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BOLETIM DE CONJUNTURA

BOCA

Ano VI | Volume 17 | Nº 49 | Boa Vista | 2024

http://www.ioles.com.br/boca

ISSN: 2675-1488

https://doi.org/10.5281/zenodo.10608072

BOLETIM DE CONJUNTURA

www.ioles.com.br/boca

HEDONIC HOUSING PRICE IN THE NORTH GAÚCHO COASTAL: THE CASE OF CAPÃO DA CANOA, BRAZIL[1]

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Abstract

The real estate market is a sector with the potential to boost a region's economy, generating jobs and income, thus contributing to economic development. Several factors are decisive in the decision to purchase a home, influencing consumers at the time of purchase. This study investigates the effect of the physical characteristics of private and common areas on the hedonic price of housing. The research, of a quantitative and descriptive nature, is based on secondary data to analyze sales prices in the real estate market. The sample comprises 964 homes in the municipality of Capão da Canoa, using data available on the ZAP Imóveis website. The results indicate that the value of housing is directly affected by the physical characteristics of the private area and the common area of the condominium. The price of housing is influenced by factors such as the number of bedrooms, the area of the home, the number of parking spaces, the number of bathrooms, whether there is a barbecue in the home, a swimming pool, a party room, among others. This study contributes to the hedonic price theory, providing valuable insights for the real estate market to apply new techniques in determining the fair value of housing, considering its characteristics.

Keywords: Consumer Behavior; Hedonic Price; Housing.

Resumo

O mercado imobiliário é um setor com potencial para impulsionar a economia de uma região, gerando empregos e renda, contribuindo assim para o desenvolvimento econômico. Diversos fatores são determinantes na decisão de adquirir uma habitação, influenciando os consumidores no momento de compra. Este estudo investiga o efeito das características físicas da área privativa e da área comum no preço hedônico das habitações. A pesquisa, de natureza quantitativa e descritiva, baseia-se em dados secundários para a análise dos preços de venda no mercado imobiliário. A amostra compreende 964 habitações do município de Capão da Canoa, utilizando dados disponíveis no site ZAP Imóveis. Os resultados indicam que o valor da habitação é diretamente afetado pelas características físicas da área privativa e da área comum do condomínio. O preço da habitação é influenciado por fatores como o número de quartos, a área da habitação, o número de vagas de garagem, o número de banheiros, possuía presença de churrasqueira na habitação, piscina, salão de festas, entre outros. Este estudo contribui para a teoria do preço hedônico, fornecendo insights valiosos para o mercado imobiliário aplicar novas técnicas na determinação do valor justo das habitações, considerando suas características.

Palavras-chave: Comportamento do Consumidor; Habitação; Preço Hedônico.

[1] Acknowledgements for the research support funded by the Meridional Foundation (Brazil).

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INTRODUCTION

Families, when deciding where to live and which housing unit to acquire, consider various characteristics, with housing area being one of the primary factors influencing the purchasing decision and willingness to pay. From a demand perspective, housing area is a critical factor used to define and narrow down options among various types of housing. Additionally, area constraints play a significant role when consumers seek improvements in their residences.

On the supply side, the area of a housing unit is a key parameter adjusted by real estate developers to maximize profits. Housing area also plays a crucial role in shaping urban development policies. Given the relevance of housing characteristics for both public policies and real estate transactions, this study focuses on understanding the characteristics that contribute to housing prices.

In this context, the restrictive measures imposed by the COVID-19 pandemic required a reassessment of housing characteristics, considering the need for longer family stays within their residences (TAJANI *et al.*, 2021). Consequently, isolating only the housing area to assess its effect on price proves to be insufficient, underscoring the importance of considering other housing characteristics. Since the early studies on hedonic price theory, empirical applications of this method to highlight the characteristics that make up the price equation have grown extensively, especially in the real estate market.

Furthermore, sustainable development has become a significant presence in the real estate market, influencing not only job generation and income but also the adoption of practices aimed at reducing environmental impacts. Housing projects have evolved, incorporating sustainable practices ranging from the use of recycled construction materials to reducing raw material wastage.

