scientific reports

OPEN

Revisiting factors influencing consumer travel for purchasing goods and experiencing services in Shanghai, China

Ning Kang[1,2] & Xinyi Niu [1,2]✉

This paper revisits the relationships among the perceived built environment, travel attitude, perceived value, and consumer travel in the particular era of the changing retail landscape amid advances in information technology. This study thus uses consistent partial least squares structural equation modelling (PLSc-SEM) to estimate the focal parameters on the basis of data from 30 commercial centres in Shanghai, China. Additionally, this inquiry uses multigroup analysis structural equation modelling (MGA-SEM) to evaluate the disparities between two types of consumer travel: purchasing goods and experiencing services. The results show that consumers' perceived values and travel attitude significantly influence their travel and that these effects are even more apparent for experience services. In addition, the perceived built environment plays a partially positive role in consumer travel. Notably, however, accessibility cannot directly influence consumer travel and only indirectly influences travel attitude, whereas commercial attractiveness positively influences both of these factors. Accordingly, this study offers valuable insights, enabling urban planning, transportation, and commercial services to better address the evolving retail landscape and emerging consumer travel demands.

With the rapid advancement of information technology, lifestyles and shopping habits have undergone significant transformations. Extensive research has demonstrated the complex relationship between online shopping and offline consumer travel[1–3]. Nevertheless, commercial centres remain vital for consumption, constantly evolving and restructuring themselves[4,5]. Online shopping can replace some travel demands, and technological advancements often stimulate new consumer demands. Commercial centres are thus shifting their focus from primarily department stores, retail, and other shopping establishments to becoming a "premier habitat for consumers" and providing leisure and entertainment facilities as well as experiential services[6]. As the retail landscape and consumer preferences continue to evolve, understanding the factors influencing consumer travel behaviour is critical for urban planning and transportation research. Previous findings cannot directly explain whether the influencing factors that attracted consumers to commercial centres in the past have changed. Are there new factors in the consumer environment that attract consumers to retail centres? Therefore, revisiting the factors influencing consumer travel in the changing social environment seems to be a more direct and effective approach. That is, it can support the urban planning and transport sectors in developing relevant policies regarding consumer travel.

Many studies in urban planning and transportation have focused on the relationship between the built environment and travel behaviour[7–11]. However, such research has indicated a relatively weak correlation between the objective built environment and travel behaviour. In contrast, the perceived built environment and individual attitudes have shown more substantial explanatory power concerning the built environment[12–14]. Previous studies have focused primarily on commuting behaviour[15,16]; nonetheless, for consumption-related travel, the characteristics of destination commercial centres are worth considering, in addition to transportation accessibility[8]. Additionally, as online shopping continues to thrive, competition has become fiercer. Consequently, compared with online retail consumers, offline consumers place greater value on the services and experiences

[1]College of Architecture and Urban Planning, Tongji University, Shanghai 200092, China. [2]Key Laboratory of Spatial Intelligent Planning Technology, Ministry of Natural Resources, Shanghai 200092, China. ✉email: niuxinyi@tongji.edu.cn

offered by commercial centres[17]. The perceived value of in-person consumption at these centres significantly influences consumers' attitudes towards consumer travel[18]. As a result, travel attitude and consumers' perceived value play a more direct role in shaping and influencing the retail landscape[5]. Therefore, considering the changing retail landscape, it is imperative to establish a framework for examining the pivotal factors influencing consumer travel that encompass the direct and indirect relationships among the perceived built environment, travel attitude, value perceptions, and consumer travel.

The attitudes and perceived values of consumer travel stem from the experiences offered by various stores and activities[19]. Previous research has confirmed that various goods, such as books, electronics, and clothing, can influence travel frequency, duration, and choice of transportation mode[20–22]. With the changing landscape of retail formats, commercial centres have expanded their entertainment offerings, e.g., experiential services such as dining, cinemas, indoor sports, health and beauty, and other leisure facilities[23,24]. This approach differs from their previous focus on experiential goods. Despite the above shift, however, research on the impact of leisure and entertainment facilities on consumer travel remains limited; only one study has indicated a positive effect of online search on the frequency of experiential service travel[25]. Such research on consumer travel purposes thus requires expansion and updating. A better understanding of the distinctions among the influencing factors and mechanisms between consumer travel for purchasing goods and experiencing services is essential. Such research findings will enable commercial centres to reposition themselves by better identifying their competitive advantages amidst online shopping competition.

Furthermore, the development of urban transport infrastructure has dramatically improved resident travel accessibility[26]. As Shanghai is a megacity, its rail network covers all its commercial centres above the district level. In addition, Shanghai is developing into an international consumer centre, and its consumer environment has matured. Therefore, this study utilises survey data collected in Shanghai and employs structural equation modelling to describe the relationships among the complex variables and explore the variability in the paths of influence of different kinds of consumer travel. The aim is thus to answer the following questions: How do the perceived built environment, travel attitude, and perceived value impact consumer travel in the current retail landscape? Additionally, is there a distinction between the two paths of influence on consumer travel, i.e., purchasing goods and experiencing services?

On the basis of these research questions, the research objectives are as follows: (1) Validate a theoretical framework that explores the relationships among the perceived built environment, travel attitude, perceived value, and consumer travel. (2) Compare the effects of consumer travel behaviour related to purchasing goods versus experiencing services and offer recommendations for enhancing commercial centres and retail environments on the basis of these findings.

This paper is structured as follows: the next section reviews related studies in terms of the research bases, influencing factors, and different consumption travel purposes. The methodology section then describes the applied methods of data processing, variable assessment, modelling and estimation. The results section presents the results of the models. The last two sections discuss these results and offer some conclusions.

Literature review

In the fields of urban planning and transportation research, the relationship between the built environment and travel behaviour has long been a primary focus of scholarly investigation[7–11]. Research indicates that while the direct correlation between the objective built environment and travel behaviour is relatively limited, the perceived built environment and individual attitudes have demonstrated greater explanatory power in predicting travel behaviour[12–14]. However, current studies focus predominantly on two areas. The first is work-related travel, with limited attention given to consumer travel[9–11,16]. Notably, consumer travel differs significantly from commuting behaviour in several aspects[27]. In consumer travel, factors such as the attractiveness of destination commercial centres, in addition to transportation convenience, play a critical role in shaping travel decisions[28].

The second focus of existing research pertains to nonwork travel and examines the influence of individual psychological characteristics on travel behaviour[12,29]. This research posits that traits such as motivation, attitudes, and perceived value are crucial determinants of travel behaviour, which is shaped by external environmental factors[29,30]. Psychological factors, including consumer value perceptions and attitudes, not only directly affect travel behaviour but also have broader implications by altering the dynamics of the retail industry[5,31]. However, existing studies often concentrate on nonwork travel associated with shopping tourism, which is characterised by longer and more time-consuming trips in which consumption at commercial centres is not the primary goal[32]. These studies typically emphasise unconventional retail, souvenirs, and shopping as cultural experiences[33]. In contrast, this study focuses on consumer travel, which involves essential activities carried out by local residents to fulfil their daily shopping and service needs[34].

In summary, research on built environment travel behaviour helps reveal how factors of the built environment influence individual travel decisions, whereas the consumer behaviour model emphasizes the importance of psychological characteristics (such as motivation, attitudes, and perceived value) in consumer decision-making (Table 1). Given the evolving retail landscape, integrating theories from transport geography and consumer psychology is necessary to develop a comprehensive theoretical framework. This framework should highlight the combined influence of external environmental factors and internal psychological factors on consumer travel behaviour, particularly in examining the relationships between the perceived built environment (e.g., accessibility, commercial attractiveness), travel attitude, and perceived value.

Perceived built environment

Consumer travellers typically make travel decisions based on retail attraction and preference, considering factors such as accessibility, parking facilities, and the goods or services offered at commercial centres[35,36]. On the one hand, better accessibility and parking facilities encourage more consumers to travel by increasing their

	Theory and literature	Author	Year	Description
Conceptual framework	Built environment–travel behaviour (BE-TB)	Ewing, R. & Cervero, R[7], Handy et al.[10]., Ma, L. & Cao, J[14], Zhou et al.[11].	2001 2005, 2019, 2022	These studies have validated a strong correlation between the built environment (such as density, diversity, design, destination accessibility, and perceptions mediating) and travel behaviour.
	Consumer behaviour model	Schiffman, L. G., & Wisenblit, J[30].	2015	This model comprises three key components: external influences affecting the consumer (including environmental factors and marketing stimuli), the consumer (encompassing internal characteristics and the decision-making process), and outcomes (manifested as consumer behaviours).
Research hypotheses	Consumer perceived value	Jillian C. Sweeney, Geoffrey N. Soutar[46]	2001	Perceived consumer value is primarily influenced by three dimensions: the functional dimension (economic and quality aspects), the social dimension, and the emotional dimension.
	Theory of planned behaviour (TPB)	Ajzen[49]	1991	In the TPB, perceived behavioural control (PBC)—the ease or difficulty of performing a behaviour—can moderate the relationship between attitude and intention, as well as between intention and behaviour.
	Social cognitive theory	Bandura, Albert[50]	1986	This theory emphasises reciprocal causation through the interplay of cognitive, behavioural, and environmental factors.
	Sophisticated stimulus–organism–response (SOR) model	Sherman, E., Mathur, A., & Smith, R. B[52]	1997	This study applies the SOR framework to a commercial context, explaining how environmental characteristics influence behaviour by stimulating individuals' attitudes and emotions.

Table 1. Summary of relevant theories and literature.

willingness to travel[37,38]. On the other hand, the perceived attractiveness of commercial centres positively affects consumer travel behaviour[36,39] and includes factors such as the shopping atmosphere[40,41], scale[42] and diversity of commercial offerings[41,43]. When the environment supports consumer behaviour, consumers have access to a broader range of services and choices, which increases their perception of value and positively influences their attitude and behaviour[44]. While prior research has confirmed a strong association between the perceived built environment and travel behaviour, the focus has predominantly been on commuting behaviour[14], with an emphasis on the built environment of residential areas[10,16]. However, for consumer travel, more attention should be given to the perceived built environment of destination commercial centres, where critical factors encompass both accessibility and commercial attractiveness. Thus, this study posits the following hypotheses:

H1: Accessibility has a positive influence on travel attitude.

H2: Accessibility has a positive influence on consumer travel.

H3: Commercial attractiveness has a positive influence on travel attitude.

H4: Commercial attractiveness has a positive influence on consumer travel.

