The Social Divide of Urban Land Use Regulatory Changes: Evidence from Chile *

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Abstract

This paper investigates the drivers of land-use regulatory changes in Santiago, Chile, over a 20-year period, focusing on downzoning (stricter regulations) and upzoning (more flexible regulations). Leveraging an original dataset covering 15 urban municipalities, we examine how neighborhood characteristics, including homeownership rates, income levels, and proximity to transportation networks—influence these zoning decisions. Our findings reveal that high-income neighborhoods are more likely to experience downzoning, especially where homeownership is less prevalent, reflecting a "social divide" in land-use policy. Contrary to expectations, high-density areas favor stricter regulations, while large-scale zoning changes dilute the influence of affluent residents, arguably due to competing interests such as those of the real estate industry. These results contribute to the debate between the "growth machine" theory, where real estate interests dominate, and the "homevoter" theory, where residents hold sway, suggesting that both frameworks may apply depending on the city's level of social segmentation. Methodologically, we introduce a novel dataset of municipal land-use regulations, offering new insights into the political economy of urban development.

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1 Introduction

There is an increasing academic and policy interest in land use regulations. Several authors argue that strict land use regulations contribute to the affordable housing crisis that many metropolitan areas worldwide are confronting (Vicki Been and O'Regan, 2019; Hills Jr and Schleicher, 2015). By limiting housing supply, land use controls may affect land prices, making cities increasingly unaffordable for middle and low-income individuals (Brueckner, 2009; Gyourko and Molloy, 2015; Anagol et al., 2021). Indeed, recent empirical evidence points to a strong relationship between regulatory stringency and high housing prices (Glaeser et al., 2005; Ihlanfeldt, 2007; Kok et al., 2014; Glaeser and Ward, 2009; Hilber and Vermeulen, 2016; Kahn et al., 2010).

Although there seems to be a growing consensus about the problematic policy outcomes of strict land use regulations, less is known about the mechanisms that lead local governments to favor strict or less strict land use controls. Land-use decisions ought to balance the interest of homeowners who want to protect the economic value and social character of their neighborhoods, on the one hand, and the interest of the industry and potential residents who push for real estate developments in those neighborhoods, on the other hand (Serkin, 2020). Understanding the influence of the wide array of interests behind land-use regulatory processes is critical to addressing cities' policy challenges.

This paper explores whether neighborhood socio-demographic characteristics and urban attributes are associated with changes in urban land-use regulations. To achieve this, we leverage a novel dataset we have assembled over the past four years through a collective and intensive effort involving several research assistants and geographers. To our knowledge, this dataset represents the most comprehensive effort to codify and georeference local land-use regulations at the lot level in a major metropolitan area over a 20-year period. This paper focuses on data from 15 centrally located municipalities in Santiago, Chile's capital, home to around 7 million people—approximately 40% of the country's population. Our dataset includes all changes to local ordinances and zoning plans between December 2002 and October 2019. This paper focuses on the two most important rules affecting real estate development: the maximum floor area ratio (FAR) and maximum building height.

Our analysis focuses on three potential outcomes at the lot level over the study period: first, whether stricter land-use regulations were implemented, preventing dense real estate development ("downzoning"); second, whether more flexible standards were introduced, allowing for denser and taller construction ("upzoning"); and third, whether no changes occurred at the lot level during the study period. We enhanced our dataset by incorporating additional information from various administrative sources, such as census data. Our empirical approach involves estimating a linear probability model of upzoning or downzoning using municipality and neighborhood fixed effects. We investigate whether land use regulatory changes are associated with the baseline socioeconomic characteristics and infrastructure variables of the neighborhoods where these changes occurred. Specifically, we test the influence of three key factors on urban land-use regulatory changes: homeownership, the presence of high-income residents, and accessibility to transport networks.

Our primary finding is that the presence of high-income residents strongly correlates with an increased likelihood of downzoning throughout the 20-year study period. This association is less pronounced when the proportion of homeowners is high. Therefore, property ownership appears to partially counterbalance the influence of high-income residents who favor stricter land use regulations. By contrast, we do not observe similar associations with upzoning processes. Additionally, our analysis shows that in areas where high-income residents are not significantly present, the probability of downzoning or upzoning is not linked to ownership. We refer to this as "the social divide" of land use regulatory changes, where socio-demographic factors play a crucial role in higher-income areas while, at the same time, different dynamics operate in other parts of the city.

To further explore the relationship between wealth and downzoning, we compare neighborhoods that transitioned from middle- or low-income areas in 1992 to high-income areas in 2002 with those that did not experience such a demographic shift. We find that blocks that became high-income neighborhoods between 1992 and 2002 have a greater likelihood of downzoning five to seventeen years after that transition than those that did not undergo this transformation.

Our key finding is further supported by a set of robustness tests. We estimate the model: (i) without controls and only fixed effects; (ii) replacing baseline controls with historical population controls; (iii) changing the definition of downzoning considering only changes that modified the FAR or height limit by at least 20%. We also estimate the model with fixed effects using a Poisson Pseudo-Maximum-Likelihood estimator, reaching the same conclusions as with the OLS estimator.

We also explore two additional questions to deepen our understanding of the political-economic forces shaping land use regulatory changes. First, we examine whether our main finding is stronger in areas dominated by single-family housing, as the literature examining the United States urban and suburban context suggests (Ellickson, 2020). Surprisingly, we find the opposite: in high-income blocks with a minority of single-family homes, the likelihood of downzoning is higher compared to similar areas without a significant presence of affluent residents. In other words, the preference for maintaining the regulatory status quo is more pronounced in high-density, high-income neighborhoods. Second, we investigated whether large-scale regulatory changes present a different political-economic context due to the strong interests of the real estate industry. This appears to be the case, as the association between high-income blocks and downzoning weakens significantly when focusing on regulatory changes affecting more than 5 square kilometers.

Our paper contributes to the academic debate between two prominent theories: one views cities as "growth machines," where the real estate industry is the dominant force influencing decisions made by city officials (Molotch, 1976), while the other suggests that urban areas are primarily shaped by the interests of "homevoters" (Fischel, 2002; Been et al., 2014; Gabbe, 2018). We argue that both theories can be valid, depending on the degree of social segmentation within a city. The social composition of neighborhoods strongly influences the political-economic context local officials navigate. Additionally, in contrast to previous literature, we argue that urban areas where multi-family housing is prevalent tend to be more resistant to zoning changes regardless of location. A plausible explanation is that residents become more actively engaged in advocating for stricter regulations once they witness dense real estate development in their neighborhoods. Finally, we suggest that large-scale zoning changes create a distinct political-economic environment, providing empirical support for some of the theories proposed by Schleicher (2012) for the U.S. context.

Methodologically, we advance the field by introducing the first comprehensive dataset on land use regulatory changes, with data sourced directly from local ordinances and zoning plans. Given the challenges in quantifying land use regulatory stringency, prior empirical studies have primarily relied on survey data (Gyourko et al., 2021; Turner et al., 2014; Jackson, 2016; Hilber and Vermeulen, 2016). While some studies measure land use regulations similarly to ours, they often focus exclusively on the Floor Area Ratio, lack temporal variation, or are limited to a single municipality (Brueckner et al., 2017; Brueckner and Singh, 2020; Zhang, 2023; Gabbe, 2018; Been et al., 2014). By contrast, our analysis examines the evolution of two key land use regulations—maximum floor area ratio and maximum building height—over 20 years across 15 urban municipalities.

The paper unfolds in the following way. In Section 2, we analyze the theoretical and empirical literature that has examined the politics of land-use decision-making, and we describe the institutional setting we discuss in this paper. Section 3 describes the data assembled and our method and presents descriptive statistics. Sections 4, 5 and 6 analyze the main results of the regression models used. Finally, Section 7 discusses the main findings and concludes.

2 Background

2.1 Theories and Evidence on Land-Use Regulatory Changes

Urban development is a contested political space because land-use decisions strongly impact the interests of different groups. Therefore, many interest groups often try to participate and push for their agendas at the local instances where the corresponding authorities make the major decisions that shape urban growth within cities. Explaining the influence of interest groups on local land-use decisions has increasingly been the subject of academic work. However, there is a scarcity of systematic evidence testing the theories that have been elaborated.

Until recently, the dominant theory about the political economy of land-use decision-making conceptualized cities as "growth machines". This theory is associated with the sociologist Harvey Molotch, who, in a seminal paper published in 1976, argued that any city or locality expresses the interests of local elites, and growth is one of their critical motivations (Molotch, 1976). In the subsequent work he developed with John Logan, they argue that urban politics is heavily influenced by a coalition of the real estate industry and local elites to facilitate economic growth through local decisions (Logan and Molotch, 1987). They suggest that private developers influence local authorities through campaign contributions and lobbying, which is how urban officials share the benefits that the real estate companies obtain from decisions that impact the rents and prices of their properties.

The economist William Fischel proposed an alternative theory to understand the factors that shape land-use decisions, coining the "homevoter hypothesis" (Fischel, 2002). Fischel argues that property owners are the main force behind zoning policies because they are the most directly affected by local land-use decisions. The homeowners represent the primary voters in local elections, and their votes will be strongly influenced by their perceptions of which local decisions maximize the values of their properties. Therefore, local authorities have strong incentives to favor this group by adopting decisions that increase the value of the homes in their districts.

The homevoter theory was primarily conceived to understand the political dynamics of U.S. suburbs. These are areas in the urban periphery characterized by relative social homogeneity and where detached single-family housing predominates. The local community's collective action costs are relatively low in these places. Therefore, homevoters can pressure local authorities to make land-use decisions consistent with the municipality's social and physical character.

Recent empirical evidence suggests that the homevoter theory provides a realistic picture of land-use politics in both socially homogeneous suburban districts and large and diverse urban areas. Been et al. (2014) studied rezoning initiatives in New York City between 2002 and 2009. They found that in neighborhoods with a high rate of residents who own their homes, there is a lower probability of upzoning and a higher likelihood of downzoning. Gabbe (2018) did a similar analysis for the city of Los Angeles and found that neighborhoods with an increased presence of homeowners and good-quality urban amenities are associated with a lower probability of upzoning. Both studies do not see clear associations between neighborhood income and land-use changes. Along similar lines, Ellickson (2020) studied, from a historical perspective, zoning policies in several metropolitan areas in the USA. He found that most localities built under a rule limiting developments to detached single-family housing have never changed that rule, despite all socio-demographic changes since then.

