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The Impact of Architectural Facade Attributes on Shopping Center Choice: A Discrete Choice Modeling Approach

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Abstract

This study, performed in an Iranian context, explores how specific architectural attributes of shopping centers can influence public preferences, with the aim of supporting the development of more sustainable and user-oriented urban environments. A discrete choice experiment involving 260 participants was conducted to assess preferences across seven architectural variables, each presented at varying levels: entrance position, openness (i.e., transparency through windows), architectural style, materials, window shape, scale, and symmetry. Participants evaluated paired facade images and selected their preferred designs, enabling an analysis of how these attributes impact consumer choices. The findings indicate that most variables significantly influenced facade preferences, except for arched windows and low levels of openness. In contrast, high openness emerged as the strongest positive predictor of preference. Participants also showed a marked preference for large-scale (inhumanly scaled) facade attributes, rectangular windows, extruded entrances, asymmetrical compositions, and concrete materials. Moderate preferences were observed for symmetrical designs, mixed window shapes, contemporary and postmodern styles, and brick materials. Conversely, neoclassical style, recessed entrances, stone material, and smaller-scale (humanly scaled) facades received the lowest preference ratings. These results might offer valuable insights for architects and urban planners and guide the creation of more attractive and functional shopping centers, ultimately enhancing the quality of urban life.

Keywords: architectural styles; consumer preferences; facade design; urban esthetics; visual appeal; shopping centers; attribute; mixed logit model

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1. Introduction

Shopping centers are essential components of contemporary urban environments, functioning not only as commercial hubs but also as social spaces where people gather and interact. However, the rise in online shopping and evolving consumer behavior have posed significant challenges for many shopping centers in attracting and retaining visitors [1,2]. To stay competitive, these centers must distinguish themselves, and architectural design plays a pivotal role in this endeavor [3].

Among the most prominent and influential architectural elements of a shopping center is its facade. A facade is more than just an exterior surface; it serves as a critical interface between the interior and exterior, conveying the building's purpose and inviting the public inside [4–6]. A thoughtfully designed facade can enhance the urban streetscape, create a favorable impression, and significantly influence individuals' decisions to visit and spend time at the center [7,8]. While, in some cities, shoppers may access malls via parking garages or other indirect routes—thus limiting their view of the exterior—the shopping centers analyzed in this study are primarily accessed directly from streets or adjacent sidewalks. Accordingly, the analysis focuses on conditions where the facade and main entrance are clearly visible to pedestrians and motorists alike.

In the current urban context, residents have heightened expectations for the environments they frequent. They seek spaces that are not only functional but also visually appealing and engaging. As prominent components of the urban fabric, building facades must respond to these expectations by incorporating design elements that resonate with public preferences. Nevertheless, the rapid proliferation of shopping centers has occasionally resulted in incoherent urban design, leading to facades that appear disorganized or esthetically unappealing [9]. To counteract this trend, architects and urban designers must develop a deeper understanding of how various facade attributes influence public preferences [10]. Certain design decisions can foster positive perceptions and attract visitors, whereas others may deter them, resulting in reduced foot traffic. Consequently, identifying design strategies that elicit favorable responses is critical to the long-term success of shopping centers [11,12].

Although existing research has examined the relationship between building facades and visual preferences [12], relatively few studies have focused specifically on the architectural characteristics of shopping centers and their influence on visitor behavior. This study seeks to address that gap by exploring how specific facade features affect individuals' preferences and intentions to visit. To advance this understanding, it is first necessary to identify and describe key architectural attributes that define building facades. The following section identifies seven such attributes, drawing upon prior studies that have investigated their impact on visual preferences and user experiences.

1.1. Architectural Attributes of Building Facades

The visual and functional characteristics of building facades are determined by a variety of architectural attributes, each contributing in distinct ways to the overall perception and performance of the structure. Although the facade is often perceived as a singular external surface, it is a composition of multiple elements that collectively define the building's identity and shape the way it is experienced by the public. Based on a comprehensive review of the literature on facade design and user preferences, this study identifies seven key attributes: entrance position, openness, architectural style, materials, window shape, scale, and symmetry. These attributes were selected because they consistently appear as the most influential factors affecting visual preferences and behavioral responses, especially in the context of commercial architecture such as shopping centers. By examining these attributes both individually and in combination, this research seeks to develop a nuanced understanding of how specific design choices can enhance the visual appeal, functionality, and distinctiveness of urban environments. The following sections provide a detailed analysis of each attribute, emphasizing their role in shaping the visual character of contemporary shopping centers.

The first element individuals typically encounter when approaching a building is the surrounding street and the building's **entrance**, which serves as a transitional space linking the exterior and interior environments. Yammiyavar and Roy [12] identify the entrance as a key component of the facade that significantly influences visitors' perceptions of shopping center design, playing a vital role in encouraging entry. To highlight this intermediary zone, architectural features such as stairs, platforms, and projections are often employed. Furthermore, the importance of designing shopping center entrances in accordance with comprehensive international standards has been emphasized in the literature [13]. One particularly influential aspect of the entrance is its position relative to the building, especially when viewed from a pedestrian's eye level [12].

