

Article

Between Laws and Trends: Unraveling the Dynamics of Vertical Housing Units' Development under Institutional Forces in the Brazilian Amazon

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Abstract: This paper is based on the recognition of a phenomenon occurring in the real estate market of Belém, Pará, in the Brazilian Amazon. The phenomenon refers to the relative increase in the size of the balconies of residential apartments launched in the city between 2005 and 2017 by construction companies, with the aim of increasing the number of units built per tower. Given that balconies were originally areas of low frequency for the occupants of apartments in this region, the aim of this article was to identify and analyze the institutional factors that support this product development strategy, which is becoming increasingly consolidated among companies. To investigate this phenomenon, we collected data from official documents provided by the Municipal Urban Planning Department (Secretaria Municipal de Urbanismo—SEURB), specifically focusing on the launch of residential high-rise buildings during the specified period. Regression techniques with ordinary least squares methods were applied, as well as econometric models of spatial autocorrelation. The results of the hypothesis tests confirmed the relationship between the restrictive parameters imposed by the city's Urban Master Plan and the relative increase in apartment balconies. The spatial autocorrelation models confirmed the spatial spillover effect, showing that apartment projects with this characteristic tend to be concentrated in certain areas of the city, influencing each other. In order to discuss this phenomenon, the institutional theory was the protagonist of the analysis, showing how an organizational strategy can adapt to the authority that regulates the occupation of urban land in the city, meeting the two market forces and the demand and supply of apartments.

Keywords: real estate market; product development strategy; urban master plan; institutional theory; spatial spillover



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1. Introduction

The product development strategies in the real estate market—residential and commercial units—represent a broad research field. As they establish the starting point of a production chain with strong sectoral interconnections, studies focused on this research area yield a variety of theoretical and empirical contributions. Macro- and micro-economic issues can be addressed, as well as those related to urban planning, health and safety management, the environment, and social well-being.

Despite its breadth, this research field has aspects that are not extensively explored by the scientific community. Between 2007 and 2021, the literature addressing product development for the real estate market has been dedicated to proposing models related to data and information management for business process development [1], models addressing subjective product attributes in purchasing decisions [2], and models addressing

cost management [3]. Other studies associated real estate product development with the customer or market perspective [4–6] and project developer perspective [7].

In this context, the above-mentioned approaches have predominantly focused their efforts on understanding product development processes from the company's (builder's) perspective to the end of its value chain. In other words, these processes or strategies have been investigated based on the company's interpretation of consumer needs, tastes, and preferences, as well as the operational management of these processes, aiming to meet those tastes and preferences.

Therefore, the product development process that incorporates aspects related to the conception phase of the architectural project—from the company's perspective to the beginning of its value chain—remains underexplored. In this sense, the present study, although aligning with approaches emphasizing product attributes, as well as micro- and macro-economic aspects, primarily focuses on the impact that the environment, represented by institutional relations, has on the product development process. This process will be investigated in its preliminary phase when the architectural configuration of the property is defined by the builder and approved by regulatory authorities.

The institutional theory adopted as a theoretical framework in real estate market studies is not uncommon in academic circles. However, the authors of this research are unaware of those who have related it to the product development process. Hu et al. [8] made a special recommendation to adopt institutional theory as a theoretical foundation, seeking a better understanding of mega-project management, particularly in managing stakeholders, project planning, and procurement, as well as monitoring and controlling these projects. Prior to this contribution, Sawyer et al. [9] addressed changes and the increased complexity of the real estate market from its social structures and the importance of ICT.

Between 2019 and 2021, institutional theory has been employed to examine the role of institutions in shaping scenarios and decision-making structures within the housing industry, involving various actors such as NGOs, developers, and government [10]. Toreros et al. [11] conducted an evaluation of how institutions facilitate the emergence of new demand formats for fixed or seasonal residential units and the ensuing processes through which these units are booked via digital platforms. Additionally, Nappi and Eddial [12] delved into the disparities between the discourses of real estate market drivers regarding flexible office costs and the actual “hidden costs”.

From our perspective, there is an important research gap to be filled. Obviously, cost, taste, and preference issues on the demand side remain important. However, this gap relates to the investigation that isolates the impact of institutions on product development processes in the real estate market, on the supply side.

In other words, at the moment when the construction company requests the architectural office to design residential unit projects in the building construction segment, important questions arise in this context: What is the influence of coercive institutions on these processes? How do companies react? Are business reactions homogeneous? What aspects do companies seek to reconcile, beyond institutions, when deciding what to build and how to sustain their choices? These questions will be better specified in the next section of this paper and will guide the results discussions.

Thus, our objective in this article is to identify and analyze the impact of institutions on the development of products—vertical residential units—in the city of Belém, Pará, which is situated in the Brazilian Amazon. The theoretical argument linked to institutional theory emphasizes its coercive aspect, represented mainly by the city's urban master plan, which restricts and provokes the strategic thinking of construction company managers, aiming for the maximization of economic performance. Therefore, starting from the conception of the architectural design commissioned by the builders, it must, from the established coercive constraints, encompass meeting the expectations of both the demand and supply sides.

This study uses a database composed of 122 residential buildings constructed in Belém between 2005 and 2017. Quantitative data were incorporated into inferential statistical

models (regressions). Variables representing the physical characteristics of the apartment and the built land, as well as legal-coercive, socioeconomic, urbanistic, and temporal nature, were incorporated into the models as independent and control variables, aiming to identify their levels of correlation with the dependent variable.

This empirical strategy allowed for the identification of important results regarding the definition of the “balcony index” (dependent variable), which was measured based on the proportion of this architectural element—in square meters—relative to the total area of the apartment. Spatial models complemented and reinforced the analysis of the results, demonstrating the presence of “spatial spillover” among the observations (apartment buildings) in the sample.

The results achieved by this article represent theoretical and managerial contributions. The adoption of institutional theory in the discussion of results expands, diversifies, and supports the understanding of the strategic thinking of construction industry managers. The adoption of statistical models also broadens the types of possible empirical approaches, enriching this field of research. Managerially, the results found here can be useful for the development of public policies, especially those related to improving regulations governing urban space occupation.

The subsequent sections of this paper are organized as follows: Section 2 shows the contextual backdrop and outlines the research problems, along with stating this study’s hypotheses. Section 3 delineates the data and empirical strategy, and the outcomes of the analysis are discussed in Section 4. The initial segment of Section 4 comprises descriptive analyses and sample characterization, while the latter part delves into explicating the institutional influences on the variation observed in the balcony index.

2. Context, Research Problem and Hypotheses

2.1. Study Area

This research evaluates the continental region of the municipality of Belém, the capital of the state of Pará. According to the Brazilian Institute of Geography and Statistics [13], Belém is the second most populous city in the Brazilian Amazon region, with around 1.3 million inhabitants. In addition, the municipality has a total area of 1059 km², of which its continental region covers 176.56 km².

The city has quite peculiar characteristics in terms of the occupation of urban land since its foundation in 1616. Its foundation was based on the Presépio Fort, built by the Portuguese in the Old Town to protect the city from invasions during the colonial period [14]. It is noteworthy that, since its foundation, the city has grown in a disorderly fashion [15], adapting to its restrictive characteristics: topographical and socioeconomic.

The mainland region of the municipality resembles a peninsula and is spatially divided into 44 neighborhoods, as shown in Figure 1. Approximately 40% of its territory is made up of areas known as “baixadas”. These areas are influenced by the 14 watersheds that exist throughout the city’s territory, and they are either flooded or subject to periodic flooding [16].

Regions with firm soil were the main targets of public and private investment, while areas with floodable soil were neglected during the beginning of the municipality’s spatial development [17]. As a result, the waterfront of the municipality’s continental region is underutilized by the real estate market.

Regional, environmental, and legal/historical factors also act as restrictive parameters for the exploitation of the municipality’s territory by the real estate market. Around 18% of the territory consists of environmental conservation units, while the city’s oldest neighborhoods—Reduto and Cidade Velha—have had the verticalization process contained due to legislation protecting historical heritage [16].

These restrictive factors have led to a severe shortage of land for residential buildings on the city’s mainland. In recent years, this scenario has intensified the phenomenon of verticalization, which began in Belém in the 1930s, as a more modern way of living [18].

This urban context has created a challenging competitive environment for the companies that make up the oligopoly in the construction of vertical residential buildings. On the supply side, a relatively small number of companies are responsible for a significant portion of residential building launches, competing for the demand for apartments. In this context, the institutional role of Belém's Urban Master Plan (UMP) shares the leading role with these companies, regulating this market.

