2014•2015
SCHOOL FOR TRANSPORTATION SCIENCES
Master of Transportation Sciences

Master's thesis
Environmental Impact of Parking Measures

Supervisor :
Prof.dr.ir Tom BELLEMANS

Johannes Martens

Thesis presented in fulfillment of the requirements for the degree of Master of Transportation Sciences

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PREFACE

This paper was created in the context of a masterthesis at the University of Hasselt in the specialisation mobility management. The paper focuses on the use of push measures to influence the use of parking facilities in the urban context of Geel. It aims to gain insights into the reactions that car users exert when faced with hypothetical scenario's to their most used parking facility in a number of cities in the region of Geel.

This report would not have been possible without the continued support of Peter van der Waerden, Tom Bellemans and Caroline Ariën.

SUMMARY

As the population of the world continues to grow, as well as the portion of people living in cities and the number of privately used cars, it becomes increasingly important to create an urban environment which is sustainable and of good environmental quality. Decision makers and urban planners have a whole plethora of measures that they can use at their disposal. One category of those measures is traffic demand management or TDM for short. TDM combines both pull and push measures which can be used in conjunction to create a more equitable and sustainable transportation system. Pull measures aim to increase the use of mode choices by improving them; either by appeal accessibility cost or performance. Push measures aim to dissuade particular behaviour by implementing economic costs or other measures. These usually raise revenue, as well as quantify the cost of particular transport behaviours. One particular category within TDM is that of parking measures, which have been in use for quite a while. Parking pricing is the most known example of this. While decision makers and urban planners are aware of the tools at their disposal, they are often less certain of their effects in the setting that applies to them specifically. This report aims to shed light into that unknown, identifying the possible reactions that car users may show when confronted with a particular parking measure.

By submitting a sample in the population of the city of Geel to a self-completion questionnaire, data is gathered regarding their current transport behaviour, mobility options and reactions to five hypothetical scenario's of parking measures. These measures contained two scenario's of a monetary cost increase, two scenario's of a reduction in the amount of parking spaces of a facility and the closure of the parking facility. First an online survey was used by distributing flyers with a URL, then a paper version was used to obtain a total sample of 100 respondents. This data led to the conclusion that road users indeed change their behaviour to evade parking measures, and the reaction to parking pricing is not as strong as a decrease in the number of available parking spaces. Additionally, changing transportation modes, a switch to public transportation or the bicycle, is not as popular as continued use of a private car. Different people have different reactions, but no particular characteristic of individuals was influential across all distinct hypothetical cases and strategies. Included in the report are recommendations for decision makers questioning how to shape their urban environments, as well as a reflection for future research on the topic.

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1. INTRODUCTION

1.1 Setting

A lot has been written on the effects of car use on a well-known global problem of our time; climate change. We live in a continuously evolving world and up until a few decades ago, thinking of the future was not really an issue. Now, we are ever on the lookout for the limitations of the resources we use, the food we consume and the space we use. Each of these questions is based on the principle of sustainability, a concept which is widely used, but often misconstrued. A UN report from 1987 issues a clear definition of this elusive concept which captures the three different aspects of environmental, social and economic sustainability: “sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” (UN General Assembly, 1987). Such concerns are raised by NGO's and world summits, which are all trying to seek solutions to the problem of creating value now without damaging the future. Specified to the field of mobility, we can imagine large problems in the future regarding sustainability, since the way it currently exists is heavily reliant on fossil fuels. Taking into account that mobility, as a whole, accounts for 35% of global energy consumption (Mackay, 2008); we see that predicting the future can be problematic. Almost half of that is caused by personal car use.

Since the dawn of the auto-mobile, the number of privately (or otherwise) owned cars has increased dramatically (Dargay et al. 2007). This created possibilities which were not apparent before that mobile revolution. People could travel further distances in far less time and carry far more goods. This meant a significant difference in the transport behaviour of people. This steep increase in car use results in three main issues: firstly, as we have already discussed, the use of most cars results in environmental damage and the degradation of urban living environments. Secondly, when too many people use their cars at the same time the traffic system might collapse and cause congestion. Lastly, when not in use, cars take up available space until they are required again. This is especially relevant since more and more of the world's population will be born, grow up and live in an urban environment. In a report, the UN predicts that 60% of the world's population, 4.9 billion people, will live in a city by 2030. While the issue of sustainable development should be a worldwide concern, it is more apparent in an urban context. Here, personal car use as it exists in most societies today will inflict even more harm than it generally does with regards to congestion, pollution, unsafety and required space. In urban environments, for example, the loss of space is even more damaging than it is in more rural environments. If cities are trying to be more sustainable and optimal in regards to living conditions, actions will have to be taken to manage these adverse effects.

The cities actually have tools at their disposal to tackle these adverse effects. There is a wide array of different traffic management tools that influence the decision making process of individuals. But not only conscious tools are options for changing car use in a city or outside it. The concrete parking situation within a city influences the decision making process of individuals that wish to travel there. A particular parking situation may dissuade car use, just as another parking situation may stimulate it. These parking situations are made up of a

series of characteristics. Two of them are the location of a parking facility as well as its accessibility, but other characteristics include available space, operating hours, pleasantness and price. Changing these latter characteristics is considered to be a concrete measure in dissuading car use, and are referred to as parking measures. These parking measures have a whole range of possibilities. Changing the parking price (or charging one if it was previously free), changing the parking hours available, as well as the other characteristics such as available spaces and even accessibility and pleasantness have an impact on the use of a parking location. By using these parking measures, urban planners will actively intervene in the parking situation of a particular zone, whether within a city or outside, and thus influence the decision making process of individuals that want to come there. The question now remains however; what influence do these parking measures exert on their decision making process?

The answer is of particular interest to urban planners and the political powers of any city be it small, large or anything in between. If anyone would face the public anger regarding the lack of high standards of living in cities, it is the political elite in power. The urban planners that serve under them need all the information they can have regarding the tools that are at their disposal. In a way, answering that question shows the effectiveness of particular measures, allowing for a well-tailored solution. Additionally, if there are larger spill-over effects of any measure, surely the urban planners and their political superiors would like to know about it in advance. To tackle car use in urban contexts, urban planners need information about the effectiveness of parking measures, but also need information about the current practices of the population regarding transportation. Without that information, it is not possible to find the best tailored solution to a particular city's car use problem.

1.2 Research Aim

The foregoing is the context in which this study takes place. The study aims to increase the understanding of reactions to parking measures. If an urban planner decides to change the characteristics of a parking facility, how would the public (on average) react? Is there a way of defining which type of people would react in a particular way? The answers to these relevant questions may change what it is that the urban planner has to do in order to achieve the changes that they desire. A better understanding of these reactions is beneficial for two distinct categories of people. Firstly, it provides information to the political powers of municipalities so they can better understand the impact of specific parking measures. Using the results of this study, they will be able to better adapt their traffic management tools to suit their inhabitants' transportation behaviours. Secondly, this report can be used by researchers in the field of mobility management, specifically those interested in the effects of parking measures, who wish to do research regarding this topic. This report will enable them to replicate this research project in other settings, as well as adapt it to better fit the local circumstances.

1.3 Research Question

The next step is to define a research question. Without formulating what it is that the study wants to answer, it becomes easy to lose sight of the ultimate goal. Since there are two distinct categories of people this research aims to assist in different ways, it becomes clear that more than one research question is needed. One should focus on the existing travel behaviour, and the other on potential reactions to parking measures.
A research project must have a particular location where it takes place, a location where the data is gathered. The city of Geel is selected as the location, with its inhabitants as the target population. The particular reasons for these, and other decisions will be explained in detail in the Methodology part of this report. Bearing this in mind, the research questions thus become:

- "What is the change in travel behaviour due to parking measures in the context of non-weekly shopping trip in urban environments, of inhabitants of Geel?"
- “Which individual characteristics are influential in causing these changes?”

Looking at existing literature, which will be discussed more extensively below, a few hypotheses that are linked to the research question can be deduced.

- Firstly, as parking measures dissuade parking in a city, road users change their behaviour to evade the measures, such as choosing another parking site or travelling to other destinations.
- Second to that is, that parking pricing is the most effective way of doing so. (Pushing car users to alternative location or modes).
- Connected to that is the hypothesis that changing transportation mode will not be as popular to avoid these measures.

1.4 Report Structure

The remainder of this report is structured into four parts. A literature review that focuses on the existing literature on Traffic Demand Management (TDM) in general and different parking measures in particular. Also, attention is paid to the Pamela model, which aims to model the transportation behaviour given key parking attributes. The second part, Methodology, describes the particular choices that were made for this research project to be completed, as well as why they were made. Additionally, it will explain in depth what was researched as well as how it was researched. The next part is the descriptive analyses, which contains the analyses of the existing transportation behaviour of the sample, in relation to the demographic information which was gathered, the mobility options of the sample and the reactions of the respondents to hypothetical measures. Lastly, the report presents the results of the model analysis, which will yield which variables influence these reactions. A final conclusion and reflection will be offered at the end of this report.

2. LITERATURE REVIEW

2.1 Introduction

Understanding the situation at hand is the first step in any research project. This part of the paper will therefore focus on exploring definitions, fields and models that allow a better understanding of the field, paving the way for the interpretation of the research results. First, we will be exploring Travel Demand Management as an engineering field; followed by a closer look on different measures which can be taken, exploring both pull and push measures. Parking measures specifically, and how that relates to shopping experiences, will be discussed in more detail, as it is the focus of this paper.

2.2 Travel Demand Management (TDM)

It is unlikely that car use will decline in the near future, with the continued urbanisation, increasing car ownership and even declining fitness levels (Reimers, 2013). In the light of that fact, it is unlikely that problematic issues such as pollution, congestion and diminishing resources will cease to put pressure on the quality of urban life. This can be expressed as the citizen vs. consumer paradox; when consumers know that using a car is worse for their environment, but still prefer to use it anyway (Rowlands et al. 2002). In response to these issues, policy-makers in Asia, Europe and North America design schemes that aim to lower car usage by encouraging public transportation by making the car relatively more expensive or less convenient (Reimers, 2013).

The tools of policy makers to control, or more aptly put, manage these flows of traffic are grouped under the name Travel Demand Management or TDM for short. Broaddus defines TDM as:

'a strategy which aims to maximise the efficiency of the urban transport system by discouraging unnecessary private vehicle use and promoting more effective, healthy and environmental-friendly modes of transport, in general being public transport and non-motorised transport.'

This term is an umbrella for a plethora of different types of tools that can influence traffic streams. There are multiple ways to categorize them, one of which is by distinguishing push from pull measures.

One type of push measures are economic incentives. These economic measures are designed to capture the external costs of travel and thus increase economic efficiency. They also create revenue which can be used to facilitate other measures. They are noted as being among the most effective components of a total TDM package, but they also face resistance from drivers. Political will and strength are usually key in their implementation. Below is a ranking of what are perceived 'good' and 'bad' economical push measures to dissuade car use. But not all push measures are economic in nature; some are physical, such as traffic calming measures or the reduction of parking supply.

Rank	General Category	Examples
Best	Time- and location-specific road and parking pricing	Variable road pricing, location-specific parking management, location-specific emission charges
Second best	Mileage-pricing	Weight-distance charges, mileage-based vehicle insurance, prorated motor vehicle excise tax (MVET), mileage-based emission charges
Third best	Fuel charges	Increased fuel tax, general sales tax applied to fuel, pay-at-the-pump insurance, carbon tax, and hazardous substance tax
Bad	Fixed vehicle charges	Current MVET, vehicle purchase and ownership fees
Worst	External costs (not charged to motorists)	General taxes paying for roads and traffic services, parking subsidies, uncompensated external costs

FIGURE 1: TDM push measures ranked (Broaddus et al. 2009)

The figure above ranks economic push measures on effectiveness and efficiency. Upon examination, it is clear that these economic 'push' incentives can be implemented onto many different characteristics of driving. But they can be categorized in three different groups: those discouraging motorized vehicle ownership, those discouraging motorized vehicle use or promoting other modes of transportation, and those that encourage the use of lower emission technology. Pull measures, on the other hand, aim to facilitate the use of other mode choices without using economic incentives. Both pull and push measures do not exclude the use of the other, so it is logical that a thorough and well thought traffic management plan uses both push and pull measures. Such plans work best when the measures are specifically designed and used in tandem.

2.3 Improving mobility options (Pull measures)

One strategy in attempts to maximize the efficiency of the urban transport system is to facilitate the use of other mobility options. They are referred to as pull measures. These mobility options (or mode choice) include: walking, cycling, ridesharing, public transportation, private taxis and car-sharing. Pull measures largely aim to improve one or more of these mode choices, so they become more attractive in and of themselves, by improving the conditions in which they are used (Broaddus et al. 2009).