Another significant attribute of a facade is its **openness**, or transparency—that is, the extent to which glazing in windows and doors allows customers to view the interior spaces and offerings of the building [14]. A closed storefront with small, distinctive windows showcasing rare or high-end products may convey a sense of exclusivity and suggest higher prices, whereas a fully open storefront tends to create a more casual impression, often associated with moderate pricing [15]. Lower prices are frequently linked to perceptions of lower quality, and a narrower entrance or more enclosed facade is often viewed as indicative of a more exclusive establishment [16]. However, Fitch & Knobel [17] argue that the primary design consideration should be effective communication rather than security; thus, a more transparent entrance can project a higher-quality image. Consequently, openness plays a critical role in facade design, though its degree must be carefully calibrated in relation to the building's intended function [18].

Architectural style is widely regarded as one of the most significant attributes of a building's facade [19]. Lang [20] notes that although specific shapes—such as circles—or patterns—such as symmetry—may hold particular meanings in certain cultures, it is often the overall architectural style that conveys symbolic meaning. Architectural style can also evoke symbolic associations related to a building's function [21]. When the perceived function inferred from the architectural style does not align with the building's actual purpose, this disconnect can hinder the building's ability to communicate effectively, potentially resulting in reduced user engagement or visits [6].

The **materials** used in facade design represent another key architectural factor, as they are often directly perceived and evaluated by the public and can play a significant role in shaping the historical identity of a city [22]. Building materials also contribute meaningfully to the development of architectural character and identity [23]. Materials and textures enhance both the visual and tactile perception of facades, making them more distinctive and memorable. Moreover, they can strengthen the emotional and cultural connection between the building facade and its surrounding community [24]. Askari [19] identified concrete, stone, and brick as the three most commonly used materials in the facades of historical buildings.

Window shape is another attribute that significantly influences the quality of urban building facades. Like entrances, windows serve as key elements that mediate the interaction between interior and exterior spaces. In commercial settings, they offer valuable opportunities to display interior activity, which has been identified as particularly important for attracting visitors (2010). Key window-related factors that directly impact the facade include the number, size, and shape of the windows [18,25]. Recent studies highlight the relationship between different window shapes and individuals' cognitive responses, which in turn influence their architectural preferences and overall well-being [26–28]. Research indicates that window shapes—such as square, circular, or arched—can influence people's perceptions of visual appeal and pleasantness [28].

Scale is another important factor influencing the impression a building's facade creates [22]. The scale of facade elements—such as the relative size of the entrance and other prominent features—has been characterized as either "human" (smaller-scale) or "inhuman" (larger-scale), with the preferred scale depending largely on the building's intended function [18].

Symmetry has also been widely examined as a potentially significant factor in architectural design [29–32]. Tinio and Leder [32] investigated the role of symmetry and complexity in esthetic judgments of buildings by analyzing individual and group responses to images depicting various architectural scenarios. Their findings indicate that symmetry plays a more substantial role than complexity in shaping participants' esthetic preferences. Beyond esthetics, symmetry has also been considered from a sustainability standpoint [33]. Numerous studies emphasize symmetry's contribution to perceived beauty and its general appeal in architectural design [34,35]. However, other research challenges this view, suggesting that symmetry is not universally preferred [36]. Although symmetry in a building's facade often creates a sense of balance and order, people do not always respond positively to strict and unvaried repetition. Recent theoretical work has distinguished between an appreciation for symmetry and a separate tendency to find monotonous regularity less appealing. It appears that slight deviations from strict symmetry and adding some variation in complexity can make a facade more lively and engaging for viewers [37,38]. Indeed, studies have shown that people often favor some degree of asymmetry, particularly in the design of taller buildings [39].

1.2. Objectives and Hypotheses

While previous research has examined the visual impact of building facades, most studies have concentrated on residential contexts, with comparatively limited attention paid to shopping center facades. Moreover, few investigations have assessed how varying degrees of specific facade attributes influence public preferences. To address these gaps, the present study analyzed the architectural attributes of shopping center facades described above, evaluating them at multiple levels with the aim of generating insights that inform more user-oriented and effective design strategies. The primary objective was to assess how different levels of these seven attributes might influence individuals' preferences regarding shopping center facades. It was hypothesized that there would be a significant relationship between these attributes and users' choices. Figure 1 illustrates the theoretical model that informed this study.