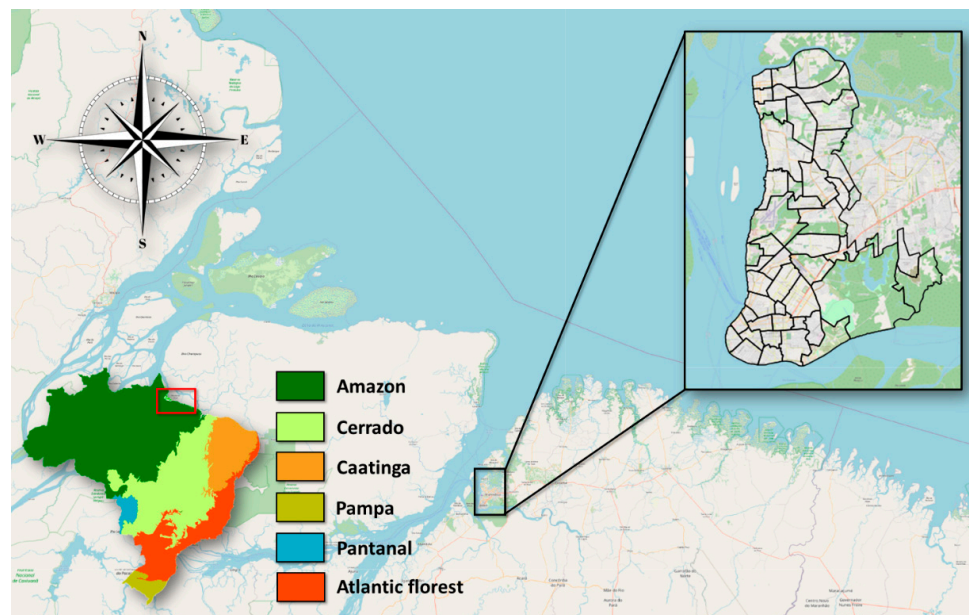


Figure 1. Belém, Pará—mainland region.

2.2. Verticalization and the Phenomenon of Larger Balconies

An attentive observer can easily see the increasing presence of residential apartment buildings in Belém, built since the beginning of the 2000s, with two strong characteristics: (a) buildings with a large number of floors; (b) apartment balconies that appear to be increasingly larger in relation to the total area of the apartment (balcony index).

Furthermore, these characteristics appear to be present in buildings concentrated in the city's noblest neighborhoods. Regardless of the total area of the apartment, as well as the construction company, the phenomenon of an increase in the balcony index (BI) seems to have been consolidated in the city. These findings seem to indicate that this is a product development strategy in Belém's real estate market, adopted by the aforementioned oligopoly in the pursuit of economic performance.

Given that the main objective of these companies is economic performance above the sector average, we would point out that the supply of residential apartments serves not only the interest of home buyers but also investors looking to receive long-term income through rentals. In this context, what would be the relationship between the proportional increase in balconies and the increase in the number of floors and, therefore, organizational performance?

We start with the simplest reasoning: in a competitive environment, the greater the number of vertical residential units built, the greater the company's overall sales value (OSV), and, therefore, the greater the business volume. This sequence of reasoning can lead to a reasonable number of research questions. The first research question is as follows: is there any relationship between an increase in the balcony index and an increase in units built and, therefore, an increase in organizational OSV?

If so, other questions arise: what is the involvement of the city's PDU in this context? Is it acting as a regulatory authority for the occupation of urban land? If there is a geographical concentration of buildings with apartments that have disproportionately large balconies,

do they influence the launch of buildings with the same characteristics in neighboring districts (spatial spillover)?

Other questions might include the following: are there socioeconomic and urban infrastructure variables that could determine a greater geographical concentration of this phenomenon? Why does this strategy only seem to have been adopted since the early 2000s? Could the complementary competitive environment (complementary sectors) to the construction industry be supporting the occurrence of this phenomenon?

2.3. The Institutional Role of the Urban Master Plan

The intensity of verticalization in Belém has led to an institutional response from the Urban Master Plan to organize the growth and functioning of the city, seeking to guarantee the population a suitable place to live, work, and live with dignity [16]. As a result, construction companies are seeking competitive advantages, but not without first adapting to the UMP's restrictions.

In this study, we have simplified the investigation of the UMP's influence, exposing the restrictive issues of the plan, emphasizing only those that are clearly related to the research problems: the urban model (UM) and the utilization coefficient (UC), which are closely related to the size of the plot and its location.

According to Annex V of the UMP, which was made available by the city council, Belém's urban territory is segmented into seven urban environment zones (UEZ) (Zonas de Ambiente Urbano—ZAU) based on specific landscape and urban occupation patterns, urban problems, and potential and specific objectives [19]. UEZ3 and UEZ6 are subdivided into sectors (Sectors I to V). In line with the aim of this study and following Annex X of the UMP, the focus of this paper is on multi-family housing. Thus, distributed between UEZ1 and UEZ6, there are five types of urban models (UMs)—UM2 to UM6—as shown in Table 1.

Table 1. Urban models and main restrictions.

Urban Models	Lot's Area (m ²)—Min/Max	UC
UM2	360/—	1.4
UM3	400/—	2.0
UM4	450/—	2.5
UM5	600/—	3.3
UM6	750/—	3.5

“—” without restrictions.

The UMs are sets of more specific standards (parameters) that determine the construction restrictions linked to their respective sectors and UEZs. Thus, it is the UM that determines which parameters must be observed by the architectural firm when it is hired by the construction company to design the architectural project for a residential building in a given region of the city.

As an example, Table 1 shows that the UC in model UM2 is 1.4, while in model UM4, the UC is 2.5. Thus, the total area for an apartment building built on a 3000 m² lot could be a maximum of 4200 m² if it follows the UM2 model standard. In contrast, the UM4 standard allows this area to be up to 7500 m². Thus, the most promising residential apartment building projects for companies, in terms of OSV, are those that, firstly, are developed on large lots and, secondly, where the lot is located in a UEZ that allows the adoption of a UM with a high UC.

2.4. The Balcony Index and the Land's Legal Building Potential

According to the Urban Master Plan of the Municipality of Belém [19], the utilization coefficient “is the index that, multiplied by the area of the land, results in the maximum construction area allowed”. Obviously, the higher the UC, the larger the total built area. In

the case of family housing, only the private areas of the dwelling units are computed for the application of the UC, excluding, in some situations, balconies.

According to the Complementary Urban Control Law No. 02, of 19 July 1999 [20], in its Annex I, glossary of terms used, balconies are deemed non-computable when calculating the utilization coefficient, provided they do not exceed 5% of the area exclusively used by autonomous units up to 120.00 m². For larger units exceeding 120.00 m² and up to 180.00 m², the non-computable threshold is 10% of the exclusive use area. Additionally, for units surpassing 180.00 m², the non-computable threshold related to the exclusive use area is 15%.

Therefore, the areas that cannot be computed by the utilization coefficient are not part of the total legal building potential of the plot, even if they are part of the whole marketable area on the real estate market. From a legal point of view, the marketable area of each apartment or housing unit (UH) is made up of its fraction of the area established by the legal building potential, plus those that are not part of it (totally or partially), such as the areas of balconies.

It is, therefore, in the real estate market's financial interest to distribute the legal building potential over as many units as possible, and for this to happen, it is a fundamental strategy to minimize the use of the areas computable by the UC and maximize those that are not part of it. Figure 2 illustrates how local urban planning legislation allows the strategy of maximizing the marketable areas of the UHs, leaving balconies completely out of the calculation of a development's legal building potential.

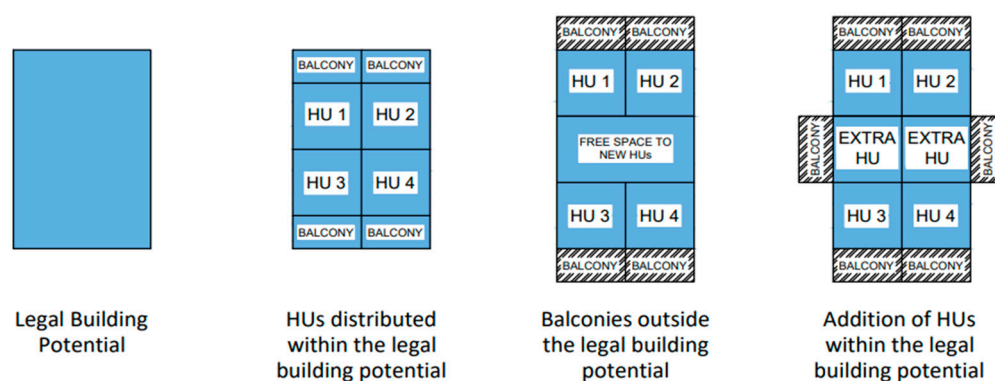


Figure 2. Balconies and the maximization of HUs within the legal building potential.

