Quantifying the Priceless: A Methodological Approach to the Evaluation of Historical-Architectural Heritage

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Abstract. That humor is invaluable is absolutely evident, but that it is also a characteristic of a property, given the advances in the discipline of Real Estate Appraisal, is today more difficult to sustain. Today, the valuation of historical-architectural properties requires rigorous methodologies that go beyond merely qualitative and subjective approaches, moving toward valuation models capable of precisely quantifying the contribution that elements of historical value bring to the overall worth. The historical-architectural heritage of Italian cities, conceived as a resource to be preserved for future generations, requires adequate appraisal tools that recognize its intrinsic complexity, connected not only to the physical characteristics of the property but also to its cultural context and its ability to generate positive externalities. The methodological challenge consists of integrating both tangible and intangible aspects into the valuation analysis, developing models that can be applied with consistency and scientific rigor even in contexts characterized by high variability and specificity, such as properties used for tourism and hospitality. This research analyzes the impact of historical-architectural value on the market value of properties used for tourism and hospitality, with specific regard to the city of Rome. Unlike previous studies, where econometric models were implemented with reference to samples of historical price data, in this case the analysis will reference samples of forecast data concerning the profitability of hospitality structures characterized by different historical-architectural values. The adopted methodology integrates the Analytic Hierarchy Process (AHP) with multiple linear regression models, allowing consideration of both qualitative and quantitative variables in real estate valuation.

Keywords: Historical–architectural significance · Marginal prices · Property values

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1 Introduction

The historical-architectural heritage of Italian cities represents an invaluable treasure that encapsulates the essence of human cultural evolution. Through its physical manifestations – tangible works created over centuries – it embodies social values of extraordinary uniqueness and relevance. The definition of real estate property with historical and architectural significance goes beyond the simple cataloging of museum buildings or places of worship, extending to entire neighborhoods of historical importance. This heritage constitutes an inheritance not oriented toward the market but rather conceived as precious capital to be preserved for present and future generations [1]. The evaluation of such "special assets" presents numerous complexities, deriving not only from the intrinsic nature of the property, but also from its broader natural and cultural context, from its ability to attract visitors, as well as from its contribution to socioeconomic and sustainable development. The valuation of real estate property with historical-architectural significance presents significant challenges on the methodological level. To determine the most probable market value, it is necessary to identify and make explicit the specific contribution that historical and architectural elements bring to the overall value [2]. The appraisal process requires solving three distinct problems: *i)* accurate measurement of the qualitative and quantitative characteristics of the property being appraised; *ii)* their appropriate weighting; *iii)* determination of the marginal price attributable to specific qualitative and quantitative variables. Only through an analysis that methodically addresses these three dimensions is it possible to arrive at an estimate that adequately reflects the market value of a property with historical-architectural significance. The literature has already defined the marginal contribution of historical-architectural value for properties used purely for residential purposes. This study intends instead to determine this contribution with specific regard to properties used for tourism and hospitality, evaluating the weight that this variable under study assumes in the formation of the most probable market value [3]. Unlike studies conducted until now, where econometric models were implemented with reference to samples of historical data (prices), in this case such analysis will reference samples of forecast data (the values of hotel rooms) concerning the profitability of hospitality structures characterized by different historical-architectural values. In this way, arriving at the estimate of the marginal contribution of the value under study, in terms of willingness to pay by users of such structures. The methodology used combines the AHP (Analytic Hierarchy Process) multicriteria analysis, which employs the pairwise comparison developed by T.L. Saaty, with multiple linear regression models to incorporate both qualitative and quantitative property characteristics in the estimation. The case study focuses on the city of Rome, a capital with high tourist flow and numerous hotels of historical interest. The results of the study will constitute a valid evaluative reference for resolving valuation issues related to properties with different historical-architectural values. The study develops through a methodical and coherent path, structured in the following sections: the Sect 2 is dedicated to an in-depth analysis of the scientific literature concerning the impact of historical-architectural component on property values, both from an intrinsic point of view, understood as the weight that such value assumes in relation to the value of the individual property, and from an extrinsic point of view, understood as externalities - positive or negative - that the neighborhood as a historical district exerts on the value of properties within it. The Sect. 3

presents the methodological model developed for the research. The integrated approach that combines the Analytic Hierarchy Process (AHP) with multiple linear regression is illustrated, highlighting how this integration allows for capturing both qualitative and quantitative aspects of the evaluation. The Sect. 4 presents the empirical results obtained from applying the model to the Rome case study. The Sect. 5 gathers the conclusions of the study, synthesizing the main theoretical and practical contributions of the research, as well as outlining the future research developments.

2 Literature Review

In the following section, a comprehensive overview is presented of the main literature concerning the impact of historical-architectural component on the market value of residential properties. The analysis is structured on two levels: *i)* the first considers the influence of this characteristic on the value of the individual property; *ii)* the second explores the "spatial effects" – the positive or negative externalities – that neighborhoods of historical-architectural significance generate on property values, the latter being devoid of the studied value but falling within the perimeter of historical districts. The investigation aims, therefore, to define the impact in percentage terms of the historical-architectural significance both from a purely intrinsic point of view, referring to the individual property, and from an extrinsic point of view, connected to the dynamics of valorization that the historical district exerts on the properties that belong to it.

2.1 Intrinsic Effects of Historical-Architectural Significance on Property Values

The American context offers a rich panorama of empirical studies documenting how the architectural style and historical designation of properties positively influence their market value, highlighting a clear economic premium associated with these characteristics. Asabere et al. (1989) conducted a pioneering study in Newburyport, Massachusetts, analyzing 520 properties from 1983–1985. The research demonstrated that Garrison, Federal, Victorian, and Colonial architectural styles generate substantial premiums on property values, with increases around 20–21%. The authors conclude that buyers are willing to pay higher prices for architecturally significant buildings compared to similar but stylistically inferior structures [4]. Expanding the research to a territorial level, Leichenko et al. (2001) extended the analysis to nine Texas cities, finding that historical designation produces positive effects on property values in all locations examined. The increases range from 4,9% in Dallas (equivalent to about $3.200 per property) to 20,1% in Nacogdoches, with San Antonio recording an increase of 18,6% (equivalent to an average property value increase of $8.900) [5]. Bergen (2015) examined the impact of historical-architectural significance in Tacoma, Washington, where single-family properties historically designated at the local level by the Tacoma Register of Historic Places show an average market value increase of 12,35%, corresponding to an average property value increase of about $23.600. To obtain such designation, properties must be at least 50 years old and maintain a significant original context [6]. In the historic city of Atlanta, Georgia, Oba et al. (2017) analyzed the impact of local historical designation on property values from 2000–2010, highlighting an average market value increase of 12,1%