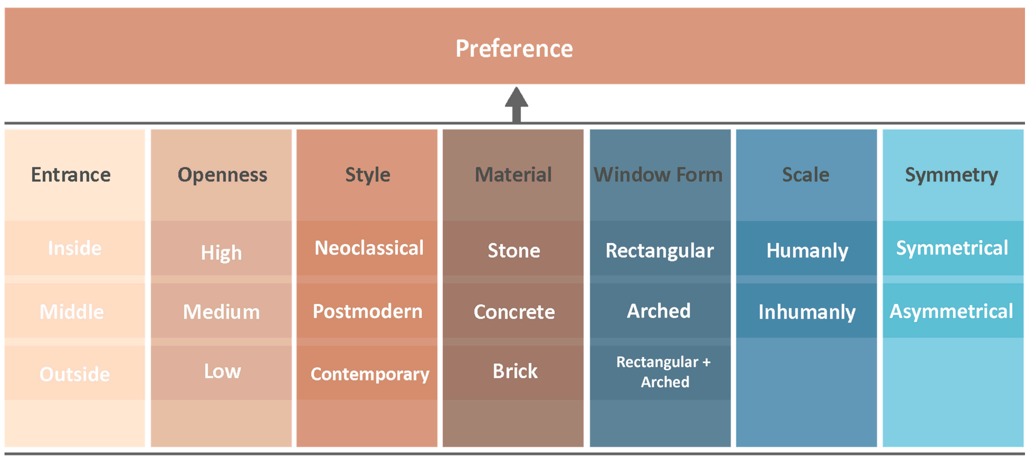


Figure 1. The theoretical model employed in this study, with the included attributes and their respective levels.

2. Materials and Methods

Visual discrete choice experiments were conducted to assess respondents' preferences regarding different levels of architectural attributes in shopping center facades. Discrete choice modeling is a widely used technique for estimating individual preferences and is a subset of selection modeling methods. This approach has been applied across various fields, including environmental economics, tourism, marketing, transportation, agriculture, healthcare, and the evaluation of landscapes and urban development prospects [40–42]. As a quantitative, survey-based method, it was first introduced by Louviere and Hensher [43] and is regarded as one of the most effective techniques for analyzing the selection behavior of individuals or groups within a specific context. The primary goal of this method is to estimate the structure of people's preferences, with particular emphasis on the relative importance of different attributes. It enables researchers to present alternatives in a controlled environment, allowing for systematic comparison and evaluation [44]. Overall, this experimental sampling technique makes it possible to identify which attributes significantly influence respondents' choices, while also determining the relative ranking of each attribute.

2.1. Study Area

This study was conducted in the city of Gorgan, the capital of Golestan Province in northern Iran, which has a population of approximately 350,000 (Figure 2). The urban fabric is predominantly composed of low-rise buildings ranging from one to four stories, although some areas contain taller structures. While several shopping centers are present in the city, only a few attract a substantial number of visitors. The facades of these centers reflect the architectural styles and attributes outlined earlier (see Introduction and Figure 1).

Figure 2. The study location: Gorgan city, the capital of Golestan Province, northern Iran.

2.2. Participants

Participation in this study was voluntary and involved adult visitors to shopping centers in the city of Gorgan, Iran (see Section 2.1). A total of 260 individuals participated, comprising 63 males and 197 females, with ages ranging from 18 to 70 years and educational backgrounds spanning from high school diplomas to doctoral degrees (Table 1). Questionnaires were administered both in person and online. Prior to participation, all respondents provided informed consent. No sensitive personal information was collected and all data was anonymized with responses aggregated and analyzed at the group level.

Table 1. Individual characteristics of study participants.

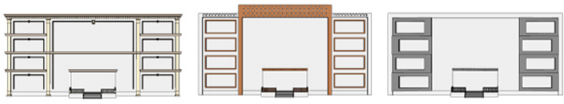
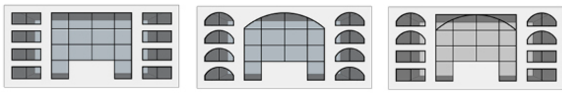
	Classification	Frequency	Frequency (%)
Gender	Male	63	24
	Female	197	76
Age	>20	70	27
	21–35	158	61
	36–50	9	3
	<51	23	9
Education	Diploma	66	25
	Bachelor	119	46
	Master	64	25
	Doctorate	11	11

2.3. Questionnaire

The questionnaire was developed in alignment with the research objectives and the reviewed literature (see Section 1.1). It comprised two main sections. The first section collected demographic information from respondents, including age, gender, and educational background. In the second section, participants were randomly assigned one block of six choice sets, each containing a pair of images depicting shopping center facades with varying levels of the specified architectural attributes. For each pair, respondents were asked to select the option they preferred—specifically, the shopping center they liked more and would be more likely to visit (see Section 2.4.2 for details on the choice sets, and Figure 3 for sample images). A "none" option was also included to allow participants to abstain from choosing either facade when neither was appealing, thereby helping to reduce inflated preference estimates. In total, each participant was exposed to 12 facade images, divided across the six randomly assigned choice sets.

Figure 3. Examples of three selected choice sets from this study, with the additional description of the included attribute levels for each scenario (see Table 2 for a detailed list of these attributes and their levels). Each participant in the study was shown six such choice sets (with a "none" option present for each if neither facade appealed to the participant).

Table 2. Seven architectural attributes of shopping center facades and their respective levels.

