NAVIGATING UPZONING: AN INSTITUTIONAL-BASED VIEW OF HOUSEBUILDERS' STRATEGIC RESPONSE TO TRANSIT-ORIENTED ZONING REGULATION IN SAO PAULO (ST-01)

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Sessão Temática 01: Produção do Espaço Urbano e Regional

Resumo: Este artigo aplica a perspectiva institucional da estratégia para investigar como incorporadoras residenciais especulativas em São Paulo responderam a cenários transitórios de mudanças nas regulamentações de zoneamento, considerando um modelo analítico centrado nas contingências em escala local do processo de desenvolvimento. A partir da análise de um conjunto de dados único sobre a produção habitacional desagregada, chegamos a três principais conclusões: primeiro, os mercados de terra tornam-se mais competitivos dentro dos distritos TOZ, resultando no aumento do poder oligopolista das empresas capazes de assegurar terrenos para desenvolvimento; segundo, a conformidade com as regulamentações de uso do solo promoveu mudanças estruturais nas características dos novos empreendimentos; e terceiro, a oferta de habitação compacta contribuiu para alavancar o desempenho financeiro durante um período de recuperação econômica. Os resultados corroboram a visão de que decisões de adensamento construtivo – entendidas como parte da estrutura institucional do processo de desenvolvimento – impõem tanto restrições quanto oportunidades para a atividade de incorporação residencial. Além disso, ao analisar a variação temporal dos indicadores de oferta habitacional, o estudo demonstra a existência de uma estratégia de precificação e uma estratégia de volume na forma como as incorporadoras empregam estratégias locais para responder a contingências estruturais mais amplas.

Palavras-chave: Visão institucional da estratégia; Incorporação residencial; Reforma zoneamento; Incorporadoras imobiliárias; São Paulo.

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NAVIGATING UPZONING: AN INSTITUTIONAL-BASED VIEW OF HOUSEBUILDERS' STRATEGIC RESPONSE TO TRANSIT-ORIENTED ZONING REGULATION IN SAO PAULO

Resumo: This paper applies the institutional-based view of strategy to investigate how speculative housebuilders in Sao Paulo have responded to transitionary scenarios in zoning regulations, considering an analytical framework centred on the local-scale contingencies of the development process. By looking at a unique dataset of disaggregated housing output, we draw three main conclusions: first, land markets become more competitive inside TOZ districts, resulting in increased oligopolistic power of those firms able to secure development sites; second, compliance with land use regulations promoted structural changes in building features of new schemes; and third, the supply of compact housing helped to leverage financial performance during a period of economic recovery. The findings corroborate the view that upzoning decisions – seen as part of the institutional structure of the development process – offer both constraints and enablers for residential development activity. Furthermore, by analysing the time variance in the behaviour of the housing supply indicators, the study demonstrates a price strategy and a volume strategy in the way housebuilders employ local strategies to respond to wider structural contingencies..

Palavras-chave: Institutional-base view; Housebuilders; Upzononing; Property development; Sao Paulo .

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1. INTRODUCTION

Plan-led and market-oriented planning policies imply the design of wider spatial strategies by the government to intervene—either enabling or constraining—in the decision-making process of what and where development initiatives take place (Meijer and Buitelaar, 2023, Rydin, 1998). In zoning systems, the overall rationale is that if developers comply with pre-determined regulatory conditions, planning approval is granted and, through the combination of the parts, planning goals will be achieved in the mid- and long-term (Valtonen et al., 2017). Therefore, such an approach to urban planning requires a deeper understanding of the intricacies, motivations and forms through which developers operate. Edward Kaiser and Shirley Weiss had already stressed in 1970 that "if public policy is to be effective in guiding patterns of new urban growth, it must be based on a realistic understanding of the development process" (Kaiser and Weiss, 1970). Unrealistic assumptions regarding how the development industry operates may overlook that, for instance, policies shape the market by encouraging some types of developers to enter the market and discouraging others (Coiacetto, 2000). The present study adds to these perspectives through an empirical analysis of the local contingencies associated with the residential development process and an institutional-based interpretation of why housebuilders behave in the way they do after implementing transit-oriented upzoning strategies. The study's main contribution lies in analysing the institutional setting defining strategy in the residential development process and the resulting built form.

The housebuilding industry consists of a comprehensive network of relationships organising all elements of the development process in ways governed by actors' motivations and interests (collective and individual) within a wider assemblage of institutional norms (Henneberry and Parris, 2013, Brill and Raco, 2022, Robin and Brill, 2018). On the one hand, the modes and strategies in which development takes place intertwine in a way that makes each development project singular. On the other hand, market and regulatory contingencies create investment scenarios that influence homogeneous decision-making across the industry at one time and space (Leishman et al., 2020, Adams and Füss, 2010). Combined, these two levels dictate housebuilders' responsiveness regarding how, when, and where to take an investment forward. Hence, the multiple possible combinations of material features, finance, interests, and regulations make each development project unique, and together, these factors are determinants of the variation seen in housing output across space and time. Notably, the outcome of this intricate organisation of inputs and outputs is seen by Healey (1992) not only as the physical structures sculpting the built environment but also as the range of property rights and symbolic values created.

After a period of prolific theoretical and empirical contributions to research on the property development industry and its modes of operation (see, for example, Adams, 1994, Keogh and D'Arcy, 2016, Coiacetto, 2007, Coiacetto, 2009, Doak and Karadimitriou, 2007, Henneberry and Parris, 2013, Guy and Henneberry, 2000, Hackworth, 2009), in the last decade the focus has shifted primarily to the role of finance and the way actors operate in the built environment to sustain financial capital remuneration (Halbert and Attuyer, 2016). Financialisation studies have concentrated on unveiling the strategies of investment in property development, revealing their

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capacity to shape development outcomes across contexts (Beswick et al., 2016). Research has shown the various nature of investor–developer relationships (Sanfelici and Halbert, 2015) and the governance of financialised forms of real estate (Anselmi and Vicari, 2019). Yet, this strand of the literature falls short of explaining how development strategies take place and what changes when considering institutional settings upheavals, with a focus on their capacity to respond to local planning policy. We aim to fill this gap by analysing speculative housebuilders' strategy to navigate transitionary scenarios in local planning regulations, considering an analytical framework centred on the local-scale contingencies of their decision-making process.

The paper proceeds in the following way. Section two addresses the theoretical perspective adopted in the analysis and presents an institutional-based view of residential development strategies during periods of institutional transitions. Section three describes the multi-scale nature of the development process and addresses the three local contingency factors influencing decision-making: land markets, local planning regulations and housing submarkets. Section four describes the case of Transit-oriented Zoning (TOZ) regulation in Sao Paulo and introduces the analytical framework employed in the analyses. In section four, we draw the empirical analyses using empirical indicators of the local contingency factors of the housebuilding activities in TOZ, arguing land markets become more competitive inside upzoned districts, which may increase the oligopolistic power of housebuilding firms; compliance with land use regulations promoted structural changes in building features of new schemes; and the supply of compact housing helped to leverage financial performance during a period of economic recovery. Section five discusses the empirical evidence in light of the IBV framework and explains the time-variant behaviour of housebuilders in TOZ. Finally, section six provides conclusion remarks.

2. INSTITUTIONAL-BASED VIEW OF THE PROPERTY DEVELOPMENT PROCESS

This study takes an institutional-based view (IBV) of strategy in the residential development process as a framework to analyse how housebuilders respond to regulatory changes in zoning, given the set of local contingency factors that influence industry behaviour. The aim is to depict the housebuilding activity beyond the limits of supply and demand signals in housing markets and provide an interpretation of the wider forces, local interests and agencies interacting over time (Kemp, 2007) in producing the urban landscape. By doing so, the paper employs the concept of an institutional-based view of strategy in decision-making to draw a holistic understanding of the local factors shaping development activity. This approach sheds light on how institutionally driven upheavals reorientate decision-making in the speculative housebuilding process based on punctuated equilibrium. This section describes what constitutes IBV in business strategy and how such a theoretical framework is useful to assess recent changes in the development industry's behaviour in Sao Paulo.

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For the past two decades, the field of strategic management has reinforced considerations of the role of institutional settings in shaping strategic decisions at the firm level, highlighting their significance beyond a static background condition (Peng et al., 2009, Garrido et al., 2014). Peng (2002) proposes an IBV of strategy in which he conceives firms' strategic choices resulting from the dynamic interaction between organisations and the formal and informal institutional environment. The IBV paradigm concerns the mechanisms through which institutions constrain or enable business organisations and how firms develop strategic behaviour to maximise benefits under the ruling institutional setting. In particular, (Rumelt et al., 1994) suggests that through the IBV, the understanding of the role of institutions (and their changes thereof) may help to decipher how firms behave, why firms are different, the determinants of their scope, and the causes for their success or failure in competition. The underlying assumption is that institutional settings interact with organisations by signalling which choices are acceptable and supportable under their business models (Peng and Heath, 1996, Peng et al., 2009, Peng et al., 2008, Peng et al., 2022).