[7]. In the same state, Cebula (2009) documented a more modest but still positive effect of 1,7% for nationally designated properties in Savannah [8]. In California, Narwold et al. (2008) studied the impact of local historical designation on single-family home values in San Diego from 2000–2006, estimating a price differential of 16% between properties covered by Mills Act contracts and those with similar characteristics but without such designation [9]. In Abilene, Texas, Coulson et al. (2001) examined a large sample of approximately 7.600 single-family properties, of which 160 were historically designated at the local level. Results indicate a market value increase of 17,6% compared to non-designated properties, equivalent to about $7.040 on a $40.000 property [5]. In Baton Rouge, Louisiana, Zahirovic-Herbert et al. (2012) evaluated the effects of historical-architectural significance on single-family residential property values using real estate transaction data from 1984 to 2005, finding increases between 5% and 8% [10]. In the northeastern United States, Vandell et al. (1989) examined the impact of historical-architectural significance on single-family home values in Boston and Cambridge, Massachusetts, documenting a notable market value increase of 22% [11]. The Australian continent offers further evidence of the studied phenomenon. Jeffries (2012) analyzed the impact of historical-architectural significance in Mosman, one of Sydney's oldest and most prestigious suburbs, finding that locally historically designated properties record an average market value increase of 17,9% [12]. In contrast, some research has shown that this studied value can also cause a decrease in property market value, highlighting the complex and multifaceted nature of the phenomenon. Not surprisingly, Asabere et al. (1994) documented a negative impact of local historical designation on property values in Philadelphia, with a 24% reduction for properties located in condominiums. This negative effect is attributed to excessively rigid and restrictive programs, limited state incentives [13].

2.2 Extrinsic Effects of Historical-Architectural Significance on Property Values

The designation of neighborhoods as historical districts generates complex and sometimes contradictory effects on property values, with dynamics that vary significantly depending on the level of recognition - national or local - and the specific regulations in different territorial contexts. Research conducted in various US metropolitan areas shows that the national designation of a historical district generally tends to produce a significant appreciation in property values. In Atlanta, properties located within national historical districts registered an average increase of 15% in their market value [14], while in Savannah, Georgia, residential properties in the Savannah Historic Landmark District benefited from an increase of 20–21% [8]. Similarly, in Philadelphia, Pennsylvania, national recognition resulted in an appreciation of 26% [15], and in Chicago, Illinois, the Ridge Historic District saw increases of 24%, with peaks of 53% in the historic districts of Longwood Drive and 104th Place [16]. These positive effects primarily derive from the prestige conferred by national recognition and the related tax benefits. The picture appears more complex when considering locally designated historical districts. In Atlanta, such properties experienced an average reduction of 3% in their market value [14], while in Massachusetts (Boston, Cambridge, and Quincy), local designation is associated with decreases between 11,6% and 15,5% [17]. In Illinois (Aurora and Elgin), on the contrary, increases of 6–7% were recorded [18], and in six different

US locations (Atlanta, Dallas, Phoenix, Cincinnati, Cleveland, and Pittsburgh), a study found an average increase of 9,5% [19]. The divergence in results reflects the diversity of local regulations: particularly severe and restrictive regulations can lead to a devaluation of properties, while policies that balance conservation constraints with adequate tax incentives tend to produce positive effects. The complex relationship between historical designation and property values finds further confirmation in the analysis of emblematic cases such as Louisville (Kentucky), Sacramento (California) and Washington DC, whose peculiarities illustrate the multiple facets of the phenomenon. Kentucky, considered among the national leaders in the preservation of historically significant buildings, represents a paradigmatic case of how targeted policies can generate particularly beneficial effects on market values. The city of Louisville, founded in 1778 and rich in architectural testimonies of the past, hosts numerous historical districts, including Old Louisville, the nation's largest Victorian-era neighborhood. The peculiarity of the Kentucky context lies in the system of federal tax incentives for national-level historical designation, coordinated by the Kentucky Heritage Council, which provides state tax credits of 30% for residential properties and 20% for commercial ones on rehabilitation and conservation investments. Since 1976, this policy has allowed the restoration of approximately 34.000 structures located within national historical districts, with a total investment of over $40 billion. The effectiveness of these measures is confirmed by the average 58% increase in market value of properties located in Louisville's ten nationally designated neighborhoods, examined in the period 2000–2006 [20]. Similarly, Sacramento's Conservation Program, established in 1975, illustrates how rigorous regulations can translate into property appreciation when accompanied by adequate tax incentives. The program, aimed at protecting structures built between 1848 and 1920, imposes significant restrictions on external alterations of buildings, regulating building materials, color tones, and architectural details. At the same time, it provides reductions of up to 20% in taxes for owners for improvements made to properties dating before 1936. This balanced approach between constraints and incentives has resulted, as evidenced by a 1997 study, in an average increase of 17,32% in the market value of properties located within Sacramento's six historical districts, suggesting the predominance of positive externalities over negative ones derived from strict restrictions [21]. The case of Washington, DC also offers a further perspective on the impact of historical-architectural significance in relation to building typology. From the first historical district of Georgetown, designated in 1950, the federal capital has progressively extended protection to include 37 historical districts, which currently comprise 4,2% of the city's residential properties. An analysis of real estate sales between 1992 and 2019 revealed that, while single-family properties and townhouses located within historical neighborhoods register an average increase in market value of 9%, condominiums experience an average reduction of 6,3%. This divergence is attributed to the higher maintenance costs associated with condominiums and their lesser historical-architectural significance, being generally more recent buildings compared to single-family properties [22].

3 Methodology

The present study has developed a logical-evaluative model capable of addressing the problem concerning the measurement and weighting of qualitative variables, allowing for the explicit determination of the monetary value of the historical-architectural significance of real estate properties.

The methodological development of the model is articulated in three distinct phases:

I. Definition of the research scope and selection of the data sample under study, composed of thirteen properties for tourist-hospitality use classified as historical by "Federalberghi Rome" and their comparable units. For the entire data sample, the most probable market value of the hotel room was determined through a direct monoparametric estimation procedure.
II. Development of a questionnaire submitted to experts in the field, invited to evaluate the thirteen historical properties according to four criteria defined based on the reference literature. The criteria were subsequently weighted through the implementation of the AHP (Analytic Hierarchy Process) method.
III. Application of a specific econometric analysis, based on the hedonic pricing technique, aimed at determining the marginal contribution made by the historical-architectural significance in the formation of the property price.