Other recent empirical studies—that do not examine land-use changes—have highlighted homeowners' critical influence in the metropolitan areas' local politics. Einstein et al. (2019) coded thousands of documents reflecting citizen participation in urban planning commissions across 97 cities and towns within the Boston Metropolitan Statistical Area (Boston MSA), finding that homeowners were more likely to participate than renters. Among those who participate, most individuals oppose the construction of new housing. Hankinson (2018), using surveys, measured the attitudes of homeowners and renters toward developing new housing projects. He found that homeowners antagonize new housing and renters have a similar attitude in urban contexts with high housing prices. In these places, renters favor new housing supply, but not in their neighborhoods. The author concludes that if the land-use institutional regime allows the opposition to selected projects, renters may join homeowners in blocking increased housing supply.

Schleicher (2012) has explained the political-economic factors that have led big cities to impose housing development and density restrictions. He argues that local land-use decisions are made in an institutional context that favors the consideration of specific developments or rezoning initiatives rather than sweeping citywide changes to land-use regulations. Residents directly affected by the proposed changes in this institutional structure can impose their preferences over other interest groups, such as housing consumers or the real estate industry, who face higher costs to intervene in localist decisions. Ellickson (2020) elaborates on several hypotheses that may complement Schleicher's explanations on why homeowners oppose land-use regulatory changes that allow denser housing developments in their neighborhoods. One of the central hypotheses proposed by Ellickson is that residents have a psychological predisposition to maintain the status quo in their communities. Homeowners could sell their property at higher prices if a real estate company is interested in building a high-rise project. However, many downsides may be brought by the change from a lower to a higher density residential area, such as traffic, noise, pollution, and less privacy, which may lead people to prefer to keep the status quo, especially considering that individuals give more weight to losses than gains.

The literature so far has focused mainly on the influence of homeowners on land-use policies, and little has been found or argued about whether any heterogeneous effects depend on the income status of the individuals affected by zoning changes. This is an essential gap in the literature, considering that one of the most defining characteristics of prominent and diverse cities is their inequality (Florida, 2017). The political and social dynamics of high-income urban areas differ from those of low-income neighborhoods. Our paper aims to fill that gap by providing systematic evidence on whether socioeconomic status constitutes a relevant variable to explain land-use regulatory changes.

2.2 Socioeconomic and housing background in Chile

Chile is a country that has made significant economic, social, and institutional progress in the last decades, especially since the return to democracy in 1990. Its GDP per capita has more than doubled in the past two decades and is the highest in the Latin American region (OECD 2021). The country has significantly reduced the level of poverty during the past decades. Chile has an open-market economy, with strong protection of private property rights and good law enforcement.

Despite decades of social and economic progress, Chile still faces significant policy challenges. One of these challenges refers to the housing sector. One critical indicator is the "quantitative housing deficit," which is the number of dwelling units needed to accommodate the requirements of individuals who lack access to housing or live in a unit that must be replaced (Ministerio de Vivienda y Urbanismo, 2020b). According to official statistics, Chile reduced its housing deficit from around 520,000 units in 2002 to approximately 390,000 in 2017 (Ministerio de Vivienda y Urbanismo, 2020b). However, recent studies suggest that the housing deficit has increased in the past couple of years to around 600,000 units (Mendía, 2022).

A dramatic example of the policy challenges in Chile's housing sector is the exponential growth of people living in informal settlements in the last few years. The pattern is relatively similar to the one observed in the housing deficit. These communities decreased in the late 1990s and 2000s, but their extent and population density have increased lately. According to the Ministry of Housing and Urbanism 2019 cadaster, 802 informal settlements hosted 47,050 families in the country. The figures represent a significant increase from the 2011 cadaster that reported 657 settlements with 27,378 families (Ministerio de Vivienda y Urbanismo, 2020a). Moreover, the pandemic has forced many individuals to relocate to a settlement. New official statistics collected in 2022 estimate that the number of families living in an informal settlement in Chile exploded during the pandemic, reaching around 72,000 (Ministerio de Vivienda y Urbanismo, 2022).

Most of the housing deficit comprises families living with relatives or friends, a situation known as "allegamiento" in Chile. Many of these households experience severe overcrowding. When asked about their reasons for living in this arrangement, 30% of those in "allegamiento" report that they cannot afford to buy or rent a home with their current income. Also, 14% indicate that they need to save money, which suggests that a significant portion of them cannot afford a dwelling unit by their means (Ministerio de Desarrollo Social, 2018). Similarly, the cadaster on informal settlements conducted in 2019 reports that 31% of the settlers justify their informal situation by pointing to the fact that rental housing is too expensive. In turn, 12% say their income is too low to afford housing, and 24% say they need family independence. Therefore, for most people living in informal settlements, housing is beyond their financial reach (Ministerio de Vivienda y Urbanismo, 2020a); this is consistent with Alves (2021), who finds that the share of families living in informal settlements increases when rents of formal housing increase.

The evidence on the evolution of the housing market in Chile is not favorable for low-income individuals. The data indicates that housing prices have increased significantly during the past decade, a threefold increase relative to workers' salaries (Vergara-Perucich and Aguirre-Nuñez, 2019). The subsidies provided by the government, mainly consisting of lump sums targeted to low-income individuals to buy a used or new dwelling unit, have increasingly become ineffective in giving them access to formal housing in urban markets (Razmilic Burgos, 2010; Gil, 2019).

2.3 Institutional Setting: Land-Use Regulation in Santiago, Chile

Chile's primary legal framework governing urban development is constituted by the General Law of Urbanism and Construction ("Ley General de Urbanismo y Construcción"), approved in 1976 and reformed several times afterward. This statute contains general rules and principles regulating urban planning and city growth processes. The previously mentioned law is detailed and complemented by the General Ordinance of Urbanism and Construction ("Ordenanza General de Urbanismo y Construcción"), a decree adopted by the President in 1992 that has been subject to multiple reforms afterward.

Public actors establish the norms that define urban land uses through the urban planning process regulated by the legal framework. According to Chile's legal framework, different public agencies intervene in the adoption of "regulatory plans" ("planes reguladores"), which are norms established at the regional and municipal levels that define the geographical boundaries of urban land, zoning, and the rules governing the construction on that land.

Similar to other countries, municipalities in Chile have the power to elaborate local regulatory plans, which, according to Chilean law, are ultimately responsible for establishing the rules that define land uses within their jurisdictions. The General Ordinance states that local regulatory plans should address issues such as the definition of city limits, the identification of land for squares and parks, and the designation of areas or buildings that should be treated as historic preservation sites. The previously mentioned ordinance also states that local regulatory plans should address each neighborhood's zoning and adopt land-use rules such as the floor area ratio, maximum heights, and maximum densities, among other norms.

The elaboration of local regulatory plans is a complex political process that intends to balance the public interest with private rights. If interest groups have an undue influence on the rules adopted by a municipal plan, this may generate unsustainable urban growth that would hinder achieving shared goals. On the other hand, if a local plan imposes too many restrictions on private property rights, it may affect homeowner's legitimate—and legally valid—expectations and cause aggregate welfare losses. This is why the elaboration and change of local plans are heavily regulated.

In Chile, the General Law of Urbanism and Construction and the General Ordinance of Urbanism and Construction contain several norms that govern the elaboration and change of local plans. The Law states that any modification (or elaboration) of an urban regulatory plan must be transparent, participative, and pass several stages. Even before a local plan is elaborated or modified, the local authorities must present an urban diagnosis, main objectives, and leading changes that aim to be achieved to the local community (a target image or "imagen objetivo"). This is then subject to processes of community participation and input (article 28-octies of the General Law of Urbanism and Construction). The modification of the local plan must go through several phases, after which it has to be approved by the Municipal Council (article 43 of the General Law of Urbanism and Construction). The stages include (1) informing the neighbors that will be affected, (2) organizing one or more public meetings with the local community to expose the main elements of the regulatory change, (3) consulting the opinion of the "Local Council of Civil Society Organizations", (4) presenting the changes proposed after the public meetings to the whole local community for 30 days to allow them to get informed and propose modifications, (5) organizing a new public meeting to present a report that summarizes all the comments, and (6) establishing a new period of a maximum of 30 days to receive more comments after the last public meeting (article 43 of the General Law of Urbanism and Construction). The law also states that the draft of the new local regulatory plan must be sent to the Ministry of the Environment for an environmental impact assessment (article 43 of the General Law of Urbanism and Construction).

Complying with all the requirements established by law to adopt or modify a local regulatory plan involves significant resources, time, and institutional capacity. That is why there are strong asymmetries among local plans regarding their level of sophistication and how updated they are to confront contemporary policy issues. The Ministry of Housing and Urbanism has calculated that, on average, it takes six years to elaborate a local regulatory plan, and many municipalities rely on the advice and resources of the central government to update their corresponding plans (Ministerio de Vivienda y Urbanismo, 2013).

Qualitatively oriented case study research has documented strong social conflicts between public and private actors because of the modification of a local regulatory plan in Chile's urban areas, motivated by the desire that the plan may favor specific interests (Wellington Caulkins 2020; Ubilla-Bravo 2020; Gil and Bucarey 2021). However, there is a lack of studies that provide systematic quantitative data on the social and political factors influencing Chile's urban land use regulations. As mentioned, this is part of a global problem related to the difficulties in accessing comprehensive data sources on land use regulatory dynamics, a gap we aim to fill with this paper.

3 Data and Methods

3.1 Regulation

We built an original database of land use regulations enacted at the municipal level between 2002 and 2019. Our focus on the local level stems from the fact that under most legal systems—including Chile's—municipalities (or cities) are ultimately responsible for adopting real estate development rules within their jurisdictions. Additionally, it is at the local level where residents exert the most influence in shaping land use controls.