As we can see, increasing the area of balconies is a good strategy for making maximum use of the legal construction potential of each plot, within the limits of the law, and for increasing the financial results by increasing the number of floors in the building. Given the above, it is possible to formulate the first hypotheses of this research.

Hypothesis 1a. *The balcony index of apartments built between 2005 and 2017 in Belém, Pará, varies according to the urban model of the building.*

Hypothesis 1b. *The balcony index of these apartments is negatively related to the total area of the land on which the building was constructed.*

2.5. The Balcony Index and Spatial Spillover

In the real estate market, the social environment imposes standards and defines what is acceptable or permitted—through laws, such as the master plan, and regulations—restricting the heterogeneity of organizations [21]. In this way, and guided by these restrictive factors, the best-known type of organization—a company—seeks legitimacy in its operating environment.

This phenomenon, known in the institutional literature as isomorphism, consists of the tendency to adopt similar strategies, processes, and, consequently, products. Thus,

institutional isomorphism forces the homogenization of companies facing similar market conditions and can occur through a combination of any of the following mechanisms: coercive, normative, and mimetic [22].

In the context of Belém, where the main restrictive factor for the construction of residential high-rise buildings is coercive—UMP—coercive isomorphism can have a direct influence on intensifying the process of adopting larger balconies. Coercive isomorphic pressures regulate the organizations' behaviors through the application of rules and their consequent monitoring, as well as the application of sanctions in the event of non-compliance [21].

In addition, construction companies, faced with the need to gain a competitive advantage and maximize production, tend to exploit the opportunities present between the lines of the market [23]. Therefore, when faced with various coercive pressures, these companies tend to develop similar strategies in order to avoid such penalties and gain the enhancement of the competitive position of their products and services within their industry [24].

The perception of organizations in relation to the successful strategies of others in the same industry leads to the mimetic aspect of isomorphism [25]. In the construction market, imitation occurs when companies adopt similar practices, both in technical and organizational aspects. Thus, institutional isomorphism—coercive and mimetic—may contribute to the phenomenon of spatial spillover.

Spatial spillover, induced by isomorphism in the construction industry, might be a determining factor in understanding how the strategies adopted by a construction company in a given location can influence neighboring areas. The imitation of successful practices not only reflects the search for operational efficiency and competitiveness [26] but also encourages the spread of construction standards on a geographical scale.

When a company incorporates new practices that have proved effective in its context, the spread of these practices to construction companies in nearby locations can result in a more comprehensive transformation of the regional construction scene. Thus, institutional isomorphism not only influences the individual decisions of organizations but also triggers a process of spatial convergence, where the adoption of similar practices contributes to greater homogeneity in strategies and operating methods throughout the production sector [22].

Thus, given the construction restrictions present in the territory of Belém, combined with the search by construction companies to maximize the production of units per building, the second hypothesis of this study can be presented:

Hypothesis 2. *The concentration of buildings with increasingly large balconies encourages the adoption of this strategy by neighboring apartment buildings.*

2.6. The Balcony Index and the Control Variables: IPC; INFRA; YEAR

Hypotheses 1a and 1b refer to the impacts that two restrictive parameters of the UMP may be having on the variation that the BI has shown in the vertical residential projects launched and built in Belém, Pará. Hypothesis 2 refers to the spatial influence of these projects. Both are the protagonists of this study.

However, it is not only these variables that can help explain the phenomenon of the increase in balconies in the period covered by this research. It is important to remember that this study investigates residential buildings distributed geographically across a city of more than 1 million inhabitants and 176 km² of territorial area.

Therefore, if the relationship between BI and the parameters of the UMP is confirmed, how does it behave when some variables associated with the urban region in which the focal residential building was built are incorporated into the model? These variables can also influence the occurrence of the phenomenon studied. To this end, this article proposes three more variables, called “control variables”: (1) per capita income; (2) urban infrastructure; and (3) the year the residential building was built.

The per capita income of a given urban region relates the wealth of that location to its population. Therefore, if the per capita income of a region is above the average in a city, it can be said to have a high per capita income. Individual or family income determines financing capacity on the buyer's side, as well as influencing issues related to urban land occupation [27–29].

The amount of financing a family can obtain depending on their socioeconomic status is strongly correlated with the choice and decision to buy housing. Thus, the maximum amount a buyer can borrow to purchase a home is related not only to the value of the property but also to their income [27].

In a broader context, in terms of the urban real estate market, growing income inequality can have significant implications. At the upper extremes, an increase in the price-income ratio (HPIR) indicates a greater risk of a housing market bubble. Conversely, at the lower extremes, there can be an increase in the vacancy rate (HRV), resulting in “ghost towns” [28].

In cities with a severe shortage of land for buildings, such as Belém, another argument that highlights the issue of income in defining the locations of residential buildings is highlighted by Vergara-Perucich [29]. According to this author, higher income segments stimulate the supply of apartments by construction companies, with the aim of “financializing housing”, i.e., UHs dedicated to investors looking to generate long-term income rather than housing.

Thus, in urban regions with higher per capita incomes—as in this study—a greater concentration of residential building launches is expected. Thus, we can say that the per capita income variable influences the definition of the locations of the buildings in our sample. In addition to influencing the locations of these buildings, we also found that, on average, they have an increasing balcony index. Therefore, we affirm that the relationship between land area and BI is controlled by the per capita income variable.

As for infrastructure, it is essential to understand the elements that contribute to sustainability and quality of life in urban areas and their consequent influence on the strategies employed in the Belém real estate market. To this end, in this study, the city's infrastructure is assessed through the proportions of coverage of public water supply services, energy supply, waste collection, and sewage treatment.

Water and energy are necessities for most, if not all, human activities, and the infrastructure needed to provide these features is essential for making urban spaces more habitable and productive. In addition, waste collection and sewage treatment are services that have a direct impact on the health and environment of cities, preventing the proliferation of diseases and the pollution of natural resources. Thus, urban infrastructure is a determining factor for the population's quality of life and for the economic development of regions [30,31].

In addition, infrastructure also influences the real estate market, as it affects the demand for and supply of real estate in urban areas. The demand for real estate depends, among other factors, on consumer preference, as consumers tend to look for places with better infrastructure and accessibility [32,33]. The supply of real estate, in turn, depends on the availability of land and the profitability of projects, which are affected by the level of existing infrastructure and the possibility of expansion or improvement [34].

Therefore, in regions with a higher percentage of urban infrastructure coverage, a higher concentration of vertical residential building launches of the standard covered by this research is expected. Therefore, similarly to the IPC variable, the infrastructure variable is expected to influence the definition of the locations of the buildings in our sample. In addition to influencing the locations of these buildings, we can also say that, on average, they have an increasing balcony index. Therefore, we affirm that the relationship between total land area and BI is controlled by the infrastructure variable.

With regard to the control variable “Year”, we emphasize the upward trend in the balcony index of the UHs. From 2005 to 2017, the buildings in our sample showed an oscillation in the BI, with an average variation of seven percentage points. We, therefore, postulate

that, like per capita income and infrastructure, this variable is statistically significant in our research context.

It is important to mention that regardless of the population's per capita income, the level of urban infrastructure coverage, and the period studied, the argument to be supported is that, on the supply side, these variables are related to the organizational strategy of increasing the proportion of balconies in apartments, especially as a response to institutional pressures.

However, on the demand side, how does the buyer receive a property with this particularity? How would this “extra area” be incorporated into the daily life of the occupants of the property, if this architectural element, by its very nature, is considered to be less frequented by the occupants of the property?

In this way, the opportunity arises to include another important aspect in the discussion of the results: is there an exogenous element to the building construction oligopoly that could contribute to the acceptance of this “novelty”? This question will not be the subject of hypotheses as it is outside the scope of this study. However, due to its relevance, it will be included in the discussion of the results of this research and could certainly be a future research agenda.

