
| **Prior to the survey year** | 1985–1994* | 47.60 | 65.96 | 44.68 | 65.76 | 46.57 |
| | 1994–2003* | 64.10 | 67.36 | 54.93 | 43.75 | 47.72 |
| | 2010–2019* | 30.50 | 34.66 | 9.23 | 9.56 | 14.85 |
| **(c) By Metropolitan Classification in 2019** | | | | | | |
| **Around the survey year** | 1990–1998 | 4.23 | 1.82 | 3.36 | 0.71 | 2.66 |
| | 1999–2007 | 7.73 | 7.19 | 4.37 | 6.77 | 6.17 |
| | 2015–2019 | 7.10 | 5.62 | 5.08 | 4.12 | 5.27 |
| **Between the survey year** | 1994–2003 | 5.47 | 4.52 | 4.78 | 4.64 | 4.13 |
| | 2003–2019 | 3.61 | 3.12 | 1.53 | 2.31 | 2.60 |
| | 1994–2019 | 4.29 | 3.58 | 2.69 | 3.08 | 3.12 |
| **Prior to the survey year** | 1985–1994* | 47.51 | 59.65 | 53.65 | 59.09 | 46.57 |
| | 1994–2003* | 69.78 | 48.37 | 57.98 | 50.52 | 47.72 |
| | 2010–2019* | 28.44 | 29.08 | 11.54 | 10.91 | 14.85 |

*Note: * This is the cumulative appreciation.*

*Source: Authors' calculation based on National Longitudinal Land Use Survey and FHFA data*

Secondly, we look at multifamily rents as in exhibit 10. The rental growth seems to follow the same pattern as the HPI appreciation, especially in the long run. So that is no longer the same as

the supply story as in the jurisdiction level analysis. The messages are less consistent on the rents per unit and per square foot (not shown). This is because there are several Northeast metropolitan areas (New York, Boston, and Philadelphia) in the "Very Restrictive" category, and their level of rent is high, although their rent growth is slow. Hence the most prominent contrast is between the "Accommodating" and the "Somewhat Restrictive" metropolitan areas.

**Exhibit 10**

Multifamily Performance by Metropolitan Area Regulation Tightness in 1994

| | Range | Accommodating | Moderate | Somewhat Restrictive | Very Restrictive | Overall |
|---|---|---|---|---|---|---|
| **(a) Rent Growth** | | | | | | |
| **Around the survey year** | 1990–1998 | 3.65 | 3.13 | 3.99 | 2.76 | 3.10 |
| | 1999–2007 | 2.29 | 2.87 | 1.91 | 1.79 | 2.15 |
| | 2015–2019 | 3.09 | 3.66 | 2.77 | 2.44 | 3.08 |
| **Between the survey year** | 1994–2003 | 3.26 | 3.27 | 3.02 | 2.68 | 2.74 |
| | 2003–2019 | 2.32 | 2.12 | 1.47 | 1.37 | 1.75 |
| | 1994–2019 | 2.96 | 2.63 | 2.14 | 1.95 | 2.32 |
| **Prior to the survey year** | 1985–1994* | 28.61 | 6.22 | 14.58 | 14.82 | 12.88 |
| | 1994–2003* | 48.06 | 41.40 | 36.08 | 34.57 | 35.92 |
| | 2010–2019* | 29.83 | 23.93 | 18.49 | 16.00 | 20.06 |
| **(b) Rent Per Unit ($)** | | | | | | |
| **Around the survey year** | 1990–1998 | 1,074 | 743 | 694 | 988 | 811 |
| | 1999–2007 | 1,483 | 983 | 878 | 1,227 | 1,018 |
| | 2015–2019 | 2,087 | 1,308 | 1,091 | 1,418 | 1,138 |
| **Between the survey year** | 1994–2003 | 1,319 | 862 | 794 | 1,121 | 923 |
| | 2003–2019 | 1,745 | 1,136 | 976 | 1,284 | 1,004 |
| | 1994–2019 | 1,594 | 1,037 | 909 | 1,264 | 1071 |
| **Prior to the survey year** | 1985–1994 | 900 | 659 | 670 | 1095 | 802 |
| | 1994–2003 | 1,278 | 835 | 771 | 1,092 | 906 |
| | 2010–2019 | 1,850 | 1,169 | 1,003 | 1,312 | 1,034 |

*Note: *This is the cumulative appreciation.*

*Sources: Authors' calculation based on National Longitudinal Land Use Survey and CoStar data*

The overall message is that if regulation in a metropolitan area is already tight, its future growth potential is limited and may not accommodate future development needs. Over the following 10 to 20 years, home prices may not grow as much as otherwise would be the case. On the other hand, if the approach by a metropolitan area toward growth is initially accommodating, it will tend to relax its density requirement, allow for multifamily development, and attract more growth in the next decades. As a result, home price growth will be robust due to income and employment growth, at least during economic expansion.