Despite real estate literature being global in both authorship and data, most studies are conducted in China (LI; LI, 2022) and the United States (KHOSHNOUD; SIRMANS; ZIETZ, 2023). This study is conducted in Brazil and focuses on the characteristics of housing (hereinafter referred to as apartments) in vertical condominiums, based on the experience of a coastal region in the southern part of the country.

On the other hand, while public policies aimed at modernizing public spaces drive housing growth in the region, housing projects have introduced significant improvements in private areas and received investments in common areas for condominium residents. These new investments highlight characteristics that are not typically observed in the composition of the housing price equation.

This study aims to investigate the effect of the physical characteristics of private and common areas on the hedonic price of housing. Analyzing market-available prices in relation to the physical

characteristics of private and common areas of the condominium can yield valuable insights into determining the hedonic price of a residence. Therefore, we aim to provide evidence that the addition of characteristics to housing increases its perceived value.

The present study is classified as quantitative and descriptive research, centered on the collection of secondary data to estimate housing prices in the real estate market of a coastal region in southern Brazil. Using a sample composed of 964 homes located in the municipality of Capão da Canoa, the analysis was conducted through the application of the hedonic price method.

The article is structured as follows: this introduction; the next section focuses on a literature review of housing and hedonic pricing. The subsequent section provides a detailed description of the research methodology procedures. The fourth section presents and discusses the results of the hedonic price estimation model. Finally, the fifth section presents the study's conclusions.

HOUSING

Housing possesses various characteristics that make it a unique object of study in the market. Apart from being considered a consumer good, it stands out as the most valuable asset for many families. A peculiarity of this market is evident in the formation of housing prices, as externalities, in addition to production costs, play a role in price composition (BUITELAAR; SCHILDER, 2017).

The immobility and durability of housing give it a heterogeneous nature (FRANCKE; VAN DE MINNE, 2021), influencing the economic dynamics of housing prices and the potential for economic segregation. This allows consumers to be willing to pay more for equivalent units (GLAESER, 2014).

The uniqueness of housing becomes apparent when compared to other goods due to its high durability and distinctive characteristics, such as private areas (e.g., number of rooms and bathrooms) and common areas (e.g., recreational and leisure areas), as well as its location (LIMA JUNIOR; MONETTI; ALENCAR, 2023).

Being a unique asset in an economy, housing stands out for its heterogeneous characteristics, differing in size and location. Its durability, maintained through good maintenance over many years, makes it a significant investment, often representing a substantial financial outlay or even being subject to financing (O'SULLIVAN, 2018). In summary, housing is an asset of high economic and patrimonial value, intrinsically linked to the principles of human dignity. Moreover, it plays a fundamental role in job and income generation, becoming essential to the economic sector (DANTAS; MAGALHÃES; VERGOLINO, 2010).

In other words, housing demand is influenced by participants' sentiments toward the market (HUI; WANG, 2014). During negotiations, there is an observable lag in a buyer's expectations compared to the seller's, as noted by Hui and Liang (2015), who highlight identifiable effects in regions where governments impose restrictions on the real estate market.

The real estate market, being complex and multidimensional, is affected by exogenous factors and the availability of information to the economic agents involved (CASTRO; MARQUES; BORGES, 2011). Even after the acquisition of the first housing, demand persists as families and investors seek better housing with a higher quality standard.

In this context, when choosing housing, consumers take into consideration certain attributes or characteristics that are essential to meet their desires and needs (PAZ; NOBRE; NOBRE, 2020). The evaluation of these characteristics precedes the purchasing decision, as they have a direct impact on the value the consumer is willing to pay for the housing (PINTO; FERNANDES, 2019).

HEDONIC PRICE

The concept of hedonic price is extensively addressed in the literature, both in assessing specific products (e.g., apartments) and analyzing products within specific sectors (e.g., the real estate sector). Although there are various studies on price, Andrew Court's seminal work (1939) defined hedonic price from a set of product characteristics (e.g., automobiles). In other words, hedonic price can be conceived as the implicit prices of attributes or characteristics in the observed prices of products, i.e., product prices are obtained by the implicit prices of their attributes or characteristics (ROSEN, 1974).

