Visitor preferences for the functions of vacant retail real estate in a Dutch city center

A best-worst scaling experiment in the city of Eindhoven

Troost, Sander Z.

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VISITOR PREFERENCES FOR THE FUNCTIONS OF VACANT RETAIL REAL ESTATE IN A DUTCH CITY CENTER

A best-worst scaling experiment in the city of Eindhoven

S.Z. Troost (1014862)
Architecture, Building and Planning
Urban Systems and Real Estate
Eindhoven University of Technology

Graduation Supervision Committee:

Dr. Ir. A.D.A.M. Kemperman
Ir. A.W.J. Borgers
Dr. Ir. P.E.W. van den Berg

Eindhoven, 4 July 2023

General information:

Student name:	S.Z. Troost
Student number:	1014862
Masters:	Architecture, Building and Planning
Master track:	Urban Systems and Real Estate
University:	Eindhoven University of Technology
Course code:	7Z45M0
Study load:	45 EC
Year of graduation:	2023

Preface

This thesis represents the conclusion of my Master's program in Urban Systems and Real Estate at Eindhoven University of Technology. Its focus is on investigating the preferences of city center visitors regarding the use of vacant retail buildings. To accomplish this, an on-street best-worst scaling experiment was conducted.

Living in the heart of Eindhoven, I had the privilege of frequently visiting the city center and observing its dynamics firsthand. This proximity and my regular interactions with the center sparked my curiosity about its functioning as an urban system. With the guidance of my supervisors, I was able to align my research with a topic that captivated me.

The process of delving into the literature and contributing to this field of research has been a rewarding experience. Moreover, engaging in conversations with the study participants offered invaluable insights into their perspectives on the center, shaped by their personal roles and histories. Despite the challenges encountered in recruiting enough participants, this enhanced my overall learning journey. I extend my gratitude to all the individuals who participated in this study.

I would also like to express my sincere appreciation to my supervision committee members, Astrid Kemperman, Aloys Borgers, and Pauline van den Berg, for their guidance and valuable advice throughout the process of this study. Our meetings were besides informative also enjoyable, and I am grateful for their availability and support.

I would like to extend my gratitude to my partner, family, and friends for their support throughout the entire duration of working on this thesis. Their encouragement and understanding have been invaluable during this journey. In particular, I would like to express my deepest appreciation to Anneloes de Lange, Kees – Jan van den Bosch, Sophie Troost, and Sander Strijbos for their invaluable assistance during the data collection process. Your contributions were essential, and without your help, I would still be tirelessly gathering data to this day. I would also like to acknowledge the members of the 'stiltehok' group for their insightful perspectives and much-needed distractions. A special thanks goes to Dennis Andreoli, who consistently made himself available for brainstorming sessions and provided valuable input. Lastly, I would thank my friends from study association SERVICE.

I hope you enjoy reading my thesis.

Sander Troost

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Summary

The declining number of retail outlets in the Netherlands over the past decades, influenced by demographic changes, evolving consumer behavior, and the rise of e-commerce, has led to a significant increase in vacant retail buildings. These vacancies are not limited to peripheral areas but are also prevalent in the heart of our cities, resulting in challenges to maintain the overall attractiveness and functionality of city centers. Given the diverse economic and social roles that city centers fulfill, it is necessary to explore viable solutions to address this issue.

Historically, city centers have served as hubs for product production and trade, with the Dutch government actively safeguarding their retail-oriented nature by discouraging peripheral retail developments. Consequently, city centers have become predominantly retail-focused environments. However, city centers possess the potential to integrate a variety of functions, including retail, public services, offices, gastronomic services, education, cultural activities, and creative enterprises. With the decline of traditional retail outlets, it becomes crucial to investigate which functions can be effectively housed in vacant buildings, without compromising the attractiveness and vitality of city centers. This results in a research question as follows:

What are the preferred functions for vacant properties in the Dutch inner cities according to the visitors of the city center, and what environmental, property, personal, and visit motivation characteristics affect this preference?

This research question was addressed through an extensive literature review encompassing several key aspects. The literature review primarily aimed to identify suitable functions for city center locations and to gain insights into the existing composition of such functions. Additionally, the literature review explored four categories of relevant characteristics for the preference for the use of vacant retail buildings: building, environment, personal and shopping trip characteristics. This investigation concerns a variety of interrelated topics such as consumer behavior, atmosphere, and attractiveness. This was necessary due to the lack of present literature concerning preferences for potential functions of vacant buildings.

To see how these attributes related to the four categories affect the visitors' preferences, the preferences needed to be measured. The measuring of preference was done by means of a stated preference experiment. Being more specific a best-worst scaling experiment was constructed using a balanced incomplete block design. This best-worst scaling experiment used nine possible functions that were identified in the literature study (daily store, non-daily store, food & beverage, office, residential, service provider, healthcare, beauty & care and, leisure & sports).

The literature review has resulted in the attributes deemed relevant for this research. Based on grounds for consumer segmentations and other research, the personal characteristics: age, gender, education and address (proxy for familiarity) were selected. The following shopping trip characteristics were selected: group size, visit motivation and visit frequency. The building characteristics mainly focus on attributes encompassing properties regarding the size and aesthetics. For the environment,

a combination of aesthetics (diversity of façades, greenery, main street) and the mix of functions in the direct surrounding was used.

The survey including the best-worst scaling task and a variety of personal and shopping trip attributes was presented to visitors of the city center of Eindhoven for seven locations. For these locations, building and environmental attributes were observed. In total, 211 respondents participated in the survey, equally divided over the seven locations. The locations used were vacant retail buildings, matching a set of requirements and ensuring variation in attribute levels.

The collected data was analyzed by a variety of methods. Starting with a descriptive analysis the composition of the sample population was elaborated upon and compared to the composition of reference groups. Most evident is the overrepresentation of younger and highly educated individuals.

Following, an initial analysis concerning the preferences was performed. This was done by a standardized best-minus-worst analysis. This analysis was performed both for the entire data set and for the seven locations separately. This has resulted in a ranking of the proposed functions (1-non-daily store, 2-food & beverage, 3-daily store, 4-sport & leisure, 5-beauty & care, 6-healthcare, 7-service provider, 8-residential, 9-office).

A more elaborate multinomial logit model was estimated for the functions and the relevant attributes. This is done both for the four categories separately: building (ρ^2=0.15), environmental (ρ^2=0.14), personal (ρ^2=0.14) and shopping trip (ρ^2=0.14) , and in an all-encompassing model (ρ^2=0.20).

These models allowed for the interpretation of significant attributes, and the identification of larger trends. For the environmental characteristics the importance of the current function mix in the direct surrounding of a building was found significant for multiple functions. The most evident finding concerning the function mix is the indication that non-store functions in the surrounding positively affect the preference for other atypical functions, indicating that already mixed used areas are considered more suitable for mixing in new functions. The preference for atypical functions was also positively affected by greenery and non-main shopping streets. This indicates that the edge of the city center is more preferred for the location of atypical functions.

The characteristics of the building can be brought back to two main findings. Firstly, larger buildings are more preferred for the incorporation of atypical functions. Consequently, both types of stores; daily and non-daily, were found to be preferred in smaller buildings. Secondly, the aesthetics of the façade came back frequently in both materials and colors. This stresses the importance of the design of a building for its preferred function.

The personal characteristics used; age, gender, education and address (Eindhoven, bordering municipality or other), were all found to have an effect on the preference for certain functions. It appears that individuals who have completed a HBO/WO bachelor's degree show a higher preference for typical functions (stores and F&B) and a lower preference for atypical functions. Conversely, individuals with a master's or PhD education level exhibit the opposite effect. For the other attributes it was not possible to identify explainable trends in the effect of the attributes on the preferences.

The significant coefficients and improvement of the model however indicate the importance of these attributes.

Lastly, the shopping trip characteristics were found to be of importance too. The most evident trend for shopping trip characteristics is the effect of the visit motivation on the preference a person has. The motivation was divided into hedonic shopping motivation, utilitarian shopping motivation and both/other. Both shopping motivations were more in favor of the typical functions (daily store, non-daily store and food & beverage) and less in favor for the atypical functions. The both/other motivation showed opposite patterns. Within the two types of shopping motivations hedonists were more extreme in their preferences compared to the utilitarian's. This provides a strong indication that for people with a hedonic shopping motive the addition of new types of functions in the city center will decrease the attractiveness of the city center.

1. Introduction

1.1 Context

Due to demographic changes, changes in consumer behavior, and the emergence of e-commerce, the once dominant retail function of the city center has been challenged (van Rooijen et al., 2018). The number of retail outlets in the totality of the Netherlands has declined by 12 percent in the past decade (Statistics Netherlands, 2023). This decrease results in vacancies for retail properties in Dutch city centers, and is especially prominent for the non-daily city center retailers in comparison to the daily neighborhood shops. Over 800.000 square meters of retail space were vacant for over a year in the Netherlands, and their transformation could provide a solution (Obbink, 2021). According to an article (Slob, 2022a), 57 percent of the 16.000 retail properties which were vacant on the first of January 2021 were still vacant a year later. Of these vacant properties 16 percent were transformed to another function. This share of transformation is higher for the larger cities with more than 100.000 inhabitants, where more than a quarter of the vacancies were transformed. Also, it is expected that in 2022, as a result of the general developments and the COVID-19 pandemic, vacancy rates in city centers will increase by 40 percent on average (Evers et al., 2020). Long term vacancies generally have negative impact on the attractiveness of the whole area. Due to the vacancies the visitors may perceive the environment as deteriorating (Hospers, 2011). Also, the social security and the livability of the area are affected by the presence of vacancies (Evers et al., 2020). Additional research furthermore found that 25% of people visit the city center less often due to vacancies (Multiscope, 2014).

The functioning of the city center and the retail functions present, is of great importance since it fulfills a multitude of economic and social functions (Multiscope, 2014). City centers combine retail, public services, offices, gastronomic services, education, cultural, and creative functions (Nelissen, 1979). The importance of the city center is further reinforced by the steady influx of people into the city as a result of mass migrations or natural growth, which is known as urbanization (Palen, 2008). There is a global trend of urbanization that is expected to increase from 55 percent in 2018 to 68 percent by 2050, according to the United Nations (United Nations Department of Economic and Social Affairs, 2019). An increasing urban population can also be seen in the Netherlands where in 2018, already 92 percent of the populations was considered to be urban (United Nations Department of Economic and Social Affairs, 2019).

The importance of the function of a city center is further stressed by the social economical role it plays. Retail and food and beverage services are a source of jobs for many, and are often located in the city center. These jobs are especially important for the more vulnerable groups; young and low-educated people. Which is also the group that was heavily affected by the COVID-19 pandemic (Keunen, 2020). These jobs are partially transferred to logistic and delivery services. However, due to the high automatization and efficiency, part of these jobs will be lost (Evers et al., 2020). Of the total number of jobs located in the city, 20 percent are in the city center. This is 11 percent of the national total of

jobs. This however concerns jobs in the field of governance, office, retail, and leisure. This thus concerns a multitude of population groups and are roughly 20 thousand jobs in for example Eindhoven (Hendriksma, 2020).

Another facet stressing the importance of the functioning of the city center is the economic importance of the retail real estate. This is discussed in research conducted by the IVBN. In this research it was found that the major pension investors have a 31 percent share of retail real estate in their real estate portfolio. This boils down to a 10 percent investment in retail real estate of the total pension capital (Evers et al., 2020; IVBN, 2018). A decrease in the value of retail real estate of 11% therefore results in a decrease of 1% of the total pension funds capital, which was predicted to happen within two years by ABN Amro in 2020 (ABN Amro, 2020). This is collective capital, which is lost and will negatively affect society. Furthermore, due to these developments the risk profile for retail real estate was changed to higher risks. Regulations for pension funds imposed by the government result in the obligated sales of these real estate properties, which will result into even lower real estate values (Evers et al., 2020).

The city center has historically been a place for (1) secondary production and (2) the trade of these produced goods, this is one of the main requirements for the existence of an urban environment globally (Sjoberg, 1965). The Greeks already created public spaces and market squares, and the Romans are known for their transport infrastructure (Snyder, 1999). The principles of ancient city planning can still be seen as the basis for the current urban form. Before the second world war, retail in Dutch cities was located through a mechanism of free market and consequently mostly present in the historic centers and the adjoining larger roads. The tremendous housing shortage which resulted from the war changed this. To cope with the shortage, large scale development plans were made at the edges of the existing cities. In this planning process, new retail centers were located. The composition of these shopping centers was based on the projected population for the new neighborhood and the maximum distance people were willing to travel for the purchase of certain product types. This resulted in the presence of retailers selling daily products in the neighborhood centers. More exclusive products that were purchased less often, and for which people were willing to travel further distances, were located in the city center. Furthermore, these new centers were only allowed if they did not compete with the existing centers (Evers, 2002). The Dutch city centers are characterized by the aesthetic quality, diverse retail offer and the presence of cultural and leisure activities (Butink, 2015). This retail function of the Dutch inner city is further enhanced by the Dutch protectionism for retail in city centers. While other Western countries generally have allowed the construction of large-scale peripheral retail locations, fueled by the emerging car ownership, the Dutch government has prevented this from happening and kept the retailers in the centers of cities and villages (Evers, 2002).

Due to these historical developments the predominant function of the current city center is retail. This retail function however is changing due to a multiplicity of developments, that will be discussed accordingly. The retail function of the city center is affected by the ongoing trend of digitalization. This has fundamentally altered consumer behavior in the retail sector. Consumers have easy access to information regardless of their location or time of day (Clemons, 2014; Eberenz & Schröer, 2019). As

a result, consumers will be able to make better informed decisions and locate products more easily (Clemons, 2014). Furthermore, the share of online purchases from the total number of purchases has increased over the last years (Weltevreden, 2007). In 2011, the share of online sales was 11 percent (Retail insiders, 2022). This increased to 18 percent in 2019, steadily changing the way people make purchases. The share of online sales differs strongly between different product groups. Media and entertainment (58 percent) and information technology (55 percent) have the highest online sales share. Food/near food (5 percent) and health/beauty (13 percent) have the lowest shares. The rise of ecommerce has resulted in different mechanisms in the form of substitution, complementary and modification (Weltevreden, 2007). Baen (2000) stated that an increase in non-physical sales will result in a decrease in retail area visitors. This will reduce the sales made as an impulse for the non-anchor tenants in the area. Also, due to the possibility of comparing products online, the pricing needs to be more competitive and the profit margins will be lower. These factors combined will contribute to an increase in vacancy (Baen, 2000). Additionally, the COVID-19 pandemic has been transformational for online shopping, since purchases had to be made online. This has resulted into a deep and widespread impact (Nanda et al., 2021).

Another development majorly affecting the city center and its retail function is the pattern of demographic change. Three demographic developments were identified in literature (van Rooijen et al., 2018).These developments are: local population contraction, aging of the population, and a decrease in the average household size. Firstly, the reconfiguration of the population as a result of urbanization results in spatial differences for population growth in the Netherlands. The growth in population for the Randstad, Almere, Arnhem, Breda, Tilburg and Eindhoven (Harms et al., 2010) will be compensated by a local population decrease in the fringes of the Netherlands (Tillema et al., 2019). These fringe areas concern; Northeast-Groningen, Zeeuws-Vlaanderen, the Achterhoek and South-Limburg. As a result, public and private functions in these fringe areas disappear. Secondly, the ageing of the population affects the current retail system (Eberenz & Schröer, 2019). Except from the food and beverage sector, retail will generally see a decrease in volumes and turnover as a result of this trend (Ministry of Economical Affairs and climate, 2015; Terra & Ellerman, 2016). Vogel (2016) states that the elderly do not use their time and money to shop since they generally have many products already and do not enjoy the shopping as activity. Furthermore, elderly spend more on services and less on products (Ministry of Economical Affairs and climate, 2015). Also, a large share of the wealth is not free to be spent since it is invested in a dwelling. Furthermore, their preferences concerning retail are different in comparison to the younger groups. Elderly value efficiency, safety and tidiness, younger people derive more value from experience and entertainment (Vogel, 2016). Lastly, the increase in single person households has implications for the retail system. An increase in single person households causes more demand for appliances in house, have less disposable income due to higher housing costs, but save on the absence of financial family responsibilities. Furthermore, single person households make more use of entertainment activities compared to other households (Hodgson, 2007).

An additional development in the field of retail is the change in the consumer behavior. The consumer demands are increasingly focused on the experience as a whole. The basis of this experience approach is the experience economy, which was introduced by Pine and Gillmore in 1998 (Pine II & Gilmore,

1998). The theory concerns that the value for the consumer, with a certain level of wealth, depends on the whole experience that surrounds the purchase of a product or service. This experience economy is the fourth stage of economic progress, following the stages of the agrarian economy, goods-based industrial economy and the service economy. Other than the other stages of economic progress, the experience economy concerns the value which is personal and unique for each consumer.

Since the focus of shopping in city centers is moving towards experience, the experiential value of an inner city is of importance for maintaining its attractiveness. van Dijck (2014) discusses the factors of the city center contributing most to the favorability of a location for the consumer. It is stated that 'shop offer' and 'aesthetic design variables' are both of importance. Shop offer with a positive effect concern: large average store size, average amount of shop branches, average ratio of fashion and luxury stores, high amount of restaurant and leisure facilities, average share of shop formulas, low vacancy rates and a low percentage of daily stores. The positively related aesthetic characteristics concern: indoor, spaciousness, diverse and historical façades, bright colored façades and height to width ratio. Negative utility was derived from striking shop windows. Rli (2020) expanded on this and states that liveliness should be considered too when discussing the experiential value. This liveliness is dependent on the variety of functions present. The importance of the variety in functions concerns the attraction of people on different times of the day and week. This contributes to the over-all attractiveness of the city and the social safety. The mix of functions or tenants in the city center is discussed in a wide variety of literature as one of the main contributors for the attractiveness or experiential value of the center (Gehl, 2010; Grijsbach, 2016; Teller, 2008; Teller & Elms, 2010).

The increasing number of vacancies offer possibilities for the transformation of retail to other functions (Obbink, 2021). This provides an opportunity to alter the city center's function and move towards the function mix matching the users' preference, contributing to a higher attractiveness of the city center. The city is transitioning from a retail area to a place with space for: living, offices, event spaces, culture, food and beverage and, production activities (van Rooijen et al., 2018). Furthermore, different functions are increasingly blurred and combined. In 2021, 2.000 vacant retail properties were transformed to another use. This is encouraged and already happening in a large amount of municipalities. Municipal initiatives changing the land-use plan from 'retail' to 'retail or residential' proactively, due to the high pressure on the residential market, are increasingly present (Slob, 2022a). Whether this is in line with consumer preferences and will increases the attractiveness of the city is not known. This however is of great importance for the future of the city center and its users. It is argued that retail change is a process driven by the demands of the consumer (Fernie, 1997). However, to be able to adapt to this demand the expectations and perceptions of the consumers need to be known (Cisek et al., 2014). Many studies have discussed the function-mix of the city center as one of the main factors contributing to its attractiveness and experiential value. (Gehl, 2010; Grijsbach, 2016; Rli, 2020; Teller, 2008; Teller & Elms, 2010; van Dijck, 2014). However, the preference for the composition of this mix is only studied within the retail field. The variety of branches within the retail field that are studied provide a basis for further research and expansion of this knowledge would be beneficial. Generally, clothing, home décor, gastronomic and leisure service contribute positively to the city center's attractiveness (Wichmann et al., 2021). The attractiveness is negatively affected by

the presence of optometrists, service providers, electronics and telecommunication stores. This is potentially due to the less frequent visits and lower suitability for hedonic shopping behavior such as browsing (Wichmann et al., 2021). How these functions relate to other functions like residential, office, healthcare and beauty facilities is not discussed in the current literature. Also, the present studies mainly concern the city center or areas as a whole and not the individual properties. Furthermore, it is unknown which factors affect the city center users' preference regarding the function for vacant retail buildings. However, studies regarding the attractiveness of cities generally include personal characteristics and shopping motivation. Also, the characteristics of the building and the characteristics of the environment are frequently included (Janssen et al., 2013; van Dijck, 2014; Weltevreden et al., 2018). Therefore, this study will aim to find if these characteristics can explain the consumer preference regarding vacant retail properties in city centers.

1.2 Research goals and problem statement

As previously discussed in the context, the increase in vacancy due to developments in consumer behavior, digitalization and demographic developments allows and asks for a considered rearrangement of the functions in the city centers in the Netherlands. For a successful strategy, the attractiveness of the city for its users is of great importance. The attractiveness of a city center depends on preference consumers have regarding the functions in the city center. Therefore, it is important to investigate which functions visitors of city centers prefer to be located in vacant buildings. These preferences might differ for the type of consumer and their visit motivation. However, the characteristics of the property and the environment could be of importance too. Furthermore, the functions in the city center are developing which allows for new uses of the real estate like offices, production, leisure etc. The available literature however predominantly focusses of the more classical retail use and lacks in the combination of all different functions that might be present in the future city center. This study aims at filling in this knowledge gap by gaining insight into the preferences of consumers for the function of vacant properties in Dutch city center areas, and identify the environmental and property characteristics determining for these preferences. This knowledge could be beneficial for policymakers regarding the inner cities, investors and developers for inner city real estate and entrepreneurs in the city center.

Main research question

What are the preferred functions for vacant properties in a Dutch inner city according to the visitors of the city center, and what environmental, property, personal, and shopping trip characteristics affect this preference?

Sub research questions

a. What are possible functions for vacant buildings in Dutch city centers?
b. How do the environmental characteristics identified relate to the preferences of the consumer?
c. How do the building characteristics identified relate to the preferences of the consumer?
d. How do the personal characteristics identified relate to the preferences of the consumer?
e. How do the visit motivation characteristics identified relate to the preferences of the consumer?

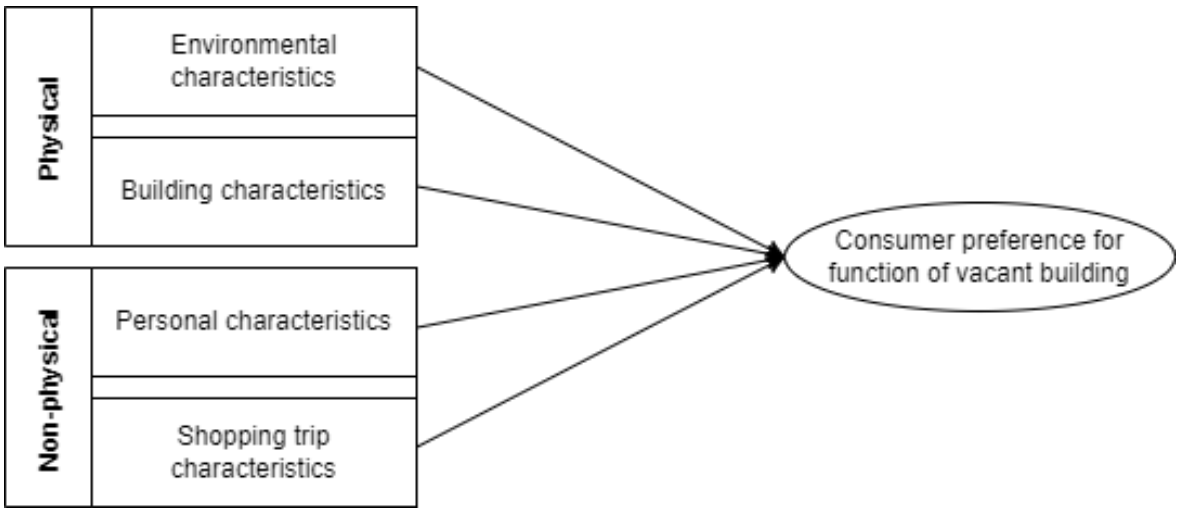


Figure 1 Conceptual framework

1.3 Research structure

This research will focus on gaining insight in the preference of the city centers users for the function of a vacant retail building, and the determinants that affect this preference. To answer this question, firstly in chapter 2 the academic literature currently available will be investigated to gain insight in the available information relevant for the research. The researched topics contribute to a better understanding of the topic regarding the consumer preference for the function of vacant buildings, and allow for the selection of a suitable method for finding the visitor prefernce. The first topics discussed in the literature review in chapter 2.1 are the topics allowing for interpretation and provide the essential background knowledge: stakeholder and functional composition. This will be further elaborated by discussing the possible functions and branching in the city center. Following, the physical characteristics relevant for the city center users are discussed in chapter 2.2. Lastly, the personal characteristics en shopping trip chracterisitics will be elaborated upon in chapter 2.3.

The knowledge gained in literature will in phase two be used to select a research method and design a research. This will be discussed in chapter 3. This research will be executed and data will be collected. This data will be analysed and the results from this analysisis will be discussed. Lastly, the found results will be interpreted and result in conclusions, discussions and recommandations. In Figure 2 the structure of the research can be seen.

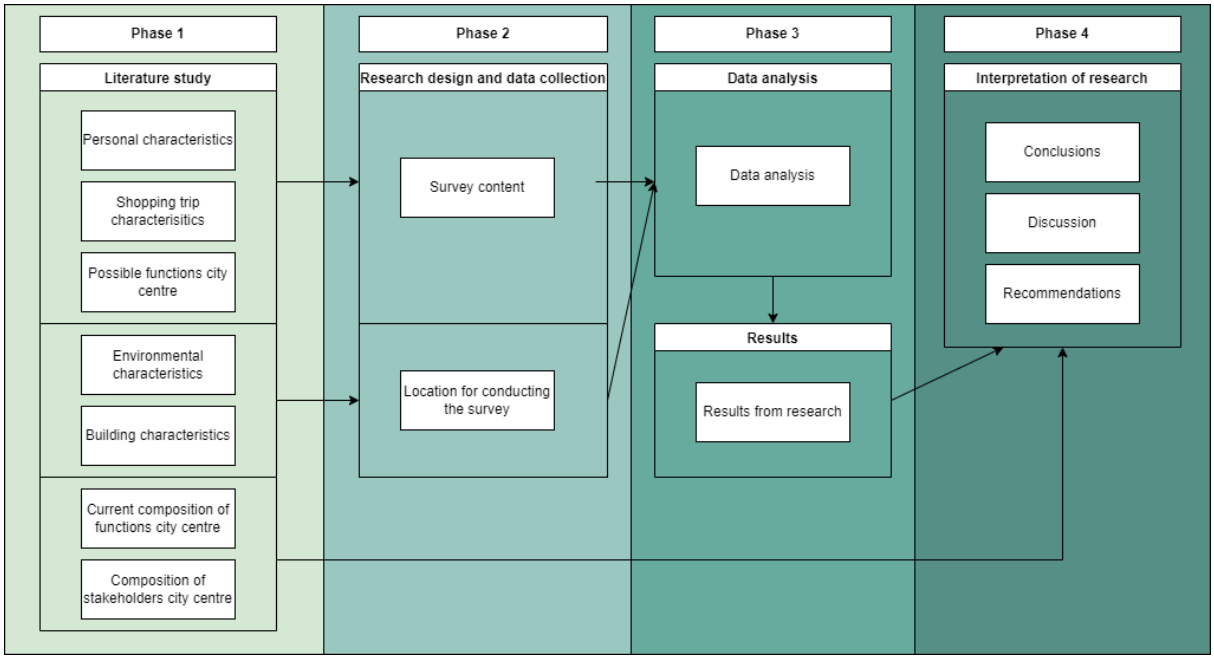


Figure 2 Research structure

2. Literature study

In this chapter, the literature currently available and relevant for the research will be discussed. The aim for the literature study is to answer the question: *''How do the environmental, building, personal, and visit motivation characteristics relate to the preferences of the consumer regarding the function of a vacant city center building?*''. Firstly, the composition of the city center will be discussed in terms of its stakeholders and functions. The current stakeholder composition will contribute to a better understanding of the context. The current and possible composition of functions in the center is beneficial for context forming, but also will be relevant for the research method, since the preference of the city center visitor regarding these functions is aimed to be measured. Secondly, the physical characteristics relevant for the city centers visitors will be discussed. These concern the environmental characteristics and the building characteristics. Lastly, the non-physical characteristics will be discussed. These concern the personal characteristics and shopping trip characteristics.

2.1 Composition of the city center

In this section, the current and possible composition of the city center will be discussed. Firstly, the stakeholder composition of the city center will be discussed. This allows for a better understanding of the research topic and will allow for better interpretation of the results. Secondly, the composition of the city center will be elaborated upon. This will be done by looking into the current composition of functions, but also new possible functions will be discussed.

2.1.1 The city center and its stakeholders

Urban areas are represented by a large variety of stakeholders. All of these stakeholders have their own goals and ambitions, but are unified in goal and ambition by a collaborative setting such as the city center (Tiemeijer, 2021). These stakeholders form a large part of the overall context, and therefore should be further elaborated upon. Furthermore, to be able to make recommendations, the stakeholders involved and affected by this should be considered. While broadly seen anyone can be a stakeholder, literature indicates it is not possible to include all parties (Leeb & Rudeberg, 2014). One definition for stakeholders found in literature is: ''Any group of people, organized or unorganized, who share a common interest or stake in a particular issue or system; they can be at any level or position in society, from global, national and regional concerns down to the level of household or intra-household, and be groups of any size or aggregation'' (Grimble & Wellard, 1997). Since not all stakeholders can be elaborated upon, the four most important stakeholders in the city center will be further discussed. These four most important stakeholders to be satisfied in city centers are: entrepreneurs, investors, visitors and residents (van Rooijen et al., 2018). Furthermore, the government and the collaboration initiatives of town center management will be discussed. This results in a total of six stakeholder groups.

In Table 1, the stakeholders of interest and their corresponding interests, objectives and responsibilities can be seen. The division previously mentioned: entrepreneurs, investors, visitors and residents is used and subdivided if needed. Also, the governmental bodies, assessed to be most important are included. Different interests are at play, but overlap can be seen too. The entrepreneurs aim at economic development and benefit from increasing number of visitors. Investors also strive for economic development but with a larger focus on the long term. Both of these interests benefit from an attractive area. The same holds for the residents of the area, which demand affordable living and a pleasant living environment. However, the attractiveness of the area should not compromise the privacy of the residents. Governmental bodies play a supportive role in achieving these objectives. However, they should aim to create a development that is suitable for all parties involved, and have an interest in the long term. Also, the quality of the urban environment and the surrounding infrastructure lay with the government.

Table 1 Inner city stakeholders (Tiemeijer, 2021)

Stakeholder	**Interests**	**Objectives**	**Responsibilities**
Entrepreneurs			
Retailers of products and services	Economic development; increasing business opportunities and (online and offline) visibility	Continuity of exploitation; profit maximization	Maintaining or increasing the number of visitors; proper accessibility; preservation of employment
Hospitality companies	Economic development; increasing business opportunities and visibility	Continuity of exploitation; profit maximization; blending of functions; increase dwell time visitors	Maintaining or increasing the number of visitors; well-kept, safe and inviting accommodation/terrace
Office companies	Economic development; safety; central location; high-quality spatial planning; good accessibility	Attracting well-trained creative workers; increasing business opportunities and visibility; providing	Attractive and healthy work environment; preservation of employment; positive corporate image
Investors			
	Economic development (long-term); safety; high-quality spatial planning and built environment	Continuity of exploitation and rental incomes; value development of property	Maintaining or increasing the attractiveness of the area; reducing vacancy
Visitors			
(shoppers, tourists and employees)	Affordable and suitable retail, leisure and hospitality facilities;	Good quality of life; experiencing a location;	Respecting the living environment and the social community;

	high-quality entertainment and information services; proper infrastructure, accessibility	feel comfortable; privacy	
Residents			
	Social, economic and spatial development; affordable and suitable availability of products and services	Pleasant living environment; good quality of life; privacy; inclusiveness	Maintaining or improving the living environment; social community and control
Governments			
Local government	Social, economic (financial) and spatial developments (long and short term)	Stimulating local developments; maintaining or increasing population and tourist appeal; retain jobs of different levels	Quality, diversity and livability of the inner city; construction and maintenance of public spaces; regulating infrastructural, environmental and real estate-related matters
National and provincial government	(Regional) economic, social and spatial developments; maintaining quality of life	Planning, realization and stimulation of (inner city) (real estate) developments	Good spatial planning; proper urban development structure and vision

To create a city center that is future proof, the stakeholders have realized the importance of collective action (Weltevreden et al., 2018). One of the main international drivers is arguably the emergence of out-of-town enclosed shopping centers, since the environmental quality was higher in these malls (Otsuka & Reeve, 2007). But also, the competitiveness with other city centers is of importance. Due to this, the majority of Dutch inner cities have collectives of entrepreneurs, local governments, real estate owners and banks. Town center management aims at creating a competitive advantage by means of maintenance and strategic development. This concerns both the public as the private space and is instituted and undertaken by the stakeholders from the public, private and voluntary sector (Warnaby et al., 2016). Collaboration in city centers is not a new phenomenon. Traditional shopping area marketing like atmospheric lighting and advocacy to local government, has been organized by entrepreneurial associations for a long time. However, actively managing the city center has gained interest. The first inner city manager was assigned in 1987 in the United Kingdom (Wells, 1991). Since, collaborations focusing on attractiveness and vitality of inner cities have emerged all over the United Kingdom, but also the Netherlands. In 2016, 758 collectives were active in the 350 largest inner city retail areas (Risselada et al., 2018). These collectives however, in general, have a low financial capacity.

This is largely due to voluntary character and results in a uncertainty surrounding the durability of these collaborations. This has resulted in legislation for BID (Business Improvement Districts) in the UK and BIZ (bedrijveninvesteringszones) in the Netherlands. These have the advantage of obliging all the stakeholders to contribute financially. In 2017, 200 of these zones were present or at least in the process of being created in the Netherlands (Weltevreden et al., 2018).

Town center management has fundamental differences in approach and goals compared to other forms of urban regeneration. Nevertheless, the regeneration of centers has become an objective for town center management initiatives and urban regeneration programs. A reason for this is the opportunities present related to: business, employment, housing development and place branding. The importance of promoting and managing these centers is emphasized in urban planning policy. Town center management has potential to deliver urban regeneration, surpassing the short-term capital and daily maintenance character. In some cases it already has, and problems associated with long term physical and economic improvement are being targeted (Otsuka & Reeve, 2007). Six categories composing the offer of a town center that can be used for the evaluation of the interventions of town center management can be distinguished. The town center offers a variety of qualities to is users such as: accessibility, quality of life, retail offer, Leisure, cultural and public utility services, Heritage and artistic aspects and their valorization and marketing strategy. This results in the research regarding the function mix preferred by the city centers' user being relevant for town center management. Since town center management can affect the mix of functions, but also the capability of affecting environmental and building characteristics which potentially affect the preference for the function of a vacant retail building.

2.1.2. Function composition of the city center

In this subsection the sub question: *''What are possible functions for vacant buildings in Dutch city centers?''* will be answered. This is done by firstly discussing the current composition of retail in the cities. In this case this is executed for the four largest cities of North-Brabant. Secondly, the scope will widen to investigate functions currently less present in city centers.

City centers consist out of a conglomeration of functions and benefit from cumulative attraction. In 1958, Nelson introduced the still applicable theory of cumulative attraction. This theory states that businesses in the same branch do more business if they are located next to or close to each other (Nelson, 1958). Furthermore, retailers and consumers benefit from agglomeration effects (Teller et al., 2008). The benefit of agglomeration for retailers lays within the possibility of sharing infrastructure and services (Teller & Elms, 2010). For the consumer the agglomeration of urban retail concerns the possibility of conducting multipurpose trips. These trips do not merely focus on the satisfaction of wants and needs on one place, but also include leisure purposes such as eating, drinking and entertainment. Furthermore, the social aspect of visiting acquaintances and making use of other services the city center has to offer (bank, council administration etc.) (Passaro et al., 2016). Consequently it can be concluded that an agglomeration offers more than the sum of the separate components to all types of consumers, and therefore has additional attractiveness compared to separate stores (Teller et al., 2008).

In Table 2, the retail composition of the four largest cities of North-Brabant can be seen (Province North-Brabant, 2021). This concerns the cities: Eindhoven, Den Bosch, Tilburg and Breda. This data concerns the city as a whole and not only the city center. Of these retail outlets, 38 percent is located in the city center (Province North-Brabant, 2021). Large differences can be seen in the share of daily versus non-daily retail outlets. Non-daily retail outlets are present in larger numbers in these cities. Within the daily retail it can be seen that specialty stores are present more in absolute numbers. The supermarkets and personal care stores are more similar in number and share. For non-daily retail, the fashion and luxury outlets are most predominant. These outlets concern stores selling clothing, domestic products and jewelry. The outlets which focus on products in the branch in and around house is the second largest. These are stores focusing on plants, animals, domestic appliances, mobility, and do-it-yourself articles. The smaller category of leisure and hobby concerns stores selling products in the fields of sports, games, hobby and media.

Table 2 Retail composition four largest cities of North-Brabant (Province North-Brabant, 2021)

	Number of outlets	**Share**
Retail	**4076**	**100%**
Daily	**1165**	**29%**
Supermarkets	309	8%
Specialty stores	589	14%
Personal care	267	7%
Non-daily	**2911**	**71%**
fashion and luxury	1351	33%
Leisure and hobby	305	7%
In and around house	1006	25%
Other	249	6%

In Table 3, the current composition of a selection of non-retail functions is included for the four largest cities in North-Brabant (Province North-Brabant, 2021). These are subdivided into two categories. The ‘leisure’ category which consists of food and beverage functions (services regarding food and drinks) and the culture and leisure functions (services regarding culture or leisure on a fixed location). Secondly, ‘service’ functions are distinguished and divided into three subcategories: crafts, private services, and other services. Crafts concern services for personal care and reparation, frequently done by hand. Private services concern services aimed at mediation (broker / employment agency). The other services concern rental and financial services. Regarding the non-retail functions, 33% is located in the city center. However, this also includes 824 automotive and fuel outlets.

Table 3 Non-retail composition four largest cities of North-Brabant (Province North-Brabant, 2021)

	Number of outlets	Share
Leisure	**2712**	**100%**
Food and beverage	2326	86%
Culture and leisure	386	14%
Service	**1670**	**100%**
Crafts	1056	63%
Private service	416	25%
Other services	198	12%

These currently present functions however are limited in level of detail. Also, the filling in of vacancies require solutions which might not be present yet. Because of this, the following section will focus on increasing the level of detail for possible functions in the city center. Also, functions which are not included by the province will be discussed. Retail and food and beverage are discussed more elaborately since these are currently the most predominant functions. Following, the service, leisure, health, office, and residential functions will be looked into.

Retail

Retail is one of the most predominant functions of the Dutch city center. The mix of branches is stressed to be important for the attractiveness of the center for the consumer. A division of the retail functions in different branches has been made, this differs between literature. In Table 4, different divisions can be seen. The branches show large similarities and aim to be all encompassing. Nevertheless, differentiations can be seen in level of detail and terminology. Also, Locatus (2010) includes leisure functions, services and fuel and transportation services, while the other literature focusses merely on stores.

Table 4 Classification of retail functions

Michon et al. (2008)	Marona et al. (2016)	Wichmann et al. (2021)	Locatus (2010)
Clothes and accessories	Fashion	Clothing	Vacant
Furniture and furnishing	Jewelry and accessories	Footwear	Daily
Sports	Kids' store	Jewelry	Fashion and luxury
Hobbies	Footwear and leather	Electronics	Leisure (store)
Presents	Sport	Home décor	In/around house
Multimedia	Health and beauty	Stationary	Other
Office equipment	Multimedia and press	Leisure	Transportation and fuel
Music and books	Furnishing	Optometrists	Leisure (activity)
	Hobbies and presents	Books	Services
		Drugs	
		Groceries	

The division of retail branches by Locatus (2010) has three levels of division, of which two (group and main branch) can be seen in Table 5. The division on the highest level consists of groups. In this group

division, five store types are identified when excluding the vacant option. The five store types are: daily stores, fashion and luxury stores, leisure stores, in and around house stores and the other store types. The other leisure functions and services will be discussed more elaborately later in this chapter. The transportation and fuel group will not further be discussed since this is not within the scope of city center functions. The groups are subdivided in main branches. These main branches can be further specified into branches, but since these are too detailed for the scope of this research they are excluded from the table. For example, the group of daily has the main branch of foodstuff. This main branch is further specified in the branches of bakery, cheese store, tobacco etc.

Table 5 Branch division by Locatus (Locatus, 2010)

Group	Main branch
Vacancy	Vacancy
Daily	Foodstuffs
	Personal care
Fashion and luxury	Department store
	Clothing and fashion
	Footwear and leather
	Jewelry and optician
	Domestic and luxury articles
	Antique and art
Leisure (store)	Sport and game
	Hobby
	Media
In/around house	Plant and animal
	Electronics
	Car and bicycle
	Hardware
	Living
Other	Other
Transport and fuel	Automotive
	Fuel
Leisure (activity)	Food and beverage
	Culture
	Leisure
Services	Rental
	Craft
	Financial
	Private services

Food and beverage

Classification of food and beverage services has been made for a variety of purposes (e.g. zoning regulations). The categories are divided by desired functions and the effects on the environment are important for this division. The division used by Van de Kreeke are the seven typologies of food and beverage services with more than 1000 outlets in the Netherlands, in the sequence of most common to least common. Cushman and Wakefield identified four categories, that differ in the service typology and served food. The categorization used by JLL and ICSC has a stronger focus on the experience for the consumer. In Table 6 an overview of food and beverage classifications can be seen.