Attribute	Levels	Description	References
Entrance Position	In Middle Out		[45]
Openness	High Medium Low		[14,46]
Building Style	Neoclassical Postmodern Contemporary		[47,48]
Material	Stone Concrete Brick		[19]
Window Shape	Rectangular Arch Rectangular + Arch		[18,28]
Scale	Humanly Inhumanly		[18,22]
Symmetry	Symmetrical Asymmetrical		[30,36]

2.4. Experimental Design

2.4.1. Attributes and Levels

In studies of this nature, it is generally recommended that the number of attributes included be limited to between five and eight, as exceeding this range may lead to participant confusion [18]. Based on a review of the literature, seven potentially influential facade attributes and their respective levels were identified for inclusion in this study (Table 2).

Entrance position was categorized into three levels: recessed behind the facade line (Inside), aligned with the facade (Middle), and protruding outward from the facade (Outside). **Openness** referred to the level of transparency provided by the facade, which was determined by the number and size of windows allowing visual access to the interior. This attribute was assessed at three levels: High, Medium, and Low. This study included three common **architectural styles** observed in the region: Neoclassical, Postmodern, and Contemporary. Similarly, three building **materials** were examined—Stone, Concrete, and Brick—along with three variations of window **shape**: Rectangular, Arched, and a combination of both (Rectangular + Arch). The **scale** of facade attributes was evaluated at two levels based on their relative proportions: smaller-scale features (Humanly scaled) and larger-scale features (Inhumanly scaled). Finally, **symmetry** was assessed as a binary attribute, with facades classified as either Symmetrical or Asymmetrical.

2.4.2. Scenarios and Choice Sets

Based on the identified attributes and their respective levels, various scenarios and choice sets were generated. It is important to note that other spatial variables—such as the presence of people, observer sight distance, advertising billboards, green spaces, and similar contextual elements—were held constant across all scenarios. As such, participant preferences were assumed to be influenced solely by the facade configurations of the depicted buildings.

To determine the total number of possible combinations arising from the seven attributes and their levels, a full factorial experimental design was employed. This approach allows for a comprehensive assessment of both the main effects of individual attributes and the interaction effects between multiple levels. In total, the complete factorial design yielded 994 potential scenarios. While this method enhances experimental validity, it is also time-consuming and resource-intensive. Therefore, to optimize the design, a fractional factorial design was applied using SAS software version 9.2, which reduced the number of scenarios to 72. These 72 scenarios were then divided into six blocks, each comprising six choice sets.

The scenario images were created using SketchUp software (version 11.0) and rendered from the observer's point of view using the 3D rendering and animation software Lumion 8.0 Pro. Final adjustments were made in Adobe Photoshop, where human figures were added to subtly animate the environments and enhance realism. The number of people depicted in each image was kept consistent to ensure that this variable did not influence participants' responses in the choice experiment. Example choice sets used in this study are presented in Figure 3.

2.5. Data Collection

The data for this study were collected through a structured survey questionnaire. Participants were provided with an explanation of the study's purpose and a brief description of the survey process. Informed consent was obtained from all participants, and all collected data were fully anonymized to ensure that individual responses could not be traced back to specific individuals. Data collection was conducted through two channels: in person, using a computer-based software that recorded participants' responses, and online, via two platforms—ZiLink and PorsiLine—which allowed participants to complete the questionnaire on their own devices. The survey links were disseminated through local social media networks. Following data collection, responses were validated based on participant age and residency criteria, resulting in a final sample of 260 confirmed responses. The data were subsequently organized and categorized using Microsoft Excel.

2.6. Modeling Choice Data

The discrete choice experiment (DCE) is a quantitative method to elicit users' preferences, and has been widely used by researchers in different areas of science. It allows researchers to uncover how individuals value selected attributes of a program, product, or service by asking them to state their choice over different hypothetical alternatives. In this method, it is assumed that each person picks the option with the highest utility from the choice alternatives, which depends on how attractive the features of that option are [49]. Many discrete choice models that use Lancaster's theory of characteristics and McFadden's random utility have been developed to measure how causal factors influence the choices of individuals [50,51]. The way in which person n's utility functions are designed to choose alternative i among the available options is expressed as

$$U_{ni} = V_{ni} + \varepsilon_{ni} \quad (1)$$

The analysis of people's choices using the random utility theory is divided into two components. The initial component pertains to the observable aspects (deterministic) V_{ni}.

$$V_{ni} = \beta_i X_{nmi} \quad (2)$$

where β_i represents the coefficient vector of parameters for alternative i = (1, . . ., I), and X_{nmi} represents the observable attribute levels of i for individual n in choice situation m. However, there are also unobserved factors, denoted as εni, that influence people's choices. Hence, as the second part, εni is a random error that follows a Gumbell distribution and is distributed equally and independently in a multinomial logit (MNL) model [52].

The likelihood of individual n selecting option i can be represented as $L(\beta)$, which is determined by parameter β and can be expressed as follows:

$$L_{ni}\ (\beta)\ =\ \frac{exp(V_{ni}(\beta))}{\sum_{j=1}^{j} exp(V_{ni}\ (\beta))} = \frac{exp(X_{nmi}\beta)}{\sum_{j=1}^{j} exp(X_{nmi}\beta)} \tag{3}$$

The deterministic part of the utility function, $V_{ni}\ (\beta)$, in this equation depends on the fixed parameter β. Although the MNL model has its advantages, it also has limitations such as the inability to account for individuals assigning different importance to various attributes. To address this issue, the mixed logit (ML) model can be used. It provides a more comprehensive version of the MNL model which considers variations in sociodemographic characteristics, replacement patterns, and unobserved factors. As such, it has become highly popular for estimating random utility models across different fields [53], including several studies on architectural preferences and urban environments [42,54–57].