In this context, the comparison of product prices can reflect the comparison of a set of attributes or characteristics of each type of product (GRILICHES, 1961, 1971). Thus, consumers evaluate a set of characteristics or properties, not just the product itself (LANCASTER, 1966). Hedonic price, therefore, represents the value that the consumer is willing to pay for the attributes or characteristics of a product (ROSEN, 1974), with these characteristics being determinants of this price (BRIGHAM, 1965).

The hedonic pricing model measures the relative contribution of each property characteristic in determining the price and its implication on the existence of a premium price. Faced with a diverse set of characteristics, prices reflect the correspondence between supply and demand, as well as the consumer's willingness to pay (CHEN; XIE, 2017). Scarce housing units will tend to have higher prices, while those with abundant supply will be relatively more affordable (BUITELAAR; SCHILDER, 2017). In the real estate market, characterized by the exchange of long-lasting goods often transacted multiple

times (FRANCKE; VAN DE MINNE, 2021), the hedonic pricing model plays a significant role in assessing housing prices."

Consequently, the hedonic price can be perceived differently based on individual priorities, influencing the selection of a set of characteristics available for each good. These characteristics are not limited to the good itself but are intrinsically linked to its utility (PAZ; NOBRE; NOBRE, 2020). This involves the consumer's willingness to pay for specific characteristics of a particular good (VERGARA-PERUCICH, 2023).

In this way, the price of housing is interpreted as an assessment of a set of characteristics of a good (SPAGNOLO *et al*., 2023). Or, to put it more precisely, the price of housing is related to each of its characteristics (SILVER, 2022). The hedonic price model recognizes that a good can be described by a set of attributes or characteristics (REY-BLANCO; ZOFIO; GONZÁLEZ-ARIAS, 2024).

Hedonic pricing has been widely applied in real estate appraisal research due to the specificities present in the real estate market. Housing aligns with the assumptions of a hedonic approach, as it can be treated as a good consisting of multiple characteristics, such as area, number of rooms, and number of bathrooms (PAZ; NOBRE; NOBRE, 2020; POTRAWA; TETEREVA, 2022).

In the discussion of housing prices, various factors can influence their determination. For example, the analysis of real estate listings highlights attributes that receive more attention, influencing the offered value of each housing unit. However, this analysis is just one facet, involving a broader economic and social context.