Relationship between perceived value and consumer travel

According to consumer behaviour theory, consumers' perceived value refers to the maximised expected utility of a particular product, service, or brand within commercial centres[45]. Sweeney and Soutar categorised consumer perceived value into three types: functional, emotional, and social[46]. The current varieties of offerings in commercial centres have enriched the perception of these three types of value. In addition to generating functional value by allowing consumers to purchase goods, commercial centres transform consumers' visits via relaxation, self-fulfilment, entertainment, and emotional engagement, thereby increasing their emotional value for consumers[23]. Commercial centres thus attract consumers and provide social value by branding and marketing high-value products.

Furthermore, consumer value perception is a significant precursor of individual attitudes and behavioural intentions[47]. Consumers tend to favour products or services with a higher perceived value. Only when the destination experience provides high value to consumers will their visit frequency and expenditure increase, thereby positively influencing consumer travel. Consequently, their value perception is a pivotal precondition for consumers to engage in consumer travel, representing a critical competitive advantage for commercial centres. However, the extant research frameworks on consumer travel have overlooked this crucial factor. Therefore, the relevant research hypotheses are as follows:

H5: Commercial attractiveness has a positive influence on perceived value.

H6: Perceived value has a positive influence on travel attitude.

H7: Perceived value has a positive influence on consumer travel.

Relationship between travel attitude and consumer travel

Acock and DeFleur posited that attitude becomes more relevant to behaviour when the social environment changes[48]. Specifically, the social environment is more likely to influence behaviour by altering an attitude rather than directly impacting behaviour. Much of this research has delved into the relationships among travel attitudes, the built environment, and travel behaviour, establishing theoretical frameworks with sociological and psychological factors. Hence, the theory of planned behaviour[49], social cognitive theory[50], social-ecological model[51], and sophisticated stimulus–organism–response (SOR) model[52] have contributed crucial insights into the pivotal role of attitudes, which are precursors to behavioural outcomes.

Furthermore, the social environment and individual perceived value shape attitudes. In the competition between online and offline shopping, attitudes towards online shopping play a key role in the attitude towards

the built environment and the frequency of consumption, influencing not only online shopping but also the frequency of offline shopping[25]. As a result, consumers' travel attitude always have a significant effect on their travel. Amidst fierce competition in online shopping, it is thus essential to investigate the direct effects of travel attitude on consumer travel. We therefore propose the following hypothesis:

H8: Travel attitude has a positive influence on consumer travel.

Classification of consumer travel: purchasing goods vs. experiencing services

The distinctions between purchasing goods and experiencing services have been extensively explored in social psychology[53]. Van Boven and Gilovich (2003) defined experiential purchases as events or series of events experienced by consumers, such as travel, movie viewing, or visiting a gym. In contrast, material purchases pertain to tangible items owned by individuals, such as jewellery, laptops, or shoes[54]. Consumer shopping motivations can be categorised into product motives and experiential motives[55]. Product motives involve acquiring goods from retail stores, whereas experiential motives regard shopping at malls as an enjoyable activity. This distinction is consistent with the differentiation between utilitarian and hedonic consumers in consumer psychology[56]. Hedonic consumers seek emotional and sensory experiences, whereas utilitarian consumers focus on the functionality, utility, and value of products[57]. Thus, experiential purchases centre on "services", whereas material purchases focus on "goods".

The rapid expansion of online retail has significantly disrupted the Chinese commercial retail market, leading commercial centres to increase their offerings of experiential services that online shopping cannot provide. Research indicates that the type of goods purchased online affects travel time and transportation mode[58]. Functional items, such as clothing, shoes, electronics, and cosmetics, are standardised products and can be transported. However, services and experiences cannot be transported. Leisure and entertainment facilities in commercial centres require consumers to experience them in person; otherwise, it is challenging to perceive their value. Therefore, the growth of online retail has further highlighted the differences between purchasing goods and experiencing services in consumer visits to commercial centres.

This analysis underscores the clear behavioural and motivational differences between purchasing goods and experiencing services, particularly in the context of evolving online retail trends in the Chinese market. Exploring the pathways influencing these two types of consumption behaviours is crucial. To clarify potential overlaps and intersections in real-world scenarios, specific examples of purchasing goods versus experiencing services were provided in the survey (Table 2), ensuring consistent respondent understanding and enhancing the reliability and validity of the research findings.

Summary

The aforementioned studies provide a foundation for understanding the factors influencing consumer travel; however, several gaps remain. First, existing research emphasises the greater explanatory power of the perceived built environment on travel behaviour, but it focuses primarily on work-related travel and the built environment of residential areas, overlooking the perceived attractiveness of commercial centres as consumer destinations. Second, with the ongoing impact of online retail, there is a contrasting relationship between consumers' travel attitude and their attitudes towards online shopping. However, the impact of consumer travel attitude on actual consumer travel behaviour has yet to be thoroughly validated. Third, consumer psychology research indicates that perceived value is a prerequisite for consumer purchasing behaviour, yet previous studies on consumer travel have often overlooked this critical factor. Finally, the current retail environment has led to disparities in consumer behaviour concerning purchasing goods and experiencing services, i.e., differences in motivational factors, consumption channels, and types of commodities. Hence, whether differential influence pathways exist in this context warrants further exploration.

Therefore, this study proposes a theoretical model that integrates consumer psychology factors into the existing framework of the built environment and travel behaviour. The research framework is divided into three main components: external influences, internal factors, and behaviour (Fig. 1). The external influences include factors such as accessibility and commercial attractiveness. The internal factors predominantly encompass elements such as perceived value and travel attitude. The assumed relationships are as follows: the perceived built environment may directly or indirectly influence consumer travel behaviour through travel attitude and perceived value. Travel attitude and perceived value can directly influence consumer travel behaviour.

Methods
Data processing

This study collected data from May 5 to May 14, 2023, with a focus on consumer travel. To ensure a representative sample, we selected 30 commercial centres of varying levels in Shanghai's main city area, including the main centres, subcentres, and district centres. These commercial centres were randomly distributed across the main city area. Figure 2 below illustrates the geographic locations of these 30 commercial centres. Additionally, the wide distribution and abundance of these commercial centres ensured a similarly random distribution of respondents.

We subsequently conducted a random survey of the residents. We contacted them by phone and online, ensured they were over 18 years old and had visited one of the 30 commercial centres within the main city area, and obtained their consent to participate in the survey. This study was approved by the Medical and Life Sciences Ethics Committee of Tongji University, which confirmed that informed consent was obtained from all the subjects. The data collected in this survey do not retain any information that can directly or indirectly identify the respondents.

	Number of observation	Percentage
Gender		
male	115	36.39%
female	201	63.61%
Age		
18–24	58	18.35%
25–34	111	35.13%
35–44	99	31.33%
45–54	33	10.44%
55–64	15	4.75%
Average monthly income of the family (RMB)		
< 2000	1	0.32%
2000–4000	7	2.22%
4000–6000	20	6.33%
6000–8000	39	12.34%
8000–10,000	35	11.08%
10,000–15,000	57	18.04%
15,000–20,000	65	20.57%
> 20,000	92	29.11%
Household Size		
single	40	12.66%
couple	83	26.27%
nuclear family	160	50.63%
extended family	33	10.44%
The primary purpose of consumption		
purchasing goods (i.e., supermarkets, clothing and accessories stores, household essentials, bookstores, electronics retailers, and flower shops)	198	62.66%
experiencing services (i.e., restaurants, beauty salons, cinemas, family amusement parks, and fitness centres)	118	37.34%