Table 6 Categorization of food and beverage outlets

Ministry of Infrastructure and Water Management (n.d.)	**Van de Kreeke (2018)**	**Cushman & Wakefield (2017)**	**JLL & ICSC (2017)**
Category A: Disco, bar dancing, party center	Café - restaurant	Full-service restaurant	Impulse (sweat treats)
Category B: Café, bar, brasserie	Fast-food	Quick service restaurant and fast food	Refuel and relax (coffee and cake)
Category C: Snackbar, grillroom, fast-food	Restaurant	Coffee and tea shop	Speed eating (fast food)
Category D: Restaurant, Bistro, lunchroom, coffee/tea shop, ice-cream	Lunchroom	Ice cream vendor	Fast-casual
	Delivery/take-away Café Grillroom/shawarma		Casual dining Finer dining Social drinking Gourmet food

Non-retail functions

In Table 7, the division of three other categories can be seen. These functions are possible on city center locations, and therefore will be discussed briefly. However, these functions are discussed less extensively than the ‘retail’ and ‘food and beverage’ functions. This is due to their lower current presence in city centers.

Table 7 Classification of relevant non-retail functions

Services	Leisure	Healthcare
Locatus (2010)	Locatus (2010)	(Connectinvest, n.d.)
Shoe and clothing reparation and cleaning	Museum / Gallery	Dentist
Hairdresser/beauty salon	Library	General practitioner
Tattoo and piercing	Leisure games (billiard, laser game)	Pharmacy
Bank	Fitness	Physiotherapist
Post office	Casino	
Phone and internet	Wellness	
Broker		
Travel agency		

Services

The functions included in Table 7 are based on the segmentation used by Locatus (2010). The services are very extensive, and therefore a selection is included in the table. This selection concerns functions that are assessed to be realistic for a city center location (for example no car-rental). Also, some branches identified by Locatus (2010) are combined (for example shoe reparation with clothing reparation and clothing cleaning services).

Leisure

The leisure division by Locatus (2010) is used for the column of leisure functions that are possible on city center locations. The leisure group is divided into the main braches of food and beverage, culture and leisure. Since food and beverage services are discussed more extensively previously, this is not included here. Again, a selection has been taken to match with the research scope.

Healthcare

The market of healthcare and its real estate is growing as a result of demographic developments. Elderly people make more use of healthcare and this group is expected to grow (Connectinvest, n.d.). Since this demand is depending on the demographic developments and not economic developments, it is a relatively predictable market. Because of this predicted increase in demand, expanding in healthcare functions in the city center might be a viable option. Healthcare related real estate is a broad term and includes different types of healthcare and its' real estate. Firstly, the healthcare real estate can be divided in cure and care. Care is divided into intramural and extramural, which indicates weather the caring happens within the walls of the care facility. This is further subdivided and can be

seen in Figure 3 Healthcare real estate overview *(Connectinvest, n.d.)*. Cure is divided into three levels. The first level, which includes the general practitioner, dentist, physiotherapist and pharmacy. The second level concerns the (specialized) hospitals and the third the academic hospitals (Connectinvest, n.d.). Due to size limitations and the public character, only the first level of care is included into the table of possible functions.

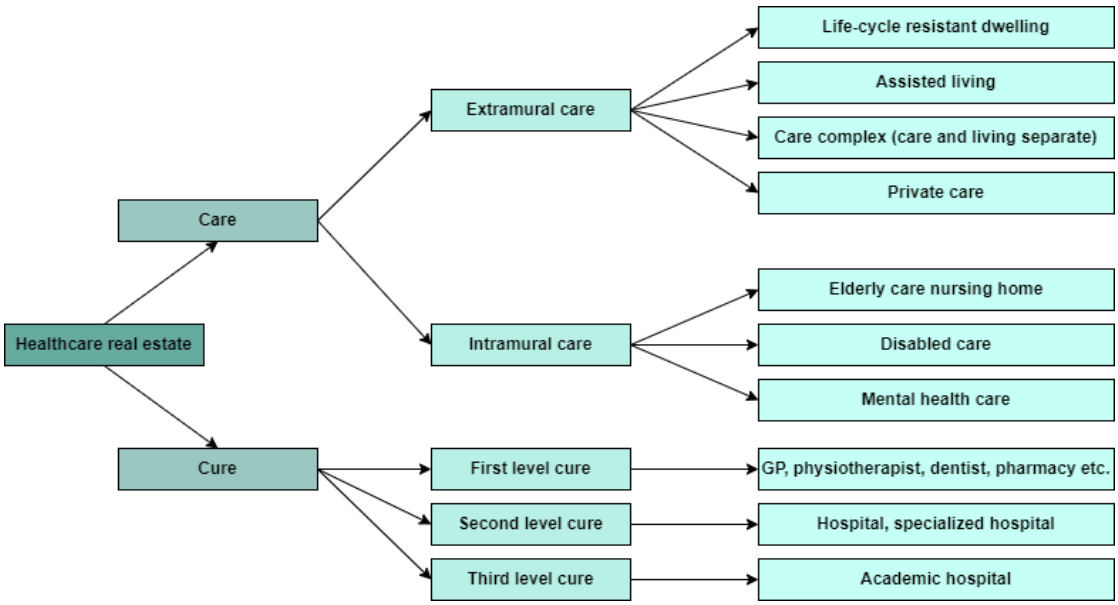


Figure 3 Healthcare real estate overview (Connectinvest, n.d.)

Office

Due to economical high tides and postponed decisions regarding offices by their users due to the COVID-19 pandemic, the office market is increasingly dynamic (NVM Business, 2022). The war in Ukraine and the consequences of this however have effect on the office markets perspective. Also, the gap between new energy efficient and older less energy efficient office buildings is increasing. The economical high time allows for investments by office users, which also have to deal with labor shortage. One of the assets in this war on talent is the office. The most attractive locations are in highly urban areas with many amenities and a good public transport connection. Vacant retail real estate in the city center has the right properties. This has for example resulted in the formal V&D building located at the Market in Groningen to be transformed to an office building (NVM Business, 2022).

Residential

For two decades the number of inner city residents has risen, and the financial crisis of 2008 has catalyzed this. Despite the popularity of the inner city as residential location, only 3 percent of the population lives in the inner city in 2019 (Evers et al., 2020). In all of the 53 inner cities studied by Evers et al. (2015), the number of residents has risen between 2015 and 2020. However, the increase in residents is more evident in modern vital inner cities like Eindhoven and Almere, compared to historical inner cities like Amsterdam and Haarlem (Evers et al., 2020). One of the most important

reasons for people to live in inner city is the presence of historical buildings and the distinct ambiance (van Duijn & Rouwendal, 2013). Furthermore, the proximity of a variety of amenities is one of the most important drivers for living in inner cities (Evers et al., 2015). On the other side, the lack of safety and parking possibilities are the most important downsides of living in city centers.

2.2 Physical characteristics affecting the consumer preference

In this section, the physical characteristics affecting the city centers' visitors will be discussed. The aim is to find characteristics affecting attractiveness, atmosphere etc. since characteristics affecting the consumer preference regarding the use of vacant retail buildings are not known. Whether these characteristics are applicable will be studied in this research. These physical characteristics can be divided into characteristics of the environment of a building and the characteristics of the building itself.

Atmospherics as a concept is defined as the use of spatial aesthetics to design a space for shopping and enhancing the purchase probability as a result of emotional effects. The term atmospherics is derived from atmosphere, which is most frequently used to describe the quality of the surroundings. Atmosphere is apprehended by sense, more specifically sight, sound, scent and touch (Kotler, 1973). Kotler distinguished three ways in which the atmosphere can have an effect on the purchasing behavior of a customer. Firstly, atmosphere can function as an attention-creating medium. This refers to a vendor standing out compared to the competitors. Secondly, as message-creating medium in which case for example the intended audience, customer service level can be communicated by atmospheric characteristics. Thirdly, the atmosphere as affect-creating medium in which case certain reactions in behavior are intended to result from atmosphere. Kotler discussed the atmospheric as internal concept, however it is not limited to this and can also concern external variables like building architecture and character of the surrounding area (De Nisco & Warnaby, 2014). The effects of the atmosphere on the consumer behavior in an urban retail area however is a relevant topic for urban marketing. Optimizing the appeal of retail destinations has become increasingly important in urban revitalization projects and from a town management perspective (De Nisco & Warnaby, 2014; Otsuka & Reeve, 2007).

Atmospheric stimuli can be divided into four different categories: external variables, general store interior, layout and design variables and the point-of-purchase and decoration variables (Berman & Evans, 1995). A fifth category, the human variables, was added in more recent literature (Turley & Milliman, 2000). These human variables focus on the personnel in the store, and the shopping public. For this research, only the external variables and a selection of human variables are of interest. This is the case because only the external characteristics and some of the personal characteristics can be seen from street level.

2.2.1 Environmental characteristics

In this chapter, the sub question: *''How do the environmental characteristics identified relate to the preferences of the consumer?''* will be partially answered, by making a start in indenting the possibly relevant characteristics.

Table 8 Environmental characteristics

	Turley & Milliman (2000)	**van Dijck (2014)**	**Wichmann et al. (2021)**	**Janssen et al. (2013)**
Topic of research	Atmosphere	Atmosphere	Attractiveness	Experience
Surrounding stores/retail offer	**X**		**X**	**X**
Accessibility	**X**	**X**		**X**
- *Parking availability/distance*	**X**	**X**		
- *Congestion and traffic*	**X**			
- *Public transport availability / distance*		**X**		
Facade		**X**	**X**	**X**
- *Shape of facades*		**X**		
- *Material of facades*		**X**		
- *Color of facades*		**X**		**X**
(advertisement) signs		**X**	**X**	
Service level/facilities		**X**	**X**	
Color/material of pavement		**X**		**X**
Indoor / outdoor		**X**		**X**
Building height (differentiation)		**X**		**X**
Shop windows		**X**		**X**
Crowdedness		**X**		**X**
Impact greenery		**X**		
Street furniture		**X**		
Address and location	**X**			
Surrounding area	**X**			
Width of street		**X**		
Width to height ratio		**X**		
Elevation		**X**		
Customer type attracted			**X**	
Tidiness				**X**
Amount of light				**X**

Environmental characteristics are the properties of the physical environment. In this section the characteristics relevant for the city center visitors will be discussed. The research aim is finding the characteristics that affect the preference regarding the function for a vacant property. This information however is currently not available. To create an all-encompassing overview, the characteristics of the environment affecting atmosphere, attractiveness and experience were used. In Table 8 Environmental characteristics, an overview of characteristics that affect the users of the city center can be seen. The found environmental characteristics show large similarities. This results in three characteristics being mentioned three times, and therefore having a high probability of being of importance for this research too. The characteristics assessed as being most important are the surrounding stores, the accessibility and the façade of the building.

2.2.2 Building characteristics

Similarly to the environmental characteristics, by identifying possible relevant characteristics a start will be made on answering the following question: ‘’*How do the building characteristics identified relate to the preferences of the consumer?*’’. Building characteristics concern the characteristics of a single property of interest. Nevertheless, there are similarities with the environmental characteristics since both look at characteristics of buildings such as façades, building height and shop windows. Turley & Milliman (2000) discussed the atmospheric variables for retail properties. Part of these variables concern the environment and another part focuses only on the specific property. In table 9, the building characteristics that were found to be relevant in previous research can be seen. Only external building characteristics, visible from street level will be discussed since internal characteristic do not fall within the scope of the research.

As can be seen in Table 9, large similarities regarding the relevant characteristics are present. Building color and display window are mentioned separately in all three studied articles. However, the characteristic of ‘storefront’ in the article of Lecointre-Erickson et al. is vague and might include the characterisitics of exterior signs, entrences and building height which are mentioned in the other articles.

The sub question aims at identifying the building characteristics that potantially affect the preference regarding the function for vacant retail buildings in the city center, which resulted in Table 9. This question is answered by identfying the relevant characteristics of retail buildings for other purposes such as atmosphere, and the interest of the retailers. The knowledge whether these are relevant for the preference will result out of this study.

Table 9 Building characteristics

	Turley & Milliman (2000)	**MBA Knowledge Base (2013)**	**Lecointre-Erickson et al. (2021)**
Topic of research	Atmosphere	Retailer interest	Atmosphere
Display window	**X**	**X**	**X**
Building color	**X**	**X**	**X**
Exterior signs	**X**	**X**	
Entrances	**X**	**X**	
Building height	**X**	**X**	
Architectural style	**X**		**X**
Building size	**X**		
Building material		**X**	
Building age		**X**	
Storefront			**X**

2.3 Non-physical characteristics affecting the consumer preference

In this part of the literature research, the non-physical characteristics are investigated. These non-physical characteristics consist out of two components. The personal characteristics and the shopping trip characteristics.

To understand the personal and shopping trip characteristics affecting the consumer preference, consumer behavior as a broader aspect should be studied. The way people shop has changed over time, which challenges and causes uncertainties for retailers and retail areas. However, shopping is still the third most favorite activity people like to do in their spare time (Ouwehand & Haringsma, 2016). The change of consumer behavior is a result of social economical, demographic and technological developments. The consumer today demands choices, convenience, service, personal attention and appreciation (Hospers, 2016). The focus of the city center shopping area increasingly focuses on the experience. Seen as the founders of the experiential economy in 1998, Pine and Gillmore introduced the idea of the value for the consumer depending on the whole experience surrounding a product or service (Pine II & Gilmore, 1998). This experience is the fourth stage of economic progress. Other than the other stages of economic progress, the experience economy is personal and unique for each consumer.

Shopping value refers to the value the consumer derives from the purchase of a product and the activity of doing this. On the highest level, shopping value is divided into two types: hedonic value and utilitarian value (Babin et al., 1994). This concerns the way consumer derives value from the shopping trip. Utilitarian value is about the fulfillment of a consumer need. It concerns the fulfillment of the

mission of the acquirement of the desired product, and thus the efficiency and ability are valued by the shopper. The hedonic value concerns the enjoyment of the shopping trip and is focused more on the fun and playful side. This value is personal and more subjective. Enjoyment, excitement, captivation, escapism and spontaneity are fundamental aspects for the hedonic shopping value. The over-all shopping value is a combination of both the hedonic value as the utilitarian value, and therefore both should be considered. Compared to utilitarian shoppers, hedonic shoppers are represented by a larger share of females and generally have a lower individual income and level of education. Hedonists furthermore make more and longer trips to retail agglomerations and visit more stores when they do. Also, hedonic shoppers in general spend the same or less money compared to utilitarian's (Teller et al., 2008). The utilitarian and hedonic shopping value was expanded by including a third dimension (Rintamäki et al., 2006) This third dimension concerns the social one. The social dimension is about the means of communicating and defining social roles. For the shopping activity, the social act with symbolic meanings, social codes, relationships, and consumer identities are of importance.

The motivation for consumers to go shopping concerns a multiplicity of psychological needs, exceeding the acquiring of a product. Shopping motivation can be divided into two categories: personal and social (Tauber, 1972). Personal motivation could be role playing, recreation by diversion of daily routines, self-gratification, physical activity, trend learning, fashion learning, keeping track of innovations, and stimulation of the senses. Social motives concern out of home social activity, socialization with same interest individuals, affiliation with peer groups, acquiring status and authority, and acquiring pleasure from bargaining and negotiation.

Hedonic shopping, which is based on the enjoyment of the activity, can be subdivided in six kinds of shopping (Arnold & Reynolds, 2003). Adventure shopping concerns shopping for sensory stimulation, adventure and the feeling of being in another world. Secondly, social shopping which refers to shopping for the sake of meeting with family and friends, socializing and bonding. Gratification shopping is the shopping type which refers to shopping for the relieve of stress, get rid of a negative mood or to treat oneself. The fourth type is idea shopping, which referrers to shopping for trend watching, and seeing new products and innovations. Role shopping refers to the shopping type where enjoyment is derived from finding the perfect product for someone else than the shopper. Lastly, value shopping in which case the enjoyment is in the looking for good deals and discounts.

2.3.1 Personal characteristics

This chapter will provide a partial answer to the sub question: *''How do the personal characteristics identified relate to the preferences of the consumer?''* by identifying possible relevant personal characteristics. This is done by investigating demographic grounds of consumer segmentation. Furthermore, it will be expanded by discussing personal characteristics included in other studies.

Consumer segmentation by demographic aspects

Consumers can be segmented on a variety of homogenous grounds. Similarities in people's values can be seen as a result of shared formative experiences. Age, gender, race, religion, and social class are categories that can be used to group people who have had similar formative experiences. (Lyons et al., 2005). For effective and efficient marketing, consumer segmentation is essential. This is because groups of consumers are more likely to respond similarly to products, services, communications, and the retail environment. (Parment, 2013). Three important grounds for segmentation are distinguished by van Dijck (2014). Segmentation by generation cohorts, segmentation by gender cohorts and segmentation by income cohorts which is an indicator for social class.

Consumer age can be used for segmentation, but a deeper understanding of why a consumer behaves a certain way is lacking. Understanding the motivations of these consumers is achieved by segmenting consumers into generational cohorts. (Parment, 2013). Based on the time of birth and the corresponding life courses, generational cohorts are segmented. Cohorts of generations have benefited marketing because they share similar values. (Lyons et al., 2005). These values are discovered to be relatively constant throughout one's life and are formed as a result of significant societal events like wars, economic changes, and technological developments. The coming of age period, late adolescence, and early adulthood are the times when these events are most defining. (Parment, 2013). Four important generational cohorts were distinguished in the research by Brosdahl and Carpenter (2012): the silent generation (1925 till 1943), baby boomer generation (1943 till 1960), generation x (1961 till 1981) and generation y or the millennial generation (1982 till 2000).

Next to age, gender is found to be an important ground for consumer segmentation. Nevertheless, gender and age should not be considered in isolation from each other (Lyons et al., 2005). Males and females differ in shopping attitude and behavior and consequently differ in the hedonic value derived from a shopping trip to a certain location (Jackson et al., 2011). Differences in attitude for utilitarian value in the case of shopping malls does not differ for gender segmentation (Jackson et al., 2011).

Lastly, social class can be used for the purpose of consumer segmentation. In social classes, members are addressed according to their value to society. Social class members have similar values, ways of thinking, speaking, and behaving. The effects on the individual are broad and subtle, but definitely have an effect on consumer behavior (Abraham, 2011). Social classes have several characteristics according to Gherasim (2013). Social class members have similar behavior and taste, such as clothing, housing, furniture, leisure and media preference. The social class make people belong lower or higher in society. The social class a person belongs to depends on several variables of the individual such as

occupation, wealth, income, and education. Lastly, it is possible to move between different social classes. Furthermore, Gherasim (2013) distinguished six different classes, the top upper class, the lower upper class, the top middle class, the lower middle class, the top under class and the lower inferior class. The effect of social classes on consumer behavior is most predominant in countries with strong class differences. In these cases the type of car, clothing and travel behavior are largely determined by social class (Hollensen, 2010). The preferences for retail differ in the way that the upper class prefers pleasant atmosphere and exciting displays while the lower class are focused my on the acquiring of clothing and household items (Durmaz, 2014).

Besides characteristics that refer to the segmentation on demographic grounds, other research includes personal characteristics such as whether someone is an e-commerce user. Contradicting to these studies, the study described in this paper will not focus on e-commerce since this is not within the scope of the project. In Table 10, the personal characteristics that are possibly relevant are included.

Table 10 Personal characteristics

	Janssen et al. (2013)	**Van Dijck (2014)**	**Van den Berg et al. (2021)**
Age	**X**	**X**	**X**
Gender	**X**	**X**	**X**
Income	**X**	**X**	**X**
Education participant	**X**	**X**	**X**
E-commerce user	**X**		
Education partner		**X**	
Household composition			**X**
Employment			**X**

2.3.2 Shopping trip characteristics

In this chapter the question: *''How do the visit motivation characteristics identified relate to the preferences of the consumer?''* is partially answered. Besides personal characteristics, consumer research frequently include characteristics concerning the specific shopping activity that is being undertaken. These characteristics are assessed to affect the consumer behaviour and perception. Certain aspects are discussed previously in the chapter of non-physical characteristics. This is elaborated by considering other publications. In Table 11 an overview can be seen.

Table 11 Shopping trip characteristics

	Janssen et al. (2013)	**Van Dijck (2014)**	**Van den Berg et al. (2021)**
Shopping motivation		**X**	**X**
Location residence /travel distance		**X**	**X**
Transport		**X**	**X**
Personal mood	**X**		
Group composition		**X**	
Familiarity			**X**
Sense of place			**X**
Time spent			**X**
Stores visited			**X**
Money spent			**X**
Type of shopper			**X**

Personal mood was recognized as a significant influence on shopping behaviour by Janssen et al. (2013). Van Dijck (2014) concentrated on a number of variables that influence shopping behaviour, such as group composition, location of residence or travel distance, and shopping motivation. This is expanded by van den Berg et al. (2021) by a number of variables, including familiarity with the shopping environment, sense of place, time spent shopping, stores visited, amount spent, and type of shopper.

2.4 Conclusion

This literature review aimed at exploring the potentially relevant physical and non-physical characteristics that influence the preferences of city center visitors in utilizing vacant retail real estate. These characteristics have been identified to incorporate them into the present research, considering the limited availability of literature specifically focused on preferences for vacant buildings.

The physical characteristics encompass both the environment surrounding the building and the building itself. In terms of the environment, it has been found that the functions of the surrounding buildings and the accessibility of the location are of paramount importance. Furthermore, visual aspects of the surroundings, such as the façades, pavement material, presence of greenery, and store signs, have consistently emerged as significant factors in previous research. Similarly, these visual aspects extend to the building itself, where characteristics such as the color, material, windows, and entrances have been frequently investigated. Additionally, the size and age of the building have been identified as relevant factors in shaping consumer preferences.

The non-physical characteristics encompass both personal characteristics of individuals and characteristics related to their shopping activities. The personal characteristics are partly derived from consumer segmentation research, including factors such as age, gender, income, and education. These factors have been further expanded upon by incorporating additional characteristics identified in other relevant literature. These extended personal characteristics encompass employment status, household composition, the education level of the partner, and whether individuals engage in e-commerce activities. Regarding trip characteristics, literature has included factors related to the motivation of the trip, transportation modes and distance, as well as the composition of the shopping group.

3. Research design and methodology

To answer the main research question: *'' What are the preferred functions for vacant properties in the Dutch inner cities according to the users of the city center, and what environmental, property, personal, and visit motivation characteristics affect this preference?''*, a suitable methodology should be decided upon.

This chapter focuses on the selection and explanation of methods that will be utilized to measure preferences and analyze the resulting data. Additionally, the attributes that will be used and the levels these attributes have will be discussed. Furthermore, the data collection method will be elaborated upon.

3.1 Measuring preferences

Measuring preferences can be done by a variety of methods (Phillips et al., 2002). These methods all have their strong points and limitations.

- Rating by Likert scale
- Ranking method
- Choice experiment
- Best-Worst scaling
- Open-end question

The Likert scale, developed by Rensis Likert, is a widely used method for measuring attitudes. It typically involves a 5- or 7-point scale where respondents are presented with statements and asked to indicate their level of agreement or disagreement (Sullivan & Artino, 2013). The Likert scale generates ordinal data and provides insights into individuals' attitudes.

Another approach to measuring preferences is through ranking. This method requires respondents to rank various proposed functions or options based on their preference (Phillips et al., 2002). While ranking can yield valuable information about relative preferences, it can be time-consuming and cognitively demanding for participants.

Choice-based conjoint analysis is a third method for measuring preferences. In this approach, participants are presented with different choice scenarios and asked to select their most or least preferred option. By varying attribute levels in these experiments, researchers can determine the relative importance of different attributes in influencing preferences (Phillips et al., 2002).

Best-Worst Scaling (BWS) is a method used to evaluate preferences, and a type of choice-based experiment. It concerns identifying the best and worst options among a set of choice options. BWS focuses on both extremes, which yields more information compared to selecting only one of the extremes.

Open-ended questions provide respondents with the freedom to express their preferences without predefined response options (Rouder et al., 2021). While this approach allows for rich, authentic and qualitative data, it can be challenging to quantitatively analyze due to the lack of standardized categories or scales.

For this research, it is chosen to use a choice-based method for the collection of data. This method is assessed to be the least demanding for the respondent. Choosing a function amongst a set of functions requires less steps, compared to evaluating each function and rating this. Also compared to ranking this method is less demanding for the respondent. In the following section, the type of choice experiment – Best-worst scaling – will be elaborated upon.

3.2 Best-worst scaling

In 1987, Louviere developed the best-worst scaling (BWS) method. The method resulted out of curiosity for what happened if respondents were asked to not only indicate their 'top' choice but also their 'bottom' choice if confronted with a choice set. By including both the 'top' and 'bottom' choice more information could be acquired regarding the respondents' value (Utility) for an alternative. Underpinning the BWS is the random utility theory (RUT), which also underlies discrete choice experiments.

In the following subsections, best-worst scaling will be explained. First, Random Utility Theory is introduced as the underlying theory (3.2.1). Next, balanced incomplete block designs will be discussed as a way to reduce respondent burden (3.2.2). In this project, the alternatives presented to respondents will be functions for vacant buildings, which will be selected in 3.2.3. The last subsection describes the methods of analyses (3.2.4).

3.2.1. Random Utility Theory

Random utility theory assumes that the relative preference of an object A over B can be derived from the (relative) frequency of A being preferred over B (Louviere et al., 2013). The random utility theory was proposed by Thurstone (1927), and used for the motivation and development of paired comparison method. For this method individuals are asked to choose the best or most preferred of two options. The observed choices made by an individual are used to estimate model parameters. The random utility theory assumes that if a set of options is proposed, individuals always chose the option that yields the most preference or utility. The respondent takes into account both preferences and constraints and compares the alternatives to make the decision. The variables that affect the decision, which are called attributes, differ for the proposed choice options. The decisions made and the corresponding attributes allow for determining the utility of the attributes. This is done by systematically varying and analyzing these attributes.

By combining the utilities of the different attributes, the overall utility for an alternative can be derived. This utility, however, is an estimate since not every variable that has an effect on the choice can be included in a model. According to the Random Utility theory, when a respondent (q) chooses an alternative (i), their overall satisfaction or utility (U) is composed of two parts: the observable utility component (V_{iq}), and the unobservable utility component (ε_{iq}). These two components combined determine the total utility of the chosen alternative (Hensher et al., 2015).

$$U_{iq} = V_{iq} + \varepsilon_{iq}$$

The relative importance of the different attributes most likely differ. To take this into account each attribute has to be weighted separately. This is accounted for in the observed utility V_{iq}. The observed utility consist of the sum of all the attributes (X_{iqk}) multiplied by their weighting (β_k) in which K refers to the number of attributes.

$$V_{iq} = \sum_{k=1}^{K} \beta_k * X_{iqk}$$

These two equations can be combined to create an equation for the calculation of the utility in accordance with the random utility theory.

$$U_{iq} = \sum_{k=1}^{K} \beta_k * X_{iqk} + \varepsilon_{iq}$$

Best-worst scaling is a probabilistic discrete choice model used to generate a ranking of things, by using the two opposite extremes such as best-worst or smallest-largest (Louviere & Flynn, 2010). Best-worse scaling is a popular method for studying importance or preference of certain issues and is applicable on the individual and the aggregate level (Burke et al., 2013). Best-worst scaling can be divided into three types: object, profile and multi-profile (Louviere & Flynn, 2010). Object scaling is used for the rating of discrete objects. For this type, subsets of items are created and a best (most preferred) and worst (least preferred) need to be selected out of this subset. These objects do not have attributes in the question. An example of objects (functions) can be seen in Table 12. Secondly, the profile typology is used to rank attributes of for example a product. The attributes are presented to the respondent, who can indicate the least and most important attribute regarding their consumption choice. This concerns a choice that only includes the attributes in the example table. Multi-profile is the last type and focusses on selecting the best and worst profiles, which have a selection of attributes. The levels of these attributes are differentiated within an experiment.

In a study regarding the use of BWS in healthcare, it was found that the BWS type 'object' and 'profile' are used more than the 'multi profile' variant (Cheung et al., 2016). For this study, the object case will be used for the data collection. The object case is the only suitable option since the objects (functions for vacant retail buildings in the city center) do not have attributes in the survey. The attributes are not varied within the experiment for the respondent and thus are not displayed explicitly.

Table 12 Example of BWS methods

		Object		
		Function 1	Function 2	Function 3
		Function 1	Function 2	Function 3
Profile	Attribute 1 (A1)	*A1 - Level 1*	*A1 - Level 3*	*A1 - Level 4*
	Attribute 2 (A2)	*A2 - Level 3*	*A2 - Level 1*	*A2 - Level 2*
	Attribute 3 (A3)	*A3 - Level 2*	*A3 - Level 2*	*A3 - Level 1*
		Multi profile		

Scale measures such as Likert scale could be used for similar purposes, but have limitations (Burton et al., 2019). Firstly, people need to remain consistent in the calibration of the scale over all objects, which is found to be hard for respondents. Secondly, the respondents may have varying interpretations of the end point of the scale, which make it hard to compare results reliably. Thirdly, respondents tend to cluster answers at end points. This limits the possibilities for comparison while in reality these objects might not be equal. BWS offers a precise and comparable scale (Burke et al., 2013). Furthermore, by using best-worst scaling, respondents are forced to differentiate. Also, the scaling problems such as end point interpretation and clustering are eliminated (Cohen & Neira, 2003). The use of best-worst scaling is found to be more consistent and reliable compared to the Likert scale, and is less cognitively demanding for the respondent (Burton et al., 2019).

Another method for deriving ones preference that could be used is the paired comparison method (Thurstone, 1927). This paired comparison method however is limited to two objects for each choice set. This makes the method unsuitable for larger numbers of objects. For example, to make a ranking for six objects, 15 choice sets are needed to allow for statistical statements, this number increases to 2556 choice sets for 72 objects, since this needs much more comparisons (Louviere et al., 2013). This problem could be mitigated by using the multiple choice approach introduced by Louviere & Woodworth (2018). This method relies on the identification of the 'best' option from a selection of options. This methodology, called a discrete choice experiment, is widely used in scientific literature. However, researchers do not appreciate that only a minimal amount of information usable for statistical estimation is gathered by solely selecting the 'best' (Louviere et al., 2013). BWS collects 'worst' information in a similar way 'best' information is gathered, and in that way provides much more information (Louviere et al., 2013). Furthermore, BWS uses the fact that individuals are more reliable in selecting the extremes ('best' and 'worst') compared to ranking the middle options, as stated in the adaptation level theory (Helson, 1964).

Best-worst comparison generally are conducted by repeating subsets of the total selection of objects. These are in the case of this experiment the proposed functions for vacant retail buildings in the city center. Three main dimensions in which variation in a BWS experiment is possible are present. Variation is possible in: number of objects, size of choice set, number of choice sets proposed (Orme, 2005). Regarding the relevance of these dimensions Orme (2005) found that for the accuracy of BWS

experiments the number of objects in the study are the most relevant. If there are less objects in the experiment, the results are more reliable. Least relevant are the number of objects per choice set.

3.2.2 Balanced incomplete block design

A full factorial design aims at creating choice sets with all combinations possible and proposes a share of these to each respondent. This results in large numbers of choice sets to be proposed to each respondent. This problem can be mitigated by using a balanced incomplete block design (BIBD). In the balanced incomplete block design, blocks (choice sets) with more than two objects are made. 'Balanced' refers to each object (function for the building) appearing the same number of times. Also, it is co-occurring with other objects the same number of times. The use of a BIBD is most common in BWS experiments. Cheung et al. (2016) found that 54 percent of object BWS studies used a BIBD, while the second most used design, orthogonal main effects, only concerns 12 percent of studies. After this, Latin square (8 percent) and full factorial (8 percent) was used most frequent.

In BIBD the following notations for indicating the relevant components are used (Sawtooth Software Inclusive, 2013):

g: number of objects
b: number of blocks
k: number of objects per block
r: Number of replicates per object
N: total number of objects (occurrence multiplied by number of objects)
λ: Co-occurrence of objects

A balanced incomplete block design requires the following conditions (Caliński, 1993):

1. Every function occurs at most once in a block.
2. Every function occurs in exactly r blocks.
3. Every pair of functions concurs in exactly λ (>0) blocks

These requirements were extended, and include the following requirements (Sawtooth Software Inclusive, 2020):

1. *Frequency balance*	Each item appears the same number of times
2. *Orthogonality*	Each item shows in sets with other items the same number of times
3. *Connectivity*	All items are directly or indirectly compared to each other
4. *Within-set positional balance*	Equal distribution within set positions of item
5. *Across-set positional balance*	Equal distribution of choice set position in over different surveys

In this study, nine functions for vacant retail buildings in the city center are intended to be studied. To make the task less demanding for the respondent, three functions per choice set would be a suitable

number. This is important since the questions will be asked on street. The BIBD should meet the design requirement of the following formula (Deagen, 2016):

$$N = g * r = b * k$$

In the case of this study, nine (g=9) objects are aimed to be included. This is done in choice sets of three (k=3) objects. Applying this in the previous formula results in the following:

$$b = 3r$$

Additionally, each object shows in sets with other objects the same number of times. This co-occurrence is indicated by λ, and should always be an integer (Deagen, 2016).

$$\lambda = \frac{r * (k-1)}{g-1}$$

If applying the same number of objects (g=9) and choice set size (k=3), the minimum value of r can be found. As can be seen in the equation below, λ is an integer (which is required for a BIBD) if r is four or a multiplicity of four.

$$\lambda = \frac{r}{4}$$

This minimum value of r (=4) is applied in the first formula, this results in a BIBD consisting out of 12 choice sets. Resulting in the following BIBD properties. This is the smallest possible BIBD for nine objects in choice sets of three. The overview of the BIBD can be seen in Table 13.

Table 13 balanced incomplete block design (object=9, set size=3)

Number of objects (functions)	g	9
Number of choice sets	b	12
Objects per choice set	k	3
Replicates of object	r	4
Total number of objects in experiment	N	36

Louviere et al. (2015) developed a table in which the BIBD for different numbers of objects, number of sets, set sizes and co-occurrences are included. For nine objects (functions for vacant retail buildings) and a choice set size of three, the discussed number of blocks can be found. This table is beneficial for the comparison of BIBD options. Also, the BIBD properties found in the calculations are included. Table 14 shows a part of this table.

Table 14 List of potential BIBDs (Louviere et al., n.d.)

Design no.	Objects (v)	No. sets (b)	Occurs (r)	Set size (k)	Co-occurs (λ)
1	4	4	3	3	2
2	5	5	4	4	3
3	5	10	6	3	3
4	6	10	5	3	2
5	7	7	3	3	1
6	7	7	4	4	2
7	7	21	15	5	10
8	8	14	7	4	3
9	9	12	4	3	1
10	9	18	8	4	3
11	9	12	8	6	5
12	9	18	10	5	5
13	10	15	6	4	2
14	10	30	9	3	2

Which design to use depends on the number of objects that need to be studied. Furthermore, the size of the choice set and the number of sets need to be considered. These affect the ease of filling in the survey for the respondent. If the ranking is desired to be estimated on the level of the individual, each object needs to occur at least four times, otherwise ranking is not possible (Burton, 2021).

The found number of blocks, block size and number of objects can be used to make a BIBD. This design will need to match the previously discussed requirements. R is used for the creation of a BIBD in this study. In R, the 'crossdes' package was used for design generation. To generate the design the command 'find.BIB(9, 12, 3)' was used. The numbers refer to the number of objects, number of blocks and block size required. The output of R can be seen in the overview in Table 15. As can be seen in this table, each object occurs four times and every object is in the block with every object exactly 1 time.

Table 15 BIBD numerical for this study

Block	**Objects in block numerical**			**Objects in block overview**								
	A	**B**	**C**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1	2	5	7		1			1		1		
2	1	3	7	1		1				1		
3	4	5	8				1	1			1	
4	3	4	6			1	1		1			
5	2	6	9		1				1			1
6	1	8	9	1							1	1
7	4	7	9				1			1		1
8	2	3	8		1	1					1	
9	1	5	6	1				1	1			
10	1	2	4	1	1		1					
11	3	5	9			1		1				1
12	6	7	8						1	1	1	

3.2.3 Proposed function selection

To finalize the method for measuring preferences, the balanced incomplete block design, as discussed, needs to be combined with a selection of nine functions. During the literature review, a broad selection of possible functions for buildings was assembled. This selection was divided into two different levels: main types and subtypes, which consists of a various number of functions. This study will focus on a small number of nine functions to reduce the number of required respondents and the length of the survey. In Table 16 the selection of the functions that will be included can be seen.

It is decided to use the first level function segmentation as proposed function for the vacant retail buildings in the city center in the best-worst scaling experiment. The second level can be used as examples of what this function could be.

Table 16 Proposed functions included in study

Function number	First level	Examples (second level)
1	Daily stores	Supermarket, Drug store, Specialty store
2	Non-daily stores	Fashion and luxury, Leisure and hobby, In and around house/electronics
3	Food & beverage (F&B)	Restaurant, bar/cafe, take away, lunchroom
4	Office	-
5	Residential	-
6	Service	Finance, telecom, broker
7	Healthcare	GP, dentist, physiotherapist, pharmacist
8	Beauty and care (B&C)	Hairdresser, beauty salon, tattoo and piercing
9	Leisure and sports (L&S)	Fitness, museum / gallery, leisure games

If the BIBD is translated to contain the corresponding functions (Table 16), the sets that will be proposed to the respondents can be seen in Table 17. Important for the reliability of the study is the variation of the position of the choices within the set. Also, the sequence in which the sets will be proposed should vary randomly. The sets that will be used for this study translated to functions can be seen in Table 17.

Table 17 BIBD with functions for this study

Set	Function in set		
1	Non-daily store	Residential	Healthcare
2	Daily store	Food & beverage	Healthcare
3	Office	Residential	Beauty and care
4	Food & beverage	Office	Service
5	Non-daily store	Service	Leisure and sports
6	Daily store	Beauty and care	Leisure and sports
7	Office	Healthcare	Leisure and sports
8	Non-daily store	Food & beverage	Beauty and care
9	Daily store	Residential	Service
10	Daily store	Non-daily store	Office
11	Food & beverage	Residential	Leisure and sports
12	Service	Healthcare	Beauty and care

3.2.4 Analysis methods for BWS data

Cheung et al. (2016) have analyzed different studies and found that a variety of analytical methods is used for analyzing data collected with BWS experiments. An overview of the five most used analytical methods, excluding the category of not reported, can be seen below:

1. Simple summary statistics - best-minus-worst (32%)
2. Hierarchical Bayes (21%)
3. MNL model (12%)
4. Latent class analysis (9%)
5. Ordered logit (9%)

Academics have widely applied the best-minus-worst analysis for BWS data, with this type of analysis being performed for approximately one third of best-worst scaling experiments (Cheung et al., 2016). This proven concept therefore will be conducted for an initial analysis and get better feeling of the tendencies of the preferences. To expand on this analysis, and to be able to better incorporate attributes in a model, an MNL will be estimated. The MNL is chosen amongst the previously discussed set of analysis methods due to its robustness and ability to cope with a limited size data set.

Best minus worst analysis

On the level of the individual, the data of the best-worst experiment is easily summarized by counting the number of bests and worsts for each of the objects. A simple scale and weak order results from the subtraction of the worst count for each object from the best count of the object in a BWS experiment, which can consecutively be ordered (Louviere et al., 2015). This can also be seen in Table 18. The best minus worst scores contain all the information that is needed for a conditional (multinomial) logistic (MNL) regression. This implies researchers do not have to use logistic regression to estimate model parameters (Marley & Louviere, 2005). This assumes the maximum difference

model holds, and no formal proof for the unbiasedness of these scores is available. The best minus worst analysis can be further elaborated by dividing the best minus worst score by the total number of appearances. In this way a standardized score can be deducted with a value between -1 and 1. Also, these scores allow for interpretation of relative importance. This is due to the values being on a ratio scale. By dividing the difference between two functions by one of the values, it is possible to say how many times more preferred a certain function is over another function.