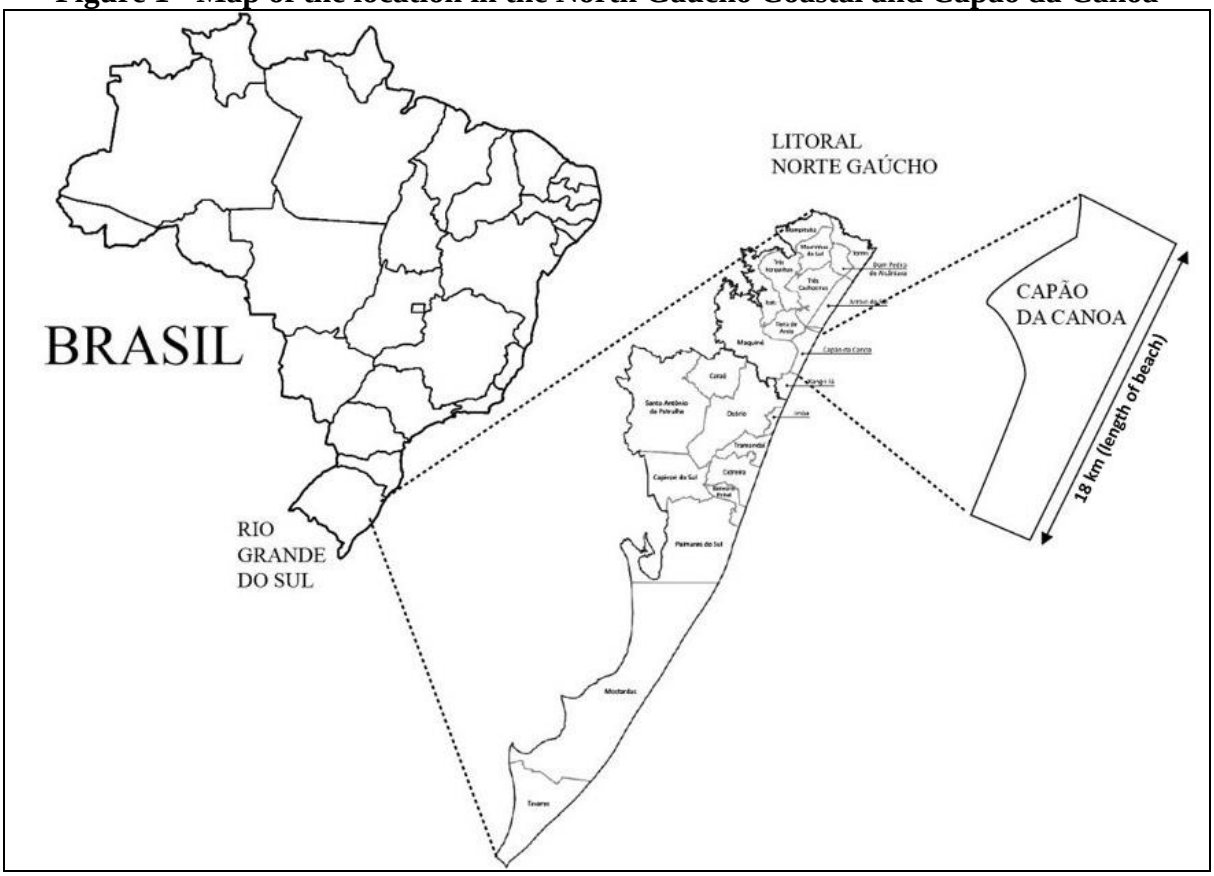
In general, hedonic price analysis assumes that the price of housing is determined by a set of housing characteristics that can be classified into various dimensions (LI *et al*., 2023). Although there are various dimensions, the structural dimension, which refers to the physical characteristics of a housing, is the one that most affects its price (WANG *et al*., 2024). Furthermore, in the case of housing that is part of a housing complex, whether vertical or horizontal, it is necessary to verify the existence of common physical characteristics shared by individuals from various housing units.

In other words, the dimension of physical characteristics can be divided into the physical characteristics of the private area of the housing and the physical characteristics of the common area of the condominium. Physical characteristics of the private area, such as housing size, the number of rooms, bathrooms, and garage spaces, among others, have a positive effect on the value of the housing and are often emphasized in studies determining the formation of the hedonic price (AHMED *et al*., 2020; KHOSHNOUD; SIRMANS; ZIETZ, 2023). Previous studies' results indicate that the physical characteristics of the private area have a positive and significant impact on housing prices (PAZ; NOBRE; NOBRE, 2020; SAYIN; ELBURZ; DURAN, 2022).

RESEARCH METHOD

The study is characterized as quantitative and descriptive research, based on the collection of secondary data to estimate housing prices in the real estate market of the municipality of Capão da Canoa, located in the North Gaúcho Coastal, in the Southern Region of Brazil (Figure 1).

Figure 1 - Map of the location in the North Gaúcho Coastal and Capão da Canoa



Source: Self elaboration.