The ML model allows for heterogeneity by allowing the parameters of all or some variables to vary across respondents, rather than being constant for all respondents. In this model, the probability of selecting an alternative is defined as follows:

$$P_{ni} = \int (\beta) f(\beta) d\beta \tag{4}$$

where P_{ni} is the possibility that person n selects alternative i; $L_{ni}(\beta)$ is the possibility that person n selects alternative i in the MNL model, which is a function of parameter b, and $f(\beta)$ is a density function defined by constant parameters b as β = b, 1, $\beta \neq$ b, and 0.

2.7. Data Analysis

The data collected from the choice experiment was examined using the theory of random utility. To account for variations in individuals' decision making, a mixed logit (ML) model was estimated using the PandaBiogeme software (version 3.1.14). The attribute levels were categorized and converted into dummy coded variables to assess their respective influences.

3. Results

3.1. The Mixed Logit Model

The sample size consisted of 260 respondents, each of whom made 6 choices, resulting in a total of 1560 observations. Following an initial estimation, variables that exhibited insignificant variation were identified as fixed parameters. Two out of seven variables were considered fixed, while the remaining five parameters were considered random. In the final mixed logit (ML) model, the estimation of the random parameters adhered to a normal distribution, suggesting that the variables could have both positive and negative effects depending on the individual respondent. The estimation process involved 200 Halton draws. The fit of the logistic regression model was evaluated using various criteria. Notably, the pseudo-R^2 or R^2 (McFadden) value was calculated to be 0.16, indicating a satisfactory performance of the model. Table 3 shows the weights of significance assigned to each attribute in the resulting ML model.

Table 3. Parameter estimates of the mixed logit (ML) model.

				Random Parameters				
Attribute Level	**Parameter**	**Value**	***p***	**Std Dev.**	***p***	**Age**	**Education**	**Gender**
Random variables								
Constant (no choice)	β0	0.04 *	0.49	−0.62	0.00 **	-	-	-
Building style								
Neoclassic	β1	0.19	0.01 **	0.48	0.00 **	-	-	0.01 *
Contemporary	β3	0.22	0.00 **	0.57	0.00 **	-	-	-
Building symmetry								
Asymmetrical	β5	0.32	0.00 **	0.37	0.00 **	-	-	0.00 **
Building material								
Concrete	β7	0.31	0.00 **	0.47	0.00 **	0.00 **	0.00 *	-
Brick	β8	0.21	0.00 **	0.31	0.00 **	-	-	-
Entrance position								
Inside	β9	0.15	0.03 *	0.45	0.00 **	-	-	-
Outside	β11	0.42	0.00 **	0.36	0.00 **	-	-	-
Openness								
High	β12	1.08	0.00 **	−0.20	0.05 *	0.01 *	-	-
Medium	β13	0.30	0.00 **	0.33	0.00 **	-	-	-
Low	β14	−0.77	0.00 **	1.06	0.00 **	-	0.00 **	-
Scale								
Inhumanly	β16	0.56	0.00 **	0.19	0.01 **	-	-	-
Window shape								
Rectangular and Arch	β19	0.28	0.00 **	0.51	0.00 **	-	-	0.00 **
Non-random variables								
Building style								
Postmodern	β2	0.213	0.00 **	0.15	0.09	0.00 **	0.02 *	-
Window shape								
Rectangular	β17	0.46	0.00 **	0.08	0.37	0.02 *	-	-
Non-effective variables								
Building material								
Stone	β6	0.10	0.14	0.41	0.00 **	0.05	-	0.01 **
Entrance position								
Middle	β10	0.05 *	0.49	0.38	0.00 **	0.02 *	0.02 *	-
Scale								
Humanly	β15	0.06	0.36	0.50	0.00 **	-	0.00 **	0.01 *
Window shape								
Arch	β18	−0.12	0.10	0.60	0.00 **	-	-	-
Model specification								
Number of estimated parameters = 40, sample size = 260, observation = 1560, likelihood ratio test = 504.2938, pseudo-R2 = 0.16								

* significance (p) < 0.05, ** significance (p) < 0.01.

3.2. Parameter Values

The model (Table 3) indicates a minimal selection of the 'no choice' or 'none' option by participants, as most respondents were able to make a distinction between the preference of one option over the other.