Institutions, in that sense, are defined as "forms of ongoing and relatively stable patterns of social practice based on mutual expectations that owe their existence to either purposeful constitution or unintentional emergence" (Bathelt and Glückler, 2013; 346). They consist of "established and prevalent social rules that structure social interactions" (Hodgson, 2016; 2) and determine "the rules of the game in a society" (North, 1990). In summary, institutions are relevant because they shape and influence behaviours and power relationships in markets and societies. They are not only formed by formal rules formulated in political and juridical instances but also by informal structures embodied in customs, traditions, and societal codes of conduct (North, 1990). Despite their relevance being almost unquestioned in the social sciences, a more contentious debate exists around "how […], under what circumstances, to what extent, and in what ways" (Powell, 1996; 296) institutions matter and exert influence over social actors.

Stephen Bell (1998) argues that "it is probably best not to think of institutions as a 'thing' but as a process or set of processes which shape behaviour", giving evidence to the dynamic nature of such social structures. This dynamism was consolidated in the concept of "punctuated equilibrium", which refers to lengthy periods of institutional stability disrupted by occasional exogenous shocks, leading to the breakdown of one equilibrium stage and a shift to a new one (Thelen and Conran, 2016). For Thelen and Steinmo (1992), such changes may be caused by 'broad changes in the socioeconomic or political context [that] can produce a situation in which previously latent institutions suddenly become salient' or when 'exogenous changes produce a shift in the goals or strategies being pursued within existing institutions'.

Mike Peng (2003) applies the IBV of strategy using a two-phased theoretical model describing how institutional transitions in emerging capitalist economies in Eastern Europe affected firms' strategic decisions. Initially, he explains, institutional changes occur incrementally in a way that marginal adjustments are introduced into the complex framework of norms, rules, and behaviours that define institutions (North, 1990). However, the author also identifies that "periods of stability […] are likely to be punctuated by discontinuous transformations" (2003; 278) that tend to be more disruptive in their effect on organisations. The idea of punctuated equilibrium is reiterated as

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companies seek to return to a point of stability already known after the institutional shock occurs. In Peng's model, the institutional transition represented by the economic system drives a two-stage response in market actors, namely an *early transition phase*, when uncertainties in formal institutional constraints often force actors to rely on informal and interpersonal relationships, and a *late transition phase*, whereby rule-based and impersonal relationships prevail and are widely absorbed within market practices implying that the need for informal network-based strategy increasingly diminishes.

Essentially, agents governed by institutions tend to be reluctant or even unresponsive to the prompt absorption of new regulatory, normative, and cognitive codes during early transition stages (Scott, 1995). North (1990) and Peng (2003) suggest that such agents' customs, traditions, and codes of conduct are only gradually reshaped despite the immediate rupture between the old and the new structuring order. In the words of Sarah Payne (2020), "institutional shocks and transitions induce the need for a response to existing ways of doing things and thus raise questions over how and why institutions and organisations adapt or what may cause a lack of response" (p. 271). To exemplify, in the same study, the author analyses housebuilders' recovery strategies after the 2008 GFC and describes a similar phasic trajectory consisting of an early recovery stage focused on de-risking land acquisition, maximising capital returns and controlling costs, and a late transition phase when developers revealed a preference for returning to an established ex-ante style of doing business by focusing production in well-known housing markets, where price stability offered a more secure prospect for margin growth and further business expansion (Payne, 2020).

From this perspective, we share the understanding of an institutional interpretation of the property development process (Healey, 1992, Ball, 1998), which operates according to social norms, rules and costumes and is inherently conservative in behaviour, often seeking long-term stability. Under the IBV, housebuilders make rational choices resulting from their assessment of how to achieve myopic self-interested benefits as much as possible (Olson, 1971). A rational choice theory, in this sense, can be viewed as a "theory of advice" that informs organisations about how best to achieve objectives, whatever these may be. As such, city-wide revision of zoning codes and land use regulations introduce exogenous punctuated upheavals to the operations of the development industry, causing a reorganisation of its productive structure. Thus, the study aims to reveal how this process unfolds, considering the cyclicality of real estate markets and the empirical evidence of the local contingency elements of the residential development process in Sao Paulo.

3. MULTISCALE DECISION-MAKING IN THE DEVELOPMENT PROCESS AND LOCAL CONTINGENCY FACTORS

In this section, we explore some of the work attempting to disentangle the different scales in which decision-making takes place in the development process and discuss in more detail the role and influence of local-scale contingencies for the industry's operation. The embedded characteristics that make housing a unique good can only imply an equally distinctive production process. Building a residential development requires the developer to assimilate and coordinate a sequence of events that, in essence, take a long period, involve the articulation of multiple specialists, and depend on

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significant amounts of capital allocation. To organise this analysis, we separate the factors playing a role across the housing development process into two categories based on the scale of their influence and housebuilders' agency upon them.

This categorisation is influenced by Adams et al. (2002) description of the upper and lower levels of housebuilding activity and by what Leishman (2015) refers to as the macro and micro factors that condition developers' decisions. In this perspective, the development process is perceived as a combination of macro wide-ranging junctures such as national monetary policies, market cycles and international investment flows, and availability of building materials, to mention a few, in association with *local contingency factors* that may include local land markets, local topography, building and land use regulations and local demand groups. As such, developers' behaviour is conditioned, at the upper level, to broader social, economic and structural forces over which they have "only limited ability to influence" (Adams et al., 2002) and, at the lower level, by local-scale contingencies (Guy and Henneberry, 2000) that provides a measurement of housebuilders' strategic responses to the upper structure based on their interests.

In one example, Adams et al. (2002) apply Healey's (1992) institutional model of the development process to assess the strategies, motivations and actions of the owners of brownfield redevelopment sites in the UK. The authors discuss that at the upper level, brownfield landowners' attitude towards redevelopment will likely be homogenised based on overall profit maximisation interests since they hold no agency or control over the components of the compounding forces at this macro scale[1]. Nevertheless, landowners' response is likely to vary considerably at the lower level based on their ability to access development resources, master local rules and procedures, and exploit new ideas. Given the qualitative nature of their study, the authors were able to identify, for instance, that even litigations and disagreement amongst multiple site owners may be sufficient to obstruct development despite positive scenarios at the upper level.

In another study, Leishman (2015) remembers that developers compete not only in the development industry alone but equally in the land and local housing submarkets, which are essentially local in scale. The author notes that whilst macro factors such as the cost of borrowing overrule the industry altogether, the behaviour of firms will vary according to micro-factors such as land-holding strategies, the project capital intensity considering the application of technology, and access to capital which is mainly subjected to firm size. These combined, the author assesses, add complexity to regulatory attempts to use the planning system and housing development function as a tool to control affordability since housebuilders' decisions are constrained by many forces beyond building regulations.

To support the analysis herein based on the multi-scale nature of the development process, an illustration of developers' decision-making environment is presented in Figure 1, based on Adams and Tiesdel (2012) and Leishman (2015). In their analysis, development interests consist of

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[1] Adams et al. (2002) summarise the macro factors at the upper level as Structural economic change, National property market cycles, National planning policy and Public expenditure priorities.

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economic activities centred on the transformation of real estate assets (land and parcel development, provision of infrastructure and building construction), which are intrinsically connected to seven outer markets across which agencies and roles are distributed, supplies are provided, and the output is traded. The seven markets outside the *Development Decision Environment* provide a platform for development interests to operate since they enable relations with other key participants to be fostered and, where necessary, mediated and negotiated (Adams and Tiesdell, 2012; 95)

The three local contingency factors discussed in this study account for four of the seven main markets involved in the development process. Land and political[2] markets are constituted within the micro level of the decision-making process. In essence, they require active participation from developers to secure their interests and pursue their strategies, for example, by directly taking part in the design of land use regulations and building codes that ultimately shape product design in new schemes (political markets strategies) or by building and managing land banks that respond to firms' mid- and long-term strategy according to market cycles (land market strategies). Like material, financial and labour markets, land and political markets are regarded as input markets in the sense that they create the conditions for development. Owner-occupied and property investment makers are classified as output markets; in many cases, these two segments overlap. Output markets refer to the connection between the development industry and its consumers, and hence, it is not only constrained by the supply and demand relationship for the new stock provided, but it also responds to second-hand property market and investment market signals (Leishman, 2015). For this reason, its connection with the development decision environment is bidirectional. Materials, labour, and financial markets are associated with the macro level of the decision-making environment, in which opportunities are created based on macroeconomic factors, the availability of constructive resources, and labour and finance. As suggested, these are factors over which the developer has limited agency individually since they tend to present constraints to the industry altogether.

Because of the local nature of zoning codes, this research focuses on the empirical evidence of local contingency factors that directly interact with planning regulations affecting housing production at a lower scale. We hypothesise that exogenous shocks, such as upzoning decisions, are likely to ignite a sequence of reactions across the decision-making environments in those firms operating in each market, such as changes in land market competition, alterations in the design and layout of new schemes, and submarket targeting strategies. The variation in response, nonetheless, reflects strategic decisions made by speculative housebuilders that are bounded not only by the local level regulatory constraints but also by the institutional setting compounding the industry operations. Therefore, the IBV paradigm provides a platform to assess how developers strategically manoeuvre

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[2] Adams and Tiesdel (2012) refer to Political Markets as instances in which developers and other stakeholders engage in political negotiations regarding development. In discretionary planning systems, this may be represented by planning negotiations regarding development potential and planning obligations at a case-by-case level. In regulatory planning systems, it can be interpreted as political engagement around the definition of rules and norms governing land use jurisdictions.