## Why the Negative Correlation, and How do Homeowners and Renters Differ?

The relationship between land-use regulation and the housing market is obviously highly complex. The different responses from the single-family market and the multifamily rental sectors are intriguing. Moreover, once we make a cross-metropolitan area comparison, the same pattern we observe in both the single-family and rental sides is puzzling. The explanation may lie in the different roles homeowners and renters play in the local political process.

Without any demand-side influence, in a tightly regulated environment, one would expect rents to be higher or grow faster. That will benefit the multifamily landlords, who may have lobbied for tight regulation. Renters are, on the other hand, negatively affected, even after controlling for the neighborhood amenities that arise with new development.[14] However, their willingness or incentive may not be as strong as homeowners to lobby in favor of more housing.

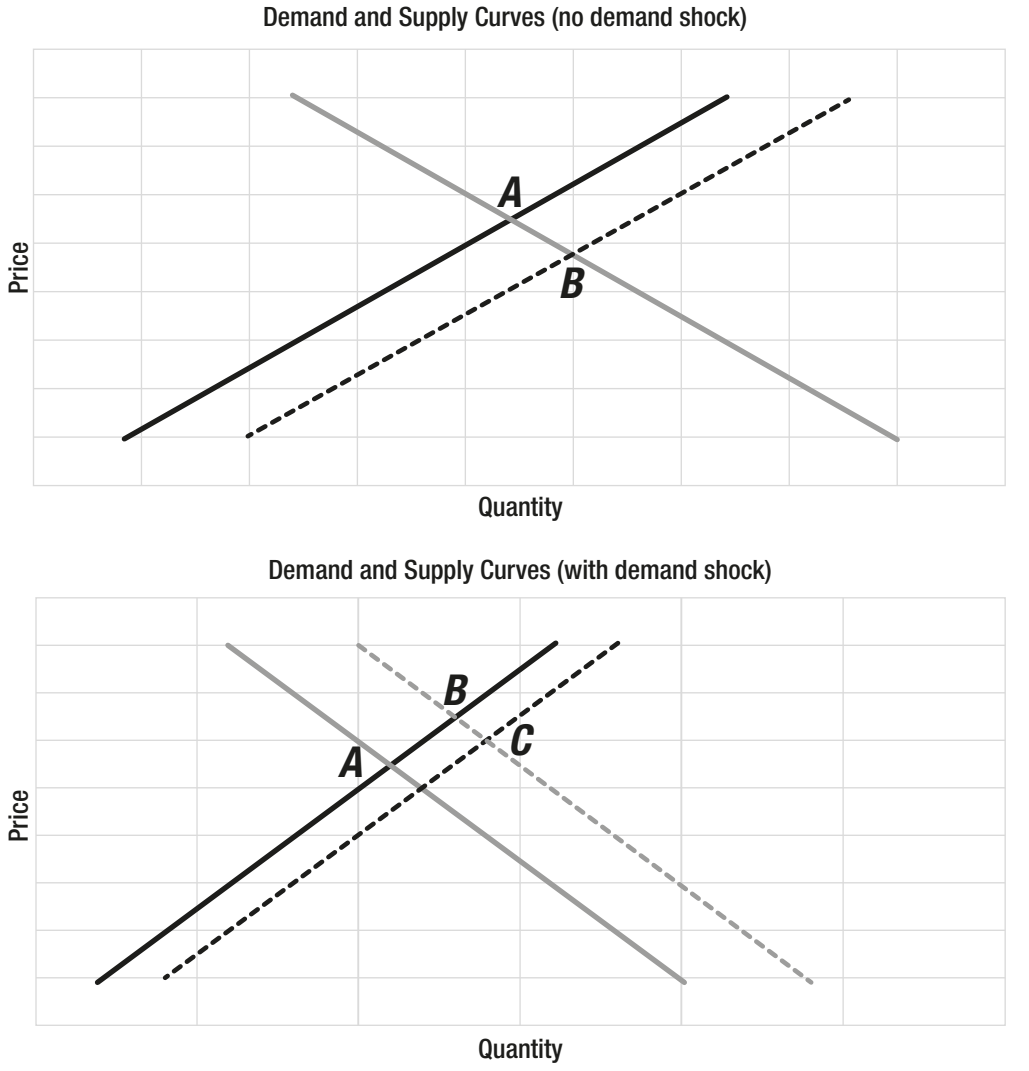
For homeowners, if there is no change in the demand side, the supply side is unlikely to change. However, if there is a positive demand shock, under the existing land use regulations, there will be faster price appreciation, implying more equity for existing homeowners, which would most likely be welcomed by them. However, several negative effects may also be present. Their property tax bills may be increasing. The existing regulation may also affect the competitiveness of the local economy, from which their employment opportunities may be limited. The high housing price may create an affordable housing crisis, too. So if homeowners care about these potential negative impacts, they could stay active in their local politics, such as in the recent YIMBY (yes in my backyard) movement. Local elected officials will consider the concerns of the local homeowners. These are the feedback loops that lead to a relaxation of the land-use regulation.