Initially, we hired TOCTOC, a Chilean real estate marketplace, to obtain data on local ordinances and zoning plans for each municipality included in our sample during the study period. However, TOCTOC's data covered only a limited number of municipalities and a shorter time frame than we required. As a result, we assembled a team of research assistants, including several geographers, to expand the data collection. The team gathered information directly from local ordinances by systematically reviewing the Official Gazette of the Republic of Chile. This daily official publication includes all laws and regulations, including municipal land use regulations.

We then matched the land use regulations identified in local ordinances with zoning plans collected from the Ministry of Housing and Urbanism's website, as well as through visits to the archives of several municipalities. Using all the collected data, the geographers on the team georeferenced the land use regulations to pinpoint the specific territorial areas where these rules apply.

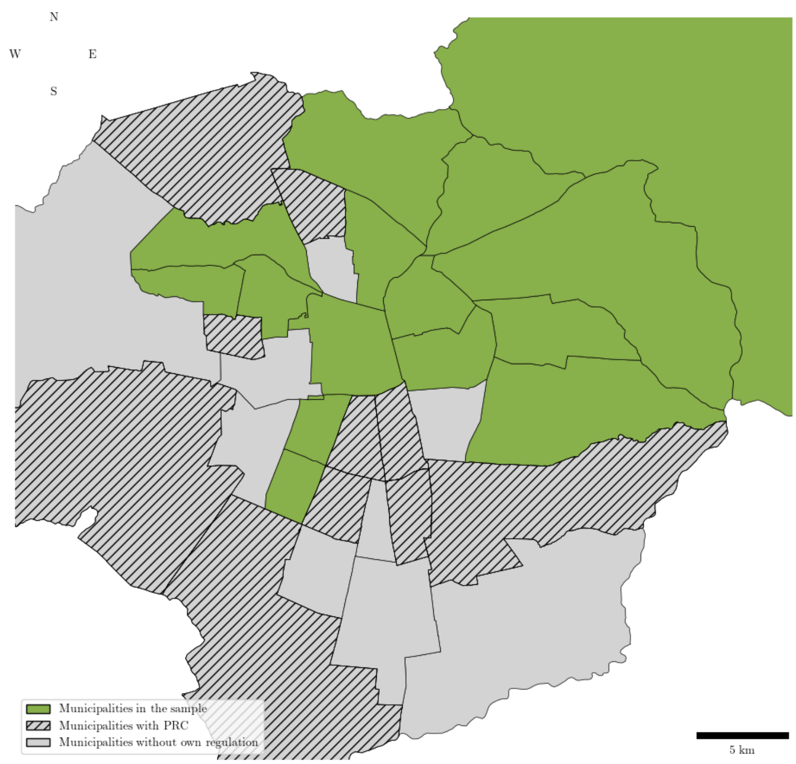
This process allowed us to construct a dataset covering a significant urban area of Santiago, which includes the most important land use regulations implemented over the past two decades. We can precisely identify the applicable rule for each lot within the area, covering the entire study period.

This dataset details the key regulations over the past two decades and precisely identifies the rules for each lot throughout the study period (December 2002 to December 2019). From this source, we derived the outcome variable for our regressions — upzoning and downzoning — defined as changes at the lot level where the floor area ratio (FAR) or permitted building height was either loosened (upzoning) or restricted (downzoning). Using 2002 as our baseline year, the first census year in which many municipalities had local regulations,[1] we coded the maximum FAR and height allowed for every lot in our sample. By tracking all changes implemented by municipalities, we constructed a balanced panel, focusing on FAR and height as the critical land use regulations that shape construction possibilities in urban areas.

[1] In contrast, in the previous census of 1992, few municipalities had local ordinances and zoning plans, leaving most of the city governed by broader regional rules.

Figure 1 shows a map of Santiago and its 34 municipalities. In 2002, nine municipalities did not have a local ordinance with a zoning plan (light-grey areas). Therefore, they are excluded from the sample because they do not have local land-use decisions. Out of the remaining, we collected information for 15 municipalities (dark-green regions).[2] Our sample covers over 89 square kilometers of residential areas, excluding urban areas zoned for purely commercial or industrial uses, and hosts approximately 2,400,000 inhabitants. It encompasses a very diverse urban area regarding socioeconomic characteristics and urban attributes, with neighborhoods with high-quality public and private services where mostly high-income people live and neighborhoods with significantly deteriorated conditions where mostly low-income residents live.

Figure 1: Municipalities in our Sample



Notes: The figure shows the municipalities of Santiago. Dark-shaded municipalities (in dark grey) are in our sample. The municipalities with striped patterns are those where we could not obtain information, and the light-shaded ones did not have local regulations set by the municipality.
Source: own elaboration.

For each year, we classify the lots according to how the regulation changed relative to 2002. For instance, in 2019, a lot was "upzoned" if it had a more permissive (higher) maximum FAR or height relative to its regulation in 2002. Analogously, we define "downzoned" as having a lower maximum FAR or height in 2019 compared to 2002. The rest are lots that did not suffer a land

[2]The municipalities in our sample are Santiago, Cerro Navia, Huechuraba, La Reina, Las Condes, Lo Barnechea, Lo Espejo, Ñuñoa, Pedro Aguirre Cerda, Peñalolén, Providencia, Quinta Normal, Recoleta, Renca, and Vitacura.

use regulatory change during the study period and those that changed the maximum height and FAR in opposite directions. For example, a lot where the maximum height was increased, and the maximum FAR was decreased is denoted as “mixed”. The same holds for decreasing maximum height and increasing the maximum FAR.

Table 1 presents descriptive statistics of all lots in our sample. It shows the number of observations (lots), the surface covered by the lots included in the sample, the (surface-weighted) mean of the maximum FAR and height in 2002 and 2019, and the difference between them. Table 1 reveals that most of the city did not change its land use regulation and that upzoned and downzoned areas cover almost the same amount of land. Upzoned surfaces experienced an average increase of 11.91% in height regulation and 24.03% in the FAR. On the other hand, downzoned areas experienced an average decrease of 25.95% and 19.58% in permitted height and FAR respectively. A very small proportion of lots had a mixed change.

Table 1: Changes in regulation over the 2002 - 2019 period.

Category	Total Area	Obs.	Max. Height (m)			Max. FAR		
	(sq km)		2002	2019	Difference	2002	2019	Difference
Upzoned	21.23	34,946	13.26	14.84	1.58	1.29	1.60	0.31
Downzoned	20.44	28,619	13.41	9.93	-3.48	1.43	1.15	-0.28
Not Rezoned	68.69	20,718	15.37	15.37	0.00	1.22	1.22	0.00
Mixed (Height Up)	0.37	231	9.39	11.34	1.95	0.98	0.81	-0.17
Mixed (FAR Up)	0.80	850	10.93	8.57	-2.36	0.39	0.53	0.14

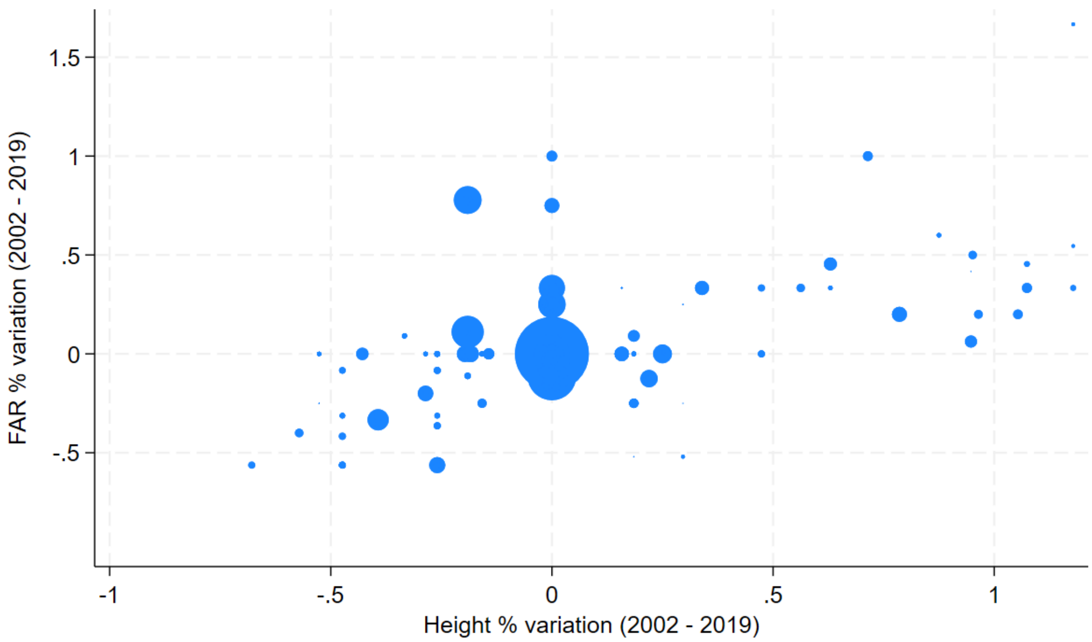
Notes: This table shows the total area of the sample that was upzoned, downzoned, not rezoned or had mixed changes between 2002 and 2019. It also shows the weighted average of the maximum height and FAR permitted for each zone type, using lot sizes as weights, in 2002 and 2019.

Figure 2 shows that the correlation between changes in maximum FAR and height is positive and relatively high. This figure represents the range of variation across lots. Each lot is located based on the change in maximum FAR and height as a percentage of the 2002 value. There are a few points where one variable becomes more permissive and the other less permissive. Indeed, Table 1 shows that they cover 1.17 sq. km., which represents 1.29% of the study area. For the analyses, we do not consider these lots to be part of our sample.