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local contingency factors in response to changes in local zoning regulation, assuming a return-maximisation strategy given their nature as profit-making enterprises. Below, we analyse the role of each of the three local contingency factors within the development process in more detail.
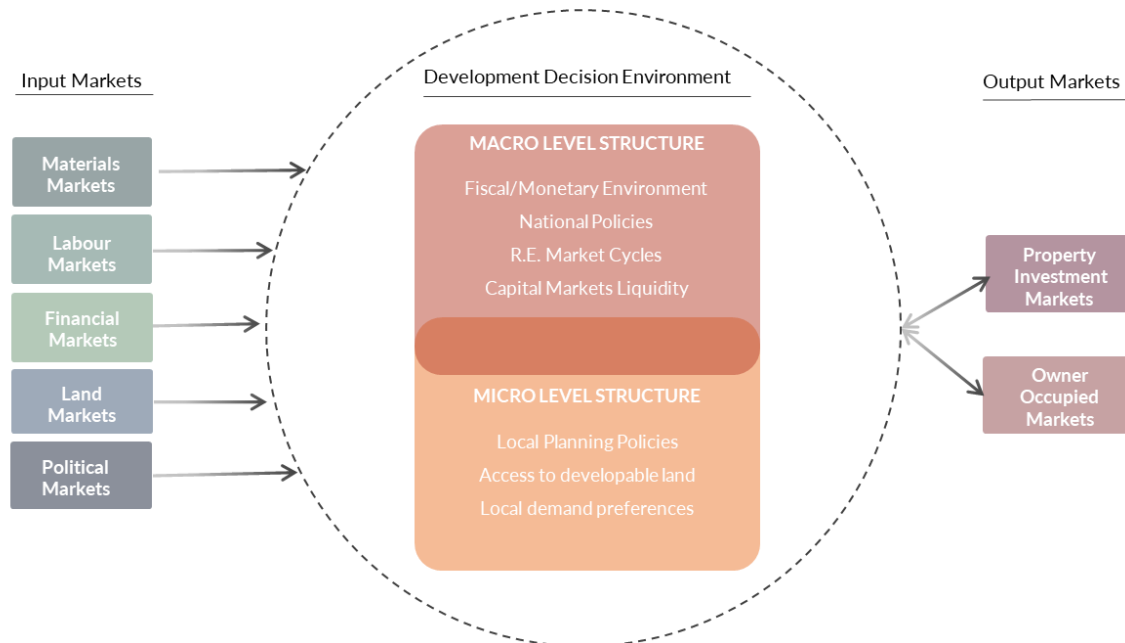
Figure 1: Essential markets influence the development of the decision-making environment. Source: Author, based on Adams et al. (Adams et al.), Adams & Tiesdel (Adams and Tiesdell) and Leishman (Leishman).

3.1. LAND MARKETS AND VERTICAL INTEGRATION OF THE DEVELOPMENT PROCESS

Land is an indissociable component of the development process. However, it is not always explicit that land and housing belong to two distinct markets (Ball et al., 2022) and that the relation between land acquisition and new housing output is not always direct. When describing the links between speculative housebuilders and land markets, Ball (2003) argued that in more competitive markets, land development and construction phases tend to be undertaken separately to allow riskiness to be distributed across builders and developers across the process, as each part commit less capital in their respective roles. However, when the supply of development land is restricted, the housing production process tends to adopt an integrated arrangement, with combined developer-builder firms assuming the entire process. With the restricted land supply, landholders exert a monopoly power through the pool of land they hold, inhibiting spatial competition and thus diminishing development risk. In this context, firms have more control over the rate and the timing of new housing supply and prices in disputed areas (Murray, 2020), as well as the possibility to maximise returns from land price appreciation. As Barker (Barker, 2004) remarked:

> When land is in relatively scarce supply, fewer permissioned sites mean that there will be fewer competing housebuilders in any one area. This can reduce consumer choice. In such situations, competition focuses on land. Once land is secured, competitive pressures are reduced: to a large extent, housebuilders can 'sell anything'. There is less need to compete

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on output by offering a higher quality product or innovative design features, except in niche markets.

The combination of the different stages in the development process over the ownership of the same firm is referred to as vertical integration. Companies adopting this strategy integrate all parts of the supply chain into their business model and may do so for various factors. Meijer and Buitelaar (2023) suggest that, for the development industry, firms choose vertical integration for three reasons: first, vertical integration strategy inhibits competition and confers market power to those companies able to secure development sites in highly competitive land markets. It creates locational monopolies and increases developers' power over decisions such as whether to build or not, when and at the rate at which housing is supplied; second, due to margin maximisation strategies. In an integrated production structure, companies hold more control over output and input prices, therefore securing a position as price setters rather than price takers. As such, they can use vertical integration strategies to maximise returns by reducing spending and optimising revenues; third, vertical integration lowers transaction costs and increases efficiency with the same firm controlling all stages of the process.

3.2. PLANNING AND BUILDING REGULATION

Regulation operates in order to influence the decision-making environment, and, in the words of Henneberry and Rowley (2002), it is used to shape the "developers' operational environment – i.e. the property market." The response, in terms of adaptation, the adherence or withdrawal from the development opportunity, is understood as the developers' behaviour given the opportunities and constraints presented by that environment. The incidence of planning regulation over housing construction has been a popular topic in research, particularly in studies assessing the impact of policy instruments on housing supply elasticity using mainstream economics (White and Allmendinger, 2003). This literature has consistently correlated the stringency of urban policy instruments to low elasticities of prices and the decline in housebuilding activity (Cheshire and Sheppard, 2004). Some seminal works include Barker (2008) and Ball and Allmendinger (2009), which reinforces the restrictive character of the British planning system and leads to delays in the industry. Similarly, Gyourko and Molloy (2015), Saiz (2008) and Glaeser and Gyourko (2018) discuss the intricacies of zoning regulations associated with topographic and regulatory constraints and local political agencies, finding similar adverse effects in locations with tighter codes.

Nonetheless, whilst these methods capture turns and shifts in the aggregate housing supply, they usually fail to explain how regulation interferes with the housebuilding decision-making process and the features of development output. Drawing on Henneberry and Rowley (2002), these techniques are rudimentary and reductionist in their capacity to control the behaviour of developer groups and other stakeholders involved in the property market. To overcome this conundrum, some authors deployed behavioural approaches to examine the complexity of the interactions between government intervention and the industry operation. For instance, early work from Monk and Whitehead (1999) describes developers moving investments towards areas in the UK with fewer regulatory restrictions and where planners were more responsive to the demand in contrast to

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regions with higher constraints, where developers showed discouragement to deal with the planning system. Their analysis indicates that new houses in more flexible areas were smaller than in more controlled regions. More interestingly, they also show that development negotiations are described as less contentious in areas of tight control, whereas areas with fewer restrictions are prone to see higher numbers of appeal applications. More recently, Sarah Payne (2015, 2018, 2020) has employed a similar analytical framework to understand how developers respond to institutional shocks, recession periods and carbon reduction policies. The author found that, after the GFC, housebuilders were attracted to low-risk, low-rise development opportunities and demonstrated reservations about increasing output levels too quickly despite the political and regulatory pressures (Payne, 2020). Specifically related to planning, such behaviour was reinforced by under-resourced planning institutions and skills and material shortages, resulting in sluggish business activity and negligible levels of innovation.

3.3.   MARKET SEGMENTATION

Lastly, on market segmentation, Leishman (2009) introduces the idea that submarkets present varying levels of development opportunities that may or may not match policy goals depending on factors such as their spatial delimitation, existing demand groups and regulation. For example, Hu et al. (2022) provide empirical evidence of different spatiotemporal dynamics of residential sales and rental submarkets in Shanghai/China. Whilst the geographic distribution of sale submarkets is more concentrated and spatially continuous, rental submarkets are more sparsely distributed and have more discrete boundaries. More importantly, by assessing changes in the structure of submarkets, the authors identify that rental submarkets operate more steadily than sales submarkets in response to public investments in urban infrastructure. They hypothesise this may intensify the capitalisation effect of public investments in housing rental prices. In response, higher demand for investment property in urban renewal areas can induce the housebuilding industry to increase the supply of rental residential properties, making planning policy more beneficial for property investors than homeowners.

Few studies have specifically looked at housebuilders' strategies according to market segmentation. In one instance, Coiacetto (2007) interrogated residential developers in Brisbane/Australia, to understand if and why they chose to operate in particular submarkets. Whilst the housing market literature has focused on identifying submarkets according to spatial distribution or hedonic features of properties (Watkins, 2001, Bramley, 2008, Jones et al., 2005, Maclennan, 1992), the author suggests that housebuilders prioritise their strategies considering market segmentation based on first-home buyers and subsequent-home buyers, as well as investment and owner-occupied properties. Although voluminous, first-buyer submarkets offer lower premiums on sales and higher risks to developers, as buyers are more likely to default without demand-incentive programmes. Subsequent home buyers (the category in which investment property developers are mainly comprised), on the other hand, is the segment most desirable to developers, as it is stable with "well set up buyers with accumulated assets and strong

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borrowing power"[3] (Coiacetto, 2007; 266). Developers in this segment pay more attention to consumers' demands and pricing strategies and maintain tighter control over supply to preserve market share in a small and competitive submarket. In summary, the study shows that there is no single formula through which developers respond to planning policy, and their reaction to regulatory shocks varies according to their internal organisational structure, accessibility to land markets, submarket competition, and market cycle moment, amongst other factors.