To explain this graphically, we resort to the classic demand and supply curve. As in exhibit 11a, the demand curve (the gray line) is downward sloping while the supply (the black line) is upward sloping. Hence if two jurisdictions are located nearby and thus face a similar market environment, the place that has a better regulatory environment for new apartment construction will have a lower market-clearing price level and a higher supply. That corresponds to Point A (the equilibrium for the tightly regulated market) and Point B (the less restrictive equilibrium). If we have cross-sectional data on the price and regulation measure, then we will see a positive correlation: places with more restrictions on land use will produce less housing and see higher prices and faster appreciation. This framework can be used to explain our jurisdiction-level rent growth result.

[14] That is to say, increased urban amenities do not fully justify the higher rent. For example, Li (2020) shows that new market-rate housing in New York City lowers nearby rents and housing prices, despite also attracting new amenities.

**Exhibit 11**

A Simple Theory to Explain the Differing Correlations




*Note: (a) Without Demand Shock (Point A is the old equilibrium point between the demand and the old supply curves; Point B is the new equilibrium after a shift in supply curve). (b)With Demand Shock (Point A is the old equilibrium point between the demand and the old supply curves; Point B is the hypothetical equilibrium after a shift in demand when there is no shift in supply curve; Point C is the new equilibrium between the demand shock and the newly shifted supply curve).*

However, we also see a negative correlation between regulatory restrictions and home price appreciation. That can be explained using exhibit 11b, where the local markets experience a demand shock (such as when a big employer like Amazon.com, Inc. or Walmart, Inc. moves into town). In this case, the demand curve will move from the solid gray line to the dashed gray one, resulting in a higher price at point B. The rapid price appreciation will cause concerns from elected officials, affordable housing advocates, and conscientious homeowners. Because of this, efforts will be made to relax the land-use restrictions. Hence, the supply curve will also shift to the right

from the solid black line to the dashed black one. The new equilibrium will be Point C, which as compared to point B, means a lower price is associated with the more relaxed regulation as the supply effect. However, Point B is a hypothetical point that indicates the equilibrium between the new demand curve (the dashed gray line) and the old supply curve (the solid black line), such as in the absence of the feedback effect. Hence the price level for Point B is not observed. Instead, a time series or cross-section data will tell that Point A has a lower-price level of appreciation and a restrictive land-use policy, while Point C has a higher price and less restrictive density control. Hence the correlation between land-use restrictiveness and home price appreciation is negative. However, that does not contradict the fact that land-use regulation is the ultimate determinant of housing supply. That supply curve, with everything else being controlled, is still upward sloping. Here this distinction between the absence of demand shock and a shift in the demand curve (which is downward sloping) is critical to understanding the negative correlation.[15]

The same story can be carried over to the cross-metropolitan area comparison because there will always be a difference in shocks to the demand curve across metropolitan areas, which is applicable for the description in exhibit 11b on both markets. Moreover, as we see in the prior section, such a feedback mechanism, such as the push to relax density controls to accommodate more growth, becomes more obvious over a longer horizon. It is not politically easy to change these regulations, so it takes a long time; moreover, even the relaxation of density control will not fully compensate for the enhanced demand; hence the housing price will stay high. Note that we see in the "Differences by Jurisdictions Population Size" section that these large and populous jurisdictions, whose density controls are on the low side nationwide, continue to relax regulations. It is exactly these places that witness faster home price appreciation and economic growth. One may ask why these metropolitan areas can still expand with the high level of home price. According to Krugman (1991) and Krugman (1992), that is because of the agglomeration effects: once New York becomes the dominant force in the financial service industry, it will attract more and more banks even with its high wages, commercial rents, and congested traffic, so is the case of the semiconductor industry in Silicon Valley.