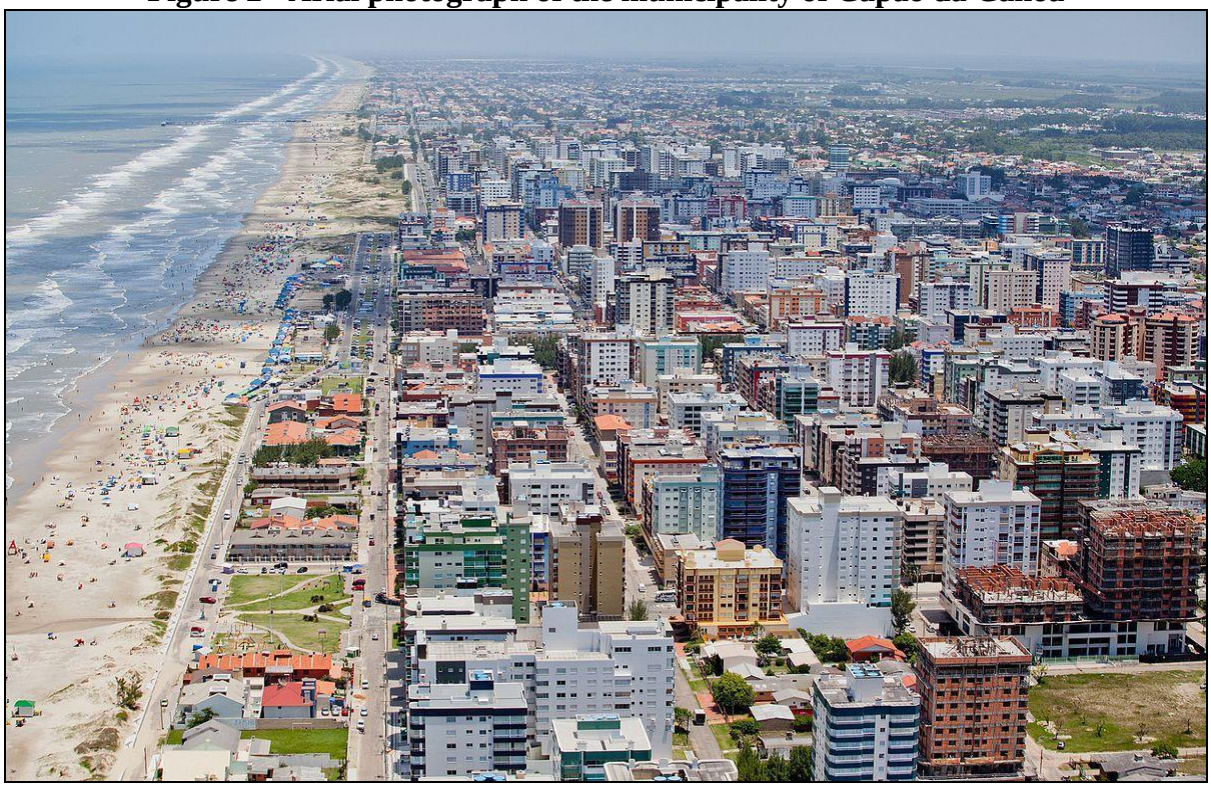
The North Gaúcho Coastal region, rich in socioeconomic and environmental diversity (RAMBO; VIANNA, 2020), is known for summer tourism, attracting a significant number of tourists during the summer season from various Brazilian states and neighboring countries such as Argentina, Uruguay, and Chile (CONTUR, 2022). This phenomenon has driven the creation of condominiums and subdivisions, resulting in significant real estate construction growth since the 1990s (AGUIAR, 2008).

The term "gaúcho" is a demonym referring to people involved in livestock farming in regions characterized by natural fields, known as pampas. These areas are located in the southern part of South America, specifically covering Brazil (the state of Rio Grande do Sul), Argentina, and Uruguay. Additionally, the term is used to designate anyone born in the state of Rio Grande do Sul.

For the research, the municipality of Capão da Canoa was selected based on advantageous criteria, considering access to a larger number of housing units for robust econometric estimates, an extensive sample allowing the study of the hedonic pricing model, and the choice of a municipality with a population exceeding 50,000 inhabitants and a beach extension exceeding 10 km. These criteria contrast with previous studies that used municipalities with little diversity in characteristics and limitations in sample size (e.g., PAIXÃO; LUPORINI, 2020; PAZ; NOBRE; NOBRE, 2020).

Capão da Canoa, the most populous municipality in the coastal region, has 55,009 inhabitants and an 18 km stretch of beaches, representing 13.5% of the population and 5.5% of the beach extension in the North Gaúcho Coastal. Access to the municipality is via the RS-389 highway, known as Estrada do Mar. The municipality offers various beachfront neighborhoods (i.e., beachfront), such as Navegantes, Centro, and Zona Nova, which have gastronomic and commercial areas, as well as parks and squares for leisure and entertainment (Figure 2). The research sample includes 964 apartments, representing 24.3% of the total available for sale.

Figure 2 - Arial photograph of the municipality of Capão da Canoa



Source: Self elaboration.