3. Research Methods

3.1. Data and Variables

In this paper, we analyze the balcony indexes of the UHs of high-rise buildings—comprising 5 or more floors [35]—present in the continental region of Belém, Pará. The initial database was assembled using data collected from the Municipal Urban Planning Department (Secretaria Municipal de Urbanismo—SEURB) between April 2018 and April 2019, based on access to three types of documentation relating to the buildings: (1) building permit/license; (2) habitation letter/housing certificate; and (3) architectural projects. As a result, the initial database had 194 observations, corresponding to high-rise buildings—residential and commercial—launched in Belém between 2005 and 2017.

In order to adjust the database to the research's scope, we excluded the observations relating to commercial buildings. In addition, to avoid specification problems in the spatial modeling, buildings with more than one UH were identified. For these buildings, the medians of the variables related to the structural characteristics of the apartments were taken as the representative value. This process resulted in a final database made up of 122 observations, corresponding to the representative UHs of each building. Notably, this dataset, representing 62.89% of the total high-rise buildings launched between 2005 and 2017, is considered a robust sample indicative of the study area.

For each observation, variables were collected relating to the structural characteristics of the housing units—APARTMENT_SIZE (total area, in square meters), BALCONY_SIZE (balcony area, in square meters), ROOMS (number of rooms), SUITES (number of suites), and YEAR (year of launch). Institutional aspects were captured through the variables MODEL (urban planning model), LAND_AREA (land area in square meters), and ADDRESS (complete location information). Furthermore, by utilizing the ADDRESS variable, we employed a geocoding service to obtain the geographical coordinates of each building and incorporated the LATITUDE and LONGITUDE variables into the database.

The dependent variable—BALCONY_INDEX (balcony index)—was computed by applying the ratio between the BALCONY_SIZE and APARTMENT_SIZE variables. In addition, to analyze the impact of the building's distribution on balcony index variation, we included the locational variable DOWNTOWN (distance to the historic city center in meters). This variable was calculated from the geographical coordinates of the buildings and Forte do Presépio, the founding site of Belém, using the Haversine formula, which measures the angular distance between two points on Earth (i.e., along a great circle).

Furthermore, we associated each building with its Human Development Unit (HDU) in order to compute the variables related to the socioeconomic and infrastructure conditions of the area in which the buildings are located. The HDUs, according to the United Nations

Development Program [36], are divisions of the municipality’s urban fabric that have similar socioeconomic and infrastructure conditions. We emphasize that the boundaries of the HDUs do not necessarily coincide with the divisions of the neighborhoods and may cover multiple neighborhoods, or a single neighborhood may contain more than one HDU.

Socioeconomic influence was therefore incorporated by including the IPC variable (income per capita, in BRL/hab). Additionally, infrastructure was quantified by the INFRA variable, which is defined as the arithmetic mean of four indicators: (1) the percentage of households served by public water supply; (2) the percentage of households served by electricity supply; (3) the percentage of households served by an adequate sewage distribution system; and (4) the percentage of households served by waste collection and disposal services. Table 2 shows all the variables used in this study.

Table 2. Variables definition.

Variable	Description	Category
BALCONY_INDEX	Ratio between the balcony size and the total size of apartments	Structural
ROOMS	Number of rooms in the apartment unit	Structural
SUITES	Number of suites in the apartment unit	Structural
MODEL	Building urbanistic model (levels: M2; M4; M5; M6)	Structural
LAND_SIZE	Land size, in square meters (m ²)	Structural
YEAR	Building construction year	Structural
DOWNTOWN	Distance to downtown, in meters (m)	Locational
IPC	Income per capita, in the UDH where the building is situated	Socioeconomic
INFRA	Infrastructure coverage, in the UDH where the building is situated	Infrastructure

3.2. Empirical Strategy

To test the hypotheses of our study, various statistical techniques were employed. Among the most fundamental approaches, we used the ordinary least squares (OLS) regression model [37], as shown in Equation (1):

$$y = X\beta + \varepsilon \quad (1)$$

where y represents the vector of the dependent variable, X represents the matrix of independent variables, β is the vector containing the regression coefficients belonging to each independent variable, and ε is the vector of error terms.

Through this technique, our study aims to evaluate the influence of various characteristics—the structure of the UHs, location, and socioeconomic and urban infrastructure conditions—on the variation of the balcony indexes of housing units in Belém, Pará. Therefore, the natural logarithmic specification of the variable related to the HUs balcony index (LN_BALCONY) was used as the dependent variable of our study. This approach aims to examine relationships that can be represented in multiplicative terms, either on an exponential scale (level–log) or in the form of potentiation (log–log).

With regard to the independent variables, a natural logarithmic transformation was performed for the continuous variable LAND_SIZE in order to improve its distribution. It should be noted that this procedure resulted in a more significant association between the dependent variable and the transformed variable (LAND), compared to the original relationship as measured through Pearson’s correlation. In addition, in order to address the heteroscedasticity, present in the OLS model, the robust standard errors technique was applied [38].

To assess the presence of spatial autocorrelation in the data, Moran’s index was used [39], which ranges from -1 to 1 , where a positive/negative value suggests positive/negative spatial autocorrelation or the presence of clusters in an observed area. The neighborhood matrix associated with the Moran index was computed using the k -nearest-

neighbors approach [40]. This approach aims to avoid unbalanced connectivity throughout the neighborhood matrix since any observation will have the same number of neighbors, k .

The optimum value of k was determined using the Lagrange multipliers (LM) test applied to the LN_BALCONY variable, as well as to the OLS model residuals. The initial value of k was set to 1 and increased by 1 during each subsequent step. The selection process ended when the value of the LM test became insignificant, with $k = 3$ being the optimized number of neighbors, i.e., the maximum point of the Moran's index after its stabilization (LN_BALCONY Moran's $I = 0.4359$; p -value < 0.001 | OLS residual Moran's $I = 0.0891$; p -value < 0.05). Thus, positive spatial autocorrelation was established in both the dependent variable and the OLS residuals.

To incorporate spatial autocorrelation into the regression models used in this study, we adopted the classic spatial auto-regression (SAR) models. The SAR model takes two general forms: the spatial lag model (SLM) and the spatial error model (SEM). The spatial lag model assumes that the dependent variable is affected not only by the independent variables but also by the values of the dependent variable in nearby observations.

Thus, in the SLM a spatially lagged component—representing the spatial weighted average around the dependent variable—is added to the regression [41]. The specification of the spatial lag model is given by Equation (2):

$$y = \rho Wy + X\beta + \varepsilon \quad (2)$$

where ρ is the spatial delay parameter and W is the spatial weight matrix that defines the neighborhood of each observation.

In contrast, the SEM assumes that spatial autocorrelation is due to unmodeled effects or other specification errors. Thus, spatial dependence, as well as its interaction, are treated as disturbances in the error term, rather than being incorporated as a spatially lagged component in the equation [41]. Equation (3) demonstrates the SEM specification.

$$y = X\beta + \mu \quad (3)$$

where $\mu = \lambda W\mu + \varepsilon$ is the vector of spatially correlated error terms, λ is the spatial error parameter, and ε is the vector of independent error terms.

Determining the most appropriate specification for spatial modeling was also guided by the LM test. The choice was based on the strength of the rejection of the test's null hypothesis, which postulates that the regression coefficient of the specified model is statistically equal to zero [42]. Thus, the spatial model chosen for use in this study was the SLM (LMSLM p -value < 0.05 | LMSEM p -value > 0.05), since it is the model that rejected the null hypothesis.

It is worth noting that the estimators of the spatial lag model, unlike those found in OLS, are not directly interpretable. In the spatial lag model (SLM), the presence of feedback effects from lags in the dependent variable causes changes in neighboring observations. Therefore, the parameters estimated by the SLM should be seen as representations of an equilibrium state in the modeling process, incorporating the effects of spatial diffusion [43].

In this scenario, the effects of each variable take the form of a matrix. This means that in order to fully understand the impact of each variable, we need to consider not only its direct effects but also how these effects spread and interact in surrounding areas. To this end, LeSage and Pace [44] recommend using scaling indicators to interpret the SLM model's estimators. These indicators include the following:

- Average direct effect, representing the effects caused by observations of an independent variable;
- Average indirect effect, which quantifies the diffusion effect between observations due to changes in an independent variable;
- Average total effect, which encompasses the total effect, direct and indirect, received by the dependent variable.