Table 2. Descriptive statistics of the sample (*N* = 316).
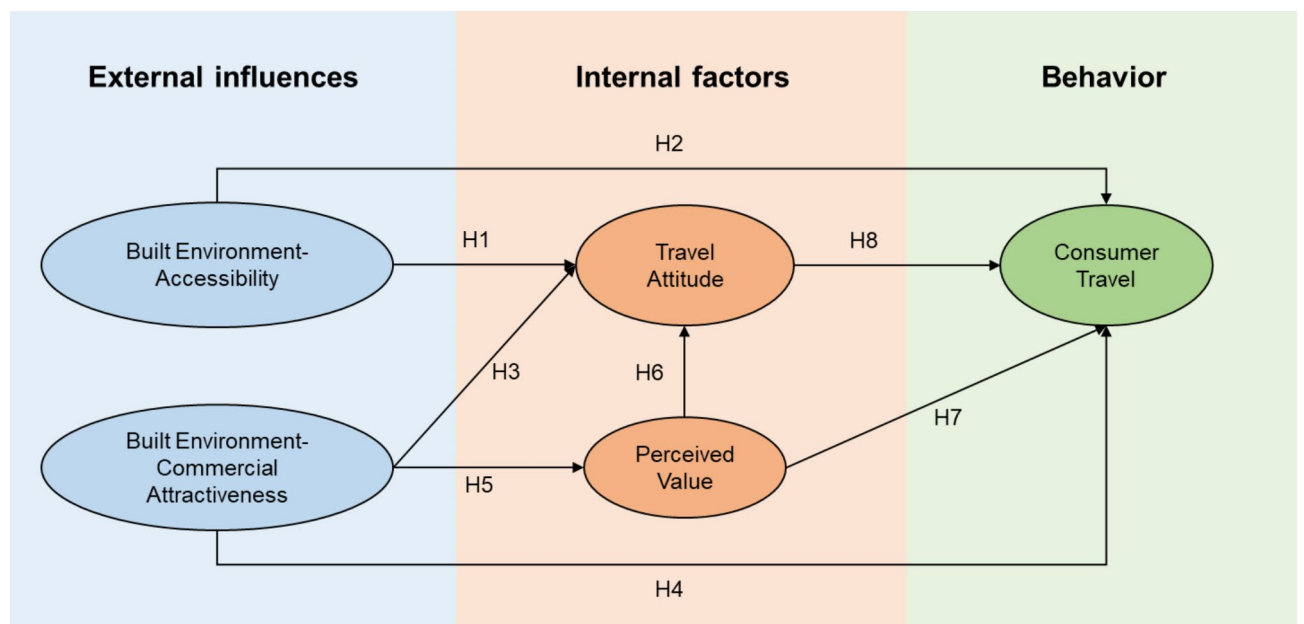
Fig. 1. Conceptual framework. The theoretical model comprises three primary components: external influences, internal factors, and behavior. External influences encompass factors like accessibility and commercial attractiveness. Internal factors mainly consist of elements such as perceived value and travel attitude.(Source: author created).
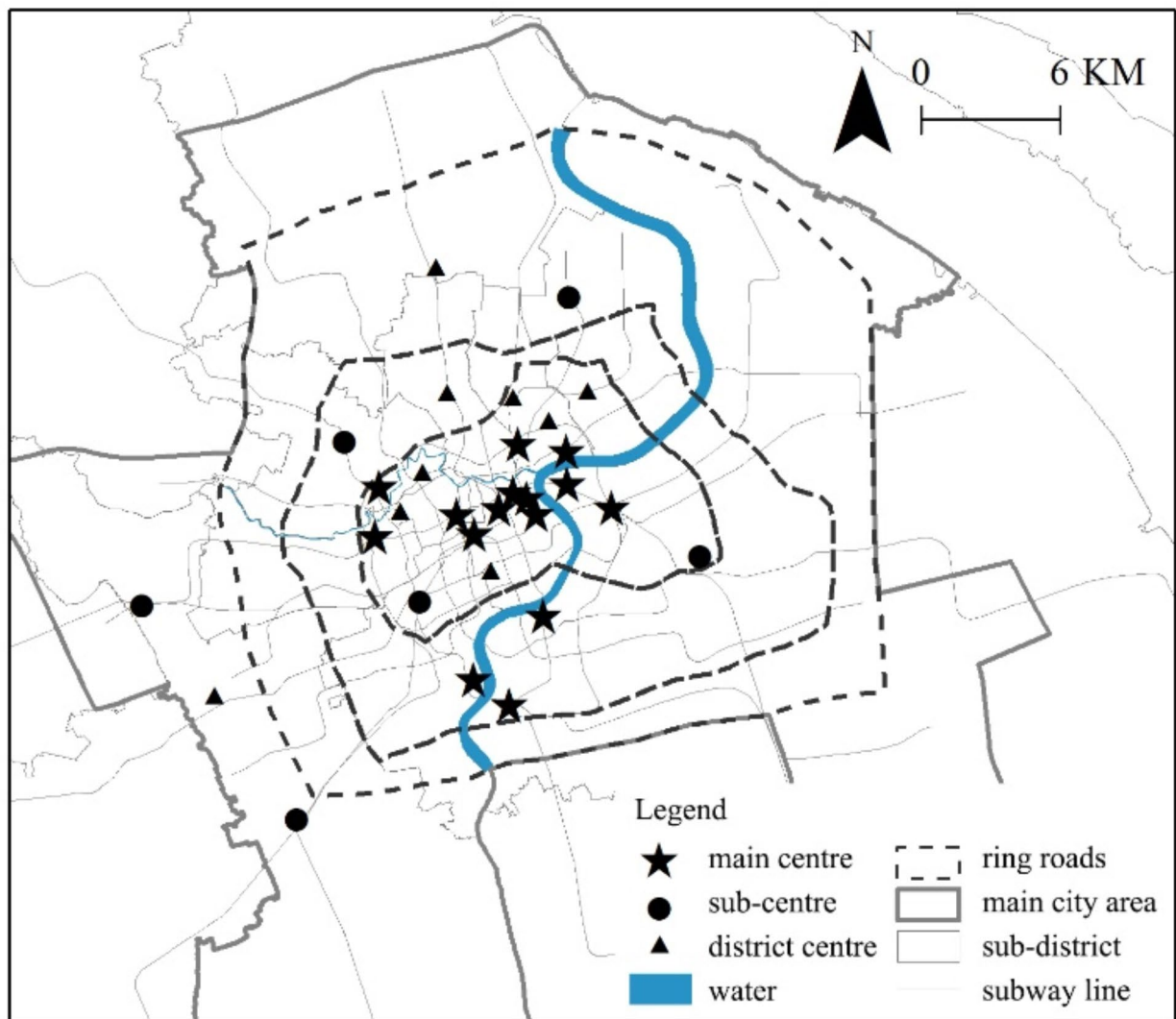
Fig. 2. Spatial distribution of sampled units. We selected 30 commercial centres of varying levels in Shanghai's main city area including the main centres, subcentres, and district centres. These were geographically distributed randomly in Shanghai's main city area.(Source: author created).

To ensure the validity of our questionnaire, we rigorously screened the responses. First, we excluded incomplete questionnaires. Next, we removed those with logical inconsistencies or duplicate answers. Additionally, questionnaires completed in less than 5 min or more than 1 h were considered potentially invalid or inaccurate and were therefore excluded. Ultimately, we accepted 316 of the 407 collected questionnaires that met our study's criteria for completeness, consistency, and completion time, and these were included in the analysis.

Among the respondents of the final 316 valid questionnaires (Table 2), 63.61% were female. The females visited shopping centres more frequently. The respondents' ages mainly fell between 18 and 64 years old, with the most active group being 25–44 years old, a middle-income demographic with purchasing power. In terms of family structure, over half were in parent-child households. Geographically, the respondents' residences were evenly distributed among areas within the Inner Ring Road, Middle Inner Ring Road, Middle Outer Ring Road, and Outer Ring Road.

This study considered five variables: (1) perceived built environment—accessibility, (2) perceived built environment—commercial attractiveness, (3) travel attitude, (4) perceived value, and (5) consumer travel. Detailed demographic information for each respondent (gender, age, average monthly income of family, household size, primary purpose of consumption) is presented in Table 2.

On the basis of the categorisation of consumer travel purposes in the literature review, consumer travel within commercial centres aimed primarily at obtaining functional value by purchasing goods was categorised as "purchasing goods". Consumer travel included locations such as supermarkets, clothing, accessories and household essential stores; bookstores; electronics retailers; and flower shops. On the other hand, consumers'

travels within commercial centres aimed primarily at enhancing their experiential enjoyment were categorised as "experiencing services"; this travel encompassed venues such as restaurants, beauty salons, cinemas, family amusement parks, and fitness centres. Additionally, although multipurpose travel was inevitable, for the sake of clarity, the respondents were explicitly instructed during the questionnaire design and data collection process to indicate their primary consumption purpose, facilitating more precise differentiation.

Variable descriptions

Perceived built environment

Assessing the perceived built environment encompasses the attributes of accessibility and commercial attractiveness. We employed a 7-point Likert scale to allow respondents to evaluate various indicators using a range from 1 to 7 (1 indicating "strongly unattractive," 7 indicating "extremely attractive"). The strength of this scale lies in its ability to gain a nuanced understanding of respondents' sentiments while providing a neutral value for greater flexibility in selection. Regarding accessibility, we primarily considered the following aspects: accessibility of residential location, accessibility of workplace, and the convenience of parking[37,38]. For the attractiveness of commercial centres, we focused on three key issues: the impact of their scale, of the influence of their diversity of commercial formats, and of their perceived commercial environment on respondents' attraction[41,43].

Travel attitude

In this study, we primarily focused on offline travel behaviour, conducting a comparative analysis of attitudes towards online shopping[1,59]. While these two aspects are not mutually exclusive, a comparative approach allows a more authentic reflection of consumer attitude. Although these two aspects are not mutually exclusive, this comparative approach provides a more comprehensive reflection of overall consumer attitudes. We treated travel attitude as a first-order construct. We maintained the 7-point rating scale (1 indicating "strongly disagree," 7 indicating "extremely agree") for the assessment. We emphasised three facets of offline travel attitude: respondents' perception of offline consumption as a regular and essential behaviour, thereby indicating their loyalty towards offline consumption; whether respondents believe that offline shopping leads to greater satisfaction than online shopping; and whether respondents have a better experience throughout the entire offline shopping process than in online shopping.

Perceived value

We focused on three key dimensions to assess consumers' perceptions of value: functionality, experience, and social value[46]. These three dimensions became indispensable considerations, given the diverse range of individuals' perceptions. Despite these dimensions, we treated perceived value as a first-order construct because our goal was to assess an overall perception of value rather than treat each dimension as a separate latent variable. Each dimension contributes directly to the single latent variable of perceived value, reflecting a holistic consumer evaluation. We utilised a rating scale ranging from 1 to 7 (1 indicating "strongly unattractive," 7 indicating "extremely attractive"). Regarding functionality, we inquired about respondents' product quality and practicality evaluations. Regarding experience, our primary focus was on consumers' emotional experiences, accompanied by corresponding inquiries. Regarding social value, we paid particular attention to the extent of their reliance on luxury and trendy brands.

Consumer travel

This survey asked respondents to review their consumer travel over the past year, paying particular attention to the time, distance, and frequency thereof to illustrate a more accurate picture of their consumer travel habits[60].

Determination of the SEM structure and parameter estimation methods

This study employed structural equation modelling (SEM) to assess the relationships among the latent variables. In the SEM literature, a distinction exists between the reflective and formative structures in representing latent variables[61]. For variables such as the accessibility, commercial attractiveness and perceived value in this study, a formative structure is more appropriate. Formative structures assume that the latent variable is composed of multiple independent indicators, with each indicator contributing to the latent variable from different dimensions such that they are neither interchangeable nor necessarily correlated. In contrast, consumer travel behaviour and travel attitude are more suited to a reflective structure[62]. In a reflective structure, the latent variable is reflected through its indicators, which are interchangeable and highly correlated[62].

The estimation method must be determined collaboratively in SEM on the basis of the model structure and data conditions[61]. This study therefore performed PLSc-SEM for the following reasons[63,64]:

1. PLSc-SEM is adept at handling nonnormally distributed data.
2. It is also suitable for complex models involving reflective and formative constructs.
3. Given the complexity of the variables in this study, we adopted an exploratory approach with a predictive orientation, extending existing frameworks and theories.
4. PLSc-SME effectively addresses issues related to consistency, path coefficients, construct correlations, and indicator loadings, thereby mitigating the overestimation and underestimation of parameters. Hence, we selected PLSc as the primary method for parameter estimation in this study.

We employed SmartPLS 4.0 for structural equation modelling (SEM). SmartPLS, a partial least squares SEM tool based on the least squares method, is widely used for analysing complex models in social science research[65]. We selected SmartPLS 4.0 because of its advantages in handling small samples and complex models, as it effectively

addresses issues of multicollinearity within models and provides robust estimation results. This makes it particularly suitable for exploratory research and theory development[66,67].