3.2 Key variables

Our key variables are socioeconomic status and ownership in 2002 at the block level from Chile’s 2002 population census (Instituto Nacional de Estadisticas, INE). For each block, we have the socioeconomic decile of each household and the share of owner-occupied dwellings, and we assign the block’s average of each variable to all the lots in that block. We also use the socioeconomic information from the 1992 Census to study whether changes in socioeconomic conditions between

Figure 2: Changes in maximum FAR and height per lot in the 2002-2019 period

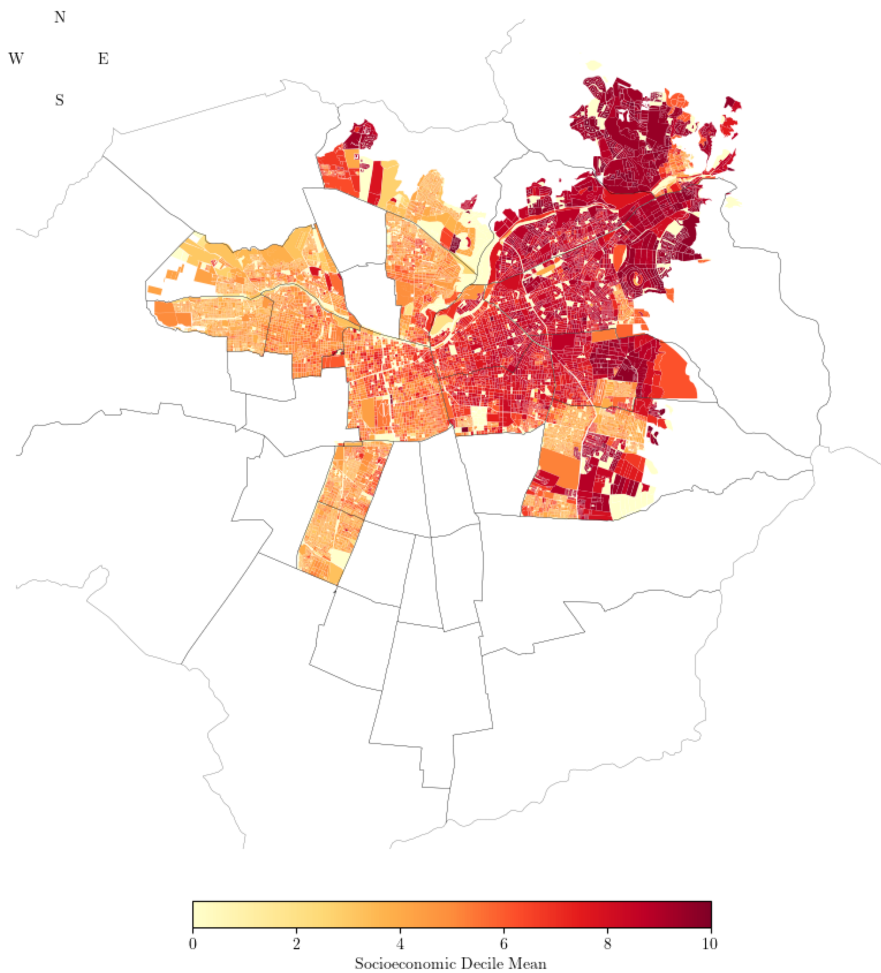


Notes: The figure plots the change in maximum height and FAR between 2002 and 2019 of each lot in our sample. We winsorized the top and bottom 1% for better visualization according to the FAR and height variation. The size of the dots depends on the analytical weights based on lot size (surface). The Y-axis is the change in maximum FAR between 2002 and 2019 as a percentage of the initial maximum FAR. The X-axis is the change in maximum height between 2002 and 2019 as a percentage of the initial maximum height.
Source: own elaboration.

1992 and 2002 correlate with regulatory changes. In addition, we consider information on the housing stock, mainly on single-family housing. This comprehensive resource allowed us to complement the regulatory information with the socioeconomic and demographic characteristics of the blocks in Santiago.

Table 2 presents descriptive statistics of our sample at the block level. On average, blocks have an average ownership rate of 0.65, around 48 households and 49 dwellings, are within 7 km of a subway station and have a surface of roughly 9,874 squared km. Our sample has a high income relative to the country, as the average socioeconomic decile is 7.58. This is, in part, because Santiago is the largest city and hosts most of the high-skill jobs. The lower-income households tend to be located in rural areas and in smaller cities. In the whole city of Santiago, the average socioeconomic decile is 5.4. Figure 3 shows our sample's income distribution across space. Wealthier neighborhoods are prevalent in the city's east, closer to the Andes Mountain Range.

Figure 3: Income distribution across space in our sample.



Notes: The Figure summarizes the socioeconomic spatial distribution of our sample. The socioeconomic decile of a block is the average socioeconomic decile of the households in the block.
Source: own elaboration.

Table 2: Descriptive statistics for the census blocks in our sample in 2002.

Variable	Average	Standard Deviation	Min.	Max.
Socioeconomic decile	7.58	1.88	0.00	10.00
Ownership ratio	0.65	0.21	0.00	1.00
Households	47.59	64.27	1.00	1,111.00
Dwellings	48.67	71.90	2.00	1,201.00
Distance to metro (km)	7.05	2.97	0.05	18.96
Surface [km^2]	9,874.86	12,276.19	53.84	85,652.46

Notes. The table presents summary statistics at the block level using the census 2002 data. For consistency with previous figures, we winsorized the top and bottom 1% according to the block's area.

3.3 Methods

We begin by studying the correlation between ownership, socioeconomic status, and the probability that a lot experiments a land use regulatory change. We estimate the following linear probability model by weighted least squares, using the lot sizes as weights:

$$\delta_{i,t-2002} = \beta_0 + \beta_1 \cdot I_i^{SES} + \beta_2 \cdot Own_i + \beta_3 \cdot I_i^{SES} \cdot Own_i + \sum_{n \in N} \gamma_n \cdot X_i^n + \phi_d + \psi_m + \epsilon_i \quad (1)$$

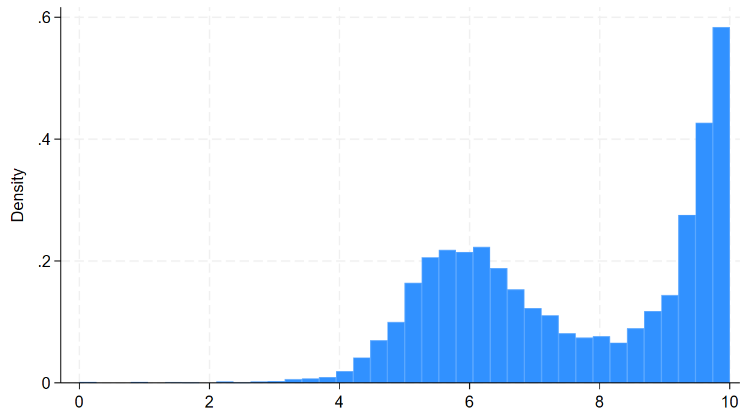
where $\delta_{i,t}$ is the dummy variable that takes the value of 1 when the lot i is upzoned in year $t \in \{2007, 2011, 2015, 2019\}$ with respect to 2002 and 0 otherwise. We also estimate the same model for $\delta_{i,t-2002}$ being one if the lot is downzoned.

One of our central hypotheses is that the concentration of wealth in Santiago's top decile is linked to land use regulatory changes. Consequently, we do not use a linear measure of wealth. Instead, based on the concentration of housing tenure at the wealthiest decile observed in the sample (see Figure 4), we use an indicator function as a key variable. The variable I_i^{SES} is set to 1 if the socioeconomic status of the block where the lot i falls within the top decile in 2002. Another key variable in our models is Own_i, which represents the average rate of owner-occupied dwellings in each block.

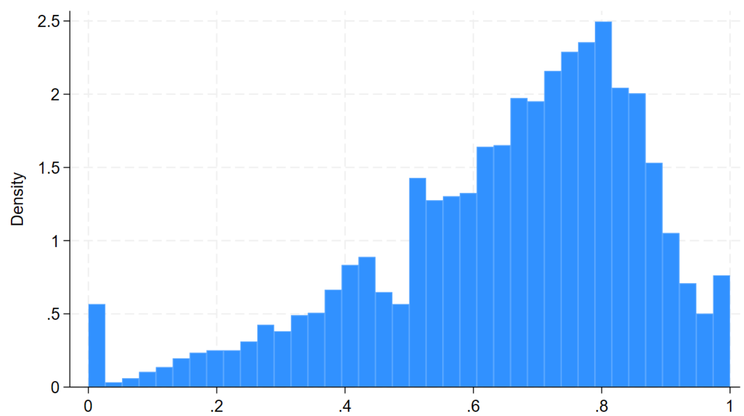
The term $X_{n,i}$ represents baseline predetermined control variables associated with the lot i, such as distance to the subway network and other variables from the census, such as population and households. To account for unobserved characteristics at the neighborhood level, we include municipality fixed effects ψ_m and census district fixed effects ϕ_d. These account for unobserved neighborhood characteristics that do not change over time. Our sample has 116 census districts with an average area of 9.5 km^2 and a standard deviation of 2,9 km^2. The average number of families per census district is 2,835. The census districts are the closest official divisions that approximate actual neighborhoods.

To examine short versus long-run regulatory changes, we study different years in separate regressions. Only the probability $\delta_{i,t-2002}$ changes when we change the year, as the other variables are all measured at baseline. In our model, as we incorporate the ownership rate as a continuous variable and interact it with a dummy variable signaling neighborhoods in the top decile, it is not straightforward to interpret the coefficients. The association between the increased rate of ownership in a block and the probability of a regulatory change is given by β_2 when the lot is not from the highest socioeconomic decile (when I_i^{SES} is zero), and $\beta_2 + \beta_3$ for lots belonging to the wealthiest blocks (when I_i^{SES} is one). Regarding income, $\beta_1 + \beta_3 \cdot Own_i$ represents the change in the probability of upzoning (or downzoning) for the wealthiest decile relative to the rest. As it depends on the ownership level, we present the estimation in figures for different values of the

Figure 4: Socioeconomic decile and ownership at the block level.



(a) Average socioeconomic decile



(b) Share of owner-occupied dwellings

Notes. Panel (a) shows the histogram of the average socioeconomic decile at the block level, and Panel (b) the histogram of the average share of owner-occupied dwellings at the block level. For consistency with previous figures, we winsorized the top and bottom 1% according to the block's area.

ownership variable and periods.