2.3.1 Improving walking and cycling conditions

In an urban environment, improving walking and cycling conditions are effective in changing the supply and demand of mobility. The first hurdle in this respect is that most cities have not developed with a priority to soft road users such as cyclists or pedestrians. The phenomenon called 'severance' illustrates this; where car infrastructure severs and divides key pedestrian or cyclist infrastructure. Busy streets, parking lots and viaducts impact the connections of the cycling and pedestrian networks. The limitation of this 'severance' factor, is one option to improve walking and cycling, but that is not the only one.
Improvements for walking include:

- Wide sidewalks with a clear walking area
- Painted, signed and lighted crosswalks
- Security lighting along sidewalks and off-street parkways
- Maintenance to pavements
- Pedestrian countdown signals at crosswalks
- Adequate street furniture such as benches, street lights and public toilets.
- Covered waiting areas for public transport.

Improvements for cycling include:

- Optimising bicycle lanes for safety and comfort
- Maintenance on bicycle lanes
- Installing bicycle parking for both short and longer terms, especially near public transportation infrastructure.
- Using shared bicycle infrastructure

2.3.2 Improving public transportation services

In cities, public transportation (PT) typically reaches its peak efficiency, reaching more travellers that usually want to travel shorter distances. To maximise the efficiency of the overall transport system, PT services will need to be optimised. The first key point is that of service integration; ergo, the adjustment of different PT services to complement each other. This helps travellers to navigate the transportation system, and makes it more attractive to new customers. While metro (light rail) and trains (commuter rails) usually have their own separated lanes to travel on, buses do not. To optimise their operation, bus lanes reduce delay times, especially when used in conjunction with bus priority at intersections. Lastly, PT infrastructure also plays a role in optimising the use of PT and should be optimised for comfort and safety. These measures include adequate lighting and visibility, boarding islands, bus turnouts, kerb realignments, clear schedule information at stops, efficient ticketing systems, etc.

2.3.3 Car sharing

While its name seems to imply that this measure does not reduce car use, it does meet the criteria for being a TDM measure, since it also aims to increase the efficiency of the transport system in an environment, here typically a city. Much like a library, users can get a subscription and subsequently loan a car in one of the car sharing locations. This allows for less car ownership (Broaddus et al. 2009), and less parking space requirements. It enables more families to have a car-free lifestyle in which they do not own a car, but occasionally do need one.

2.4 Economic Measures (Push measures)

Economic measures are used to encourage a more efficient use of the transportation system, many of them designed to capture the externalised costs of travel (Broaddus et al. 2009). These pricing measures create revenue that can in turn be used to improve other mobility options as outlined above, or to substitute other taxes. The economic, push, components of a comprehensive TDM strategy are often the most effective, but also face the greatest resistance from drivers, making them difficult to implement. Clear goals for the revenue they create can mitigate this. Additionally, not all economic measures are equally effective. The different types of economic measures below are ranked from best to worst.

- Time- and location-specific road and parking pricing (Variable road pricing, locations specific parking management, etc.)
- Mileage-pricing (weight-distance charges, mileage based vehicle insurance, etc.)
- Fuel charges
- Fixed vehicle charges (vehicle ownership fees, etc.)
- External costs (not charged to motorists)

Economic measures can also be broken down into three groups of incentive or disincentive. A first category discourages vehicle ownership. A second category encourages the use of lower-emission technology. A last category discourages either the use of motorised vehicles, or encourages the switch to public or non-motorised vehicles (Broaddus et al. 2009).

2.4.1 Discouraging car ownership

To control car ownership, decision makers can choose from a variety of measures which impact the cost of a vehicle. They can impose sales taxes or import duties, enforce an annual registration or road fee and the implementation of a car quota (a limited number of vehicles that can be registered every year).

2.4.2 Encouraging lower-emission technology

Low-emission zones restrict car access to particular areas, predominantly in cities, for vehicles which create higher levels of pollution. They are often used to protect historic city centres, improving air quality and noise levels.

2.4.3 Discouraging car use

The aim of these particular TDM measures is to affect driver behaviour and reduce single-occupant vehicle trips by increasing the cost to drive a vehicle. i.e., the more they drive a vehicle, the more a person will have to pay.

- The most straightforward of these is a fuel tax, which increases the cost of fuels.
- Road pricing is different from fuel taxes in the sense that it charges drivers a direct fee for road space, either by charging the entrance into a certain area, or per kilometre on certain roads.
- A Toll road is very similar to the latter.
- A congestion charge resembles that of an area road price, but is specifically designed

to counter traffic congestion, with higher fees under congested conditions.

- Parking pricing aims to change the price of parking, which is often overlooked as a factor affecting traffic demand. Given the nature of this paper, we will look more closely at this particular type of measure.
- Pure vehicle restrictions include the limitation of parking space, and simple prohibitions of using certain areas or certain streets. Car-free days can also be included among this category of measures. These restrictions can also be implemented based on a vehicle's number plate. While not economic in nature, these restrictions are push measures nonetheless, making car use less favourable.

2.5 Parking Management

Most car trips serve one or more purposes. Yes, car users can make trips just for the sake of making trips that is because they enjoy them, but most trips have a specific purpose at heart. That purpose can be to go to work or return home, to go to a social event or to go shopping. Shopping is a central activity in human lives, acquiring goods needed to survive or live more comfortably and transporting them home. When contemplating a shopping trip, it seems that access and parking convenience are quite important (Reimers, 2013). More aptly put, it is important that shopping locations such as malls or shopping strips are easily accessible by road design, as well as have adequate parking space on site. Changing these characteristics of a shopping location, by changing the infrastructure for example, can be categorised as TDM measures.

These TDM measures that revolve around parking infrastructure, contain both push and pull measures. A prime example of a push measure in this context is that of parking pricing. Having road users pay for their parked car depending on the time they leave it behind is an economic incentive to take the car less, or at least a way to quantify the damages of a parked car. An example of a pull measure could be the beautification of another, more distant parking site or to increase the feeling of safety by installing cameras to 'pull' car users to a particular part of the parking infrastructure. There are two types of push measures that we want to explore. The first is that of an economic push measure; increasing the parking tariff. The second is that of lowering the number of available spaces in a parking setting. An extreme variant of this is to close the parking facility altogether. In the paragraphs below, there is an exploration of key TDM measures with regards to parking.

2.5.1 Parking Pricing

While road pricing can be used to influence a broader array of trip characteristics, parking policies can be used to tackle congestion effectively under the right conditions (Marsden, 2006). In most circumstances however, the perfect condition where the true cost of parking is paid by all who park their car does not exist. Parking policy lies somewhere between a revenue raising activity, a desire to avoid deterring visitors and a need to manage transport demand. These are not in order of most importance, since a well-designed parking policy can make the use of the transport system more efficient, while poorly designed policy can do the reverse. The main objectives of a parking policy should include, according to Marsden:

- A strong and vibrant economy supported by an efficient transport system
- Better accessibility
- A clean and high quality urban environment
- A safe and secure environment
- A more equitable society

Parking facilities are mostly used for one of three purposes: the commute, residential parking or other commercial and leisure uses. Depending on the purpose, a parking policy has different aims. In the prior, it mostly aims to reduce single car commute trips, which cause more congestion and a less efficient use of space; hopefully resulting in car-pooling or a modal shift. In the latter two, a parking policy aims for a more liveable urban area. Parking policy will continue to rise in importance as car ownership continues to grow.

2.5.2 Effects of Parking Pricing

The most important of parking characteristics in the decision for a shopping opportunity are: parking price, parking location relative to the final destination, supply of parking and the nature of a guarantee on a parking space play. In 2001, Hensher & King conducted research which looked at casual car parkers (not permanent parkers such as residents or employees) using a stated preference survey in Sydney's central business district. Their research design modelled three characteristics of a parking location: hours of operation, tariff schedule and walk time from parking to main destination. Three alternatives to parking within the central business district (CBD) were offered to respondents: drive/park beyond CBD, Public transport and not travel to CBD. From the 19683 combinations that were produced, each respondent had to evaluate three of them and make a choice out of five possible alternatives. Their findings imply that a 1% increase in hourly parking rates results in a 0.541% reduction of the probability that parking location is chosen, a 1.01% reduction in the probability to park elsewhere in the CBD and a 0.476% reduction of the probability of parking on the fringe. This implies a high sensitivity to parking prices, far higher than for in-vehicle costs or even travel time. The changing of hours of operation additionally yields a much smaller amount of switching between parking location and public transportation use than the opposite; keeping the hours of operation constant and changing the parking rate. In fact, 97% of the change in CBD parking is attributable to parking prices, while only 3% is due to changes in curfews. This leads to the ultimate conclusion that a reduction in hours of operation at specific locations under existing rates will lead to a relocation of parking and small modal shift to PT, while maintaining a flux into the CBD. An increase in parking rates, however, will lead to a

significantly greater use of PT, a noticeable change to more distant parking within the CBD and a small change in parking outside the CBD or on the fringe. Important to note is that there is virtually no loss in travel to the CBD. The study by Hensher & King seems to imply that raising parking rates has a large effect on the choice of a particular parking location, but not on the general choice of the shopping centre. In this particular study, respondents park further away from the desired destination to cope with increases in parking rates, or even take other modes, while the reduction of operation hours as the same effect although much smaller.

Another study by Kelly & Clinch from 2006 investigated the effect of changing parking tariffs on different road user types. In effect, they were investigating whether a trip purpose influences the acceptance of a higher parking price. Their research used a stated preference questionnaire and an ordered probit model (due to the non-binary nature of price responses). Three pricing scenarios were included in the study. Their results reveal a counter-intuitive reality: heavy users who use the service frequently are less likely to respond to an increase in prices despite that implying a higher burden than on light users. This is explained due to high levels of business-related trips and work-trips. If engine size serves as a proxy for level of income, then the likelihood of changing behaviour decreases as income increases. Lastly, drivers from outside their particular case Dublin, were more likely to adapt their behaviour than respondents from in the city or the suburbs.

Lastly, a study by Danwen et al. In 2010 focused on the effects of parking charges on residents within a city. The case in question was the city of Nanjing, in which a parking charge survey was conducted in large public parking facilities. Approximately 1000 of these surveys were conducted. Their results show that travel time is the largest indicator of car use, while travel expenses have the greatest influence on whether to choose bus transit or not. Additionally, the share rate of car travel and the share rate of bus transit increase as parking rates increase, although the increase in parking rates needs to be higher than a certain threshold value (5 Yuan/hour and up). About 85% of car travellers will give up car travel if it rises above 12 Yuan/hour. The sensitivity of parking rate changes to car travellers can be increased by decreasing bus fares appropriately.

2.5.3 Parking pricing by the minute

One way that car users can be charged for parking their vehicle is at the beginning of every new hour. Another way of doing that is by charging car users per block of minutes that has passed. Authorities mostly expect that parkers stay as long as they need to, but not necessarily as long as they would to fill the time they have prepaid to park (Caicedo, 2012). In essence, they can choose to linger since they have prepaid for the remainder of a begun hour of parking. In this sense, pricing parking by the minute spent is more effective, reducing the wait time for clients who have not yet entered the parking facility. This is caused by a drop in probability of making additions to the durations of stay (ergo, completing an hour that has been paid for). The tariff can be recalculated so that clients do not pay more for parking and revenues are not affected for the operator. In all, it is a variation that can be useful in a parking pricing policy.

2.5.4 Curb parking pricing

Linked to parking, a tragedy of the commons occurs in cities that can be classified as residential street parking, where people tend to over-consume a free, open-access but rivalrous property without regard to society or each other (Guo & McDonnell, 2013). Parking policies can attempt to remedy these situations, but is it feasible to have residents pay market prices for their parking space? What Guo & McDonnell's research shows is that making distinct parking infrastructure part of a parking policy is not enough, since it might have spill over effects such as parking intrusion. Using parking measures on a particular shopping location can have adverse effects on the nearby living conditions; by pushing car users out of the dedicated parking space into the cheaper or free surrounding curb parking space. Additionally, it points out that there are social effects to particular parking issues, and some of the most popular measures taken do not remedy these issues. Curb parking has negative effects in different ways. Firstly, it leads to parking cruising and parking intrusion: everyone prefers to search for a free parking spot, which leads to the intrusion of non-residents. Secondly, free on-street parking can reduce cost of ownership and increase car ownership. Next, it is socially unfair: parking space is paid by all residents, but used only by car owners (who tend to have higher incomes). Lastly, it is also unfair between people with on-street parking and off-street parking (since off-street parking then takes up two usable spaces, one at the curb and one on the property).

The possible solutions are varied: to begin with the limitation of on-street parking to residents through permits, but this does not solve social and auto-dependency issues. Secondly, to convert on-street parking in off-street parking by implementing a minimum of off-street parking requirements, again, this does not solve all issues. And lastly, to introduce parking pricing which meets all mentioned issues. Research reveals that NYC residents are willing to pay 12.80$ daily for a parking permit, illustrating that curb parking pricing might be acceptable, especially if the revenue flows back to the neighbourhood. When parking congestion worsens, willingness to pay increases to an average 408$ per year. Additionally, it must be noted that residents are less likely to agree with curb parking pricing if the main issue is parking intrusion, that is, if the parking congestion is mostly caused by non-residents.