Exploratory factor analysis

The five latent variables in the model are all first-order constructs directly derived from the measurement items. Therefore, to validate the proposed scale and evaluate the specified conceptual framework, we conducted Exploratory Factor Analysis (EFA)[68,69]. The primary aim of this analysis was to reduce the variables' dimensions by exploring the data's underlying structure to identify any potential factor structures that could account for the covariation among the observed variables[70,71]. Given that the data from the Likert scale did not have a multivariate normal distribution, we opted for principal component analysis (PCA) as the primary extraction method. The ultimate results stemmed primarily from factor loadings, which reflect the strength of the relationship between the observed variables and latent factors.

This analysis yielded a KMO value of 0.855, surpassing the threshold of 0.7, and the cumulative eigenvalue reached 72.754%, exceeding the recommended threshold of 60%. The five dimensions we uncovered thus represented the entire dataset relatively comprehensively. After removing observed variables with factor loadings less than 0.6, we ultimately obtained five sets of correlated variables attributed to underlying common factors (Table 3).

Reliability and validity tests

First, we conducted reliability and validity tests on the questionnaire structure and data. Notably, different constructs require different evaluation methods[61,72]. For formative measurement structures, the literature suggests assessing their convergent validity, indicator collinearity, correlations, and significance[62,72]. For reflective measurement structures, the literature recommends evaluating their indicator loadings, internal consistency reliability, convergent validity, and discriminant validity[72,73].

With respect to reflective structures, assessments of factor loadings, internal consistency, composite reliability, and average variance extracted (AVE) are particularly crucial[74]. As shown in Table 4, the factor loadings exceeded 0.6, indicating a moderately strong correlation. All the Cronbach's α values exceeded 0.7, indicating strong consistency among the observed variables. A CR value above 0.7 suggested high model reliability, and an AVE exceeding 0.5 indicated high reliability of the measurement model[75].

Assessments of factor weights, variance inflation factors (VIFs), t statistics, and p values are crucial for formative structures[76]. However, two indicators (A4 and A5) were not significantly correlated with the construct at the 0.1 level (Table 5)[75]. This suggested that the convenience of transfers and the flexibility of travel modes were not correlated with accessibility, and these two measures were removed in subsequent measurements.

As shown in Table 5, all the remaining factor weights exceeded 0.35, indicating that the indicators contributed significantly to the latent variable. All the VIF values were less than 3, indicating that there was no evidence of collinearity issues. The t statistics and p values also demonstrated the significance of the relationships between the indicators and the latent variable[77]. Additionally, We conducted a discriminant validity test to ensure that all constructs had AVE values exceeding the squared correlations between them.

	Component				
Items	Travel attitude	Travel behaviour	Commercial attractiveness	Accessibility	Perceived value
Consumer travel experience (C1)	*0.829*	0.141	0.142	0.139	0.156
Consumer travel satisfaction (C2)	*0.801*	0.166	0.136	0.148	0.208
Consumer travel loyalty (C3)	*0.769*	0.241	0.136	0.188	0.129
Travel distance (E1)	0.208	*0.820*	0.089	0.068	0.088
Travel time (E2)	0.164	*0.791*	0.266	0.001	0.138
Travel frequency (E3)	0.154	*0.691*	0.111	0.046	0.218
Diversified commercial centre (B1)	0.132	0.057	*0.886*	0.029	0.168
Pleasant environment in the commercial centre (B2)	0.098	0.108	*0.839*	0.143	0.050
Large-scale commercial centres (B3)	0.175	0.292	*0.657*	0.136	0.148
Accessibility(workplace) (A1)	0.115	0.007	0.056	*0.907*	−0.037
Accessibility (residential area) (A2)	0.127	0.070	0.121	*0.866*	0.062
Parking accessibility (A3)	0.221	0.019	0.096	*0.632*	0.351
Convenience of transfers (A4)	0.186	0.096	0.085	*0.659*	0.176
Flexibility of travel modes (A5)	0.153	0.102	0.158	*0.602*	0.289
Emotional value (D1)	0.129	0.117	0.168	0.131	*0.836*
Functional value (D2)	0.171	0.261	0.147	−0.068	*0.785*
Social value (D3)	0.401	0.248	0.086	0.148	*0.643*

Table 3. Rotated component matrix.

Latent variable	Measurement item	Factor loading	Cronbach's α	CR	AVE
Travel attitude	Consumer travel loyalty	0.837	0.853	0.833	0.624
	Consumer travel satisfaction	0.787			
	Consumer travel experience	0.626			
Travel behaviour	Travel distance	0.762	0.761	0.7735	0.535
	Travel frequency	0.625			
	Travel time	0.796			

Table 4. Reliability and validity test of the reflective constructs.

Latent variable	Measurement item	Factor weight	VIF	t statistic	*p* value
Commercial attractiveness	Diversified commercial centre (B1)	0.419	1.774	30.274	0.000
	Pleasant environment in the commercial centre (B2)	0.414	1.731	29.493	0.000
	Large-scale commercial centre (B3)	0.376	1.383	35.819	0.000
Accessibility	Accessibility (workplace) (A1)	0.432	2.004	29.661	0.000
	Accessibility (residential area) (A2)	0.419	1.871	33.627	0.000
	Parking accessibility (A3)	0.358	1.308	30.527	0.000
	Convenience of transfers (A4)	0.139	1.763	26.015	0.439
	Flexibility of travel modes (A5)	0.116	1.258	28.694	0.398
Perceived value	Social value (D1)	0.399	1.618	37.016	0.000
	Functional value (D2)	0.39	1.522	34.557	0.000
	Emotional value (D3)	0.412	1.74	36.793	0.000

Table 5. Preliminary results of reliability and validity tests of formative constructs.

Path	Path Coefficient	SE	t-statistic	*P* value
Accessibility -> Travel Attitude	0.263	0.065	4.051	0
Perceived Value -> Travel Attitude	0.427	0.058	7.376	0
Perceived Value -> Consumer Travel	0.343	0.083	4.156	0
Travel Attitude -> Consumer Travel	0.272	0.097	2.8	0.005
Commercial Attractiveness -> Perceived Value	0.345	0.076	4.551	0
Commercial Attractiveness -> Travel Attitude	0.164	0.062	2.652	0.008
Commercial Attractiveness -> Consumer Travel	0.246	0.116	2.123	0.034
Accessibility -> Consumer travel	No direct path			
Dependent Variable	R^2			
Perceived Value	0.349			
Travel Attitude	0.280			
Consumer Travel	0.468			

Table 6. Summary of final results.

Results
Overall model results
This study employed PLSc to estimate the model parameters. Below, Table 6 presents the path coefficients, standard errors (SE), and significance levels. Among the eight assumed paths, seven passed the tests. The only exception was the path "Accessibility -> Consumer Travel", where the p value exceeded 0.1, indicating insignificance[77].

To ensure more accurate analysis, we removed nonsignificant paths and indicators from the formative constructs and refit the model via SmartPLS 4.0[78]. Since we modified the formative constructs, we also repeated the reliability and validity tests and examined the corresponding parameters, as shown in Table 6. All the parameters met the requirements for the analysis[79].

In the SEM-PLSc model, the R-squared values for each variable were significant (Table 7), reflecting the model's explanatory and predictive power[77]. Generally, an R-squared value equal to or greater than 0.10 is considered acceptable, values exceeding 0.25 are considered good, and values exceeding 0.5 are considered excellent[72,75]. In these final results, perceived value and consumer travel therefore exhibited high explanatory and predictive power levels. The hypothesised paths in the final results are illustrated in Fig. 3.

Model Fit Index	Observed Value	Acceptable Value
SRMR	0.039	< 0.08
NFI	0.936	> 0.9
d_ULS	0.186	< 0.95
d_G	0.073	< 0.95

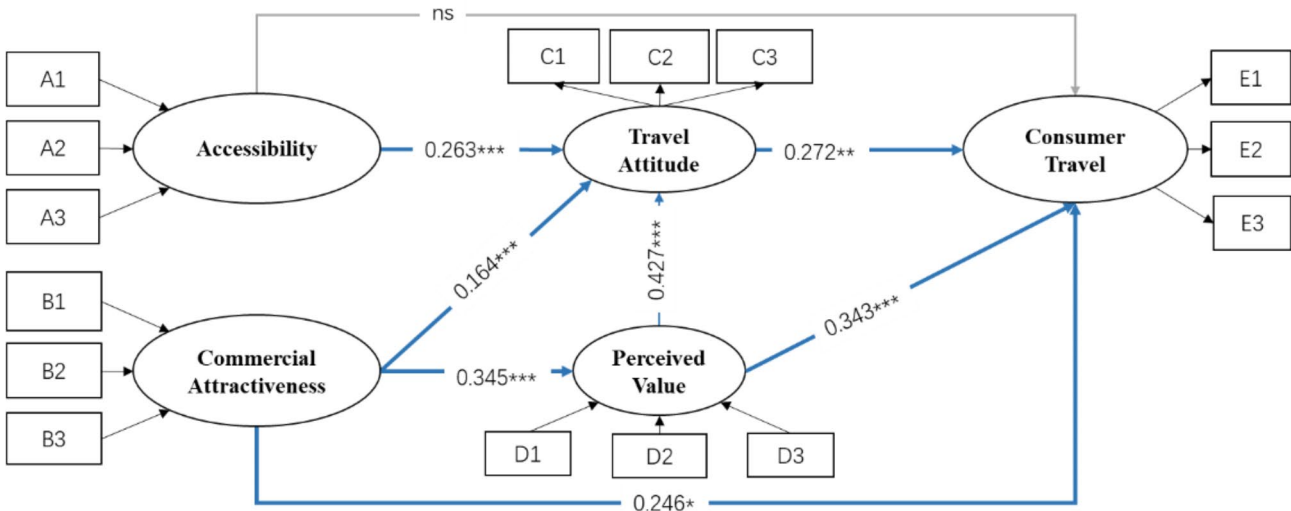**Table 7.** Model goodness-of-fit.

Fig. 3. SEM results. This diagram presents path coefficients, standard errors (SE), and significance levels. It visualizes the direct effects among perceived built environment, travel attitude, perceived value, and consumer travel. Among the assumed eight paths, seven demonstrated significant associations (Note: *** indicates $p < 0.001$; 'ns' denotes non-significant).(Source: author created).