Data collection was conducted on the ZAP Imóveis platform (www.zapimoveis.com.br) between September and November 2022. This B2C marketplace platform aggregates property listings for buying, selling, and renting, registered by brokers and companies in the real estate sector, such as real estate

agencies, construction companies, and developers. The database resulted in 969 apartment units, totaling 12,597 observations and including 13 housing characteristics (6 from the private area and 7 from the common area), which were used in estimating the hedonic pricing model (Table 1).

Table 1 - Description of the housing characteristics

Variable	Characteristic	Type	Variable description	Source
Price	-	Quantitative	Selling price of the housing.	Sayin, Elburz e Duran (2022)
Area	CF - AP	Quantitative	Total area of the housing, calculated in square meters.	Agarwal *et al*. (2021) Sayin, Elburz & Duran (2022)
Bedroom	CF - AP	Quantitative	Number of bedrooms in the housing.	Agarwal *et al*. (2021) Sayin, Elburz e Duran (2022)
Garage	CF - AP	Quantitative	Number of garage spaces for the housing.	Aliyev, Amiraslanova, Bakirova e Eynizada (2019)
Bathroom	CF - AP	Quantitative	Number of bathrooms in the housing.	Sayin, Elburz e Duran (2022)
Furnished	CF - AP	Categorical	Availability of furniture in the housing, with categories encoded as a dummy variable (0 = absence; 1 = presence).	Study authors (2023)
Barbecue area	CF - AP	Categorical	Availability of a barbecue area in the housing, with categories encoded as a dummy variable (0 = absence; 1 = presence).	Paz, Nobre e Nobre (2020)
Pool	CF - AC	Categorical	Availability of a pool in the condominium where the housing is located, with categories encoded as a dummy variable (0 = absence; 1 = presence).	Paz, Nobre e Nobre (2020)
Sauna	CF - AC	Categorical	Availability of a sauna in the condominium where the housing is located, with categories encoded as a dummy variable (0 = absence; 1 = presence).	Sedaghati, Pirbabaei, Nourian e Beyti (2022)
Gym	CF - AC	Categorical	Availability of a gym in the condominium where the housing is located, with categories encoded as a dummy variable (0 = absence; 1 = presence).	Study authors (2023)
Party hall	CF - AC	Categorical	Availability of a party hall in the condominium where the housing is located, with categories encoded as a dummy variable (0 = absence; 1 = presence).	Paz, Nobre e Nobre (2020)
Game room	CF - AC	Categorical	Availability of a game room in the condominium where the housing is located, with categories encoded as a dummy variable (0 = absence; 1 = presence).	Study authors (2023)
Leisure area	CF - AC	Categorical	Availability of a recreational area in the condominium where the housing is located, with categories encoded as a dummy variable (0 = absence; 1 = presence).	Paz, Nobre e Nobre (2020)
Sports court	CF - AC	Categorical	Availability of a sports court in the condominium where the housing is located, with categories encoded as a dummy variable (0 = absence; 1 = presence).	Paz, Nobre e Nobre (2020)

Source: Self elaboration.
Note: CF-AP = Physical Characteristic of the Private Area; CF-AC = Physical Characteristic of the Common Area.

The analysis of collected data was conducted by tabulating in a spreadsheet (Excel), followed by importation into the SPSS statistical software. During tabulation, criteria such as the elimination of cases with missing values and outliers, as well as the removal of duplicate cases, were considered.

During tabulation, the z-test was applied to the dependent variable (i.e., housing price), excluding 5 units with values considered outliers (greater than ± 2.5), according to established criteria (HAIR *et al*., 2009). Subsequently, the dependent variable was transformed into a logarithm for analysis

purposes (AGARWAL *et al*., 2021). In the data analysis, multiple linear regression technique was employed, with housing price as the dependent variable and the physical characteristics of the private and common areas as independent variables.

RESULTS AND DISCUSSIONS

The research sample consists of data collected from 964 apartments in Capão da Canoa. The data cover the physical characteristics of the private area (i.e., the entire space occupied by the apartment, including the garage) and the common area (e.g., pool, party room, and leisure area – spaces accessible to all condo residents). The physical characteristics of the private area account for 5,784 observations (46%), while the common areas have 6,748 observations (54%), totaling 12,532 observations.