2.5.5 Congestion tolls vs. Parking Fees

The question can be asked whether TDM measures which do not revolve around parking, (such as congestion tolls, road charges, road taxes, etc.) do not exercise an influence on the use of parking. In other words, if those TDM measures decrease global car usage, do they also not diminish the use of parking facilities as well? Albert & Mahalel carried out a study in 2006 that investigated just that. They looked at the attitudes towards congestion tolls compared to parking fees in the light of travel demand management. Firstly, they point out the overall use of parking fees, whereas tolling is only used in a few places. The main reason offered for this difference in 'popularity' is a technological gap which has only recently been filled. Main differences between the two management options include that the toll can be differentiated according to trip characteristics, such as distance travelled, while a parking fee cannot; and that the congestion toll only affects those who drive during the hours of

congestion, while parking fees tend to be all-day. They did a stated preference survey on the sample population of Technion University employees, 240 in total. The sample population was divided into two groups, each being subjected to a scenario. The first included a congestion toll, the second parking fees. The survey offered three distinct options: to use a private car and pay the fees, to use the Technion shuttle service or public transportation or to use a private car and park off-campus. The group subject to scenario A were also offered to arrive before the toll was charged. Their findings show that drivers tend to change their travel behaviour to avoid "out-of-pocket expenses". 54% of the sample drivers in the sample would prefer to use other options than to pay a parking fee, while 72% would avoid the congestion toll. The calculated demand elasticities were 1.2 for parking fees and 1.8 for congestion tolls. The large differences can be explained by the more widespread use and acceptance of parking fees and secondly the appealing choice of travelling at another time to avoid the congestion toll. We can conclude that parking fees are more tolerated as a TDM measure than congestion tolling.

But it does not have to be an either/or situation. According to Jansson, who wrote a comparative report on road pricing and parking pricing in 2010, both systems work best in conjunction. Looking at the literature and comparing the road pricing systems of four cities (London, Oslo, Stockholm and Singapore) as well as carrying out research on parking pricing, she found that most problematic are the car users which have free parking at their workplaces. Road pricing essentially allows for them to also pay for their use of key infrastructure in the city. She also found that between rush hours, most trips in cities are made by commercial vehicles and passenger cars on business; 70 to 80% of traffic being non-private transport. The costs of this traffic is just as high as during rush hours, which is often underestimated. She therefore offers a new definition of a 'parking price' which is combined between trip and parking charges. It would take the form of $P = a+bT$ (Jansson, 2010). Where ‘a’ is the congestion charge for the trip length and ‘b’ is the parking price for a period of ‘T’. All vehicles parked on off-street and private parking spaces would still pay the charge 'a', which should be regarded as a municipal congestion tax. In short, both TDM measures can be used in conjunction to increase the efficiency of parking policies, while at the same time mitigating social inequalities and injustices.

2.6 Pamela

Pamela, a Parking Analysis Model for predicting Effects in Local Areas, is a model which was specifically constructed to model the process of decision-making in the field of planning a trip and searching for parking (Van der Waerden, 2012). In effect, the model can reveal responses to parking measures, which is exactly what this paper also aims to research. Pamela has a few suppositions that should be identified. Firstly, it assumes that car users consider all available alternatives, while that is not necessarily the case (as we have seen in the discussion of choice models above). Secondly, it also assumes that car users are able and willing and able to use public transport or a bicycle, while that may also not be the case. Lastly, it assumes that there is no competition between different shopping locations (on the field of shop differentiation or other characteristics) (Van der Waerden, 2012). Pamela is able to quantify the response of car users to particular parking measures, which is useful for mobility planners. Using the model, they can more accurately design a comprehensive TDM scheme that is best suited for the current needs.

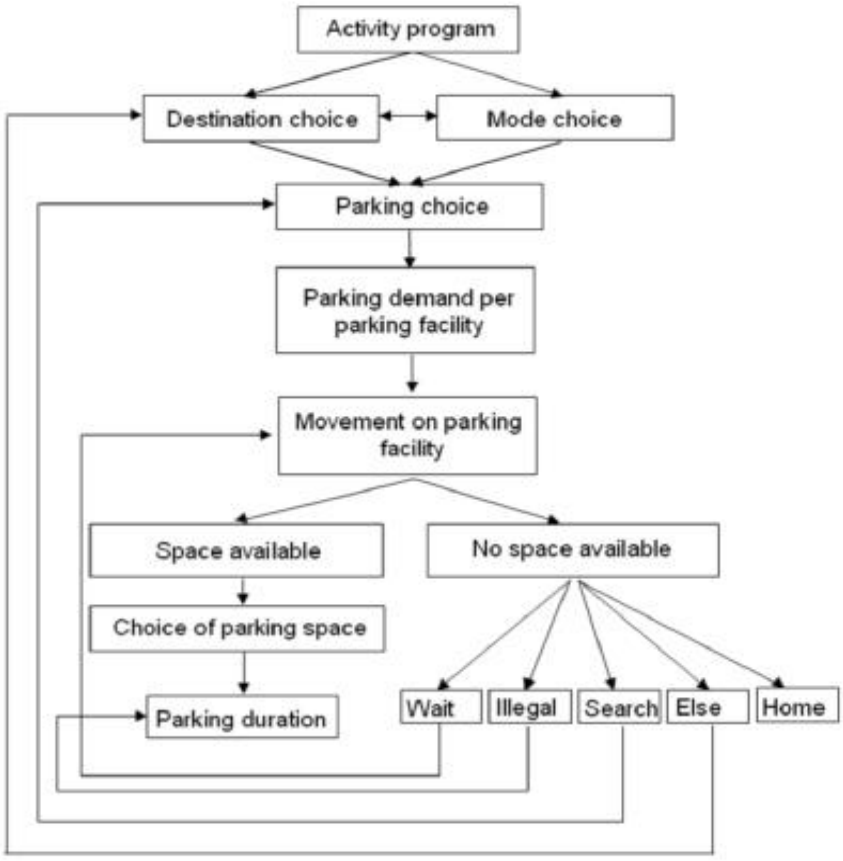

FIGURE 2: Pamela's Framework (Source: Van der Waerden, 2012)

Above is a diagram of the Pamela framework, including three decision models that compose Pamela and how they relate to one another. Concretely, the three distinct decisions are

involved to determine the shopping destination, the mode of transport and the parking facility if applicable. The models includes a distinct choice model for each key decision: "The traveller's parking consideration set", "the traveller's combined choice of travel mode, destination and bicycle stall/parking" and "traveller's adaptive parking choice behaviour when she/he faces a fully occupied parking facility".

Attributes	*Levels*		
Size of the parking facility	50 spaces	250 spaces	450 spaces
Chance of finding a free parking space	25 %	50 %	75 %
Parking costs per hour	free	DFL 1.00	DFL 2.00
Maximum parking duration	unlimited	max 3 hours	max 1 hour
Average egress time	0 minutes	2 minutes	4 minutes
Driving space in the parking facility	limited	average	spacious
Type of parking facility	parking lot	-	parking garage
Type of security	none	video	guards
Location in relation to residence	favorable	neutral	unfavorable
Location in relation to other parking facilities	close	neutral	at distance
Distance to supermarket/department store[1]	50 meters	150 meters	250 meters

FIGURE 3: Attributes which influence the consideration set (Source: Van der Waerden, 2012).

The first model, "the traveller's parking consideration set" uses a number of variables to determine which parking sites are being considered as part of the car driver's choice set. The figure above demonstrates the different variables, as well as some examples of different configurations. It is important to note that it does not yield the final decision, but simply the parking sites being considered as part of the car driver's choice set. Depending on the differences across the different parking sites, particular sites may or may not be considered as a viable option. The figure above contains the different characteristics that are under scrutiny. The model uses a Monte Carlo simulation to reach a particular result. Due to the repetition of calculations in this mathematical method, reality can be more closely approached.

Alternatives	*Attributes*	*Attribute levels*
Shopping destinations	Supply of shops	limited, average, broad
	Distribution of shops	scattered, concentrated, dense
Travel modes	Travel time Car	5, 15, 25 minutes
	Travel time Bicycle	10, 20, 30 minutes
	Travel time Bus	10, 15, 20 minutes
Parking facilities	Walking distance to final destination	50, 150, 250 meter
	Parking costs	free, DFL 1.00/hour, DFL 2.00/hour
	Maximum parking duration	unlimited, max 3 hours, max 1 hour
Bicycle stalls	Level of security	secured, unsecured
	Storage charge	free, DFL 0.50/time, DFL 1.00/time
	Walking distance to final destination	25, 75, 125 meter

FIGURE 4: Attributes which influence the combined travel choice (Source: Van der Waerden, 2012).

The second model, "combined travel choice model", aims to define the final decision of a particular road user, selecting the destination, mode choice and parking site. That they are decided together at this time is due to the fact that the three separate decisions are closely linked. For example; the choice for a particular mode choice can limit the number of available destinations and can eliminate the need for parking space all together. This model contains all available possibilities in these three respects, and places all of them under scrutiny much like the previous model did for the selection of parking facility. The figure above demonstrates the different attributes of alternatives, as well as example values.

The last model, "the traveller's adaptive parking choice", models what a particular road user would do if she or he were to encounter a full parking site. This adaptive choice model offers five distinctly different choices to cope with this particular issue:

- The car driver waits until a parking space is available
- The car driver parks illegally
- The car driver goes to a different parking site
- The car driver goes shopping somewhere else (different shopping site)
- The car driver returns home

The decision between these presented options depends on three things: the characteristics of the parking site, the travel history of the car driver and the price level of the travel time and other parking sites. This final model actually tries to predict the reactions that road users have to a particular situation, in this case that their chosen parking facility is already full. In this respect, it is a guideline for what is to come in this research, which aims to understand particular reactions to parking measures.

In short, Pamela models many different characteristics of the mode choice, shopping site and parking site. This allows it to very realistically model the decision of any shopper. The verification of this model has not yet been completed, especially in other environments since it was largely applied in the Dutch context. Applicability could be transferable, but it cannot be guaranteed. Ruben Ratgers successfully applied the model in 2013, but as discussed earlier there are some assumptions that the model makes. Indirectly, the answers to this research's research questions can also (partially) shed light on these assumptions.
In no means is this paper a critique or completion of the Pamela model, but both projects reinforce the understanding of their mutual subject.

2.7 Conclusion

Considering the consulted literature, it becomes apparent that resolving mobility related issues can be achieved by a multitude of different measures. These measures can broadly be divided into 2 types, push and pull measures, but should ideally be combined to achieve most impact on car-use. The effects of parking pricing, a prime example of an economic push measure, has largely been discussed in a variety of settings, revealing varying impacts.

One way of investigating the impacts of particular travel management plans is to use a mathematical model called Pamela. It is made up of a series of models, in all trying to predict the behaviour of road users. The Pamela model makes a few assumptions that need verification, but the three models that define it use variables which are interesting for other research, such as this.

3. METHODOLOGY

3.1 Introduction

As has already been discussed, the liveability in cities is under growing stress. Rising urbanisation levels, car ownership and population numbers are main factors in that respect. These issues show the growing need for a data gathering tool in respect with how parking situations influence car use patterns, as well as the need for the analysis of this data. Only when the effects of parking situations are adequately understood, can there be an effective intervention into the adverse effects of car use in cities. What follows is an explanation of the different choices that had to be made during the research, along with the motivation of the choices that were made. It will also explain the way the research was actually carried out. A reflection on this is offered in the final chapter of this report.

3.2 Explaining Key Decisions

To research the effects of parking measures it was necessary to make a few choices. A number of factors influenced the research question and ultimately the results in both size and scope.

The first of these decisions was which population and location was to be selected and researched. In this particular case, the city of Geel was selected, for a number of reasons. First of all, since it would be impossible to study the full population of a country with the limited available resources. Secondly, researching the population who live in a rural environment is not the prime population to research this topic. For these particular citizens, there is more often than not no real alternative from using the car, since non-weekly shopping and weekly shopping locations can be further away than a few kilometres. Another pragmatic reason is that Geel is my hometown, so I am familiar with its structure and specificities. Geel has a population of roughly 38,000 inhabitants and has a city centre where one can do non-weekly shopping. The other three selected cities were chosen for reasons of diversity. Antwerp, the largest city in the relative neighbourhood, which features a large diversity of stores, is very well connected by train. Turnhout, a smaller but still larger city than Geel, features more diversity, but is not well connected by train. Lastly, Herentals shares many characteristics with Geel and is well connected by train and bus. This way, Geel and three cities with varying profiles were selected.