Finally, the comparison between the non-spatial and spatial models applied was performed using the Akaike Information Criterion (AIC). The AIC represents the relationship between the log-likelihood function—a statistical test used to compare the adequacy of two or more statistical models [45]—and the number of variables evaluated. The best model result is the one with the lowest AIC value.

4. Results and Discussion

4.1. Sample Characterization and Descriptive Analyses

The basic descriptive statistics of the variables used in this paper are shown in Table 3.

Table 3. Descriptive statistics.

Variable	Mean	SD	Min	Max
BALCONY_INDEX	0.163	0.0681	0.0283	0.376
SUITE	2.37	1.20	0.00	5.00
LAND_SIZE (m ²)	3565.00	9320.652	158.50	92,594.9
DOWNTOWN (m)	3899.85	2248.35	476.95	13,392.01
IPC (BRL/hab)	2573.49	1156.92	370.59	4342.04
INFRA (%)	98.23	1.39	87.03	99.56

The HUs evaluated have an average balcony index of 0.163, i.e., on average, around 16.3% of the area of these apartments is dedicated to balconies, ranging from lower values of 0.0283 (2.83%) to higher values of 0.376 (37.6%). Furthermore, the land size, representing one of the main limiting factors, has an average of 3565.00 m², with minimum values of 158.50 m².

Figure 3a shows that most of the buildings constructed on lots ranging from 158.50 m² to 1904.72 m² (59.83% of the sample) are concentrated in the south and southwest regions—one of the main centers of economic activity (commerce and services) [14]. This configuration results mainly from two aspects: greater financial attractiveness for companies and land scarcity due to the various factors that restrict exploitation by the real estate market. This condition also contributes to the prevalence of progressively smaller lots of urban land becoming available.

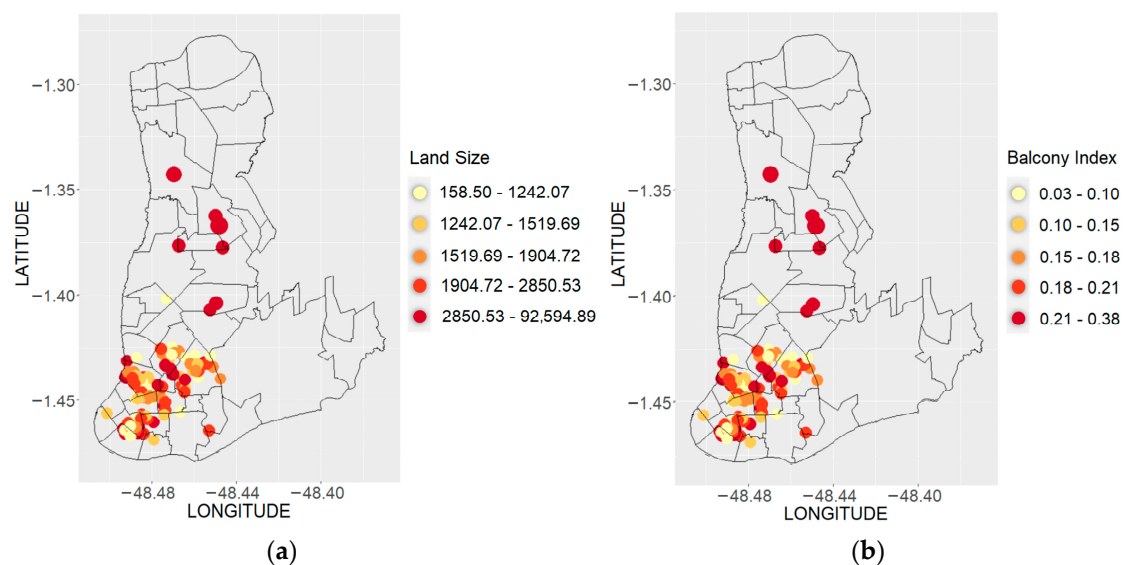


Figure 3. Distribution of buildings in mainland Belém. (a) Variation in land size; (b) variation in balcony index.

Figure 3 shows that the balcony index (Figure 3b) has an inverse spatial distribution to the land size (Figure 3a), tending to be higher in the south and southwest regions. In this

way, the plot size and the balcony index appear to have a negative relationship, i.e., the smaller the land, the higher the balcony index. This relationship will definitively be tested by the inferential models (Hypothesis 1b).

In the context of socioeconomic aspects, Table 3 reveals a wide variability in income per capita, ranging from 370.59 BRL/hab to 4342.04 BRL/hab. This disparity, combined with the substantial standard deviation (SD) of the IPC variable—1156.92 BRL/hab—points to the heterogeneity present in this variable.

On the other hand, the significant average infrastructure coverage of the HDUs (98.23%) indicates that the residential buildings in this sample are well served by public services such as water supply, energy, garbage collection, and sewage. In addition, the low standard deviation (1.39) suggests that the HUs are concentrated in regions that are considerably homogeneous in terms of infrastructure coverage.

The variability in income per capita and infrastructure coverage in the neighborhoods of mainland Belém is shown in Figure 4.

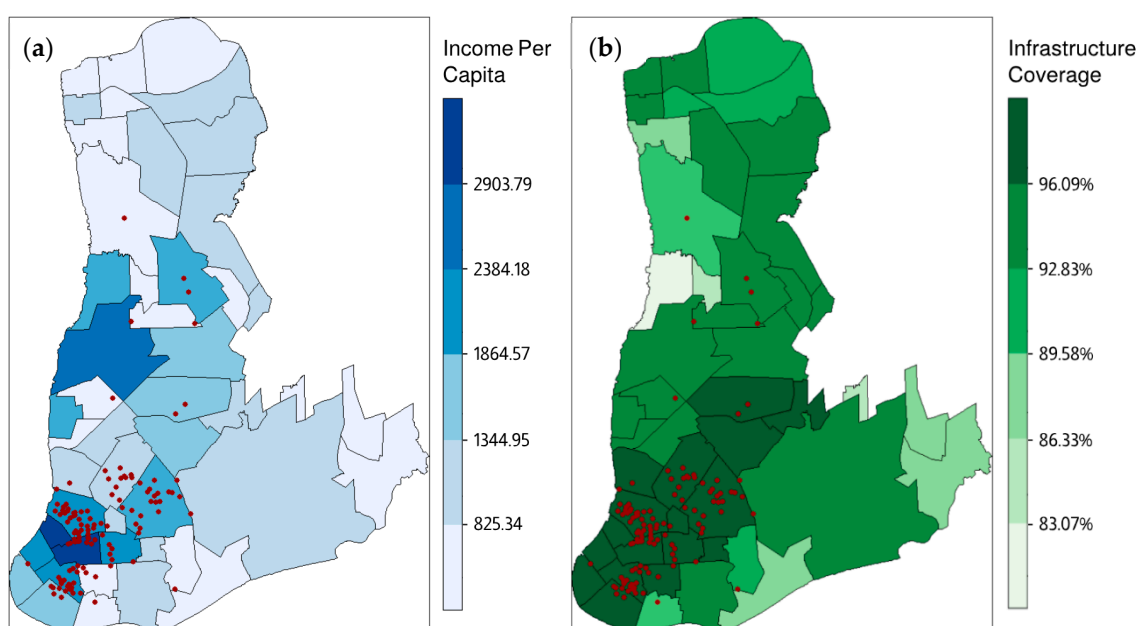


Figure 4. Spatial distribution of neighborhood characteristics in mainland Belém. (a) Per capita income; (b) infrastructure coverage.

Figure 4a shows the heterogeneity present in the distribution of income per capita and reveals that a large part of the sample (41.80%) is concentrated in neighborhoods with an IPC higher than 2384.18 BRL/hab: Batista Campos, Nazaré, São Brás, and Umarizal. Figure 4b shows that 96.72% of the UHs are located in neighborhoods with infrastructure coverage higher than 96.09%, reinforcing the homogeneity in the distribution of this variable.

Analysis of the correlation matrix, shown in Table 4, revealed significant relationships between the independent variables and the HUs balcony index. The variables LAND_SIZE and DOWNTOWN showed a negative relationship with BALCONY_INDEX, while SUITE, IPC, and INFRA showed a positive relationship. Furthermore, it can be seen in Table 4 that none of the independent variables show a substantially high correlation with each other, since none of the Pearson correlations exceed 0.7, showing that multicollinearity should not be a problem for the inferential models in this article.