As discussed in the previous sections, our analysis does not pretend to infer causal effects, as we do not have an exogenous variation of the key variables. The model in Eq. (1) may suffer from omitted-variables bias or simultaneity, among others. To tackle this issue, besides performing a large set of robustness tests (detailed in Section 7), we use a different specification to exploit a variation of the key variable beyond the cross-section comparison. We use the previous census to study the relationship between changes in the socioeconomic composition during the previous decade, i.e., from 1992 to 2002, and changes in regulation after 2002.

For this purpose, we estimate the same model as before but change the key variable:

$$\delta_{i,t-2002} = \beta_1 \cdot I_i^{SES_{(2002)}} \cdot \left(1 - I_i^{SES_{(1992)}}\right) + \sum_{n \in N} \gamma_n \cdot X_i^n + \psi_m + \phi_d + \epsilon_i \tag{2}$$

where $I_i^{SES_{(t)}}$ is defined as above: it is 1 when the lot i is in a block whose average socioeconomic decile in year t is the highest. The ownership variable is included in the vector of controls (X_i), ψ_m are the municipality fixed effects, ϕ_d are the census district fixed effects, and θ_t the time fixed effects.

The relationship between $I_i^{SES_{(2002)}}$ and $(1 - I_i^{SES_{(1992)}})$ indicates blocks that transitioned from not being in the highest decile in 1992 to being among the wealthiest blocks. Like the model in Eq. (1), we determine if the lot was upzoned, downzoned, or not changed to create the dependent variable. On the right-hand side, we include controls measured at baseline and fixed effects for each year included in the estimation. Therefore, if we focus on downzoning, β_1 can be understood as the average change in the probability of downzoning after 2002.

4 Main Results

Table 3 and Figures 5 and 6 display the results of estimating Equation (1), which aims to determine if income and ownership are significant factors related to changes in land use regulations. Each column represents a different regression. Columns (1)–(4) present estimates using the probability of downzoning as the outcome, while Columns (5)–(8) present estimates for upzoning. All models control for municipality fixed effects, census district fixed effects, the share of single-family households in the block, the logarithm of the block's population, and the distance to the nearest subway station in 2002.

Our main results shown in Table 3 indicate that being in the top 10% socioeconomic decile is strongly linked to a higher chance of downzoning over the entire period. Specifically, when ownership levels are low, there is a 14 to 18 percentage point greater likelihood of observing downzoning in the wealthiest areas compared to others. In blocks with a null ownership rate, this correlation is directly represented by the top-decile coefficient in Table 3, which is large and statistically significant regardless of the time horizon considered.[3]

In high-income areas, a high share of owner-occupied dwellings is strongly associated with a lower probability of downzoning up to ten years later, and this effect diminishes afterward. For instance, a block with ten percentage points higher share of owner-occupied dwellings is associated

[3]The probability of downzoning associated with being in the wealthiest decile depends on the level of ownership ($\beta_1 + \beta_3 \cdot Own_i$ from Eq. (1)). The association between ownership and the likelihood of downzoning also depends on socioeconomic status (from Eq. (1), $\beta_2 + \beta_3$ for lots in the highest decile and β_2 for the rest).

Table 3: Association between socioeconomic status, ownership and the probability of land use regulation change.

	Downzoning				**Upzoning**			
	2007	2011	2015	2019	2007	2011	2015	2019
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Highest decile	0.157***	0.178***	0.143***	0.166***	-0.0447	-0.0359	0.0181	0.0181
	(0.0311)	(0.0432)	(0.0477)	(0.0520)	(0.0345)	(0.0351)	(0.0390)	(0.0439)
Ownership x	-0.217***	-0.170***	-0.126**	-0.148**	0.0546	0.0225	-0.0604	-0.0701
Highest decile	(0.0395)	(0.0574)	(0.0629)	(0.0661)	(0.0354)	(0.0372)	(0.0454)	(0.0575)
Ownership	0.0183	0.0283	0.0930***	0.0855***	0.0220	0.0504**	0.0439	0.0221
	(0.0129)	(0.0261)	(0.0299)	(0.0320)	(0.0227)	(0.0243)	(0.0341)	(0.0509)
Avg Dep. Var	0.058	0.135	0.163	0.254	0.181	0.221	0.222	0.202
R-squared	0.231	0.259	0.227	0.377	0.794	0.825	0.763	0.739
Observations	78,226	78,226	78,213	77,445	78,226	78,226	78,213	77,445

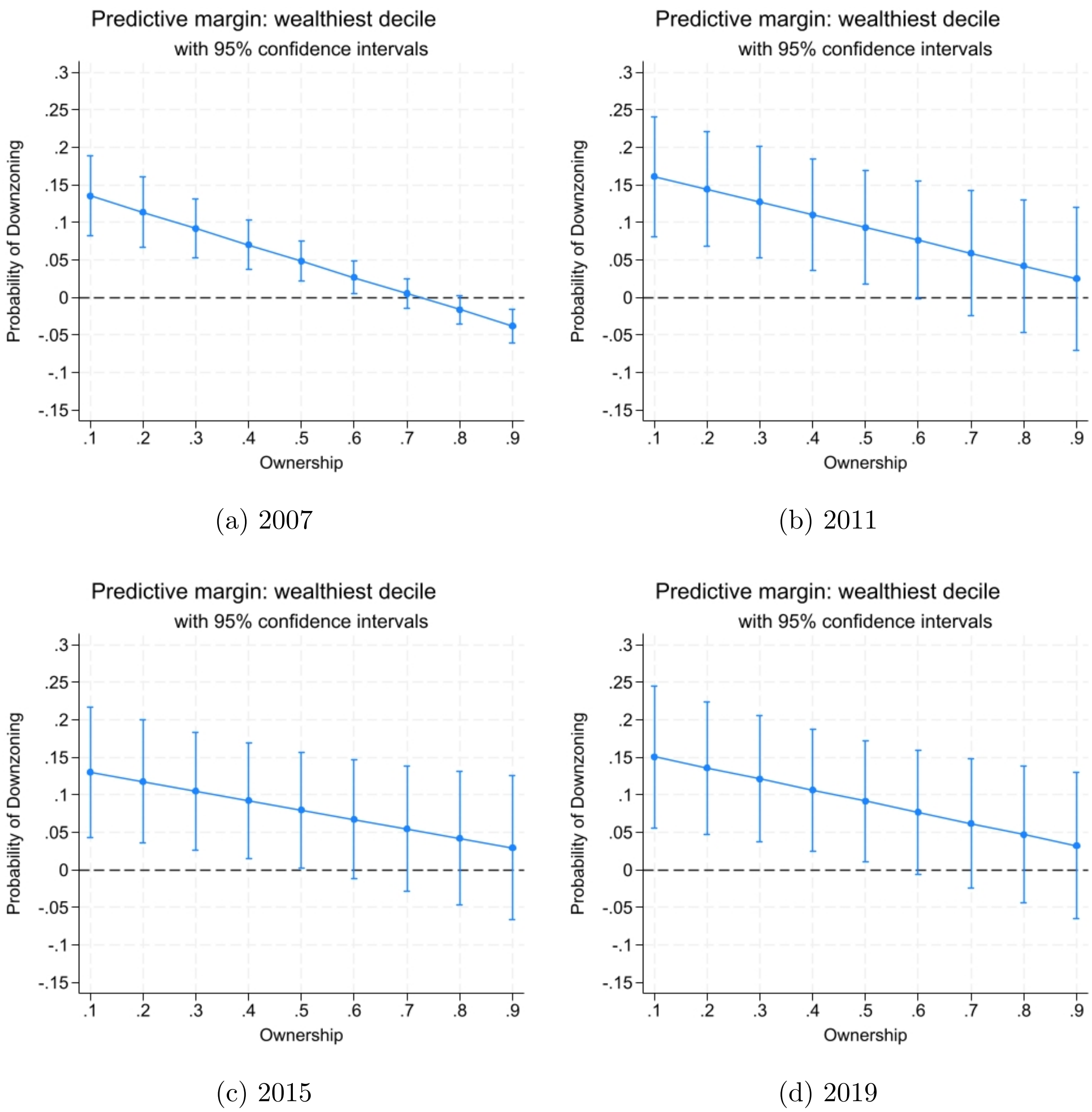
Notes: The table shows the OLS estimates between baseline socioeconomic variables (wealthiest decile, share of owner-occupied dwellings and the interaction) and the probability of downzoning (columns 1-4) and upzoning (columns 5-8). Each column reports results from a separate regression. The unit of observation is a lot observed in the baseline (year 2002), and each column uses the changes in regulation between 2002 and 2007 (columns 1 and 5), 2011 (columns 2 and 6), 2015 (columns 3 and 7), and 2019 (columns 4 and 8). All regression specifications include as control variables an indicator of whether the block is above the mean of the share of single-family housing, the log population, the distance to the metro network and municipality and census district fixed effects. Robust standard errors are clustered at the block level. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

with a two percentage point decrease in the probability of downzoning in 2007 (Table 3's column (1), a coefficient of -0.217) and a 1.7 percentage point decrease in 2011 (column (2), a coefficient of -0.170). Figure 5 summarizes the difference in probability of downzoning between high-income blocks and the rest for different ownership levels. Such figure shows that the probability of experiencing more restrictive regulations in affluent neighborhoods decreases as ownership increases. Figure 5 also illustrates that the negative relationship between wealth and downzoning is evident in most cases. Finally, we do not observe significant correlations between our key variables, ownership and top income decile, and the probability of upzoning.

On the other hand, for blocks not belonging to the wealthiest decile, the probability of downzoning or upzoning is not associated with ownership. The coefficients in the third row of Table 3 are small, and most of the years are not statistically significant, especially in 2002-2011.

Finally, Columns (5)–(8) from Table 3 and Figure 6 confirm that there is no significant association between wealth and the probability of upzoning, regardless of the ownership level for all four time periods.

Figure 5: Association between blocks in the wealthiest decile and the probability of downzoning over the years.