The estimated parameters from the model reveal the relative influence of facade attribute levels on participants' preferences. High openness exhibited the strongest positive effect (β = 1.08, $p < 0.01$), followed by inhumanly (i.e., larger) scaled facade features (β11 = 0.56, $p < 0.00$), rectangular window shape (β17 = 0.46, $p < 0.00$), and outside (protruding) entrance position (β11 = 0.42, $p < 0.00$). Moderate effects were observed for asymmetrical facades (β5 = 0.32, $p < 0.00$), concrete material (β7 = 0.31, $p < 0.00$), and moderate openness (β13 = 0.30, $p < 0.00$). Next, the combination of rectangular and arched window shapes (β19 = 0.28, $p < 0.00$), contemporary building style (β3 = 0.22, $p < 0.00$), postmodern building style (β2 = 0.21, $p < 0.00$), and brick material (β8 = 0.21, $p = 0.00$) was of importance. Finally, a neoclassical building style (β1 = 0.19, $p < 0.01$) and an inside (recessed) entrance position ($\beta9 = 0.15$, $p < 0.05$) had the lowest preference rate. Low openness exhibited a negative value ($\beta14 = -0.77$, $p < 0.00$), indicating this attribute level to be undesirable to the participants.

Stone material ($\beta6 = 0.10$, $p = 0.14$), humanly scaled ($\beta15 = 0.06$, $p = 0.36$), middle (i.e., aligned with the facade) entrance position ($\beta10 = 0.05$, $p = 0.49$), and arched window shape ($\beta18 = -0.12$, $p = 0.10$) were not significant in the model.

The model also reveals the relationship between sociodemographic variables and facade attributes. Age, gender, and education all had a significant effect on some of the attributes ($p < 0.05$) and thus constitute important target group variables to consider in design projects.

The results, visualized in Figure 4, highlight openness, scale, window shape, and entrance position as critical drivers of preference, while symmetry and material choices yielded less pronounced effects, with building style being the least influential factor. A facade demonstrating the most preferred attribute levels according to the resulting model is shown in Figure 5.

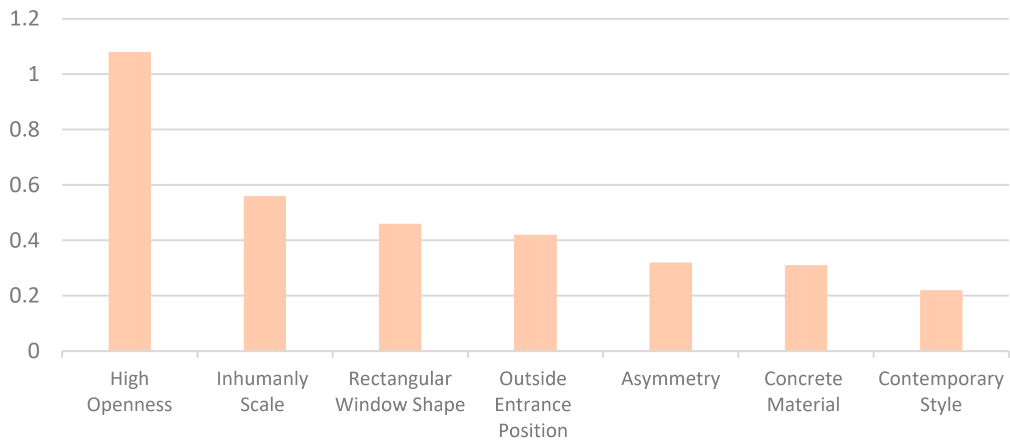


Figure 4. Attribute levels arranged according to their influence on participant choices in this study (Y-axis shows variable values, e.g., their relative influence on preference).

Figure 5. A facade displaying the most preferred attribute levels in this study, with high openness, inhumanly scaled (i.e., large-scale entrance and windows), rectangular window shapes, an outside entrance position, an asymmetric facade distribution, concrete materials, and a contemporary design style.

3.3. Random Parameter

The mixed logit analysis assessed seven facade attributes at multiple levels. For architectural styles, contemporary (SD = 0.57, $p < 0.01$) and neoclassical (SD = 0.48, $p < 0.01$) styles both showed significant heterogeneity, but the postmodern style did not (SD = 0.15, $p = 0.15$). For symmetry, asymmetrical facades exhibited significant heterogeneity (SD = 0.37, $p < 0.01$); therefore, symmetrical facades did not. For materials, concrete (SD = 0.47, $p < 0.01$) and brick (SD = 0.31, $p < 0.01$) revealed significant heterogeneity, while stone did not (β = 0.10, $p = 0.14$). For entrance position, the outside and inside entrance level exhibited significant heterogeneity (SD = 0.36, $p < 0.01$: SD = 0.45, $p < 0.01$), while middle entrance levels did not (β = 0.05, $p = 0.49$). In the openness attribute, high and medium openness demonstrated significant heterogeneity (SD = −0.20, $p < 0.05$: SD = 0.33, $p < 0.01$), whereas low openness did not (β = −0.77, $p < 0.05$). Regarding scale, inhumanly scaled facade attributes showed significant heterogeneity (SD = 0.19, $p < 0.01$), while humanly scaled facade attributes did not (β = 0.06, $p = 0.36$). For window shape, the combination of rectangular and arched windows had significant heterogeneity (SD = 0.51, $p< 0.01$), but rectangular and arched windows did not (SD = 0.08, p =0.37: B = −0.12, $p = 0.09$).