4. STUDY AREA AND ANALYTICAL FRAMEWORK

The study concentrates on the development industry operating in Sao Paulo, the largest urban agglomeration in the southern hemisphere and Brazil's financial centre. The city was chosen for three main reasons: due to its relevance to the Brazilian real estate and development markets (it received 23% of new starts in the country in 2023), due to recently implemented comprehensive reforms in the zoning regime, which introduced changes in land use regulations to promote high-density corridors next to the existing and future transit network, and due to the availability of disaggregated data on the supply of newly built residential properties. Sao Paulo houses most of the larger housebuilders acting locally, regionally and nationally. Whilst the nature of the development industry varies regionally or nationally, this study provides a unique opportunity to develop an empirical analysis of the dynamics of the local scale contingencies of the development process following a city-wide rezoning framework approved in 2016.

In terms of residential production in the city and its metropolitan region, various authors linked the geography, price and volume dynamics in the newbuild stock with macro determinants of the national economy, with special attention to the effects of the counter-cyclical housing programme "Minha Casa, Minha Vida" (MCMV), implemented in 2009, which offered below-market-rate finance for housebuilders and subsidised mortgage for first-time buyers across the country (Rolnik, 2019). By operating within the MCMV, developers leveraged their market share by applying strategies that included mass production of large residential developments in peri-urban locations, bidding for low land prices in greenfield regions and using standardised constructive techniques. Many firms, in particular large housebuilders, migrated their activities to outer metropolitan areas and inner regions of the country as a strategy to benefit from the volume of housing demanded through the MCMV programme during the boom period between 2009 and 2011, as described by Rolnik (2019). This scenario shifted with the worsening of the Brazilian economy after 2013, as the country's economy entered a period of contraction (2012 – 2014) and recession (2015 – 2016) (Mioto, 2022), resulting in drastic reductions in MCMV investments, leading firms to readjust their

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[3] The proliferation of policies designed to subsidise lending for first-time buyers across many countries has shift this scenario in more recent years. In Brazil, for instance, an extensive body of research has revealed how the industry became increasingly reliant on the operation of the federal housing programme Minha Casa, Minha Vida. In the absence of such demand stimuli, the industry maintain its dependency on less riskier demand groups.

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balance sheet (Penha Filho, 2020) and retract to consolidate higher-income markets, such as the city of Sao Paulo (Mioto, 2022).

At the local level, the Sao Paulo Municipal Authority introduced a reformulation in the city's planning regulation framework in 2014, with the approval of the Municipal Strategic Master Plan and the city's zoning ordinance in 2016. The new regulatory framework established the concept *Eixos de Estruturação da Transformação Urbana* (we translate this concept as Transit Oriented Zoning District – TOZ Districts hereafter), which are defined by urban blocks located within a 400m radius from transit stations and within 150m buffer from BRT and LVT lines. Plots inside TOZ corridors are assigned with a higher development potential that can reach a Floor Area Ratio (Adams et al.) up to 4 (i.e., four times the plot size), whereas elsewhere in other zoning districts, this limit varies between 1 or 2. The new zoning code established TOZ Districts next to the existing transit network and defined Future TOZ Districts along planned transit lines. Future TOZ districts are assigned lower development rights that can be increased to existing TOZ levels via the Mayor's order after the initiation of construction works. With the TOZ districts, the planning authority in Sao Paulo aims to drive more housebuilding investments alongside the city's transit network and stimulate urban transformation of serviced areas without necessarily expanding the urban perimeter (Leite et al., 2023).
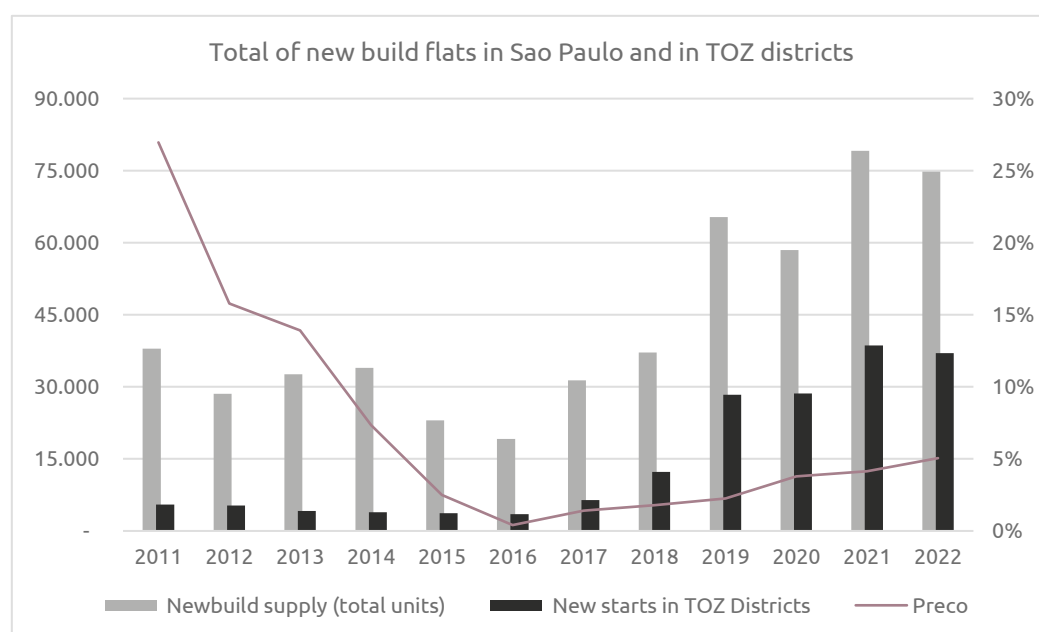

Figure 2: Behaviour of housing supply volumes in Sao Paulo and TOZ Districts, and Housing Price Volatility Index. Source: The author based on Embraesp and FizeZAP.

The revision of Sao Paulo's zoning ordinance in 2016 coincides with the trough of the industry's last economic cycle. The decline in housebuilding activity from 2012 to 2016 has been widely covered in the academic literature. It is mainly explained in terms of its macroeconomic components leading to significant reductions in the subsidies from the MCMV housing programme for low-

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income families and firms to reduce new construction and sell off existing stocks at lower prices (Mioto et al., 2019). The decline in new starts in the city was accompanied by a continuous decline in price volatility rates between 2011 and 2016 (Figure 2). The sector, which had previously experienced a 27% appreciation in 2011, entered a recession and reached stagnation by 2016. Price volatility fell 4.8% on average every year during this period. Penha Filho (2020) shows that companies (and in particular, volume housebuilders) revised their cost structure and, in order to avoid loss, invested in strategies to liquidate their assets, such as land banking and subsidiary firms. The author highlights that only those developers operating closely associated with the MCMV programme and those adopting more conservative strategies spatially confined to traditional markets and able to invest in land acquisition managed to overcome the economic recession.

Price volatility remained relatively low after 2016 during the recovery phase, with an average 0.8% increase during the following six years. Given the record increases in new construction (Figure 2 shows that the city received record numbers of newbuild houses in 2018, 2019 and 2021 with 37,124; 65,978 and 81,841 new units, respectively), there are signs of high housing supply elasticity in the city, reiterating the importance of this market for industry. Figure 2 also illustrates the increasing relevance of TOZ districts in accommodating the industry's retraction to the city after 2016. For the period prior to rezoning, these districts represented, on average, 15% of the overall supply in the capital, and after 2016, this rate increased to circa 41%. From 2019 to 2022, in particular, TOZ districts received half of the city's new residential supply. This figure reinforces the role of local upzoning in attracting housebuilding investments and fomenting reformulation of development strategies in a scenario of macroeconomic shifts and local regulatory transitions.

5. DATA AND EMPIRICAL ANALYSIS STRATEGY

The objective is to examine the variation in response from speculative housebuilders to the introduction of TOZ districts in Sao Paulo based on the behaviour of indicators of the local contingency factors affecting the development process. With this goal, we employ an empirical analysis using a new residential output dataset. This dataset, produced by *Empresa Brasileira de Estudos de Patrimônio* (Embraesp), provides detailed information on new formal multifamily residential schemes for sale (including pre-sale[4]) from 2012 to 2022. The dataset contains 3,570 new schemes, totalling 470,259 new dwelling units. Information is provided at the development scheme level – location, construction start date, land plot, zoning district, development, building and selling company – and at the dwelling level – number of bedrooms and bathrooms, garage space, size, price and total units per dwelling type. This allowed the construction of unique empirical

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[4] Developers seek to leverage development revenues through pre-sale agreements. The practice is widespread in the Brazilian housing market and offers the developer substantial risk reduction with the possibility to offset initial capital allocation. Pre-sale contracts are tied to construction costs inflation rate which further reduces financial risks in the construction phase.

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indicators in the related literature, such as the level of vertical integration for each development scheme and the variation in dwelling size for units in the same project. This study focuses on new residential production in TOZ areas; therefore, we selected projects released in these perimeters. They sum up 1,078 new schemes, accounting for 171,862 residential units[5]. The analysis presented in the following sections is based on this sample. Complementary to the housing supply dataset, we include data about the volume of developable site transactions inside TOZ published on the municipal authority data transparency portal. Moreover, we added data regarding newbuild sales volume and sales and rental housing price volatility published by the Housebuilders Unions and FipeZAP, respectively.