After deciding the setting in which we would conduct our research, and narrowing the population under study, the method of reaching them has to be selected. It is decided that a self-completion questionnaire is the best way forward. It is easy to administer and cheap (Bryman, 2008). Additional benefits of this method are the absence of any interviewer effects (the effect the presence of an interviewer has, given his/her gender, ethnicity or social background), and the absence of interviewer variability (where interviewers ask different questions per respondent or ask them in a different manner). Above all this method allowed us to ask for the stated reaction to hypothetical changes in parking measures. A detailed discussion of stated and revealed preference is outlined below. Selecting this method has some downsides, which include: cannot prompt or probe, not knowing who fills in the questionnaire, questionnaire can be read as a whole (in part avoided by using Qualtrics

online suite), greater risk of missing data and a lower response rate (Bryman, 2008).

After the decision to use a questionnaire to collect the necessary data, it is obvious that the next question should be which questions to ask, or more critically; which parking measures to research. As discussed before, there is a whole array of TDM measures, and the same is true for parking measures more specifically. But to keep the questionnaire concise, a selection has to be made. The decisions is made to research the more monetary incentives and capacity characteristics, including the most extreme of measures: closing the parking facility indefinitely. These are part of the variables that are discussed in the first model of Pamela, which identifies them as influential to car users' choices. While it is true that the practical aspects of a parking facility and the aesthetic of it also carry with them effects on the popularity of the parking facility, they are pull measures, and require greater investment. They are certainly valid options in constructing a comprehensive traffic management plan, but here we decide to focus on push measures. After lining out the topics that the questions cover, the way to ask them is equally important. In general, there are two main ways: open or closed questions. Both ways have advantages and disadvantages, but most questions are selected to be closed ended for the following reasons:

Advantages	Disadvantages
Easy to process answers	Loss of spontaneity
Answers are perfectly comparable	Difficult to make forced-choice answers exhaustive
Answer categories may clarify the question	May be irritating if respondents do not identify with any provided category
Easy for respondents to complete	
TABLE 1: Advantages and disadvantages of self-completion questionnaires (Bryman, 2008).	

When designing a questionnaire, particular kinds of questions should be avoided. Examples include: leading questions, double-barrelled questions, questions that include a negative, etc. (Bryman, 2008). As such, these types of questions were avoided so that respondents were not influenced and received clear and unambiguous questions, and that the answers that are provided are balanced for each closed question.

3.3 Stated Preference vs Revealed Preference

In doing scientific research, there are two major ways of acquiring data. The first is to use revealed preference data (RP), the second is to use stated preference data (SP). The main difference between these two is that RP is based on actual behaviour that has already been displayed, while SP uses hypothetical scenario's to gauge what people *would* do (Department of Civili Engineering, Unknown). Within these two variants, there are methods of acquiring the data such as experiments, observations, questionnaires, etc. Both of these larger 'paradigms' have advantages and disadvantages, which we discuss in the table below.

Revealed Preference data (RP)	Stated Preference data (SP)
Based on actual market behaviour	Based on hypothetical scenarios
Attribute measurement error	Attribute framing error
Limited number of attributes	Extended number of attributes
Attributes correlated	Attributes uncorrelated by design
Hard to measure intangibles (how much culture does one consume?)	Intangibles can be incorporated
Cannot directly predict response to new alternative	Can elicit preferences for new alternatives
Preference indicator is choice	Preference indicators can be rank, rating or choice intention
Congruent with market behaviour	May be non-congruent or biased
TABLE 2: Comparison of RP and SP data. (Department of civil engineering, unknown).	

Given the limited funds that are available for the completion of this research project, the scope of possibilities is limited. A revealed preference experiment requires data of actual behaviour however, which would need to be acquired or observed. The prior requires unavailable funds, the latter requires unavailable manpower. But the choice for SP is not solely one by default. SP methods are, unlike RP methods, able to isolate particular effects from each other. It can also investigate multiple hypothetical scenarios within the same study. This makes it vastly more efficient to use in the context of this study than RP methods. Additionally, it can elicit the preference for non-existing alternatives (such as underground parking below the shops in question, for instance). RP methods cannot do this without constructing such situations in reality. In short, selecting SP allows for a more comprehensive as well as a more efficient study of the effects of parking measures.

Unfortunately, the expected disadvantage in stated preference methods is that of possible bias. It is not totally surprising that not everyone acts exactly the way they might state they do. Research by Fifer et al. (2014) shows that indeed a bias exists in stated preference methods. The source of this problem appears to lie in possible inconsistencies in responses due to the hypothetical nature of the survey. According to the authors, one to two in five respondents are affected by this, which makes it a very prevalent issue. Fifer at al. (2014) offer two main methods of mitigating this rather problematic bias. Cheap talk, as referred to in the paper in question, is a text which is offered before the completion of a questionnaire, with the aim of increasing the certainty of respondents in their choices. Supposedly, the cheap talk script encourages the respondent to take the task more seriously and to answer as if they were in real life scenarios. Additionally, a certainty scale is offered. In essence, every question is followed by the question which ask how sure respondents are they would indeed act the way they have predicted. Important to note is the fact that these two methods can be combined in varying degrees.

3.4 Discrete Choice Models (DCM)

In order to understand and research the relative impact of parking measures on the decisions of people, the process of making choices needs to be examined more closely. The literature of this particular subject is extensive, each offering a different paradigm on the subject of making choices, trying to model reality as best as possible. In general, Discrete Choice Models assume that consumers are able to compare a limited set of alternatives for a set of characteristics that they find relevant and selecting the alternative that maximises some measure of utility (Arentze & Timmermans, 2001). Below, focus is placed on three distinct models within DCM that have relevant points to raise for the research topic of this paper.

3.4.1 Rational Choice Model

Classical rational choice models state that people want to maximise value; selecting the best alternative according to their utility functions (Schwartz, 2011). Order-relaxed rationality weakens the assumption that people have full ordering, and fully follow their utility functions. Bounded rationality assumes a utility function, but allows the selection of an alternative which is not optimal. Crucial in this theory is that it is often enough to achieve a person's aspiration level, satisficing, instead of maximising utility. Another version is that the difference between the selected and optimal alternatives does not exceed a certain threshold. Bounded rationality, as such, can accommodate cognitive and perceptual limits. Both alternatives to classical rational choice models (ordered-relaxed rationality and bounded rationality) thus allow the selection of what are seemingly sub-optimal alternatives, each through their own paradigm. In the particular topic of this paper, bearing in mind cognitive and perceptual limits are relatively important. Not all alternatives are known to a person at all times, and even then perception could cloud possible alternatives.

3.4.2 Sequential Choice Model

Choice is usually presented as the result of careful evaluation of all available alternatives. (Vasconcelos et al. 2009). Going over all alternatives that are possible can be a time consuming process, and if this particular supposition were true, then the more available alternatives, the longer it would take to make a decision. Shapiro, Siller and Kacelnik (2008), presented different findings. In their Sequential Choice Model (SCM), they challenged the basic assumption that alternatives are offered to subjects simultaneously, instead insisting on a more sequential way of encountering alternatives. In other words, a particular subject will only be faced with one distinct alternative at a time, instead of them all appearing at the same time. Even when no alternatives are present, they found that there was a latency to accept even lonely options. These latencies imply that if two alternatives are offered simultaneously, the slower is suppressed by the quicker and is expressed as a choice. Although the model was mostly tested on animals, it offers a unique perspective towards the concept of choice. It is not unthinkable that choices made while driving a car can be modelled with the SCM, as not all alternatives can be processed at the same time due to cognitive limits. Searching for alternatives if a particular choice cannot be fulfilled are good examples of this.

3.4.3 Habitual Choice Model

Habit is defined as the repeated performance of behaviour sequences, but how does a person arrive at these sequences? Sequences that are combinations of mode and purpose, time of travel, route and the destination. Gärling and Axhausen (2003) assume that it is generally too high a cost to search and construct new alternatives, with expected gains too uncertain. In these situations, it is logical that past solution are reused to make behaviour easy and less risky. For transport modelling and planning, it is crucial to understand how habits are created, as well as how to incorporate habitual choice. In light of the current topic, it is interesting to bear the existence of habitual choice in mind. The selection of a given shopping and/or parking site may not be the result of deliberation, but can also be the result of a lack thereof. When people are too constrained cognitively or perceptually, they may reuse past behaviour and decisions.

3.4.4 Choice model selection

Despite all models bringing an interesting dimension regarding choice to the table, a final decision has to be made regarding which choice model must be adopted in this project. For the purpose of this project, the rational choice theory is the most efficient in explaining the decision process of people. This is especially true in its bounded rationality form, where there is the possibility of the selection of a sub-optimal alternative. Perceptual and cognitive limits are very likely in reality, where respondents may not think of particular parking facilities, mode choices or shopping locations as alternatives even though they are present. They may also not know about them at all. Offering alternative parking facilities, mode choices and shopping locations might break the perceptual limits and allow for a choice with higher utility. That is why these alternatives are offered in the specific questionnaire that the respondents has to complete. It attempts to reduce the influence of the perceptual and cognitive limits in the final results.

3.5 Survey

Given the choice of the stated preference paradigm, and thus the decision of not going with revealed preference, excludes a few methods of acquiring data. Observations, most experiments and the simple buying or acquiring of datasets are not possible. This is not regrettable, as we have methods available that are opportune for this type of research. The method of self-completing questionnaire is selected, in order to acquire the data necessary to answer the research question. Bryman (2008) speaks of a number of advantages and disadvantages to this particular method. The advantages include that it is cheaper and quicker to administer, there are no interviewer effects or variability and it is more convenient for respondents. Every method also has disadvantages, and it is important to note them from the beginning. They include, but are not limited to: not knowing who answers, difficult to ask a lot of questions, greater risk of missing data and a lower response rate. Additionally, compared to personal interviews we cannot probe or prompt.

In general, the main issue is that of a low response rate. This particular issue is serious and requires mitigation. Writing a good covering letter, which can include cheap talk as outlined before, is a first step (Bryman, 2008). Keeping the questionnaires as short as possible also

tends to help, in addition to having clear instructions and an attractive layout. Beginning the questionnaire with questions that are relevant to the respondent is also beneficial. Lastly, creating monetary incentives also has a positive influence on the response rate.

The template of self-completing questionnaires that will be used mostly contains closed-ended questions, with an open category if applicable. The advantages of closed ended questions are that they are more easily processed, are vastly more comparable, answers may clarify the question and are easy to complete (Bryman, 2008). The main disadvantage is that of loss of spontaneity; but it is also detrimental if multiple answers overlap or not all possible answers are included. The questionnaire should bear in mind the specifics of making a clear and understandable as well as an efficient questionnaire, meaning that the questions that it contains should follow the rules of thumb that are outlined by Bryman.

In short, the selected method is that of the self-completing questionnaire because it is capable to contain mostly closed ended questions, which are easier and quicker to complete. It is also cheaper and quicker to administer within the set time-frame and funds available.

3.6 Sampling & Administration method

The administration method of a self-completing questionnaire is an important decision. It is one that might bring about certain disadvantages, mostly regarding response rate. Given the nature of our small sample, the response rate needs to be very high in order to improve representativeness. The actual administration method of the questionnaire will be a mail/internet hybrid. Respondents will be invited to participate in a letter in their physical mailbox. They receive a flyer with a URL to fill out the online form, which then returns itself to the sender automatically.

To increase the response rate, which is classically an issue with self-completing questionnaires, four (4) tickets for a movie-theatre were randomly assigned to participants. To facilitate this, the name and address of the respondents had to be requested at the end of the survey. It was stressed that this information is only going to be used for this specific purpose, and was optional.

The target population is the inhabitants of the city of Geel, which is a small city in a rather rural environment of the province of Antwerp. This city is selected because it has a large diversity of living environments; a dense city centre and small municipalities that are somewhat distanced from that city centre. An additional reason to choose Geel is that we have easy access to information regarding parking and mobility.

Within the available time and funds, a large scale survey would be nigh on impossible. The target was set at least 100 respondents, to have some degree of representativeness. Administering the flyer as outlined above was not done in a totally random fashion. To avoid spending most flyers in the city centre, and not being representative in that respect, the number of flyers was relatively equally divided between the city centre and outside the ring road. Concretely, 160 flyers were mailed in the outlying municipalities Zammel, Ten Aard,

Bel, Winkelomheide and Larum. The remaining 640 were distributed within the city centre, in sets of 160 to have an equal spread. 160 of those were spread in Holven, the 'Leunen', the city centre, and Sint-Dimpna. Resulting in a total of 1440 flyers being mailed.
Mailing started on Friday 14th of November, and lasted until Monday 29th of November. On Friday the 19th of November, very few respondents had reacted to the flyer (6). This dire situation called for additional measures.