Table 18 Best minus worst overview example (Louviere et al., 2015)

Issue no.	Issues (spend more on)	Best	Worst	B minus W
1	Streets and roads	2	1	1
2	K-12 education	2	0	2
3	Tertiary education	4	0	4
4	Parks and recreation	0	1	−1
5	Sports facilities	0	4	−4
6	Housing developments	0	2	−2
7	Job creation	3	0	3
8	Broadband access/speed	1	1	0
9	Tourism facilities	0	3	−3

Multinomial logit modeling

Multinomial logit modeling (MNL) is used to predict a nominal dependent variable given one or more independent variables. Just as other regression techniques, independent variables can be nominal and continuous. Since not all data is suitable to be analyzed by a multinomial logit model it is important to check whether it is possible with the data planning to be gathered. There are six assumptions that need to be passed for data to be suitable for a MNL (Laerd statistics, 2018).

1. Dependent variable should be nominal.
2. There are one or more continuous, ordinal or nominal independent variables.
3. Independence of observations and mutually exclusive and exhaustive dependent categories.
4. No multicollinearity (highly correlated independent variables)
5. A linear relationship between continuous variables and the logit transformation of the dependent variable
6. No outliers, high leverage values

Assumptions one, two and three can be checked in the experiment design. Therefore, it can be concluded that these three assumptions are met. Assumption four can be checked considering the selected locations and their values. Assumptions five and six need to be checked during further steps in the data analysis.

Due to its' closed form and being ready for interpretation logit models are the most widely used and easiest type of discrete choice model. The multinomial logit model makes use of the random utility theory and adds a specific distribution for the unobserved utility. It is assumed that the utility that a decision maker (q) derives from choosing an alternative (i) is composed out of the known utility (V_{iq}) and the unknown part of the utility (ε_{iq}). By assuming that the ε_{iq} is an independently (covariates are zero) and identically (variances constant) distributed extreme value, the logit model is obtained (Train, 2009). This distribution is also referred to as the Gumbel and type 1 extreme value. The independence of the error terms implies that the unobserved part for the utility of a choice alternative is not related to the unobserved portion of the utility of another choice alternative. The model calculates the probability of an individual choosing an alternative (i) from a number of alternatives. This probability is calculated by using the formula as discussed by Train (2009).

$$p_{iq} = \frac{\exp(V_{iq})}{\sum_i \exp(V_{iq})}$$

$P_{iq} = Probability\ of\ chosing\ alternative\ i\ for\ individual\ q$
$V_{iq} = Observed\ component\ of\ the\ utility\ individual\ q\ derives\ from\ alternative\ i$

Calculate the model fit

To calculate the model fit, the McFadden's pseudo R-squared value is calculated. This value is calculated by dividing the log likelihood of the model by the log likelihood of the null model and subtracting this from one. This calculation can be seen in the following formula (Hensher et al., 2015):

$$\rho^2 = 1 - (LL_{Model} \,/\, LL_{Null})$$

Software

For the process of analyzing results obtained from the Best-Worst Scaling (BWS) experiments, a range of software options are available. Among these options, the most prevalent choice is the widely-used 'Sawtooth software', which accounts for approximately 27% of the object BWS analyses conducted, as reported by (Cheung et al., 2016). Additionally, other statistical software packages such as 'SAS', 'Stata', and 'SPSS' are utilized for 8% of the object BWS each.

However, it is worth noting that in approximately 50% of the cases investigated by Cheung et al. (2016), the specific software employed for the object BWS analysis remains unknown, indicating a lack of explicit documentation in those instances.

Turning to the influence of Nlogit software, the aforementioned study observed that it was not explicitly employed in the investigations of object BWS. In other words, the studies examined by Cheung et al. did not make use of Nlogit software when analyzing object BWS scenarios.

In contrast, for the profile case of best-worst scaling, where multiple attributes or features are assessed, Nlogit software was found to be utilized in approximately 10% of the analyses. This suggests that Nlogit software found some application and relevance in a subset of studies employing the profile-based best-worst scaling methodology, as documented by Cheung et al. (2016).

3.3 Required data

To measure the preferences of the city center visitors regarding the use of currently vacant retail buildings, a survey will be deployed. Besides the previously discussed method (best-worst scaling) for the measurement of preferences, this survey aims at collecting both information regarding the personal and shopping trip characteristics of the participant. The physical attributes (building and environment) that are aimed to be included will be varied by the selection of different survey locations. These used locations and their attributes will also be discussed.

3.3.1 Demographic and shopping trip attributes

Firstly, several demographic aspects will be asked to the respondent. These aspects are expected to be relevant for consumer behavior and consequently for the preferences regarding the functions for the vacant retail buildings in the city center. Furthermore, these demographic characteristics allow for a comparison with the group of non-respondents. These are the people that will not engage in the proposal of filling in the survey. The demographic aspects that will be included in the survey are:

1. Age
2. Gender
3. Education level
4. Address

The age of the respondents will be collected using ten-year age cohorts. The use of cohorts also allows for a relatively small cohort size, enabling more detailed analysis and the potential for combining cohorts if deemed necessary. Regarding the gender characteristic, respondents will be provided with four answer options: male, female, other, and prefer not to say. This allows for a comprehensive representation of gender identities, accommodating diverse gender expressions. Furthermore, the educational level of respondents will be categorized into five answer options. These categories align with those used by Statistics Netherlands and cover a range from primary education to higher levels such as master's or PhD qualifications. Lastly, the place of residence of the respondents will be gathered on the level of the 4-digit zip-code. By using this zip-code, it can be determined whether a respondent is a resident of the city or comes from further away. By only using the four digits, people are more inclined to fill in the question and no privacy issues arise.

Second, in addition to demographic information, the survey will also collect data on shopping trip characteristics. These characteristics are deemed important as they contribute to the context in which

preferences are measured and are relevant according to the existing literature on shopping behavior. The specific shopping trip characteristics that will be included in this study are:

1. Shopping motivation
2. Group composition
3. Visit frequency

The literature review indicates that shopping motivation, whether hedonic or utilitarian, has a significant impact on behavior and the perception of attractiveness. Given this finding, it is hypothesized that shopping motivation plays a crucial role in measuring preferences. To assess shopping motivation, the survey question is rephrased in a more understandable manner for respondents. They are asked to indicate whether they are shopping for fun, shopping for a specific purpose, both, or other motivations.

Another important shopping trip characteristic to be considered is group composition. Group composition will be measured in terms of the number of adults and minors present during the shopping trip.

Additionally, visit frequency is included as a relevant trip characteristic. Visit frequency will be assessed using the following levels: daily, weekly, monthly, yearly, and less than yearly. This provides information about both the familiarity with the shopping center and the frequency of utilization.

The third component of the survey involves an open-ended question where respondents are asked to provide their most preferred function for the specific vacant building. This question is presented prior to the subsequent questions to mitigate the potential bias of influencing respondents' answers in a specific direction. By gathering initial preferences through an open-ended format, respondents have the opportunity to freely express their preferences without being influenced by predetermined response options.

Lastly, the preference of respondents regarding the utilization of the vacant retail building will be quantitatively measured using the method discussed in the previous section.

3.3.2 Building and environmental attributes

Data will be collected for various locations in the city center of Eindhoven. It is chosen to focus on the city center of one city to eliminate differences in city typology, which would result in a larger experiment. Eindhoven in particular was selected due to the availability of suitable buildings and practical implications

The survey previously discussed will be completed by respondents for various buildings on different locations. This is done to assure variation in explanatory variables, the building and environmental characteristics. These vacant locations should vary in the building characteristics and environmental

characteristics assessed to be most important. The ranking of the relative importance of the attributes is based on a combination of the literature review and practical implications.

To keep the data collection manageable, the number of vacant retail buildings that will be used is limited to seven. The attributes of these buildings should vary as much as possible, especially the most important attributes. Therefore, the attributes are ranked on importance, based on the literature study (Table 19).

Table 19 Ranking of physical characteristics

Rank	Building characteristic	Environmental characteristic
1	Building size (width)	Surrounding stores/functions
2	Building size (height)	Accessibility
3	Façade building	Façades environment
4	Building entrance	Building height / height to width ratio
5	Building age	Crowdedness
6		Pavement

Given the limited availability of literature specifically addressing the preferences of visitors to city centers regarding the use of vacant retail buildings and the corresponding physical attributes influencing these preferences, alternative literature sources were utilized. The existing research primarily focuses on attractiveness, which serves as a suitable indicator for identifying what visitors find important in their evaluations. However, selecting a function for a building involves considerations beyond visual aspects, as suitability is also influenced by various constraints.

To account for these factors, two building characteristics related to size were deemed to be of most importance. Size directly affects the feasibility of different functions within the building. Additionally, the façade of the building holds significant importance as it represents the only visual component observed when standing in front of it. The façade serves as an indicator of quality and can provide insights into the building's potential for transformation, such as its capacity to accommodate sufficient daylight.

Regarding environmental characteristics, the surrounding stores and functions were identified as the most crucial factor. The clustering of stores with similar products has a known effect on consumer behavior and preferences. Additionally, the function mix in the surrounding environment can indicate the typology or nature of the location. The second-ranked factor is accessibility, which serves as an indicator of location typology as well. Proximity to the train station may suggest a certain type of area, while being close to a bus stop might indicate a location situated on the outskirts of the city center.

The availability of vacant retail buildings suitable for this research was limited. This resulted in less freedom of choice for choosing the locations making up the desired composition. Even though vacancies are present, a variety of reasons made locations unsuitable for this research. For the unbiasedness of the respondents' choices, it is important for the buildings to be empty and well visible. In reality vacant buildings are often used for temporary functions such as pop-up stores or galleries. Also, in some occasions the retail building was being used by a retailer while being available for new renters. In this case, the current user probably does not pay the full rent but can stay till a new occupier is found. Also, some of the vacant buildings were under construction or had new functions being promoted on the window. These constraints combined resulted in the selection of seven buildings (Figure 4).

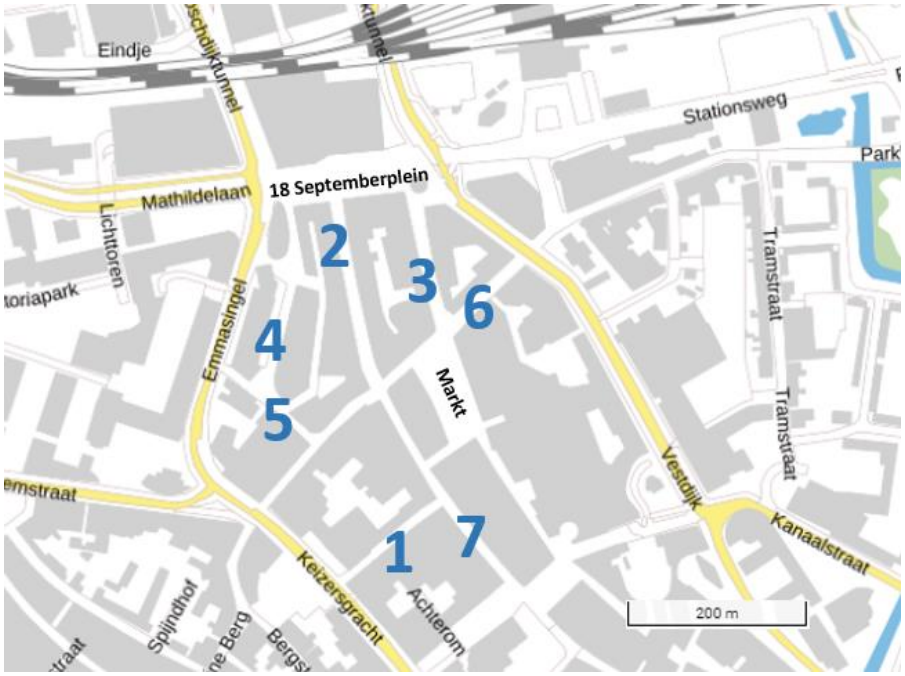


Figure 4 Research locations

As can be seen the vacant buildings are evenly distributed over the city center. Only two of the buildings are located in the same street. The other buildings vary in street and location typologies. The buildings seem to surround an area for which no vacant buildings could be selected. This is the area surrounding the section of the 'Demer' and the 'Marktstraat'. Below, the buildings and their location will be discussed in more detail.

Location 1 - Hooghuisstraat 27

The first vacant retail building (Figure 5), located on Hooghuisstraat 27 has a width of 5.5 meters, and a height of 8.1 meters (equivalent of 3 floors). This building is made of brick and the plinth consists of a combination of wood cladding and large dark window frames. Whilst taking the survey the windows were temporary blocked by a black window foil. The plinth has a window surface share of 45 percent. The bricks are painted white on the upper floors. The building has one entrance which is 1.3 meters wide. The building was constructed in 1939.

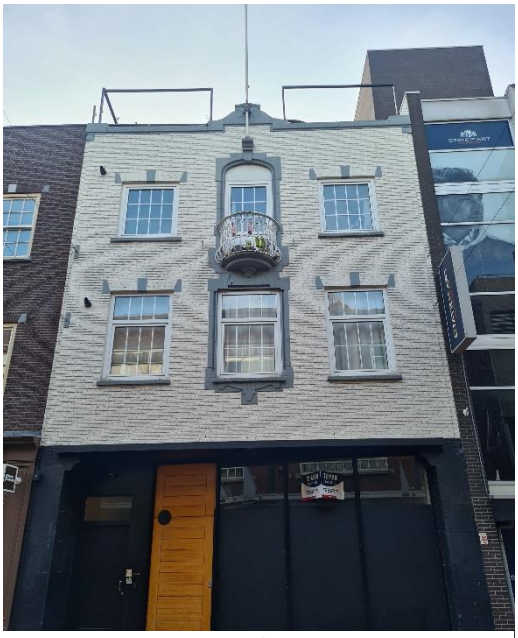


Figure 5 Location 1 - Hooghuisstraat 27

Hooghuisstraat 27 is situated in a place that is not considered to be a main street (Figure 6). The paving on the street is made of red bricks. The street has trees in it and so is visually green. The street is 11 meters wide, with a width-to-height ratio of 1.4. The buildings in the area are all the same height, and their façades have different features. The general style of the façades in the area is not considered modern.

In terms of accessibility, the closest parking garage is located only 40 meters from this building. This parking garage is the Q-park Hooghuis, which has a pedestrian entrance in the street. For the public transport accessibility, the bus stop is located at a distance of 120 meters. This is the bus stop at the west side of the city center. Due to the building being on the west side of the city center the distance to the closest train station is a bit further, 600 meters.

If considering the mix of functions in the direct surrounding it can be seen that only commercial functions are present. 91 percent of the surrounding buildings are stores, and all of these stores are retailers in the field of clothing. 9 percent, the equivalent of 1 building has a food and beverage function in the plinth.

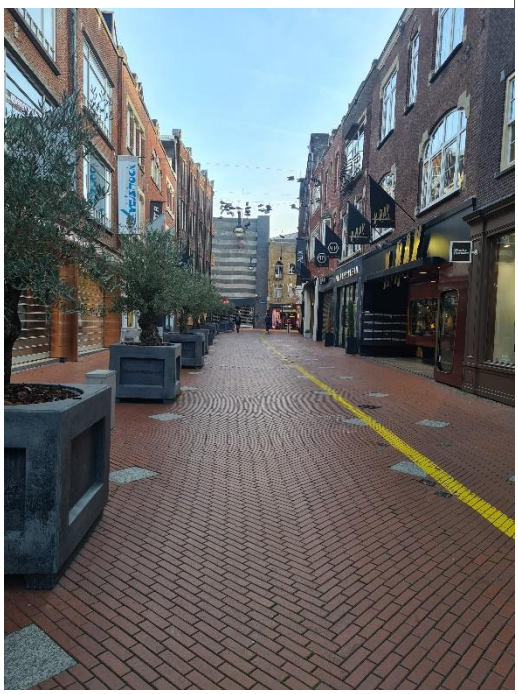


Figure 6 Hooghuisstraat

Location 2 – Demer 6

This structure of location 2 (Figure 7) is made of brick and sandstone with wooden cladding on the plinth, and it measures 5 meters in width and 10.8 meters in height, which equates to four floors. For the plinth, 55 percent of the façade is made up of windows, and it has a red/sand color. There is only one entrance, which is 1.8 meters wide. The building was built in 1951.

Demer 6 is located on what is regarded as a main street (Figure 8). Red bricks are used for the street's paving. There aren't any trees or other significant visual examples of greenery along the street. The street is 13 meters wide, with a width-to-height ratio of 1.2. The buildings in the area vary in height, and their façades display a variety of features. There are no contemporary façades in the area.

This building is located 150 meters from the pedestrian entrance of the closest parking facility. This parking facility is the Q-park at the Mathildelaan. The closest bus stop is at 180 meters walking distance. However due to the central location there are multiple options with approximately the same distance. The distance to the closest train station is 280 meters.

Of the surrounding functions, 90 percent is a type of retail store. The retailed products have a variety of branches. 30 percent of the surrounding stores are retailing in the clothing branch. 10 percent of the surrounding functions are active in the food and beverage (in this case a larger fast-food chain).

Figure 7 Location 2 - Demer 6

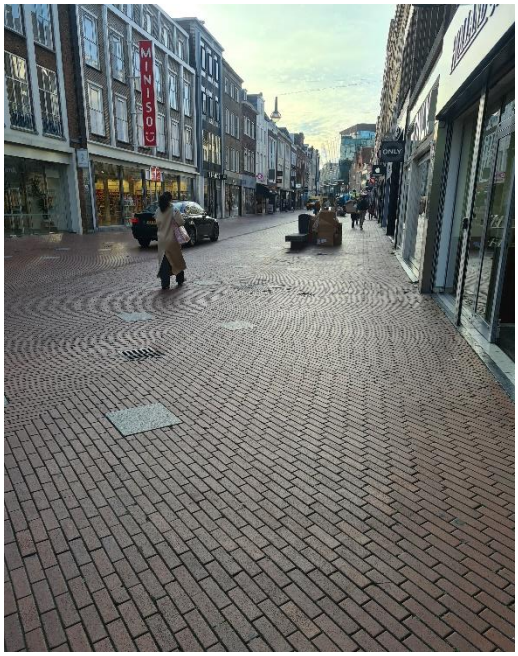


Figure 8 Demer

Location 3 - Hermanus Boexstraat 30

This building (Figure 9) with an almost exclusively glass plinth façade is 13.5 meters tall, or the equivalent of 5 floors, and 6.8 meters wide. 55 percent of the black frame plinth façade is made up of windows. There is only one entrance, which is 2.1 meters wide. The building wasn't built on a corner and was built in 1955.

The Hermanus Boexstraat 30 is a main street with red brick pavement (Figure 10). There are trees lining the street which results in a visually green environment. The street has a width-to-height ratio of 1.1 and is 15.5 meters wide. The buildings in the area are all the same height, and they all have similar-looking façades. There are no contemporary façades in the area.

This location has a distance of 180 meters to the closest parking facility. This parking facility is the Q-park at the Heuvel. The pedestrian entrance is located within the Heuvel shopping center. The distance to the bus stop is 200 meters and to the train station 280 meters.

The location at the Hermanus Boexstraat is predominantly surrounded by retailers. 82 percent of the surrounding buildings are stores, of which more than half is an optician. Only one of the surrounding retailers is active in the clothing branch. Besides retail also, one food and beverage outlet is present within range.

Figure 9 Location 3 - Hermanus Boexstraat 30

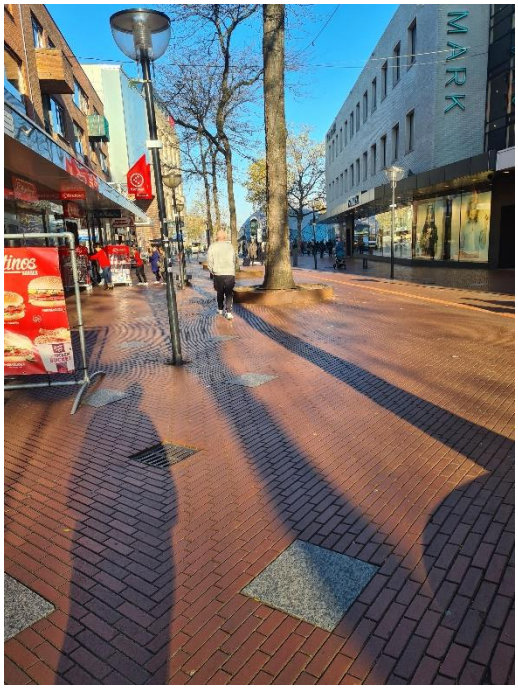


Figure 10 Hermanus Boexstraat

Location 4 - Nieuwe Emmasingel 28

This structure (Figure 11) is made of glass (plinth) and cladding (upper floors) and measures 7.7 meters in width by 13.5 meters in height. 85 percent of the plinth façades consists out of windows. The remainder has a grey/black color scheme. There is only one entrance, which is 2.4 meters wide. The building is not a corner building and was built in 2011.

On the street where Nieuwe Emmasingel 28 is located, the paving is made of a mix of brick and natural stone (Figure 12). The street is visually green but does not have trees. The street is 9.2 meters wide, with a width-to-height ratio of 1.1. The buildings in the area are all the same height, and they all have similar-looking façades. Modern façades can be seen in the area.

For this location, the distance to the entrance of a parking facility is only 25 meters. The parking facility is the Q-park of the Admirant. The bus stop is further away with a distance of 160 meters. The train station is even further away and has a walking distance of 450 meters.

55 percent of the buildings surrounding this location has a retail function. Of these retailers there are none operating in the clothing branch and 18 percent are opticians. 27 percent of the surrounding buildings has a food and beverage function. This contains both restaurants and coffee business. 18 percent of the surrounding buildings is vacant.

Figure 11 Location 4 - Nieuwe Emmasingel 28

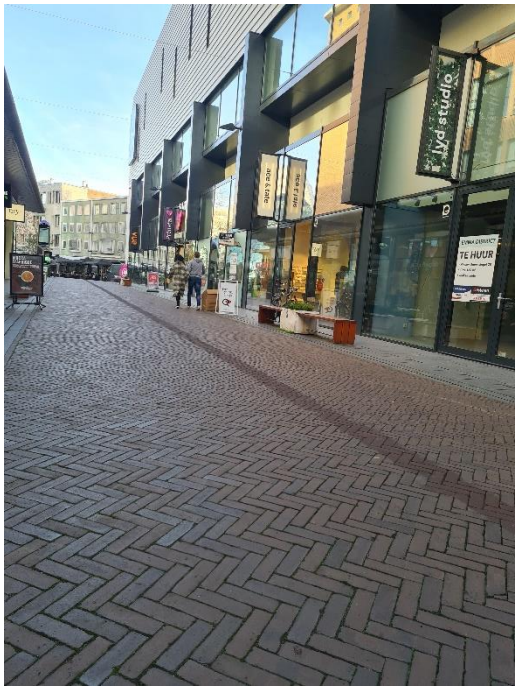


Figure 12 Nieuwe Emmasingel (a)

Location 5 - Nieuwe Emmasingel 92

This brick structure (Figure 13) is 10.8 meters tall (equal to 4 floors), 8.4 meters wide. The façade has a dark red color, and 45 percent of its plinth is made up of windows. There is only one entrance, which is 1.5 meters wide. The building which is location at a corner was constructed in 2009.

The address Nieuwe Emmasingel 92 is situated on a street that is made of brick and natural stone (Figure 14). The street is visually green but does not have trees in it. The Nieuwe Emmasingel is 8.8 meters wide, with a width-to-height ratio of 0.8. This is the street the entrance of the building is located on. The buildings in the area vary in height, and their façades display a variety of features. The buildings in the area are assessed to have modern façades.

The closest parking facility is the same as for location 4, and lays in between location 4 and 5. From this location the distance to the entrance is 60 meters. The closest bus stop from this location is 120 meters away. The train station of the central station is a 550 meters walk.

At this location only 64 percent of the surrounding functions is a store of some kind. Almost half of these stores operate in the clothing branch. Food and beverage is relatively well represented at this location and makes up 27% of the function mix. No vacancies are present in the used range. The Philips museum is within range and results in a share of 9 percent for leisure.

Figure 13 Location 5 - Nieuwe Emmasingel 92

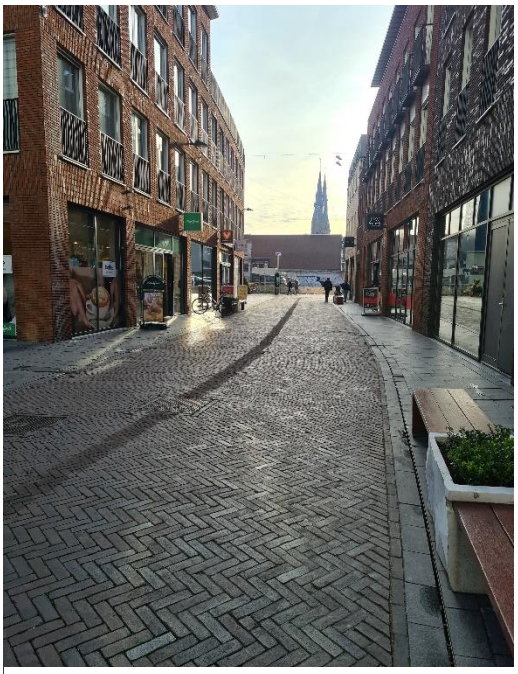


Figure 14 Nieuwe Emmasingel (b)

Location 6 – Nieuwstraat 15

This brick structure (Figure 15) has a width of 8.5 meters, a height of 8.1 meters, the equivalent of three floors. 50 percent of the plinths' façade is made up of windows, and it has predominantly a sand color. There is only one entrance, which is 1.8 meters wide. The building, a corner structure, was built in 1992.

The location of Nieuwstraat 15 is on a red brick-paved street (Figure 16). Brick is used in the construction of the structures, the trees that are present in the street make it visually green. The width-to-height ratio of the street is 2.0, and it is 16.3 meters wide. The buildings in the area vary in height, and their façades display a variety of features. Modern façades can be seen in the area.

For this location, the closest entrance to a parking facility is 160 meters away. This is the same facility as location 3, and therefore the entrance is located within a shopping center. In terms of public transport, the location has a walking distance of 130 and 280 meters for the bus stop and train station.

The function mix at this location differs from the other locations. No stores are present within range and thus retail makes up 0 percent of the function mix. This is largely compensated by the high share of food and beverage services. This makes up 82 percent. Furthermore, a leisure function is present within range (casino) and one of the surrounding buildings is vacant.

Figure 15 Location 6 – Nieuwstraat 15

Figure 16 Nieuwstraat

Location 7 - Rechtestraat 40

This structure (Figure 17) is made of brick with wooden cladding on the plinth, has a width of 6 meters, a height of 10.8 meters (equivalent to 4 floors), and is 10.8 meters tall. 30 percent of the plinths' façade is made up of windows, and it has a blue color. There is only one entrance, which is 1.6 meters wide. The structure, which wasn't built on a corner, was built in 1938.

In the Rechtestraat (Figure 18), there is a road which is paved with red bricks. Visually, the street has no greenery. The street width is 9.5 meters, and the width-to-height ratio is 0.9. Buildings in the area differ in height and façade design. Façades in the area do not feature modern designs.

This location makes use of the same parking facility as location 1, the Q-park Hooghuis. The entrance to this parking facility is located at 110 meters walking distance. In terms of public transport this location does not have the shortest distances. The bus stop is 200 meters away and the train station a 550 meters walking distance.

In the direct surrounding, 82 percent of the buildings has a retail function in the plinth. Most retailers, 62 percent, are operating in the clothing branch. No food and beverage services are present within the used range. One of the surrounding buildings is vacant and under construction during time of the data collection.

Figure 17 Location 7 - Rechtestraat 40

Figure 18 Rechtestraat

3.3.3 Overview of research locations

In this section an overview of the chosen research locations will be discussed. This overview is important since it includes the attribute levels that will be used for the following analyses. The location attributes are divided over three tables. The building attributes are presented in the first table (Table 20). The environmental characteristics are subdivided in environmental properties and the retail mix (Table 21 and Table 22).

Table 20 Building attributes by location

	Location 1	**Location 2**	**Location 3**	**Location 4**	**Location 5**	**Location 6**	**Location 7**
Width	5.5 m	5.0 m	6.8 m	7.7 m	8.4 m	8.5 m	6.0 m
Height	8.1 m	10.8 m	18.4 m	13.5 m	10.8 m	8.1 m	10.8 m
Plinth window (%)	45%	55%	55%	85%	45%	50%	30%
Plinth Brick (%)	0%	0%	0%	0%	40%	20%	0%
Plinth wood (%)	15%	45%	10%	0%	0%	0%	60%
Color plinth	Grey/ black	Blue	Grey/ black	Grey/ black	Other	Other	Blue
Material façade brick?	Brick	Other	Brick	Other	Brick	Brick	Brick
Color façade	White/ grey	Sand	Red	White/ grey	Red	Sand	Red
Door width	1.3 m	1.8 m	2.1 m	2.4 m	1.5 m	1.8 m	1.6 m
older than 1990	Yes	Yes	Yes	No	No	No	Yes
Corner	No	No	No	No	Yes	Yes	No

In Table 20 the distribution of building properties can be seen. Both the height and the width of the buildings are included in meters. The height of the used buildings varies between 8.1 and 18.4 meter and the widths are between 5 and 8.5 meter. The plinth of the building is included in three attributes: the material, the color and the percentage window. Wood cladding is most common, but also glass and brick occur. The colors represented in the data are divided in three categories (grey/black, blue and other). The percentage window concerns the percentage of the ground floor façade that consist of window. For the rest of the façade, concerning the other floors, both color and the material are included. The door width, which is another attribute, varies between 1.3 and 2.4. This is the width of the entrance to the ground floor of the building, so doors to properties located above the vacant store are not included in the data. The building age is brought back to a two-level attribute indicating whether a building is older than 1990. Lastly two of the research locations are located at a corner, with an ally like street next to it.

Table 21 Environmental attributes by location

	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7
Main shopping street	No	Yes	Yes	No	No	No	Yes
Pavement color	Red	Red	Red	Grey/ brown	Grey/ brown	Red	Red
Greenery in Street	Visual	No barely	Visual	Visual	Visual	Visual	No barely
Trees in street	Yes	No	Yes	No	No	Yes	No
Width street	11.0 m	13.0 m	15.5 m	9.2 m	8.8 m	16.3 m	9.5 m
Width height ratio	1.4	1.2	1.1	1.1	0.8	2.0	0.9
Diverse facades	Yes	Yes	No	No	Yes	Yes	Yes
Modern environment facades	No	No	No	Yes	Yes	Yes	No
Height differentiation?	No	Yes	No	No	Yes	Yes	Yes
Distance train	600 m	280 m	280 m	450 m	550 m	280 m	550 m
Distance bus	120 m	180 m	200 m	160 m	120 m	130 m	200 m
Distance parking	40 m	150 m	180 m	25 m	60 m	160 m	110 m

In Table 21, the street is included in the data by the color of the pavement, which has two levels. This attribute is constraint by the typologies of the streets in Eindhoven. Almost the whole city center is paved with the similar material in the same color. The Nieuwe Emmasingel is one of the only streets with other pavement. This results in the two locations at this street being the only locations with different pavement, and consequently it cannot be determined whether effects in further analysis will be a result from pavement or other street typologies that are unobserved. Also, a distinction is made between main street and no main street. Three locations are assessed to be on a main street based on the footfall discussed in the thesis by Van Brussel (2022). The greenery in the street is included in two different ways. The presence of trees on the one hand and the visual greenery in streets (visual or barely) on the other hand. The width of the street is also included, measured at the point of the building of interest. Large variation is present with the narrowest street being 8.8 meter and the widest being over 16 meters. The width to height ratio is included in the data too. The surrounding buildings are included in terms of whether these are modern, divers and whether the height of the buildings is similar or varying. For these attributes, a decent mix in levels is present. Lastly, the distance from the locations to different transportation possibilities are included. The distance to the train station varies between 280 and 600 meters. The distance to bus stations varies between 120 and 200 meters. This is however from different bus stations with different bus lines. The direction of the bus

and the route is not accounted for. Lastly, parking facilities can be seen. This is the distance till the (pedestrian) entrance of the closest parking facility. Large variation is present with the closest entrance being only 25 meters away from location 4 to being 160 meters away from location 6.

Table 22 Retail mix by location

	Location 1	**Location 2**	**Location 3**	**Location 4**	**Location 5**	**Location 6**	**Location 7**
Store	91%	30%	82%	55%	27%	0%	82%
Clothing	91%	10%	9%	0%	64%	0%	55%
F&B	9%	0%	9%	27%	27%	82%	0%
Vacant	0%	0%	0%	18%	27%	9%	9%
Optician	0%	0%	45%	18%	0%	0%	0%
Leisure	0%	0%	0%	0%	9%	9%	0%

The functional mix (Table 22) of the built environment has been analyzed in terms of six different types of functions, namely stores in general, clothing stores, food and beverage (F&B) establishments, vacancies, opticians, and leisure functions. The percentage of each function has been determined based on the presence of eleven surrounding functions, three on the left and right sides, and five on the opposite side of the street. The proportion of stores in the vicinity exhibits substantial variation across locations. For instance, no stores are present in the surroundings of Location 6, which is characterized by a predominance of F&B establishments. Conversely, Location 1 is almost exclusively comprised of stores. Locations 4 and 5 are notable for their higher-than-average incidence of vacancies, and they are both situated in the same street. Location 3 has a remarkably high concentration of opticians, which are considered to be a type of store. Lastly, locations 5 and 6 feature a leisure function in their immediate surroundings.

3.3.4 Data collection

The research methodology employed a survey administered through the Lime Survey program, allowing for online data collection with features like randomization of choice orders. Participants were presented with choice tasks (Figure 19), and each survey included twelve instances of these tasks with variations in functions and order. Respondents saw each proposed function four times, always in sets with two other functions. An example survey is included in the appendix (Appendix A).

Least preferred		Most preferred
○	**Non-daily store** (Fashion and luxury, Leisure and hobby, Electronics)	○
○	**Leisure and sports** (Fitness, Museum / Gallery, Leisure games)	○
○	**Service** (Bank, Telecom, Broker)	○

Figure 19 Example choice task (BWS)

Data collection for the study involved approaching individuals in the city center of Eindhoven, using tablets to facilitate on-site survey completion. The target group consisted of city center visitors, and data was collected from December to February (2023), aligning with retail opening hours. Seven vacant retail buildings served as survey locations, with thirty respondents recruited at each location. Observable characteristics of non-participating visitors were also noted for comparison purposes.

The study focused on the target population of city center users, which includes consumers, residents, workers, commuters, and others. In order to ensure statistical robustness and the ability to make valid claims regarding respondent preferences, it is considered to be a rule of thumb that 30 choice task entries are required. Since all respondents answer all the choice tasks in an experiment, this results in 30 respondents per research location. Conducting the survey on-site within the city center provided direct access to the desired group and accounted for environmental and physical characteristics that could influence preferences and behaviors.

3.4 Conclusion

In conclusion, considering the research aim, a context-dependent best-worst scaling experiment is deemed most suitable for integrating the attributes in the preference for vacant retail real estate. This method involves respondents indicating both a best and a worst choice from a set of options. The experiment will utilize nine functions identified from the literature review, including daily store, non-daily store, food & beverage, office, residential, service provider, healthcare, beauty & care, and leisure & sports.

To minimize the number of choice tasks, a balanced incomplete block design will be employed. The survey design will consist of twelve choice sets, with three functions per set. All respondents are faced with the same twelve choice sets. The order in and between sets will be randomly varied across all surveys.

The survey will also include personal and shopping trip attributes, encompassing factors such as age, education, gender, address, visit frequency, visit motivation, and group composition. Furthermore, the physical characteristics of the buildings and the surrounding environment will be varied using seven different buildings located in different streets within the city center of Eindhoven. These buildings offer sufficient variation in a range of attributes.

Both physical and non-physical attributes will be incorporated into the dataset for analysis to explain the observed preferences. To this end, a combination of best-minus-worst scaling and a multinomial logit model will be employed. The Nlogit software will be used for estimating this model.

4. Data analysis and results

In this chapter, the data analysis and results will be discussed. In the first part, the sample will be described by means of descriptive statistics. Secondly, a best-minus-worst analysis will be conducted to gain knowledge concerning the preferences of the respondents without including explanatory variables. Following a more elaborate model, the multinomial logit model, will be used for the purpose of finding out which characteristics affect the city center visitors' preference regarding the use of currently vacant retail buildings.

4.1 The sample

Data was collected for 211 respondents in the city center of Eindhoven. Every respondent has executed the survey for one location. The totality of respondents is divided approximately evenly over the seven different locations. There are thirty respondents per location except one, which has thirty-one respondents.

4.1.1 Demographics

This section discusses the demographic characteristics of the research sample. The characteristics that will be described are the gender, age, and level of education and place of residence. These characteristics will be compared with the non-respondents of this study. In this study, it is determined whether the sample is representative of the target group of 'visitors of the city center'. The target group is based on the non-respondent sample which was also collected in this study. This is a sample of the group of people who denied the proposal of filling in the survey. From this data it can be determined whether there is a differentiation in respondent and non-respondents.

Furthermore, group attribute levels were aggregated. By consolidating certain attribute levels into the new aggregated levels, the distribution of attribute levels across various locations is more balanced. This approach allows for more robust analysis while maintaining meaningful group sizes and accounting for the variations in composition of attribute levels.

Gender

In the data collection, the gender attribute had three answer possibilities. The possibilities included are male, female and other.

Table 23 Gender distribution in sample

		Respondents		**Non-respondents**	
Gender composition	Male	109	51.7%	129	44.5%
	Female	101	47.9%	161	55.5%
	Other	1	0.5%	-	-
Total		211	100%	290	100%

In Table 23, the composition of the group of respondents and non-respondents regarding the gender can be seen. In the sample for this study, almost 52 percent of the respondents identified themselves as male while almost 48 per percent of respondents indicated to be female. Also, one respondent in the dataset indicated to be 'other'. This will be compared to the non-respondents of this study. The group of non-respondents concerns a sample of the people who did not engage in filling in this survey. A sample of these people were noted for three properties that were visually assessed. One of these properties is the gender (Male, Female). If comparing the group of respondents to the non-respondents, it is evident that the respondents have a slight overrepresentation of males. If conducting a Chi-Square test, using only male or female, a statistical difference is found (X^2= 4.684, df=1, p-value=0.030). This indicates that the observed composition of the male and female group differs from the non-respondents.

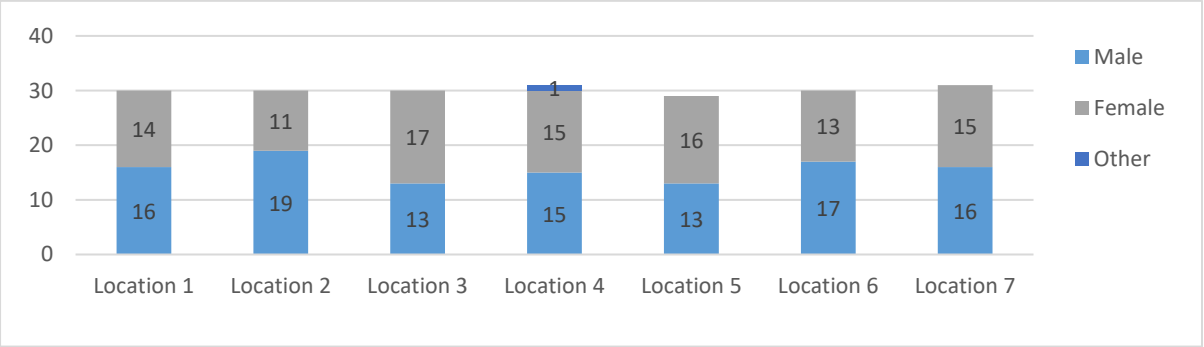


Figure 20 Gender by location

Upon comparing the gender distribution of respondents across different locations, slight differences were observed. Notably, location 2 (Demer) and location 6 (Nieuwstraat) had a higher proportion of male respondents, while location 5 (Nieuwe Emmasingel) and location 3 (Hermanus Boexstraat) had a higher proportion of female respondents. Overall, males were slightly overrepresented in the data, which is evident from Figure 20. Conversely, two locations had more female than male respondents, while gender distribution was equal in location 4. It is also worth noting that one respondent in location 5 identified as 'other' for gender.

Age

For this study, the age of respondents was collected in 10-year cohorts. However, age was limited to individuals aged 16 years and above, as they are considered capable of participating in research without parental consent. Additionally, age was capped at 65 years and above. The age distribution of respondents was compared to a sample of individuals who declined participation in this research.

Table 24 Age distribution in sample

		Respondents		Non-respondents	
Age composition	16-24	81	38.4%	23	8%
	25-34	69	32.7%	66	23%
	35-44	16	7.6%	43	15%
	45-54	13	6.2%	79	27%
	55-64	15	7.1%	50	17%
	>65	17	8.1%	29	10%
Total		211	100%	290	100%

As can be seen (Table 24) the two youngest age cohorts have a vast overrepresentation. Together these groups make up over 70 percent of the respondents in this research data. The age of the non-respondents was estimated by the interviewers in the city center. This allows for a large uncertainty of the reliably of the data. It can be seen that the group of the respondents differs drastically from the group of non-respondents, where the age distribution is spread more evenly.