The analysis of housing prices reveals that the lowest value is R$ 185,000.00, while the highest value is R$ 3,300,000.00 (Table 2). In this context, Court's concept (1939) is highlighted, emphasizing that the housing price encompasses a set of characteristics.

Table 2 - Physical characteristics of the private and common areas of housing

Physical characteristics	Capão da Canoa	
	Minimum	Maximum
Price (R$)	185,000	3,300,000
Area (m^2)	40	360
Bedroom (unit)	1	5
Garage (unit)	0	4
Bathroom (unit)	1	6
Furnished (absence/presence)	0	1
Barbecue area (absence/presence)	0	1
Pool (absence/presence)	0	1
Sauna (absence/presence)	0	1
Gym (absence/presence)	0	1
Party hall (absence/presence)	0	1
Game room (absence/presence)	0	1
Leisure area (absence/presence)	0	1
Sports court (absence/presence)	0	1

Source: Self elaboration.

It is observed that, in the private area characteristics, the smallest housing area is 40 m2, while the largest is 360 m2. Housing in Capão da Canoa are used by owners and also rented seasonally, prepared to accommodate tourists during the summer. Notably, 89% of housing are furnished, and 94.8% have a barbecue, a regional culinary device.

The characteristics of the common area encompass spaces accessible to all condo residents. Several housings have a pool (21.6%), sauna (4.1%), gym (13.8%), party room (32.5%), game room (10.8%), leisure area (5.9%), and sports court (3.4%).

To assess the effect of the characteristics more appropriately, a hierarchical regression was performed, prioritizing the order of the characteristics: first those of the private area and then those of the common area. The hedonic pricing model measures the relative contribution of each real estate feature to prices, being effective in isolating the effect of a specific feature from other attributes (ROSEN, 1974).

The test of the effect of characteristics on housing prices, hierarchically, was proposed from two regression models. Both had an explanatory power above 60% of the variation in housing prices. Model 1, which includes only private area characteristics, explains 66.5% (Adjusted $R^2 = 0.665$), while Model 2, which also incorporates common area characteristics, explains 68.0% (Adjusted $R^2 = 0.680$).

The analysis of variance (ANOVA) confirmed that both Model 1 ($F = 262.776$; $p < 0.000$) and Model 2 ($F = 130.705$; $p < 0.000$) fit the collected data. The estimated values of the linear regression coefficients were calculated to interpret the contribution of each characteristic to housing prices (Table 3).

The coefficient of determination (Adjusted R^2) shows that the characteristics have an effect on the variability of housing prices. Model 2, which includes common area characteristics, increased the coefficient, indicating a more comprehensive understanding of price variability.

Table 3 - Standardized coefficients (β) of linear regression models for Capão da Canoa

Characteristics	Beta (β)	
	Model 1	Model 2
Area	* 0.216	* 0.233
Bedroom	* 0.405	* 0.411
Garage	* 0.181	* 0.172
Bathroom	* 0.152	* 0.128
Furnished	0.036	** 0.039
Barbecue area	* 0.111	* 0.106
Pool	-	* 0.118
Sauna	-	-0.047
Gym	-	** 0.050
Party hall	-	-0.014
Game room	-	-0.032
Leisure area	-	** 0.058
Sports court	-	** -0.075
Intercept	5.172	5.168
Sample	964	964
F-statistic	319.665	158.735
F-Sig.	0.001	0.001
R^2 (Adjusted R^2)	0.667 (0.665)	0.685 (0.680)

Source: Self elaboration.
Note. The dependent variable is the logarithm of housing price (Log_Price). Variables with standardized coefficients have a significant effect on the price (Log_Price) at the level of $p < 0.01$ (*); $p < 0.05$ (**).

Private area characteristics (Model 1) with the highest positive effects on housing prices were the number of bedrooms (β = 0.405), housing area (β = 0.216), number of garage spaces (β = 0.181),

number of bathrooms (β = 0.152), and the availability of a barbecue (β = 0.111). Furniture did not have a significant effect. Five out of six private area characteristics showed a positive and significant effect on housing prices, indicating that an increase in these characteristics implies an increase in housing prices.