In order to have data to analyse, more respondents had to be found. Regrettably, the use of acquaintances and family had to be invoked to reach more potential respondents. A call for help was launched on Facebook on Monday 22nd. By that time, the number of respondents that had reacted had shifted to 65 (including uncompleted questionnaires). Instead of asking just my acquaintances and family to fill in the survey, I asked them to reach out to people they knew instead, hoping for a more equal spread of respondents. When the survey was closed on Monday 29th, and then counted 89 respondents (including unfinished questionnaires, 58 fully completed). To increase the number of respondents even further, another round of flyering was organised, distributing around 1200 additional flyers in the same way as before, making sure no household received two flyers. 400 flyers were left in shops that were willing to leave them near their registers, so that who was interested could respond to them. Additionally, printed out surveys were left in doctor's and dentist's practices so that people in waiting areas could be persuaded to spend their waiting time productively for our research. All in all, this second wave of respondents matched the number of fully completed questionnaires up to 100. It must be noted that this number is coincidental, as 2 web based surveys of this second wave were incomplete, as well as another paper-based version.

3.7 Questionnaire

This part of the report will elaborate on some key characteristics of the questionnaire that has been used to complete this research, it aims to explain why particular questions were asked, as well as which answers were provided as options. The full questionnaire is located in the annex on page 64.

The questionnaire was structured much like a tree. A particular answer to one question steered the respondent down a specified set of questions regarding that answer. It therefore started with the questions that were closest to them (Bryman, 2008). The question that all respondents were required to answer was in which cities they made their non-weekly purchases. Four cities were offered and an 'other' category remained open for respondents to fill in if their particular location was not on the list. The four cities that were selected were Geel, Turnhout (the largest city in the region around Geel), Antwerp (the capital of the province and the second largest city of Belgium) and Herentals (A small neighbouring city of Geel oriented towards Antwerp) (for the reasons outlined before). The second question, which was equally crucial for the research project was if a car was used for any of those purchases. A negative answer (no) to that question resulted in a shift to the final block of questions before terminating the survey. After all, it wouldn't make much sense for respondents who don't use their private car (or don't have one) to answer questions about

parking their car.

The cities that the respondent indicated they considered for doing non-weekly shopping largely affected which questions the respondents faced. To clarify, the survey was structured into four different blocks, one per city that was selected. For each of these blocks, the questions were identical. Additionally, the overall structure of the survey was the same for each individual respondent. They either had to fill in none, one or multiple blocks for the particular city they selected. In these blocks, two types of questions were asked.

The first category of questions revolved around the past and existing behaviour of the respondents in that city. The four questions were roughly:

- How long is the typical visit to that city?
- How often is the city visited for this type of purchase?
- Which transport mode is used predominantly to do these purchases in that city?
- Which parking facility is used predominantly?

The next category of questions revolved around the supposed reaction to a hypothetical change in parking measures. Naturally, respondents who noted that they didn't use a car to go to this particular city to do their non-weekly shopping did not have to fill in these questions. This category of questions contained 5 hypothetical scenarios for the selected parking facility:

- Low increase in parking tariff.
- High increase in parking tariff.
- Small reduction of available number of parking spaces.
- Large reduction of available number of parking spaces.
- The closure of the selected parking facility.

In each cases did the respondents have the ability to convey what they were most likely to do in those situations, as well as the amount of certainty they felt they had regarding this behaviour change. These questions were the core of the research project. The responses to this block of questions made sure that we could analyse the reactions to particular parking measures, in five different scenarios. Without these questions, the results can only show mode and parking choice data.

Lastly, the questionnaire asked for demographical information. The most classical of demographic variables were included in the design; age, sex and level of education. It also asked questions more related to the topic of transportation:

- Which transport modes are available?
- Do you have a disability?
- Do you have a fuel card from your employer?
- Do you have any special parking permits?

The prior variables allow us to get a better view of who responded to the questionnaire, while the latter variables might yield information as to why particular respondents answered a certain way. (For example, who does not have access to a car cannot use it; and knowing who does have a car but does not use it for this particular purpose is also very relevant). Additionally, all of these variables allow an in-depth analysis of which factor might explain a particular reaction or behaviour.

The questionnaire itself was, in its longest form, as limited as possible to attempt to prevent respondents from growing weary of the questionnaire and not completing it (Bryman, 2008). It was also constructed using Qualtrics (www.Qualtrics.com), an online questionnaire suite developed by a US based company, Qualtrics. It offers its software to 6000 clients, including universities. The platform, next to allowing to build a web-based survey also records the responses and allows for an exportation to SPSS files. The analysis will be provided by using that statistical software suite, SPSS.

4. DESCRIPTIVE ANALYSIS

4.1 Introduction

The first part of this chapter concerns the acquisition of the data. The data has been gathered as previously outlined. After closing all respective channels to acquire the data; closing web surveys and picking up paper surveys, the analysis of the data started. First, important steps have to be taken, investigating the completeness and potentially validity of the data. In addition, the total number of cases can be looked at.

One step that is given is that the paper versions of the survey must be translated into the same format as the web-based versions. Additionally, the results of the second web-based period had to be joined with the rest. These processes were meticulously completed and double-checked. In total, we have 100 finished surveys, of which 58 were completed in the fall of 2014, 12 in the winter of 2015 and 30 in March/April of 2015. 33 were incomplete, which translates to 24.8% of the total number of respondents. The cases that involve an incomplete survey have varying degrees of incompleteness. Some had no data at all, where respondents did not continue after the presentation of the introductory message. Some failed to complete sections on parking behaviour that were appropriate for them. Others did not fill in the demographic part of the survey. Since most of the respondents who did not complete the questionnaire did not fill in at least part of this final block of questions, there is no way of compiling a demographic analysis of who did not complete the survey. Unfortunately, the reasons for their incompleteness will never be known.

After closing the surveys and compiling one database of all available data, another step is required that is necessary to conduct statistical analysis; recoding of some variables. Some variables have been coded in ways that make it impossible to conduct certain types of statistical analyses, however. An example; instead of having one variable for diploma in which the software noted the answer category, the software has made one variable for each answer category. In order to look at the spread in educational levels, first these variables have to be recoded into one variable. The same is true for a number of other variables. Not all variables have to be adjusted at this stage, before any analysis has been done. Other changes to the dataset can occur whilst analysing, when particular issues arise that were unforeseen, or when additional information is deemed interesting and appropriate for inclusion.

After these steps the next step is naturally to analyse the results of the survey. Using SPSS, a statistical analysis software suite, the hypothesis and additional questions can be answered. The report of this analysis is structured as follows: first there will be an analysis of demographic variables separately. This will define the subset of the population (sample) which filled in the survey. By looking at this data, we gain insight in the composition of the research sample. What type of people has responded to the survey? Is this representative of the larger population? In what ways is it representative? These are all questions that affect the interpretation of the results. Without it, we would not be able to analyse the results correctly. Next, we looked at the broad results of main transportation themed questions, such as: how popular is the car, where does the majority of the respondents go for their non-

weekly shopping, which modes of transport or transport benefits are at their disposal? Last, but certainly not least, we will look more in-depth into the responses to the changes in parking measures.

4.2 Demographic Analysis

The first demographic variables that come to mind are those of biological sex and age. The analysis of these variables reveals that the respondents are predominantly female; with 71% of valid responses being of women, and 29% of men.

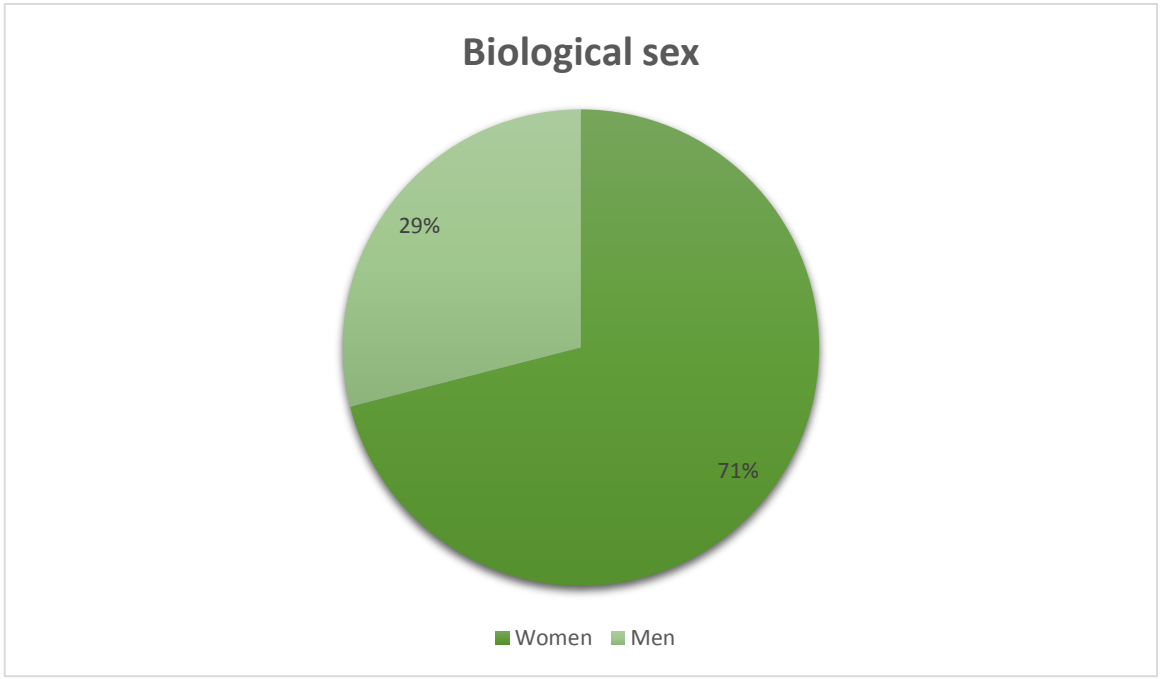

FIGURE 5: Biological sex distribution in the sample.

Looking at age, it reveals that the largest age category was the one of 18-27 years of age with 34% of respondents. The second largest category is the following age group 28-37 years of age with 28% of respondents. The next categories (38-47, 48-57, 58+) count 14%, 13% and 11% respectively.

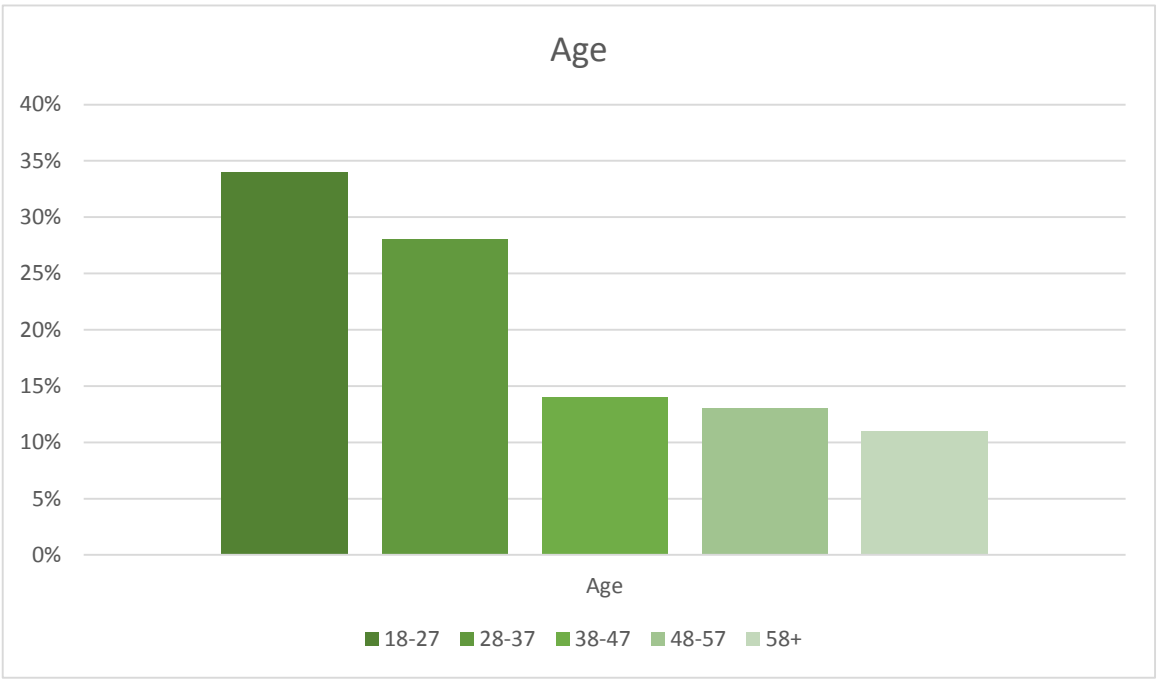

FIGURE 6: Age distribution in the sample.