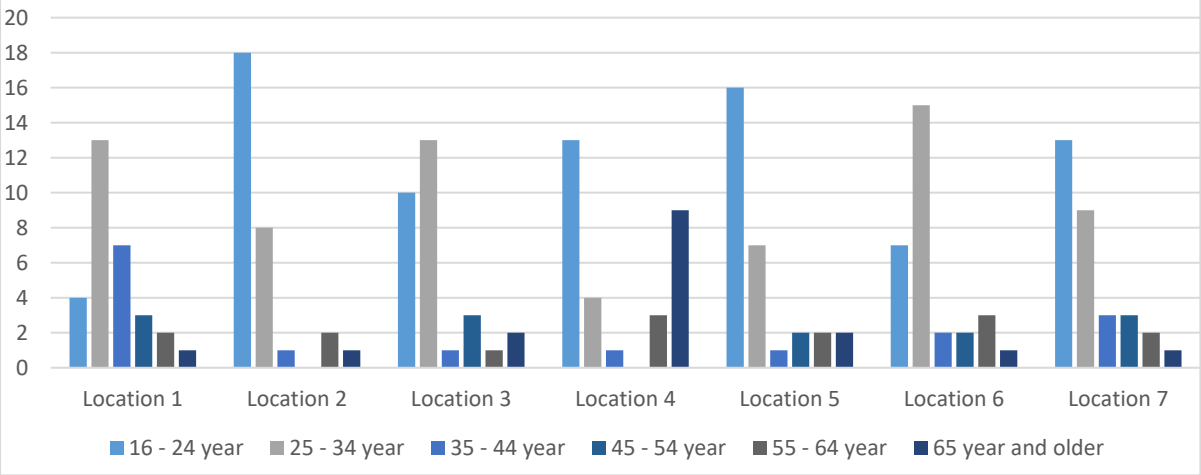


Figure 21 Age by location

Figure 21 provides a visualization of the age composition of respondents across different locations. Notably, there are significant differences in the age distribution among these locations, with a higher representation of younger age groups overall, as previously described. This trend is clearly evident in the figure, which illustrates a large proportion of 16 to 24-year-olds in location 2 (Demer) and location 5 (Nieuwe Emmasingel), accounting for over half of the total respondents for these locations. The concentration of younger people in location 2 may be attributed to its strategic location at the 'Demer', the primary shopping street in the city center, as well as its proximity to the central square. This location, which hosts many larger retailers, may be more attractive to younger individuals than the other locations. Conversely, location 4 stands out in terms of the number of respondents aged over 65, likely due to the popular bookstore 'Van Piere' located directly opposite from this location.

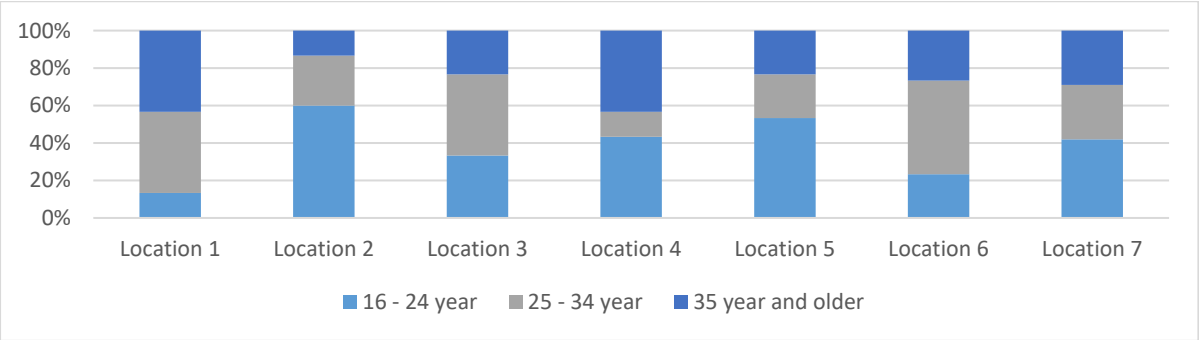


Figure 22 Age by location aggregated

To facilitate analysis with meaningful sample sizes and distributions, the original age cohorts were combined to create new attribute levels (Figure 22). This approach aimed to address the limitation of small group sizes by merging age ranges. Specifically, the new age cohorts comprised individuals aged 16 to 24, 25 to 34, and 35 years and older.

The decision to combine the age range of 35 years and older into a single group was driven by the need for adequately sized groups. Although this age group may encompass diverse characteristics within it, the smaller individual groups obtained by separating them were deemed insufficient for meaningful analysis. By aggregating the data into these new age cohorts, it was aimed to strike a balance between maintaining a sufficient sample size and capturing broader age categories that would enable reliable analysis.

On the new aggregated levels, a Chi-Square test was performed to compare the respondents to the non-respondents. The results of the Chi-Square test (X^2= 307.113, df=2, p-value<0.000) indicate that there is a statistical difference between the age composition of the sample and the age composition of the group of non-respondents.

Education level

Table 25 is created to check whether the sample's education level matches the Dutch national average.

Table 25 Education distribution in sample

		Respondents		Dutch population (x1000)	
Education level composition	Primary	1	0.5%	1265	8.8%
	Lower vocational	8	3.8%	2847	19.9%
	Vocational	43	20.4%	5211	36.5%
	Higher education bachelor	70	33.2%	3122	21.8%
	Higher education master/PhD	89	42.2%	1850	12.9%
Total		211	100%	14 295	100%

Statistics Netherlands was consulted to obtain information on the population's education level (Statistics Netherlands, 2021). The Dutch population includes people who are at least 15 years old, whereas the respondents are 16 years or older. The composition of the samples' education level does vary compared to the national composition. The respondents typically have completed a higher degree of education than the average person. 75% of the respondents in the sample have completed a higher education, compared to the national average of 35%.

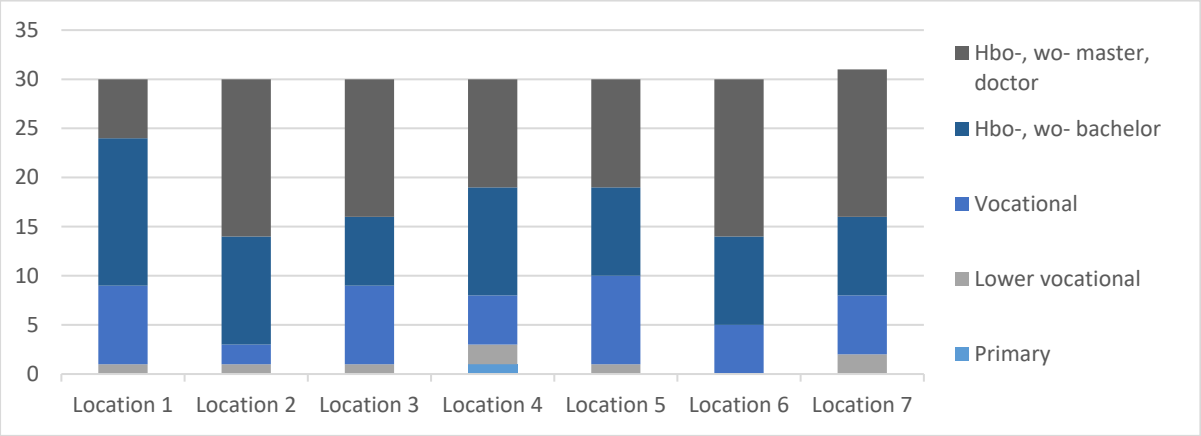


Figure 23 Education level by location

In Figure 23, the distribution of education level for the different locations can be seen. As expected, the two highest levels of education are most visible. Especially for location 2 (Demer), where these groups make up 90 percent of the respondents. Location 1 (Hooghuisstraat) has a relatively large group of the second highest level of education. The lowest level of education, primary education, only occurs once at location 4 (Nieuwe Emmasingel).

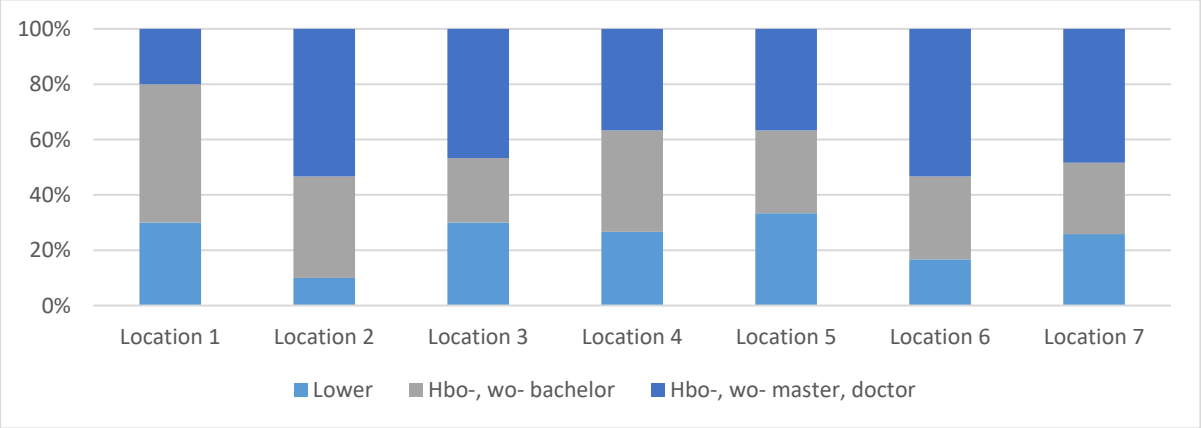


Figure 24 Education level by location aggregated

To enable further analysis with attribute levels of adequate size, the lowest education levels were aggregated (Figure 24). This aggregation was undertaken with the goal of ensuring sufficient sample sizes and improving the distribution of education levels across different locations.

The new attribute levels in the analysis pertain to individuals who have completed a master's degree or higher, those who have obtained a bachelor's degree or higher, and individuals with educational attainment below the bachelor's level, referred to as "lower" education levels.

On the new aggregated levels, a Chi-Square test was performed to compare the respondents to the Dutch population. The results of the Chi-Square test (X^2=205.057, df=2, p-value<0.000) indicate a statistical difference between the education composition of the sample compared to the Dutch national composition.

4.1.2 Familiarity

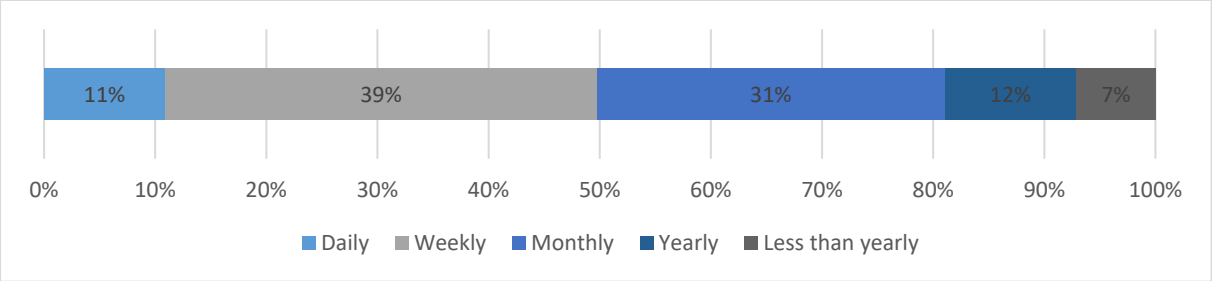


Figure 25 Visit frequency

The respondent was asked to indicate how frequently they visited the city center in order to investigate how familiar they were with the city center of Eindhoven. As can be seen (Figure 25), 50% of the respondents visits the city center at least once per week. This group most likely has a good awareness of their non-visual surroundings. The same is the case, in a smaller degree, for the 31% of visitors who make an average of one monthly trip to Eindhoven's city center. Finally, just short of one-fifth (19%) of the respondents said they visited the center once a year or less. This group most likely knows less about the environment besides what is directly in view when the survey is being conducted.

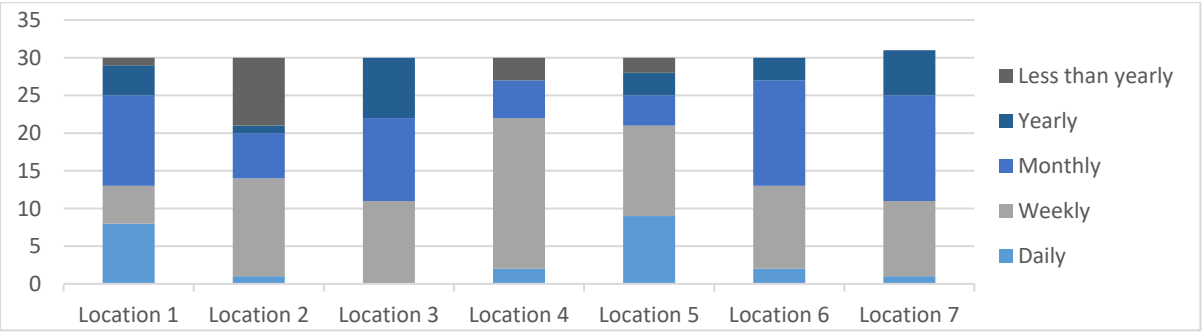


Figure 26 Visit frequency by location

It is clear that there are differences when the visit frequency is divided among the locations (Figure 26). The locations with the most daily visitors are 5 (Nieuwe Emmasingel) and 2 (Demer). The pattern is different at location 4 (Nieuwe Emmasingel), though. Given that locations 4 and 5 are on the same street, this is odd since similar patterns might be expected. The majority of respondents who

answered "less than yearly" were at location 2 (Demer). Although it may seem strange, this can largely be attributed to one relatively sizable group of respondents. Additionally, location 2 is close to the "18 September" square on the one of city's main shopping streets. There may be more tourists coming to this prominent location. Furthermore, location 4 and 5 (Both Nieuwe Emmasingel) also included respondents who visit the city center less than once a year. This might apply to tourists who intended to go to the Philips Museum, which is situated on the same street as these two locations. It is reasonable to assume that respondents who reported visiting the center on a monthly basis or more frequently had a good understanding of their surroundings. This group accounted for at least two-thirds of the respondents in all locations, frequently exceeding 80%.

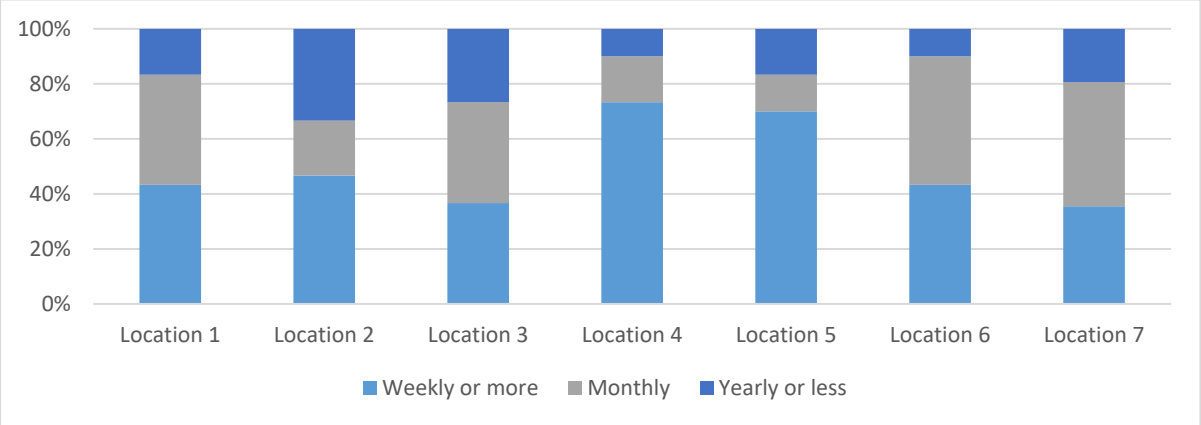


Figure 27 Visit frequency by location aggregated

In a manner consistent with the aggregation of personal characteristics, the visit frequency variable was also aggregated into specific levels to establish a new distribution suitable for further analysis (Figure 27). Within this revised distribution, individuals who visit on a weekly basis or more frequently are combined into a single group. The attribute level representing monthly visits remains unchanged. Similarly, individuals who visit yearly or even less frequently are combined into a single group.

The decision to combine these levels was driven by the similarities observed among the respective groups. It was assumed that the difference between visitors on a weekly and daily basis is minimal, as is the difference between visitors on a yearly or less than yearly basis.

The resulting distribution can be observed in Figure 27. However, it is important to note that the large representation of frequent visitors remains evident in locations four and five. This observation suggests that these locations attract a significant number of individuals who visit with high frequency, possibly indicating a distinct pattern or preference for these particular locations.

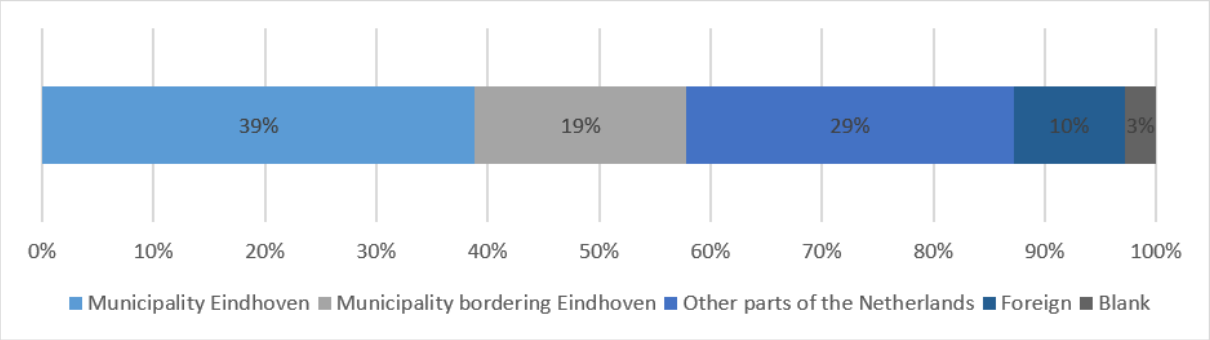


Figure 28 Place of residence

The place of residence is based on the result of two questions. Firstly, a respondent is asked whether they reside in the Netherlands. If the answer to the first question is yes, the four numbers of the zip-code are requested. As can be seen in

Figure 28, the respondents vary in their place of residence. Just short of 40% of the respondents live in Eindhoven. Following, 20%, lives in one of the municipalities bordering to the municipality of Eindhoven. These municipalities are: Oirschot, Best, Son en Breugel, Nuenen, Geldrop-Mierlo, Heeze-Leende, Waalre, Veldhoven, and Eersel. About 30% of respondents were living in other parts of the country. 10% of the respondents were residing abroad and visiting the city center possibly as a tourist. Where the foreigners come from is not asked in the survey and thus unclear. Lastly, six respondents living in the Netherlands did not to indicate their zip-code. This could be due to privacy concerns or the respondent not memorizing it.

4.1.3 Shopping trip characteristics

In the following section, the shopping trip characteristics of the respondents in the sample will be discussed. These shopping trip characteristics concern the motivation of the visit to the city center and the group composition during the visit to center of Eindhoven. Both the visit motivation and the group composition will be discussed for all different locations.

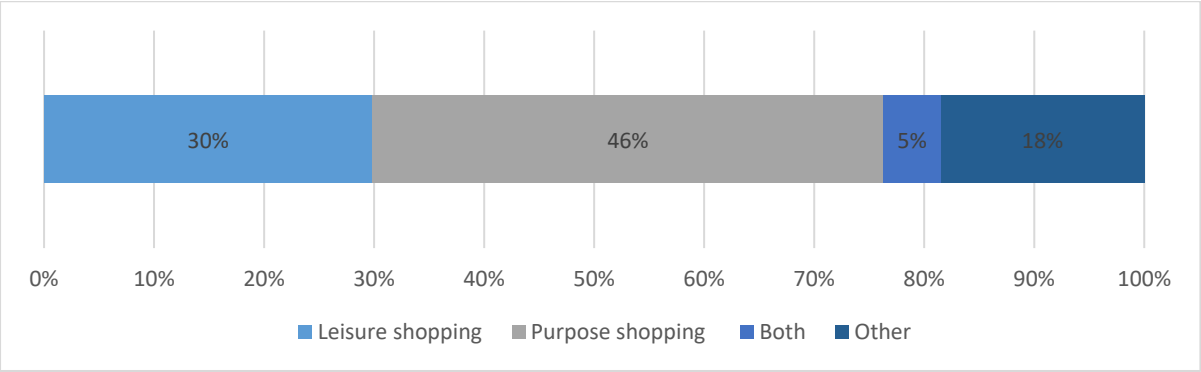


Figure 29 Visit motivation

The most frequent reason for the respondents' visit, as shown in Figure 29, is for shopping purposes. Out of the 211 respondents, 46% said they were there to make a specific purchase. This is consistent with a utilitarian motive. Leisure shopping was the second-most frequently mentioned reason. The group of respondents who were in the city center for their enjoyment comprised 30% of those visiting the city center. This leisure shopping fits the hedonic shopping motivation. With only 5% of respondents saying both of these reasons played a role in their visit, this group is quite small. Finally, a sizable 18% of respondents indicated that "other" was the reason for their visit. This group of respondents frequently mentioned: passing through, food and beverage or leisure activities as being their main visit motivation.

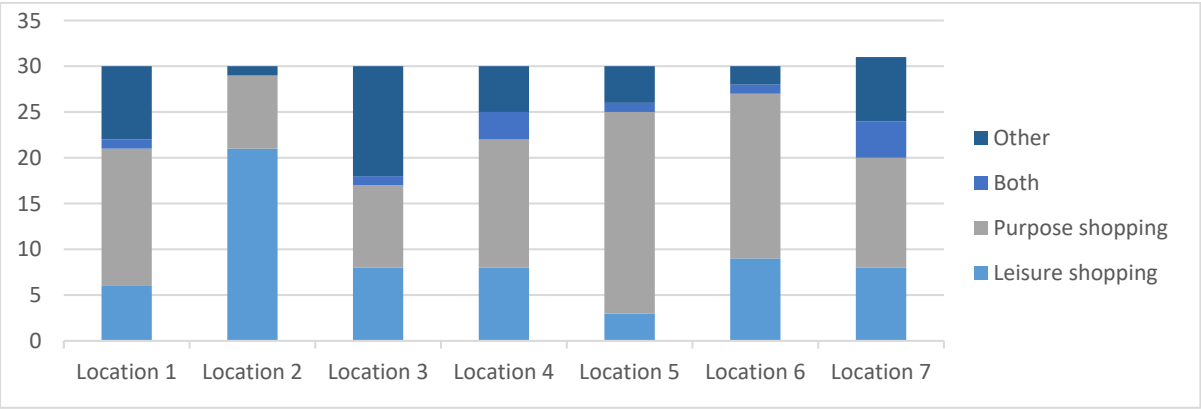


Figure 30 Visit motivation by location

Figure 30 illustrates how the respondents' motives for visiting differs over the various locations. The high percentage of leisure shoppers at location 2 (Demer) stands out most in this figure. This might seem strange, but it could be related to the fact that the location chosen for this study was on the most noticeable main street. Location 2 is situated on the Demer, a short distance from the main "18 September" square. The proportion of leisure shoppers is lowest at location 5 (Nieuwe Emmasingel), whereas the proportion of purpose shoppers is highest when it is compared to the other research locations. One could argue that location 5 is one of the city center's less traveled streets and that leisure shoppers are less likely to stray here. However, given that location 4 is on the same street, this

is odd. The majority of visitors who have "other" visit motivation are concentrated at location 3 (Hermanus Boexstraat). This may have been influenced by the location of the Hermanus Boexstraat, which is near the main thoroughfare from the central station to the city center and the "Markt", an area where food and beverage businesses form the majority. The second-highest proportion of 'other' visit motivations occurs at Location 7 (Rechtestraat). The same argumentation holds, to a lesser extent, for location 7 than for location 3. The Rechtestraat is close to "Stratumseind", a district with a lot of bars, cafes, and restaurants, and is situated close to the south entrance of the city center.

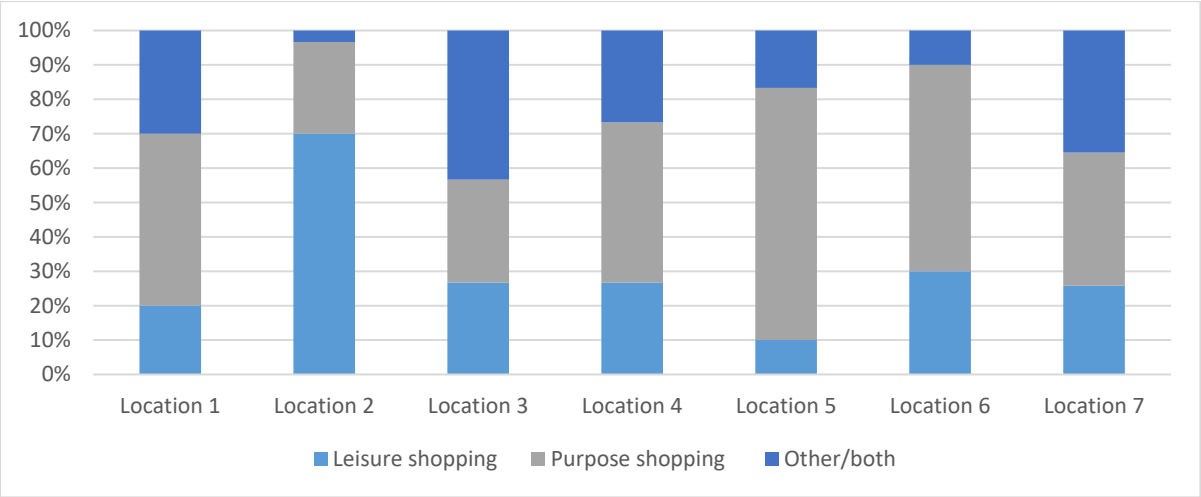


Figure 31 Visit motivation by location aggregated

In order to facilitate further analysis, the visit motivation variable was rearranged to establish three distinct nominal levels. These levels were designed to retain the differentiation between hedonic and utilitarian shopping motivations, specifically shopping for leisure purposes versus shopping with a specific purpose in mind.

The group of respondents who indicated both motivations (hedonic and utilitarian) was combined with the larger group that indicated "other" motivations. This consolidation allowed for a more comprehensive understanding of the overall visit motivations. The new distribution of these aggregated levels is illustrated in Figure 31.

It is worth noting that there are distinct patterns within specific locations. Location 2 exhibits a significant overrepresentation of visitors motivated by leisure shopping. This might be the result of location 2 being the most evident example of prime shopping location. On the other hand, locations 3 and 7 stand out in terms of the "other/both" visit motivation category.

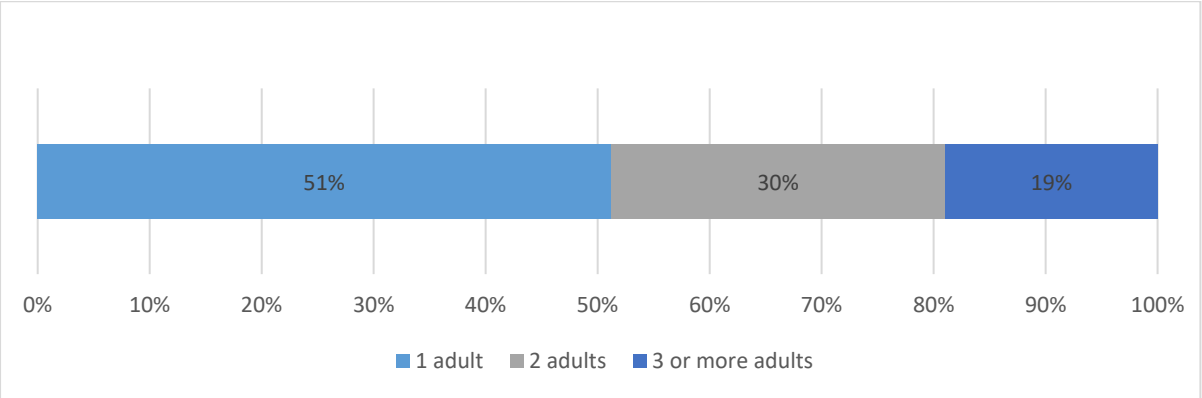


Figure 32 Group size during visit (adults)

The majority of respondents to the survey visited the city center without company, as indicated in Figure 32. The majority of respondents (51%) indicated that they were visiting as '1 adult' composition. Secondly, two adults are the most common composition of a group. Lastly, 19% of respondents were combined into the category of 3 or more adults, 6% of these respondents were traveling with a group of eight or more people. Additionally, respondents were asked to state the number of minors (16 years or younger) during their visit. Seven respondents in total indicated their group included one or two minors while they were there.

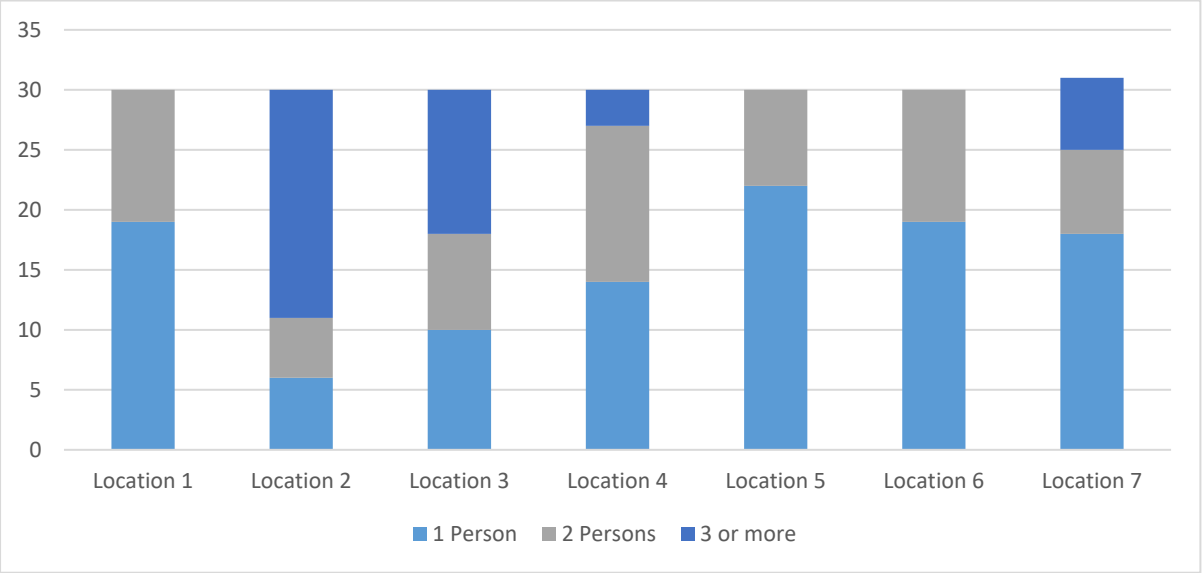


Figure 33 Group size by location

The distribution of group size among the various functions is remarkably uneven (Figure 33). The vast majority of groups with 3 or more people have conducted the survey for location 2 or 3. Even though they only make up 19 percent of all respondents, this group accounts for more than half of respondents at location 2. This study indicated both of these places as being on a main shopping street. Adults who are visiting alone were most frequently seen in locations 1, 5, 6, and 7. This closely

matches the expectations raised by the overall results. Additionally, at three locations there were no groups which included three or more adults.

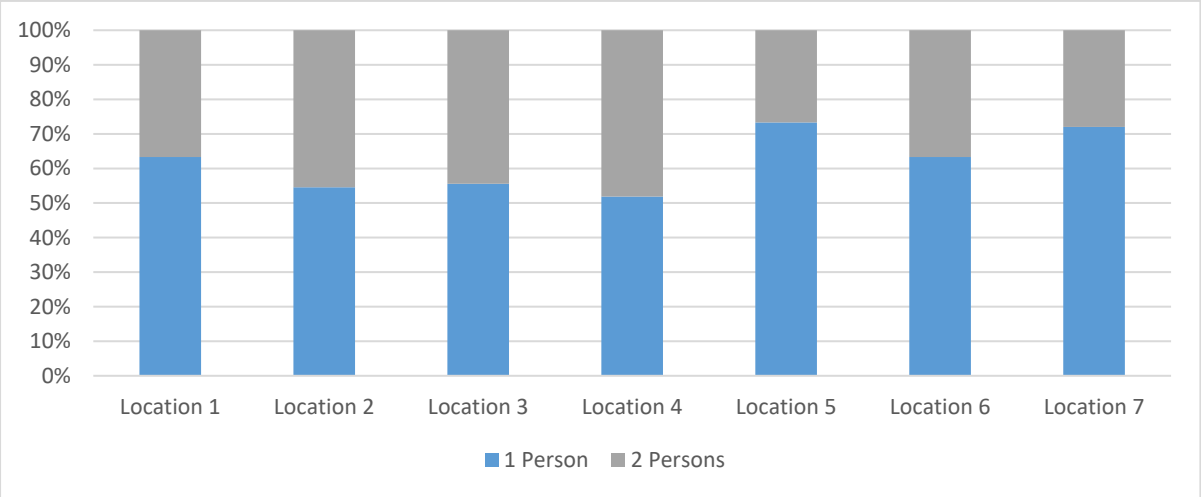


Figure 34 Gender by location aggregated

When considering the group composition in terms of the number of adults per location, there is a notable variation in the group size of three or more across different locations. To address the potential impact of this variation on further analysis, the group size of three or more will be merged with groupsize of 2 adults. The new distribution of these merged groups can be seen in Figure 34.

4.1.4 Relationships between personal and shopping trip characteristics

To find out if there are any relationships between the personal and shopping trip characteristics, Chi-Square analyses were conducted. De Chi-Square test evaluates the sample against the expected values assuming independence between both variables. If the result is significant, it implies that the observed distribution of respondents statistically deviates from what might be expected and cannot be assumed to be independent.

Table 26 Chi-Square test of personal and visit characteristic attributes

Variable	Sub- categories	Chi-squared (X^2)	Df	p-value	Significant
Age	Gender	16,045	2	0.000	yes
	Education	14.909	4	0.005	yes
	Visit motivation	4.702	4	0.319	no
	Visit frequency	19.240	4	0.001	yes
	Number of adults	12,402	4	0.015	yes
	Address	5.290	4	0.259	no
Gender	Education	2.124	2	0.346	no
	Visit motivation	2.853	2	0.240	no
	Visit frequency	1.396	2	0.497	no
	Number of adults	3.707	2	0.157	no
	Address	8.850	2	0.012	yes
Education	Visit motivation	0.304	4	0.990	no
	Visit frequency	5.811	4	0.214	no
	Number of adults	16.827	4	0.002	yes
	Address	7.290	4	0.121	no
Visit motivation	Visit frequency	24.574	4	0.000	yes
	Number of adults	45.291	4	0.000	yes
	Address	39.866	4	0.000	yes
Visit frequency	Number of adults	27.017	4	0.000	yes
	Address	91.033	4	0.000	yes
Number of adults	Address	19.904	4	0.001	yes

As can be seen in Table 26, the Chi-Square test is significant for twelve of the attribute combinations. For nine of the attribute combinations, no significant relation was found. In particular, gender is mostly unrelated to other attributes. These relations are important to keep in mind during further research. Whether the relation is too strong to use both attributes simultaneously will be discussed in section 4.3.2.

4.2 Best minus worst scaling

In order to gain an overview of the general preferences for the various proposed functions, a best minus worst (BMW) analysis is performed. The frequency with which a proposed function is selected as best, neutral, or worst is shown in Figure 36. The BMW value is derived by deducting the number of times a function is selected as the worst from the number of times a function is selected as the best, and then dividing this result by the total number of appearances (844). This value ranges between 1 and -1 and shows the preference relative to other functions and the average value for all these functions combined, which is 0.

4.2.1 General BMW results

Every respondent received twelve choice sets, each choice set containing three different functions. Each function has been proposed to the respondent four times with different alternatives functions. As can be seen in Figure 36, office is chosen as most preferred the least number of times, and most often as worst option. As a result, the overall BMW value is the lowest for office. Although the residential function's share of the best responses is about a quarter, the standardized BWS value still ranks it as the second-least preferred function due to a relatively high share of worst responses.

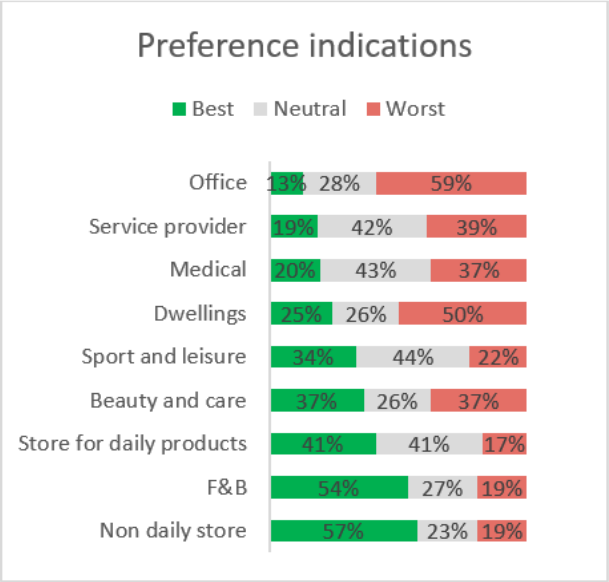


Figure 36 Indicated preference distribution

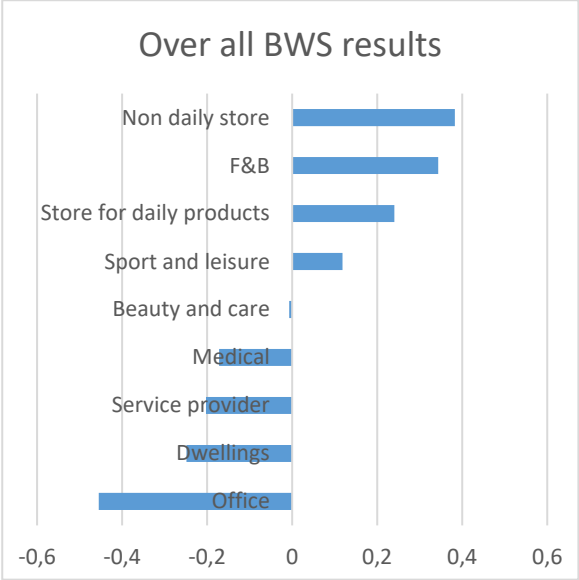


Figure 35 Over-all standardized BMW result

If considering the BMW results without taking into account the different locations, it can be seen that non-daily stores are most preferred (0.38) followed by food and beverage outlets (0.34) and store for daily products (0.24). These values suggest that the participants prefer the city center to have a mix of mainly retail and F&B functions. In this preferred function mix there is demand for both non-daily stores and the more practical everyday stores.

The three functions with the lowest BMW values are office, dwellings and service providers with values ranging between -0.45 and -0.20. These low values indicate that compared to the other functions included in this research, participants have relatively low preferences for these. This could be due to these functions being less relevant or appealing to the visitors of the city center compared to retail, F&B, and leisure functions.

4.2.2 Location specific BMW results

This research aims at investigating which characteristics affect the differences in preferences for different functions. To be able to do this it is necessary that the preferences differ over the different locations. This is due to the environmental and building characteristics being dependent on actual characteristics of the seven locations.

For each location, a best-worst analysis has been performed. Similar to how the overall BMW analysis was conducted, but only for the respondents in a particular location. The results of this BMW analysis per location can be seen in Table 27.

Table 27 Standardized best-minus-worst values for functions by locations

	L1	L2	L3	L4	L5	L6	L7
1. daily store	0.28	0.54	-0.08	0.28	0.12	0.28	0.27
2. Non-daily store	0.51	0.77	-0.14	0.49	0.32	0.26	0.48
3. F&B	0.39	0.71	0.07	0.27	0.37	0.36	0.25
4. Office	-0.54	-0.69	-0.16	-0.48	-0.48	-0.39	-0.44
5. Residential	-0.19	-0.78	-0.05	-0.21	-0.11	-0.11	-0.29
6. Service provider	-0.45	-0.44	0.3	-0.23	-0.26	-0.22	-0.13
7. Healthcare	-0.29	-0.29	-0.18	-0.01	-0.06	-0.13	-0.23
8. Beauty and care	0.04	0.18	0.27	-0.21	-0.21	-0.08	-0.04
9. Leisure and sport	0.26	0.01	-0.03	0.1	0.32	0.04	0.13

It can be seen in Table 27 that the values for each function differ over the locations. For example, the preference for 'non-daily store' is highest at the Demer, location 2 (0.77) and lowest at location 4 the Nieuwe Emmasingel (0.49). For dwellings the difference is even larger. For the Demer (Location 2) it is lowest with a value of –0.78 and highest at location 3 (Hermanus Boexstraat) where the value is only -0.05.