Incorporating common area characteristics (Model 2), the highest positive effects continued to be the number of bedrooms (β = 0.411), housing area (β = 0.233), number of garage spaces (β = 0.172), and number of bathrooms (β = 0.128). Next, the availability of a pool in the condominium (β = 0.118) and the availability of a barbecue in the housing (β = 0.106) had the highest effects. Furthermore, there were lower positive effects of the availability of a leisure area (β = 0.058), availability of a gym (β = 0.050), and furniture in the housing (β = 0.039). The sports court showed a negative effect (β = -0.075), possibly due to the search for tranquility in the condominium, avoiding possible noise caused by sports activities. Four out of seven common area characteristics contributed to explaining housing prices.

The results corroborate the national literature, indicating that housing area, number of bedrooms, number of garage spaces, and number of bathrooms have positive and significant effects in explaining housing prices. These findings are in line with national (ALVES *et al.*, 2011; FÁVERO; BELFIORE; LIMA, 2008; JOHN; PORSSE, 2016; PAZ; NOBRE; NOBRE, 2020; PINTO; FERNANDES, 2019) and international (AHMED *et al.*, 2020; BHATTACHARJEE; CASTRO; MARQUES, 2012; MARQUES; CASTRO; BHATTACHARJEE, 2013; KHOSHNOUD; SIRMANS; ZIETZ, 2023; RANDENIYA; RANASINGHE; AMARAWICKRAMA, 2017; SAYIN; ELBURZ; DURAN, 2022) literature.

The availability of a barbecue in the housing is a characteristic typical of the region, not found in scientific studies in other locations in Brazil, due to its relevance in regional cuisine and gaucho tradition.

Another highlight is the presence of pools in the condominiums of the North Gaúcho Coastal, compensating for the cooler sea temperature, influenced by air masses and marine currents from the South Pole. This aspect led to the construction and offer of pools in the condominiums themselves.

In summary, the real estate market and consumer behavior in Capão da Canoa present distinct characteristics. The estimated model was effective in explaining the variability in housing prices, indicating that, for the most part, the effects of variables on prices align with reality.

CONCLUSION

The study of the real estate market in the North Gaúcho Coast was based on the analysis of housing prices in Capão da Canoa. Despite sharing characteristics with other municipalities in the

region, some differences were identified. Notably, the housing area and the number of bedrooms stood out as key characteristics in the model that best explains the formation of the hedonic price.

The results suggest that the characteristics of the private area are the ones that best explain the price formation, while the common area characteristics of the condominium contribute to a lesser extent to explain the housing pricing model.

It is highlighted that determining characteristics in price formation, such as the number of bedrooms, housing area, number of garage spaces, the number of bathrooms, and the availability of a condominium pool, align with the results of national and international studies. On the other hand, the presence of a barbecue in the housing emerges as a crucial regional feature in the price formation of homes in Capão da Canoa.

Thus, this study contributes to expanding existing discussions in the literature on the hedonic price of housing, adding results from a coastal municipality. It is worth noting that there is greater diversity in hedonic price studies in municipalities far from the coast, with national studies often having a reduced number of housings.

The real estate market, composed of brokers, real estate agencies, builders, and developers involved in buying, selling, and renting transactions, lacks in-depth knowledge about the formation of hedonic housing prices. In this sense, this study can contribute to the application of new pricing techniques, aiming to establish fair values based on housing characteristics.

However, it is important to mention some limitations of this study. The research focused on a single Brazilian coastal municipality, representing a significant geographical limitation. Additionally, location characteristics were not considered. The scope was limited to investigating the effects of the characteristics of the private and common areas in vertical condominium housings.

For future studies, it would be interesting to address the housing pricing process considering the supply and demand of the real estate market in coastal municipalities. Another possibility would be to compare characteristics between these municipalities to identify common patterns in housing pricing. It is also recommended to include information reflecting economic and social changes, such as poverty and crime, as well as considering infrastructure factors, such as the creation of new developments and location characteristics.

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