(a) 2007

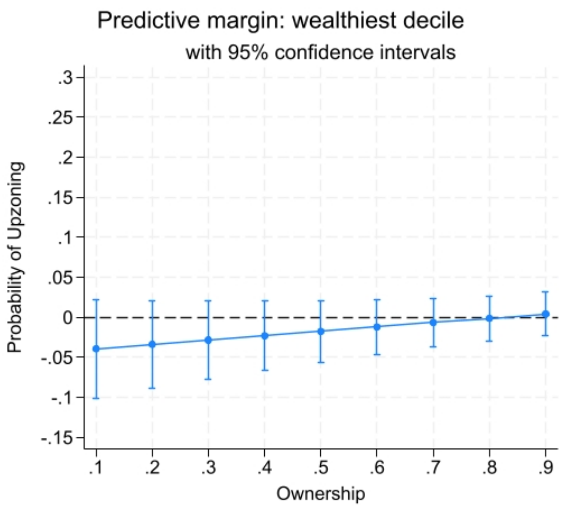
(b) 2011

(c) 2015

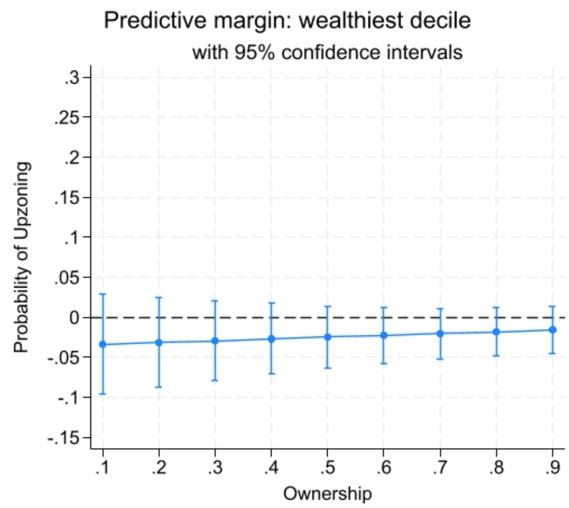
(d) 2019

Notes. Each panel shows the average marginal effect of belonging to the wealthiest decile on the predicted probability of downzoning between 2002 and 2007 (panel a), 2011 (panel b), 2015 (panel c), and 2019 (panel d) for different values of the share of owner-occupied dwellings. Each panel comes from a different regression; each is presented in Table 3's columns 1-4.

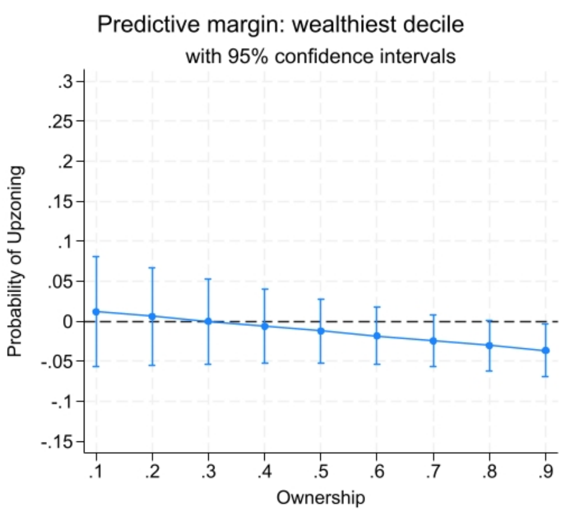
Figure 6: Association between blocks in the wealthiest decile and the probability of upzoning over the years.



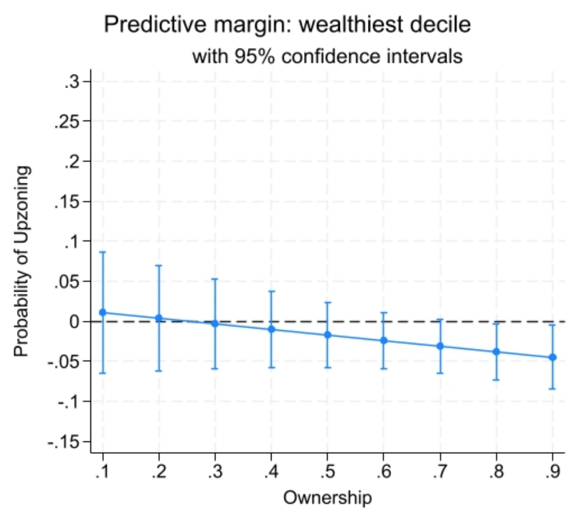
(a) 2007



(b) 2011



(c) 2015



(d) 2019

Notes. Each panel shows the average marginal effect of belonging to the wealthiest decile on the predicted probability of upzoning between 2002 and 2007 (panel a), 2011 (panel b), 2015 (panel c), and 2019 (panel d) for different values of the share of owner-occupied dwellings. Each panel comes from a different regression; each is presented in Table 3's columns 5-8.

5 Changes in neighborhoods' socioeconomic characteristics

In this Section, we estimate the model in Eq. (2) to investigate whether high income is linked to changes in land-use regulations. Specifically, we are examining the probability of downzoning or upzoning in blocks that were not in the top wealth decile in 1992 but were in 2002, compared to the rest of the blocks.[4] In the first specification in Table 4's Panel A, we use the total sample, so the comparison group consists of all blocks that did not transition to the wealthiest decile in the previous decade. In the second specification in Panel B, we are narrowing down the comparison group to blocks not part of the richest decile in 1992, excluding the already wealthy blocks in 1992 for a better counterfactual for studying changes in neighborhood composition.

Table 4: Association between changes in socioeconomic status and the probability of land use regulation change.

	Downzoning				**Upzoning**			
	2007	2011	2015	2019	2007	2011	2015	2019
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: full sample								
Becoming highest decile	0.00726	0.0306***	0.0262**	0.0162	-0.00166	-0.00544	-0.00271	0.0118
	(0.00618)	(0.0110)	(0.0111)	(0.0122)	(0.00824)	(0.00799)	(0.00794)	(0.0104)
Avg Dep. Var	0.0575	0.135	0.163	0.254	0.181	0.221	0.222	0.202
R-squared	0.446	0.619	0.581	0.686	0.794	0.825	0.762	0.739
Observations	78,226	78,226	78,213	77,445	78,226	78,226	78,213	77,445
Panel B: restricted sample								
Becoming highest decile	0.0160***	0.0690***	0.0664***	0.0544**	0.0253	-0.000555	-0.0129	-0.0208
	(0.00571)	(0.0227)	(0.0228)	(0.0239)	(0.0156)	(0.0153)	(0.0154)	(0.0205)
Avg Dep. Var	0.0302	0.0996	0.127	0.234	0.162	0.165	0.191	0.197
R-squared	0.543	0.632	0.611	0.736	0.777	0.798	0.748	0.731
Observations	45,926	45,926	45,924	45,852	45,926	45,926	45,924	45,852

Notes: The table shows the OLS estimates of downzoning (columns 1-4) and upzoning (columns 5-8) on an indicator variable of whether a block transitioned from not belonging to the wealthiest decile to do so. Each column reports results from a separate regression and uses the changes in regulation between 2002 and 2007 (columns 1 and 5), 2011 (columns 2 and 6), 2015 (columns 3 and 7), and 2019 (columns 4 and 8). The unit of observation is a lot observed in each year between the baseline (year 2002) and the years indicated for each column. All regression specifications include as control variables an indicator of whether the block is above the mean of the share of single-family housing, the log population, the distance to the metro network and municipality, census district, and year fixed effects. Robust standard errors are clustered at the block level. Statistical significance: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 4 summarizes the estimation of Eq. (2) for different periods. Each column is a different regression and uses a different sample for the estimation, where the year indicates the end of the period used. Column (1), for instance, estimates the model using the 78,226 lots in our sample observed for six years (2002–2007). Column (2) adds four years to the sample, and the process repeats until 2019 with the whole sample. Also, regressions in columns (1)–(4) use downzoning as an outcome, and in columns (5)–(8), upzoning.

[4] The Chilean census right before 2002 took place in 1992.

The estimates in Table 4 show that blocks that transitioned into the wealthiest decile between 1992 and 2002 are more likely to experience stricter regulation afterward. The findings are statistically significant in both scenarios, with larger coefficients observed when the comparison group excludes already wealthy neighborhoods (Panel B). In this case, the places that became rich are between one and four percentage points more likely to get downzoned. These results provide further evidence of the connection between wealth and downzoning.

6 Heterogeneity

This Section shows estimates of our main equation in different subsamples to examine heterogeneous effects. We begin by studying land use regulatory changes in blocks with a low share of single-family housing. The hypothesis, drawn from the U.S. literature, is that in areas dominated by single-family housing, the pressure for the status quo is stronger. Then, we focus on changes that were part of a geographically broader regulatory change. Again, the literature discussed above suggests that legal changes affecting broad areas can create a more neutral regulatory environment, balancing the interests of affluent residents and homeowners with those of the real estate industry.

6.1 Low share of single-family housing

We estimate Equation (1) for lots in blocks with a low share of single-family housing, which are primarily characterized by a significant presence of buildings or multi-family housing. We restrict our sample to blocks with an average share of single-family housing below the median. Table 5 presents the results, which are analogous to those in Table 3.

Results in Table 5 are consistent with those in Table 3, though the coefficients tend to be larger in magnitude. This suggests that in areas that have experienced significant densification, wealthier residents are more likely to advocate for downzoning. These findings imply that residents are responding to the increased construction of buildings, with high-income residents in these areas more strongly associated with efforts to restrict further development through downzoning. Therefore, land use regulatory changes that become stricter over time seem to be a reactive process rather than the protection of low-density neighborhoods.

6.2 Large changes

In this second exercise, we restrict the sample to regulatory changes that were part of large-scale transformations, specifically those affecting areas larger than 5 sq. km. We aim to examine the relationship between income, ownership, and urban regulation in these comprehensive changes.

Table 5: Association between socioeconomic status, ownership and the probability of land use regulation change. Subsample with low share of single-family housing.