The level of education shows that only 1% (1 individual) has a lower degree of education while 41% has a secondary degree of education, one respondent used the category other and disclaimed that they were studying for a higher degree, thus they should be counted here (55% + 1% = 56%). 56% of respondents noted to have a higher degree of education (bachelor or master). Another respondent used the category other to define they had a “NSK” Diploma. What that exactly means is uncertain.

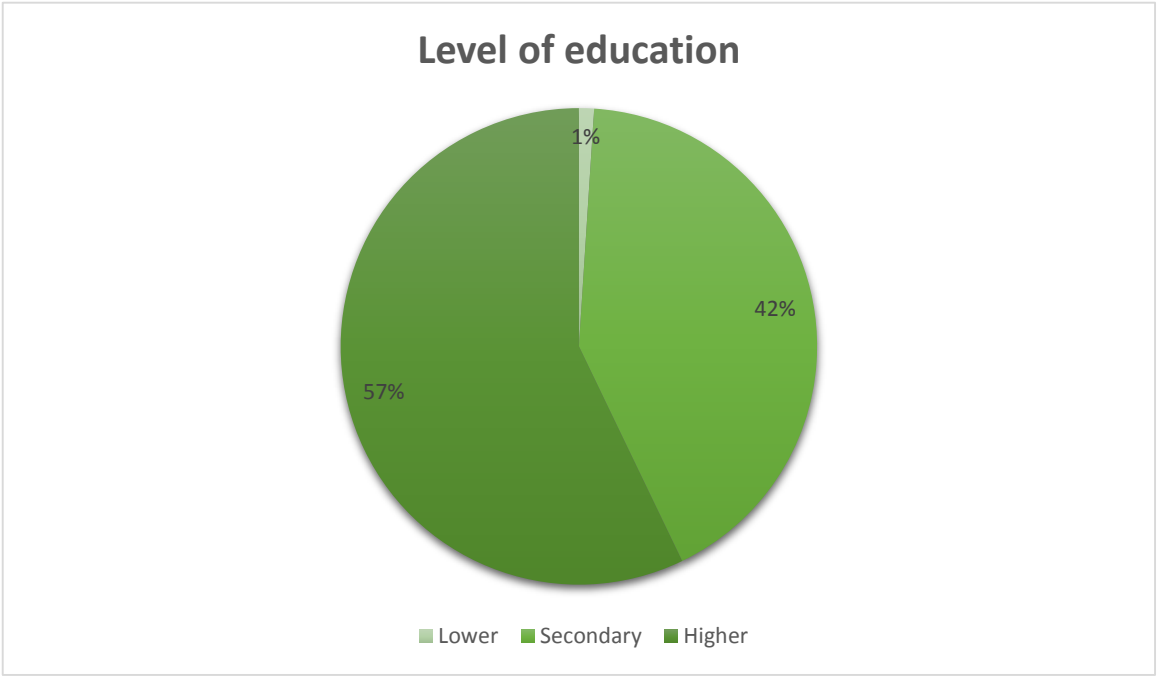

FIGURE 7: Level of education distribution in the sample.

When looking at the question of personal limitations, 91% of respondents stated not having any physical, auditory or visual limitation. 1 respondent indicated having a hearing limitation while 3 stated to have a visual limitation. One of the respondents had a physical limitation which did not allow them to drive while 5 respondents indicated they preferred not to answer.

When trying to identify the relative location of respondents in the broader city of Geel, the research location, the first important point is that of missing values. A total of 2 respondents failed to answer the question where they (relatively) lived. They did not need to fill in a detailed address. They simply needed to identify the broader part of the city they live in. The majority of the respondents that answered live in the historical centre of Geel or within the ring road that designates some other places as being within the 50 km/h 'centre' area. (65% to be exact), while the rest (35%) lived beyond that ring road. (2 in the area Zammel, 5 in Stelen, 8 in Winkelomheide, 8 in Larum, 6 in Ten Aard and 2 in Bel, 2 in Oosterlo). This is interesting information because respondents living in the city centre have a better connection to public transport, especially the train; since they are nearer the station.

When considering all the results it is clear that it is not a clear representation of the broader population of the city of Geel. Foremost, it is the gender unbalance that is supposedly closer to 50/50 in the city, as it is in Flanders. While not being a very good representation, there is enough of either category to carry out reliable analyses. One possible explanation is that women are more motivated to answer questions about parking or shopping, or just more motivated to reply to questionnaires in general. Another point of attention, with the 18-27 age category being the largest age category. One possible explanation for this fact is that it was

an internet-based survey, which is considered less open towards older people who may not have a computer or a high enough skill. The large part of higher educated respondents, 56%, can be partly explained by the presence of an institution of higher education there, but most students are not actually permanently residing in the city and thus excluded. The over-representation of higher educated adults is possibly a result of the over-representation of the lower age categories, as a linear regression reveals a strong correlation between age and having a higher degree of education. The divide between people living within the ring road and beyond it is more or less representative, with the majority of citizens of Geel living within the ring road.

4.3 Mobility Analysis

Besides demographic variables that are characteristics of the individual, there are also some properties that might influence the mobility choices that an individual makes or can make. Flowing from these properties, there are also choices that individuals make that influence their mobility needs and preferences, as well as their parking needs and preferences. First to be discussed are these mobility related properties; characteristics that an individual has that shape their mobility behaviour. Secondly there will also be a look into the decisions that individuals take that shape their shopping trip. Lastly there will also be a look at the average respondent reaction per investigated destination city.

4.3.1 Mobility related properties

The possession of different transport modes and/or subscriptions to public transportation is a very important variable in this respect. 13% of respondents indicated they do not own a car (87% did). 24% do not own a bicycle (76% does). A large majority of 87% does not have a subscription for the bus, while 84% does not have one for the train. 7% never uses a car to do their non-weekly shopping. The use of a double check in the survey allows for an identification of an inconsistency in a few respondents. Of the 13 respondents that noted they did not have a car, 7 of them stated earlier in the survey that they sometimes used a car to do their non-weekly shopping. This could be explained by perhaps someone lending a vehicle of a friend or family, or with a subscription to a car sharing programme, although the latter does not (yet) exist in Geel. On the other hand, of the respondents who said they own a car, only 2 noted that they never used it to do their non-weekly shopping.

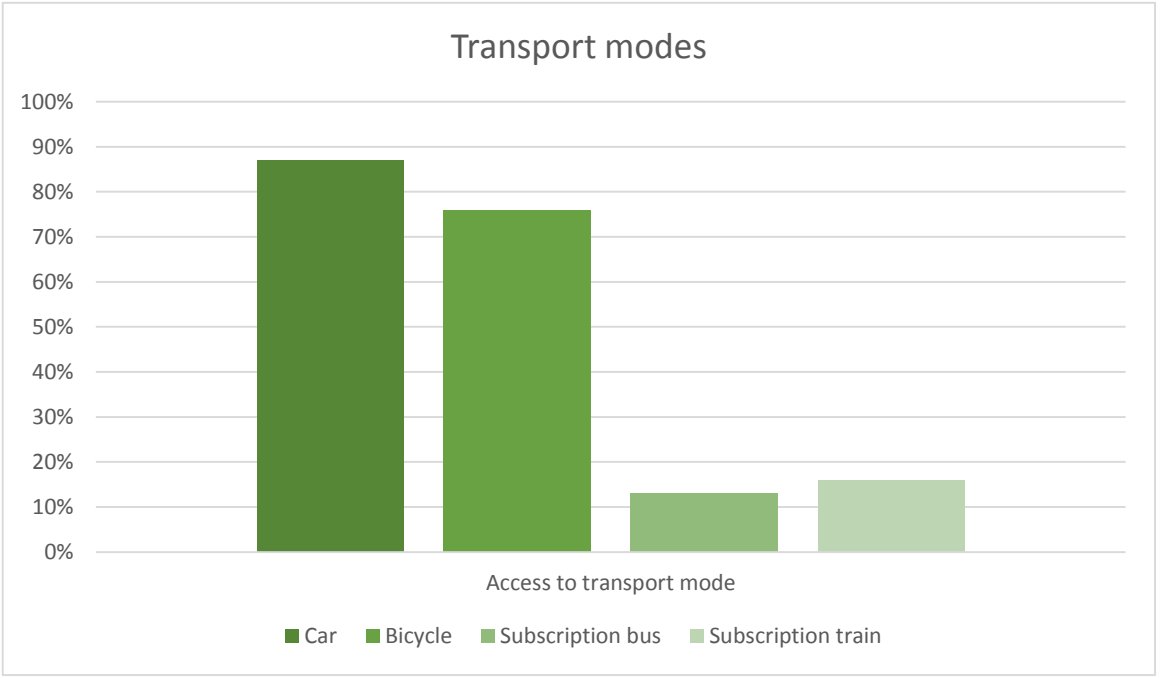

FIGURE 8: Access to transport modes in the sample.

Being in the possession of a parking card can have a large effect on how an individual organises their mobility. If a respondent for instance has a particular card that has a flat yearly rate and then allows them to park up to 4 hours in any parking facility which is normally about €1.50 per hour, that may have a large effect on the number of visits to that parking facility. First we must note that such a parking card exists for Geel and that one respondent (1%) specified they had it. Another special card is that citizens of Geel may park for free during only half an hour. Strangely, only 25% of respondents admitted to having either this parking card or the 4 hour parking card, despite the City of Geel having distributed the half hour parking card to all citizens. An explanation for this phenomenon can be that respondents forgot they have it, which explains why they didn't disclose it underneath the option 'other' (only 3% stated they possessed this card this way). Additionally, one respondent noted to have a disability parking card, but either failed to disclose their disability (they noted not to have any disability), marked 'disability parking card' by mistake, has a family member with a disability or uses it illegally.

When looking at the possession of a tanking card (which is defined as a card with which the employer of the respondent fully or partly pays for the fuel costs of a privately owned vehicle or a company vehicle) 19% of respondents noted they had one, while 80% noted they didn't. One (1) respondent preferred not to answer. Not having to pay, or only partly paying for one's fuel consumption implies that using a car is relatively cheaper. This in turn might make it a more popular choice for a respondent who can use it more frequently or over larger distances. The longest reported distance for non-weekly shopping was done in Ghent, and the respondent who noted this uses a car and has a tanking card.

Lastly, we look at the number of locations that a particular person considers to go for their non-weekly shopping. 36% considers only one city for their non-weekly shopping. They selected one of the four offered options and did not offer any other city or location. 30% considered two locations, 20% considered three locations and 14% considered four locations. These figures show that only 36% of shoppers do not have an alternative to the city they usually do their shopping in. Conversely, 64% has at least one alternative shopping location. This shows that most shoppers can change to a different shopping destination should they feel the need to do so. When examining the selected locations into more detail, we see that 78% considers Geel, their hometown, as a possible destination, 52% considers Antwerp, 34% considers Turnhout and 10% considers Herentals. 38% considers another option besides these that were offered in the survey. (Bear in mind that multiple answers were possible, which explains why these numbers appear to not add up.)

4.3.2 Shopping trip properties

The mobility related properties that we have discussed above exert a large influence on the decisions individuals make and are able to make. Not possessing a private car means that parking space will not be an issue when deciding where to shop; but a good public transport connection might be much more important. Now, we will be discussing the choices that respondents make along their shopping trips.

First, we will discuss the length of the most recent shopping trip to a particular city. Then, we will be looking into the frequency of visiting that particular city. Also relevant is the use of transport modes, specified to that particular city.

Duration	Geel	Turnhout	Herentals	Antwerp
< 30 minutes	16	2	1	0
Between	48	12	6	0
> 2 hours	8	18	2	47
Don’t know	0	1	1	1
Total	72	33	10	48
TABLE 3: Distribution of trip duration for non-weekly shopping.				

In the table above, we see that the frequency of short shopping trips is highest in Geel, the hometown of the respondents. On the other end of the spectrum, we see that the visits to Antwerp are exclusively of the long(er) variety.

Frequency	Geel	Turnhout	Herentals	Antwerp
> 1 per week	8	1	2	0
> 1 per month	27	3	0	3
1 per month	25	2	0	5
< 1 per month	12	27	8	39
Total	72	33	10	48

TABLE 4: Distribution of trip frequency for non-weekly shopping.

In this table, it is apparent that Geel is, if visited for non-weekly shopping purposes, visited most frequently; 83.3% of the respondents that visit Geel as a destination do it at least once per month. In Turnhout, Herentals and Antwerp, similar numbers are applicable to less than once per month.

Transport mode	Geel	Turnhout	Herentals	Antwerp
Car	1.49 (67)	1.06 (31)	1.22 (9)	1.65 (34)
Bus	4.96 (28)	2.54 (13)	3 (2)	2.82 (11)
Train	5.15 (27)	3.71 (7)	6 (2)	1.64 (39)
Bicycle	2.25 (60)	3.75 (8)	3 (3)	5 (4)
On foot	3.04 (49)	4.17 (6)	3 (3)	4.8 (5)

TABLE 5: Average ranking of mode choices by respondents; 1 is most used, 7 is least used (Number of respondents selecting this mode for the particular city in parenthesis).