Section 3 reviews the role of local contingency factors in development strategies for building houses. It describes that developers' behaviour can be investigated through the level of competition in local land markets, adherence to building and land use regulations and submarket strategy. Essentially, as Crosby and Henneberry (2016) discussed, market agents' different strategies are summarised in calculative practices that define development feasibility in ways that the ideal final product should minimise costs and maximise returns. Hence, valuation practices incorporate strategies and format the built environment. Based on such understanding, we draw a descriptive analysis of key indicators for the design and structure of new residential schemes in Sao Paulo in light of speculative housebuilders' behaviour prioritising risk-minimisation and profit-maximisation. The repeated cross-sectional nature of the data allows for an assessment of the indicators over time and space, making it possible to assess change in behaviour following the introduction of the new zoning regulation in 2016.

Table 1 below describes each indicator applied in the analyses and the respective housebuilder behaviour they may capture.

Table 1: Empirical indicators of housing supply in Sao Paulo.

[5] Costa et al. 2022 calculated the proportion of planning applications for residential schemes using the new parameters under the upzoned regulation. The numbers increased as follow, 2016: 3%, 2017: 48%, 2018: 77%, 2019: 87%, 2020: 95% and 2021: 92%. Data from the municipal planning authority reveals that it takes between one and two years for approval to be granted for larger schemes. Thus, we estimate that it took two to three years for new projects reflecting the new regulatory parameters to come into the market and then become noticeable in the newbuild dataset.

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Local Contingency Factor	Indicator	Expected behaviour	Source
Land Markets	Transaction volumes of developable sites	Anticipation effect to secure land in TOZ	Property Transaction Tax - PMSP
	Vertical integration in new schemes	Vertical integration of the development process in high-demand markets	Development and building company - Embraesp
Planning Regulation	Land Plot Quota	Adherence to regulatory density limits	Land plot size per total units - Embraesp
	Share of compact units	Return maximisation strategy	The proportion of one-bedroom and studio units - Embraesp
	Dwelling size distribution	Standardisation of construction aiming risk reduction at risk reduction	Dwelling size standard deviation - Embraesp
	Average dwelling size		Average dwelling size for compact and larger units - Embraesp
Housing submarket	Price structure of the residential supply	Return maximisation strategy	Supply volumes per dwelling price stratification - Embraesp
	Submarket spatial strategy	Intensification of structural densities in high land value areas	Dwelling offer price - Embraesp

6. DEVELOPMENT STRATEGIES IN TOZ DISTRICTS

6.1. LAND COMPETITION AND VERTICAL INTEGRATION OF THE DEVELOPMENT PROCESS

By redistributing higher development potential (FAR) across TOZ districts, the rezoning strategy interferes with land prices. This is in line with the residual price method, which states that development costs and profit are subtracted from the overall anticipated revenues for a given project, with the residual value corresponding to the amount a developer has available to bid for land. Thus, by increasing revenue potentials (higher development rights), developers may bid higher value for development sites. Restricted land supply in high-demand areas, such as TOZ districts, may also lead to higher land values as landowners' expectations increase with more developers competing for the same plot. These two circumstances, therefore, would theoretically drive speculative developers into a race for creating landbanks, given the real prospect for windfall gains emerging from land value appreciation. An indicative of how competitive land in TOZ became after 2016 is shown in Figure 3. The graph illustrates the share of property transaction volumes for developable sites[6] in a given year. Rates are presented for existing and future TOZ districts. It is noticeable that there is a steady and parallel trend between the two areas in the period prior to the

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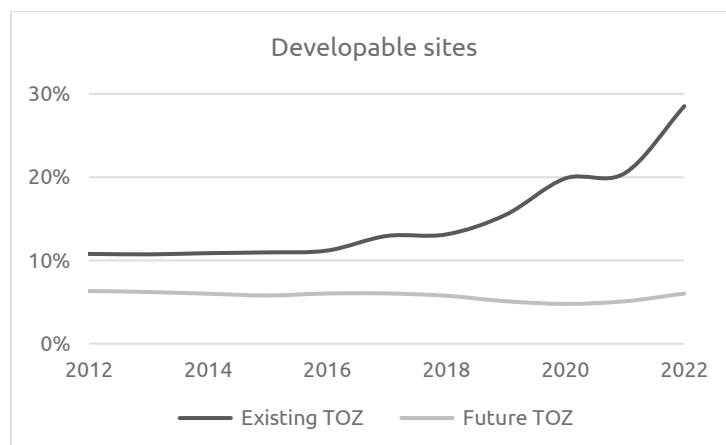[6] Potential developable sites consist of the following edification categories for transacted properties: land plots, horizontal residential, horizontal commercial, warehouse and workshops. These are official categories defined by the municipal authority for property tax purposes.

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rezoning decision, with TOZ representing around 11% of developable site transactions in the city and Future TOZ accounting for circa 6%. Interestingly, the data does not indicate an anticipation effect associated with increased property transactions across TOZ areas in the period immediately before its effective implementation in 2016. Such behaviour would be expected to some extent since the Transit Corridors concept was introduced in 2014 in the municipal strategic master plan. A reason for this behaviour could be the recessionary moment, which forced some companies to reassess new investment plans and induced the adoption of strategies to reduce costs and liquidate existing assets to generate cash (Penha Filho, 2020). This may suggest that housebuilders prioritise short-term economic stability instead of long-term investment strategies during economic downturns.
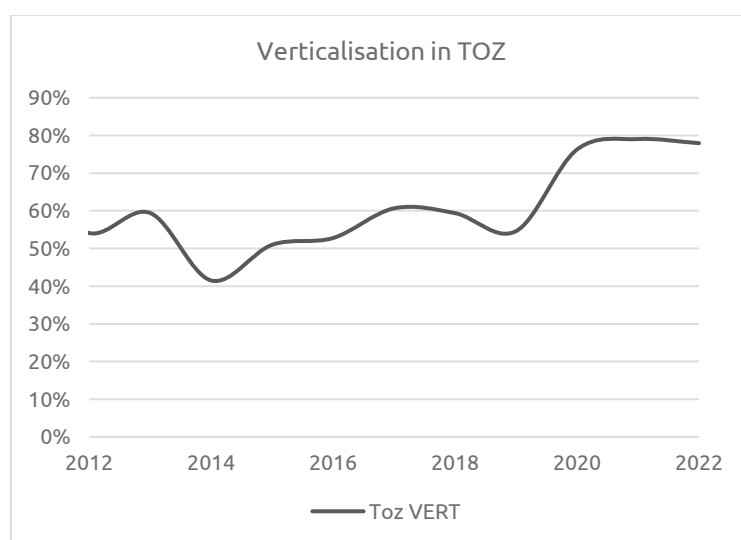
After 2016, the city's property market showed signs of recovery and the role of TOZ in the upswing moment is evidenced by the concentration of developable site transactions in these areas. Between 2016 and 2022, the share of developable site transactions taking place in TOZ almost tripled. Future TOZ districts, on the other hand, despite their potential for higher development rights, performed at lower-than-average levels during the same period. Two main factors may influence trends in development site transaction volumes, as seen in TOZ and Future TOZ. First, the activation of Future TOZ into effective TOZ districts depends on initiating construction works for the new transit infrastructure. A contentious decision that is not only associated with public investment plans but equally with political decisions in a government structure traditionally known for delays and lack of prioritisation in mass-transit investments. Consequently, the time imprecision associated with the activation of Future TOZ districts presents constraints to housebuilders' return strategies and risk assessment, which can explain the low demand levels in these areas. This is consistent with the perception that a developer will identify a market opportunity first and then find appropriate land rather than get the land and then work out what to do with it (Bookout, 1990). Second, data in Figure 3 does not capture land equity deals, a common practice in the Sao Paulo housebuilding industry consisting of developers and landowners developing a legal agreement in which land is offered as equity in the overall investment, whereby landowners frequently choose to receive in-kind payments, in the form of new dwellings. In 2023, specialised news reported that Direcional, one of the largest publicly listed housebuilders in Sao Paulo, had built a landbank equivalent to 35 billion BRL, with land equity agreements representing 82% of this figure[7].

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[7] Direcional launches total R$ 1.4 billion in the 2nd quarter, an annual increase of 84.3%. https://valor.globo.com/empresas/noticia/2023/07/11/lancamentos-da-direcional-somam-r-14-bi-no-2o-tri-alta-anual-de-843percent.ghtml

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Developable sites

Figure 3: Transaction volumes for developable sites in TOZ districts. Source: PMSP.

Verticalisation in TOZ

Figure 4: Proportion of new residential schemes in TOZ employing a vertical integration design. Source: Embraesp.

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The level of vertical integration in new projects can indicate how developers respond to higher competition levels in TOZ. Vertical integration of the development process mainly involves the combination of land acquisition, development and construction phases of one project under the control of the same builder-developer firm. Figure 4 displays the proportion of residential schemes in TOZ districts undertaken by the same builder-developer firm for a specific year. Although, on average, vertical integration has been the norm across the years (averaging around 60%), after 2016, the proportion of this development model rose from 53% to 78% in six years – the largest value in the time series. In particular, this strategy strengthened after 2019. Between 2020 and 2022, transaction volumes increased by 8.7% a year, on average, whereas for the previous period, between 2016 and 2019, the average rate stayed at 2.3% a year. The fixity of TOZ districts confers market advantages to those companies capable of securing land in these blocks. Furthermore, the possibility of playing a stronger influence over the definition of new housing prices favours margin maximisation for an industry that became systematically more dependent on the Sao Paulo market. As demonstrated elsewhere (Nogueira, forthcoming), offer prices of new houses showed signs of stronger resilience inside TOZ compared to adjacent regions. These findings align with the understanding that vertical integration could have been used for price control and competition advantages across transit corridors.