3.4. Interaction

The interactions between different attributes were investigated and analyzed by PandaBiogeme (Table 4). Two significant relationships were found (between Medium Openness * Humanly Scaled and Arched Window Shape * Postmodern Style), which both had a negative effect on choice.

Table 4. Interactions between levels of variables.

Interaction Attribute Level	Parameter Value	Significance (p)
Stone Material × Neoclassical Style	0.34	0.14
High Openness × Humanly Scaled	−0.26	0.10
Rectangular Window Shape × Neoclassical Style	−0.19	0.37
Arched Window Shape × Neoclassical Style	−0.24	0.23
Medium Openness × Humanly Scaled	−0.53	0.00 **
Arched Window Shape × Postmodern Style	−0.64	0.00 **
Model specification		
Number of estimated parameters = 20, sample size = 260, observation = 1560, likelihood ratio test = 533.1489, pseudo-R2 = 0.156		

** significance (p) < 0.01.

4. Discussion

This study examined the relationship between seven architectural attributes of shopping centers—namely building style, symmetry, material, entrance position, openness, scale, and window shape—at various levels, and their influence on public preference. The results indicated that a high degree of openness was the most influential positive predictor of participants' preferences. All variables, with the exception of arched windows and low openness, were found to be statistically significant.

4.1. Attributes' Influence on Choices

The results indicated that the attribute of openness had the greatest influence on participants' choices. Consequently, it can be concluded that facades with high levels of openness represent the most significant factor shaping public preference. While moderately open facades also had a positive effect, their impact was less pronounced. This finding aligns with prior research emphasizing the role of transparency and visual accessibility in allowing passersby to observe and engage with interior activities [14]. In contrast, facades with low openness had minimal influence on preferences, supporting the view that a building's function should guide design decisions [18]. For example, residential buildings typically require more privacy, whereas shopping centers benefit from transparent facades and window displays that reveal interior content and stimulate interest [46].

The second most influential factor identified was the scale of the facade features, with facades exhibiting inhumanly (i.e., larger) scaled features being preferred over those with humanly or smaller scaled features. This preference may stem from perceptions that larger-scale buildings convey prestige, while smaller-scale designs foster approachability [18].

The third most significant attribute was window shape. Rectangular windows were most favored, while arched windows had no statistically significant effect on preferences. Facades combining both rectangular and arched window shapes also elicited positive responses. This result may be attributed to psychological factors, as neural responses to geometric forms can affect individuals' esthetic preferences [28].

Entrance position was another attribute that significantly influenced participants' preferences. An extruded entrance—protruding beyond the facade—was much more preferred compared to an entrance recessed into the building or aligned with the facade plane, with the latter being the least favored. This underscores the importance of architectural features such as stairs, platforms, and elevation in emphasizing the entry point [45].

This study also found that building symmetry had an impact on participants' choices. This may be attributed to an inherent human inclination toward visual interest and complexity, with asymmetrical facades often perceived as more dynamic and engaging [58]. Additionally, previous research suggests that individuals tend to favor unique and distinctive architectural features, particularly in tall buildings, where asymmetry enhances visual appeal [39].

Facade material also influenced participants' preferences, with concrete emerging as the most favored material among the options presented. This finding is consistent with previous studies that have emphasized the significance of materials in shaping public perception of facades [22,59]. However, past research has not reached a consensus regarding the most preferred material, likely due to individual differences in esthetic taste and cultural context [60].

Lastly, in line with earlier findings, architectural style had a notable effect on preference [10,19,61]. The contemporary style was the most preferred among respondents, followed closely by the postmodern style, with a relatively small margin. The neoclassical style was the least favored. The lack of consensus in previous research regarding preferred styles may be explained by variations in individual visual preferences and regional familiarity.

4.2. Heterogeneity

Our findings reveal significant heterogeneity in individual preferences concerning the architectural facade attributes of shopping centers. The mixed logit analysis demonstrated that, although certain features—such as high openness and rectangular window shapes—were generally well-received, substantial variability existed in how participants evaluated other attributes, including entrance position, symmetry, and material. This result aligns with previous research emphasizing the importance of accommodating diverse esthetic expectations in facade design [5,6,8]. For example, while some respondents expressed a clear preference for asymmetrical facades or inhuman-scale elements, others favored more traditional or human-scale designs. This variation highlights the need for flexibility and diversity in architectural approaches to better meet the nuanced tastes of urban users [11,22].

The observed variation in preferences across demographic categories such as age, gender, and education confirm findings from earlier studies. For instance, younger participants tended to prefer modern and unconventional elements—such as asymmetry and concrete materials—whereas older individuals showed a stronger preference for traditional features, including symmetry and brick [19,21]. Gender differences were also evident, with female respondents placing greater emphasis on openness and entrance position. This is consistent with prior studies indicating that women are more sensitive to environmental cues and responsive to welcoming designs [18]. Furthermore, participants with higher levels of education demonstrated a greater appreciation for innovative and contemporary architectural styles, supporting previous findings that educational background influences esthetic exposure and the valuation of diverse design approaches [25,61].