The table above outlines the average values that respondents attributed to the different mode choices that were available to them to reach the respective shopping destinations. A low score means that it was highly prioritized, while a high score meant that it was less popular. In parenthesis are the numbers of respondents that consider this mode choice as an option for that particular city. The numbers reveal that the car is the most popular mode of transportation to all 4 considered cities but Antwerp. Bicycle and walking are the 2nd and 3rd alternatives in Geel. In Antwerp and to a lesser extent in Turnhout, public transportation is king, offering the 1st choice (train) and 3rd choice (bus). To reach Turnhout, the bus is more popular than the train, both after the car. In Herentals, we can only say for sure that the Car is most popular, despite it's being easily accessible by train and bus.

# Alternatives	Geel	Turnhout	Herentals	Antwerp
No Alternatives	5	17	4	9
1 Alternative	7	6	2	8
More than 1 alternative	56	6	3	13
No answer	4	4	1	18

TABLE 6: Number of respondents for each number of alternative parking facilities per destination city.

This table outlines the number of alternative parking facilities that respondents consider as viable. When asked how they might respond to changes in the characteristics of parking facilities, respondents can answer that they change to a different parking facility. The question then is how many alternatives respondents consider. For Geel, presumably the best known of the four cities, respondents have a relatively high number of alternatives. Only 4 respondents did not disclose any parking choice, and 5 did not have an alternative to their current parking preference. We must note that this might be caused (in part) by the way this was asked in the survey, using a system of ranking the alternatives in which most respondents failed to do as instructed, indicating it was perhaps too complex.
In Turnhout, we see that a large number of respondents, almost half to be exact, does not have an alternative to their current choice. The same is true for Herentals. Antwerp shows peculiar data, with a lot of respondents not selecting any parking facility. This may be caused due to the fact that a lot of respondents take public transportation to Antwerp, but may take their car to other locations. This means that they are included as using the car to do non-weekly shopping (in general) but may not do so to reach Antwerp, which is why they wouldn't specify a parking facility.

4.3.3 Reaction analysis

Before performing an in-depth model analysis, there is something that can be looked at in general; the average reactions that respondents made when confronted with certain situation. In the model analysis, we will be looking at explanatory factors for this behaviour, but we will discuss the actual behaviour here first. It’s important to note that the results of using a certainty scale resulted in a large percentage of respondents indicating they were very sure or fairly sure across all different scenarios (76.3% sure or very sure, in the case of a high tariff increase). Only marginal amounts of people were not sure or very unsure.

GEEL	€0.20 increase	€0.50 increase	20% smaller	50% smaller	Closed
Stay on parking	63.7	31.5	32.3	21.8	-
Use PT	1.6	1.6	1.6	1.6	1.6
Use bicycle	13.7	16.1	23.4	30.6	22.6
Postpone purchases	0	8.1	8.1	5.6	7.3
Doing purchases earlier	-	-	12.9	7.3	-
Change city	3.2	16.9	2.4	14.5	22.6
Change parking	10.5	17.7	12.1	9.7	37.9
Other	7.3	8.1	7.3	8.9	8.1
TABLE 7: Reaction analysis for Geel (in percentages).					

The table above outlines the popularity of a particular alternative for each hypothetical scenario that was offered, for the city of Geel. Foremost, it must be noted that the city of Geel was selected by 124 as a potential shopping location. When looking at the table, multiple things become clear. Firstly, a higher increase in monetary costs yields a higher decrease in the use of that parking. However, only a small portion of that behaviour is a shift to the use of bicycles (+2.4%), but mostly to a change in city or parking selection. (+13.7% and +7.2% respectively). A larger decrease in available parking spaces yields a smaller decrease in the use of that parking facility, but it yields a much higher mode shift to bicycle, especially in the 50% category. In the 20% category, a very limited number of people shifts to a different city, which increases strongly as the number of spaces decreases. Closing the parking facility leads in part to a mode change, but also to a very strong change in city or parking selection.

TURNHOUT	€0.20 increase	€0.50 increase	20% smaller	50% smaller	Closed
Stay on parking	76.5	41.2	31.4	13.7	-
Use PT	0	3.9	2	2	2
Use bicycle	2	2	2	2	2
Postpone purchases	0	0	0	2	0
Doing purchases earlier	-	-	9.8	3.9	-
Change city	7.8	15.7	21.6	25.5	33.3
Change parking	9.8	33.3	33.3	51	60.8
Other	3.9	3.9	0	0	2
TABLE 8: Reaction analysis for Turnhout (in percentages).					

51 respondents selected Turnhout as one of their shopping locations. Foremost, we see that there is virtually no change in mode choice, with the use of public transportation and bicycles remaining stable over scenario categories. A small increase in monetary costs offers little change in mode choice (+3.9%) but a strong change in city (+7.9%) and parking selection (+23.5%). A decrease in parking size has a stronger influence, with more respondents shifting away from the status quo. Most of the change between a small decrease in size and a large one shifts to the use of a different parking facility. In short, the scenarios are mostly

dealt with by selecting another parking facility, but a relatively large proportion of respondents would not visit Turnhout anymore if changes are made to the capacity of their favourite parking facilities.

HERENTALS	€0.20 increase	€0.50 increase	20% smaller	50% smaller	Closed
Stay on parking	69.2	46.2	53.8	30.8	-
Use PT	0	0	0	0	0
Use bicycle	0	0	0	0	0
Postpone purchases	0	0	0	15.4	15.4
Doing purchases earlier	-	-	15.4	23.1	-
Change city	15.4	15.4	15.4	15.4	15.4
Change parking	15.4	38.5	15.4	15.4	61.5
Other	0	0	0	0	0
TABLE 9: Reaction analysis for Herentals (in percentages).					

Firstly, it must be noted that only 13 respondents selected Herentals. Pointing that out, we see that a small monetary cost increase has little effect, and increasing that leads more to a change in parking selection than city selection. The decrease in parking spaces is largely dealt with by changing shopping timing, and closing a parking facility only leads to a change in parking selection. In short, shopping in Herentals suffers little from changes in its parking policy (in the 5 testes scenarios). This could be partly explained by the low number of respondents, who may have a strong preference for Herentals.

ANTWERP	€0.20 increase	€0.50 increase	20% smaller	50% smaller	Closed
Stay on parking	50.8	36.9	40	23.1	-
Use PT	18.5	26.2	35.4	36.9	35.4
Use bicycle	0	0	0	0	3.1
Postpone purchases	3.1	3.1	0	3.1	0
Doing purchases earlier	-	-	13.8	7.7	-
Change city	1.5	4.6	0	6.2	23.1
Change parking	12.3	16.9	6.2	18.5	29.2
Other	13.8	12.3	4.6	4.6	9.2
TABLE 10: Reaction analysis for Antwerp (in percentages).					

Lastly, there's the changes in behaviour for Antwerp, the second most popular shopping location with 65 respondents. The first thing that can be seen is that there is a large increase in use of public transportation as the monetary costs increase, but not really if the parking becomes gradually smaller. Only a small fraction of behaviour change by an increase in monetary cost is to change the selected parking (half of the decrease in continuing to use the parking shifts to using public transportation), 4.6% to a change in parking and 3.1% to a change in city. For the decrease in parking size, the picture is very different. Only 1.5% shifts

to public transportation, while 6.2% shift to another city and 12.3% to a different parking. The coping mechanism of doing the shopping earlier in the day loses about half of its popularity. Only closing the parking appears to have a strong effect on pushing shoppers away from the city. It also causes a relatively strong change to public transportation and change in parking selection.

4.4 Conclusion

The demographic analysis showed that the research sample is not very representative of the overall population of Flanders, or even the city of Geel itself. Women, younger age groups and higher educated are over-represented in comparison to general distributions. Connected to that, we see that a large majority of respondents have a car and a bicycle, and a solid proportion has a tanking card.

Just as every respondent has a particular profile on a number of variables, cities appear to have the same. Each city has a different mix of popular mode choices, as well as different levels of visit frequency and length. For instance, visits to Geel are short and frequent and there's virtually no use of public transportation; while in Antwerp visits are long and infrequent, and public transportation is the most popular mode (by a small margin).

The responses of respondents to the different hypothetical scenario differs across the cities that were studied, but there is one main common thread. A decrease in parking spaces leads to a bigger change in behaviour than a tariff increase; partly to PT and bicycle use and partly to a change in parking facility or city.

5. MODEL ANALYSIS

5.1 Introduction

Naturally, there is more to be deducted from the research data than was discussed up until this point. The reactions to certain parking measures have been discussed, but merely looking at the percentages of particular reactions does not show some details, so we have to look in more depth in what the research data seems to imply for the sample.

To investigate which variables predict particular behaviours, a multinomial logistic regression is used. This method is used for multiple reasons; firstly, since we use categorical variables (Reaction A does not naturally follow on reaction B, for example), the principle of linearity is violated, so we cannot use a simple linear regression. In other words, the variables that we are investigating do not show a linear relationship (Field, 2013). To resolve this problem, the data will be transformed using the logarithmic transformation, expressing the multiple linear regression equation in logarithmic terms. In practice, the value of a variable Y gives a predictor X that will not be estimated, but the probability of Y will be predicted given a set of known values of X. For example; when considering sex as a predictor for mode choice, we will not be looking into what the value of Y will be given that predictor, but we will be looking at the probabilities for each mode choice for one sex (the other is the reference category). We will also use more than two categories to try and predict certain variables, which is why a multinomial logistic regression is used instead of, for example, a binomial one. This means that we can add multiple predictors in order to find a model which can optimally predict particular behaviours, choices, etc. In the table below are the equations of what has been discussed.

Simple linear regression	$Y_i = b_0 + b_1 X_{1i} + \varepsilon_i$
Multinomial linear regression	$Y_i = b_0 + b_1 X_{1i} + b_2 X_{2i} + \cdots + b_n X_{ni} + \varepsilon_i$
Multinomial logistic regression	$P(Y) = \frac{1}{1 + e^{-(b_0 + b_1 X_{1i})}}$
TABLE 11: Regression formulas (Field, 2013).	

5.2 Variables and their coding

In order to run a statistical analysis in SPSS, variables have to be coded in a certain way. Especially for multinomial logistic regression, not any coding of a variable will do. Most variables that are relative to the model analysis offer more than two categories, which need transformation since they are not necessarily categorical, as earlier discussed. When looking at the frequencies per response category, multiple answer categories have been grouped together in order to form two final categories, which can be coded as 1 and -1 respectively (this is known as 'effect coding').

The first category that was recoded this way was the non-weekly shopping city selection. Using two categories; City1 and City2, the distinction could be made between Geel, Turnhout and Herentals & Antwerp (where Herentals and Antwerp are grouped together). Similarly, the five age categories were reformed to three categories by using two new variables; Age1 and Age2. Education was reduced to having a higher degree and not having that (two categories), while the available transport modes were reformed to having a subscription to PT and not having one (two categories). Similarly, possession of a parking card was changed to a yes/no variable.

5.3 Increase in parking tariffs

One of the scenarios that respondents faced was that of an increase in parking costs, namely by increasing the parking tariffs. A number of reactions were provided for respondents to choose from, and the following paragraphs look at the influential factors of the decisions that they made. First, the influential factors are investigated per alternative reaction and after that the results will be combined for an overview. All effects have to be placed against the reference category 'Keep using chosen parking facility'.

Using Public transport for future visits		**€0.20 increase**		**€0.50 increase**	
	Variable	**B**	**Sig.**	**B**	**Sig.**
	Sex	1.305	0.000	1.168	0.000
	Age1: 18-27	0.085	0.874	0.602	0.214
	Age2: 28-37	0.138	0.765	-0.031	0.943
	City1: Geel	-1.562	0.004	-1.338	0.009
	City2: Turnhout	-0.472	0.443	0.034	0.947
	Education	-0.844	0.024	-0.281	0.410
	Subscription PT	1.177	0.000	0.281	0.368
	Fuel card	-1.020	0.002	-1.178	0.001
	Parking card	0.419	0.251	-0.214	0.542

TABLE 12: Model analysis for increase in tariffs scenarios, for alternative using public transportation for future visits.

Since the status quo response, 'keep using the initially chosen parking facility' is selected as the reference category, the first alternative is that of switching to public transportation for future visits. We see in both levels of tariff increase that sex is an influential factor, and given its positive nature we see that men are more likely to change their behaviour this way than women. Doing non-weekly shopping in Geel influences the likelihood of using public transportation negatively. Education and available transport modes is only influential in the case of a €0.20 increase, where people with a secondary degree of education have a lower chance of switching to public transportation. The possession of a subscription influences the chance of taking public transportation in a positive way, meaning that those who have a subscription to public transportation have a higher chance of changing to that mode. This is only the case for the €0.20 increase, not the €0.50 increase. Lastly, the possession of a fuel card influences the chance to use public transportation in the future at both tariff increases, by lowering the chance of using public transportation.