Construct	STEP 1 Configural Invariance	Compositional Invariance Original Correlation	Confidence Interval	STEP 2 Partial Measurement Invariance Established	Equal Mean Value Differences	Confidence Interval	Equal Variances Differ	Confidence Interval	STEP 3 Full Measurement Variance Established
Accessibility	Yes	0.69	[0.915,0.752]	No	0.121	[-0.239,0.218]	-0.114	[-0.398,0.439]	Yes
Commercial Attractiveness	Yes	0.97	[0.974,0.92]	Yes	0.079	[-0.22,0.228]	-0.209	[-0.443,0.459]	Yes
Perceived Value	Yes	0.999	[0.999,0.998]	Yes	-0.099	[-0.216,0.231]	0.041	[-0.33,0.347]	Yes
Travel Attitude	Yes	0.999	[0.998,0.993]	Yes	0.291	[-0.233,0.217]	-0.293	[-0.406,0.448]	Yes
Consumer Travel	Yes	0.958	[0.929,0.788]	Yes	0.226	[-0.241,0.213]	-0.332	[-0.453,0.506]	Yes

Table 8. MICOM.

Furthermore, we evaluated the SEM–PLSc model fit on the basis of certain fitting parameters: the standardised root mean squared residual (SRMR) and normed fit index (NFI)[66,72]. The SRMR and NFI belong to the series of approximate fit indices. Typically, when the SRMR value is less than 0.08 and the NFI value exceeds 0.9, these values indicate a well-fitting model[69,80]. As shown in Table 8, all the parameters met these criteria.

Tests of variability in multigroup analytical structural equation modelling

To explore the heterogeneity in consumer travel between purchasing goods and experiencing services, we performed multigroup analysis (MGA) via PLSc-MGA, which reveals meaningful differences among structural paths across multiple groups[81]. Before performing MGA, the measurement invariance of the two groups conforming to the model was determined via the MICOM three-step procedure[82]. Measurement invariance is essential for the validity of results, i.e., group differences cannot be due to differences among the measurement indicators, data treatment, algorithms, and optimisation criteria in the focal groups.

The first step in the MICOM procedure involved examining configural invariance to check whether the same basic factor structure exists for the two groups[81–83]. As the same indicators, variable data treatment, and

Path	Path Coefficient (purchasing goods)	Path Coefficient (experiencing services)	Path Coefficient difference	Permutation p value
Accessibility -> Travel Attitude	0.408***	0.139	0.269	0.043
Perceived Value -> Travel Attitude	0.382***	0.547***	-0.165	0.201
Perceived Value -> Consumer Travel	0.269*	0.349*	-0.081	0.366
Travel Attitude -> Consumer Travel	0.219	0.437**	-0.218	0.39
Commercial Attractiveness -> Perceived Value	0.35**	0.342**	0.008	0.963
Commercial Attractiveness -> Travel Attitude	0.122	0.215*	-0.093	0.498
Commercial Attractiveness -> Consumer Travel	0.351*	0.089	0.262	0.403
Dependent Variable	R²	Permutation p value		
Perceived Value	0.122	0.964		
Travel Attitude	0.39	0.656		
Consumer Travel	0.312	0.177		

Table 9. Summary of MGA results. ***$P<0.001$, **$0.001 \leq P<0.01$, *$0.01 \leq P<0.0$.
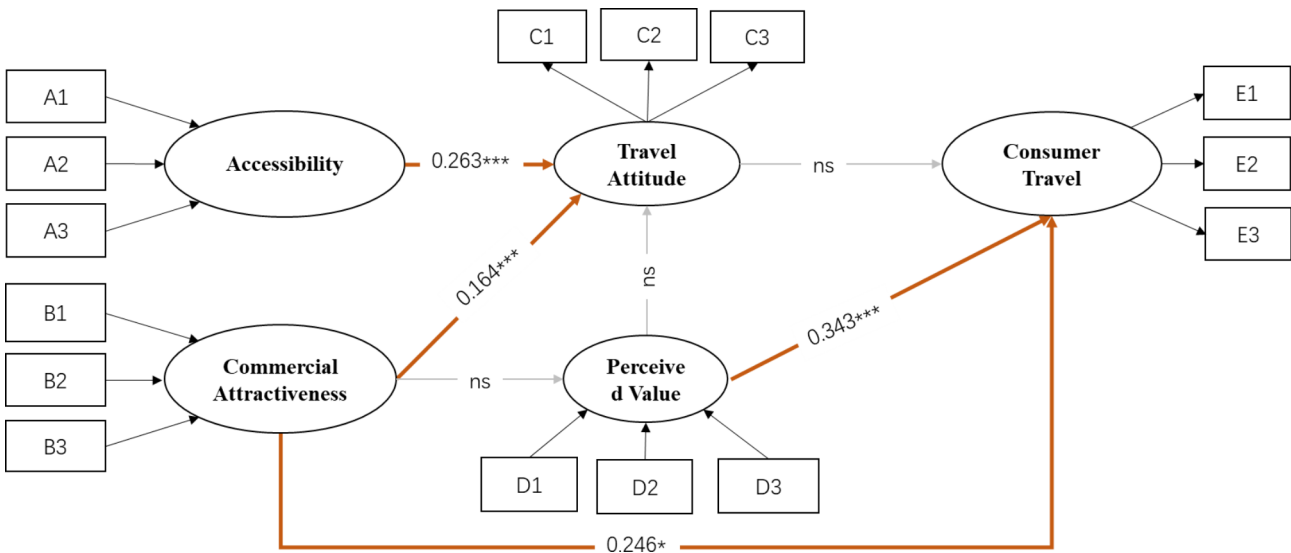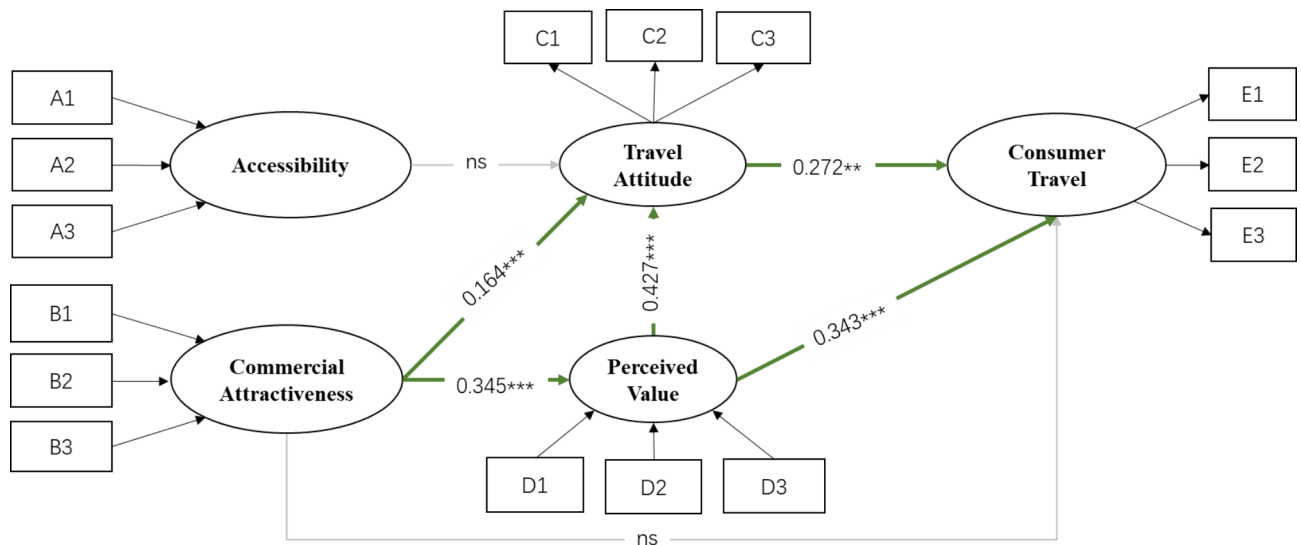

Fig. 4. MGA-SEM results: Consumer travel for purchasing goods. This diagram explores the path coefficients and significance levels related to Consumer travel for purchasing goods using multigroup analysis (MGA) via PLSc-MGA. (Note: ***: $p<0.001$; ns: not significant).(Source: author created).

algorithm were used for the two groups, compositional invariance was demonstrated for all the constructs. The second step was to check the compositional invariance of the two groups (Table 8). For the two groups, the raw correlation was equal to or greater than the 5% quantile correlation; therefore, component invariance was established[81,82]. The third step was to assess the equality of the mean values and variances across the constructed groups, thus establishing full measurement invariance[83,84]. The results of the MICOM three-step procedure, shown in Table 8, therefore indicated that we could perform multigroup analyses on both groups.

Multigroup analysis structural equation modelling results
To obtain the path differences between consumer travel for purchasing goods or experiencing services, the model was tested using multigroup analysis. Table 9 shows the model's path coefficients and significance levels. The original hypotheses for which eight path coefficients were obtained were not significantly correlated[77,84]. In each of the two groups, the hypothesised paths were rejected, indicating that the paths of influence were significantly different. In the group purchasing items (Fig. 4), the paths travel attitude -> consumer travel and commercial attractiveness -> perceived value were rejected; in the group experiencing services, the paths commercial attractiveness -> perceived value and commercial attractiveness -> consumer travel were rejected; all other paths were significantly related.

The main influence paths in consumer travel for purchasing goods are therefore accessibility - travel attitude, commercial attractiveness - travel attitude, commercial attractiveness - consumer travel, and perceived value - consumer travel. In consumer travel for experiencing services (Fig. 5), the main influence paths are commercial attractiveness - travel attitude - consumer travel; commercial attractiveness - perceived value - consumer travel;

Fig. 5. MGA-SEM results: Consumer travel for experiencing services. This diagram explores the path coefficients and significance levels related to Consumer travel for experiencing services using multigroup analysis (MGA) via PLSc-MGA. (Note: ***: $p < 0.001$; ns: not significant).(Source: author created).

and commercial attractiveness - perceived value - travel attitude - consumer travel. At $p < 0.001$, there is a significant difference between the above paths for the two groups of consumer travel.

Discussion

Revisiting the influences on consumer travel

It is necessary to revisit the influences on consumer travel amid the ongoing changes in the retail landscape. This study therefore finds that travel attitude and perceived value play important roles in consumer travel, verifies that the perceived built environment remains important amidst changes in the consumer environment, reveals the differences between consumer travel for two consumption purposes—purchasing goods vs. experiencing services—and provides more direct recommendations for policy design in urban planning, transport, and commercial operations.