The variation over time in the balcony index of housing units launched between 2005 and 2017 is illustrated in Figure 5. It can be seen that during the period evaluated, there was an increase of 7.73 percentage points in the average balcony index of apartments, rising from 0.1316 (13.16%) in 2005 to 0.2089 (20.89%) in 2017. The year 2015 saw the launch

of units with the largest balcony areas in relation to the apartment total area, 3 units, with an average balcony index of 0.2622 (26.22%).

Table 4. Correlation matrix.

N	Variable	1	2	3	4	5	6
1	BALCONY_INDEX	1					
2	SUITE	0.47 ***	1				
3	LAND_SIZE	−0.23 *	−0.11	1			
4	DOWNTOWN	−0.38 ***	−0.35 ***	0.58 ***	1		
5	IPC	0.54 ***	0.45 ***	−0.29 **	−0.38 ***	1	
6	INFRA	0.25 **	0.15	−0.24 **	−0.60 ***	0.41 ***	1

* p -value < 0.05; ** p -value < 0.01; *** p -value < 0.001.

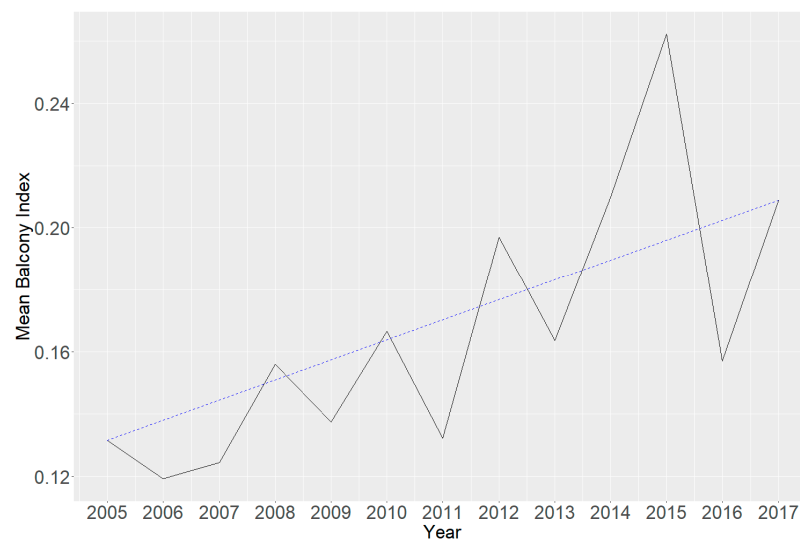


Figure 5. Temporal variation in the balcony index of HUs between 2005 and 2017.

Although the phenomenon of increasing balconies has varied over the years, with periods of abrupt decline, such as 2011, 2013, and 2016, in general, the adoption of this strategy seems well-established among construction companies during the period studied. Therefore, the research problem of this article becomes relevant given the need to understand the variables involved in this phenomenon in the context of the real estate market in Belém of Pará, considering its legal, economic, and urban implications.

Regarding the categorical variable related to the constructive models of the HUs (MODEL), it can be seen—based on Figure 6—that during the period studied, only five buildings were built, following the M2 standard.

Given that this UM is the most restrictive (refer to Table 1), these companies' behavior was already expected. Another characteristic common to these five observations is that they have a balcony index below 0.10 (10%), as shown in Table 5. This behavior may be reinforced by the fact that these buildings' temporal distribution shows that four observations were launched in the period from 2005 to 2006 and only one in 2009.

Table 5. Characteristics of the HUs adapted to the M2 urban model.

ID	BALCONY_INDEX	YEAR	NEIGHBORHOOD
3	0.0405	2005	Jurunas
7	0.0610	2009	Marco
10	0.0635	2006	Batista Campos
18	0.0863	2005	Batista Campos
24	0.0959	2006	Jurunas

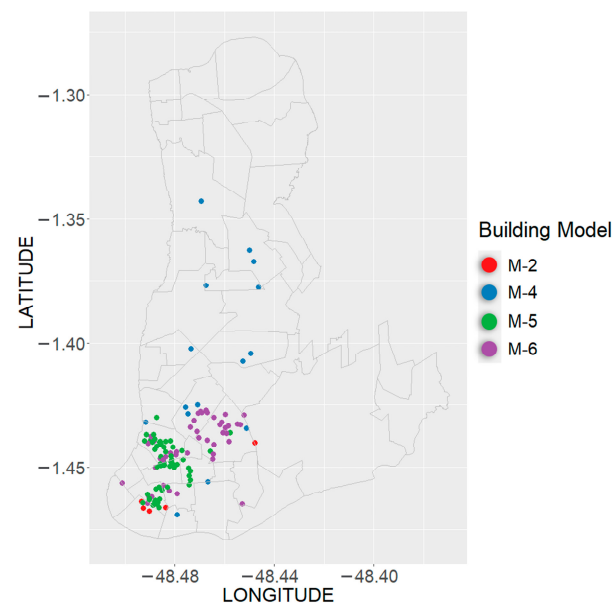


Figure 6. Spatial distribution of the HUs' building models.

Therefore, it can be seen that this specific pattern has been avoided throughout the period studied; this is possibly due to its low utilization coefficient ($UC = 1.4$). Furthermore, the low balcony index found in these buildings dates back to the early stages of the study period, when the strategy of adopting larger balconies might not have been established among construction companies.

4.2. Hypotheses Testing

The first question of our research asks the following: “Is there any relationship between the increase in the balcony index and the increase in the number of units (apartments) built and, consequently, the increase in the companies' OSV?” In order to answer this question, the first argument to consider is that the gradual increase in the balcony index in residential apartments has been a real phenomenon in the Belém real estate market since the early 2000s. This phenomenon is shown in Figure 5.

Although the number of launches stagnated in the last 4 years of the period studied—due to a serious economic and political crisis not covered in the scope of this article—the average number of launches was 10.5 apartment buildings per year [46]. Thus, despite the crisis, this performance seems to show that the gradual increase in balconies continues to serve both the supply side, construction companies, and the demand side, apartment buyers.

The second aspect refers to the legal argument of this context and incorporates the second question of our research, complementary to the first: “What is the involvement of the city's Urban Master Plan (UMP) in this context, as a regulatory authority?” To put it another way, in order to offer housing units with ever-larger balconies, construction companies need to adapt to the institutions that organize the growth and functioning of the city. In this way, the gradual increase in the balcony index must be legitimized by the city's UMP.

4.2.1. The Role of Institutional Theory

Answering the two questions, Hypotheses 1a and 1b relate the increase in the balcony index to the urban model (UM) and the utilization coefficient (UC), both determined by the UMP. The former determines all the parameters that restrict the construction of a building, and the latter is the parameter directly related to the size of the plot on which the apartment building is built. The OLS regression model in Table 6 confirms both hypotheses.

Table 6. OLS regression model.

Variable	Estimate	White Standard Error
(Intercept)	−0.8311 ***	20.94
SUITE	0.1057 ***	0.03013
MODEL: UM4	0.3854 °	0.2194
MODEL: UM5	0.4532 *	0.1973
MODEL: UM6	0.3741 °	0.1954
LAND	−0.1309 **	0.04887
YEAR	0.04011 ***	0.01035
DOWNTOWN	-2.669×10^{-5}	2.495×10^{-5}
IPC	8.773×10^{-5} *	4.069×10^{-5}
INFRA	8.202×10^{-3}	0.02747

Adjusted R-squared: 0.5067; Max. VIF: 3.6285; AIC: 96.2134 Breusch-Pagan Test: 17.302 *; White Test: 8.37 *

° p -value < 0.10; * p -value < 0.05; ** p -value < 0.01; *** p -value < 0.001.

In Hypothesis 1a, selecting UM2 as the reference, Table 6 shows that models UM4 (0.3854; p -value < 0.10), UM5 (0.4532; p -value < 0.05), and UM6 (0.3741; p -value < 0.10) have statistical significance and a positive sign, demonstrating that these three models are more associated with the increase in balconies than UM2. This result is consistent with the fact that Model 2 is the most restrictive among the four urban models and, probably for this reason, arbitrates the urban areas that received only 5 of the 122 buildings in our sample.

In Hypothesis 1b, Table 6 shows that the total land area (LAND) has statistical significance and a negative sign (−0.1309; p -value < 0.01), showing that the apartments with the highest balcony rates are found in buildings that were built on the smallest plots. Therefore, the influence of the urban model and the utilization coefficients linked to these plots of land are shown.