6.2.   HIGH-DENSITY STRATEGIES

In essence, a firm will employ profit-maximisation strategies to extract a site's full development potential in ways that, on one side, secure competitiveness in land markets and, on the other side, stay within the limits of regulatory and technological constraints. There is evidence demonstrating that developers have consistently surpassed regulatory optimal densification defined in the zoning code for new projects in TOZ districts, as shown by the Plot Quota Indicator (Column a,

Erro**! Autoreferência de indicador não válida.** tells how floorplan layouts have become more diversified after 2016, with the intense addition of compact units as a mechanism to achieve density goals (Column b) and with more variation in dwelling sizes within the same scheme (Column c). For instance, the mean dwelling size standard deviation indicator (Column c) measures the extent of the variation in unit sizes for a given new project every year. Before 2016, the indicator remained at low levels – 4.8 m2 on average– suggesting a higher degree of standardisation in floorplan layouts when compared to recent trends, i.e., on average, dwelling sizes in one same development would vary around 5 m2 around the mean. A rapid growth in this indicator occurred after 2016, reaching a peak of 14.4 m2 in 2021 and oscillating around 11.9 m2 on average for the post-2016 period. Additionally, the proportion

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of compact units in TOZ districts plunged from 20% to 50% of the overall supply between 2016 and 2020 (Column b). This is not an unprecedented boom in small flats in relative terms, but it certainly is in terms of volume supplied. In the post-TOZ period, developers seem to have been using compact units as the main mechanism to achieve and surpass densification goals.

Table 2). This metric represents the average land plot equity per unit in ways that the lower the index, the denser the development scheme is. Its level remained significantly lower than the maximum limit permitted and decreased over time. Plot Quota declined from 25.6 to 17.1 sqm/unit between 2016 and 2019 despite a maximum limit of 30 sqm/unit. Subsequently, the densification strategy intensified, with this indicator oscillating between 13.4 and 14 sqm/unit from 2019 to 2022, when the regulatory cap was reduced to 20 sqm/unit. Traditionally, the intensification of structural density levels in multifamily projects is positively correlated to higher land values, thereby reinforcing the hypothesis that competition for land in TOZ in Sao Paulo has been exacerbated over the years motivated by the relaxation in development rights parameters, therefore driving developers not only to build more projects but also increasing the number of units per project.

Whilst land competition and regulatory constraints act as levers for higher structural densities, how companies adopt strategies to increase density in their projects may vary. Substantially, for any given plot, structural density rises with the addition of more dwellings of the same size, resulting in taller buildings or the construction of smaller units per floor. The decision for one alternative over the other depends on conditions such as firms' constructive expertise, soil quality and demand for larger or smaller units.

Erro! Autoreferência de indicador não válida. tells how floorplan layouts have become more diversified after 2016, with the intense addition of compact units as a mechanism to achieve density goals (Column b) and with more variation in dwelling sizes within the same scheme (Column c). For instance, the mean dwelling size standard deviation indicator (Column c) measures the extent of the variation in unit sizes for a given new project every year. Before 2016, the indicator remained at low levels – 4.8 m^2 on average– suggesting a higher degree of standardisation in floorplan layouts when compared to recent trends, i.e., on average, dwelling sizes in one same development would vary around 5 m^2 around the mean. A rapid growth in this indicator occurred after 2016, reaching a peak of 14.4 m^2 in 2021 and oscillating around 11.9 m^2 on average for the post-2016 period. Additionally, the proportion of compact units in TOZ districts plunged from 20% to 50% of the overall supply between 2016 and 2020 (Column b). This is not an unprecedented boom in small flats in relative terms, but it certainly is in terms of volume supplied. In the post-TOZ period, developers seem to have been using compact units as the main mechanism to achieve and surpass densification goals.

Table 2: Annual values for housebuilding indicators in Sao Paulo. Source: Embraesp.

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Year	Density (a) Plot Quota (m²/unit)	Compact Supply (b) Proportion Compact Units in TOZ	Floorplan layout (c) Mean Std. Deviation Size (m²)	House size variation (d) Compact Unit Size (m²)	House size variation (d) Larger Units (m²)
2012	38.52	36.5%	5.55	43.84	92.93
2013	44.70	37.5%	3.65	46.27	90.71
2014	41.56	51.4%	4.33	41.50	82.01
2015	35.84	35.7%	3.98	41.91	80.05
2016	36.22	20.2%	5.33	36.89	85.36
2017	25.64	30.5%	8.55	34.78	78.76
2018	21.70	44.2%	12.18	37.45	85.63
2019	17.06	41.8%	12.35	34.38	89.61
2020	13.36	50.3%	10.60	31.15	81.28
2021	14.83	33.9%	14.37	31.00	79.79
2022	13.98	34.1%	13.28	29.00	85.05

The strategy to diversify the floorplan layout was mainly undertaken by incorporating compact units within projects. It is assessed that developers can boost revenues beyond increasing density levels by adding compact units, considering that these units are sold at a higher price per square metre. Considering the heightened reliance of the industry on the Sao Paulo market during the post-recessionary period after 2016, it could be interpreted that housebuilders invested in the densification of new schemes not only to cover higher bids for upzoned land inside TOZ but also as a strategy to amplify raise revenues to help navigate across the recovery period.

It should also be noted that the diversification in floorplan layouts is also likely to increase development risk due to two reasons: first, it requires adaptation in the construction process when speculative developers favour the use of standardised construction methods to promote efficiency, reduce time and create economies of scale in their project. Second, it leads developers to adapt marketing strategies targeting two or more submarkets within the same project. To reduce risk with the former, vertical integration of the development process can help housebuilders maintain tight control of the constructive process and rapidly respond to adversities. To tackle the latter risk, developers have been partnering with property management platforms to facilitate their relationship with investors who acquire compact properties for investment purposes[8] in TOZ districts – a prominent demand group incentivised by falling interest rates experienced between 2016 and 2021.

[8]https://valor.globo.com/patrocinado/imoveis-de-valor/noticia/2023/03/17/gestao-de-ativos-para-renda-cresce-na-capital.ghtml

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By looking at the supply volume and the average size of compact and larger units, we notice that this densification strategy followed two distinct phases. In the first phase, from 2017 to 2019, densification occurred mainly through the combination of declining size and a supply surge of compact units. In those years, the volume of compact units increased by twentyfold, whilst larger dwelling volume experienced a fivefold expansion. This pattern prevailed until both categories reached equivalent levels, with circa 14,000 new units for each dwelling category in 2020 (Figure 5). In the second phase, from 2020 onwards, volumes of compact dwellings came to a halt, and densification became primarily conditioned to even smaller compact units, with the average flat area reduced by 4.12 m^2 between the two periods [t(689) = 5.12, p = 0.00]. Factors such as the outbreak of the COVID-19 pandemic in 2020, the depreciation in rental prices between 2020 and 2021 and the subsequent rise in interest rates in the post-pandemic period led to the deterioration of property investment conditions, which could have deterred investment in this submarket and thereby leading developers to hold the delivery of new supplies into the market.

Meanwhile, the larger unit supply maintained resilience, with volumes increasing to record levels in 2021 (25,549 new dwellings – Figure 5). Interestingly, this group of properties did not experience significant changes in average size from the first phase to the second [t(1255) = 0.22, p = 0.82], suggesting a solid demand preference for the features of this product. Out of the overall supply of larger units, approximately 74% consist of two-bedroom dwellings and, as shown in Table A1, from 2019 to 2022, sales volume for this type of property almost tripled in TOZ districts, in contrast to sales rates for compact units which nearly halved in the same period. This finding aligns with views that the city sustains a consolidated demand for mid-income family housing, to which the industry resorts in moments of economic instability. It also demonstrates that to be able to supply the housing market in TOZ with family homes; housebuilders need to adopt development viability strategies to increase both revenues (and cover land costs) and structural densities, for which compact dwelling supply has a strategic role. These findings reveal that, in designing new projects, speculative housebuilders squeeze viability strategies within constraints represented by minimum density levels regulations (maximum Plot Quota), the appreciative nature of upzoning to land prices, demand preferences in consolidated submarkets and their financial structure during real estate cycles. Given these constraints, the physical outcome seen across the built environment represents the best profit-maximisation and risk-reduction strategies.
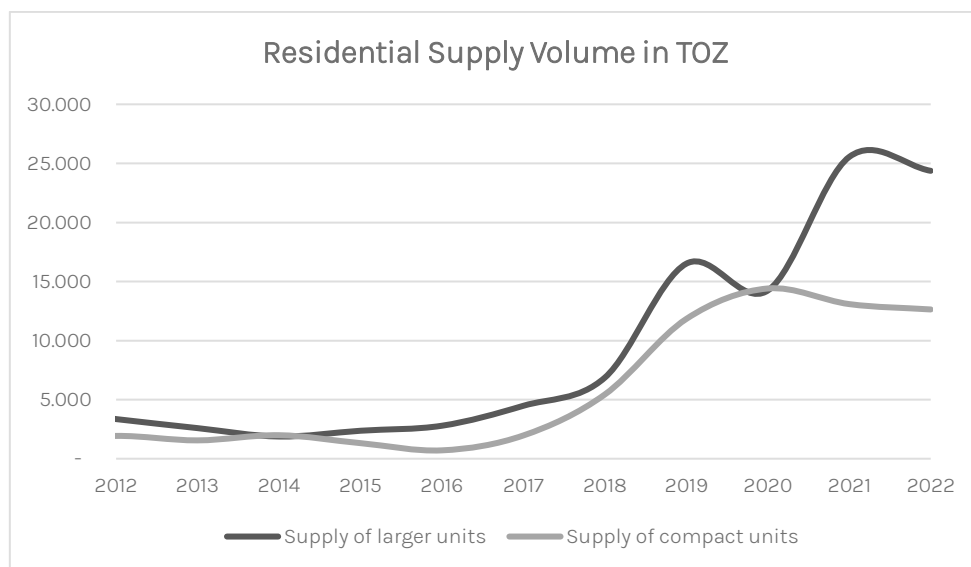
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Figure 5: Supply volumes for compact and larger residential units in TOZ districts. Source: Embraesp.