	Downzoning				Upzoning			
	2007	2011	2015	2019	2007	2011	2015	2019
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Highest decile	0.198***	0.255***	0.210***	0.270***	0.0192	0.0859	0.00987	0.0352
	(0.0538)	(0.0635)	(0.0694)	(0.0722)	(0.0881)	(0.0931)	(0.104)	(0.0964)
Ownership x	-0.256***	-0.371***	-0.265**	-0.354***	0.0280	0.0330	-0.119**	-0.123**
Highest decile	(0.0929)	(0.109)	(0.116)	(0.119)	(0.0510)	(0.0520)	(0.0610)	(0.0620)
Ownership	0.00339	0.114	0.186**	0.204***	0.00913	-0.0534	-0.129	-0.158**
	(0.0457)	(0.0704)	(0.0730)	(0.0744)	(0.0686)	(0.0741)	(0.0836)	(0.0804)
Avg Dep. Var	0.147	0.203	0.239	0.335	0.325	0.326	0.311	0.290
R-squared	0.447	0.455	0.412	0.509	0.713	0.724	0.643	0.616
Observations	31,919	31,919	31,901	31,344	31,919	31,919	31,901	31,344

Notes: The table shows the OLS estimates between baseline socioeconomic variables (wealthiest decile, share of owner-occupied dwellings and the interaction) and the probability of downzoning (columns 1-4) and upzoning (columns 5-8). Each column reports results from a separate regression. The unit of observation is a lot observed in the baseline (year 2002), and each column uses the changes in regulation with respect to 2007 (columns 1 and 5), 2011 (columns 2 and 6), 2015 (columns 3 and 7), and 2019 (columns 4 and 8). Only lots in a block with an average share of single-family housing below the mean are included in the sample. All regression specifications include as control variables an indicator of whether the block is above the mean of the share of single-family housing, the log population, the distance to the metro network and municipality and census district fixed effects. Robust standard errors are clustered at the block level. Statistical significance: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 6 presents the results. In line with existing literature, we find that the association between high-income blocks and downzoning weakens considerably when focusing on large-scale regulatory changes. A plausible explanation for this finding is the increased interest and influence of the real estate industry in these larger areas, which may mitigate the impact of high-income residents on downzoning efforts.

7 Robustness

In this section, we present our set of robustness tests. In Panel A of Table 7, we estimate the main equation for downzoning excluding control variables, retaining only the fixed effects. We do this to account for possible biases in the selection of the control variables. In Panel B, we substitute the baseline year controls for population and the number of households with those measured in 1992. Finally, Panel C examines changes where the maximum FAR or height was reduced by 20% or more. The results remain consistent when excluding or altering covariates but are sensitive to the intensity of the changes. Specifically, when focusing on reductions of 20% or more, the relationship between high-income and downzoning becomes weaker in the short term.

Our last robustness check is to estimate Eq. (1) using a Poisson Pseudo Maximum Likelihood

Table 6: Association between socioeconomic status, ownership and the probability of land use regulation change. Subsample of regulatory changes that cover more than 5 square kilometers.

	Downzoning				Upzoning			
	2007	2011	2015	2019	2007	2011	2015	2019
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Highest decile	0.0624*	0.0458	-0.0457	0.0006	-0.115**	-0.0539	0.0480	0.0295
	(0.0355)	(0.0452)	(0.0564)	(0.0663)	(0.0486)	(0.0553)	(0.0660)	(0.0674)
Ownership x Highest decile	-0.0736*	-0.0263	0.110	0.0517	0.160***	0.0418	-0.119	-0.0974
	(0.0446)	(0.0613)	(0.0776)	(0.0857)	(0.0594)	(0.0713)	(0.0882)	(0.0887)
Ownership	0.0217	-0.0259	0.0960*	0.0939	0.0138	0.131**	0.0594	-0.0530
	(0.0283)	(0.0442)	(0.0522)	(0.0584)	(0.0444)	(0.0539)	(0.0682)	(0.0663)
Avg Dep. Var	0.0789	0.293	0.365	0.470	0.485	0.599	0.599	0.524
R-squared	0.503	0.771	0.687	0.701	0.804	0.774	0.672	0.705
Observations	50,211	50,211	50,215	49,648	50,211	50,211	50,215	49,648

Notes: The table shows the OLS estimates of the probability of downzoning (columns 1-4) and upzoning (columns 5-8) on baseline socioeconomic variables (wealthiest decile, share of owner-occupied dwellings, and their interaction). Each column reports results from a separate regression. The unit of observation is a lot observed in the baseline (year 2002), and each column uses the changes in regulation with respect to 2007 (columns 1 and 5), 2011 (columns 2 and 6), 2015 (columns 3 and 7), and 2019 (columns 4 and 8). Only lots that were part of large-scale transformations, specifically those affecting areas larger than 5 sq. km., are considered in the regressions. All regression specifications include as control variables an indicator of whether the block is above the mean of the share of single-family housing, the log population, the distance to the metro network and municipality and census district fixed effects. Robust standard errors are clustered at the block level. Statistical significance: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

estimator. This is because the main dependent variables are non-negative integers (either 0 or 1) and the linear probability model may fail to account for this. Therefore, we also estimate the treatment effects using a count data model. The results are summarized in Table 8 and confirm that our findings are robust.

Table 7: Association between socioeconomic status, ownership and the probability of land use regulation change. Robustness checks.

	2007	2011	2015	2019
	(1)	(2)	(3)	(4)
Panel A: Downzoning without controls				
Highest decile	0.189***	0.214***	0.163***	0.175***
	(0.0290)	(0.0428)	(0.0472)	(0.0526)
Ownership x Highest decile	-0.255***	-0.212***	-0.149**	-0.158**
	(0.0368)	(0.0561)	(0.0616)	(0.0656)
Ownership	0.00918	0.0320	0.0877***	0.0797**
	(0.0124)	(0.0265)	(0.0301)	(0.0316)
Avg Dep. Var	0.0575	0.135	0.163	0.254
R-squared	0.448	0.621	0.583	0.689
Observations	78,226	78,226	78,213	77,445
Panel B: Downzoning with 1992 controls				
Highest decile	0.173***	0.174***	0.133***	0.149***
	(0.0299)	(0.0384)	(0.0431)	(0.0475)
Ownership x Highest decile	-0.230***	-0.153**	-0.104	-0.119
	(0.0368)	(0.0561)	(0.0616)	(0.0656)
Ownership	0.00351	0.0116	0.0741***	0.0681**
	(0.0135)	(0.0240)	(0.0277)	(0.0301)
Avg Dep. Var	0.0576	0.135	0.163	0.254
R-squared	0.450	0.623	0.584	0.689
Observations	78,219	78,219	78,206	77,438
Panel C: Downzoning intensity 20%				
Highest decile	0.0524***	0.0582**	0.00538	0.0947**
	(0.0199)	(0.0267)	(0.0345)	(0.0468)
Ownership x Highest decile	-0.00883	-0.000526	0.0673***	0.0598**
	(0.00864)	(0.0168)	(0.0225)	(0.0276)
Ownership	-0.0779***	-0.0850***	-0.0194	-0.114**
	(0.0243)	(0.0325)	(0.0423)	(0.0510)
Avg Dep. Var	0.0219	0.0448	0.0731	0.158
R-squared	0.500	0.548	0.506	0.663
Observations	72,291	71,930	71,433	67,919

Notes: The table shows the OLS estimates of the probability of downzoning (columns 1-4) on baseline socioeconomic variables (wealthiest decile, share of owner-occupied dwellings and their interaction). Each column in each panel reports results from a separate regression. The unit of observation is a lot observed in the baseline (year 2002), and each column uses the changes in regulation between 2002 and 2007 (column 1), 2011 (column 2), 2015 (column 3), and 2019 (column 4). All regression specifications include municipality and census district fixed effects. Regressions in Panel A do not include additional control variables. Panel B uses the log population and the log number of households in 1992 as control variables. Panel C changes the definition of downzoning, considering only reductions in the maximum height or FAR larger than 20%. Regressions in Panel C use as control variables: an indicator of whether the block is above the mean of the share of single-family housing, the log population, the distance to the metro network, and municipality and census district fixed effects. Robust standard errors are clustered at the block level. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 8: Association between socioeconomic status, ownership and the probability of land use regulation change. PPML.

	2007	2011	2015	2019
	(1)	(2)	(3)	(4)
Highest decile	1.409***	0.810***	0.585***	0.493***
	(0.306)	(0.235)	(0.196)	(0.157)
Ownership x Highest decile	-2.613***	-0.905**	-0.671**	-0.516**
	(0.561)	(0.365)	(0.313)	(0.232)
Ownership	1.028**	0.184	0.722***	0.378**
	(0.486)	(0.342)	(0.265)	(0.158)
Avg Dep. Var	0.205	0.344	0.364	0.478
Observations	29,237	35,515	49,170	60,191

Notes: The table shows the Poisson Pseudo Maximum Likelihood estimates between baseline socioeconomic variables (wealthiest decile, share of owner-occupied dwellings and the interaction) and the probability of downzoning (columns 1-4). Each column reports results from a separate regression. The unit of observation is a lot observed in the baseline (year 2002), and each column uses the changes in regulation with respect to 2007 (column 1), 2011 (column 2), 2015 (column 3), and 2019 (column 4). All regression specifications include as control variables an indicator of whether the block is above the mean of the share of single-family housing, the log population, the distance to the metro network and municipality and census district fixed effects. As the number of fixed effects is high, there are several separated observations. This explains the drop in observations with respect to Table 3. Robust standard errors are clustered at the block level. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

8 Summary, discussion and policy implications

Enacting and modifying land use regulations is a highly technical and often opaque institutional process, yet it carries significant economic, social, and political implications. Recent research has sought to uncover the political and economic factors driving land use decisions, though access to the necessary data remains a major barrier to academic contributions in this crucial policy area. This paper aims to address this gap by analyzing an original database constructed by the authors that contains information on land use regulations governing real estate development over the past 20 years in a large urban area comprising 15 municipalities in Santiago, the capital of Chile.