To deepen our discussions, we turn to institutional theory (IT). We begin by emphasizing the seminal contributions of the field, highlighting institutions as cognitive, normative, and regulatory structures and activities that provide stability and meaning to social behavior [47], reducing the uncertainty of the environment by establishing stable structures of interaction [48]. These structures are expressed by conventions, codes of conduct, norms of behavior, laws, and contracts,

When viewed from the perspective of human behavior, the application of IT is associated with two main focuses. The first covers individuals or groups guided by calculations that maximize their interests. On the other hand, the second focuses on actors who follow social commitments guided by habits, customs, and values, without the logic of optimization [49].

In this context, companies are organizations participating in an environment driven by relationships between well-defined parties, with some degree of clearly recognized order [50]. The company is a classic type of formal organization; it is the subject of various approaches to organizational analysis. These organizations seek material and social progress and are guided or mediated by technologies [51]. In this type of approach, the central role of institutions is highlighted, perceiving the competitive environment with a more ecological vision, focused on the role of selection and adaptation [52].

All this reasoning, adapted to our research problem, gives the UMP a central institutional role, establishing rules and norms that bring stability to the competitive environment among construction companies in Belém. In order to maximize their interests, these companies implement product development strategies that are legitimized by institutions. Entrepreneurial capacity determines the ability to adapt, which some companies possess more than others.

Thus, by confirming Hypotheses 1a and 1b, the first and the second research questions are answered: the UMP, through restrictions related to urban models, as well as the utilization coefficient, regulates the occupation of urban land and triggers the strategic thinking

of construction industry managers. This strategic thinking establishes the proportional increase of balconies in relation to the area of the apartment, “freeing up” more space for the construction of a greater number of apartments/floors, up to the limit of the utilization coefficient. Consequently, an increase in the organization’s OSV results in enhanced investment capacity in new technologies and management methods, thereby impacting the construction sector as a whole. Other significant impacts in this industry are linked to job creation and income generation.

4.2.2. The Spatial Spillover

The institutional theory can also be applied to answer the third research question of this paper: “If there is a geographical concentration of buildings with apartments that have disproportionately large balconies, do they influence the launch of buildings with the same characteristics in neighboring districts (spatial spillover)?” In order to answer this question, the presence of positive spatial autocorrelation found in the balcony indexes of the HUs evaluated during the empirical strategy section must be considered (LN_BALCONY Moran’s $I = 0.4359$; p -value < 0.001).

Such phenomenon is strengthened by Figure 3b, which shows that apartments with the largest balcony areas in relation to their total area are located in nearby regions, mainly in the Batista Campos, Marco, Nazaré, and Umarizal neighborhoods. Answering this question, Hypothesis 2 states that the concentration of buildings with increasingly large balconies encourages the adoption of this strategy by neighboring buildings. The SLM regression model shown in Table 6 confirms this hypothesis.

In Hypothesis 2, Table 7 shows that the spatial lag parameter (ρ) is statistically significant (0.2308; p -value < 0.05) and also exhibits a positive sign, confirming the presence of spatial spillover in the strategy of maximizing the legal building potential by adopting larger balcony indexes. Additionally, the AIC test between the OLS (96.2134) and SLM (92.117) models was highly significant, indicating that the spatial lag model provides a better fit to the data due to its lower AIC, as shown in the Empirical Strategy subsection.

Table 7. Spatial specification—SLM.

Variable	Estimate	Standard Error
(Intercept)	−87.654 ***	19.516
SUITE	0.0958 ***	0.02801
MODEL: M4	0.3776 °	0.20462
MODEL: M5	0.423 *	0.18498
MODEL: M6	0.3414 °	0.18279
LAND	−0.1015 *	0.04546
YEAR	0.0423 ***	0.00964
DOWNTOWN	-2.156×10^{-5}	2.375×10^{-5}
IPC	6.055×10^{-5}	3.878×10^{-5}
INFRA	0.0136	0.02557
Rho (ρ): 0.2308 *; Adjusted R-squared: NA; AIC: 92.117		

° p -value < 0.10 ; * p -value < 0.05 ; *** p -value < 0.001 .

In the case of our sample, there are a variety of companies that have incorporated the strategy of increasing the balcony index. This spatial pattern can be interpreted as a manifestation of institutional isomorphism, which is another approach to help explain the competition phenomenon among companies. This approach considers that the environment is dominated by institutional rules and constraints, resulting in the similarity of organizational models, based on the phenomenon of institutional isomorphism [22].

For our research problem, the type of institutional isomorphism seems to be coercive, since it results from strong external influences, both formal and informal, exerted on organizations by stakeholders [22], as well as the application of sanctions in the event of non-compliance [21].

Mimetic isomorphism also seems to occur from the perception of organizations in relation to the successful actions of others in the institutional field [25]. Thus, mimetic processes reveal the influential role of uncertainty, acting as a formidable force that drives imitation and the broader embrace of institutional rules and norms. In certain cases, entities face ambiguous problems or uncertain environments, making imitation a viable solution [26].

In the real estate market, mimicry or imitation occurs when companies adopt similar practices, both in technical and organizational aspects. This reaction is a response to uncertainty and a lack of knowledge about the most effective or market-accepted practices. In addition, due to the high costs required to solve specific problems, organizations tend to adopt similar successful organizations' strategies as a reference in order to adapt to the demands of the sector and seek competitive advantage [53].

Furthermore, institutional isomorphism plays a crucial role in shaping the dynamics of the real estate market in Belém, Pará. Companies operating in this context, driven by external pressures, particularly those arising from the Urban Master Plan, act strategically to formulate effective business strategies. As a result, they manage to enhance their competitive advantage through the exploration of opportunities within the UMP, consequently maximizing the production and sales of HUs.

Moreover, as companies observe the successful strategies employed by their counterparts in response to these external pressures, a pattern of imitation emerges. These observed practices become a viable approach to ensuring adaptability within the industry. This mimetic behavior, driven by the uncertainty inherent in the real estate market, further contributes to the homogenization of strategies among companies.

Thus, by confirming Hypothesis 2, the third research question is answered: the geographical concentration of buildings with apartments that have disproportionately large balconies reflects a spillover effect in neighboring buildings, influencing the launch of buildings with similar characteristics. This result is a convergence towards common practices, emphasizing the powerful influence of institutional isomorphism in fostering similarities and shared responses among market participants.

Regarding the coefficients of the SLM model, we calculated the average of the direct and indirect effects to obtain the semi-elasticity of the model. This enabled us to capture the effects caused by changes in the characteristics of neighboring buildings. As indicated in the Empirical Strategy subsection, the direct effects represent the impact caused by observations of an independent variable, while the indirect effects quantify the diffusion effect among observations due to changes in an independent variable—spatial spillover [44].

Table 8 shows the direct, indirect, and total effects, which are equal to the sum of both the direct and indirect effects, of the explanatory variables.

Table 8. SLM—direct, indirect, and total effects.

Variable	Direct	Indirect	Total
SUITE	0.0972 ***	0.0274 °	0.1246 ***
MODEL: M4	0.3828 °	0.1081	0.4909 °
MODEL: M5	0.4288 *	0.1211	0.5499 *
MODEL: M6	0.3461 °	0.0977	0.4438 °
LAND	−0.1029 *	−0.0291	−0.1319 *
YEAR	0.0428 ***	0.0121 °	0.0549 ***
DOWNTOWN	-2.185×10^{-5}	-6.173×10^{-6}	-2.803×10^{-5}
IPC	6.138×10^{-5} °	1.734×10^{-5}	7.872×10^{-5} °
INFRA	0.0138	3.906×10^{-3}	0.0177

° p -value < 0.10; * p -value < 0.05; *** p -value < 0.001.

Concerning the direct effects, as shown in Table 8, all the explanatory variables, except for DOWNTOWN and INFRA, are significant and exhibit the expected signs. The confirmation of Hypotheses 1a and 1b by the OLS model in Table 6 is corroborated by the

SLM direct effects. This is evident in all the urban models, UM4 (0.3828; p -value < 0.10), UM5 (0.4288; p -value < 0.05), and UM6 (0.3461; p -value < 0.10), and the LAND variable (−0.1029; p -value < 0.05) maintain their significance. These results reinforce the central institutional role of the UMP in bringing stability to the competitive environment among construction companies in Belém and serve as a robustness check for our previous findings.