6.3.   SUBMARKETS

The indicators presented in this study suggest that TOZ regulation in 2016 stimulated the emergence and consolidation of a self-contained compact-unit submarket with distinctive features compared to larger units. The surge in construction positively correlates with increasing rental price rates from 2016 to 2019, which raised above sales price (Figure A1). In 2020, rental rates plunged into negative rates, mainly caused by the outbreak of the COVID-19 pandemic when landlords and tenants agreed on alleviation measures such as discounts, rent stabilisation or payment holidays. On the supply side, housebuilders held off the release of new build compact units (Figure 5) face the riskiness in this particular segment whilst demand for larger residential space remained latent (Gamal et al., 2023, Guglielminetti et al., 2021, Boesel et al., 2021) . Therefore, the supply of compact dwellings demonstrated a heightened sensibility to rental price volatility, possibly explained by developers' precautionary actions fearing oversupply and consequent price depreciation of the stock.

There are limitations in the data preventing conclusions regarding any significant improvement in TOZ affordability levels since compact units are sold at a higher unitary price (per sqm). Nevertheless, the data consistently support the finding that the introduction of TOZ has shifted submarket geographies and made it possible to create economies of scale. Figure 6 shows the distribution of supply volumes across price quartiles for every year (with square-metre prices adjusted for inflation using the IGP-DI rate for the base year 2019). Consistently, over the first seven years in the period, more than half of the new housing supply in TOZ areas was formed by the three upper price quartiles, showing a vocation of these areas to receive the costliest residential supply (in comparison, the city-wide new supply falling in the three upper quartiles represented 33%, on average for the same period). Notably, from 2016 to 2019, the share of supply in the two upper price quartiles doubled despite the rapid increase in the overall supply. We attribute this phenomenon to

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housebuilders' strategy to speed up the supply of compact dwellings sold at higher relative prices. It was only after 2020 that a more notorious shift in the price structure of TOZ was revealed, with the proportions taken by the upper end being squeezed by the lower quartile. Indeed, the share of the lower quartile took up 80% of the overall supply in the last two years of the series. This happened when developers brought down the rate at which compact units were being supplied and concentrated strategy on the argument of larger units.
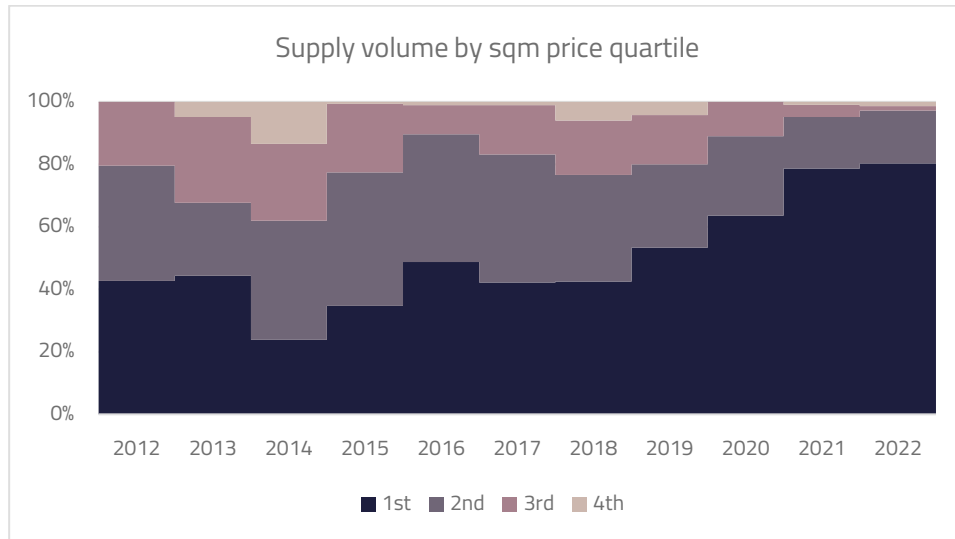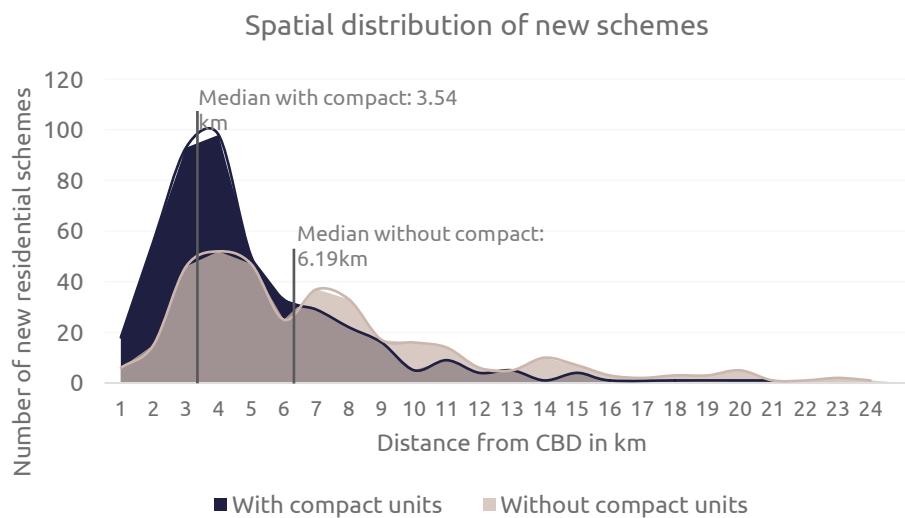

Figure 6: Price structure of the new housing supply inside TOZ districts. Source: Embraesp

Notwithstanding, building compact units as a strategy to intensify structural densities has spatial limitations. Figure 7 demonstrates Euclidian distances from each new scheme to the closest CBD in Sao Paulo (Praça da Sé, Avenida Paulista and Avenida Faria Lima). Those new residential schemes containing compact units cluster within the first five kilometres from the city's CBD areas, with a median distance of 3.54 km. New schemes without compact units distribute more sparsely toward outer TOZ districts, with a median distance of 6.19 km. In spite of all observations in the sample being located within TOZ districts with the highest development potential in the city, the potential to exploit the compact housing submarket is primarily constrained within central areas with higher land values.

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Spatial distribution of new schemes

Figure 7: Spatial distribution of residential schemes with and without compact units. Source: Embraesp.

7. DISCUSSION: TEMPORAL VARIATION IN DEVELOPERS' RESPONSE TO TOZ

This paper applies the institutional-based view of strategy to investigate how speculative housebuilders in Sao Paulo have responded to transitionary scenarios in planning regulations, considering an analytical framework centred on the local-scale contingencies of their strategic decision-making process. Based on the empirical indicators presented in Section 5, we argue the existence of a temporal variation in the behaviour of the housebuilding industry inside TOZ districts, which is mostly explained by a combined effect of the rebounding effects of the local land use regulation on land markets and the heightened reliance on the city's housing market during a recovery period. Drawing on Peng's (2003) temporal bracketing of early and late transition phases in strategic response to institutional upheavals, we identify an initial stage focused on a **price strategy** to maximise revenue by substantially investing in the construction of compact dwellings and then a second response stage underpinned by a **volume strategy** driven by the supply of family housing to consolidated demand groups.

In the *price strategy* phase, between 2017 and 2019, housebuilders who survived the recessionary period of the previous two years adopted practices to maximise return on capital based on the increase in housing supply and the stability of mean prices. At the group level, developers supplied an unprecedented volume of compact dwellings – which are usually sold at higher relative prices – during a period of timid land market competition whereby upzoning inflationary effects on land prices were not yet consolidated (Ball et al., 2022). This period resembles the cautionary post-recession moment described by Payne (2020), whereby firms demonstrated financial responsibility by concentrating activity on stable markets and prioritising cash-making strategies. The propitious scenario for property investment with declining interest rates and rising rental prices meant that builders could operate in a risk-reduced market, especially in those TOZs proximate to central regions in the city. The reliance

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on interpersonal relationships to help navigate uncertainties during the first moments of institutional transitions, as described by Peng (2003), was found through evidence of developers seeking to build new partnerships with property management firms with expertise in operating in this submarket. By bridging the relationship between housebuilders and property investors, those companies acted to reduce commercialisation risks associated with the growth of the compact submarket.