In general location 2 (Demer), which is a typical main shopping location, tends to have the most extreme values in both the positive and negative direction. In contrast, the Hermanus Boexstraat (location 3) has the least variation in preference values. However, for the more mixed use area location 3, it is noteworthy that it has the highest value for beauty and care, office, dwellings, and service provider. For the function service provider, it has even the only positive score compared to the other locations. Also, the Hermanus Boexstraat is the only location with negative values for non-daily and daily stores. Location 5 (Nieuwe Emmasingel) stands out in having relatively high values for food and beverage and sport and leisure, especially compared to the less extreme values for the other functions at this location.

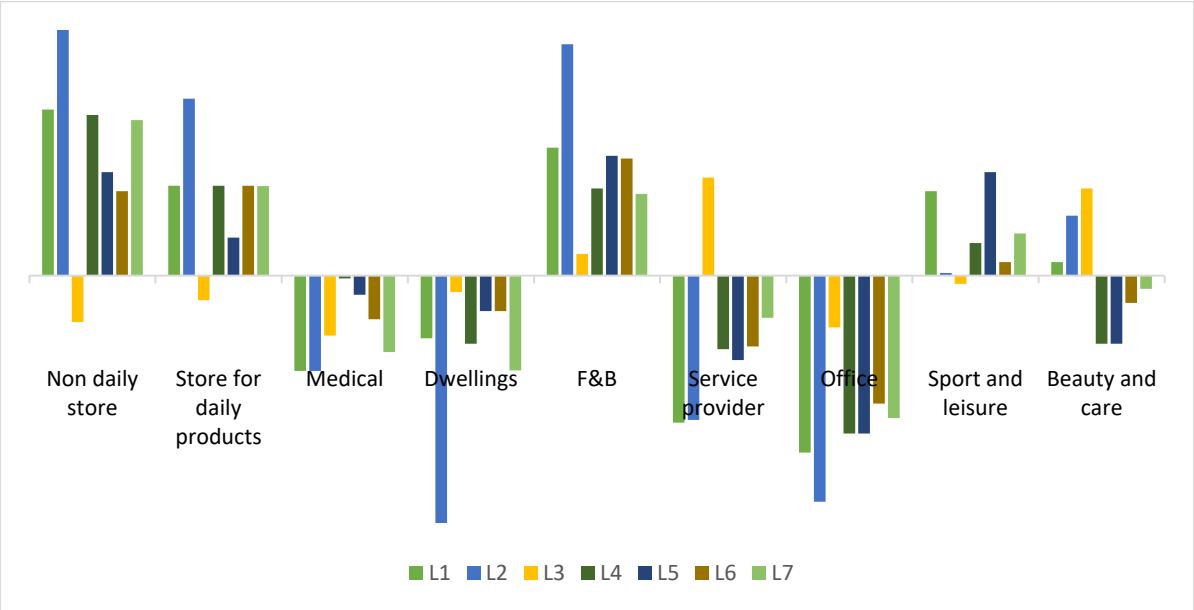


Figure 37 Standardized BMW values per function

In Figure 37, it can be seen how the normalized BMW scores vary per function and location. The general trends are in line with the over-all BMW results. The commercial functions, non-daily stores, daily stores and food & beverage tend to the positive upper side and the functions office, service provider, medical and dwellings have a stronger tendency towards the negative side. Sport and leisure and beauty and care are less extreme and are compared with the other functions assessed to be more neutral. However, within the functions it can be seen that the scores differ per location. One of the most extreme differences is the strong disliking of the dwelling function for location 2. Also, the results for location 3 often are contradicting to the other locations.

In Table 28 the proposed functions are ranked in their normalized BMW score for the different locations. Non-daily stores and food & beverage are most dominant in the highest ranks, followed up by stores for daily products. Only at location 3 the highest ranks really stand out with service provider being highest ranked while on average this scores a seventh rank. This might be explained by the composition of the retail mix in this street. This street compared to the other locations has a lot of opticians, a function which combines retail with a mix of healthcare and service. While food and beverage and non-daily stores are well represented in the city center, the stores for daily products, especially in the food branch are less common. The generally high rank for this function indicates that the city centers' visitors might be fond of an extension in this branch. Offices and service providers generally turn up at the lowest two ranks which indicate that of the proposed functions these two are least favored by the visitors. The middle ranks have more variation in their functions. This might indicate that some locations are more suitable for a function than another.

Table 28 Best-minus-worst based ranking of function preferences by location

Rank	L1	L2	L3	L4	L5	L6	L7
1	Non-daily store	Non-daily store	Service provider	Non-daily store	F&B	F&B	Non-daily store
2	F&B	F&B	Beauty and care	Store for daily products	Sport and Leisure	Store for daily products	Store for daily products
3	Store for daily products	Store for daily products	F&B	F&B	Non-daily store	Non-daily store	F&B
4	Sport and Leisure	Beauty and care	Sport and Leisure	Sport and Leisure	Store for daily products	Sport and Leisure	Sport and Leisure
5	Beauty and care	Sport and Leisure	Dwellings	Medical	Medical	Beauty and care	Beauty and care
6	Dwellings	Medical	Store for daily products	Dwellings	Dwellings	Dwellings	Service provider
7	Medical	Service provider	Non-daily store	Beauty and care	Beauty and care	Medical	Medical
8	Service provider	Office	Office	Service provider	Service provider	Service provider	Dwellings
9	Office	Dwellings	Medical	Office	Office	Office	Office

In Appendix C, the results for the open-end questions (most preferred function) can be seen and compared with Table 28. To compare, the answers were categorized and counted for the functions of store and food & beverage (Table 29). Despite locations two, six and seven seemingly having overlap with the most preferred option in table 28, differences can be seen. This is further confirmed if comparing the counts with figure 37. This indicates that the preferences indicated in the best-worst scaling experiment differ from the most preferred function indicated in the open-end question.

Table 29 Count of categorized open-end questions (most preferred function)

	L1	L2	L3	L4	L5	L6	L7
Store	16	27	20	16	9	17	23
F&B	6	3	7	7	7	13	3

4.3 Multinomial logit model

Within the scope of the research, the best-worst scaling method was employed to collect data on the preferences of respondents regarding the utilization of a vacant retail building. Specifically, participants were required to indicate their most and least favored options among a set of three

choices. To further elucidate these preferences, a model was constructed with dependent variables representing preference for use and independent variables encompassing building, environmental, personal, and visit characteristics. However, the effects and relative importance of these attributes may vary based on the proposed function of the building. To account for this variation, a MNL model with separated utility functions per function was used to calculate the relative importance of attributes for the different proposed functions. For instance, the size of the building may be more critical for an office building than a store for daily products, and the MNL model allows for these differences to be taken into account.

The results of the best-worst scaling experiment are essentially a ranking of the three proposed functions (best, middle, least). This could be rewritten to result in three separate binary choice sets.

1. Dwellings		Dwellings > Office
2. Office	➡	Dwellings > Beauty and care
3. Beauty and care		Office > Beauty and care

This approach generates 3 choice sets per observation, which is considered an important advantage given the relative limited sample size.

Data preparation

The data collected and exported from Lime Survey is not suitable for processing by the Nlogit software. The data that is exported from Lime Survey is in wide-format, organized in one row per respondent. For the analysis in Nlogit, the data has to be converted to long format. This is done by executing the MatLab script, which can be found in appendix D. This script also has converted the data from one best-worst set to the three separate choice sets. Furthermore, the attributes that correspond to the survey location are added to the data. This is done by using the indicated location to add the building and environmental attributes in the row which already contains the other characteristics (personal and shopping trip).

The demographic analyses in section 4.1 shows the distribution of the demographic and shopping trip characteristics. Depending on the number of respondents per category, new categories were defined to avoid categories with small numbers of respondents and to limit the number of parameters to be estimated. In the following analyses, the new categories were used. The overview of the attributes and the levels of these attributes can be seen in Appendix B.

Model construction

To find the effect of the attributes on these choices, a MNL model was constructed. The construction of the model was performed through the gradual addition of one variable to the model each time. Each addition was subjected and ran by the Nlogit software, and the model was deemed statistically significant if there was a marked improvement and the newly introduced variable was significant. The explanatory variables employed in the model were classified into four main categories: building characteristics, environmental characteristics, personal characteristics, and shopping trip characteristics. Notably, personal and visit characteristics were introduced last, as the study was

mainly focused on the physical environment. The order of addition of the two other categories of attributes to the model was varied.

In order to determine whether the inclusion of a variable led to a significant improvement in the model, the likelihood ratio statistic (LRS) was utilized. The LRS is also deployed to compare different models and determine which one performs better. The LRS works by comparing the log likelihood function and degrees of freedom of two models and then using a chi-square (x^2) test to compare the two models. The formula utilized for this purpose is:

$$LRS = -2\,(\,LL(\beta 1) - LL(\beta 2))$$

LRS = X^2-value for K degrees of freedom
K = The difference in number of parameters between the models
LL(β2) = Log likelihood function of new model
LL(β1) = Log likelihood function of previous or null model

The threshold value for the chi-square (x^2) test with one degree of freedom (K) to achieve statistical significance at the 0.05 level is 3.841. This value can be employed to calculate the disparity between the log likelihood (LL) functions, which indicates a meaningful enhancement of the model.

$$3.841 = -2 * \big(\,LL(\beta 1) - LL(\beta 2)\big)$$
$$LL(\beta 1) - LL(\beta 2) = -1.921$$

The forward stepwise technique was manually performed for all variables and for each potential function. This process necessitated the laborious assessment of multiple instances of model improvement. To be on the safe side, the divergence between the models was rounded off to 2.0. This meant that if an attribute was introduced and the variation between the current and the previous model was equal to or greater than 2.0, and the variable was significant (at least p-value < 0.1), the variable was retained in the model, and the process was reiterated.

Model estimation

As indicated in the research questions, this study aims at finding relevant attributes for four different categories of explanatory variables. These categories are building characteristics, environmental characteristics, personal characteristics and shopping trip characteristics. Due to the limited number of included research locations (seven) there is a relatively large correlation between attributes of these buildings and its environment. Because of this, firstly four different MNL models will be constructed for each of these main categories. This will be used for the construction of the overall MNL model. The model per category allows for the selection of most important attributes.

4.3.1 MNL without attributes

Firstly, a MNL model with only the constant for each choice alternative (function for vacant retail building) was estimated (Appendix F). This was done for the totality of the data and for the locations used separately. This model provides the general utility for each choice alternative without taking into account the explanatory variables. This allows for ranking the alternatives regarding the general preference of the city centers visitors. The model fit for the totality of the data is expressed in the ρ^2 which is 0.10. The results are similar to the results of the best-minus-worst scaling analysis. Note that the utility of the Daily store function was set to zero.

Table 30 MNL model constants per location without attributes

	L1	L2	L3	L4	L5	L6	L7	Totaal
1. daily store	0	0	0	0	0	0	0	0
2. Non-daily store	0.53	0.9	-0.12	0.47	0.4	-0.03	0.43	0.29
3. F&B	0.26	0.65	0.26	-0.02	0.5	0.17	-0.05	0.21
4. Office	-1.77	-4.28	-0.15	-1.53	-1.21	-1.29	-1.41	-1.38
5. Residential	-0.97	-4.66	0.05	-0.95	-0.43	-0.73	-1.1	-0.95
6. Service provider	-1.54	-3.36	0.7	-0.98	-0.73	-0.93	-0.78	-0.86
7. Healthcare	-1.18	-2.86	-0.2	-0.56	-0.34	-0.77	-0.99	-0.79
8. Beauty and care	-0.49	-1.27	0.63	-0.95	-0.63	-0.68	-0.61	-0.48
9. Leisure and sport	-0.04	-1.86	0.09	-0.35	0.4	-0.45	-0.29	-0.23

If comparing Table 30 to the values in Table 27 (the standardized best-minus-worst values), similar patterns can be seen. For both tables, the most outspoken values can be seen for location 2. Furthermore, for both tables, location 3 shows the least variation in coefficients and it can be seen that, similar to the BMW analysis, it has remarkably high values for the functions: service provider, beauty and care, office and residential. Remarkable for location 5 (Nieuwe Emmasingel) is the high coefficient for the function leisure and sport. This is also visible in the BMW analyses.

4.3.2 Correlations in attributes

To check for correlations within the attributes that will be included in the multinomial logit model, a bivariate correlation matrix was made. This correlation matrix was made using the same data as is used for the MNL model, which uses the aggregated levels of the attributes. The used attribute levels can be seen in appendix B. The correlation matrix was created using SPSS and results in a matrix with Pearson correlations for all attributes. The matrix is included in the appendix E.

This study makes use of seven vacant retail buildings, which directly correspond to the attribute levels of the building and the environment. This relatively small variation in location inevitably results in many significant correlations within the attributes. During the construction of the models, it is important to check whether there are large correlations between the attributes that are included for the proposed functions. If the correlation for a building or environmental attribute with another attribute was found to be higher than 0.75, these two attributes will not be entered simultaneously for the estimation of the utility for a function. For the personal and shopping trip characteristics, no problematic correlations were identified. An exception is the correlation between frequency and place of residents, for which people living further away are found to visit less frequent. These two attributes will therefore not be entered together into the model estimation.

4.3.3 MNL building characteristics

The first model contains only attributes in the category building characteristics. The number of attributes in the model is 34 and the model has a log likelihood function value of -4458.49. This results in a model fit of ρ^2 =0.154.

The models show the coefficients for both the constant (except for Daily store) and the attributes that contribute significantly to explaining preferences. These coefficients indicate the effect a certain property has on the utility of a choice alternative. The relative importance of attributes for a specific choice alternative can be interpreted most easily. The significance of the attributes is indicated by means of asterisks. With one asterisk indicating significance on the ten percent level. Two asterisks indicating significance on the five percent level and three asterisks being significance on the one percent level. Furthermore, some of the attributes are marked with an ‘m.c.’, which indicates that the value of the coefficient is manually calculated by using the coefficients of the other levels of the attribute. This is necessary for the effect coded nominal attributes, for which the model does not provide a coefficient for one of the attribute levels. And is based on the fact that the sum of the coefficients should be zero, the average.

Table 31 Output MNL building attributes

1. Daily store				**5. Residential**			
Building height		-0.042	*	Constant		-2.767	***
Material plinth	Glass (%)	0.030	***	Building width		0.302	***
	Brick (%)	-0.024	***	Building height		0.072	***
Corner building	Yes	0.259	**	Façade material	Brick	0.376	***
	No	-0.259	*m.c.*		Other	-0.376	*m.c.*
2. Non-daily store							
Constant		-0.147		**6. Service provider**			
Building height		-0.099	***	Constant		-3.097	***
Material plinth	Glass (%)	0.043	***	Building height		0.026	**
	Brick (%)	0.034	***	Façade material	Brick	0.576	***
	Wood (%)	0.017	***		Other	-0.576	*m.c.*
				Door width		1.361	***
3. Food & beverage							
Constant		-2.431	***	**7. Healthcare**			
Building height		0.381	***	Constant		-1.561	***
Material plinth	Glass (%)	-0.031	**	Building width		0.223	***
	Brick (%)	-0.047	***	Building height		0.046	**
	Wood (%)	0.086	***				
Color facade	Red	-2.177	***	**8. Beauty and care**			
	Sand	0.774	***	Constant		0.898	*
	White/grey	1.403	*m.c.*	Building width		-0.125	***
				Building height		0.070	***
4. Office							
Constant		-3.428	***	**9. Leisure and sports**			
Façade material	Brick	0.678	***	Constant		1.103	***
	Other	-0.678	*m.c.*				
Door width		1.670	***				

**** p < 0.01, ** p < 0.05, * p< 0.1 , m.c.= Manually calculated*

This section examines the building attributes that influence the preferences of city center visitors regarding the use of vacant retail buildings. The analysis yielded several key findings. Firstly, it was found that the size of the building, specifically its width, had significant effects on three out of nine functions. Larger buildings were preferred for residential and healthcare purposes, aligning with the typical typology of such buildings. Conversely, smaller buildings were more suitable for beauty and care functions. Similarly, building height showed positive effects on food and beverage, residential, service provider, healthcare, and beauty and care functions, indicating a preference for taller buildings in these categories. However, daily and non-daily stores showed a preference for lower buildings, possibly due to retail businesses typically occupying lower floors.

Additionally, building height was examined and yielded positive effects for food and beverage, residential, service provider, healthcare, and beauty and care functions. This suggests a preference for

taller buildings for these functions. Similar to building width, the functions of residential and healthcare were consistently preferred in larger buildings. Notably, the impact of increasing building width by one meter was found to be approximately equivalent to increasing the building height by four meters. This indicates width having a more substantial effect. This may be due to the visibility of building width at eye level, while building height is less noticeable from street level. Negative effects of building height were observed for daily and non-daily stores, indicating a preference for lower buildings, possibly due to retail businesses typically utilizing lower floors.

The size of the entrance was another attribute considered, and it consistently demonstrated a positive effect on the utility for office and service provider functions. The relatively high coefficient value suggests that door width had a significant impact, potentially due to limited variation in door sizes in the dataset. Also, the value is calculated for a meter increase, which is an extreme difference in door width. An increase in door width of one decimeter would result in a 0.136 increase in utility for service providers and 0.167 for offices.

Regarding the material of the plinth, three materials were analyzed: window, brick, and wood. An increase in the share of window surface had a positive effect on the utility for daily and non-daily store functions, likely because windows are commonly utilized for product displays. However, for food and beverage functions, an increase in the share of glass had a negative effect, possibly indicating a preference for a more enclosed environment in this context. The share of brick in the façade showed negative effects on daily stores and food and beverage functions but had a positive effect on non-daily store functions. The share of wood in the plinth had a positive coefficient for both non-daily store and food and beverage functions.

Furthermore, the material of the façade above the ground floor, particularly whether the majority was brick or another material, was found to have a significant effect on three choice alternatives. A brick façade had a positive effect on the utility for residential, service provider, and office functions. Additionally, the color of the façade was considered, and red façades were found to have a negative impact on the utility for food and beverage functions, while other colors had a positive effect.

Lastly, the attribute indicating whether a building was located on a corner positively influenced the utility for daily store functions, indicating a preference for daily stores in corner buildings.

In summary, this section revealed several factors that significantly influence the preferences of city center visitors regarding the use of vacant retail buildings. The size of the building, both in terms of width and height, played a crucial role, with width having a more pronounced effect. Visual aspects, such as the properties of the façade, including materials and colors, were also important determinants of preference. Retailers were more preferred in buildings with greater window surface in the plinth, potentially due to the display opportunities they offer.

4.3.4 MNL environmental characteristics

The second model contains the attributes associated with the environmental characteristics. This model has 32 attributes included in the model and a log likelihood function of -4510.11. The LL can be used for the calculation of the ρ^2-value which is $\rho^2 = 0.143$.

Table 32 Output MNL environmental attributes

1. Daily store			
Percentage store		-0.014	***
Percentage vacant		-0.044	***
2. Non-daily store			
Constant		0.193	
Percentage store		-0.012	***
Percentage vacant		-0.029	***
Greenery in street	Yes	-0.273	***
	No	0.273	*m.c.*
3. Food & Beverage			
Constant		0.390	**
Percentage store		-0.017	***
Percentage vacant		-0.047	***
4. Office			
Constant		-2.282	***
Percentage clothing		-0.010	***
Percentage vacant		-0.035	***
Percentage leisure		0.047	**
Greenery in street	Yes	0.416	***
	No	-0.416	*m.c.*
5. Residential			
Constant		-2.853	***
Percentage F&B		0.015	***
Percentage optician		0.023	***
Greenery in street	Yes	0.256	***
	No	-0.256	*m.c.*
6. Service provider			
Constant		-2.806	***
Percentage F&B		0.021	***
Percentage optician		0.034	***
Main street	Yes	0.366	***
	No	-0.366	*m.c.*
7. Healthcare			
Constant		-2.509	***
Percentage F&B		0.015	***
Percentage optician		0.018	***
8. Beauty and care			
Constant		-1.512	***
Percentage vacant		-0.087	***
Percentage optician		0.026	***
Percentage leisure		0.144	***
Trees in street	Yes	-0.270	***
	No	0.270	***
9. Leisure and sports			
Constant		-1.380	***
Trees in street	Yes	0.213	***
	No	-0.213	*m.c.*

**** p < 0.01, ** p < 0.05, * p< 0.1 , m.c.= Manually calculated*

In Table 32 it can be seen which of the attributes associated with the environment of a building affect the choice of the most preferred function for the use of a vacant retail building. Most evident are the percentages of certain functions in the direct surrounding of a building. Furthermore, whether a building is located in a street with trees, green street or is located on a main street affect the choice.

The percentage of stores (all type of stores) in the surrounding is found to have an effect on the utility for the functions daily store, non-daily store and F&B. For all of these functions, the coefficient is negative, indicating a decreasing preference for these functions if there are more stores in the surrounding of a building.

Secondly, clothing stores in the surrounding was found to have a significant effect on the utility derived of the office alternative. This indicates that people prefer offices less in an area with more clothing stores. This might be due to clothing stores being associated with leisure shopping, and offices not matching this atmosphere.

The share of food and beverage in the surrounding area has an effect on the utility derived from the functions residential, service provider and healthcare. For all of these functions the coefficient is positive. This indicates that people are more likely to prefer these functions if the vacant building has a higher share of F&B in the surrounding. This might arguably be the result from F&B functions being located in another area than the core shopping area, and thus more mix in functions is suitable.

Also, the presence of vacancies in the surrounding was found to have a significant effect on a multiplicity of attributes. The coefficient was found to be negative for all the functions for which it was included. These are the functions: daily store, non-daily store, F&B , office and beauty and care. For both types of stores and F&B this might be explained by the type of activity one undertakes when visiting these facilities, and the expected ambiance. To a limited degree the same holds for beauty and care, but this cannot be said for the office function. The utility derived from the office function in an environment with more vacancies seems to decrease as well.

The percentage of opticians in the area was included in the model too. A significant effect was found on the utility derived from the choice alternatives residential, service provider, healthcare and beauty and care. The coefficient is positive for all functions, indicating an increased preference if more opticians are present in the surrounding. This might arguably be explained by an optician being an atypical function, which is most likely not in the core of the shopping area. These locations therefore might be better suited for other atypical functions in the center. Furthermore, one might argue that healthcare has a certain degree of overlap with the optician function, and thus be explained by clustering.

The last attribute related to the function mix in the area concerns the share of leisure. This is found to have significant effects for the functions office, and beauty and care. Both the effects are positive. Similarly to the previous paragraph, this might arguably result from leisure functions in the city being located outside the shopping core, for which a mix of functions is already more present and thus might explain the increase in preference for these atypical functions.

Whether there was greenery present in the street was included on the levels ‘yes’, which indicates the presence of visual green. The ‘no’ indicates there was no or barely presence of greenery. This attribute was included for the functions non-daily store, office and residential. The presence of visual greenery has a negative effect on the utility for non-daily stores and a positive effect on the office, and residential functions. This might be explained by greenery being less common in shopping areas while

residential and office locations often have more greenery. The presence of trees in the street is another attribute included in the model. For the function leisure and sport the effect is positive while for beauty and care the effect is negative. This might be attributed to the same effect as used for the presence of visual greenery.

Lastly, whether a building is located at a main street or not was included once. Service providers are more preferred for locations that are considered to be the main street. This might however be partially explained by this function being significantly more preferred at location 3, which is also a main street.

In summary, the mix of functions in the surrounding is included for all the used indicators. This indicates the importance of the currently present function in the surrounding of a building when assessing the preference for a future function. The most evident trend visible concerns the atypical functions being more preferred if other non-retail functions are located in the area. Indicating that more mixed use areas are more suitable for mixing in other functions. Also, the presence of greenery in the form of greenery and trees shows a pattern. The pattern showing the more typical functions such as retail and F&B have opposite effects compared to the atypical center functions which are more preferred in greener streets.

4.3.5 MNL personal characteristics

The third model that was created includes the personal characteristics of the respondents. The personal characteristics include the age, gender, educational level and the address of the respondent. The model in total has 39 attributes. The log likelihood function value is -4568.94. This results in a model fit of ρ^2=0.135.

The attribute of age occurs four times in the model containing only the personal characteristics. For the choice alternative daily store, being aged between 25 and 34 has a negative effect on the utility (-0.260). Having an age over 34 has a positive effect on the utility (0.293), however the significance is uncertain due to the manual calculation. The food & beverage choice alternative yields higher utility in the age group of 16 till 24 (0.244) and lower utility from the age cohort of 25 till 34 (-0.308). The office choice alternative is more preferred by the group of 25 till 34-year-olds. The opposite is most likely the case for the ages higher than this. The choice alternative ‘residential’ yields higher utility for the age group of 25 till 34 (0.338), compared to the other age groups.

The attribute ‘gender’ occurs five times in the model. This indicates that gender has a significant effect for the utility for five of the 9 choice possibilities. Being a male positively affects the utility for the choice alternatives daily store, non-daily store, food & beverage and service provider. This results in female having a negative effect on the utility for the same functions. For the choice alternative ‘residential’, the opposite is visible.

Table 33 Output MNL personal attributes

1. Daily store			
Gender	Male	0.133	*
	Female	-0.133	*
2. Non-daily store			
Constant		0.328	***
Age	16 till 24	-0.033	
	25 till 34	-0.260	***
	35 and over	0.293	*m.c.*
Gender	Male	0.203	***
	Female	-0.203	***
Education	Lower	-0.265	***
	HBO/WO bachelor	0.313	***
	HBO/WO master, PhD	-0.048	*m.c.*
Address	Eindhoven	0.121	
	Bordering municipality	0.129	
	Other	-0.250	*m.c.*
3. Food & beverage			
Constant		0.265	***
Age	16 till 24	0.244	***
	25 till 34	-0.308	***
	35 and over	0.063	*m.c.*
Gender	Male	0.207	***
	Female	-0.207	***
Education	Lower	-0.015	
	HBO/WO bachelor	0.316	***
	HBO/WO master, PhD	-0.301	*m.c.*
4. Office			
Constant		-1.525	***
Age	16 till 24	0.022	
	25 till 34	0.455	***
	35 and over	-0.477	*m.c.*
Education	Lower	0.041	
	HBO/WO bachelor	-0.473	***
	HBO/WO master, PhD	0.432	*m.c.*
5. Residential			
Constant		-0.960	***
Age	16 till 24	-0.179	**
	25 till 34	0.338	***
	35 and over	-0.159	*m.c.*
Gender	Male	-0.165	***
	Female	0.165	***
Education	Lower	0.332	***
	HBO/WO bachelor	-0.372	***
	HBO/WO master, PhD	0.040	*m.c.*
6. Service provider			
Constant		-0.949	***
Gender	Male	0.138	**
	Female	-0.138	**
Education	Lower	-0.059	
	HBO/WO bachelor	-0.257	***
	HBO/WO master, PhD	0.317	*m.c.*
Address	Eindhoven	-0.029	
	Bordering municipality	-0.306	***
	Other	0.335	*m.c.*
7. Healthcare			
Constant		-0.859	***
Education	Lower	0.044	
	HBO/WO bachelor	-0.385	***
	HBO/WO master, PhD	0.342	*m.c.*
8. Beauty and care			
Constant		-0.482	***
Address	Eindhoven	-0.204	***
	Bordering municipality	-0.046	
	Other	0.250	*m.c.*
9. Leisure and sports			
Constant		-0.241	***

**** p < 0.01, ** p < 0.05, * p< 0.1 , m.c.= Manually calculated*

The attribute education is found to be significant for six of the nine choice alternatives. Having an education level lower than HBO/WO bachelor results in a lower preference for non-daily store and a higher preference for residential. Having an education level of HBO/WO bachelor results in higher preferences for non-daily stores and food & beverage. For this educational level lower preferences are found in case of the choice alternatives office (-0.473), residential (-0.372), service provider (-0.257) and healthcare (-0.385). The coefficients for HBO/WO master and PhD are calculated manually and consequently the significance is uncertain. The coefficients indicate more preference for office, service provider and healthcare compared to the average. A lower coefficient is visible for food & beverage.

Lastly, the attribute place of residence was included three times in the model. People from bordering municipalities have a lower preference (-0.306) for service providers. This is most likely in contradiction to people living further away (0.335). The beauty and care choice alternative is less preferred by people from Eindhoven (-0.204) which is most likely in contradiction to people living further away (0.158). For the office function, no significant coefficient was estimated. This attribute was however retained in the model due to the contribution it has to the log likelihood function.

4.3.6 MNL shopping trip characteristics

The last category for which a separate model was created are the shopping trip characteristics. The shopping trip characteristics include the group composition of adults, the shopping motivation and the frequency of the respondent visiting the center of Eindhoven. The model includes 37 attributes and has a log likelihood function of -4529.30. The model fit for the model is $\rho^2 = 0.141$.

The frequency of visiting the city center of Eindhoven a respondent has, is found to have a significant effect for the utility gained for five of the choice alternatives. For the function F&B, it has a negative effect on the utility which can be seen for monthly visitors, compared to the average. Respondents visiting on a yearly or less frequent basis attach higher utilities to this choice alternative. For people visiting most often (weekly or more) the effect is limited and insignificant. The proposed function office yields more utility for people visiting the center monthly. Negative effects can be seen on the utility for this alternative in the case of the respondent visiting weekly or more. The effects on the utility for the functions service provider, healthcare and B&C seem to have a similar trend. The utility is lowest for the group visiting most often (weekly or more), the effect on the utility of monthly visitors is small or insignificant and the effect on the utility of yearly or less visitors is positive.

The attribute of group composition was included in binary format. The composition of the group was included in the levels alone or with two people. The group compositions' effect on the utility was found to be significant for three of the choice alternatives. People visiting the city center alone tend to gain more utility from the choice alternatives office and leisure and sports, compared to the average. People visiting alone in general have lower preferences for beauty and care.

Table 34 Output MNL shopping trip attributes

1. Daily store			
Motivation	Purpose	0.143	
	Leisure	0.197	*
	Both/Other	-0.340	*m.c.*
2. Non-daily store			
Constant		0.291	***
Motivation	Purpose	0.256	**
	Leisure	0.402	***
	Both/Other	-0.658	*m.c.*
3. Food & beverage			
Constant		0.245	***
Frequency	Weekly or more	0.073	
	Monthly	-0.252	**
	Yearly or less	0.179	*m.c.*
Motivation	Purpose	0.106	
	Leisure	0.351	***
	Both/Other	-0.457	*m.c.*
4. Office			
Constant		-1.446	***
Frequency	Weekly or more	-0.185	**
	Monthly	0.183	**
	Yearly or less	0.002	*m.c.*
Composition	1 person	0.188	***
	2 persons	-0.188	***
Motivation	Purpose	0.050	
	Leisure	-0.778	***
	Both/Other	0.728	*m.c.*
5. Residential			
Constant		-1.016	***
Motivation	Purpose	0.244	**
	Leisure	-0.885	***
	Both/Other	0.641	*m.c.*
6. Service provider			
Constant		-0.815	***
Frequency	Weekly or more	-0.258	***
	Monthly	0.013	***
	Yearly or less	0.245	*m.c.*
Motivation	Purpose	0.169	*
	Leisure	-0.623	***
	Both/Other	0.454	*m.c.*
7. Healthcare			
Constant		-0.810	***
Frequency	Weekly or more	-0.181	**
	Monthly	0.022	
	Yearly or less	0.159	*m.c.*
Motivation	Purpose	0.326	***
	Leisure	-0.445	***
	Both/Other	0.119	*m.c.*
8. Beauty and care			
Constant		-0.386	***
Frequency	Weekly or more	-0.218	***
	Monthly	0.099	**
	Yearly or less	0.119	*m.c.*
Composition	1 person	-0.113	*
	2 persons	0.113	*
9. Leisure and sports			
Constant		-0.291	***
Composition	1 person	0.120	*
	2 persons	-0.120	*
Motivation	Purpose	0.214	**
	Leisure	-0.234	**
	Both/Other	0.020	*m.c.*

**** p < 0.01, ** p < 0.05, * p< 0.1 , m.c.= Manually calculated*

Finally, the motivation of the visit to the city center has a significant relation with the preference for functions in eight occasions. The leisure shopping purpose results in positive coefficients for daily stores, non-daily stores, and F&B, indicating that these functions are more likely to be chosen if people are leisure shopping. Negative coefficients for leisure shopping are observed for the functions of

office, residential, service provider, healthcare and L&S indicating that these functions are less likely to be chosen if people are leisure shopping compared to the average. This could potentially be attributed to these retail and F&B functions having a higher experiential value.

4.3.7 MNL model with all attributes

The four separate models (Appendix F) that were previously discussed provide a detailed understanding of the relation attributes have to the preference for the proposed functions. This however does not take into account all the attributes combined to gain a deeper understanding of the context as a whole. This will be aimed at by making the large model for which all attributes will be used during construction (Appendix H). Due to the large correlations, especially in the physical attributes, this model however will decrease in level of detail and number by including less attributes per category.

The model is constructed by the addition of one attribute at a time. This attribute as previously discussed was kept if it was found to be significant, resulted in an increase of the log likelihood function of 2.0 or more and was not strongly correlated to the other included variable. In the case of strong correlations, it was checked to see which attribute was desired to be included. This was based on the information desired to be acquired and statistical values.

The model that resulted from this method of construction will now be elaborated upon. The model is explained per choice alternative (function). For each function the relevant attributes and their parameter estimates are discussed.

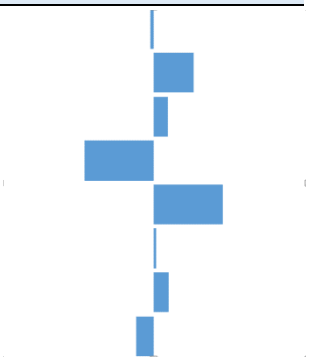
The model constructed has 77 attributes in the model. This excludes the manually calculated values that are indicated by the 'm.c.'. These values are calculated by hand which is a result from the use of effect coding. The log likelihood function of the model has a value of -4190.57. This was used to calculate the model fit. The resulting value of $\rho^2 = 0.204$ was utilized to assess the model fit, indicating a good fit (McFadden, 1979).

Daily store

When respondents were asked to indicate their preference for the use of a vacant retail building in the city center of Eindhoven, the preference for the daily store alternative was found to be significantly influenced by several attributes (Table 35). Among the four attributes with a significant effect, three pertained to the building characteristics, while one related to the shopping trip.

Table 35 All attribute MNL - Daily store

	1. Daily store	Coefficient	
Building height		-0.044	*
Plinth material	Window (%)	0.057	***
	Brick (%)	0.020	***
Material façade	Brick façade	-0.986	***
	Other façade	0.986	*m.c.*
Motivation	Purpose	0.036	
	Leisure	0.211	**
	Both/Other	-0.247	*m.c.*



Firstly, the building height was found to significantly impact the preference derived from the daily store choice alternative. Similar to separate models, a negative parameter estimate indicated a decreasing preference as the building height increased. This observation could be attributed to the limited use of upper floors by stores (Slob, 2022b) and a higher preference for stores located in the city core, the historical center which has lower building heights compared to the periphery of the center (Gemeente Eindhoven, 2019).

Secondly, the share of plinth materials, specifically window and brick, positively affected preference. These coefficients indicate a positive change in preference for each one percent increase. The positive effect on the preference for the daily store function of increasing the share of windows might be attributed to the common practice of using windows for product displays and branding (Oh & Petrie, 2012), which visitors to the center are familiar with and express in their preference. The effect of increasing the share of brick was about half as influential as the effect of increasing the share of windows.

Thirdly, the material used for the remainder of the façade, excluding windows, significantly influenced preference. The coefficient for a brick façade was strongly negative, indicating a decrease in preference for brick buildings. It is odd that the effect of a brick façade plinth differs from the remainder of the façade. Currently, no existing literature discusses the effect of the material of the façade on the preference for a certain function. Consequently, it cannot be explained why the effects differ.

Lastly, the motivation of respondents visiting the city center during the survey completion was included as an attribute. Leisure shoppers showed a positive effect on preference for daily stores (with a ten percent significance level), while the effect of shopping for a specific purpose was not found to be significant. Respondents with a "both/other" visit motivation had a negative coefficient, indicating a lower preference. It appears that respondents shopping for pleasure have a higher preference for daily stores compared to other respondents. This preference for leisure shoppers may be due to the perception that daily stores are more suitable for fun-shopping experiences compared to other non-

commercial functions. The negative coefficient for "both/other" motivations could be attributed to the less shopping-focused nature of these motivations, resulting in lower demand for retailers.

Non-daily store

The preference for the non-daily store function was found to be significantly related to five attributes, encompassing physical characteristics of the building, personal characteristics, and shopping trip factors. Firstly, the proportion of window space in the material plinth's façade was considered. Surprisingly, an increase in the share of window space was found to decrease the preference for the non-daily store alternative. This finding contradicts the expectation that larger windows would be more suitable for retail display, and it differs from the findings of the sub-model that only included building attributes.

Table 36 All attribute MNL - Non-daily store

	2. Non-daily store		
Constant		2.839	**
Plinth material	Window (%)	-0.113	***
Color plinth	Blue	-1.246	***
	Grey / Black	0.532	**
	Other	0.714	*m.c.*
Material façade	Brick façade	-2.142	***
	Other façade	2.142	*m.c.*
Education	Lower	-0.238	***
	HBO/WO bachelor	0.412	***
	HBO/WO master or PhD	-0.174	*m.c.*
Motivation	Purpose	0.189	**
	Leisure	0.383	***
	Both/Other	-0.572	*m.c.*

Secondly, the color of the plinth, excluding glass, was found to impact the preference for the non-daily store alternative. A blue plinth had a negative effect on preference compared to a grey/black color or other colors. This might be due to the association of blue plinth material with classical buildings, which contrasts with the more modern typology of plinths often seen for city center retailers.

Additionally, the building material used for the façade above the first floor significantly influenced preference. Buildings with primarily brick façades, apart from the windows, had lower preference for the non-daily store compared to those constructed with different materials. This substantial effect might be attributed to the classical style associated with brick, which contrasts with the modern design often seen in non-daily stores in the city center. This is however not grounded in literature.

The level of education also played a role in preference for the non-daily store alternative. Individuals with lower education levels or those with an HBO/WO master or PhD exhibited lower preference

compared to the average. Conversely, individuals with a bachelor's degree displayed higher preference for the non-daily store option. This relationship is non-linear, considering the ordered attribute of education, and cannot be explained.

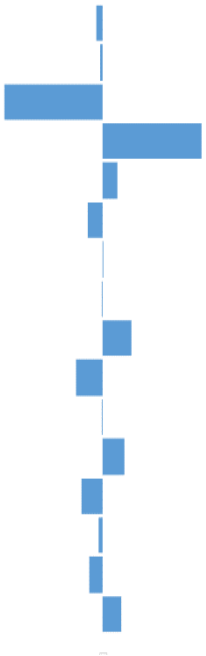
Lastly, shopping motivation was considered as an attribute. Strong positive associations were found between preference and utility for leisure shoppers, while purpose shoppers also showed a positive despite weaker association. However, individuals with a motivation labeled as "both/other" had a negative effect on preference for the non-daily store alternative. Similar patterns were observed when compared to the daily store alternative, indicating that individuals with clearly defined shopping motivations experience greater preference for these functions compared to those with less defined motivations.

Food & beverage

The Food & Beverage function, as analyzed in Table 37, demonstrated a noteworthy sensitivity to various attributes. Specifically, the plinth material, encompassing window and brick proportions, emerged as significant factors affecting preference. Remarkably, both coefficients exhibited a negative direction, implying a reduced preference for F&B if the share of glass or brick is higher. Notably, the effect of glass was found to be approximately twice as pronounced as that of brick. This seemingly counterintuitive finding regarding glass may be attributed to the preferred architectural typology sought by individuals for Food & Beverage establishments, where excessive daylight might not always contribute favorably to the indoor ambiance (Van de Kreeke, 2018).

Table 37 All attribute MNL - Food & beverage

	3. Food & beverage		
Constant		2.848	**
Plinth material	Window (%)	-0.103	***
	Brick (%)	-0.040	***
Material façade	Brick façade	-1.534	***
	Other façade	1.534	*m.c.*
Age	16 till 24	0.221	**
	25 till 34	-0.233	***
	35 and over	0.012	*m.c.*
Education	Lower	-0.020	
	HBO/WO bachelor	0.438	***
	HBO/WO master or PhD	-0.418	*m.c.*
Motivation	Purpose	-0.008	
	Leisure	0.336	***
	Both/Other	-0.328	*m.c.*
Frequency	Weekly or more	-0.068	
	Monthly	-0.218	**
	Yearly or less	0.286	*m.c.*



Moreover, the material composition of the remaining façade emerged as another attribute with a significant impact on preference for the F&B function. A predominantly brick façade was found to exert a negative influence, aligning with the previously observed attribute effect on non-daily stores. This suggests that brick façades, with their association to a more traditional style and atmosphere, may not align with the desired typology of Food & Beverage services in the city center.