3.1 Data Sample

Assuming that the purpose of the work is to explicitly determine the monetary value of the historical-architectural characteristic of real estate properties, that is, the "weight" that this variable assumes in the formation of the property's market value, the preliminary phase of the analysis consists of defining an appraisal sample that includes both properties of historical significance and comparable structures lacking this value. The sample of historical properties consists of thirteen hotel structures recognized as having particular historical value by the Historical Hotels Committee of "Federalberghi Rome" and listed on the tourist portal of the city of Rome: *1. Eitch Borromini, 2. Hotel Vilòn, 3. Donna Camilla Savelli, 4. Hotel Principe Torlonia, 5. Villa Laetitia Roma, 6. Albergo Del Sole Al Pantheon, 7. Grand Hotel De La Minerve, 8. Albergo D'Inghilterra, 9. Grand Hotel Plaza, 10. Hotel Hassler Villa Medici, 11. Hotel Ambasciatori Palace, 12. Hotel Eden, 13. The St. Regis Rome.* To obtain the designation of "historical hotel" from "Federalberghi Rome", a structure must satisfy the following requirements: *i) Construction date*, the hotel must have been operational at least since 1950 and situated in a building of notable historical-architectural significance, generally built no less than seventy years ago. *ii) Historical-cultural relevance*, the structure must possess significant historical value, such as having hosted events of local or national importance, illustrious personalities, or having been designed by renowned architects. *iii) Preservation of authenticity*, the property must preserve intact the original architectural and decorative elements representative of a specific historical period or distinctive architectural style. *iv) Privileged location*, the hotel must be located in an area of the city of particular historical or cultural relevance. For evaluation purposes, for each property used as a hotel designated as historically significant, a variable number of comparables was considered, from a minimum of one to a maximum of seven units, for a total of forty-one comparable properties. Overall,

the data sample, including both historical hotels and "comparable" properties lacking significance, consists of fifty-four properties (see Table 1). The comparable properties were selected based on specific productive characteristics, such as the hotel's star rating (taken as a proxy variable for the services offered by the structure); intrinsic positional characteristics, such as the advertised area of suites expressed in square meters (sqm); extrinsic positional characteristics, such as macro-location in homogeneous territorial zones (OMI zone); technological characteristics related to the state of preservation and maintenance of the property.

Determination of Individual Hotel Room Value

Once the data sample was selected, the market value of the individual hotel room was estimated for the fifty-four properties through a direct monoparametric procedure. This was done to provide an econometric measure of the higher price paid for a room offered by a historical accommodation structure compared to a similar one without that significance. For the purpose of estimating the market value of the hotel room, it was necessary to previously define the *gross annual revenue of the room* (R_{LC}), obtained as the product of: the average cost of the room (C_c) calculated as the average between low, medium and high season rates; the annual occupancy rate (t_0), which varies depending on the number of stars of the hotel, and the number of days in the year.

Therefore:

$$R_{LC} = C_C \cdot t_0 \cdot 365 \tag{1}$$

This gross annual revenue of the room must then be multiplied by a rate (k) that expresses the remuneration due to the property owner (remuneration of real estate capital), thus obtaining the *gross rental value* or the market rental rate of the room (V_{LC}):

$$V_{LC} = R_{LC} \cdot k \tag{2}$$

Finally, to estimate the market value of the hotel room (V_C), the aforementioned gross rental value must be "capitalized" using a suitable rate (r_c):

$$V_C = {}^{V_{LC}}/_{r_c} \tag{3}$$

In this way, we arrive at the determination of the values attributable to the rooms of historically designated hotels and comparable similar structures. (see Table 2).

3.2 Implementation of the AHP Method

In the second phase, a questionnaire was submitted to sector experts to evaluate, according to four appropriate criteria (defined based on the reference literature), the data sample consisting of only thirteen hotels with historical-architectural significance located in the city of Rome. Obviously, the "weight" that each of these criteria can express in the experts' judgment is capable of influencing the value differences found between historically designated properties and properties lacking this characteristic. Objectifying this weight becomes fundamental for the purpose of estimating these value differences. In other words, it becomes essential to establish a set of rules that make transparent

Table 1. Summary of historical units with their comparable units.

Historical units	Comparable unit 1	Comparable unit 2	Comparable unit 3	Comparable unit 4	Comparable unit 5	Comparable unit 6	Comparable unit 7
1. Eitch Borromini	Lifestyle Suites Rome	Bio Hotel Raphael	–	–	–	–	–
2. Hotel Vilòn	Fendi Private Suites	Hotel J.K. Place Roma	–	–	–	–	–
3. Donna Camilla Savelli	Hotel Horti 14 Borgo Trastevere	Hotel la Rovere	–	–	–	–	–
4. Hotel Principe Torlonia	Mercure Roma Corso Trieste	Hotel Villa Torlonia	Hotel Fenix	–	–	–	–
5. Villa Laetitia Roma	Albergo Etico Roma	Roma in una stanza	Ferrari Home – Guesthouse	–	–	–	–
6. Albergo Del Sole Al Pantheon	Pantheon Royal Suite	Hotel Pantheon	Hub Pantheon	Terrace Pantheon Relais	–	–	–
7. Grand Hotel De La Minerve	The Pantheon Iconic Rome Hotel	Singer Palace Hotel	–	–	–	–	–
8. Albergo D'Inghilterra	Portrait Roma	–	–	–	–	–	–
9. Grand Hotel Plaza	Fendi Private Suites	J.K. Place Roma	The First Roma Dolce	–	–	–	–
10. Hotel Hassler Villa Medici	Hotel de la Ville	–	–	–	–	–	–
11. Hotel Ambasciatori Palace	Hotel Sofitel Roma Villa Borghese	Baglioni Hotel Regina	Hotel The Westin Excelsior	Grand Hotel Palace	Aleph Rome Hotel	Hotel Sina Bernini Bristol	Hotel Splendide Royal
12. Hotel Eden	Hotel The Westin Excelsior	Aleph Rome Hotel	Hotel Splendide Royal	Hotel Sofitel Roma Villa Borghese	Baglioni Hotel Regina	Grand Hotel Palace	Hotel Sina Bernini Bristol
13. The St. Regis Rome	Baglioni Hotel Regina	Hotel The Westin Excelsior Roma	Hotel Sina Bernini Bristol	Hotel Splendide Royal	–	–	–

the process of assigning weights to the evaluation criteria considered in the questionnaire. This set of rules should conform to the typical approach of non-monetary evaluation techniques often used to support decision-making processes involving goods and resources characterized by qualitative aspects [23, 24]. For this reason, the evaluative approach underlying the "multicriteria" analysis technique called Analytic Hierarchy

Table 2. Summary of individual hotel room values for historical units and their comparable units.