Importance of perceived value and travel attitude

This research demonstrates that travel attitude and perceived value positively and significantly influence consumer travel behaviour. This finding aligns with those of previous studies, affirming the positive impact of shopping enjoyment on travel behaviour[18]. Furthermore, the physical spatial environment of a commercial centre serves as the foundation for consumers to perceive value, and the perception of the commercial environment can directly influence consumers perceived value and travel attitude. When retailers offer leisure and entertainment facilities, establish connections with customers, and enhance their place attachment, these factors elevate the overall consumer experience[23]. Thus, the implication is that operators of commercial centres must cater to the diverse demands of consumer travel, create a comfortable and enjoyable consumer environment, and understand consumers' multifaceted value perceptions. These factors are critical for commercial centres to effectively navigate and adapt to the evolving retail landscape.

Perceived built environment in a changing retail environment

The perceived built environment continues to exert a positive influence on consumer travel. Research indicates that the attractiveness of commercial centres directly impacts consumer travel. This finding aligns with Calvo-Porral and Lévy-Mangín (2018), who highlighted the importance of the attractiveness of shopping centres in consumer travel[41]. The attractiveness of a commercial centre is reflected in aspects such as its commercial scale, ambient environment, and format diversity[85]. These factors form the basis for perceived consumer value and indirectly influence consumer behaviour through travel attitude[86]. Therefore, commercial managers should prioritise these aspects, as they remain highly important.

This study also reveals that accessibility does not directly impact consumer behaviour. Does this conclusion imply that geographical distance has become irrelevant? Not exactly: Spatial distance and accessibility are still significant, albeit with less perceptual weight[36]. Accessibility can influence consumer travel by indirectly affecting offline travel attitude. Notably, our findings on transportation accessibility are partially consistent with those of Raza et al. (2022), who suggested that high-accessibility areas make commercial activities more attractive and generate greater travel demand[37]. However, our research further indicates that transportation accessibility does not enhance all types of travel demand; its positive effects are particularly evident in trips made for purchasing goods.

Heterogeneity in consumer travel for purchasing goods vs. experiencing services

In consumer travel for purchasing goods, the impact pathways of goods acquisition are relatively short and operate directly. This suggests that purchasing goods has distinct utilitarian characteristics, enabling consumers to make travel decisions that maximise utility. The impact of travel attitude and perceived value on travel behaviour is limited in the context of purchasing goods, a finding that aligns with Kesari and Atulkar (2016)[57]. In other words, while such consumers are concerned about the functional value of products, for most daily goods, the functional value derived from purchasing them does not directly impact travel attitude. Additionally, travel attitude do not play a role in consumer travel for purchasing goods, indicating a high substitutability of purchasing channels. Even when consumers hold a positive travel attitude, practical complexities may lead them to choose an alternative purchasing channel, thereby not directly affecting their travel[87]. However, perceived value can directly influence consumer travel, indicating that when the functional value of products is sufficiently high, as exemplified by luxury brands and in adept marketing campaigns, individuals readily engage in consumer travel[88]. Finally, the perceived built environment significantly impacts travel attitudes and consumer travel. Specifically, accessibility solely influences travel attitudes, whereas commercial attractiveness directly affects consumer travel. This underscores the supportive role of accessibility in consumer travel for purchasing goods, where commercial attractiveness plays a decisive role[36].

In contrast to consumer travel for purchasing goods, in experiential service travel, accessibility does not influence travel attitude or behaviour. This conclusion aligns with research findings suggesting that convenience is not a compelling factor attracting consumers to shopping centres[38]. This finding also affirms that when pursuing experiential services, consumers exhibit relatively low sensitivity to accessibility. Conversely, the combination of diversity and recreational facilities is more attractive. Additionally, consumers' perceived value significantly and positively impacts their travel attitude. When consumers attain high levels of satisfaction from experiential services, they naturally hold positive attitudes towards travel[89]. The current competitive and complementary online shopping and commerce retail environment is unique. However, regardless of how much technology drives change in retail, the consumer will always be at the centre[5]. To attract more consumers to physical retail spaces, commercial centres should therefore increase the perceived value consumers derive from their experiential service consumption travel, thereby fostering their positive attitudes towards consumer travel rather than being supplanted by online shopping.

Our study emphasises the significance of travel attitude and perceived value for consumer travel behaviour in the ever-evolving retail environment, confirming the enduring influence of the perceived built environment. These findings not only enhance our understanding of consumer travel behaviour but also offer new insights for the design and operation of shopping centres. However, our research reveals that in cities with highly developed transportation systems, such as Shanghai, transportation accessibility does not have a direct effect on consumer behaviour, particularly in the context of experiential travel. This conclusion challenges traditional views on the role of these factors, indicating the need for future research to further explore the mechanisms of action across different consumption purposes and transportation factors.

Conclusion

This study explores the interrelationships among the perceived built environment, travel attitude, perceived value, and consumer travel at the individual level. We have verified the positive impact of the perceived built environment and travel attitude on consumer travel while emphasising the significance of perceived consumption value. This work thus somewhat extends previous theoretical frameworks. Additionally, we have employed multigroup analysis structural equation modelling to compare the heterogeneity of consumer travel for purchasing goods and for experiencing services.

First, perceived value and travel attitude are crucial in consumer travel. Specifically, consumer travel to experience services is more significantly influenced by perceived value and travel attitude. In contrast, perceived value positively influences travel attitude in consumer travel for purchasing goods, but travel attitude do not directly influence consumer travel.

Second, the path through which the perceived built environment affects consumer travel is partially effective. On the one hand, accessibility does not influence consumer travel directly but rather does so indirectly through travel attitude. Specifically, in consumer travel for purchasing goods, accessibility indirectly affects travel behaviour through travel attitude. In contrast, in consumer travel for experiencing services, accessibility affects neither travel attitude nor behaviour. On the other hand, commercial attractiveness still has an essential influence on consumer travel, influencing travel attitude and directly influencing consumer travel. Especially with respect to consumer travel for purchasing goods, the perception of commercial attractiveness has a direct effect.

These findings emphasise the importance of re-evaluating service offerings in commercial centres and adapting to evolving consumer demands. While accessibility has traditionally played a crucial role in travel behaviour, its significance has been supplanted by the positive impact of travel attitude and perceived value on consumer travel. Additionally, it is crucial to gain a deeper understanding of the varying factors that influence consumers' travel purposes for purchases of goods and experiential services by focusing on the factors that drive consumers to travel for experiential services, such as new leisure and recreational facilities in commercial centres. Therefore, to respond more effectively to the evolving retail environment, understanding consumers' motivations for consumer travel is a major challenge for the urban planning and transport sectors as well as commercial managers and is essential to meet consumers' diverse value demands for different consumer travel purposes.

Contributions

This study extends the existing theoretical framework by integrating social psychology theories with the established framework of the built environment and travel behaviour. It establishes a framework for the factors

influencing specific types of consumer travel. Additionally, it employs multigroup structural equation modelling (MSEM) to reveal behavioural differences between consumers when purchasing goods versus experiencing services. The study also identifies changes in the roles of traditional factors, such as accessibility and commercial attractiveness, within the new retail environment, highlighting the significant roles of travel attitude and perceived value.

The findings suggest practical recommendations for urban planners, transportation managers, and commercial centre operators. Urban planning should focus on optimising the scale, environment, and diversity of commercial centres to support emerging business models. Transportation planners should address specific consumer travel needs to provide better transportation support. Commercial operators are advised to offer diverse experiential services within commercial centres to increase consumer perceived value and improve offline travel attitude, thereby meeting consumers' increasingly varied demands.

Limitations and future research directions

This study has identified several findings regarding the relationships among the perceived built environment, travel attitude, perceived value, and consumer travel behaviour. However, the sample is limited to a specific region—Shanghai, China—and may not fully represent consumer behaviour across different cultural and socioeconomic backgrounds. This limitation affects the generalisability of the findings to other regions or countries, particularly those where the built environment (e.g., transportation accessibility) and consumer behaviour differ significantly[26,90]. To enhance the broader applicability of the findings, future research should aim to validate these results in a diverse range of cities.

Moreover, while multigroup analysis is a powerful tool for comparing group differences, it may overlook certain potential moderating variables and within-group heterogeneity, which could affect the robustness of the results[91,92]. Future research could incorporate socioeconomic factors (e.g., age, income, lifestyle) as moderating variables to further explore how different types of consumer travel, such as for purchasing goods or experiencing services, are related to the perceived built environment and travel attitude. This would provide more targeted insights for urban planning and retail strategies[93,94].

Furthermore, our study is based on cross-sectional data, which constrains the ability to establish causal relationships among variables. Longitudinal studies, which can track changes over time, are essential for uncovering the dynamic interactions among these factors and their long-term effects on consumer behaviour[95]. Considering the continuously evolving nature of the retail environment, future research should adopt longitudinal designs to gain deeper insights into the causal links among the perceived built environment, travel attitude, perceived value, and consumer travel behaviour.

Data availability

For the sake of individual privacy, the datasets generated and analysed in this study are not publicly available. However, they can be obtained from the corresponding author upon reasonable request.