As for the structural variable concerning the number of suites of each HU, it can be seen in Table 8 that both its direct (0.0972; p -value < 0.001) and indirect effects (0.0274; p -value) are positive and significant. In other words, it can be inferred that the direct effect associated with the variable SUITE indicates that for each extra suite, the balcony index of a housing unit will increase by approximately 9.72%, while the indirect effect is approximately 2.74%. This could be due to the fact that an apartment can be indirectly influenced by being located next to other apartments with better characteristics.

The significant spillover effect of SUITE can be attributed to the fact that the balcony index of an HU “*i*” is influenced not only by the balcony index of the neighboring housing units (as can be seen in Figure 3b) but also by the structural characteristics of housing units surrounding HU “*i*”. Put simply, improvements in my neighbors’ apartment features will likely “compel” me to enhance mine as well, given that they are my competitors. Consequently, apartments in close proximity are more likely to share similar structural characteristics rather than the other way around. Hence, the HUs with similar characteristics are clustered geographically [54].

4.2.3. Control Variables Implications

In relation to the control variables, when dealing with the IPC variable, the two models, OLS and SLM—direct effects—showed a positive relationship: (8.773×10^{-5} ; p -value < 0.05) and (6.138×10^{-5} ; p -value < 0.1), respectively. These results indicate that HDUs with higher per capita income are more likely to receive buildings with higher balcony indexes. This association can be attributed to the buyer’s financing capacity [27–29] and its subsequent influence on the urban occupancy pattern.

The historic factor of Belém’s urban development also plays a significant role in explaining this result. HDUs with lower per capita incomes tend to exhibit less verticalization and are often avoided by the middle and high-end real estate market [17]. As a result, the neighborhoods with a higher number of buildings, such as Batista Campos, Marco, Nazaré, and Umarizal, consequently exhibiting a greater mean balcony index, are often situated in HDUs with high per capita incomes.

Additionally, the absence of significance found for the variable related to infrastructure coverage (INFRA) in both OLS and SLM models shows that this result can be associated with the homogeneity present in the distribution of this variable, as shown in Figure 4b. Therefore, although urban infrastructure is a determining factor for the economic development [31,32] and the consequent exploitation of the region by the real estate market [34], its uniformity in the sample under analysis may explain the lack of a discernible impact on the dependent variable of the models.

Finally, regarding the control variable YEAR, both OLS and SLM—direct effects—models showed a positive relationship: (0.04011; p -value < 0.001) and (0.0428; p -value < 0.001), respectively. These findings imply that newer buildings tend to have higher balcony indexes. This association can primarily be attributed to the nature of the construction industry, where achieving the intended durability and complexity of the final product is capital-intensive, involves a large number of laborers, and takes a long time to complete [55].

These findings are further substantiated by Figure 5, illustrating a gradual growth in the balcony index of housing units at the onset of the analyzed period. Given that a majority of the buildings in our sample had construction times ranging from 4 to 5 years, it is clear that the integration of larger balconies has been a strategy that requires time for acknowledgment and legitimization within the social environment [56]—Belém real estate market.

Furthermore, the argument gains strength from the examination of the spillover effect associated with the YEAR variable in the SLM indirect effects (0.0121; p -value < 0.1)—Table 8. This aspect reveals that as buildings become newer, there is a corresponding increase in the balcony index of new housing units developed in neighboring areas. In essence, the newer the buildings, the higher the probability that the balcony index increases in the new HUs developed in adjacent regions, emphasizing a broader impact of the environment and temporal trends in the adoption of new characteristics by organizations [57]—in the context of this paper, architectural features.

4.2.4. The Demand Side

The arguments used in the discussion of the results so far have established that the strategy of increasing the draw rate is a real strategy and has also been tested and confirmed by inferential models. Thus, the phenomenon studied on the supply side (companies) was evidenced. However, in a market such as real estate, with products classified as an extreme case of differentiated goods [58], for a strategy to be successful, demand plays an important role.

Therefore, given that this particular product has been well received on the demand side, even though balconies are originally spaces that do not constitute part of the apartment's living area [20], why would a purchaser agree to buy a housing unit with increasingly larger “wasted” areas? Although the demand side has not been the protagonist in our paper, we consider it important to briefly incorporate this topic into the discussion, as it could be a viable future research agenda.

Our brief answer incorporates the theoretical framework of the organizational ecosystem, which consists of different “species” of companies, complementary or substitutes, acting in a competitive environment, sometimes collaboratively, sometimes as competitors [57]. In this specific study, we highlight the “balcony glazing” companies. These companies act as a complement to building firms, by incorporating this type of technology. In fact, the glazing technology has been around for 25 years but has only been established in Belém for a little more than 10 years.

This consolidation has led to the point where building companies have developed balconies in advance that are fully compatible with this technology, allowing them to be perfectly protected from adverse weather conditions and aesthetically aligned with the building's facades. In other words, balconies, which were not originally part of the living area of the apartments, ended up being attached to living rooms, bedrooms, and suites, thereby becoming fully usable areas for the apartment's occupants.

5. Conclusions

The aim of this paper was to identify and analyze the impact of institutions on the development of real estate products—vertical residential units—in the city of Belém, Pará, which is situated in the Brazilian Amazon. To this end, we investigated the increasingly consolidated occurrence of balconies that are proportionally larger when compared to the total area of the apartment (balcony index). This is a curious fact since, regionally, balconies have always been considered less frequented areas by the occupants of these apartments, mainly for climatic reasons.

Considering economic performance issues as primary conditions for companies in the sector, we first showed that the relative increase in balconies actually allows the company to launch and build more apartments per tower built. Thus, we established and confirmed the main hypotheses by relating the increase in the balcony index to restrictive factors present in the city's Urban Master Plan. In this way, by increasing the balcony index, companies meet the requirements of the law, obeying the urban planning models to which the plots belong, as well as the utilization coefficient linked to these plots and, consequently, their dimensions.

In addition, we also confirmed the hypothesis that towers with relatively large balconies influence their neighborhoods. Put another way, there are more and more launches

with apartments with the same characteristics in certain areas of the city, characterizing the concentration of these towers, which the literature calls “spatial spillover”.

In this sense, it was possible to consistently understand the strong level of influence of institutions in Belém’s real estate market, legitimizing their strategies. The central lessons of this research can be understood from at least two aspects: the first concerns the very nature of the relationship between the regulatory authority and the companies, which is a relationship that at first would be simply and exclusively one of limitation and coercion and can, in fact, provoke a re-signification of the concept or way of living, “bringing into” the apartment areas that were previously less used. The second aspect reinforces the understanding of the residential real estate market product as a differentiated good, establishing a competitive environment of high investments in which companies imitate each other to an important degree, seeking to reduce uncertainties.

With regard to the impacts on the city, we can consider that the proportional increase in the balcony index, although well accepted by apartment buyers, can certainly bring up issues that should be discussed by the people drafting the Urban Master Plan. As the glazing of balconies spreads, issues related to the availability of views or natural ventilation for immediate neighbors may be questioned, as the apartment building takes on an opaque format. In a city located in the Amazon region, the free and strong circulation of wind can be very important for general well-being. Therefore, these concerns highlight the potential necessity for a revision of the city’s master plan.

In reality, regardless of the region in which a city is located, verticalization is a common phenomenon in Brazilian big cities. In this context, even though the institutions that regulate this environment differ significantly among the states, another essential conclusion is that this type of debate can be faced by the entire Brazilian territory. Finally, our research shows the importance of engineering and architecture in mediating the dilemma of a business–client city.

One of the limitations of our study concerns the period studied. The number of years and, consequently, the sample size could have been greater. However, the data were collected from an institution through manual extraction from hard-copy records, which were not available in digital format. The institution retains these documents, with complete access granted solely from the year 2005 onwards. Moreover, it is important to note that data predating 2005 were subject to poor conservation and had many missing values. Prior to 2005, the institution utilized a different data collection method, resulting in a database with incomplete values and an inadequate format.

Concerning the acquisition of data beyond 2017, limitations arise due to delays in negotiating the renewal of permission to collect the data, which remains in a non-digital format and is not accessible through open access. Upon the conclusion of these negotiations, it will be crucial to extend this period. Future research agendas could explore the relationships between complementary and substitute companies in Belém’s real estate market, with the potential to identify innovation in the construction sector. Additionally, incorporating the perceptions of apartment buyers through questionnaires could provide valuable insights, helping to identify new trends in architectural configurations.

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