Historical units	V(x)	V(x) Comparable unit 1	V(x) Comparable unit 2	V(x) Comparable unit 3	V(x) Comparable unit 4	V(x) Comparable unit 5	V(x) Comparable unit 6	V(x) Comparable unit 7
1. Eitch Borromini	**€ 1.073.627,79**	€ 891.064,30	€ 909.264,73	–	–	–	–	–
2. Hotel Vilòn	**€ 2.465.550,94**	€ 1.512.934,64	€ 1.959.648,39	–	–	–	–	–
3. Donna Camilla Savelli	**€ 555.595,49**	€ 372.154,06	€ 214.806,26	–	–	–	–	–
4. Hotel Principe Torlonia	**€ 444.669,38**	€ 175.615,04	€ 188.729,16	€ 115.461,16	–	–	–	–
5. Villa Laetitia Roma	**€ 257.964,84**	€ 111.985,18	€ 70.430,87	€ 61.846,55	–	–	–	–
6. Albergo Del Sole Al Pantheon	**€ 615.207,98**	€ 261.384,23	€ 478.473,16	€ 285.564,60	€ 289.941,40	–	–	–
7. Grand Hotel De La Minerve	**€ 1.058.906,86**	€ 866.597,30	€ 674.295,89	–	–	–	–	–
8. Albergo D'Inghilterra	**€ 1.086.738,76**	€ 842.141,36	–	–	–	–	–	–
9. Grand Hotel Plaza	**€ 5.129.161,02**	€ 1.512.940,48	€ 1.959.654,22	€ 1.279.236,05	–	–	–	–
10. Hotel Hassler Villa Medici	**€ 982.207,31**	€ 856.711,28	–	–	–	–	–	–
11. Hotel Ambasciatori Palace	**€ 1.043.948,80**	€ 671.951,86	€ 839.011,72	€ 846.436,61	€ 599.243,71	€ 680.304,86	€ 821.377,63	€ 881.704,80
12. Hotel Eden	**€ 1.014.046,33**	€ 846.436,61	€ 680.304,86	€ 881.704,80	€ 671.951,86	€ 839.011,72	€ 599.243,71	€ 821.377,63
13. The St. Regis Rome	**€ 5.366.540,09**	€ 839.011,72	€ 846.436,61	€ 821.377,63	€ 881.704,80	–	–	–

Process (AHP), which uses pairwise comparison, appears entirely suitable for "weighting" the criteria considered. The implementation of a model whose formalization is based on the pairwise comparison technique has made it possible to transform qualitative variables, apparently expressible only on nominal or ordinal scales, into variables measurable on interval scales. The advantages of this approach lie in the creation of a flexible and universally valid logical-evaluative framework, optimally adaptable to specific decision-making contexts. From an operational point of view, four criteria were defined to encompass the peculiarities or distinctive characteristics of the historical properties examined: *i) Historical-Artistic Importance Criterion*, criterion related to the building's connection with historical events or famous guests who have stayed there; *ii) Architect*

Criterion, criterion related to the prestige of the Architect who designed and/or oversaw the construction of the building; *iii) Preservation of Original Appearance Criterion,* criterion related to the preservation of the original appearance of the building and the significant elements that reflect its history; *iv) Cultural Importance Criterion,* criterion related to the integration of the hotel with the surrounding architectural and cultural context. Therefore, pairwise comparison was applied to the thirteen tourist accommodation properties under study, with reference to the four criteria. The results obtained, the product of a series of multiple comparisons based on subjective judgments formulated by sector experts - particularly architects - can be summarized in a matrix, called the *ratio matrix* or *pairwise comparison matrix*.

In particular, four ratio matrices are defined, each associated with one of the established criteria (Figs. 1, 2, 3 and 4):

A - Historical-Artistic Importance Criterion													
	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13
H1	1	9	7	3	9	1	1	3	5	5	5	7	3
H2	0,111	1	3	0,143	5	0,143	0,143	0,143	0,143	5	0,2	3	0,111
H3	0,143	0,333	1	0,143	3	0,111	0,111	0,143	0,2	0,333	0,333	3	0,1429
H4	0,333	7	7	1	7	0,143	0,143	3	3	5	3	7	0,2
H5	0,111	0,2	0,333	0,143	1	0,111	0,111	0,143	0,143	0,2	0,143	0,333	0,143
H6	1	7	9	7	9	1	3	5	5	7	5	7	3
H7	1	7	9	7	9	0,333	1	3	5	5	1	7	3
H8	0,333	7	7	0,333	7	0,2	0,333	1	5	7	0,2	7	0,2
H9	0,2	7	5	0,333	7	0,2	0,2	0,2	1	5	0,333	7	0,2
H10	0,2	0,2	3	0,2	5	0,143	0,2	0,143	0,2	1	0,143	3	0,111
H11	0,2	5	3	0,333	7	0,2	1	5	3	7	1	7	0,333
H12	0,143	0,333	0,333	0,143	3	0,143	0,143	0,143	0,143	0,333	0,143	1	0,111
H13	0,333	9	7	5	7	0,333	0,333	5	5	9	3	9	1

Fig. 1. Matrix A synthesizes the pairwise comparisons between the thirteen historically significant tourist accommodation properties, examined in relation to the Historical-Artistic Importance criterion.

B Architect Criterion													
	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13
H1	1	3	1	5	7	9	9	5	9	9	7	9	7
H2	0,333	1	0,333	3	7	9	9	5	9	9	7	9	5
H3	1	3	1	5	7	9	9	5	9	9	7	9	7
H4	0,2	0,333	0,2	1	7	9	9	3	9	9	5	9	3
H5	0,143	0,143	0,143	0,143	1	9	9	0,2	3	9	0,333	3	0,2
H6	0,111	0,111	0,111	0,111	0,111	1	1	0,111	1	1	0,111	0,111	0,111
H7	0,111	0,111	0,111	0,111	0,111	1	1	0,111	1	1	0,111	0,111	0,111
H8	0,2	0,2	0,2	0,333	5	9	9	1	7	9	5	7	3
H9	0,111	0,111	0,111	0,111	0,333	1	1	0,143	1	1	0,2	0,333	0,143
H10	0,111	0,111	0,111	0,111	0,111	1	1	0,111	1	1	0,111	0,111	0,111
H11	0,143	0,143	0,143	0,2	3	9	9	0,2	5	9	1	5	0,333
H12	0,111	0,111	0,111	0,111	0,333	9	9	0,143	3	9	0,2	1	0,2
H13	0,143	0,2	0,143	0,333	5	9	9	0,333	7	9	3	5	1

Fig. 2. Matrix B synthesizes the pairwise comparisons between the thirteen historically significant tourist accommodation properties, examined in relation to the Architect criterion.