This contrasts with the other side of the spectrum, where the less populous places, which already have strict low-density requirements, continue to tighten their density. These jurisdictions are experiencing fewer positive demand shocks, less economic growth, and a slower home price appreciation trend. That big picture is why we have observed a largely negative correlation.

Finally, this feedback loop also means that the long-horizon time series of regulation measure, as well as the true empirical relationship between regulation and home price, may be an inverse-U shaped curve: first positive and then negative. Suppose initially that no place has any zoning or density regulation, the situation in place through the 19th and early part of the 20th centuries. As the economy gradually develops, there is a huge demand for scarce land, and existing homeowners do not want to suffer from negative externality associated with incompatible uses, and enact zoning and land-use restrictions. Local jurisdictions have incentives to pass various land-use restrictions

[15] In theory, it is possible to have a positive relationship between regulations and home price. However, as seen in the graph, that means the shift in supply response needs to dominate the demand shock. What we usually see is that the affordability problems led to pressure to loosen, but such governmental intervention was usually insufficient to lower price appreciation as caused by rising demands in the market.

that limit the housing supply, which pushes the housing prices higher. However, when the economy develops further, the sustained demand will push the housing market to the brink of an affordable housing crisis in the short run. Note that there are also some adverse effects of a high housing price, even to homeowners. At that point, the local jurisdiction may tend to relax some of the restrictions a bit. This is what is happening in the most populous metropolitan areas today. On the other hand, many small suburban towns are faced with the declining demand side, and there is no need for them to allow more high-density development.

## Conclusion

This article uses data from the National Longitudinal Land Use Survey conducted in 1994, 2003, and 2019, to look at changes in density control over time and across different jurisdictions. We find that overall, there is an increase in the percentage of jurisdictions that are classified as low-density or as high-density, which means correspondingly the share of middle-density jurisdictions are consistently shrinking over time. On the willingness to allow multifamily development, between 2003-2019, we observe that there is a decline in "not allowed" responses, a corresponding increase in "by permit" responses, while the "by right" responses remain similar. We also find that jurisdictions with smaller and less dense population are tightening their density restrictions while more populous places tend to be more accommodating toward high-density and multifamily developments.

The relationship between land-use regulation and home price or rent appreciation is a heated topic in public policy discussion. The common narrative is that regulation will increase land and building costs and thus make housing appreciate more. Our empirical investigation, using both home price appreciation and the multifamily rental information, tells a more nuanced story. The supply constraint story holds well when we look at the multifamily rental section at the jurisdiction level: if there are multifamily units in a jurisdiction, the tighter the density control, the faster rental growth. However, we also find evidence for the other side of the same story. In these populous jurisdictions, demand for housing is ever increasing because of a large influx of migration and economic expansion during the time covered in this analysis. In response to growing affordability issues, density control regulations in these jurisdictions are generally now less restrictive, and the attitude toward multifamily development is more accommodating. Therefore, on the housing price appreciation at the jurisdiction- and metropolitan-level, we find they are negatively correlated. This is precisely because of the feedback loop: high demand in large and populous places will cause prices to increase *more* than they would otherwise and the supply to rise *less* if the regulatory environment stays tight relative to less populous areas. By changing the attitude to be more welcoming to high-density developments, these populous places can induce more production and relieve but not wholly compensate for the pressure from a rapid price increase. At the metropolitan level, this is also true, as gradually in the long run, households and business have incentives to find places that are more accommodating to the rising housing demand and are working to relax the regulations in response to keep rental, and in some cases, home price from rising as quickly.

Finally, we would like to point out a concerning trend on the policy implication: land-use density control followed a bifurcated path over the past quarter-century. While high-density places have

relaxed their rules further, this is not the case across the board: the low-density jurisdictions are tightening their density and becoming more restrictive toward the multifamily developments. The country is becoming more cohesive in these large populous places, yet at the same time more fragmented in these small and less populous places. We conjecture this is because of the slow productivity growth, but it also could be that residents in some jurisdictions located in the fast-growing metropolitan areas are more concerned about the negative externalities of developments, so there is a within-metropolitan-area sorting across jurisdictions. Although we know from census data that America has become more urbanized over time, such rising inequality across jurisdictions or between urban and suburban places may have far-reaching implications to the housing market.

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