Furthermore, the influence of age on preference was examined. Notably, the youngest age group (16-24 years old) exhibited significantly higher preference for the Food & Beverage function compared to the average. Conversely, the slightly older group (25-34 years old) displayed significantly lower preference. The age group above 35 demonstrated a coefficient close to zero, though its significance remains uncertain. These distinctions among age groups may signify inherent variations in priorities, with younger individuals showing a greater inclination towards engaging in social activities within Food & Beverage establishments, while the preferences of slightly older individuals tend to exhibit a diminished level of favorability. This effect however is not found in literature.

The educational background of respondents was also considered within the model. Completion of a bachelor's degree was found to exert a positive and significant influence on preference compared to the average. However, this effect was counterbalanced by individuals who had completed a master's or PhD, as their coefficients exhibited similar magnitudes but in a negative direction. Notably, respondents with an educational level lower than a bachelor's degree displayed an insignificant coefficient. This cannot be explained by existing literature or reasoning.

Regarding visit motivation, a significant effect was once again observed. Leisure shoppers displayed a positive preference for the Food & Beverage function in currently vacant retail buildings compared to the average. Conversely, the coefficient for purpose shoppers was close to zero and lacked significance. Strikingly, respondents categorized as "both/other" exhibited a markedly more negative response compared to purpose shoppers. This observation appears peculiar, considering that this group primarily comprises individuals indicating transferring or Food & Beverage as their primary visit motivations.

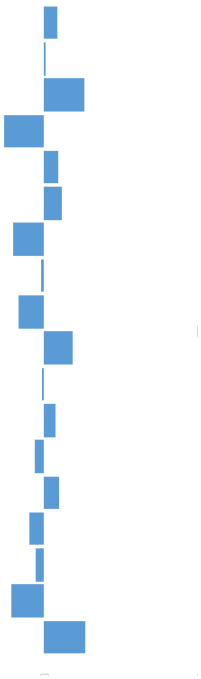
Lastly, visit frequency was examined as an attribute influencing the Food & Beverage function. Notably, visitors with a monthly frequency displayed significantly lower preference compared to the average. Conversely, individuals visiting weekly or more frequently did not exhibit a significant effect on the preference. Interestingly, those visiting yearly or less frequently demonstrated a substantially positive coefficient. This suggests that individuals who visit infrequently tend to perceive the Food & Beverage function more positively, possibly attributing it to special occasions or as a treat during such rare visits. This group might also contain tourists, who are more dependent on this function.

Office

The preference for the office function, as illustrated in Table 38, is influenced by multiple attributes, three of which pertain to building properties. Firstly, building width emerged as a significant attribute positively affecting preference for the office function. The coefficient of 0.200 indicates that with each

Table 38 All attribute MNL - Office

	4. Office		
Constant		-8.833	***
Building width		0.200	***
Plinth material	Window (%)	0.020	**
Material façade	Brick façade	0.636	***
	Other façade	-0.636	*m.c.*
Age	16 till 24	0.220	**
	25 till 34	0.277	***
	35 and over	-0.497	*m.c.*
Education	Lower	-0.051	
	HBO/WO bachelor	-0.405	***
	HBO/WO master or PhD	0.456	*m.c.*
Frequency	Weekly or more	-0.029	
	Monthly	0.185	**
	Yearly or less	-0.156	*m.c.*
Composition	1 person	0.242	***
	2 persons	-0.242	*m.c.*
Motivation	Purpose	-0.135	
	Leisure	-0.515	***
	Both/Other	0.650	*m.c.*



one-meter increase in building width, the preference (utility) increases by this value. This observation suggests that individuals prefer wider buildings for office purposes, potentially due to the association of larger buildings with office typologies.

Secondly, the plinth material, specifically the percentage of glass, was found to be a significant attribute. The positive coefficient of 0.02 implies that for every one percent increase in the share of windows, the preference increases by 0.02. Thus, a ten percent increase in window space has a similar effect on preference as a one-meter increase in building width. This finding suggests that people may associate glass-clad buildings more strongly with office environments compared to more enclosed structures.

The final building attribute concerns the material of the remaining façade. A predominantly brick façade demonstrated a positive coefficient, indicating higher preference for the office function in such buildings. Conversely, façades made of other materials exerted a negative effect on preference. It is worth noting that while this study identified a correlation between the façade material and office function preference, the specific reasons for this effect is not fully understood.

Two attributes related to personal properties were considered. Both younger age groups (16 to 24 and 25 to 34) exhibited significantly positive coefficients for the office function, while the group aged 35 and over displayed a strongly negative coefficient. These results suggest that younger individuals

tend to hold a more positive attitude towards the presence of office buildings in the city center compared to their older counterparts. This might arguably be attributed to the fact that mostly young people move to the city, while people over the age of 30 tend to leave the city (Husby et al., 2019), indicating a stronger preference for living and working in cities for younger people.

The other personal attribute examined was the level of education. Individuals who had completed a bachelor's degree exhibited a significant negative coefficient, whereas the coefficient for lower-educated individuals was insignificant and close to zero. On the other hand, individuals with a master's or PhD displayed a positive coefficient. This pattern indicates that individuals further along in their studies or already engaged in professional endeavors tend to have a greater preference for office environments, possibly driven by their aspirations for employment in such locations.

Three attributes captured characteristics of the shopping trip. Firstly, visit frequency to the city center revealed no significant relationship for individuals visiting more than once a week. However, those visiting monthly exhibited a positive coefficient, suggesting a greater preference for the office function compared to the average. On the other hand, individuals visiting the center once a year or less displayed a negative coefficient. This finding may be linked to the center's function for different visitor types, with annual visitors perceiving the center more as a touristic destination, while those visiting monthly likely view it as a functional space encompassing work-related activities as well.

Furthermore, the composition of the group during the visit to the city center emerged as a relevant factor. Individuals visiting on their own derived more preference from the office function compared to those in groups of two. Why this is the case is uncertain.

Lastly, the motivation for visiting the city center was taken into account. The lowest coefficient was observed for leisure shopping motivation, followed by purpose shopping motivation. Notably, the "both/other" motivation exhibited a more positive coefficient compared to the average. These findings suggest that individuals visiting the city center for shopping purposes have lower preferences for the office function compared to those with different motivations. Moreover, it can be concluded that the office function has a stronger negative impact on leisure shopping compared to purpose shopping. This observation may result from the limited experiential value that the office function contributes to the overall city center experience.

Residential

The preference for the residential function in vacant retail buildings within the city center of Eindhoven is examined in Table 39, revealing the significant influence of six attributes.

The first attribute considered is building width, which exhibited a positive effect on the preference for the residential function. The coefficient of 0.262 indicates that for each one-meter increase in width, the preference (utility) increases by this value. This finding suggests that individuals favor residential functions in wider buildings as opposed to narrower ones. Furthermore, the height of the building was included in the model resulting in a positive contribution to the preference with a coefficient of 0.053. However, the impact of width per meter is significantly higher compared to the effect of height. Larger buildings, encompassing both width and height, are more preferred for residential purposes. This

observation may be attributed to the typology of apartment buildings, which often require larger structures.

Table 39 All attribute MNL - Residential

	5. Residential		
Constant		-8.197	***
Building width		0.262	***
Building height		0.053	**
Material façade	Brick façade	0.564	***
	Other façade	-0.564	*m.c.*
Main street	Yes	-0.358	***
	No	0.358	*m.c.*
Gender	Male	-0.262	***
	Female	0.262	*m.c.*
Motivation	Purpose	0.037	
	Leisure	-0.628	***
	Both/Other	0.591	*m.c.*

The material of the façade was also incorporated into the model, revealing a positive coefficient of 0.56 for predominantly brick façades, while façades made of other materials exhibited an opposite value of -0.56. These findings indicate that individuals have a greater preference for the residential function when the vacant retail building is constructed with brick. This preference might be the result from the prevalent use of brick in residential buildings in the Netherlands, aligning with people's perception of an ideal residential structure.

The attribute indicating whether the building is situated on a main street was considered as well. It was found that buildings located on main streets are less preferred for transformation into residential units compared to other locations within the city center. This finding aligns with expectations, as main streets tend to have a stronger commercial orientation.

Gender was identified as a significant factor influencing people's preferences. The coefficient is negative for males and positive for females, indicating that females generally have a stronger preference for the residential function in the city center compared to males.

Lastly, the motivation for visiting the city center was incorporated into the analysis for the residential function. Leisure shoppers displayed a negative coefficient, implying a lower preference for the residential function. The effect for purpose shoppers was found to be insignificant. On the other hand, individuals with the "both/other" motivation exhibited a positive coefficient. The overall pattern aligns with that observed for the office function, indicating that non-commercial functions such as office or residential have a stronger negative impact on leisure shoppers compared to purpose shoppers. Moreover, the group indicating less obvious shopping as their purpose tends to be more accepting of these types of atypical functions.

Service provider

The preference for the service provider function in vacant retail buildings is significantly influenced by six attributes, as shown in Table 40. Both the width and height of the building were found to be relevant factors. Larger buildings are more preferred for the service provider function compared to smaller buildings, as indicated by the positive coefficients. This might be attributed to the typology of services people have in mind such as banks, which are often located in larger buildings. The effect is measured per meter increase, with the effect of width being approximately three times larger than the effect of height. This observation may be attributed to people's tendency to be more aware to their eye-level (Bertamini et al., 1998) and thus are more sensitivity to the width of a building.

Table 40 All attribute MNL - Service provider

	6. Service provider		
Constant		-8.473	***
Building width		0.267	***
Building height		0.090	***
Material façade	Brick façade	0.387	***
	Other façade	-0.387	*m.c.*
Education	Lower	-0.188	**
	HBO/WO bachelor	-0.086	
	HBO/WO master or PhD	0.274	*m.c.*
Address	Eindhoven	-0.106	
	Bordering municipality	-0.244	***
	Other	0.350	*m.c.*
Motivation	Purpose	0.127	
	Leisure	-0.437	***
	Both/Other	0.310	*m.c.*

The material of the façade, particularly the floors above the plinth and the predominant material used besides the windows, is another significant attribute. Buildings with a brick façade are more preferred for the service provider function compared to those constructed with other materials. This is similar to the office function but cannot be explained.

The level of education also influences the preference for the service provider function. Individuals with a lower level of education have significantly less preference for this function. The effect is insignificant for those with a bachelor's degree, while individuals with a master's or PhD degree exhibit a positive coefficient, indicating a stronger preference for the service provider function. Generally, as the level of education increases, people derive more preference from service providers. This might be related to the education level the users of service providers people had in mind typically have.

Considering the address, a distinction is made between residents of Eindhoven, residents of bordering municipalities, and residents living further away. No significant effect was found for Eindhoven

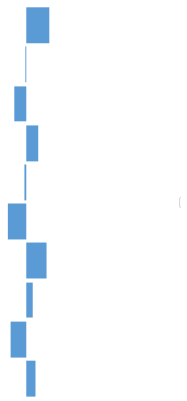
residents. However, residents of bordering municipalities exhibit a negative and significant effect on the preference for the service provider function. On the other hand, people living further away have a positive coefficient, indicating a higher preference for this function. No clear explanation for this trend can be found.

Lastly, the visit motivation is included in the model. The pattern of the coefficients follows a similar trend observed for functions like office and residential. Negative coefficients (lower preference) are observed for leisure shopping motivation, positive values (higher preference) for "both/other" motivation, and the coefficient for purpose shopping motivation falls in between or is insignificant. This finding aligns with expectations since the service provider function is not one of the primary commercial function typologies. However, it differs from offices and residences, as service providers often have customers and can be accessed by visitors to the city center.

Healthcare

The preference for the healthcare function in vacant retail buildings in the city center is influenced by several attributes. The parameter estimates can be seen in Table 41.

Table 41 All attribute MNL - Healthcare

7. Healthcare				
Constant		-8.041	***	
Building width		0.370	***	
Percentage clothing store		-0.005	**	
Gender	Male	-0.188	***	
	Female	0.188	*m.c.*	
Education	Lower	-0.033		
	HBO/WO bachelor	-0.295	***	
	HBO/WO master or PhD	0.328	*m.c.*	
Motivation	Purpose	0.100		
	Leisure	-0.245	**	
	Both/Other	0.145	*m.c.*	

The width of the building is a significant attribute that significantly influences the preference for the healthcare function. The positive coefficient indicates that wider buildings are more preferred for healthcare functions compared to narrower ones. This preference may stem from people associating healthcare facilities with larger buildings based on their typical building typology.

The percentage of clothing stores in the immediate vicinity is also included in the model. The negative coefficient suggests that buildings with a high proportion of clothing stores in the surrounding area are less preferred for healthcare functions compared to buildings with fewer clothing stores. This observation could be attributed to the fact that clothing stores are associated with a distinct non-daily

retail environment, which may not align with people's preferences for atypical functions such as healthcare.

Gender is found to have a significant impact on the preference for the healthcare function. The coefficient is negative for males and positive for females, indicating that females generally have more preference for healthcare functions in the vacant buildings within the city center compared to males.

Education level is another attribute that affects the preference for the healthcare function. Individuals who have completed a bachelor's degree exhibit significantly less preference for healthcare functions compared to the average. This effect is compensated by the positive effect observed for individuals who have completed a master's or PhD degree, which increases the preference for the healthcare function. No significant effects were found for individuals with a lower level of education.

The visit motivation attribute follows a similar pattern observed for other atypical functions such as office, residential, and service provider. The leisure shopping motive has the most negative coefficient, indicating a lower preference for healthcare functions. On the other hand, the 'other/both' motive has the most positive coefficient, suggesting a higher preference. The coefficient for the purpose shopping motive falls in between or is insignificant, indicating a moderate preference for healthcare functions among purpose shoppers.

Beauty and care

The preference for the beauty and care (B&C) function in vacant retail buildings is influenced by four different attributes. An overview of the parameter estimates can be seen in Table 42.

Table 42 All attribute MNL - Beauty and care

	8. Beauty and care		
Constant		-5.183	***
Material plinth	Window (%)	-0.011	**
Street width		0.078	***
Age	16 till 24	0.277	***
	25 till 34	-0.216	***
	35 and over	-0.061	*m.c.*
Composition	1 person	-0.143	**
	2 persons	0.143	*m.c.*

The material of the plinth, specifically the share of windows in the plinth, significantly influences the preference for the B&C (Beauty and Care) function. The negative coefficient indicates that an increase in the share of windows in the building's plinth leads to a lower preference for this function. The coefficient value represents the effect on preference for a one percent increase. For instance, a ten percent increase in the share of windows would result in a decrease in preference of 0.1. This observation may be attributed to the B&C function being less dependent on daylight and visual connection to the street compared to other functions included.

The width of the street is another significant attribute that impacts the preference for the B&C function. The positive coefficient suggests that a wider street results in higher preferences for B&C, and it corresponds to the change in preference for a one-meter increase in width. With a coefficient value of 0.08, it can be concluded that having a one-meter narrower street has a similar effect on preference as increasing the share of windows by 8 percent.

Age is also found to be a relevant factor. The youngest age group (16-24 years old) has a positive and significant coefficient, indicating that they have significantly more preference for the beauty and care function on average. Conversely, the age group between 25 and 34 years old has a coefficient indicating less preference compared to the average. The effect for individuals over 35 years old is uncertain.

The composition of the group during the visit to the city center is included as an attribute. The coefficients indicate that people visiting the city alone, on average, have a lower preference for the beauty and care function. On the other hand, people visiting with a group of two show a more positive attitude towards this function, as indicated by the opposite effect.

Leisure and sports

The leisure and sports (L&S) function in vacant retail buildings is significantly influenced by two attributes related to the properties of the building (Table 43).

Table 43 All attribute MNL - Leisure and sports

	9. Leisure and sports		
Constant		-4.191	***
Plinth material	Window (%)	-0.013	**
	Wood (%)	-0.031	***
Color façade	Red	-0.145	
	Sand	-0.284	***
	White / Grey	0.429	*m.c.*

The first attribute that significantly influences the preference for the leisure and sports function in vacant retail buildings is the material of the plinth, considering both the share of windows and wood. The coefficients for both attributes are negative, indicating that an increase in the share of these materials would decrease the preference for this function. The effect of adding wood to the building's plinth is approximately three times as large as the effect of adding a percent of glass.

Lastly, the color of the façade above the plinth was found to be relevant. Specifically, having a sand-colored façade has a negative effect on the preference for leisure and sports, while having a white or grey façade is most likely to have a positive effect.

These building attributes provide valuable insights into understanding people's preferences for the leisure and sports function in vacant retail buildings. The material of the plinth, including the share of

windows and wood, as well as the color of the façade above the plinth, play a significant role in influencing the preference for this function. Remarkably, no personal and trip characteristics were found to have a significant impact on the preference for this function.

4.3.8 Separate model comparison

In Table 44 an overview of the discussed models can be seen. The model fit, indicated by the ρ^2 is included in the first column. As can be seen the model containing all attributes has the best model fit, which is 0.20. The other models which contained the attributes separately per category had similar model fits, which were lower than the 'all attribute' model.

Table 44 Model overview

	ρ^2	LL	K
Building MNL	0.154	-4458.49	34
Environment MNL	0.143	-4404.01	32
Personal MNL	0.135	-4568.94	39
Shopping trip MNL	0.141	-4529.30	37
All attributes MNL	0.204	-4190.57	77

4.4 Conclusion

In conclusion, the demographic analysis which described the sample and whether this was representative indicated that the sample used for this study was not representative. This was based on a comparison with a sample of the group non-respondents on their visual attributes. The sample group has an overrepresentation for younger and male respondents compared to the non-respondents. If comparing the education level of the sample to the Dutch average, a strong overrepresentation of higher educated people was visible. Dependent on the distribution over the different attribute levels, a new distribution was made by the merging of certain levels. This was done to make the data better distributed for further analysis and eliminate problems related to the smallest groups. Furthermore, a Chi-Square test indicated a relation between a large share of the personal and visit motivational attributes.

A best-minus-worst analysis was performed after this. This type of analysis subtracts the count of best choice from the count of worst choice and standardizes this. This results in a value for each proposed function and gives an indication of the general preference. These values allowed for a ranking of the possible functions (1 - non-daily store, 2 - food & beverage, 3 - daily store, 4 - sport & leisure, 5 - beauty

& care, 6 - healthcare, 7 - service provider, 8 - residential, 9 - office). This was confirmed by the estimation of a multinomial logit model without attributes.

This was expanded by performing both a best-minus-worst analysis and a MNL for each of the locations separately. This gave a clear indication for the general differences in preferences for the functions by location. The most evident findings are the extreme values for location 2, which concerns a building on the main shopping street of the city center of Eindhoven (Demer). The values were in line with the general preferences, however the values were much more extreme. For location 3, the Hermanus Boexstraat, the opposite was visible. All the preference indicators were much more mellow compared to the other locations. Also, at this location the general pattern for functions differed from the other locations.

To find out how the attributes were contributing to the preference indicated by the respondents a more elaborated MNL was estimated. This MNL determined the utilities separately for the choice possibilities to allow for the estimating of parameters for the different functions separately. This was done separately per category (building, environment, personal and shopping trip) and for all the attributes combined. The separate models had model fits between ρ^2=0.135 and ρ^2=0.154. The model containing all attributes has resulted in a model fit of ρ^2=0.204.

General trends could be derived from the results of these models. The separate model containing only the environmental attributes emphasized the importance of the current function mix in the immediate surrounding of a building. Notably, non-store functions in the surroundings positively affected the preference for other atypical functions, suggesting that areas already featuring mixed uses are more preferred for incorporating new functions. Atypical functions were also positively influenced by greenery and being situated away from main streets, often found at the fringes of the city center.

Building characteristics were found to be relevant in both the separate building attribute and the all-encompassing model, with two main findings. Firstly, larger buildings were preferred for incorporating atypical functions, while smaller buildings were preferred for both daily and non-daily stores. Secondly, the aesthetics of the building's façade, including materials and colors, consistently emerged as important factors, highlighting the significance of design for the preferred function of a building.

Personal characteristics, such as age, gender, education, and address, all had an impact on the preference for specific functions. This is a strong indication for their importance in determining preferences for functions in the city center. It appears that individuals who have completed a HBO/WO bachelor's degree show a higher preference for typical functions (stores and F&B) and a lower preference for atypical functions. Conversely, individuals with a master's or PhD education level exhibit the opposite effect. The group with a lower education level does not have many significant relations, however stands out in the preference for residential functions.

Shopping trip characteristics also played a significant role. The most prominent trend was the influence of visit motivation on preferences. Hedonic and utilitarian shopping motivations favored typical functions (daily store, non-daily store, and food & beverage) while being less inclined towards atypical functions. However, the "both/other" motivation showed opposite patterns. Within the two

types of shopping motivations, hedonists exhibited stronger preferences compared to utilitarian shoppers, indicating that the addition of new function types in the city center may decrease attractiveness for those with a hedonic shopping motive.

5. Conclusions and recommendations

The number of retail outlets in the Netherlands has decreased over the past decades due to changes in demographics, consumer behavior and the emergence of e-commerce. This decrease in retail outlets has led to an increase in vacant retail buildings. These vacancies are not limited to peripheral locations but are also found in the center of our cities. This challenges the attractiveness and functioning of the city center. It is, however, important to investigate solutions since the city center fulfills vital economic and social functions.

The city center has always been a location for the production and trade of products. The Dutch government has actively protected this retail role by preventing peripheral retail developments. This has resulted in centers which are dominated by retail. However, the city center has the ability to mix functions and combine retail, public services, offices, gastronomic services, education, cultural, and creative functions. Due to the decrease in retail outlets it is necessary to investigate which functions can be located in the vacant buildings without further damaging the attractiveness of the city center. This has resulted in the following research question:

What are the preferred functions for vacant properties in the Dutch inner cities according to the visitors of the city center, and what environmental, property, personal, and visit motivation characteristics affect this preference?

This research question was answered, first, with a literature review. The literature review aimed at investigating which functions are possible to locate in vacant retail buildings in the city center. Furthermore, four relevant categories of attributes were identified which were assessed to have an effect on the preference for the function of a vacant retail building. The four categories were: building, environment, personal and shopping trip. These were subdivided in two sections: physical characteristics, and non-physical characteristics. The conducted research concerned a variety of related topics such as consumer behavior, atmosphere and attractiveness. This was necessary due to the lack of present literature concerning the topic of preference for the function a building has.

The physical characteristics encompass both the environment surrounding the building and the building itself. In terms of the environment, it has been found that the functions of the surrounding buildings and the accessibility of the location are of importance. Furthermore, visual aspects of the surroundings, such as the façades, pavement material, presence of greenery, and store signs, have consistently emerged as significant factors in previous research. Similarly, these visual aspects extend to the building itself, where characteristics such as the color, material, windows, and entrances have been frequently investigated. Additionally, the size and age of the building have been identified as relevant factors in shaping consumer preferences.

The non-physical characteristics encompass both personal characteristics of individuals and characteristics related to their shopping activities. The personal characteristics are partly derived from consumer segmentation research, including factors such as age, gender, income, and education. These factors have been further expanded by incorporating additional characteristics identified in other

relevant literature. These encompass employment status, household composition, the education level of the partner, and whether individuals engage in e-commerce activities. Regarding trip characteristics, literature has included factors related to the motivation of the trip, transportation modes and distance, as well as the composition of the shopping group. For this study, a selection of these were used. The personal characteristics included are: age, gender, education, and address (Eindhoven, bordering municipality and other). For the trip characteristics the visit motivation, visit frequency and group composition were used.

The relevant characteristics found for these four categories were used for the construction of a survey for investigating the city center visitors' preferences regarding the use of vacant retail buildings. Measuring the preference was performed by means of a best-worst scaling experiment in which a respondent is asked to indicate both their most and least preferred function for a vacant building given a set of three alternative functions. This was done while being present at one of the seven selected vacant retail buildings in the city center of Eindhoven. In this way, the physical characteristics were included in a realistic manner and true shopping trip characteristics could be included.

Nine possible functions for vacant retail buildings in the city center were selected by means of the literature study and used for the best-worst scaling experiment (daily store, non-daily store, food & beverage, office, residential, service provider, healthcare, beauty & care and, leisure & sports). To answer the first part of the research question: *What are the preferred functions for vacant properties in the Dutch inner cities according to the visitors of the city center?*, two analyses were performed. These analyses calculated values referring to their relative preference without taking into account any attributes representing characteristics of the vacant buildings (their environment, the respondents and their shopping trips). The performed analysis methods were both a standardized best-minus-worst analysis and a multinomial logit model. Both of these methods have resulted in the same ranking of included functions.

The most preferred function is the non-daily store, which refers to stores such as clothing stores, shoe stores and jewelry. These are the types of stores currently predominantly present in the city center. Food and beverage was ranked as second best option, and is already a frequently used function for filling vacancies. Thirdly, stores for daily products function were ranked. If considering those three functions, it is evident that in general the centers' visitors prefer functions that are already well present in the center. Ranked fourth and fifth are 'leisure and sports' and 'beauty and care'. These functions are less typical retail functions but are still accessible for customers. After this, healthcare was ranked, followed by service providers. The two least preferred functions were residential and office.

The preferences for the function of a currently vacant retail building differ for the seven locations included in the study. This allowed for the construction of a more elaborate multinomial logit model. In this multinomial logit model the relative importance and significance of attributes were estimated for each proposed function. This allowed for including different attributes per function and having other corresponding part-worth utilities for these attribute levels. This allows for answering the

second part of the research question: *what environmental, property, personal, and visit motivation characteristics affect this preference?*

In total five different multinomial logit models were estimated. This is done both for the four categories separately: building (ρ^2=0.15), environmental (ρ^2=0.14), personal (ρ^2=0.14) and shopping trip (ρ^2=0.14) , and in an all-encompassing model (ρ^2=0.20). The sub-models have a similar model fit whilst the all-encompassing model is a significant improvement.

For the environmental attributes, the separate model indicated the importance of the current function mix in the direct surrounding of a building. The most evident finding concerning the function mix is the indication that non-store functions in the surrounding positively affect the preference for other atypical functions. Indicating that already mixed used areas are more preferred for mixing in new functions. The preference for atypical functions was also positively affected by greenery and not being on a main street. Locations with these characteristics can often be found on the fringes of the city center.

The effect of characteristics of the building can be brought back to two main findings. Firstly, larger buildings are more preferred for the incorporation of atypical functions. Consequently, both types of stores included in this research; daily and non-daily stores, were found to be preferred in smaller buildings. Secondly, the aesthetics of the façade came back frequently in both materials and colors. This stresses the importance of the design of a building for its preferred function.

The personal characteristics used; age, gender, education and address (Eindhoven, bordering municipality or other), were all found to have an effect on the preference for certain functions. It appears that individuals who have completed a HBO/WO bachelor's degree show a higher preference for typical functions (stores and F&B) and a lower preference for atypical functions. Conversely, individuals with a master's or PhD education level exhibit the opposite effect. For the other attributes it was not possible to identify explainable trends in the effect of the attributes on the preferences. The significant coefficients and improvement of the model however indicate the importance of these attributes.

Lastly, the shopping trip characteristics were found to be of importance. The most evident trend for shopping trip characteristics is the effect of the visit motivation on the preference of a person. The motivation was divided into hedonic shopping motivation, utilitarian shopping motivation and both/other. Both shopping motivations were more in favor of the typical functions (daily store, non-daily store and food & beverage) and less in favor for the atypical functions. The both/other motivation showed opposite patterns. Within the two types of shopping motivations hedonists were more extreme in their preference compared to the utilitarian. This provides a strong indication that for people with a hedonic shopping motive the addition of new types of functions in the city center will decrease the attractiveness.

5.1 Limitations

In this research, the preference for the use of vacant retail buildings in a Dutch city center, Eindhoven, was determined. This was expanded by the investigation of relevant factors affecting this preference. Significant progress was made in the understanding of these preferences and valuable insights were obtained. However, it is important to acknowledge that every research has its limitations, and this study is no exception. This section will discuss the limitations encountered during the course of this research, highlighting areas where further improvements or considerations could enhance the overall validity and reliability of the findings. By openly addressing these limitations it is aimed to provide a balanced perspective on the scope and implications of this study.

Lack of present literature

This study aimed at identifying the physical (building and the environment) and non-physical (personal and shopping trip) characteristics that affect the preference for the use of a vacant retail building in a city center. This was done for a selection of proposed functions surpassing the scope of the more established functions city centers currently have. Literature regarding the preference for the function of a vacant retail building is missing, and further complicated by including non-commercial functions. This has resulted in the use of related research topics such as attractiveness and atmosphere for the identification of relevant characteristics. This might have resulted in missing relevant characteristics in this research.

Research method

The method in this study combined a best-worst-scaling experiment with a specific context. While this method performs well for capturing real effects, this results in attributes referring to the physical environment being constant for each vacant building throughout the whole survey. By using attribute levels instead of a context, each respondents' preference could have been measured for multiple levels of an attribute which would benefit the reliability. Also, due to the used method, the sample of vacant buildings should be relatively large to ensure enough variation in physical attribute levels. Even with many research locations certain building attributes will remain correlated to each other and thus the effect of these attributes separately cannot be determined.

Correlations

Due to the result of the chosen research method and time constraints only a limited number of seven locations could be included in this study. These locations were selected in the city center of Eindhoven for practical purposes which ignores between-city differences. Despite the presence of a number of vacancies, the selection procedure (no temporary uses, advertising or construction sites) eliminated a substantial share of these buildings which resulted in a limited degree of choice freedom. This has resulted in a substantial correlation for numerous attributes. These correlations limit the number of attributes that can be included in the all-encompassing model and limit interpretation of effects. Also, the correlation value for which attributes were prohibited to be combined in the multinomial logit model was set at a higher value than might be desired.

Survey design

The levels for which certain attributes were collected limited the freedom for the analysis or were missing information that would have been desired to have. The age distribution was measured in ten-year cohorts, which are reasonably large cohort sizes. Especially considering over seventy percent of respondent fell in the first two levels. By collecting the age numerical, the creation of cohorts could have done post data collection. Also, the visit motivation could have been further detailed. No further difference was made to see someone was leisure shopping for the benefit of socializing or the pleasure derived from the acquiring of a product. Furthermore, the purpose shopping motivation could have been further divided into daily products or non-daily products. This however would have resulted in an increase of required sample size.

Sample

The sample of this study was not distributed in the composition that matches with the expected population. Despite the expected population being hard to determine, the disparity between the respondents and the non-respondents gave a clear indication of a mismatch. Younger people, males, and higher educated respondents were overrepresented. Besides limiting the generalizability of the results, analyzing the influence of personal or trip characteristics was also complicated. This has resulted in the indication of these characteristics having an effect on the preference but sometimes in unexpected directions.

Generalizability

The data was collected for seven buildings in the city center of Eindhoven. The preferences and their attributes therefore correspond to Eindhoven and the buildings used. As a result from the different ways city centers function and physical differences, the generalizability of the data is relatively low. Especially for the physical properties, which strongly differ over cities. An older building in Eindhoven might be more unique compared to the cities which have an older city center. This could also affect the way people perceive these characteristics. More general observations such as the importance of shopping motivation and the effect it has on the preference, are more likely to surpass this limitation.

Unexplainable effects

Not all of the parameters found in the models show an expected or explainable trend. Especially the seemingly ordered attributes have this limitation. One might for example expect that increasing the level of education or age results in an increase or decrease in preference for a function accordingly. This is not the case, which makes it hard to explain these observations. This might be a limitation that is related to the sample distribution. Another unexplainable effect is the negative effect for the share of glass in the plinth for non-daily stores in the overall model, while glass has a positive effect in the model considering building characteristics only.

Definition of vacant retail buildings

In this research, the definition of vacant buildings did not concern the building as a whole. The buildings used were always vacant in the plinth, but the upper floors were not necessarily empty. The respondents asked for their preference, therefore, could be affected by the functions currently above the plinth level. Another problem related to this definition concerns the mix of uses in a building.

Residential functions in the city center appear to be strongly disliked in this research. This is however the case for residential functions in the plinth. It might be the case, and is frequently indicated by respondents verbally, that residential functions on all floors above is much more favored.

5.2 Implications

In this section the implications resulting from this study will be discussed. This is divided into implications for practice, in which recommendations will be made for policy makers and other stakeholders concerned. The second part are the implications and recommendations for further research and theoretical findings.

Implications for practice

This study has contributed to a better understanding regarding the preferences city center visitors have for the functions in vacant retail buildings. The general trend indicates the more typical city center functions are also more preferred by the visitors. The addition of new functions to the city center will most probably negatively affect its' attractiveness. Therefore, the key for policy makers and other stakeholders is to make well considered decisions regarding solving of the problems related to vacancies.

For policy makers and other stakeholders involved in the management of the city center, the over-all ranking of functions gives a good indication of what the centers' visitors prefer. This ranking can be beneficial for making visions and investment decisions.

Since the function of the city center is increasingly focused on the experience and the attractiveness, decision makers should focus more on people with a hedonic shopping motivation. For this group it is found that the typical city center functions are most preferred, e.g. retail and food & beverage. Therefore, caution is advised when aiming for a city center including atypical functions. For the over-all attractiveness of the city center it is possible to indicate designated mixed-use areas where atypical functions can be located. These are locations where a mixed use is already present, are non-central and have more greenery. However, introducing offices and residences should be carefully considered as these are less preferred compared to the other function types.

On a more refined level the attributes included can benefit decision making on the level of single buildings. For a scenario in which multiple buildings are considered for a certain function, this research can contribute to selecting the building that would be most preferred as a result of its' physical characteristics. For example, choosing a larger, brick cladded building for a residential function.

For the real estate owners, it is possibly beneficial to see how certain building characteristics affect the preference for the use of the building according to the users of the city center. Real estate owners can use this to select adequate tenant typologies, but can also make adaptations to the building and make the building more suited for a certain function.

Implications for theory

This thesis has contributed to the field of research concerning consumer preferences in a Dutch city center. In the study larger effects, such as the effect of shopping motivation and building size, were identified and a first step is made into gaining knowledge regarding the preference for the use of vacant retail buildings in a city center. A first indication of relevant attributes was made, but an all-encompassing interpretation is not available yet.

The chosen method for measuring preference, best-worst scaling was found to be an adequate way of measuring preferences. It was found to be relatively easy for the respondents of the survey. The use of balanced incomplete block design was suitable for reducing the number of tasks to an acceptable amount. This was import for an experiment that was executed on-site. This method however did limit the number of functions to be included in the study to nine. This is a relatively course level of subdividing possible functions. By limiting the proposed function to this level of detail, nuances in function typology were lost. A supermarket might be different from a bakery and one type of office might be different from another type. For further research it is recommended to extend on the knowledge regarding a more refined level of function segmentation.

The physical attributes in this research were accounted for by varying in the context in which the preferences were measured. Whilst this method allows for a broader understanding for a variety of characteristics, a more detailed understanding is lacking. For further research it might be beneficial to isolate relevant attributes and simulate these attributes in a digital environment. In this way the researcher is in control of the attribute levels in the choice sets, and a more balanced research design can be made. This can be beneficial for gaining better understanding in the effect of the different attribute levels representing a building, and investigating characteristics that are currently not present. Furthermore, by taking the experiment off the street, more complicated and time-consuming surveys might be possible.

This study has focused on a specific context in Eindhoven. Due to the possible variations in effects of attributes, this results in a lack of generalizability. It is recommended for further research to investigate differences for other cities. This would be beneficial for more widely applicable knowledge.

This research can be considered as a first step in investigating visitor's preferences regarding vacant buildings in city centers. The findings of this research give an indication of relevant topics and can contribute to future research.

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Appendix

Appendix A – English survey

Section B: Personal characteristics

B1. What is your gender?

- Male ☐
- Female ☐
- Other ☐
- No answer ☐

B2. What is your age?

- 16 - 24 years old ☐
- 25 - 34 years old ☐
- 35 - 44 years old ☐
- 45 - 54 years old ☐
- 55 - 64 years old ☐
- 65 years or older ☐

B3. What is the composition of your group with which you are visiting the city center today?

Number of adults (16 years and over) | | | | | |

Number of children (till 16 years) | | | | | |

B4. Continue to the next page?

- Yes ☐
- No ☐

Section C: What should come here?

C1. Look at the vacant building which you are standing in front of.

For what function could this building be best utilized?

Section D: Proposed functions

All of the following tables have three possible uses for the building you are standing in front of. Indicate in each table your most and least preferred use.

D1.

	Most preferred	Least preferred
Non-daily store (Fashion and luxury, Leisure and hobby, Electronics)	☐	☐
Dwellings	☐	☐
Healthcare (GP, Dentist, Physiotherapist, Pharmacist)	☐	☐

D2.

	Most preferred	Least preferred
Food & beverage (Restaurant, Bar / Cafe, Take away, Lunchroom)	☐	☐
Office	☐	☐
Service (Bank, Telecom, Broker)	☐	☐

D3.

	Most preferred	Least preferred
Non-daily store (Fashion and luxury, Leisure and hobby, Electronics)	☐	☐
Service (Bank, Telecom, Broker)	☐	☐
Leisure and sports (Fitness, Museum / Gallery, Leisure games)	☐	☐

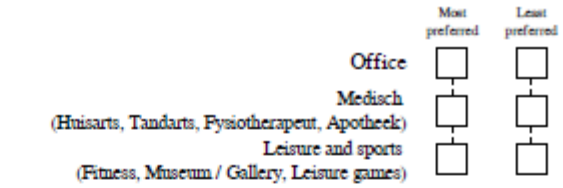
D4.

	Most preferred	Least preferred
Daily store (Supermarket, Bakery, Drug store)	☐	☐
Beauty and care (Hairdresser, Beauty salon, Tattoo and piercings)	☐	☐
Leisure and sports (Fitness, Museum / gallery, Leisure games)	☐	☐

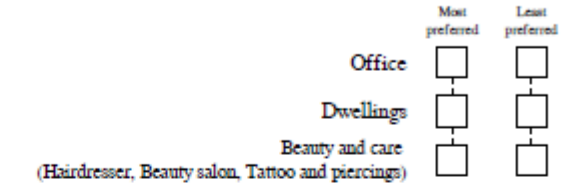
D5.

	Most preferred	Least preferred
Daily store (Supermarket, Bakery, Drug store)	☐	☐
Food & beverage (Restaurant, Bar / Cafe, Take away, Lunchroom)	☐	☐
Healthcare (GP, Dentist, Physiotherapist, Pharmacist)	☐	☐

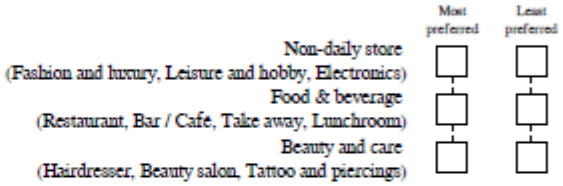
D6.



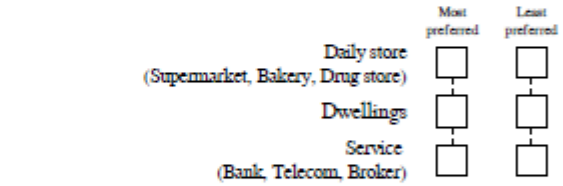
D7.



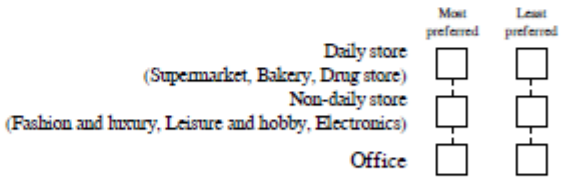
D8.



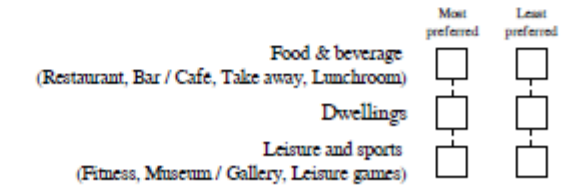
D9.



D10.



D11.



D12.

	Most preferred	Least preferred
Service (Bank, Telecom, Broker)	☐	☐
Healthcare (GP, Dentist, Physiotherapist, Pharmacist)	☐	☐
Beauty and care (Hairdresser, Beauty salon, Tattoo and piercings)	☐	☐

Section E:

E1. How often do you visit the city centre of Eindhoven?

- ☐ Daily
- ☐ Weekly
- ☐ Monthly
- ☐ Yearly
- ☐ Less than 1 time a year

E2. What is your main reason for visiting the city centre today?

- ☐ Goal oriented shopping
- ☐ Shopping for fun
- ☐ Both
- ☐ Other

Other

E3. Do you live in the Netherlands?

- ☐ Yes
- ☐ No

E4. What are the 4 digits of your postal code?

E5. **What is your highest achieved level of education?**

- Primary education ☐
- Lower vocational education ☐
- Vocational education ☐
- Higher education (bachelor) ☐
- Higher education (Master/Phd) ☐
- Other ☐
- No answer ☐

Section F: Is your preference the unchanged?