At this point, to calculate the weights *w* of the four criteria, the elements of the ratio matrices were normalized by dividing the same elements by their sum, thus obtaining matrices characterized by the reciprocal property (Figs. 5, 6, 7, and 8):

Subsequently, the "weights" of each individual criterion were calculated as the ratio between the sum of the row elements and the sum of all elements of the normalized matrix, arriving at the determination of the weight related to the four criteria for each of the thirteen hotels under study (Fig. 9):

C - Preservation of Original Appearance Criterion

	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13
H1	1	7	5	9	7	7	5	3	0,333	5	5	7	0,2
H2	0,143	1	0,333	5	5	0,2	3	0,333	0,143	3	3	5	0,143
H3	0,2	3	1	7	5	3	3	0,2	0,143	3	3	5	0,143
H4	0,111	0,2	0,143	1	0,200	0,143	0,2	0,143	0,111	0,2	0,2	0,333	0,111
H5	0,143	0,2	0,2	5	1	0,2	3	0,143	0,111	0,2	0,2	3	0,111
H6	0,143	5	0,333	7	5	1	5	0,333	0,143	5	5	7	0,143
H7	0,2	0,333	0,333	5	0,333	0,2	1	0,143	0,1	0,2	0,2	3	0,111
H8	0,333	3	5	7	7	3	7	1	0,2	5	5	7	0,143
H9	3	7	7	9	9	7	7	5	1	7	7	9	0,333
H10	0,2	0,333	0,333	5	5	0,2	5	0,2	0,143	1	1	5	0,143
H11	0,2	0,333	0,333	5	5	0,2	5	0,2	0,143	1	1	5	0,143
H12	0,143	0,2	0,2	3	0,333	0,143	0,333	0,143	0,111	0,2	0,2	1	0,111
H13	5	7	7	9	9	7	9	7	3	7	7	9	1

Fig. 3. Matrix C synthesizes the pairwise comparisons between the thirteen historically significant tourist accommodation properties, examined in relation to the Preservation of Original Appearance criterion.

D - Cultural Importance Criterion

	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13
H1	1	5	7	9	7	3	3	5	5	1	5	5	7
H2	0,2	1	7	7	7	0,2	0,2	0,333	0,333	0,143	5	5	5
H3	0,143	0,143	1	3	0,333	0,143	0,143	0,143	0,143	0,111	0,143	0,143	0,2
H4	0,111	0,143	0,333	1	0,333	0,143	0,143	0,143	0,143	0,111	0,143	0,143	0,2
H5	0,143	0,143	3	3	1	0,143	0,143	0,143	0,143	0,111	0,143	0,143	0,2
H6	0,333	5	7	7	7	1	3	5	3	0,2	5	5	7
H7	0,333	5	7	7	7	0,333	1	3	0,333	0,2	5	5	7
H8	0,2	3	7	7	7	0,2	0,333	1	0,333	0,2	5	5	7
H9	0,2	3	7	7	7	0,333	3	3	1	0,2	7	7	9
H10	1	7	9	9	9	5	5	5	5	1	5	7	9
H11	0,2	0,2	7	7	7	0,2	0,2	0,2	0,143	0,2	1	3	5
H12	0,2	0,2	7	7	7	0,2	0,2	0,2	0,143	0,143	0,333	1	5
H13	0,143	0,2	5	5	5	0,143	0,143	0,143	0,111	0,111	0,2	0,2	1

Fig. 4. Matrix D synthesizes the pairwise comparisons between the thirteen historically significant tourist accommodation properties, examined in relation to the Cultural Importance criterion.

A - Normalized matrix

	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13
H1	0,196	0,150	0,114	0,121	0,114	0,246	0,130	0,116	0,152	0,088	0,256	0,102	0,260
H2	0,022	0,017	0,049	0,006	0,063	0,035	0,019	0,006	0,004	0,088	0,010	0,044	0,010
H3	0,028	0,006	0,016	0,006	0,038	0,027	0,014	0,006	0,006	0,006	0,017	0,044	0,012
H4	0,065	0,117	0,114	0,040	0,089	0,035	0,019	0,116	0,091	0,088	0,154	0,102	0,017
H5	0,022	0,003	0,005	0,006	0,013	0,027	0,014	0,006	0,004	0,004	0,007	0,005	0,012
H6	0,196	0,117	0,146	0,283	0,114	0,246	0,389	0,193	0,152	0,123	0,256	0,102	0,260
H7	0,196	0,117	0,146	0,283	0,114	0,082	0,130	0,116	0,152	0,088	0,051	0,102	0,260
H8	0,065	0,117	0,114	0,013	0,089	0,049	0,043	0,039	0,152	0,123	0,010	0,102	0,017
H9	0,039	0,117	0,081	0,013	0,089	0,049	0,026	0,008	0,030	0,088	0,017	0,102	0,017
H10	0,039	0,003	0,049	0,008	0,063	0,035	0,026	0,006	0,006	0,018	0,007	0,044	0,010
H11	0,039	0,083	0,049	0,013	0,089	0,049	0,130	0,193	0,091	0,123	0,051	0,102	0,029
H12	0,028	0,006	0,005	0,006	0,038	0,035	0,019	0,006	0,004	0,006	0,007	0,015	0,010
H13	0,065	0,150	0,114	0,202	0,089	0,082	0,043	0,193	0,152	0,158	0,154	0,132	0,087
	1	1	1	1	1	1	1	1	1	1	1	1	1

Fig. 5. Normalized matrix of ratios for the Historical-Artistic Importance criterion.

Finally, the quality of the weight estimation was verified in terms of measuring the consistency of the ratio matrices A, B, C, D. The pairwise comparison matrix is consistent only if the maximum eigenvalue λ_{max} is equal to the order of the matrix n. A small error in the estimation of the ratios results in a variation of λ_{max}, where the deviation of the latter from n involves an inconsistency error that can be represented by the ratio $(\lambda_{max} - n)/(n - 1)$, defined as the *consistency index* (C.I.). Therefore, once the consistency index (C.I.) has been calculated using the maximum eigenvalue (λ_{max}) for