References

1. Farag, S., Schwanen, T., Dijst, M. & Faber, J. Shopping online and/or in-store? A structural equation model of the relationships between e-shopping and in-store shopping. *Transp. Res. Part. A: Policy Pract.* **41**, 125–141. https://doi.org/10.1016/j.tra.2006.02.003 (2007).
2. Lee, R. J., Sener, I. N., Mokhtarian, P. L. & Handy, S. L. Relationships between the online and in-store shopping frequency of Davis, California residents. *Transp. Res. Part. A: Policy Pract.* **100**, 40–52 (2017).
3. Le, H. T. K., Carrel, A. L. & Shah, H. Impacts of online shopping on travel demand: a systematic review. *Transp. Rev.* **42**, 273–295. https://doi.org/10.1080/01441647.2021.1961917 (2022).
4. Babin, B. J., Feng, C. & Borges, A. As the wheel turns toward the future of retailing. *J. Mark. Theory Pract.* **29**, 78–91. https://doi.org/10.1080/10696679.2020.1860688 (2021).
5. Helm, S., Kim, S. H. & Riper, S. V. Navigating the 'retail apocalypse': A framework of consumer evaluations of the new retail landscape. *J. Retail Consumer Serv.* **54** https://doi.org/10.1016/j.jretconser.2018.09.015 (2020).
6. Krey, N., Picot-Coupey, K. & Cliquet, G. Shopping mall retailing: a bibliometric analysis and systematic assessment of Chebat's contributions. *J. Retail Consumer Serv.* **64**, 102702. https://doi.org/10.1016/j.jretconser.2021.102702 (2022).
7. Ewing, R. & Cervero, R. Travel and the built environment. *Transp. Res. Rec.* **1780**, 87–114 (2001).
8. Etminani-Ghasrodashti, R. & Ardeshiri, M. Modeling travel behavior by the structural relationships between lifestyle, built environment and non-working trips: the case of Shiraz. *Iran. Transp. Res. Part. A: Policy Pract.* **78**, 374–393 (2015).
9. Ewing, R. & Cervero, R. Travel and the built environment: a meta-analysis. *J. Am. Plann. Assoc.* **76** (3), 265–294 (2010).
10. Handy, S., Cao, X. & Mokhtarian, P. L. Correlation or causality between the built environment and travel behavior? Evidence from Northern California. *Transp. Res. Part. D: Transp. Environ.* **10** (6), 427–444 (2005).
11. Zhou, M., Wang, D. & Guan, X. Co-evolution of the built environment and travel behaviour in Shenzhen, China. Transport Res Part. *Transp. Environ.* **107** https://doi.org/10.1016/j.trd.2022.103291 (2022).
12. Van Acker, V., Van Wee, B. & Witlox, F. When transport geography meets social psychology: toward a conceptual model of travel behaviour. *Transp. Rev.* **30**, 219–240. https://doi.org/10.1080/01441640902943453 (2010).
13. De Vos, J., Mokhtarian, P. L., Schwanen, T., Van Acker, V. & Witlox, F. Travel mode choice and travel satisfaction: bridging the gap between decision utility and experienced utility. *Transportation.* **43**, 771–796. https://doi.org/10.1007/s11116-015-9619-9 (2016).
14. Ma, L. & Cao, J. How perceptions mediate the effects of the built environment on travel behavior? *Transportation.* **46**, 175–197. https://doi.org/10.1007/s11116-017-9800-4 (2019).
15. Fan, M. et al. A study on commuters' public transportation mode choice behavior in river valley-type cities considering terrain spatial perception: evidence from Lanzhou, China. *Sci. Rep.* **14**, 13237. https://doi.org/10.1038/s41598-024-64062-z (2024).
16. Wang, D. & Zhou, M. The built environment and travel behavior in urban China: a literature review. *Transp. Res. Part. D: Transp. Environ.* **52**, 574–585. https://doi.org/10.1016/j.trd.2016.12.005 (2017).
17. Dholakia, U. M. et al. Consumer behavior in a multichannel, multimedia retailing environment. *J. Interact. Mark.* **24**, 86–95 (2010).

18. Lutz, R. J., O'Guinn, T. C. & Smith, L. A. Shopping for fun or shopping to buy: is it different online and offline? *J. Retailing Consum. Serv.* **21**, 258–267. https://doi.org/10.1016/j.jretconser.2014.02.007 (2014).
19. Flacandji, M. & Krey, N. Remembering shopping experiences: the shopping experience memory scale. *J. Bus. Res.* **107**, 279–289. https://doi.org/10.1016/j.jbusres.2018.10.039 (2020).
20. Titiloye, I., Al Adib Sarker, M., Asgari, H. & Jin, X. Online and in-store shopping interactions for non-essential experience goods. *Comput. Urban Sci.* **3** https://doi.org/10.1007/s43762-023-00105-x (2023).
21. Zhai, Q., Cao, X., Mokhtarian, P. L. & Zhen, F. The interactions between e-shopping and store shopping in the shopping process for search goods and experience goods. *Transportation.* **44**, 885–904. https://doi.org/10.1007/s11116-016-9683-9 (2017).
22. Zhen, F., Du, X., Cao, J. & Mokhtarian, P. L. The association between spatial attributes and e-shopping in the shopping process for search goods and experience goods: evidence from Nanjing. *J. Transp. Geogr.* **66**, 291–299 (2018).
23. Elmashhara, M. G. & Soares, A. M. The impact of entertainment and social interaction with salespeople on mall shopper satisfaction: the mediating role of emotional states. *Int. J. Retail Distribut Manag.* **47**, 94–110. https://doi.org/10.1108/IJRDM-06-2018-0112 (2019).
24. Dolega, L., Reynolds, J., Singleton, A. & Pavlis, M. Beyond retail: new ways of classifying UK shopping and consumption spaces. *Environ. Plann. B Urban Analytics City Sci.* **48**, 132–150. https://doi.org/10.1177/2399808319840666 (2021).
25. Shi, K. et al. Does buying intangible services online increase the frequency of trips to consume these services? *Cities.* **119**, 103364. https://doi.org/10.1016/j.cities.2021.103364 (2021).
26. Saif, M. A., Zefreh, M. M. & Török, Á. Public transport accessibility: a literature review. *Periodica Polytech. Transp. Eng.* **47**, 36–43. https://doi.org/10.3311/PPtr.12072 (2018).
27. Zhang, M. Exploring the relationship between urban form and nonwork travel through time use analysis. Landsc. *Urban Plan.* **73**, 244–261. https://doi.org/10.1016/j.landurbplan.2004.11.003 (2005).
28. Drucker, J. & Linton, R. Examining the role of destination attractiveness in shaping travel behavior: evidence from the retail sector. *Tourism Manag.* **56**, 12–22 (2016).
29. Rahman, M. & Sciara, G. C. Travel attitudes, the built environment and travel behavior relationships: causal insights from social psychology theories. *Transp. Policy.* **123**, 44–54. https://doi.org/10.1016/j.tranpol.2022.04.012 (2022).
30. Schifmann, L. & Kanuk, L. *Comportamiento Del Consumidor, Prentice-Hall, 3ra* (Edicion, 1993).
31. Cruz-Cárdenas, J. & Arévalo-Chávez, P. Consumer behavior in the disposal of products: forty years of research. *J. Promotion Manag.* **24**, 617–636 (2018).
32. Shim, C. & Santos, C. A. Shopping tourism. In Jafari, J. & Xiao, H. (Eds.) Encyclopedia of Tourism (pp. 1–3). *Springer*, Cham (2016). https://doi.org/10.1007/978-3-319-01384-8_315
33. Cohen, S. A., Prayag, G. & Moital, M. Consumer behaviour in tourism: concepts and applications. *Ann. Tour Res.* **59**, 81–85. https://doi.org/10.1016/j.annals.2016.03.004 (2016).
34. Wiese, A., Zielke, S. & Toporowski, W. Shopping travel behaviour: influencing factors, shopper types and environmental consequences. *Int. J. Retail Distrib. Manag.* **43**, 403–421. https://doi.org/10.1108/IJRDM-06-2014-0081 (2015).
35. Kalvo, R. & Sevtsuk Patronage of urban commercial clusters: a network-based extension of the Huff model for balancing location and size. *Environ. Plann. B Urban Analytics City Sci.* **45**, 508–528 (2018).
36. Thanasi-Boçe, M., Kwiatek, P. & Labadze, L. The importance of distance and attraction in patronizing a shopping mall. *J. Place Manag Dev.* **14**, 222–238. https://doi.org/10.1108/JPMD-06-2020-0053 (2020).
37. Raza, A., Safdar, M., Zhong, M. & Hunt, J. D. Analyzing spatial location preference of Urban activities with Mode-Dependent accessibility using Integrated Land Use–Transport models. *Land.* **11**, 1139. https://doi.org/10.3390/land11081139 (2022).
38. Wong, S. C. & Nair, P. B. Mall patronage: dimensions of attractiveness in urban context. *Int. J. Bus. Soc.* **19**, 281–294 (2018).
39. Piovani, D., Zachariadis, V. & Batty, M. Quantifying Retail Agglomeration using diverse spatial data. *Sci. Rep.* **7**, 5451. https://doi.org/10.1038/s41598-017-05304-1 (2017).
40. Schreuder, E., Erp, J. V., Toet, A. & Kallen, V. L. Emotional responses to Multisensory Environmental Stimuli: a conceptual Framework and Literature Review. *SAGE Open.* **6** https://doi.org/10.1177/2158244016630591 (2016).
41. Calvo-Porral, C. & Lévy-Mangín, J. P. Pull factors of the shopping malls: an empirical study. *Int. J. Retail Distribut Manag.* **46**, 110–124. https://doi.org/10.1108/IJRDM-02-2017-0027 (2018).
42. Borgers, A. & Vosters, C. Assessing preferences for mega shopping centres: a conjoint measurement approach. *J. Retail Consumer Serv.* **18**, 322–332 (2011).
43. Singla, V. & Rai, H. S. Investigating the effects of retail agglomeration choice behavior on store attractiveness. *J. Market Anal.* **4**, 108–124. https://doi.org/10.1057/s41270-016-0004-0 (2016).
44. Poushneh, A. & Vasquez-Parraga, A. Z. Discernible impact of augmented reality on retail customer's experience, satisfaction and willingness to buy. *J. Retailing Consumer Serv.* **34**, 229–234. https://doi.org/10.1016/j.jretconser.2016.10.005 (2017).
45. Zeithaml, V. A. Consumer Perceptions of Price, Quality, and value: a Means-End Model and Synthesis of evidence. *J. Mark.* **52**, 2–22 (1988).
46. Sweeney, J. C. & Soutar, G. N. Consumer perceived value: the development of a multiple item scale. *J. Retailing.* **77**, 203–220. https://doi.org/10.1016/S0022-4359(01)00041-0 (2001).
47. Salehzadeh, R. & Pool, J. K. Brand attitude and Perceived Value and Purchase Intention toward global luxury brands. *J. Int. Consumer Market.* **29**, 74–82 (2016).
48. Acock, A. C. & Defleur, M. L. A Configurational Approach to Contingent consistency in the attitude-behavior relationship. *Am. Sociol. Rev.* **37**, 714 (1972).
49. Ajzen, I. The theory of planned behavior. *Organ. Behav. Hum. Decis. Process.* **50**, 179–211 (1991).
50. Bandura, A. *Social Foundations of Thought and Action: A Social Cognitive Theory* (Prentice-Hall, 1986).
51. Sallis, J. F., Owen, N. & Fisher, E. B. Ecological models of health behavior. In: Glanz, K., Rimer, B.K., Lewis, F.M.:(eds.) Health Behavior and Health Education: Theory, Research, and Practice. 4th ed., 465–485 (2008).
52. Sherman, E., Mathur, A. & Smith, R. B. Store environment and consumer purchase behavior: mediating role of consumer emotions. *Psychol. Market.* **14**, 361–378 (1997).
53. Gilovich, T. & Gallo, I. Consumers' pursuit of material and experiential purchases: a review. Consum. *Psychol. Rev.* **3**, 20–33. https://doi.org/10.1002/arcp.1040 (2020).
54. Van Boven, L. & Gilovich, T. To do or to have? That is the question. *J. Pers. Soc. Psychol.* **85**, 1193–1202. https://doi.org/10.1037/0022-3514.85.6.1193 (2003).
55. Westbrook, R. A. & Black, W. C. A motivation-based shopper typology. *J. Retailing.* **61**, 78–103 (1985).
56. Botti, S. & McGill, A. L. The locus of choice: personal causality and satisfaction with hedonic and utilitarian decisions. *J. Consum. Res.* **37**, 1065–1078. https://doi.org/10.1086/656570 (2011).
57. Kesari, B. & Atulkar, S. Satisfaction of mall shoppers: a study on perceived utilitarian and hedonic shopping values. *J. Retail Consumer Serv.* **31**, 22–31 (2016).
58. Cao, X. J., Xu, Z. & Douma, F. The interactions between e-shopping and traditional in-store shopping: an application of structural equations model. *Transportation.* **39**, 957–974. https://doi.org/10.1007/s11116-011-9376-3 (2012).
59. Shi, K., Shao, R., Vos, J. D. & Witlox, F. Do e-shopping attitudes mediate the effect of the built environment on online shopping frequency of e-shoppers? *Int. J. Sustainable Transp.* **17**, 41–51. https://doi.org/10.1080/15568318.2021.1983676 (2023).
60. Ewing, R. & Cervero, R. Travel and the built environment: a Meta-analysis. *JAPA.* **76** (3), 265–294. https://doi.org/10.1080/01944361003766766 (2010).