F1.

Is the answer to the question:

Look at the vacant building which you are standing in front of.

Which function would you prefer most for the use of this building?

Still ?

- Yes ☐
- No ☐

F2. **What would your answer be now?**

Thank you for filling in this survey!

Appendix B – Attribute merging and coding

Attributes	Unit	# level	input levels	V1	V2	V1 name	V2 name
Building Attribute							
Building width	Meter		Numeric			B_width	
Building height	Meter		Numeric			B_height	
Façade material plinth glass	Percentage		Numeric			B_RAAM	
Façade material plinth brick	Percentage		Numeric			B_BRICK	
Façade material plinth wood	Percentage		Numeric	-1	-1	B_WOOD	
Façade color plinth	Nominal level	3	Blue	1	0	B_CP1	B_CP2
			Grey / Black	0	1		
			Other	-1	-1		
Façade material	Binary	2	Brick (>70%)	1		B_MF	
			Other	-1			
Façade color	Nominal level	3	Red	1	0	B_CF1	B_CF2
			Sand	0	1		
			White / Grey	-1	-1		
Entance door width	Meter		Numeric			B_DOOR	
Building year before 1990	Binary	2	Yes	1		B_AGE	
			No	-1			
Corner building	Binary	2	Yes	1		B_CORN	
			No	-1			
Environmental attribute				**V1**	**V2**		
Main shopping street	Binary	2	Yes	1		E_MAIN	
			No	-1			
Pavement color	Binary	2	Red	1		E_PAVEC	
			Grey / Brown	-1			
Greenery in street	Binary	2	Visual	1		E_green	
			No / Barely	-1			
Trees in street	Binary	2	Yes	1		E_tree	
			No	-1			
Street width	Meter		Numeric			E_SW	

Width to height ratio	Width/Heigh		Numeric			E_WtH	
Environmental façade diversity	Binary	2	Diverse	1		E_Divrs	
			Uniform	-1			
Environmental façade moden	Binary	2	Yes	1		E_modern	
			No	-1			
Environment façade height differentiation	Binary	2	Yes	1		E_DIFH	
			No	-1			
Distance to closest trainstation	Meters		Numeric			E_train	
Distance to closest busstop	Meters		Numeric			E_bus	
Distance to closest parking facility	Meters		Numeric			E_parkng	
Retail mix							
Stores	percentage		Numeric			RM2_S	
Clothing store	percentage		Numeric			RM2_CS	
Food and beverage	percentage		Numeric			RM2_FB	
Percentage vacant	percentage		Numeric			RM2_V	
Optician	percentage		Numeric			RM2_OPT	
Leisure and Sport	percentage		Numeric			RM2_LS	
Personal				**V1**	**V2**		
Age		3	16 till 24	1	0	P_age1	P_age2
			25 till 34	0	1		
			35 and over	-1	-1		
Gender	Binary	2	Male	1		P_Gender	
			Female	-1			
			Other	0			
Level of education completed		3	lower	1	0	P_EDU1	P_EDU2
			HBO wo bachelor	0	1		
			Hbo wo mastar/ PhD.	-1	-1		
Postal code		3	Eindhoven	1	0	P_Post1	P_Post2

			Bordering municipality	0	1		
			Other	-1	-1		
Shopping trip				**V1**	**V2**		
City center visit frequency	Nominal level	3	Weekly or more	1	0	FWEEK	FMONTH
			Monthly	0	1		
			Yearly or less	-1	-1		
Group composition adults	Adults (>16)	2	1 person	1		F_Gcomp3	
			2 persons	-1			
Children in group	Binary	2	Yes	1		F_Child	
			No	-1			
Visit motivation	Nominal level	3	Specific purpose	1	0	F_Motiv1	F_Motiv2
			Shopping for fun	0	1		
			Both or Other	-1	-1		

Appendix C – Open-end question results

This table displays the results from the open end question concerning the most preferred function for the vacant building respondents were standing in front of. The results are divided over the different locations that were used in this research.

Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7
Residence	Clothing store	Gym	F&B	Shop	Lunchroom	Lego store
Residence	Bakery	Lunchroom	High-quality toys	Pet store	Indoor plant store	Small lunch place
Multiple shops together (local party)	Pastry shop	Second-hand shop	Grocery store	Not sure	Eating establishment	Craft beer store
Shop	Clothing store	Plant shop	Shop	Coffee, lunch, breakfast	Rental	Starbucks
High-end segment shop	Sustainable men's fashion	Seasonal store (currently Christmas)	Open office	Residences	Takeaway restaurant/fast food restaurant	Affordable clothing store
Co-working space	Specialty store/grocery	Pizza takeaway shop	Shelter for people in need	Public daycare space	Cafe for brunch etc. (above residential)	Place of worship
Shop and residences	Clothing store	Luxury sandwiches	F&B	F&B	F&B	Selling
Clothing store	Florist	Bookstore	Restaurant	Hairdresser	Shop	Store for upscale clothing
Wellness	Bakery	Affordable luxury hair salon	Restaurant	Coffee place	Ground floor shop	Men's fashion
Residences	Shoe store	Flower shop	Small furniture store	Youth center	Shop	Shop
F&B/juice bar	Miscellaneous shop	Specialty food shop	Not sure	Gallery	retail, care (nail studio,	Residence

					hairdresser, salon, etc.)	
Retail	Pizza restaurant	Lunchroom	Exclusive women's fashion	Clothing store	Shop	Shop
Coffee/bar	Patisserie	Shop	Vintage store	Lunchroom	Shop	Shop
Fancy office	Shoes	Hairdresser	Luxury men's fashion	Not sure	Coffee shop	Shop
High-quality brand retail	Jewelry	Shop	Clothing store	Non-daily shop	F&B/shop	Shop
Starting retailer (reduced rent)	Jewelry	Second-hand shop	Luxury interior	Live music, art, furniture sales	Sports store	Another clothing store
F&B	Bakery	Clothing store	Residence	Gallery	Lunchroom	Coffee shop
Luxury boutique	Donut shop	Clothing store	Bar with terrace	Clothing store	Plant shop	
Specialty non-food shop	Coffee and bakery store	Xenos	Shop	F&B or cozy, seasonal	Shop/F&B	Clothing store
Model shop	Shoes	Kitchenware shop	Gallery	Kitchenware shop	Bag and shoe store	Retail space
Gallery	Coffee	Clothing store	Shop	Gym	Restaurant	Chocolatier
Indian food shop	Bakery	Shop	Shop	Not sure	Coffee bar	Plant shop
Clothing store	Clothing store	Spanish restaurant	Bookstore	Residence	Organic supermarket	Shop, as long as the upper floors are occupied
F&B restaurant	Delicatessen shop	F&B	Music store	Elderly center for meeting and support	Beautiful showroom	Tapas shop

Restaurant	Clothing store	Clothing store	Gallery	F&B	F&B	Delicatessen shop
Shop same	Shop (non-clothing)	Clothing store	Bike shop	Pharmacy	Shop	Shop
Shop	Shop	Bookstore	F&B	Clothing store	Florist	Clothing store
Hairdresser	Bakery	Children's clothing	Shop	Shop	Shop	Homeless drop-in room
Craft beer shop	Shops	Delicatessen shop	Restaurant	Store (residential above)	Clothing, shoes, or cafe	Shop
F&B High tea	Coffee bar	F&B	Showroom	F&B	F&B	Kitchenware shop
						Pop-up show for small entrepreneurs

Appendix D – Code for data preparation

This appendix contains the MatLab code which is used to transform the data retrieved from Lime Survey. The data is transformed from wide-format to long-format, which can be analyzed by the Nlogit software. During the process of the analysis adaptions were made to the data, this was done by simple commands in excel and thus are not visible in the code.

```
 clear

listID = [];

listTASK = [];

listSETS = [];

listCASE = [];

listALT = [];

listALTID = [];



for i = 1:211
    for p = 1:72
        listID = [listID, i]; %Create empty list with all participant ID's
        x = 36;
        listSETS = [listSETS, x]; %Create empty list with choice sets
        z = 2;
        listALT = [listALT, z]; %Create empty list with choise within choice sets
        p = p + 1;
    end
    i = i + 1;
end

for i = 1:211
     for x = 1:12
         for z = 1:6
             listTASK = [listTASK, x]; % Create empty list with all proposed choice
tasks
             z = z + 1;
         end
         x = x + 1;
     end
    i = i + 1;
end

for i = 1:211
    for p = 1:12
        for x = 1:3
            for z = 1:2
```

```
                listCASE = [listCASE, x]; %Create empty list with the 3 choices
within the 12 proposed tasks
                z = z + 1;
            end
            x = x + 1;
        end
        p = p + 1;
    end
    i = i + 1;
end

for i = 1:211 % Create variables with the choice options for the 12 tasks
    x1 = [5 2 2 7 5 7];
    x2 = [3 4 4 6 3 6];
    x3 = [2 9 9 6 2 6];
    x4 = [8 9 9 1 1 8];
    x5 = [3 7 1 7 1 3];
    x6 = [9 7 4 7 4 9];
    x7 = [4 5 5 8 4 8];
    x8 = [2 3 2 8 3 8];
    x9 = [1 5 5 6 1 6];
    x10 = [1 2 1 4 2 4];
    x11 = [9 3 5 3 9 5];
    x12 = [7 6 7 8 8 6];
    listALTID = [listALTID x1 x2 x3 x4 x5 x6 x7 x8 x9 x10 x11 x12];
    i = i + 1;
end

%Reverse all the lists.
ListId = listID';
listTask = listTASK';
listSets = listSETS';
listCase = listCASE';
listAlt = listALT';
listAltid = listALTID';


Tab = readtable('Ordered_logit.xlsx','Range','O2:AL212'); %Read excel sheet with
data
Array = table2array(Tab); %Turn table into an array
z = 1;
Array2 = Array'; %Reverse the array
Larray = length(Array); %Calculate the number of columns
Harray = height(Array2); %Calculate the number of rows

%Create a list with all choices made by the participant
list = [];
for x = 1:72:Larray * 72
      for p = 1:2:Harray
        L1 = listAltid(x);
        L2 = Array(z, p);
        L3 = listAltid(x+1);
        L4 = listAltid(x+2);
        L5 = listAltid(x+3);
        L6 = listAltid(x+4);
        L7 = listAltid(x+5);
            if L1 == L2
```

```
                list = [list, 1];
            else
                list = [list, 0];
            end
            if L3 == L2
                list = [list,1];
            else
                list = [list, 0];
            end
            if L4 == L2
                list = [list,1];
            else
                list = [list, 0];
            end
            if L5 == L2
                list = [list,1];
            else
                list = [list, 0];
            end
            if L6 == L2
                list = [list,1];
            else
                list = [list, 0];
            end
            if L7 == L2
                list = [list,1];
            else
                list = [list, 0];
            end
      x = x + 6;
      end
      z = z + 1;
end
listKeuze1 = list';


z = 1;
list2 = [];
for x = 1:72:Larray * 72
      for p = 2:2:Harray
        L1 = listAltid(x);
        L2 = Array(z, p);
        L3 = listAltid(x+1);
        L4 = listAltid(x+2);
        L5 = listAltid(x+3);
        L6 = listAltid(x+4);
        L7 = listAltid(x+5);
            if L1 ~= L2
                list2 = [list2, 1];
            else
                list2 = [list2, 0];
            end
            if L3 ~= L2
                list2 = [list2,1];
            else
                list2 = [list2, 0];
            end
```

```
            if L4 ~= L2
                list2 = [list2,1];
            else
                list2 = [list2, 0];
            end
            if L5 ~= L2
                list2 = [list2,1];
            else
                list2 = [list2, 0];
            end
            if L6 ~= L2
                list2 = [list2,1];
            else
                list2 = [list2, 0];
            end
            if L7 ~= L2
                list2 = [list2,1];
            else
                list2 = [list2, 0];
            end
      x = x + 6;
      end
      z = z + 1;
end
% Create the list with the final choice by combining the two previous made
% lists.
listKeuze1 = list';
listKeuze2 = list2';
listKeuze2 = [listKeuze2; 0; 0];
listKeuze1 = [listKeuze1; 1; 0];
listfinal = [];
q = 211*72;
for i = 2:2:q
        P1 = listKeuze1(i);
        P2 = listKeuze2(i);
        P3 = listKeuze2(i+1);
        P4 = listKeuze2(i-1);
        if P1 == 1 && P2 == 0
            listfinal = [listfinal, 1];
        elseif P2 == 1 && P1 == 1
            listfinal = [listfinal, 1];
        elseif P1 == 0 && P2 == 1 && P4 == 0
            listfinal = [listfinal, 1];
        else
            listfinal = [listfinal, 0];
        end
        i = i + 1;
        P1 = listKeuze1(i);
        P2 = listKeuze2(i);
        P3 = listKeuze2(i+1);
        P4 = listKeuze2(i-1);
        if P1 == 1 && P2 == 0
            listfinal = [listfinal, 1];
        elseif P2 == 1 && P1 == 1
            listfinal = [listfinal, 1];
        elseif P1 == 0 && P2 == 1 && P3 == 0
            listfinal = [listfinal, 1];
```

```
        else
            listfinal = [listfinal, 0];
        end

end

listfinal = [1 listfinal];
listF = listfinal';
listF(15193,:) = [];


% Create 9 lists for each of the different functions within the city
% center, in case it applies
C1 = [];
C2 = [];
C3 = [];
C4 = [];
C5 = [];
C6 = [];
C7 = [];
C8 = [];
C9 = [];
for L = 1:length(listAltid)
    Number =listAltid(L);
    if Number == 1
        C1 = [C1; 1];
    else
        C1 = [C1; 0];
    end
    if Number == 2
        C2 = [C2; 1];
    else
        C2 = [C2; 0];
    end
    if Number == 3
        C3 = [C3; 1];
    else
        C3 = [C3; 0];
    end
    if Number == 4
        C4 = [C4; 1];
    else
        C4 = [C4; 0];
    end
     if Number == 5
        C5 = [C5; 1];
    else
        C5 = [C5; 0];
     end
     if Number == 6
        C6 = [C6; 1];
    else
        C6 = [C6; 0];
     end
     if Number == 7
        C7 = [C7; 1];
    else
```

```
        C7 = [C7; 0];
     end
     if Number == 8
        C8 = [C8; 1];
    else
        C8 = [C8; 0];
     end
     if Number == 9
        C9 = [C9; 1];
    else
        C9 = [C9; 0];
     end
end


% Create 2 lists with the education level
TabEdu = readtable('Ordered_logit.xlsx','Range','AR2:AR212');
ArrayEDU = table2array(TabEdu);
Edu1 = [];
Edu2 = [];
for x = 1:211
    for p = 1:72
        Edu = ArrayEDU(x,1);
        if Edu == 1 | Edu == 2 | Edu == 3
            Edu1 = [Edu1; 1];
            Edu2 = [Edu2 ;0];
        elseif  Edu == 4
            Edu1 = [Edu1; 0];
            Edu2 = [Edu2 ;1];
        elseif Edu == 5
            Edu1 = [Edu1; -1];
            Edu2 = [Edu2; -1];
        end
        p = p + 1;
    end
    x = x + 1;
end

% Create a list with the gender of the participants
TabGe = readtable('Ordered_logit.xlsx','Range','I2:I212');
ArrayGe = table2array(TabGe);
Ge1 = [];
for x = 1:211
    for p = 1:72
        Ge = ArrayGe(x,1);
        if Ge == 1
            Ge1 = [Ge1; 1];
        elseif Ge == 2
            Ge1 = [Ge1; -1];
        else
            Ge1 = [Ge1; 0];
        end
        p = p + 1;
    end
    x = x + 1;
end
```

```
% Create 2 lists with the age of the participants
TabAge = readtable('Ordered_logit.xlsx','Range','J2:J212');
ArrayAge = table2array(TabAge);
Age1 = [];
Age2 = [];
for x = 1:211
    for p = 1:72
        Age = ArrayAge(x,1);
        if Age == 1
            Age1 = [Age1; 1];
            Age2 = [Age2; 0];
        elseif Age == 2
            Age1 = [Age1; 0];
            Age2 = [Age2; 1];
        elseif Age == 3 | Age == 4 | Age == 5 | Age == 6
            Age1 = [Age1; -1];
            Age2 = [Age2; -1];
        end
        p = p + 1;
    end
    x = x + 1;
end

% Create 3 lists with the visit frequency of the participants
TabVN = readtable('Ordered_logit.xlsx','Range','AM2:AM212');
ArrayVN = table2array(TabVN);
VN1 = [];
VN2 = [];
VN3 = [];
for x = 1:211
    for p = 1:72
        VN = ArrayVN(x,1);
        if VN == 1
            VN1 = [VN1; 1];
            VN2 = [VN2; 0];
            VN3 = [VN3; 0];
        elseif VN == 2;
            VN1 = [VN1; 0];
            VN2 = [VN2; 1];
            VN3 = [VN3; 0];
        elseif VN == 3;
            VN1 = [VN1; 0];
            VN2 = [VN2; 0];
            VN3 = [VN3; 1];
        elseif VN == 4 | VN == 5;
            VN1 = [VN1; -1];
            VN2 = [VN2; -1];
            VN3 = [VN3; -1];
        end
        p = p + 1;
    end
    x = x + 1;
end

% 2 lists with the group composition (number of adults)
TabGA = readtable('Ordered_logit.xlsx','Range','K2:K212');
ArrayGA = table2array(TabGA);
```

```
GA1 = [];
GA2 = [];
for x = 1:211
    for p = 1:72
        GA = ArrayGA(x,1);
        if GA == 1
            GA1 = [GA1; 1];
            GA2 = [GA2; 0];
        elseif GA == 2;
            GA1 = [GA1; 0];
            GA2 = [GA2; 1];
        elseif GA >= 3;
            GA1 = [GA1; -1];
            GA2 = [GA2; -1];
        end
        p = p + 1;
    end
    x = x + 1;
end

% List to indicate whether children were present
TabGC = readtable('Ordered_logit.xlsx','Range','L2:L212');
ArrayGC = table2array(TabGC);
GC1 = [];
for x = 1:211
    for p = 1:72
        GC = ArrayGC(x,1);
        if GC >= 1
            GC1 = [GC1; 1];
        else
            GC1 = [GC1; 0];
        end
        p = p + 1;
    end
    x = x + 1;
end

% 2 lists with the motivation for visiting the city center
TabVM = readtable('Ordered_logit.xlsx','Range','AN2:AN212');
ArrayVM = table2array(TabVM);
VM1 = [];
VM2 = [];
for x = 1:211
    for p = 1:72
        VM = ArrayVM(x,1);
        if VM == 1
            VM1 = [VM1; 1];
            VM2 = [VM2; 0];
        elseif VM == 2
            VM1 = [VM1; 0];
            VM2 = [VM2; 1];
        else
            VM1 = [VM1; -1];
            VM2 = [VM2; -1];
        end
        p = p + 1;
    end
```

```
    x = x + 1;
end

% 2 lists to differentiate between different postal code areas from the
% participants
TabPC = readtable('Ordered_logit.xlsx','Range','AQ2:AQ212');
ArrayPC = table2array(TabPC);
PC1 = [];
PC2 = [];
for x = 1:211
    for p = 1:72
        PC = ArrayPC(x,1);
        if PC >= 5611 && PC <= 5658
            PC1 = [PC1; 1];
            PC2 = [PC2; 0];
        elseif PC >= 5500 && PC <= 5610 | PC >= 5659 && 5731 | PC == 6029 | PC ==
5090 | PC == 5091
            PC1 = [PC1; 0];
            PC2 = [PC2; 1];
        else
            PC1 = [PC1; -1];
            PC2 = [PC2; -1];
        end
        p = p + 1;
    end
    x = x + 1;
end

% The number of the building where the survey is taking place
TabPr = readtable('Ordered_logit.xlsx','Range','H1:H212');
ArrayPr = table2array(TabPr);
Pr1 = [];
Pr2 = [];
Pr3 = [];
Pr4 = [];
Pr5 = [];
Pr6 = [];
Pr7 = [];

for x = 1:211
    for p = 1:72
        Pr = ArrayPr(x,1);
        if Pr == "A1"
            Pr1 = [Pr1; 1];
        else
            Pr1 = [Pr1; 0];
        end
        if Pr == "A2"
            Pr2 = [Pr2; 1];
        else
            Pr2 = [Pr2; 0];
        end
        if Pr == "A3"
            Pr3 = [Pr3; 1];
        else
            Pr3 = [Pr3; 0];
        end
```

```
        if Pr == "A4"
            Pr4 = [Pr4; 1];
        else
            Pr4 = [Pr4; 0];
        end
        if Pr == "A5"
            Pr5 = [Pr5; 1];
        else
            Pr5 = [Pr5; 0];
        end
        if Pr == "A6"
            Pr6 = [Pr6; 1];
        else
            Pr6 = [Pr6; 0];
        end
        if Pr == "A7";
            Pr7 = [Pr7; 1];
        else
            Pr7 = [Pr7; 0];
        end
        p = p + 1;
    end
    x = x + 1;
end

%Add the location attributes (from separate file) using the building number
TabLA = readtable('Locatie_attribuut.xlsx','Range','B3:AK9');
L_A = table2array(TabLA);
TabPr = readtable('Ordered_logit.xlsx','Range','H1:H212');
ArrayPr = table2array(TabPr);
LA = [];
for x = 1:211
    for p = 1:72
        Pr = ArrayPr(x,1);
        if Pr == "A1"
            LA1 = L_A(1,:);
            LA = [LA; LA1];
        elseif Pr == "A2"
            LA2 = L_A(2,:);
            LA = [LA; LA2];
        elseif Pr == "A3"
            LA3 = L_A(3,:);
            LA = [LA; LA3];
        elseif Pr == "A4"
            LA4 = L_A(4,:);
            LA = [LA; LA4];
        elseif Pr == "A5"
            LA5 = L_A(5,:);
            LA = [LA; LA5];
        elseif Pr == "A6"
            LA6 = L_A(6,:);
            LA = [LA; LA6];
        elseif Pr == "A7"
            LA7 = L_A(7,:);
            LA = [LA; LA7];
        end
        p = p + 1;
```

```
    end
    x = x + 1;
end

%create a table and add variable names
Table = [ListId listTask listSets listCase listAlt listAltid listF C1 C2 C3 C4 C5
C6 C7 C8 C9 Edu1 Edu2 Ge1 Age1 Age2 VN1 VN2 VN3 GA1 GA2 GC1 VM1 VM2 PC1 PC2 Pr1 Pr2
Pr3 Pr4 Pr5 Pr6 Pr7 LA];
TF = array2table(Table);
TF = renamevars(TF,"Table1","ID");
TF = renamevars(TF,"Table2","TaskNR");
TF = renamevars(TF,"Table3","Set");
TF = renamevars(TF,"Table4","CaseNR");
TF = renamevars(TF,"Table5","AltNR");
TF = renamevars(TF,"Table6","AltID");
TF = renamevars(TF,"Table7","Choice");
TF = renamevars(TF,"Table8","C1");
TF = renamevars(TF,"Table9","C2");
TF = renamevars(TF,"Table10","C3");
TF = renamevars(TF,"Table11","C4");
TF = renamevars(TF,"Table12","C5");
TF = renamevars(TF,"Table13","C6");
TF = renamevars(TF,"Table14","C7");
TF = renamevars(TF,"Table15","C8");
TF = renamevars(TF,"Table16","C9");
TF = renamevars(TF,"Table17","Edu1");
TF = renamevars(TF,"Table18","Edu2");
TF = renamevars(TF,"Table19","Ge1");;
TF = renamevars(TF,"Table20","Age1");
TF = renamevars(TF,"Table21","Age2");
TF = renamevars(TF,"Table22","VN1");
TF = renamevars(TF,"Table23","VN2");
TF = renamevars(TF,"Table24","VN3");
TF = renamevars(TF,"Table25","GA1");
TF = renamevars(TF,"Table26","GA2");
TF = renamevars(TF,"Table27","GC1");
TF = renamevars(TF,"Table28","VM1");
TF = renamevars(TF,"Table29","VM2");
TF = renamevars(TF,"Table30","PC1");
TF = renamevars(TF,"Table31","PC2");
TF = renamevars(TF,"Table32","Property1");
TF = renamevars(TF,"Table33","Property2");
TF = renamevars(TF,"Table34","Property3");
TF = renamevars(TF,"Table35","Property4");
TF = renamevars(TF,"Table36","Property5");
TF = renamevars(TF,"Table37","Property6");
TF = renamevars(TF,"Table38","Property7");
TF = renamevars(TF,"Table39","B_width");
TF = renamevars(TF,"Table40","B_height");
TF = renamevars(TF,"Table41","B_MP1");
TF = renamevars(TF,"Table42","B_MP2");
TF = renamevars(TF,"Table43","B_CP1");
TF = renamevars(TF,"Table44","B_CP2");
TF = renamevars(TF,"Table45","B_MF");
TF = renamevars(TF,"Table46","B_CF1");
TF = renamevars(TF,"Table47","B_CF2");
TF = renamevars(TF,"Table48","B_PW");
TF = renamevars(TF,"Table49","B_door");
```

```
TF = renamevars(TF,"Table50","B_age");
TF = renamevars(TF,"Table51","B_Corn");
TF = renamevars(TF,"Table52","E_main");
TF = renamevars(TF,"Table53","E_PAVEC");
TF = renamevars(TF,"Table54","E_PAVEM");
TF = renamevars(TF,"Table55","E_green");
TF = renamevars(TF,"Table56","E_tree");
TF = renamevars(TF,"Table57","E_SW");
TF = renamevars(TF,"Table58","E_WtH");
TF = renamevars(TF,"Table59","E_Divrs");
TF = renamevars(TF,"Table60","E_modern");
TF = renamevars(TF,"Table61","E_DIFH");
TF = renamevars(TF,"Table62","E_train");
TF = renamevars(TF,"Table63","E_bus");
TF = renamevars(TF,"Table64","E_parkng");
TF = renamevars(TF,"Table65","RM1_S");
TF = renamevars(TF,"Table66","RM1_CS");
TF = renamevars(TF,"Table67","RM1_FB");
TF = renamevars(TF,"Table68","RM1_V");
TF = renamevars(TF,"Table69","RM2_S");
TF = renamevars(TF,"Table70","RM2_CS");
TF = renamevars(TF,"Table71","RM2_FB");
TF = renamevars(TF,"Table72","RM2_V");
TF = renamevars(TF,"Table73","RM2_OPT");
TF = renamevars(TF,"Table74","RM2_LS");

writetable(TF,'data_MNL.xlsx');
```

Appendix E – Correlation matrix

This matrix indicates the correlation between the attributes used during the process of analysis. The correlations over 0.75 are colored red. The insignificant relations are colored blue and marked 'NS'.

	RAAMP	BRICKP	WOODP	B_width	B_height	B_CP1	B_CP2	B_MF	B_CF1	B_CF2	B_door	B_age	B_Corn	E_main	E_PAVEC	E_green	E_tree	E_SW	E_WtH
RAAMP	--																		
BRICKP	0,53	--																	
WOODP	0,20	0,49	--																
B_width	0,26	**0,75**	0,72	--															
B_height	0,38	NS	0,28	NS	--														
B_CP1	NS	**0,88**	**0,78**	**0,86**	0,15	--													
B_CP2	0,42	NS	**0,81**	0,49	0,50	0,45	--												
B_MF	0,73	NS	0,37	0,24	NS	0,41	0,27	--											
B_CF1	0,58	0,28	0,37	0,15	0,36	NS	0,44	0,49	--										
B_CF2	0,30	0,25	0,26	NS	0,16	NS	0,68	NS	0,45	--									
B_door	**0,82**	0,27	0,32	0,28	0,67	NS	0,36	0,58	0,15	NS	--								
B_age	0,44	0,72	0,68	**0,91**	0,18	**0,77**	0,49	NS	0,15	NS	0,29	--							
B_Corn	0,18	0,52	**0,93**	**0,78**	0,39	**0,84**	**0,87**	0,40	0,27	0,42	0,25	0,73	--						
E_main	0,31	**0,76**	0,51	0,61	0,48	**0,77**	0,20	NS	0,55	0,38	NS	**0,75**	0,55	--					
E_PAVEC	0,52	0,52	0,50	0,59	NS	0,42	NS	0,30	NS	0,42	0,30	0,73	0,30	0,55	--				
E_green	0,40	**0,96**	0,37	0,65	NS	**0,84**	NS	0,29	0,28	0,42	0,16	0,55	0,40	0,73	0,40	--			
E_tree	NS	0,40	NS	NS	NS	0,39	0,20	0,54	0,15	NS	NS	0,16	NS	0,17	0,54	0,55	--		
E_SW	NS	0,17	NS	NS	0,16	0,18	NS	0,17	NS	0,60	0,19	0,14	0,15	0,23	0,64	0,15	0,72	--	
E_WtH	NS	0,31	NS	0,18	0,45	0,36	0,19	NS	0,43	0,36	NS	0,20	0,32	0,35	0,45	0,29	0,67	0,71	--
E_Divrs	0,73	0,38	0,37	0,20	**0,85**	NS	0,65	0,30	NS	0,42	**0,85**	NS	0,40	NS	0,30	-0,40	NS	NS	0,19
E_modern	0,44	0,72	0,68	**0,91**	0,18	**0,77**	0,49	NS	0,15	NS	0,29	**1,00**	0,73	**0,75**	0,73	0,55	0,16	0,14	0,20
E_DIFH	0,53	0,40	0,51	NS	0,48	NS	**0,89**	NS	0,50	**0,76**	0,37	0,16	0,54	0,17	NS	-0,55	0,42	NS	NS
E_train	0,32	NS	0,14	NS	0,36	NS	NS	0,30	NS	0,69	0,55	NS	NS	0,36	0,34	NS	0,27	**0,84**	0,46
E_bus	NS	0,63	0,63	0,44	0,65	0,74	0,37	0,21	0,43	0,17	0,44	0,57	0,64	**0,91**	0,36	-0,60	0,23	0,14	0,38
E_parkng	0,27	0,25	NS	NS	0,29	NS	0,23	0,18	0,54	**0,80**	0,14	0,33	NS	0,65	0,67	-0,29	0,35	**0,83**	0,32
RM2_S	0,16	0,33	0,63	0,56	0,36	0,50	**0,79**	0,20	NS	0,68	NS	0,68	**0,77**	0,34	0,23	NS	0,14	0,29	0,44
RM2_CS	0,61	0,18	0,17	0,29	0,43	NS	NS	0,52	NS	0,45	**0,85**	0,29	NS	0,20	NS	NS	NS	0,54	0,32
RM2_FB	0,17	0,63	0,52	**0,78**	0,34	**0,78**	0,55	0,20	0,15	0,32	0,14	**0,76**	**0,77**	0,62	NS	0,53	0,37	0,43	0,74
RM2_V	0,17	0,41	0,73	0,74	NS	0,53	0,48	NS	0,16	0,18	NS	**0,81**	0,59	0,54	**0,89**	0,29	0,54	0,59	0,36
RM2_OPT	0,42	0,29	0,33	NS	**0,94**	NS	0,58	NS	0,19	0,21	0,66	0,16	0,35	0,32	NS	0,36	0,33	0,36	0,17
RM2_LS	0,18	0,52	**0,93**	**0,78**	0,39	**0,84**	**0,87**	0,40	0,27	0,42	0,25	0,73	**1,00**	0,55	0,30	0,40	NS	0,15	0,32

P_EDU1	NS	NS	NS	NS	NS	NS	NS	NS	NS	-0,19	NS	NS	NS	NS	NS	NS	NS	NS	NS
P_Gender	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
P_age1	NS	NS	NS	NS	NS	NS	NS	NS	0,15	0,17	NS	NS	NS	0,15	NS	-,157*	-0,18	NS	NS
FWEEK	0,14	-0,16	NS	0,17	NS	-0,14	NS	NS	NS	NS	NS	-0,22	NS	-0,20	-0,23	NS	NS	NS	NS
S_GCOMP3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
S_Motiv1	NS	NS	0,23	0,16	-0,19	-0,19	-0,22	NS	NS	NS	NS	-0,21	0,24	-0,20	NS	NS	NS	NS	NS
P_Post1	NS	NS	0,18	0,15	NS	NS	NS	NS	NS	NS	NS	-0,18	0,14	-0,14	-0,19	NS	-0,14	-0,15	NS

	E_Divrs	**E_modern**	**E_DIFH**	**E_train**	**E_bus**	**E_parkng**	**RM2_S**	**RM2_CS**	**RM2_FB**	**RM2_V**	**RM2_OPT**	**RM2_LS**	**P_EDU1**	**P_Gender**	**P_age1**	**FWEEK**	**S_GCOMP3**	**S_Motiv1**	**P_Post1**
E_Divrs	--																		
E_modern	NS	--																	
E_DIFH	0,73	0,16	--																
E_train	-0,30	NS	NS	--															
E_bus	-0,40	-0,57	NS	-0,36	--														
E_parkng	NS	-0,33	-0,33	**-0,81**	-0,51	--													
RM2_S	-0,31	-0,68	-0,63	-0,47	-0,40	-0,24	--												
RM2_CS	-0,53	-0,29	NS	**-0,86**	-0,39	-0,51	-0,47	--											
RM2_FB	NS	**-0,76**	-0,22	-0,32	-0,54	NS	-0,73	-0,38	--										
RM2_V	NS	**-0,81**	-0,27	-0,39	-0,40	-0,52	-0,39	NS	-0,32	--									
RM2_OPT	**-0,89**	-0,16	-0,65	-0,42	-0,51	-0,31	-0,38	-0,44	-0,16	-0,23	--								
RM2_LS	-0,40	-0,73	-0,54	NS	-0,64	NS	**-0,77**	NS	**-0,77**	-0,59	-0,35	--							
P_EDU1	NS	NS	NS	-0,17	NS	-0,16	NS	-0,15	NS	NS	NS	NS	--						
P_Gender	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	--					
P_age1	NS	NS	-0,17	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	--				
FWEEK	NS	-0,22	NS	NS	-0,15	-0,18	NS	NS	NS	-0,21	NS	NS	NS	NS	-0,24	--			
S_GCOMP3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-0,16	--		
S_Motiv1	-0,15	-0,21	-0,15	NS	-0,23	NS	-0,23	NS	-0,18	-0,17	-0,19	-0,24	NS	NS	NS	NS	NS	--	
P_Post1	NS	-0,18	NS	NS	NS	-0,14	NS	NS	NS	-0,23	NS	-0,14	NS	NS	NS	-0,61	-0,18	-0,31	--

Appendix F – MNL constants without attributes for separate locations

MNL location 1

```
|-> reject;locat1=0$
|-> NLOGIT
    ; lhs =   Choice, AltNR, AltID
    ; choices = 1, 2, 3, 4, 5, 6, 7, 8, 9
    ; Model: U(2) = P20*C2  /
    U(3) = P30*C3  /
    U(4) = P40*C4  /
    U(5) = P50*C5  /
    U(6) = P60*C6  /
    U(7) = P70*C7  /
    U(8) = P80*C8  /
    U(9) = P90*C9
    ; keep=prob
    $
Iterative procedure has converged
Normal exit:   5 iterations. Status=0. F=    .6116627D+03

------------------------------------------------------------------------------
Discrete choice (multinomial logit) model
Dependent variable                Choice
Log likelihood function      -611.66267
Estimation based on N =   1080. K =   8
Inf.Cr.AIC  =   1239.3 AIC/N =    1.148
--------------------------------------
           Log likelihood R-sqrd R2Adj
ASCs  only  model must be fit separately
              Use NLOGIT ;...;RHS=ONE$
Note: R-sqrd = 1 - logL/Logl(constants)
Warning:  Model does not contain a full
set of ASCs. R-sqrd is problematic. Use
model setup with ;RHS=one to get LogL0.
--------------------------------------
Response data are given as ind. choices
Number of obs.=  1080. skipped    0 obs
--------+---------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
  CHOICE|  Coefficient       Error       z    |z|>Z*         Interval
--------+---------------------------------------------------------------------
     P20|     .53311***      .19751     2.70  .0070      .14599    .92022
     P30|     .25705         .19214     1.34  .1809     -.11953    .63363
     P40|   -1.76551***      .20802    -8.49  .0000    -2.17322  -1.35780
     P50|    -.96572***      .19131    -5.05  .0000    -1.34068   -.59076
     P60|   -1.53842***      .20176    -7.62  .0000    -1.93386  -1.14297
     P70|   -1.17914***      .19439    -6.07  .0000    -1.56014   -.79814
     P80|    -.48538***      .18772    -2.59  .0097     -.85331   -.11745
     P90|    -.03564         .18880     -.19  .8503     -.40568    .33440
--------+---------------------------------------------------------------------
***, **, * ==>  Significance at 1%, 5%, 10% level.
Model was estimated on May 01, 2023 at 11:44:34 AM
```

MNL Location 2

```
|-> include;locat1=0$
|-> reject;locat2=0$
|-> NLOGIT
    ; lhs =   Choice, AltNR, AltID
    ; choices = 1, 2, 3, 4, 5, 6, 7, 8, 9
    ; Model: U(2) = P20*C2  /
    U(3) = P30*C3  /
    U(4) = P40*C4  /
    U(5) = P50*C5  /
    U(6) = P60*C6  /
    U(7) = P70*C7  /
    U(8) = P80*C8  /
    U(9) = P90*C9
    ; keep=prob
    $
Iterative procedure has converged
Normal exit:   7 iterations. Status=0. F=    .3532079D+03

------------------------------------------------------------------------------
Discrete choice (multinomial logit) model
Dependent variable                Choice
Log likelihood function       -353.20793
Estimation based on N =   1080. K =   8
Inf.Cr.AIC  =    722.4 AIC/N =     .669
--------------------------------------
           Log likelihood R-sqrd R2Adj
ASCs  only  model must be fit separately
              Use NLOGIT ;...;RHS=ONE$
Note: R-sqrd = 1 - logL/Logl(constants)
Warning:  Model does not contain a full
set of ASCs. R-sqrd is problematic. Use
model setup with ;RHS=one to get LogL0.
--------------------------------------
Response data are given as ind. choices
Number of obs.=  1080. skipped    0 obs
--------+---------------------------------------------------------------------
        |                 Standard            Prob.      95% Confidence
  CHOICE|  Coefficient       Error       z    |z|>Z*         Interval
--------+---------------------------------------------------------------------
     P20|     .90289***      .27010     3.34  .0008      .37350   1.43229
     P30|     .65141**       .26115     2.49  .0126      .13956   1.16325
     P40|   -4.27536***      .33450   -12.78  .0000    -4.93096  -3.61976
     P50|   -4.66421***      .34910   -13.36  .0000    -5.34843  -3.97998
     P60|   -3.36258***      .30896   -10.88  .0000    -3.96814  -2.75702
     P70|   -2.85754***      .29711    -9.62  .0000    -3.43987  -2.27521
     P80|   -1.27051***      .26151    -4.86  .0000    -1.78307   -.75796
     P90|   -1.86209***      .27452    -6.78  .0000    -2.40014  -1.32403
--------+---------------------------------------------------------------------
***, **, * ==>  Significance at 1%, 5%, 10% level.
Model was estimated on May 01, 2023 at 11:50:33 AM
```

MNL location 3

```
|-> include;locat2=0$
|-> reject;locat3=0$
|-> NLOGIT
    ; lhs =   Choice, AltNR, AltID
    ; choices = 1, 2, 3, 4, 5, 6, 7, 8, 9
    ; Model: U(2) = P20*C2  /
    U(3) = P30*C3  /
    U(4) = P40*C4  /
    U(5) = P50*C5  /
    U(6) = P60*C6  /
    U(7) = P70*C7  /
    U(8) = P80*C8  /
    U(9) = P90*C9
    ; keep=prob
    $
Iterative procedure has converged
Normal exit:   4 iterations. Status=0. F=    .7210683D+03

------------------------------------------------------------------------------
Discrete choice (multinomial logit) model
Dependent variable                Choice
Log likelihood function       -721.06828
Estimation based on N =   1080. K =   8
Inf.Cr.AIC  =   1458.1 AIC/N =    1.350
--------------------------------------
           Log likelihood R-sqrd R2Adj
ASCs  only  model must be fit separately
              Use NLOGIT ;...;RHS=ONE$
Note: R-sqrd = 1 - logL/Logl(constants)
Warning:  Model does not contain a full
set of ASCs. R-sqrd is problematic. Use
model setup with ;RHS=one to get LogL0.
--------------------------------------
Response data are given as ind. choices
Number of obs.=  1080. skipped    0 obs
--------+---------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
  CHOICE|  Coefficient       Error       z    |z|>Z*          Interval
--------+---------------------------------------------------------------------
     P20|    -.12242         .17503     -.70  .4843     -.46548    .22064
     P30|     .25818         .17468     1.48  .1394     -.08419    .60054
     P40|    -.15327         .17523     -.87  .3817     -.49671    .19017
     P50|     .04563         .17442      .26  .7936     -.29623    .38749
     P60|     .69634***      .17889     3.89  .0001      .34573   1.04695
     P70|    -.19978         .17556    -1.14  .2551     -.54388    .14432
     P80|     .63156***      .17794     3.55  .0004      .28280    .98032
     P90|     .09117         .17438      .52  .6011     -.25060    .43295
--------+---------------------------------------------------------------------
***, **, * ==>  Significance at 1%, 5%, 10% level.
Model was estimated on May 01, 2023 at 11:52:53 AM
```