B - Normalized matrix

	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13
H1	0,2690009	0,3498704	0,2690009	0,3212319	0,1627907	0,1058824	0,1058824	0,2456715	0,1384615	0,1058824	0,194085	0,1560694	0,2572629
H2	0,089667	0,1166235	0,089667	0,1927391	0,1627907	0,1058824	0,1058824	0,2456715	0,1384615	0,1058824	0,194085	0,1560694	0,1837592
H3	0,2690009	0,3498704	0,2690009	0,3212319	0,1627907	0,1058824	0,1058824	0,2456715	0,1384615	0,1058824	0,194085	0,1560694	0,2572629
H4	0,0538002	0,0388745	0,0538002	0,0642464	0,1627907	0,1058824	0,1058824	0,1474029	0,1384615	0,1058824	0,1386322	0,1560694	0,1102555
H5	0,0384287	0,0166605	0,0384287	0,0091781	0,0232558	0,1058824	0,1058824	0,0098269	0,0461538	0,1058824	0,0092421	0,0520231	0,0073504
H6	0,029889	0,0129582	0,029889	0,0071385	0,002584	0,0117647	0,0117647	0,0054594	0,0153846	0,0117647	0,0030807	0,0019268	0,0040835
H7	0,029889	0,0129582	0,029889	0,0071385	0,002584	0,0117647	0,0117647	0,0054594	0,0153846	0,0117647	0,0030807	0,0019268	0,0040835
H8	0,0538002	0,0233247	0,0538002	0,0214155	0,1162791	0,1058824	0,1058824	0,0491343	0,1076923	0,1058824	0,1386322	0,1213873	0,1102555
H9	0,029889	0,0129582	0,029889	0,0071385	0,0077519	0,0117647	0,0117647	0,0070192	0,0153846	0,0117647	0,0055453	0,0057803	0,0052503
H10	0,029889	0,0129582	0,029889	0,0071385	0,002584	0,0117647	0,0117647	0,0054594	0,0153846	0,0117647	0,0030807	0,0019268	0,0040835
H11	0,0384287	0,0166605	0,0384287	0,0128493	0,0697674	0,1058824	0,1058824	0,0098269	0,0769231	0,1058824	0,0277264	0,0867052	0,0122506
H12	0,029889	0,0129582	0,029889	0,0071385	0,0077519	0,1058824	0,1058824	0,0070192	0,0461538	0,1058824	0,0055453	0,017341	0,0073504
H13	0,0384287	0,0233247	0,0384287	0,0214155	0,1162791	0,1058824	0,1058824	0,0163781	0,1076923	0,1058824	0,0831793	0,0867052	0,0367518
	1	1	1	1	1	1	1	1	1	1	1	1	1

Fig. 6. Normalized matrix of ratios for the Architect criterion.

C - Normalized matrix

	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13
H1	0,0924567	0,2023121	0,1837592	0,1168831	0,1189128	0,2390244	0,0933998	0,1681794	0,0582363	0,1322751	0,1322751	0,1055276	0,0705487
H2	0,0132081	0,0289017	0,0122506	0,0649351	0,0849377	0,0068293	0,0560399	0,0186866	0,0249584	0,0793651	0,0793651	0,0753769	0,0503919
H3	0,0184913	0,0867052	0,0367518	0,0909091	0,0849377	0,102439	0,0560399	0,011212	0,0249584	0,0793651	0,0793651	0,0753769	0,0503919
H4	0,010273	0,0057803	0,0052503	0,012987	0,0033975	0,004878	0,003736	0,0080085	0,0194121	0,005291	0,005291	0,0050251	0,0391937
H5	0,0132081	0,0057803	0,0073504	0,0649351	0,0169875	0,0068293	0,0560399	0,0080085	0,0194121	0,005291	0,005291	0,0452261	0,0391937
H6	0,0132081	0,1445087	0,0122506	0,0909091	0,0849377	0,0341463	0,0933998	0,0186866	0,0249584	0,1322751	0,1322751	0,1055276	0,0503919
H7	0,0184913	0,0096339	0,0122506	0,0649351	0,0056625	0,0068293	0,01868	0,0080085	0,0249584	0,005291	0,005291	0,0452261	0,0391937
H8	0,0308189	0,0867052	0,1837592	0,0909091	0,1189128	0,102439	0,1307597	0,0560598	0,0349418	0,1322751	0,1322751	0,1055276	0,0503919
H9	0,2773701	0,2023121	0,2572629	0,1168831	0,1528879	0,2390244	0,1307597	0,280299	0,1747088	0,1851852	0,1851852	0,1356784	0,1175812
H10	0,0184913	0,0096339	0,0122506	0,0649351	0,0849377	0,0068293	0,0933998	0,011212	0,0249584	0,026455	0,026455	0,0753769	0,0503919
H11	0,0184913	0,0096339	0,0122506	0,0649351	0,0849377	0,0068293	0,0933998	0,011212	0,0249584	0,026455	0,026455	0,0753769	0,0503919
H12	0,0132081	0,0057803	0,0073504	0,038961	0,0056625	0,004878	0,0062267	0,0080085	0,0194121	0,005291	0,005291	0,0150754	0,0391937
H13	0,4622835	0,2023121	0,2572629	0,1168831	0,1528879	0,2390244	0,1681196	0,3924186	0,5241265	0,1851852	0,1851852	0,1356784	0,3527436
	1	1	1	1	1	1	1	1	1	1	1	1	1

Fig. 7. Normalized matrix of ratios for the Preservation of Original Appearance criterion.

D - Normalized matrix

	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13
H1	0,2377358	0,1665081	0,0941704	0,1139241	0,0976744	0,271786	0,1817657	0,2145484	0,3159478	0,2680851	0,1283305	0,1146038	0,1118211
H2	0,0475472	0,0333016	0,0941704	0,0886076	0,0976744	0,0181191	0,0121177	0,0143032	0,0210632	0,0382979	0,1283305	0,1146038	0,0798722
H3	0,0339623	0,0047574	0,0134529	0,0379747	0,0046512	0,0129422	0,0086555	0,00613	0,0090271	0,0297872	0,0036666	0,0032744	0,0031949
H4	0,0264151	0,0047574	0,0044843	0,0126582	0,0046512	0,0129422	0,0086555	0,00613	0,0090271	0,0297872	0,0036666	0,0032744	0,0031949
H5	0,0339623	0,0047574	0,0403587	0,0379747	0,0139535	0,0129422	0,0086555	0,00613	0,0090271	0,0297872	0,0036666	0,0032744	0,0031949
H6	0,0792453	0,1665081	0,0941704	0,0886076	0,0976744	0,0905953	0,1817657	0,2145484	0,1895687	0,053617	0,1283305	0,1146038	0,1118211
H7	0,0792453	0,1665081	0,0941704	0,0886076	0,0976744	0,0301984	0,0605886	0,1287291	0,0210632	0,053617	0,1283305	0,1146038	0,1118211
H8	0,0475472	0,0999049	0,0941704	0,0886076	0,0976744	0,0181191	0,0201962	0,0429097	0,0210632	0,053617	0,1283305	0,1146038	0,1118211
H9	0,0475472	0,0999049	0,0941704	0,0886076	0,0976744	0,0301984	0,1817657	0,1287291	0,0631896	0,053617	0,1796627	0,1604453	0,14377
H10	0,2377358	0,2331113	0,1210762	0,1139241	0,1255814	0,4529767	0,3029429	0,2145484	0,3159478	0,2680851	0,1283305	0,1604453	0,14377
H11	0,0475472	0,0066603	0,0941704	0,0886076	0,0976744	0,0181191	0,0121177	0,0085819	0,0090271	0,053617	0,0256661	0,0687623	0,0798722
H12	0,0475472	0,0066603	0,0941704	0,0886076	0,0976744	0,0181191	0,0121177	0,0085819	0,0090271	0,0382979	0,0085554	0,0229208	0,0798722
H13	0,0339623	0,0066603	0,0672646	0,0632911	0,0697674	0,0129422	0,0086555	0,00613	0,0070211	0,0297872	0,0051332	0,0045842	0,0159744
	1	1	1	1	1	1	1	1	1	1	1	1	1