Overall, these patterns reinforce existing research by suggesting that demographic factors significantly shape visual preferences and should be carefully considered in facade design to enhance user satisfaction and promote urban vitality. By offering insights into the architectural features of commercial facades that affect public perception, this study contributes valuable knowledge for architects and designers aiming to create more attractive and user-centered shopping center exteriors [10,19,61].

4.3. Interaction Effects Among Facade Attributes

The analysis identified significant interaction effects among architectural facade attributes. In particular, the combination of high openness and modern architectural style markedly increased user preference, indicating that these elements enhance each other's visual appeal. Moreover, entrances positioned outside the facade, when paired with concrete or brick materials, were especially well-received, reflecting both functional legibility and esthetic compatibility. Interactions between window shape and scale also proved influential; for instance, rectangular windows combined with larger-scale facades were preferred, likely due to their reinforcement of a contemporary appearance. These results highlight that the joint impact of multiple facade attributes may surpass the influence of individual features, underscoring the importance of adopting integrated and holistic design strategies in architectural practice.

4.4. Limitations

While this study provides valuable insights into the architectural factors influencing people's preferences for shopping center facades, several limitations should be acknowledged. First, data collection was conducted within a limited timeframe and restricted to a single geographic and cultural context. Consequently, participants' responses may have been shaped by the specific socioeconomic and cultural conditions at the time and location of the study. As such, caution is warranted when attempting to generalize these findings to other regions or time periods.

Additionally, this study focused solely on architectural features of shopping center facades, overlooking other potentially influential factors such as accessibility, pricing, and product quality. Further research is needed to evaluate the relative importance of architectural elements compared to these and other determinants of consumer choice. The study also restricted its scope to seven facade attributes pertaining to the building itself, excluding other potentially relevant design variables. Future studies could expand the range of architectural characteristics to develop a more comprehensive understanding of what drives user preferences. Biophilic and green design features—such as green walls, trees, and plants—should be considered here, as much previous research has highlighted their significance in shaping environmental preferences.

Moreover, by concentrating exclusively on facade elements, this study did not account for broader urban environmental features that may also affect site preference and visitor attraction. Again, natural elements like vegetation in the surrounding area may play a critical role and warrant further investigation. The research was also limited to shopping centers, which may restrict the applicability of the findings to other building types. Future research should explore whether similar preferences exist across different building functions and typologies. Furthermore, only medium-sized buildings were evaluated; subsequent studies could examine preferences for larger-scale malls or commercial complexes to test the consistency of the results across different spatial scales.

The discrete choice experiment method employed, while useful for capturing preference data, comes with its own limitations. Including more attributes can improve the realism and robustness of findings, but also increases the cognitive load on participants and the costs of data collection. Thus, future studies should balance the need for comprehensiveness with practical constraints, ensuring reliability without overburdening respondents.

It is also important to recognize the potential influence of social dimensions on participants' perceptions, which were not a primary focus of this study. Aspects such as community identity, cultural associations with specific materials, or the social functions of facades—such as encouraging interaction—may also contribute meaningfully to the attractiveness and utility of shopping centers. Future research could benefit from exploring the intersection of architectural design and social experience to enrich the understanding of how facade design affects urban life.

Moreover, this study considered only three sociodemographic variables—age, gender, and education—leaving out other potentially influential factors such as income, cultural background, and lifestyle. Expanding this scope in future research could offer more nuanced insights. Finally, since this study relied on computer-generated images, participant responses may have been shaped by the representational medium itself. Future investigations might adopt more immersive technologies, such as virtual reality, to simulate a more realistic and engaging evaluation context.

5. Conclusions

This study advances the understanding of how specific architectural facade attributes influence user preferences for shopping centers, potentially offering insights for architects, urban designers, and commercial stakeholders. The findings suggest that features such as high openness/transparency of the facade, asymmetrical forms, and the use of modern materials can enhance esthetic appeal and the perceived social value of shopping centers.

However, the study is not without limitations, for example, the focus on a single urban setting and cultural context and the reliance on visual simulations rather than real-world implementations. Additionally, the study did not account for the potential impact of biophilic design features in the surrounding environment—such as the presence of natural elements like trees and plants—which may also shape user preferences.

Nevertheless, one of the central implications of the study lies in highlighting the dynamic relationship between architectural investment and commercial viability. While the integration of distinctive and engaging facade elements may involve higher initial costs, such investments can be justified if they contribute to increased foot traffic, enhanced user experience, and long-term economic performance. However, these decisions must be weighed against practical business considerations such as budget limitations, brand identity, and operational functionality.

Future research should examine the long-term outcomes of such architectural strategies by evaluating their social and economic impacts across a variety of urban contexts. An integrated approach that balances architectural quality with commercial feasibility has the potential to yield shopping centers that not only achieve business success but also enrich the broader urban fabric. Further studies are encouraged to investigate the role of biophilic facade features and the influence of the surrounding urban environment in shaping user preferences and satisfaction, while also including diverse cultural and geographic settings.

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