Most existing studies on the factors influencing land use regulations have focused on suburban contexts in the U.S.A., where the role of homeowners is particularly pronounced due to its particular social and political dynamics. However, inner-city contexts differ substantially. They should provide a more level playing field for all stakeholders involved in land use decisions. Yet evidence on the determinants of land use regulations in inner cities is scarce and predominantly focuses on U.S. metropolitan areas (Been et al., 2014; Gabbe, 2018; Hilber and Robert-Nicoud, 2013). This paper fills that gap by presenting evidence from a vast urban area in one of Latin America's largest and most economically dynamic cities. Furthermore, we use administrative records to codify and georeference land use regulations that applied to all lots across Santiago's urban landscape over a 20-year period. This distinguishes our study from recent research that relies on cross-sectional data or survey-based analyses (Hilber and Robert-Nicoud, 2013; Gyourko et al., 2021; Jackson, 2016; Brueckner et al., 2017).

The results of this study highlight the significant role of socioeconomic status in influencing land use regulatory changes. Our analysis suggests that neighborhoods with a high concentration of residents in the top-income decile are more likely to experience stricter land use regulations over time. This finding implies that socioeconomic status is a key driver of downzoning processes, perhaps even more so than factors such as homeownership, which previous literature has emphasized. Moreover, our results indicate that the presence of homeowners tends to counterbalance the influence of high-income residents in favoring strict land use norms.

Studies from U.S. metropolitan areas have emphasized homeownership—rather than socioeconomic status—as the primary driver of stricter land use controls (Been et al., 2014; Gabbe, 2018; Hilber and Robert-Nicoud, 2013). By contrast, our analysis shows that homeownership is correlated with a lower probability of downzoning, indicating that homeowners may prioritize a favorable regulatory environment for profitable housing development rather than opposing dense developments. The exception to this trend occurs in affluent neighborhoods, where homeownership remains a crucial factor but in a different direction than previously thought. In these cases, affluent residents, rather than homeowners per se, resist more flexible zoning regulations to preserve the social and physical character of their neighborhoods.

Another key divergence from prior studies is that the association between high-income residents and land use regulations does not strengthen when we limit our sample to blocks dominated by single-family housing. On the contrary, it appears that in already dense neighborhoods, high-income residents push for stricter regulations. A possible explanation for this finding is that local opposition to development intensifies only after taller buildings are constructed, prompting residents to mobilize against future real estate projects.

One factor that may mitigate the influence of high-income residents and homeowners is the scale of the regulatory change. Schleicher (2012) argues that modern land use law in the U.S. favors small, localized zoning changes, which impose high costs on developers seeking to alter regulations for dense real estate projects. These developments often face resistance from neighboring property owners, who can easily coordinate efforts to block the proposed changes. Meanwhile, developers and potential housing consumers face greater challenges in organizing collective action. However, in large-scale zoning changes, the cost-benefit analysis may shift in favor of the real estate industry, as the changes could impact more companies. In our analysis of land use changes covering more than 5 square kilometers, the association between high-income residents and a higher likelihood of downzoning weakens, providing empirical support for the idea that the real estate industry can counterbalance the influence of affluent residents when its interests are sufficiently large.

Our findings show that the political-economic context shaping land use decisions is highly heterogeneous in socially segmented cities. The regulatory landscape faced by city planning officials differs dramatically between high-income areas and the rest of the city.

References

Alves, G. (2021). Slum growth in brazilian cities. *Journal of Urban Economics*, 122:103327.

Anagol, S., Ferreira, F. V., and Rexer, J. M. (2021). Estimating the economic value of zoning reform. Technical report, National Bureau of Economic Research.

Been, V., Madar, J., and McDonnell, S. (2014). Urban Land-Use Regulation: Are Homevoters Overtaking the Growth Machine? *Journal of Empirical Legal Studies*, 11(2):227–265. _eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/jels.12040.

Brueckner, J. K. (2009). Government Land Use Interventions: An Economic Analysis. In Lall, S. V., Freire, M., Yuen, B., Rajack, R., and Helluin, J.-J., editors, *Urban Land Markets: Improving Land Management for Successful Urbanization*, pages 3–23. Springer Netherlands, Dordrecht.

Brueckner, J. K., Fu, S., Gu, Y., and Zhang, J. (2017). Measuring the stringency of land use regulation: The case of china's building height limits. *Review of Economics and Statistics*, 99(4):663–677.

Brueckner, J. K. and Singh, R. (2020). Stringency of land-use regulation: Building heights in us cities. *Journal of Urban Economics*, 116:103239.

Einstein, K. L., Palmer, M., and Glick, D. M. (2019). Who Participates in Local Government? Evidence from Meeting Minutes. *Perspectives on Politics*, 17(1):28–46. Publisher: Cambridge University Press.

Ellickson, R. C. (2020). The Zoning Straitjacket: The Freezing of American Neighborhoods of Single-Family Houses. *Indiana Law Journal*, 96(2):395–428.

Fischel, W. A. (2002). *The homevoter hypothesis: How home values influence local government taxation, school finance, and land-use policies*. Harvard University Press Cambridge, MA.

Florida, R. (2017). *The New Urban Crisis: How Our Cities Are Increasing Inequality, Deepening Segregation, and Failing the Middle Class-and What We Can Do About It*. Hachette UK. Google-Books-ID: 5mQRDgAAQBAJ.

Gabbe, C. J. (2018). Why Are Regulations Changed? A Parcel Analysis of Upzoning in Los Angeles. *Journal of Planning Education and Research*, 38(3):289–300. Publisher: SAGE Publications Inc.

Gil, D. (2019). Law and inclusive urban development: lessons from chile's enabling markets housing policy regime. *The American journal of comparative law*, 67(3):587–636.

Glaeser, E., Gyourko, J., and Saks, R. (2005). Why Is Manhattan So Expensive? Regulation and the Rise in Housing Prices. *The Journal of Law and Economics*, 48(2):331–369. Publisher: The University of Chicago Press.

Glaeser, E. L. and Ward, B. A. (2009). The causes and consequences of land use regulation: Evidence from Greater Boston. *Journal of Urban Economics*, 65(3):265–278.

Gyourko, J., Hartley, J. S., and Krimmel, J. (2021). The local residential land use regulatory environment across U.S. housing markets: Evidence from a new Wharton index. *Journal of Urban Economics*, 124:103337.

Gyourko, J. and Molloy, R. (2015). Chapter 19 - Regulation and Housing Supply. In Duranton, G., Henderson, J. V., and Strange, W. C., editors, *Handbook of Regional and Urban Economics*, volume 5 of *Handbook of Regional and Urban Economics*, pages 1289–1337. Elsevier.

Hankinson, M. (2018). When Do Renters Behave Like Homeowners? High Rent, Price Anxiety, and NIMBYism. *American Political Science Review*, 112(3):473–493. Publisher: Cambridge University Press.

Hilber, C. A. and Robert-Nicoud, F. (2013). On the origins of land use regulations: Theory and evidence from US metro areas. *Journal of Urban Economics*, 75:29–43.

Hilber, C. A. and Vermeulen, W. (2016). The impact of supply constraints on house prices in england. *The Economic Journal*, 126(591):358–405.

Hills Jr, R. M. and Schleicher, D. (2015). Planning an affordable city. *Iowa L. Rev.*, 101:91.

Ihlanfeldt, K. R. (2007). The effect of land use regulation on housing and land prices. *Journal of Urban Economics*, 61(3):420–435.

Jackson, K. (2016). Do land use regulations stifle residential development? evidence from california cities. *Journal of Urban Economics*, 91:45–56.

Kahn, M. E., Vaughn, R., and Zasloff, J. (2010). The housing market effects of discrete land use regulations: Evidence from the california coastal boundary zone. *Journal of Housing Economics*, 19(4):269–279.

Kok, N., Monkkonen, P., and Quigley, J. M. (2014). Land use regulations and the value of land and housing: An intra-metropolitan analysis. *Journal of Urban Economics*, 81:136–148.

Logan, J. R. and Molotch, H. L. (1987). *Urban Fortunes: The Political Economy of Place*. University of California Press.

Mendía, S. (2022). *Análisis territorial de la brecha habitacional y el déficit potencial comunal: un insumo para el plan de emergencia habitacional*. Disponible [ONLINE] en https:// deficitcero.cl/.

Ministerio de Desarrollo Social (2018). *Encuesta Casen 2017. Síntesis de Resultados*. Ministerio de Desarrollo Social.

Ministerio de Vivienda y Urbanismo (2013). *Hacia Una Nueva Política Urbana Para Chile: Elementos de Diagnóstico*. Ministerio de Vivienda y Urbanismo.

Ministerio de Vivienda y Urbanismo (2020a). *Catastro Nacional de Campamentos*. Ministerio de Vivienda y Urbanismo.

Ministerio de Vivienda y Urbanismo (2020b). *Metodología Del Cálculo Del Déficit Habitacional Cuantitativo Ajustada al Censo 2017*. Ministerio de Vivienda y Urbanismo.

Ministerio de Vivienda y Urbanismo (2022). *Déficit Habitacional Casen En Pandemia 2020: Resultados y Notas Metodológicas*. Ministerio de Vivienda y Urbanismo.

Molotch, H. (1976). The City as a Growth Machine: Toward a Political Economy of Place. *American Journal of Sociology*, 82(2):309–332. Publisher: The University of Chicago Press.

Razmilic Burgos, S. A. (2010). *Property values, housing subsidies and incentives: evidence from Chile's current housing policies*. PhD thesis, Massachusetts Institute of Technology.

Schleicher, D. (2012). City Unplanning. *Yale Law Journal*, 122(7):1670–1737.

Serkin, C. (2020). A Case for Zoning. *Notre Dame Law Review*, 96(2):749–798.

Turner, M. A., Haughwout, A., and Van Der Klaauw, W. (2014). Land use regulation and welfare. *Econometrica*, 82(4):1341–1403.

Vergara-Perucich, J. F. and Aguirre-Nuñez, C. (2019). Housing prices in unregulated markets: Study on verticalised dwellings in santiago de chile. *Buildings*, 10(1):6.

Vicki Been, I. G. E. and O'Regan, K. (2019). Supply skepticism: Housing supply and affordability. *Housing Policy Debate*, 29(1):25–40.

Zhang, J. (2023). Jue insight: Measuring the stringency of land use regulation using a shadow price approach. *Journal of Urban Economics*, 133:103461. Special Issue: JUE Insight Shorter Papers.