Fig. 8. Normalized matrix of ratios for the Cultural Importance criterion.

the four criteria, it can be compared with random indices (R.I.) calculated from matrices generated randomly through software, such as “Expert Choice”. If the consistency ratio (C.R.) is less than or equal to the random index x corresponding to the specific order of the matrix (C.R. $\leq$ x), the weights assigned to the criteria can be considered consistent, thereby attesting to the “consistency” of the system. In the case under examination, all four criteria passed the consistency check, thus proving to be fully coherent.

A	B	C	D
0,81706	1,00000	0,51677	0,82996
0,15402	0,70389	0,18706	0,29325
0,09378	1,00000	0,24849	0,06552
0,50006	0,51545	0,04646	0,05749
0,06200	0,21193	0,09771	0,08310
1,00000	0,05508	0,28379	0,57688
0,71036	0,05508	0,08275	0,41002
0,31469	0,41527	0,33451	0,31527
0,26632	0,06039	0,72887	0,50113
0,13019	0,05508	0,16077	1,00000
0,39095	0,26378	0,14226	0,20857
0,07587	0,18227	0,05615	0,20150
0,66461	0,33055	1,00000	0,12634

Fig. 9. Weight vectors related to the criteria of (A) Historical-Artistic Importance, (B) Architect, (C) Preservation of Original Appearance, (D) Cultural Importance for each of the thirteen historic hotels

3.3 Implementation of Econometric Analysis

Once the weights attributable to the four criteria have been determined through the Analytic Hierarchy Process (AHP), it is necessary to understand to what extent these weights influence the price of historic hotels, that is, how they contribute to determining the price of these properties [25, 26]. Therefore, one can proceed with the implementation of the multiple linear regression model which, with specific regard to the case under examination, can be schematized as follows:

$$\Delta V = \beta_0 + \beta_A w_A + \beta_B w_B + \beta_C w_C + \beta_D w_D + \varepsilon \tag{4}$$

In which, ΔV represents the *dependent variable*, that is, the difference in value between the room of the historic hotel and the room of the comparable hotel (without the historical-architectural significance); obviously, in the case of a historic hotel that has multiple "comparables", the ΔV will consist of the difference between the value of the historic hotel room and the arithmetic mean of the values of the rooms of the comparable structures; conversely $\{w_A, w_B, w_C, w_D\}$ define the *independent variables* consisting of the "weights" respectively attributed to the four criteria obtained through the implementation of the AHP. Therefore, the dependent variable, together with the independent variables incorporated in the model, are configured as follows (Fig. 10):

Based on the sample data, the following algebraic model is determined through multiple linear regression analysis:

$$\Delta V = 0,51987 + 0,03440 \cdot A - 0,18125 \cdot B + 0,44832 \cdot C - 0,51396 \cdot D \tag{5}$$

The results of which and the main statistical verification indices are shown in the following figures (Figs. 11, 12, and 13).

4 Results

From the results of the multiple regression model, an R-squared value of 72,27% emerges, indicating a significant relationship between the dependent variable and the group of selected independent variables. This value attests that a share equal to 72,27%

Value difference	A	B	C	D
0,16000	0,81706	1,00000	0,51677	0,82996
0,30000	0,15402	0,70389	0,18706	0,29325
0,47000	0,09378	1,00000	0,24849	0,06552
0,64000	0,50006	0,51545	0,04646	0,05749
0,68000	0,06200	0,21193	0,09771	0,08310
0,47000	1,00000	0,05508	0,28379	0,57688
0,27000	0,71036	0,05508	0,08275	0,41002
0,23000	0,31469	0,41527	0,33451	0,31527
0,69000	0,26632	0,06039	0,72887	0,50113
0,13000	0,13019	0,05508	0,16077	1,00000
0,25000	0,39095	0,26378	0,14226	0,20857
0,27000	0,07587	0,18227	0,05615	0,20150
0,84000	0,66461	0,33055	1,00000	0,12634

Fig. 10. Summary of the dependent variable and independent variables entered as input in the multiple linear regression model.

Dependent variable	Value difference									
Independent variables	A, B, C, D									
Regression statistics										
R	0,81407	*R-sqared*				0,72270	*Adjusted R-squared*			
	Coefficients	*Error Std.*	*LCL*	*UCL*	*t Stat*	*p-value*	*H0 (5%)*	*VIF*	*TOL*	*Beta*
Intercept	0,51987	0,10955	0,26726	0,77249	4,74565	0,00145	*rejected*			
A	0,03440	0,16586	-0,34808	0,41688	0,20741	0,84087	*accepted*	1,19351	0,83787	0,04653
B	-0,18125	0,14207	-0,50886	0,14636	-1,27579	0,23782	*accepted*	1,03342	0,96766	-0,26630
C	0,44832	0,17532	0,04403	0,85260	2,55714	0,03380	*rejected*	1,12141	0,89174	0,55603
D	-0,51396	0,16868	-0,90294	-0,12497	-3,04689	0,01590	*rejected*	1,11127	0,89987	-0,65952

Fig. 11. Model verification results and statistical indices.