The *volume strategy* phase is identified from 2020 to 2022, suggesting a shift in the prioritisation of compact units and a reconcentration of supply for mid-income family houses. Two reasons may explain this change in strategy. First, the combination of factors such as the plunge in rental prices, the end of the decline cycle in interest rates and changes in demand perception over living in smaller houses resulting from the outbreak of the COVID pandemic had, altogether, an evident impact on developers' decision to control the rate at which compact housing was being supplied. Second, on the local scale, the growing stiffness in the land market competition, as suggested by the evidence of increased verticalisation of the development process, consisted of an added factor driving higher densities and, thus, volume. This meant speculative housebuilders, still highly reliant on the Sao Paulo market (given the prevailing scarcity in the federal housebuilding programme), adapted their strategies to maintain revenue streams inside TOZ by focusing on consolidated (i.e. less risky) demand groups.

In terms of the impact of the widespread upzoning decision across transit neighbourhoods in Sao Paulo, we argue that TOZs – through the provision of more permissive development potentials – sustained a key role in the industry recovery after the previous recession by sustaining cash generation potentials and enabling further growth. Furthermore, the risk scenario during the price strategy phase is thought to be reduced comparatively to the subsequent volume strategy phase, given the industry's initiative to invest in building innovation in the provision of compact housing during the first phase. The volatility of the market and the uncertainties with the demand for the compact submarket led developers to return to conventional demand groups in the second phase. Arguably, the transition from the first phase to the second represents a rational choice by developers given wider institutional constraints and their own capabilities to maximise benefits. In Sarah Payne's (Payne) words:

> ... when the rules of the game are highly uncertain, many organisations will be unable to develop new capabilities and so will, virtually by default, continue to carry out much the same activities in similar ways as before (Peng, 2000, p. 145). In this sense, housebuilders successfully aligned their conventional business strategies to the transitionary institutional environment, achieving strategic fit and keeping a level of business performance that secured their survival during the recession and their growth during the recovery.

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8. CONCLUSIONS AND IMPLICATIONS FOR PLANNING POLICIES

This paper provides an institutional-based view of speculative housebuilders' strategies to operate in upzoned neighbourhoods by looking at indicators of the local contingency factors interacting with the development process. The analysis suggests that whilst TOZ regulation has been effective in approximating residential supply to transit, the features of the new housing output observed after the introduction of TOZ districts in Sao Paulo reflect not only regulatory constraints imposed by the new regulation but also a broader combination of rational choices developers adopted seeking revenue maximisation during a period of economic recovery for the industry when the reliance on the city's housing market was intensified.

The main empirical findings are threefold. First, an unprecedented demand for land within TOZ districts was observed as the volume of developable sites increased threefold in five years, indicating the strength of the regulation in orienting the geography of market activity through the distribution of high development potentials. Nevertheless, it is argued that tight competition for land contributes to the adoption of vertical integration of the development process, whereby firms concentrate ownership over all stages of the housebuilding process, conferring market advantages for developers who are able to secure development sites, intensifying their influence over price formation and the timing in which new housing is delivered onto the market.

Secondly, we show that housebuilders consistently exceeded minimum density parameters in TOZ districts. Developers introduce innovative construction practices by diversifying floorplan layouts by combining compact and larger dwellings within the same project. Compact units boost revenues since they are sold at higher relative prices, and they can be used to manoeuvre regulatory constraints on density levels without a drastic reduction in the size of larger units, which is shown to have a solidified demand in the Sao Paulo market. Such a strategy introduces risks associated with the construction and commercialisation of this compact stock. Thirdly, there is evidence for the emergence of a compact property submarket focused on rental markets. This submarket is geographically constrained closer to central neighbourhoods in the city and highly sensitive to rental price volatility. Importantly, its geographical features intensify capitalisation effects from proximity to transit, job markets and urban amenities.

Drawing on the institutional-based interpretation of the speculative residential development, the paper assesses that whilst housebuilders invest in maximising revenue by substantially exploiting the high development potential of central TOZ districts, their strategy vary over time given the existent risk scenario. Initially, housebuilders benefited from a price strategy centred on the supply of compact dwellings with higher liquidity in a buoyant property investment market. This strategy created opportunities to boost cash generation in the short term despite possible risks associated with the introduction of innovation in the floorplan

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layouts. The succeeding volume strategy phase came in response to the sudden shift in property investment setting and led developers to create cash through the increase in supply volumes of properties sold at a discounted price.

In as much as housing supply is partially determined by land use and zoning regulations, this study helps to shed light on the array of market factors and their influence over development decisions. This informs planners that the appreciation effect on land value by the distribution of development potentials produces reactions in land market competition that directly interfere with development viability assessment conducted by speculative housebuilders. The output seen across the urban landscape, however, is diverse and reflects the multiple combinations of macro and local contingencies that may or may not respond to planning expectations. Whether the characteristics of this residential output satisfy planning policy expectations across TOZ districts should be a topic for further research. Notwithstanding, the analyses of developers' behaviour and its variations offer a holistic interpretation of how the development industries respond to institutional shocks brought by widespread regulatory changes given pressing wider institutional settings.

In conclusion, the analysis here introduces a framework for planners to consider wider contingencies of the development process when evaluating the effectiveness of zoning regulations. The analysis has been based on new residential output data, which only makes for a share of the overall housing market. We, therefore, welcome further initiatives that can provide insights into the price dynamics in land and housing markets inside TOZ. Moreover, as the implementation of TOZ continues and developable land becomes increasingly scarce, we encourage further studies that look into agents' behaviour towards land banking, viability assessment and market segmentation, considering their heterogeneity in size and investment capabilities.

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9. APPENDIX
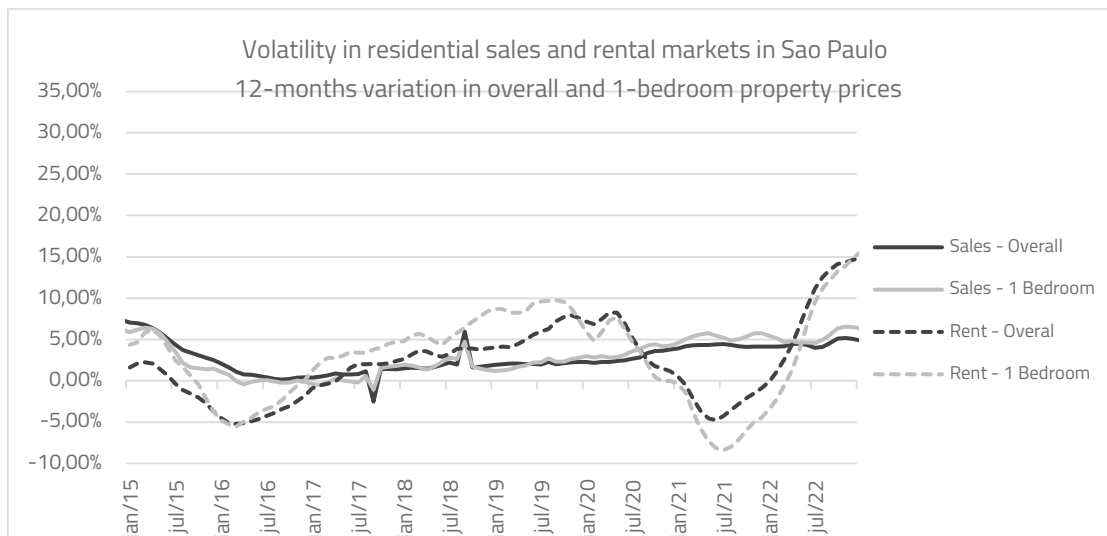
Figure A1: Sales and rental housing prices volatility in Sao Paulo. Source: FipeZAP

Table A1: Annual changes in sales volume in Sao Paulo

Year	Sales	
	Sales/Stock 1 Bed	Sales/Stock 2Bed
2009	19%	10%
2010	37%	9%
2011	20%	11%
2012	9%	11%
2013	18%	14%
2014	8%	12%
2015	4%	10%
2016	3%	7%
2017	7%	8%
2018	14%	9%
2019	15%	14%
2020	11%	13%
2021	10%	17%
2022	8%	36%

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% newbuild in Sao Paulo - as a proportion of overall formal residential transaction

Year	Resi Sales	Newbuild output	Newbuild sales	% NB output	% NB sales
2007	83,781	38,990	36,615	47%	44%
2008	94,454	34,475	32,847	36%	35%
2009	86,920	31,584	35,832	36%	41%
2010	90,967	37,990	35,869	42%	39%
2011	86,689	37,933	28,316	44%	33%
2012	81,905	28,517	26,958	35%	33%
2013	84,078	32,589	33,319	39%	40%
2014	70,745	33,955	21,576	48%	30%
2015	57,062	23,040	20,148	40%	35%
2016	50,960	19,157	16,170	38%	32%
2017	57,213	31,379	23,629	55%	41%
2018	61,910	37,124	29,929	60%	48%
2019	69,599	65,312	49,224	94%	71%
2020	74,160	58,491	51,417	79%	69%
2021	106,839	79,125	66,092	74%	62%
2022	91,088	74,818	69,340	82%	76%

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