MNL location 4

```
|-> include;locat3=0$
|-> reject;locat4=0$
|-> NLOGIT
    ; lhs =   Choice, AltNR, AltID
    ; choices = 1, 2, 3, 4, 5, 6, 7, 8, 9
    ; Model: U(2) = P20*C2  /
    U(3) = P30*C3  /
    U(4) = P40*C4  /
    U(5) = P50*C5  /
    U(6) = P60*C6  /
    U(7) = P70*C7  /
    U(8) = P80*C8  /
    U(9) = P90*C9
    ; keep=prob
    $
Iterative procedure has converged
Normal exit:   5 iterations. Status=0. F=    .6613347D+03

---------------------------------------------------------------------------
Discrete choice (multinomial logit) model
Dependent variable                Choice
Log likelihood function       -661.33466
Estimation based on N =   1080. K =   8
Inf.Cr.AIC  =   1338.7 AIC/N =    1.240
--------------------------------------
           Log likelihood R-sqrd R2Adj
ASCs  only  model must be fit separately
              Use NLOGIT ;...;RHS=ONE$
Note: R-sqrd = 1 - logL/Logl(constants)
Warning:  Model does not contain a full
set of ASCs. R-sqrd is problematic. Use
model setup with ;RHS=one to get LogL0.
--------------------------------------
Response data are given as ind. choices
Number of obs.=  1080. skipped    0 obs
--------+------------------------------------------------------------------
        |                   Standard            Prob.      95% Confidence
  CHOICE|  Coefficient       Error       z    |z|>Z*          Interval
--------+------------------------------------------------------------------
     P20|     .47119**       .19225     2.45  .0142       .09438    .84799
     P30|    -.01699         .18434     -.09  .9266      -.37829    .34431
     P40|   -1.53100***      .19709    -7.77  .0000     -1.91729  -1.14471
     P50|    -.94618***      .18590    -5.09  .0000     -1.31054   -.58183
     P60|    -.97943***      .18631    -5.26  .0000     -1.34460   -.61426
     P70|    -.55650***      .18287    -3.04  .0023      -.91491   -.19809
     P80|    -.94618***      .18590    -5.09  .0000     -1.31054   -.58183
     P90|    -.34718*        .18263    -1.90  .0573      -.70512    .01076
--------+------------------------------------------------------------------
***, **, * ==>  Significance at 1%, 5%, 10% level.
Model was estimated on May 01, 2023 at 11:55:10 AM
```

MNL location 5

```
|-> include;locat4=0$
|-> reject;locat5=0$
|-> NLOGIT
    ; lhs =   Choice, AltNR, AltID
    ; choices = 1, 2, 3, 4, 5, 6, 7, 8, 9
    ; Model: U(2) = P20*C2  /
    U(3) = P30*C3  /
    U(4) = P40*C4  /
    U(5) = P50*C5  /
    U(6) = P60*C6  /
    U(7) = P70*C7  /
    U(8) = P80*C8  /
    U(9) = P90*C9
    ; keep=prob
    $
Iterative procedure has converged
Normal exit:   5 iterations. Status=0. F=    .6689707D+03

------------------------------------------------------------------------------
Discrete choice (multinomial logit) model
Dependent variable                Choice
Log likelihood function       -668.97069
Estimation based on N =   1080. K =   8
Inf.Cr.AIC  =   1353.9 AIC/N =    1.254
--------------------------------------
           Log likelihood R-sqrd R2Adj
ASCs  only  model must be fit separately
              Use NLOGIT ;...;RHS=ONE$
Note: R-sqrd = 1 - logL/Logl(constants)
Warning:  Model does not contain a full
set of ASCs. R-sqrd is problematic. Use
model setup with ;RHS=one to get LogL0.
--------------------------------------
Response data are given as ind. choices
Number of obs.=  1080. skipped    0 obs
--------+---------------------------------------------------------------------
        |                 Standard            Prob.      95% Confidence
  CHOICE|  Coefficient       Error       z    |z|>Z*         Interval
--------+---------------------------------------------------------------------
     P20|     .39704**       .18295     2.17  .0300       .03846    .75562
     P30|     .50156***      .18458     2.72  .0066       .13978    .86334
     P40|   -1.20915***      .19251    -6.28  .0000     -1.58645   -.83184
     P50|    -.43178**       .17996    -2.40  .0164      -.78449   -.07907
     P60|    -.72672***      .18289    -3.97  .0001     -1.08517   -.36826
     P70|    -.33558*        .17945    -1.87  .0615      -.68730    .01614
     P80|    -.62695***      .18166    -3.45  .0006      -.98300   -.27090
     P90|     .39704**       .18295     2.17  .0300       .03846    .75562
--------+---------------------------------------------------------------------
***, **, * ==>  Significance at 1%, 5%, 10% level.
Model was estimated on May 01, 2023 at 11:58:02 AM
```

MNL location 6

```
|-> include;locat5=0$
|-> reject;locat6=0$
|-> NLOGIT
    ; lhs =   Choice, AltNR, AltID
    ; choices = 1, 2, 3, 4, 5, 6, 7, 8, 9
    ; Model: U(2) = P20*C2  /
    U(3) = P30*C3  /
    U(4) = P40*C4  /
    U(5) = P50*C5  /
    U(6) = P60*C6  /
    U(7) = P70*C7  /
    U(8) = P80*C8  /
    U(9) = P90*C9
    ; keep=prob
    $
Iterative procedure has converged
Normal exit:   5 iterations. Status=0. F=    .6921648D+03

------------------------------------------------------------------------------
Discrete choice (multinomial logit) model
Dependent variable                Choice
Log likelihood function      -692.16476
Estimation based on N =   1080. K =   8
Inf.Cr.AIC  =   1400.3 AIC/N =    1.297
--------------------------------------
           Log likelihood R-sqrd R2Adj
ASCs  only  model must be fit separately
              Use NLOGIT ;...;RHS=ONE$
Note: R-sqrd = 1 - logL/Logl(constants)
Warning:  Model does not contain a full
set of ASCs. R-sqrd is problematic. Use
model setup with ;RHS=one to get LogL0.
--------------------------------------
Response data are given as ind. choices
Number of obs.=  1080. skipped    0 obs
--------+---------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
  CHOICE|  Coefficient       Error       z    |z|>Z*          Interval
--------+---------------------------------------------------------------------
     P20|    -.03293         .18149     -.18  .8560     -.38864    .32277
     P30|     .16871         .18391      .92  .3589     -.19174    .52917
     P40|   -1.28661***      .18893    -6.81  .0000    -1.65689   -.91632
     P50|    -.72741***      .18102    -4.02  .0001    -1.08219   -.37262
     P60|    -.93414***      .18306    -5.10  .0000    -1.29292   -.57536
     P70|    -.77465***      .18140    -4.27  .0000    -1.13018   -.41913
     P80|    -.68035***      .18069    -3.77  .0002    -1.03450   -.32621
     P90|    -.44638**       .17983    -2.48  .0131     -.79883   -.09393
--------+---------------------------------------------------------------------
***, **, * ==>  Significance at 1%, 5%, 10% level.
Model was estimated on May 01, 2023 at 00:01:33 PM
```

MNL location 7

```
|-> include;locat6=0$
|-> reject;locat7=0$
|-> NLOGIT
    ; lhs =   Choice, AltNR, AltID
    ; choices = 1, 2, 3, 4, 5, 6, 7, 8, 9
    ; Model: U(2) = P20*C2  /
    U(3) = P30*C3  /
    U(4) = P40*C4  /
    U(5) = P50*C5  /
    U(6) = P60*C6  /
    U(7) = P70*C7  /
    U(8) = P80*C8  /
    U(9) = P90*C9
    ; keep=prob
    $
Iterative procedure has converged
Normal exit:   5 iterations. Status=0. F=    .6887526D+03

------------------------------------------------------------------------------
Discrete choice (multinomial logit) model
Dependent variable                Choice
Log likelihood function      -688.75258
Estimation based on N =   1116, K =   8
Inf.Cr.AIC  =   1393.5 AIC/N =    1.249
--------------------------------------
           Log likelihood R-sqrd R2Adj
ASCs  only  model must be fit separately
              Use NLOGIT ;...;RHS=ONE$
Note: R-sqrd = 1 - logL/Logl(constants)
Warning:  Model does not contain a full
set of ASCs. R-sqrd is problematic. Use
model setup with ;RHS=one to get LogL0.
--------------------------------------
Response data are given as ind. choices
Number of obs.=  1116, skipped    0 obs
--------+---------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
  CHOICE|  Coefficient       Error       z    |z|>Z*         Interval
--------+---------------------------------------------------------------------
     P20|     .43388**       .18784     2.31  .0209      .06571    .80205
     P30|    -.04892         .18061     -.27  .7865     -.40291    .30507
     P40|   -1.41296***      .19056    -7.41  .0000    -1.78646  -1.03946
     P50|   -1.10447***      .18460    -5.98  .0000    -1.46628   -.74266
     P60|    -.78455***      .18078    -4.34  .0000    -1.13888   -.43023
     P70|    -.99056***      .18298    -5.41  .0000    -1.34919   -.63194
     P80|    -.61352***      .17966    -3.41  .0006     -.96565   -.26139
     P90|    -.28763         .17931    -1.60  .1087     -.63907    .06381
--------+---------------------------------------------------------------------
***, **, * ==>  Significance at 1%, 5%, 10% level.
Model was estimated on May 01, 2023 at 00:03:05 PM
------------------------------------------------------------------------------
```

Appendix G – MNL model separated by category

Building MNL

```
|-> NLOGIT
    ; lhs = Choice, AltNR, AltID
    ; choices = 1, 2, 3, 4, 5, 6, 7, 8, 9
    ; Model:
            U(1) =       PB14A*RAAMP + PB14B*BRICKP + PB12*B_height +
PB191*B_CORN/
            U(2) = P20*C2 + PB22*B_height + PB24A*RAAMP + PB24B*BRICKP+
PB24C*WOODP /
            U(3) = P30*C3 + PB34A*RAAMP + PB34B*BRICKP + PB34C*WOODP +
PB32*B_height + PB37A*B_CF1 + PB37B*B_CF2 /
            U(4) = P40*C4 + PB45*B_MF + PB48*B_DOOR   /
            U(5) = P50*C5 + PB51*B_width`+ PB52*B_height + PB55*B_MF /
            U(6) = P60*C6 + PB62*B_height + PB65*B_MF + PB68*B_DOOR/
            U(7) = P70*C7 + PB71*B_width  +  PB72*B_height  /
            U(8) = P80*C8 + PB81*B_width +  PB82*B_height /
                 U(9) = P90*C9
    $
Iterative procedure has converged
Normal exit:   6 iterations. Status=0. F=    .4458489D+04

---------------------------------------------------------------------------
Discrete choice (multinomial logit) model
Dependent variable                Choice
Log likelihood function     -4458.48903
Estimation based on N =   7596, K =  34
Inf.Cr.AIC  =   8985.0 AIC/N =    1.183
--------------------------------------
           Log likelihood R-sqrd R2Adj
ASCs  only  model must be fit separately
              Use NLOGIT ;...;RHS=ONE$
Note: R-sqrd = 1 - logL/Logl(constants)
Warning:  Model does not contain a full
set of ASCs. R-sqrd is problematic. Use
model setup with ;RHS=one to get LogL0.
--------------------------------------
Response data are given as ind. choices
Number of obs.=  7596, skipped    0 obs
--------+------------------------------------------------------------------
        |                 Standard            Prob.      95% Confidence
  CHOICE|  Coefficient       Error       z    |z|>Z*         Interval
--------+------------------------------------------------------------------
   PB14A|     .02952***      .00584     5.05  .0000      .01807    .04097
   PB14B|     .02416***      .00474     5.10  .0000      .01486    .03345
    PB12|    -.04248*       .02216    -1.92  .0552     -.08591    .00095
   PB191|     .25859**       .10369     2.49  .0126      .05537    .46181
     P20|    -.14686        .54310     -.27  .7868    -1.21131    .91759
    PB22|    -.09885***      .02106    -4.69  .0000     -.14012   -.05758
   PB24A|     .04286***      .00628     6.83  .0000      .03055    .05516
   PB24B|     .03431***      .00479     7.16  .0000      .02492    .04369
   PB24C|     .01722***      .00587     2.93  .0033      .00572    .02872
     P30|   -2.43097***      .91251    -2.66  .0077    -4.21945   -.64248
   PB34A|    -.03067**       .01499    -2.05  .0407     -.06005   -.00129
   PB34B|     .04668***      .00923     5.06  .0000      .02858    .06477
   PB34C|     .08618***      .01996     4.32  .0000      .04706    .12529
    PB32|     .38067***      .10796     3.53  .0004      .16907    .59227
```

```
   PB37A|   -2.17742***       .53945    -4.04   .0001    -3.23472  -1.12011
   PB37B|     .77409***       .14672     5.28   .0000      .48652   1.06166
     P40|   -3.42756***       .56843    -6.03   .0000    -4.54166  -2.31347
    PB45|     .67754***       .09280     7.30   .0000      .49567    .85942
    PB48|    1.67086***       .24401     6.85   .0000     1.19262   2.14910
     P50|   -2.76721***       .53943    -5.13   .0000    -3.82448  -1.70995
    PB51|     .30180***       .04881     6.18   .0000      .20613    .39748
    PB52|     .07230***       .01932     3.74   .0002      .03444    .11017
    PB55|     .37601***       .07124     5.28   .0000      .23637    .51565
     P60|   -3.09744***       .56458    -5.49   .0000    -4.20399  -1.99088
    PB62|     .07165***       .02616     2.74   .0062      .02039    .12292
    PB65|     .57603***       .09529     6.04   .0000      .38926    .76280
    PB68|    1.36088***       .30873     4.41   .0000      .75579   1.96597
     P70|   -1.56085***       .52937    -2.95   .0032    -2.59839   -.52331
    PB71|     .22290***       .04701     4.74   .0000      .13077    .31503
    PB72|     .04602**        .01917     2.40   .0164      .00845    .08359
     P80|     .89833*         .52419     1.71   .0866     -.12907   1.92573
    PB81|    -.12466***       .04657    -2.68   .0074     -.21593   -.03339
    PB82|     .07033***       .01915     3.67   .0002      .03280    .10787
     P90|    1.10326**        .42884     2.57   .0101      .26275   1.94378
--------+-------------------------------------------------------------------
***, **, * ==>  Significance at 1%, 5%, 10% level.
Model was estimated on May 31, 2023 at 00:45:46 PM
-----------------------------------------------------------------------------
```

Environment MNL

```
|-> NLOGIT
    ; lhs = Choice, AltNR, AltID
    ; choices = 1, 2, 3, 4, 5, 6, 7, 8, 9
    ; Model:
            U(1) =     PM11*RM2_S + PM14*RM2_V  /
            U(2) = P20*C2 + PM21*RM2_S + PM24*RM2_V  + PEV27*E_green /
            U(3) = P30*C3 + PM31*RM2_S + PM34*RM2_V   /
            U(4) = P40*C4 + PM43*RM2_CS + PM44*RM2_V + PM46*RM2_LS +
PEV47*E_green/
            U(5) = P50*C5 + PM52*RM2_FB + PM55*RM2_OPT + PEV57*E_green/
            U(6) = P60*C6 + PM62*RM2_FB   + PM65*RM2_OPT + PEV61*E_main /
            U(7) = P70*C7 + PM72*RM2_FB + PM75*RM2_OPT /
            U(8) = P80*C8 + PM84*RM2_V + PM85*RM2_OPT + PM86*RM2_LS +
PEV88*E_tree /
            U(9) = P90*C9 + PEV18*E_tree
    $
Iterative procedure has converged
Normal exit:   6 iterations. Status=0. F=    .4510112D+04

-----------------------------------------------------------------------------
Discrete choice (multinomial logit) model
Dependent variable                Choice
Log likelihood function     -4510.11187
Estimation based on N =   7596, K =  32
Inf.Cr.AIC  =   9084.2 AIC/N =    1.196
--------------------------------------
           Log likelihood R-sqrd R2Adj
ASCs  only  model must be fit separately
              Use NLOGIT ;...;RHS=ONE$
Note: R-sqrd = 1 - logL/Logl(constants)
Warning:  Model does not contain a full
set of ASCs. R-sqrd is problematic. Use
model setup with ;RHS=one to get LogL0.
--------------------------------------
```

```
Response data are given as ind. choices
Number of obs.=  7596, skipped    0 obs
--------+--------------------------------------------------------------------
        |                 Standard            Prob.      95% Confidence
  CHOICE|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
    PM11|    -.01412***      .00218    -6.48  .0000     -.01839   -.00985
    PM14|    -.04369***      .00670    -6.52  .0000     -.05681   -.03056
     P20|     .19258        .19664      .98  .3274     -.19283    .57800
    PM21|    -.01185***      .00227    -5.23  .0000     -.01629   -.00741
    PM24|    -.02936***      .00721    -4.07  .0000     -.04348   -.01524
   PEV27|    -.27335***      .07370    -3.71  .0002     -.41780   -.12890
     P30|     .38973**       .19647     1.98  .0473      .00465    .77480
    PM31|    -.01678***      .00226    -7.41  .0000     -.02121   -.01234
    PM34|    -.04659***      .00692    -6.73  .0000     -.06014   -.03303
     P40|   -2.28229***      .18587   -12.28  .0000    -2.64658  -1.91799
    PM43|    -.00971***      .00174    -5.57  .0000     -.01313   -.00629
    PM44|    -.03485***      .00755    -4.61  .0000     -.04965   -.02004
    PM46|     .04688**       .01910     2.46  .0141      .00946    .08431
   PEV47|     .41627***      .07837     5.31  .0000      .26268    .56987
     P50|   -2.85341***      .20240   -14.10  .0000    -3.25010  -2.45672
    PM52|     .01547***      .00292     5.30  .0000      .00976    .02119
    PM55|     .02255***      .00408     5.52  .0000      .01455    .03055
   PEV57|     .25594***      .09104     2.81  .0049      .07750    .43438
     P60|   -2.80618***      .20101   -13.96  .0000    -3.20015  -2.41221
    PM62|     .02103***      .00294     7.15  .0000      .01526    .02679
    PM65|     .03399***      .00376     9.05  .0000      .02663    .04136
   PEV61|     .36626***      .07828     4.68  .0000      .21283    .51968
     P70|   -2.50886***      .19781   -12.68  .0000    -2.89655  -2.12117
    PM72|     .01490***      .00235     6.33  .0000      .01029    .01951
    PM75|     .01851***      .00353     5.24  .0000      .01159    .02543
     P80|   -1.51248***      .18420    -8.21  .0000    -1.87351  -1.15145
    PM84|    -.08657***      .01236    -7.00  .0000     -.11080   -.06234
    PM85|     .02588***      .00429     6.03  .0000      .01747    .03429
    PM86|     .14384***      .02658     5.41  .0000      .09174    .19594
   PEV88|    -.27021***      .10370    -2.61  .0092     -.47346   -.06696
     P90|   -1.37984***      .17050    -8.09  .0000    -1.71401  -1.04568
   PEV18|     .21252***      .05809     3.66  .0003      .09866    .32638
--------+--------------------------------------------------------------------
***, **, * ==>  Significance at 1%, 5%, 10% level.
Model was estimated on May 31, 2023 at 02:41:46 PM
-----------------------------------------------------------------------------
```

Personal attributes MNL

```
|-> NLOGIT
    ; lhs = Choice, AltNR, AltID
    ; choices = 1, 2, 3, 4, 5, 6, 7, 8, 9
    ; Model:
            U(1) =      Pp12*P_Gender /
            U(2) = P20*C2 + Pp21A*P_age1+Pp21B*P_age2 + Pp22*P_Gender +
Pp23A*P_EDU1+Pp23B*P_EDU2 + Pp24A*P_Post1+Pp24B*P_Post2/
            U(3) = P30*C3 + Pp31A*P_age1+Pp31B*P_age2 + Pp32*P_Gender +
Pp33A*P_EDU1+Pp33B*P_EDU2 /
            U(4) = P40*C4 + Pp41A*P_age1+Pp41B*P_age2 +
Pp43A*P_EDU1+Pp43B*P_EDU2 /
            U(5) = P50*C5 + Pp51A*P_age1+Pp51B*P_age2 + Pp52*P_Gender +
Pp53A*P_EDU1+Pp53B*P_EDU2 /
            U(6) = P60*C6 + Pp62*P_Gender       + Pp63A*P_EDU1+Pp63B*P_EDU2 +
Pp64A*P_Post1+Pp64B*P_Post2/
            U(7) = P70*C7          + Pp73A*P_EDU1+Pp73B*P_EDU2 /
            U(8) = P80*C8 + Pp84A*P_Post1+Pp84B*P_Post2/
            U(9) = P90*C9
```

```
$
Iterative procedure has converged
Normal exit:   6 iterations. Status=0. F=    .4568937D+04

------------------------------------------------------------------------------
Discrete choice (multinomial logit) model
Dependent variable                Choice
Log likelihood function     -4568.93683
Estimation based on N =   7596, K =  39
Inf.Cr.AIC  =   9215.9 AIC/N =    1.213
--------------------------------------
           Log likelihood R-sqrd R2Adj
ASCs  only  model must be fit separately
              Use NLOGIT ;...;RHS=ONE$
Note: R-sqrd = 1 - logL/Logl(constants)
Warning:  Model does not contain a full
set of ASCs. R-sqrd is problematic. Use
model setup with ;RHS=one to get LogL0.
--------------------------------------
Response data are given as ind. choices
Number of obs.=  7596, skipped    0 obs
--------+---------------------------------------------------------------------
        |                 Standard            Prob.      95% Confidence
  CHOICE|  Coefficient       Error       z    |z|>Z*         Interval
--------+---------------------------------------------------------------------
    PP12|     .13270**       .05611     2.36  .0180      .02273    .24267
     P20|     .32806***      .07406     4.43  .0000      .18292    .47321
   PP21A|    -.03337         .08085     -.41  .6798     -.19184    .12510
   PP21B|    -.26004***      .08566    -3.04  .0024     -.42792   -.09216
    PP22|     .20317***      .06196     3.28  .0010      .08172    .32461
   PP23A|    -.26522***      .09386    -2.83  .0047     -.44919   -.08126
   PP23B|     .31301***      .09076     3.45  .0006      .13513    .49090
   PP24A|     .12057         .07945     1.52  .1291     -.03516    .27629
   PP24B|     .12945         .08633     1.50  .1337     -.03975    .29866
     P30|     .26469***      .07334     3.61  .0003      .12095    .40843
   PP31A|     .24446***      .08084     3.02  .0025      .08602    .40290
   PP31B|    -.30785***      .08388    -3.67  .0002     -.47226   -.14344
    PP32|     .20723***      .06056     3.42  .0006      .08854    .32592
   PP33A|    -.01491         .09450     -.16  .8746     -.20013    .17031
   PP33B|     .31566***      .08926     3.54  .0004      .14071    .49061
     P40|   -1.52513***      .07853   -19.42  .0000    -1.67903  -1.37122
   PP41A|     .02185         .08336      .26  .7932     -.14152    .18523
   PP41B|     .45527***      .08402     5.42  .0000      .29058    .61995
   PP43A|     .04063         .10063      .40  .6864     -.15661    .23787
   PP43B|    -.47261***      .09495    -4.98  .0000     -.65871   -.28650
     P50|    -.96041***      .07283   -13.19  .0000    -1.10316   -.81766
   PP51A|    -.17868**       .07786    -2.29  .0217     -.33129   -.02608
   PP51B|     .33815***      .08279     4.08  .0000      .17587    .50042
    PP52|    -.16496***      .05834    -2.83  .0047     -.27930   -.05061
   PP53A|     .33233***      .09128     3.64  .0003      .15343    .51124
   PP53B|    -.37191***      .08630    -4.31  .0000     -.54105   -.20277
     P60|    -.94920***      .07289   -13.02  .0000    -1.09206   -.80633
    PP62|     .13801**       .05688     2.43  .0152      .02653    .24949
   PP63A|    -.05914         .09049     -.65  .5134     -.23649    .11822
   PP63B|    -.25736***      .08643    -2.98  .0029     -.42676   -.08796
   PP64A|    -.02876         .07478     -.38  .7005     -.17533    .11780
   PP64B|    -.30649***      .08273    -3.70  .0002     -.46864   -.14435
     P70|    -.85927***      .07180   -11.97  .0000    -1.00001   -.71854
   PP73A|     .04360         .08809      .49  .6206     -.12906    .21626
   PP73B|    -.38538***      .08496    -4.54  .0000     -.55190   -.21887
     P80|    -.48215***      .06963    -6.92  .0000     -.61862   -.34568
   PP84A|    -.20431***      .07248    -2.82  .0048     -.34637   -.06225
   PP84B|    -.04633         .07849     -.59  .5550     -.20016    .10750
     P90|    -.24122***      .06914    -3.49  .0005     -.37672   -.10571
```

```
--------+-------------------------------------------------------------------
***, **, * ==>  Significance at 1%, 5%, 10% level.
Model was estimated on Apr 19, 2023 at 02:45:47 PM
-------------------------------------------------------------------------------
```

Shopping trip attributes MNL

```
|-> NLOGIT
    ; lhs = Choice, AltNR, AltID
    ; choices = 1, 2, 3, 4, 5, 6, 7, 8, 9
    ; Model:
            U(1) =      Pp18A*S_Motiv1+Pp18B*S_Motiv2 /
            U(2) = P20*C2 + Pp28A*S_Motiv1+Pp28B*S_Motiv2 /
            U(3) = P30*C3 + Pp35A*FWEEK + Pp35B*FMONTH +
Pp38A*S_Motiv1+Pp38B*S_Motiv2/
            U(4) = P40*C4 + Pp45A*FWEEK + Pp45B*FMONTH + Pp46A*S_Gcomp3 +
Pp48A*S_Motiv1+Pp48B*S_Motiv2/
            U(5) = P50*C5 + Pp58A*S_Motiv1+Pp58B*S_Motiv2 /
            U(6) = P60*C6 + Pp65A*FWEEK + Pp65B*FMONTH  +
Pp68A*S_Motiv1+Pp68B*S_Motiv2/
            U(7) = P70*C7 + Pp75A*FWEEK + Pp75B*FMONTH  +
Pp78A*S_Motiv1+Pp78B*S_Motiv2 /
            U(8) = P80*C8 + Pp85A*FWEEK + Pp85B*FMONTH  + Pp86A*S_Gcomp3 /
            U(9) = P90*C9 + Pp96A*S_Gcomp3+ Pp98A*S_Motiv1+Pp98B*S_Motiv2
    $
Iterative procedure has converged
Normal exit:   6 iterations. Status=0. F=    .4529305D+04

-------------------------------------------------------------------------------
Discrete choice (multinomial logit) model
Dependent variable                Choice
Log likelihood function     -4529.30472
Estimation based on N =   7596, K =  37
Inf.Cr.AIC  =   9132.6 AIC/N =    1.202
--------------------------------------
           Log likelihood R-sqrd R2Adj
ASCs  only  model must be fit separately
              Use NLOGIT ;...;RHS=ONE$
Note: R-sqrd = 1 - logL/Logl(constants)
Warning:  Model does not contain a full
set of ASCs. R-sqrd is problematic. Use
model setup with ;RHS=one to get LogL0.
--------------------------------------
Response data are given as ind. choices
Number of obs.=  7596, skipped    0 obs
--------+----------------------------------------------------------------------
        |                   Standard            Prob.      95% Confidence
  CHOICE|  Coefficient       Error       z    |z|>Z*         Interval
--------+----------------------------------------------------------------------
   PP18A|     .14274         .09636     1.48  .1385     -.04612    .33159
   PP18B|     .19669*        .11280     1.74  .0812     -.02439    .41777
     P20|     .29140***      .07464     3.90  .0001      .14510    .43770
   PP28A|     .25559**       .09947     2.57  .0102      .06064    .45054
   PP28B|     .40228***      .11759     3.42  .0006      .17181    .63275
     P30|     .24490***      .07742     3.16  .0016      .09316    .39663
   PP35A|     .07330         .08124      .90  .3669     -.08593    .23253
   PP35B|    -.25244***      .08527    -2.96  .0031     -.41956   -.08532
   PP38A|     .10632         .09946     1.07  .2850     -.08861    .30126
```

```
   PP38B|      .35087***       .11852      2.96   .0031       .11857     .58318
     P40|    -1.44572***       .08352    -17.31   .0000     -1.60942   -1.28202
   PP45A|     -.18490**        .08627     -2.14   .0321      -.35399    -.01580
   PP45B|      .18258**        .09052      2.02   .0437       .00516     .36000
   PP46A|      .18789***       .07173      2.62   .0088       .04730     .32849
   PP48A|      .04976          .10403       .48   .6324      -.15414     .25365
   PP48B|     -.77830***       .12584     -6.18   .0000     -1.02494    -.53165
     P50|    -1.01600***       .07602    -13.36   .0000     -1.16500    -.86700
   PP58A|      .24443**        .09739      2.51   .0121       .05354     .43531
   PP58B|     -.88494***       .11734     -7.54   .0000     -1.11492    -.65497
     P60|     -.81528***       .07697    -10.59   .0000      -.96614    -.66442
   PP65A|     -.25779***       .07925     -3.25   .0011      -.41311    -.10246
   PP65B|      .01303          .08389       .16   .8766      -.15138     .17744
   PP68A|      .16915*         .09743      1.74   .0825      -.02180     .36011
   PP68B|     -.62343***       .11562     -5.39   .0000      -.85003    -.39682
     P70|     -.81000***       .07659    -10.58   .0000      -.96012    -.65988
   PP75A|     -.18106**        .07854     -2.31   .0212      -.33500    -.02712
   PP75B|      .02159          .08323       .26   .7954      -.14155     .18472
   PP78A|      .32563***       .09683      3.36   .0008       .13583     .51542
   PP78B|     -.44464***       .11432     -3.89   .0001      -.66870    -.22058
     P80|     -.38614***       .07595     -5.08   .0000      -.53501    -.23728
   PP85A|     -.21783***       .07783     -2.80   .0051      -.37038    -.06528
   PP85B|      .09908          .08260      1.20   .2304      -.06282     .26097
   PP86A|     -.11319*         .06367     -1.78   .0754      -.23798     .01160
     P90|     -.29122***       .07342     -3.97   .0001      -.43512    -.14733
   PP96A|      .11993*         .06342      1.89   .0586      -.00438     .24423
   PP98A|      .21385**        .09630      2.22   .0264       .02510     .40259
   PP98B|     -.23436**        .11189     -2.09   .0362      -.45366    -.01506
--------+-------------------------------------------------------------------------
***, **, * ==>  Significance at 1%, 5%, 10% level.
Model was estimated on May 10. 2023 at 11:57:44 AM
---------------------------------------------------------------------------------
```

Appendix H – MNL model all attributes

```
|-> NLOGIT
    ; lhs = Choice, AltNR, AltID
    ; choices = 1, 2, 3, 4, 5, 6, 7, 8, 9
    ; Model:
            U(1) =   PB15*B_MF + PB12*B_height + PB14A*RAAMP + PB14B*BRICKP +
Pp18A*S_Motiv1+Pp18B*S_Motiv2 /

    U(2) = P20*C2 + PB25*B_MF + Pp23A*P_EDU1+Pp23B*P_EDU2
    + Pp28A*S_Motiv1+Pp28B*S_Motiv2 + PB24A*RAAMP + PB26A*B_CP1 + PB26B*B_CP2/

    U(3) = P30*C3 + PB34A*RAAMP + PB34B*BRICKP + PB35*B_MF +
Pp31A*P_age1+Pp31B*P_age2 + Pp33A*P_EDU1+Pp33B*P_EDU2+ Pp35A*FWEEK +
Pp35B*FMONTH
    + Pp38A*S_Motiv1+Pp38B*S_Motiv2 /

    U(4) = P40*C4 + PB41*B_width + PB45*B_MF + Pp41A*P_age1+Pp41B*P_age2 +
Pp43A*P_EDU1+Pp43B*P_EDU2+ Pp46A*S_Gcomp3+ Pp45A*FWEEK + Pp45B*FMONTH
            + Pp48A*S_Motiv1+Pp48B*S_Motiv2 +PB44A*RAAMP /

    U(5) = P50*C5 + PB51*B_width + PB52*B_height  + PB55*B_MF + PEV51*E_main  +
Pp52*P_Gender
            + Pp58A*S_Motiv1+Pp58B*S_Motiv2/

    U(6) = P60*C6 + PB61*B_width  + PB62*B_height   + PB65*B_MF +
Pp63A*P_EDU1+Pp63B*P_EDU2
            + Pp64A*P_Post1+Pp64B*P_Post2 + Pp68A*S_Motiv1+Pp68B*S_Motiv2/

    U(7) = P70*C7 + PB71*B_width + PM73*RM2_CS+ Pp72*P_Gender+
Pp73A*P_EDU1+Pp73B*P_EDU2 + Pp78A*S_Motiv1+Pp78B*S_Motiv2/

    U(8) = P80*C8 + PB84A*RAAMP + PEV19*E_SW + Pp81A*P_age1+Pp81B*P_age2 +
Pp86A*S_Gcomp3/

    U(9) = P90*C9 + PB94A*RAAMP + PB94C*WOODP  + PB97A*B_CF1 + PB97B*B_CF2
    $
Iterative procedure has converged
Normal exit:   6 iterations. Status=0. F=    .4190574D+04

------------------------------------------------------------------------------
Discrete choice (multinomial logit) model
Dependent variable                Choice
Log likelihood function     -4190.57417
Estimation based on N =   7596, K =  77
Inf.Cr.AIC  =   8535.1 AIC/N =    1.124
--------------------------------------
           Log likelihood R-sqrd R2Adj
ASCs  only  model must be fit separately
              Use NLOGIT ;...;RHS=ONE$
Note: R-sqrd = 1 - logL/Logl(constants)
Warning:  Model does not contain a full
set of ASCs. R-sqrd is problematic. Use
model setup with ;RHS=one to get LogL0.
--------------------------------------
Response data are given as ind. choices
Number of obs.=  7596, skipped    0 obs
--------+---------------------------------------------------------------------
        |                   Standard            Prob.      95% Confidence
  CHOICE|  Coefficient       Error       z    |z|>Z*         Interval
--------+---------------------------------------------------------------------
```

PB15	-.98605***	.24668	-4.00	.0001	-1.46953	-.50256
PB12	-.04359*	.02321	-1.88	.0604	-.08909	.00191
PB14A	-.05740***	.01683	-3.41	.0006	-.09039	-.02441
PB14B	-.02013***	.00712	-2.83	.0047	-.03410	-.00617
PP18A	.03611	.08786	.41	.6810	-.13608	.20830
PP18B	.21112**	.10277	2.05	.0400	.00969	.41255
P20	2.83891**	1.30779	2.17	.0299	.27568	5.40214
PB25	-2.14214***	.29892	-7.17	.0000	-2.72801	-1.55627
PP23A	-.23810***	.09197	-2.59	.0096	-.41836	-.05783
PP23B	.41161***	.09217	4.47	.0000	.23096	.59226
PP28A	.18911**	.09254	2.04	.0410	.00774	.37048
PP28B	.38294***	.10840	3.53	.0004	.17048	.59540
PB24A	-.11336***	.01850	-6.13	.0000	-.14962	-.07710
PB26A	-1.24647***	.27664	-4.51	.0000	-1.78867	-.70427
PB26B	.53221***	.18065	2.95	.0032	.17815	.88627
P30	2.84827**	1.14409	2.49	.0128	.60588	5.09065
PB34A	-.10304***	.01405	-7.33	.0000	-.13058	-.07549
PB34B	-.04002***	.00632	-6.33	.0000	-.05241	-.02763
PB35	-1.53408***	.21755	-7.05	.0000	-1.96047	-1.10768
PP31A	.22106**	.08913	2.48	.0131	.04637	.39574
PP31B	-.23269***	.08597	-2.71	.0068	-.40119	-.06419
PP33A	-.02047	.09600	-.21	.8312	-.20862	.16769
PP33B	.43796***	.09171	4.78	.0000	.25821	.61771
PP35A	-.06801	.08948	-.76	.4472	-.24338	.10736
PP35B	-.21821**	.08873	-2.46	.0139	-.39211	-.04431
PP38A	-.00777	.09263	-.08	.9332	-.18933	.17379
PP38B	.33614***	.11052	3.04	.0024	.11953	.55275
P40	-8.83272***	1.10036	-8.03	.0000	-10.98938	-6.67606
PB41	.20025***	.07129	2.81	.0050	.06052	.33998
PB45	.63561***	.15260	4.17	.0000	.33651	.93470
PP41A	.22036**	.09349	2.36	.0184	.03711	.40361
PP41B	.27683***	.08997	3.08	.0021	.10049	.45317
PP43A	-.05148	.10307	-.50	.6174	-.25349	.15053
PP43B	-.40478***	.09749	-4.15	.0000	-.59586	-.21370
PP46A	.24230***	.07671	3.16	.0016	.09194	.39265
PP45A	-.02854	.09436	-.30	.7623	-.21348	.15640
PP45B	.18546**	.09388	1.98	.0482	.00147	.36946
PP48A	-.13450	.09906	-1.36	.1746	-.32866	.05967
PP48B	-.51475***	.12009	-4.29	.0000	-.75012	-.27937
PB44A	.02033**	.00846	2.40	.0163	.00375	.03691
P50	-8.19697***	1.08843	-7.53	.0000	-10.33025	-6.06369
PB51	.26188***	.06944	3.77	.0002	.12578	.39797
PB52	.05330**	.02556	2.09	.0370	.00320	.10339
PB55	.56393***	.09423	5.98	.0000	.37925	.74862
PEV51	-.35751***	.10431	-3.43	.0006	-.56196	-.15307
PP52	-.26173***	.05817	-4.50	.0000	-.37575	-.14771
PP58A	-.03673	.09013	-.41	.6837	-.21338	.13993
PP58B	-.62753***	.10788	-5.82	.0000	-.83896	-.41610
P60	-8.47282***	1.08237	-7.83	.0000	-10.59423	-6.35141
PB61	.26691***	.05851	4.56	.0000	.15224	.38158
PB62	.08985***	.01892	4.75	.0000	.05276	.12694
PB65	.38664***	.09069	4.26	.0000	.20888	.56439
PP63A	-.18813**	.09215	-2.04	.0412	-.36875	-.00752
PP63B	-.08581	.08836	-.97	.3315	-.25899	.08737
PP64A	-.10556	.08172	-1.29	.1964	-.26573	.05461
PP64B	-.24384***	.08633	-2.82	.0047	-.41305	-.07463
PP68A	.12735	.09522	1.34	.1811	-.05928	.31397
PP68B	-.43748***	.10757	-4.07	.0000	-.64830	-.22666
P70	-8.04125***	1.13090	-7.11	.0000	-10.25777	-5.82472
PB71	.37037***	.05823	6.36	.0000	.25625	.48449
PM73	.00529**	.00224	2.36	.0182	.00090	.00969
PP72	-.18793***	.05633	-3.34	.0008	-.29833	-.07752
PP73A	-.03278	.08922	-.37	.7133	-.20765	.14209
PP73B	-.29484***	.08538	-3.45	.0006	-.46218	-.12751

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   PP78A|      .10028          .08779     1.14  .2534     -.07179     .27235
   PP78B|    -.24472**        .10248    -2.39  .0169     -.44559    -.04386
     P80|   -5.18252***     1.00042    -5.18  .0000    -7.14332   -3.22172
   PB84A|    -.01148**        .00503    -2.28  .0225     -.02134    -.00162
   PEV19|     .07779***       .01974     3.94  .0001      .03909     .11648
   PP81A|     .27699***       .07887     3.51  .0004      .12241     .43157
   PP81B|    -.21598***       .08167    -2.64  .0082     -.37605    -.05590
   PP86A|    -.14295**        .06436    -2.22  .0263     -.26908    -.01681
     P90|   -4.19117***       .99814    -4.20  .0000    -6.14749   -2.23484
   PB94A|    -.01324**        .00585    -2.26  .0237     -.02470    -.00177
   PB94C|     .03146***       .00476     6.61  .0000      .02213     .04079
   PB97A|    -.14450          .09140    -1.58  .1139     -.32363     .03464
   PB97B|    -.28405***       .09075    -3.13  .0017     -.46192    -.10617
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***, **, * ==>  Significance at 1%, 5%, 10% level.
Model was estimated on May 25, 2023 at 03:01:38 PM
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