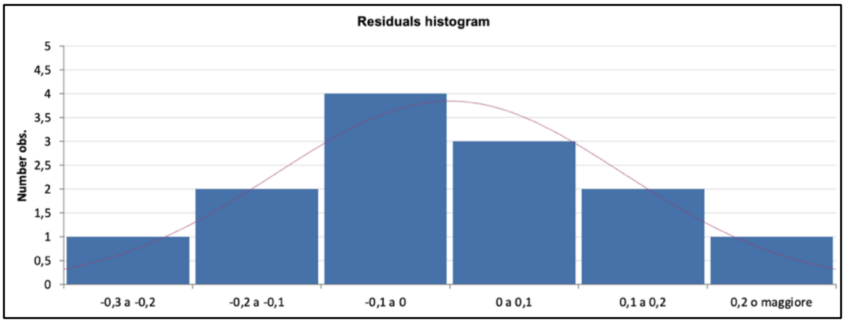


Fig. 12. Residuals histogram.

of the dependent variable can be explained by the set of independent variables included in the model, suggesting a good explanatory capacity of the adopted regression. From the analysis of the coefficients, it is noted that the independent variables A and B (i.e., historical-artistic importance and the prestige of the architect) are not significant in determining the value delta ΔV, which is the differential between the value of historic hotel rooms and the value of comparable hotel rooms. On the contrary, the coefficients of variables C (preservation of the original appearance) and D (cultural importance, understood as integration with the surrounding architectural context) are statistically

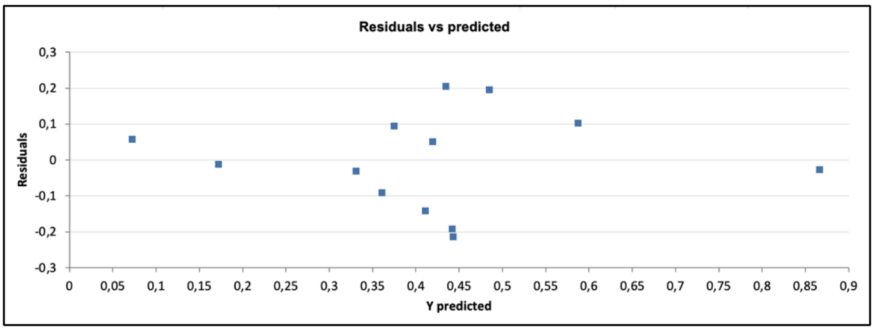


Fig. 13. Residuals vs predicted histogram.

significant, demonstrating a concrete explanatory capacity with respect to the dependent variable. Not surprisingly, for these significant variables, the standard error also appears statistically significant, thereby confirming a low dispersion of data around the regression line and indicating a good adherence between observed values and estimated values (see Fig. 14). This data underscores the high precision of the model in providing reliable estimates of the coefficients, as a more contained standard error is correlated with greater accuracy in the estimation.

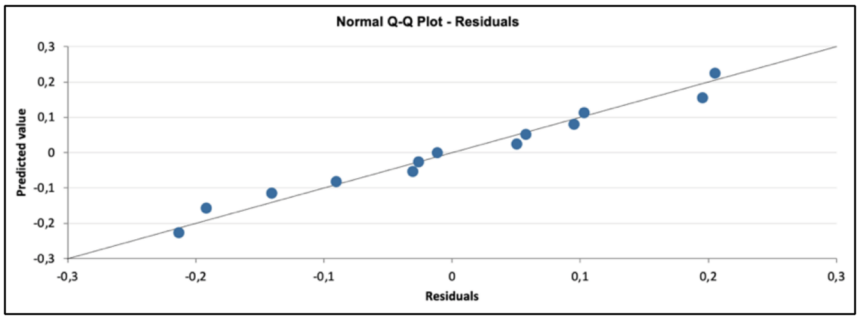


Fig. 14. Dispersion of data around the regression line.

Moreover, the Student's t-test relating to the significance of the explanatory variables C and D produced values within the range of statistical significance (> 2 or < -2), demonstrating that, for the independent variables considered, the test is significant. The p-value also respected the threshold of statistical significance (less than 0,05), further consolidating the robustness of the model. Specifically, variable C (preservation of the original appearance) has a positive coefficient, indicating that a 10% increase in this variable is associated with a 4,5% increase in the dependent variable represented by the value delta indicated by ΔV. This suggests that the preservation of the original appearance of the historic hotel translates into greater appreciation, giving the property a surplus value compared to non-historic hotels. Conversely, variable D (cultural importance) presents a negative coefficient. A 10% increase in the integration of the historic hotel with

the surrounding architectural and cultural context is associated with a 5,1% decrease in the dependent variable ΔV. This inverse relationship indicates that greater harmonization with the surrounding environment tends to reduce the perceived distinction between the historic hotel and the comparable hotels without such significance under study, thus reducing the value differential. In other words, the more the historic hotel blends into the cultural and architectural context, the less the surplus value appears compared to accommodation facilities of the same category but without historical character.

5 Conclusions

The results that emerged are indicative of an interesting phenomenon: the perceived added value of historic hotels derives not so much from their historical-artistic importance or the architect's signature, but rather from the preservation of their original architectural characteristics and their relationship with the surrounding cultural-architectural environment. This suggests some fundamental considerations about the relationship between historical real estate heritage and the economic value perceived by its users:

- *Enhancement through authenticity*: Variable C (preservation of the original appearance) shows a significantly positive impact on the value delta ΔV. This means that visitors and customers are attracted by the tangible authenticity of the historic structure, that is, by those visible characteristics that refer to a past era and give the place a unique and distinctive atmosphere. In other words, it is not so much the "history" in an abstract sense or past events that enhance the hotel, but rather the visual and sensory perception of a structure that has remained faithful to its era of construction.
- *The architect and historical importance as peripheral elements*: The non-significance of variables A (historical-artistic importance) and B (architect) suggests that these factors are less perceptible or appreciable. The identity of an architect, however famous, and the historical events that may have marked a building are information that requires prior knowledge and are often appreciated only by a niche of experts or enthusiasts. Therefore, while being important factors in the history of the building, they do not directly contribute to the value perceived by the average clientele.
- *Integration with the cultural context:* Variable D (integration with the cultural context), while significant, exerts a negative effect on the perceived value. This can be interpreted to mean that if a historic hotel is too harmonized with the surrounding environment, it loses part of its distinction as a "special" or iconic reference point. When a building completely blends with the urban or cultural landscape, its uniqueness is attenuated, and this can lead to a reduction in the value perceived by visitors, who seem to appreciate more a building that, while integrating, maintains a distinctive character that visually separates it from surrounding buildings.

In conclusion, it appears evident that the value delta ΔV, that is, the difference in value between the room of the historic hotel and the room of the comparable hotel (without the historical-architectural significance), does not reside so much in the intangible cultural heritage of the building—such as the historical events that have distinguished it or the prestigious signature of its Architect—but rather in elements capable of evoking authenticity and uniqueness of the property, such as the preservation of its original

appearance. The practical implications of the research conducted concern the usefulness of the outputs, as a valid evaluative reference, in resolving estimation issues connected to urban properties with historical-architectural significance. Future developments of the work could consist of expanding the analysis to additional urban contexts, integrating and systematizing this methodology.

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