61. Hair, J. F. & Christian, M. Ringle. & Marko Sarstedt. PLS-SEM: indeed a silver bullet. *J. Mark. Theory Pract.* **19**, 139–152. https://doi.org/10.2753/MTP1069-6679190202 (2011).
62. Chi, O. H., Jia, S., Li, Y. & Gursoy, D. Developing a formative scale to measure consumers' trust toward interaction with artificially intelligent (Ai) social robots in service delivery. *Comput. Hum. Behav.* **118**, 106700. https://doi.org/10.1016/j.chb.2021.106700 (2021).
63. Dijkstra, T. K. & Henseler, J. Consistent partial least squares path modeling. *Manag Inf. Syst. Q.* **39**, 297–316. https://doi.org/10.25300/misq/2015/39.2.02 (2015).
64. Dash, G. & Paul, J. Cb-sem vs pls-sem methods for research in social sciences and technology forecasting. *Technol. Forecast. Soc. Change.* **173**, 121092 (2021).
65. Ringle, C. M., Wende, S. & Becker, J. M. SmartPLS 3. *Bönningstedt*. SmartPLS. https://doi.org/10.1007/978-1-4614-8283-3_12 (2015).
66. Hair, J. F., Hult, G. T. M., Ringle, C. M. & Sarstedt, M. A. Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM). 2nd ed. *Sage Publications, Inc.* (2017).
67. Sarstedt, M., Ringle, C. M. & Hair, J. F. Partial least squares structural equation modeling. In (eds Homburg, C., Klarmann, M. & Vomberg, A.) Handbook of Market Research. *Springer*, Cham. 1–40 DOI:https://doi.org/10.1007/978-3-319-05542-8_15-1. (2019).
68. Taherdoost, H., Sahibuddin, S. & Jalaliyoon, N. Exploratory factor analysis; concepts and theory. *Adv. Adv. Appl. Pure Math.* **27**, 375–382 (2014).
69. Hair, J. F., Hult, T., Ringle, C. M. & Sarstedt, M. A primer on partial least squares structural equation modeling (PLS-SEM) (3rd ed.). Thousand Oaks: *Sage* (2022).
70. Costello, A. B. & Osborne, J. W. Best practices in exploratory factor analysis: four recommendations for getting the most from your analysis. *Pract. Assess. Res. Eval.* **10**, 1–9. 10.1.1.129.6664 (2005).
71. Henson, R. K. & Roberts, J. K. Use of exploratory factor analysis in published research: common errors and some solutions. *Educ. Psychol. Meas.* **66**, 393–416 (2006).
72. Hair, J. F., Hult, G. T. M., Ringle, C. M. & Sarstedt, M. A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM). *Sage Publications* (2021).
73. MacKenzie, S. B., Podsakoff, P. M. & Podsakoff, N. P. Construct measurement and validation procedures in MIS and behavioral research: integrating new and existing techniques. *MIS Q.* **35** (2), 293–334. https://doi.org/10.2307/23044045 (2011).
74. Mandhani, J., Nayak, J. K. & Parida, M. Interrelationships among service quality factors of Metro Rail Transit System: an integrated bayesian networks and PLS-SEM approach. *Transp. Res. Part. A: Policy Pract.* **140**, 320–336. https://doi.org/10.1016/j.tra.2020.08.014 (2020).
75. Hair, J. F., Hult, G. T. M., Ringle, C. M. & Sarstedt, M. A primer on partial least squares structural equation modeling (PLS-SEM). *SAGE Publications.* https://doi.org/10.4135/9781483391108 (2019).
76. Rose, J. M., Borriello, A. & Pellegrini, A. Formative versus reflective attitude measures: extending the hybrid choice model. *J. Choice Modelling.* **48**, 100412. https://doi.org/10.1016/j.jocm.2023.100412 (2023).
77. Henseler, J., Ringle, C. M. & Sinkovics, R. R. The use of partial least squares path modeling in international marketing. *Adv. Int. Mark.* **20**, 277–319. https://doi.org/10.1108/S1474-7979(2009)0000020014 (2009).
78. Henseler, J., Ringle, C. M. & Sarstedt, M. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *J. Acad. Mark. Sci.* **43** (1), 115–135 (2015).
79. Sarstedt, M., Ringle, C. M. & Hair, J. F. Partial least squares structural equation modeling. In Handbook of Market Research (eds (eds Homburg, C., Klarmann, M. & Vomberg, A.) *Springer*, Cham (2021).
80. Bagozzi, R. P. & Yi, Y. Specification, evaluation, and interpretation of structural equation models. *J. Acad. Mark. Sci.* **40**, 8–34. https://doi.org/10.1007/s11747-011-0278-x (2012).
81. Cheah, J., Thurasamy, R., Memon, M. A., Chuah, F. & Ting, H. Multigroup Analysis using SmartPLS: step-by-step guidelines for Business Research. *Asian J. Bus. Res.* **10**, 1–15 (2020).
82. Matthews, L. Applying multigroup analysis in PLS-SEM: a step-by-step process. In (eds Latan, H. & Noonan, R.) Partial Least Squares Path Modeling (175–200). *Springer*, Cham DOI:https://doi.org/10.1007/978-3-319-64069-3_10. (2017).
83. Henseler, J., Ringle, C. M. & Sarstedt, M. Testing measurement invariance of composites using partial least squares. *Int. Mark. Rev.* **33**, 405–431. https://doi.org/10.1108/IMR-09-2014-0304 (2016).
84. Hair, J. F., Sarstedt, M., Hopkins, L. & Kuppelwieser, V. Partial least squares structural equation modeling (PLS-SEM): an emerging tool in business research. *Eur. Bus. Rev.* **26**, 106–121. https://doi.org/10.1108/EBR-10-2013-0128 (2014).
85. Luk, S. T. K., Sharma, P. & Chen, I. S. N. Shopping motivation as a moderator in the retail service evaluation. *J. Serv. Mark.* **27**, 40–48. https://doi.org/10.1108/08876041311296365 (2013).
86. Du, F., Wang, J., Mao, L. & Kang, J. Daily rhythm of urban space usage: insights from the nexus of urban functions and human mobility. *Humanit. Soc. Sci. Commun.* **11**, 1–10. https://doi.org/10.1057/s41599-023-02577-y (2024).
87. Shah, H., Carrel, A. L. & Huyen, T. K. L. Impacts of teleworking and online shopping on travel: a tour-based analysis. *Transportation.* **24**, 1–29. https://doi.org/10.1007/s11116-022-10321-9 (2022).
88. Allard, T., Babin, B. J. & Chebat, J. C. When income matters: customers evaluation of shopping malls' hedonic and utilitarian orientations. *J. Retail Consumer Serv.* **16**, 40–49 (2009).
89. Sadachar, A. & Fiore, A. M. The path to mall patronage intentions is paved with 4E-based experiential value for Indian consumers. *Int. J. Retail Distribut Manag.* **46**, 442–465. https://doi.org/10.1108/IJRDM-07-2017-0152 (2018).
90. Cheng, Y. H. & Chen, S. Y. Perceived accessibility, mobility, and connectivity of public transportation systems. *Transp. Res. Part. A: Policy Pract.* **77**, 386–403. https://doi.org/10.1016/j.tra.2015.04.012 (2015).
91. Cheung, G. W. & Rensvold, R. B. Evaluating goodness-of-fit indexes for testing measurement invariance. *Struct. Equ Model.* **9** (2), 233–255 (2002).
92. Bauer, D. J. & Curran, P. J. The integration of continuous and discrete latent variable models: potential problems and promising opportunities. *Psychol. Methods.* **24** (4), 526–540. https://doi.org/10.1037/met0000218 (2019).
93. Minj, S. K. & Mishra, J. M. Socio-economic factors and residents' motivation for travel: a conceptual study. *Atna J. Tour Stud.* **14** (1), 1–15. https://doi.org/10.12727/ajts.21.1 (2019).
94. Zhang, Y., Zhao, P. & Lin, J. Exploring shopping travel behavior of millennials in Beijing: impacts of built environment, life stages, and subjective preferences. *Transp. Res. Part. A: Policy Pract.* **147**, 49–60 (2021).
95. Ployhart, R. E. & Vandenberg, R. J. Longitudinal research: The theory, design, and analysis of change. *J. Manag.* **36**(1), 94–120 (2010).

Author contributions

NK: Study conception and design, data collection, literature review, analysis and interpretation of results, manuscript writing; XYN: Study conception and design, Analysis and interpretation of results, writing and editing.

Declarations

Competing interests
The authors declare no competing interests.

Ethical approval
All procedures performed in the study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the1964 Helsinki declaration and its later amendments or comparable ethieal standars.
All the authors have read the manuscript and confirm that it has not been published or considered for publication elsewhere, including on the Internet.

Informed consent
The data collected in this survey does not contain any information that can directly or indirectly identify the respondents. Furthermore, informed consent was obtained from all participants.

Additional information
Correspondence and requests for materials should be addressed to X.N.

Reprints and permissions information is available at www.nature.com/reprints.

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.