Using a bicycle for future visits		**€0.20 increase**		**€0.50 increase**	
	Variable	**B**	**Sig.**	**B**	**Sig.**
	Sex	0.147	0.611	-0.212	0.499
	Age1: 18-27	-0.130	0.759	-0.588	0.182
	Age2: 28-37	0.574	0.098	0.214	0.560
	City1: Geel	0.392	0.196	0.777	0.014
	City2: Turnhout	-0.160	0.723	0.000	1.000
	Education	-0.739	0.010	-0.802	0.009
	Subscription PT	1.234	0.000	0.472	0.132
	Fuel card	-0.657	0.019	-0.870	0.006
	Parking card	0.596	0.018	0.139	0.579

TABLE 13: Model analysis for increase in tariffs scenarios, for alternative using bicycle for future visits.

Using a bicycle for future visits is influenced by the level of education and fuel card for both tariff increases, while available modes and parking card only for the €0.20 increase. Selecting Turnhout for non-weekly shopping is only influential at the €0.50 increase, showing a positive influence on the chance of using the bicycle. Those with a secondary degree have a lower chance of using a bicycle and the same is true for having a fuel card. Having a subscription for public transportation also increases the chance of taking the bicycle (at the €0.20 increase only), while having a parking card also increases the chance of using a bicycle.

Postponing purchases		€0.20 increase		€0.50 increase	
	Variable	**B**	**Sig.**	**B**	**Sig.**
	Sex	1.588	0.002	0.469	0.175
	Age1: 18-27	0.787	0.348	-0.671	0.184
	Age2: 28-37	0.264	0.695	0.955	0.039
	City1: Geel	-1.678	0.015	0.324	0.420
	City2: Turnhout	0.008	0.991	-0.385	0.505
	Education	-0.974	0.067	-1.431	0.000
	Subscription PT	1.487	0.002	0.107	0.778
	Fuel card	-1.261	0.011	-1.322	0.001
	Parking card	1.549	0.010	0.193	0.551

TABLE 14: Model analysis for increase in tariffs scenarios, for alternative postponing purchases.

For postponing purchases, when looking at sex, being a man increases the chance of postponing purchases, but only at the €0.20 increase. At the €0.50 increase, being between 28 and 37 increases the chance to postpone, while the opposite is true for selecting Herentals/Antwerp; decreasing the chance of postponing. Education is negatively influential on both increase levels; having a higher degree decreases the chance for postponing. Having a fuel card decreases the chance to postpone, while having a subscription to public transportation increases the chance to postpone (but only at the €0.20 increase). The same holds true for having a parking card.

Go to a different city		€0.20 increase		€0.50 increase	
	Variable	**B**	**Sig.**	**B**	**Sig.**
	Sex	0.251	0.447	0.421	0.134
	Age1: 18-27	-0.172	0.713	-0.140	0.710
	Age2: 28-37	0.247	0.543	0.870	0.006
	City1: Geel	-0.860	0.027	0.288	0.312
	City2: Turnhout	0.486	0.221	0.328	0.350
	Education	-0.969	0.003	-0.368	0.176
	Subscription PT	0.932	0.003	-0.047	0.867
	Fuel card	-0.819	0.008	-0.560	0.064
	Parking card	0.301	0.291	-0.213	0.362

TABLE 15: Model analysis for increase in tariffs scenarios, for alternative go to a different city.

For changing cities, being between 28 and 37 increases the chance of changing cities at the €0.50 increase, while choosing either Herentals or Antwerp decreases the chance of switching, but only at the €0.20 level. Having a higher degree lowers the chance of changing at the €0.20 level, while having a subscription to public transportation does the opposite at that same level. Having a fuel card decreases the chance of changing cities, at both increase levels. While having a parking card is not influential.

Go to a different parking facility		€0.20 increase		€0.50 increase	
	Variable	**B**	**Sig.**	**B**	**Sig.**
	Sex	0.359	0.167	0.118	0.664
	Age1: 18-27	0.539	0.152	-0.135	0.697
	Age2: 28-37	0.123	0.696	0.651	0.024
	City1: Geel	-0.309	0.269	-0.097	0.717
	City2: Turnhout	-0.122	0.723	0.365	0.230
	Education	-0.208	0.427	-0.121	0.645
	Subscription PT	0.555	0.023	-0.532	0.053
	Fuel card	-0.912	0.000	-0.973	0.000
	Parking card	0.131	0.589	-0.379	0.089

TABLE 16: Model analysis for increase in tariffs scenarios, for alternative go to a different parking facility.

Less of a change is switching parking facilities instead of cities. Being between 28 and 37 increases the chance of switching parking facilities. Having a subscription for public transportation increases the chance of switching parking facilities at the €0.20 increase but decreases it at the €0.50 increase (although it is borderline not significant at the 95% level). Possessing a fuel card decreases the chance of switching parking facilities at both increases, while having a parking card does the same for the €0.50 level.

Considering these results there are a few overall tendencies:
We see that age and sex are not strong influential factors regarding tariff increases.
Having a fuel card always decreases the chance of using an alternative. This can be explained by a decreased cost in using a car, which in turn makes (at least in part) up for a generally higher cost of using a car. The opposite is true for having a subscription to public transportation; increasing the chances of using all alternatives, and only for the €0.20 level. This can possibly be explained by a heightened awareness of alternatives with those who have a subscription, or a heightened environmental awareness.

5.4 Decrease in parking size

In this section, two other closely linked scenario's will be discussed together; the decrease in size of a parking facility. The first hypothetical was of a 20% decrease in the number of available spaces, the second of one by half. The reference category is once again the status quo; 'continue using initially chosen parking facility'.

Using Public Transport for future visits		20% decrease		50% decrease	
	Variable	**B**	**Sig.**	**B**	**Sig.**
	Sex	0.426	0.208	0.313	0.415
	Age1: 18-27	0.173	0.713	-0.780	0.120
	Age2: 28-37	-0.643	0.162	-0.055	0.916
	City1: Geel	-1.530	0.010	-2.286	0.001
	City2: Turnhout	-0.115	0.866	0.614	0.429
	Education	-0.206	0.547	0.117	0.744
	Subscription PT	2.029	0.000	1.699	0.000
	Fuel card	0.106	0.765	0.890	0.025
	Parking card	-0.020	0.957	0.201	0.618

TABLE 17: Model analysis for decrease in spaces scenarios, for alternative using public transportation for future visits.

Foremost, the chance of switching to public transportation is very strongly influenced by having a subscription for one or more modes of public transportation. A fuel card only influences the chance at the 50% decrease, and only at half that potency. If Geel is selected as a non-shopping destination, the chance of taking public transportation on future visits

decreases strongly. Sex, age, education and having a parking card show no effect.

Using a bicycle for future visits		20% decrease		50% decrease	
	Variable	**B**	**Sig.**	**B**	**Sig.**
	Sex	-0.450	0.184	-0.416	0.219
	Age1: 18-27	0.434	0.323	-0.478	0.265
	Age2: 28-37	-0.514	0.140	-0.181	0.655
	City1: Geel	1.063	0.001	0.784	0.038
	City2: Turnhout	0.142	0.785	0.829	0.221
	Education	0.281	0.367	0.440	0.139
	Subscription PT	1.331	0.000	0.687	0.055
	Fuel card	-0.388	0.230	0.169	0.625
	Parking card	0.672	0.009	0.477	0.090

TABLE 18: Model analysis for decrease in spaces scenarios, for alternative using bicycle for future visits.

In the case of switching to the bicycle the same pattern holds true for the subscription to public transportation, though the effect is not as strong, and not significant at the 95% level for the 50% decrease. Additionally, selecting Geel here leads to an increase in chance of using the bicycle in future visits. Having a parking card, finally, leads to an increase in the chance of using the bicycle, but only at the 20% decrease.

Postponing purchases		20% decrease		50% decrease	
	Variable	**B**	**Sig.**	**B**	**Sig.**
	Sex	0.726	0.500	1.101	0.006
	Age1: 18-27	0.346	0.533	-0.601	0.289
	Age2: 28-37	-0.039	0.942	1.163	0.034
	City1: Geel	0.443	0.334	-0.979	0.054
	City2: Turnhout	0.724	0.266	0.814	0.276
	Education	-0.785	0.073	-0.232	0.579
	Subscription PT	0.550	0.217	0.292	0.562
	Fuel card	-1.160	0.015	0.537	0.279
	Parking card	0.561	0.117	0.713	0.066

TABLE 19: Model analysis for decrease in spaces scenarios, for alternative postponing purchases.

Postponing the purchases is a valid option to circumvent a lack of space, but not a long term solution. Sex is influential; men are more likely to postpone their shopping. Age is influential at that same level of space reduction; the 28-37 category is more likely to postpone purchases. Lastly, the fuel card is only influential at the 20% decrease, having a fuel card decreases the chance of postponing the purchases.

Leaving earlier for purchases		20% decrease		50% decrease	
	Variable	**B**	**Sig.**	**B**	**Sig.**
	Sex	0.457	0.119	0.458	0.204
	Age1: 18-27	0.739	0.071	-0.344	0.473
	Age2: 28-37	-0.504	0.153	0.527	0.250
	City1: Geel	0.005	0.987	-0.711	0.102
	City2: Turnhout	0.324	0.459	0.776	0.238
	Education	0.398	0.169	0.250	0.453
	Subscription PT	0.109	0.758	-0.002	0.997
	Fuel card	-0.522	0.088	0.250	0.524
	Parking card	0.126	0.636	0.216	0.528

TABLE 20: Model analysis for decrease in spaces scenarios, for alternative leaving earlier for purchases.

Another way of dealing with the decrease in space is to leave earlier, so that parking spaces are still available. There are no correlations to be found in this response category, as none of

the variables show a significant relation.

Go to a different city		20% decrease		50% decrease	
	Variable	**B**	**Sig.**	**B**	**Sig.**
	Sex	1.075	0.002	0.911	0.006
	Age1: 18-27	0.689	0.168	-0.327	0.501
	Age2: 28-37	0.305	0.448	1.485	0.001
	City1: Geel	-0.998	0.020	-0.521	0.188
	City2: Turnhout	1.823	0.000	1.878	0.001
	Education	0.250	0.459	0.441	0.179
	Subscription PT	0.676	0.078	-0.062	0.870
	Fuel card	-0.092	0.800	-0.153	0.666
	Parking card	0.144	0.634	-0.377	0.266

TABLE 21: Model analysis for decrease in spaces scenarios, for alternative go to a different city.

Changing the destination of the trip is influenced by sex, the selection of alternative cities and age at the 50% decrease level. When considering sex, it's apparent that men have a larger chance of switching cities than women. Age is only influential at the 50% decrease, where the category 28-37 is more likely to change cities. When considering alternative cities, selecting Herentals/Antwerp leads to a decrease in chance for changing cities (for the 20% decrease only), selecting Turnhout leads to an increase in the chance of changing cities.

Go to a different parking facility		20% decrease		50% decrease	
	Variable	**B**	**Sig.**	**B**	**Sig.**
	Sex	0.603	0.037	0.091	0.800
	Age1: 18-27	0.872	0.032	-0.710	0.105
	Age2: 28-37	-0.570	0.100	0.414	0.294
	City1: Geel	-0.221	0.476	-1.447	0.000
	City2: Turnhout	1.428	0.000	2.108	0.000
	Education	0.692	0.019	1.150	0.001
	Subscription PT	0.021	0.950	-0.051	0.898
	Fuel card	-0.632	0.035	0.614	0.800
	Parking card	-0.136	0.609	0.329	0.270

TABLE 22: Model analysis for decrease in spaces scenarios, for alternative go to a different parking facility.

When considering changing the parking facility when confronted with less space, sex is an influential factor, along with alternative cities, education and having a fuel card. However, most of these variables are only significant at one of the two levels of space reduction. Sex is only influential at the 20% decrease, where men are more likely to change parking facility. Selecting Herentals or Antwerp decreases the chance of changing parking facilities at the 50% decrease level, while selecting Turnhout increases the chance quite steeply. Level of education is influential for the first time in this set of scenarios, where having a higher degree increases the chance to switch to another parking facility. The fuel card is only influential for the 20% decrease, where having it decreases the chance of switching to another parking facility.

To summarise these results: There is a much higher loyalty to the selected city in the cases of Herentals and Antwerp (probably caused by the latter, since the number of selection of Herentals is so small), than in Turnhout, where the chances of changing to another city or parking facility is much higher. This may be the case since trips to Antwerp are less frequent and last longer, implying that they may be more planned in advance. Antwerp is also further away, making changes less straightforward. Education as a variable was only explanatory when considering to change the parking facility to use, and not with any other variable, not even when considering switching cities. Having a fuel card continues its influence of decreasing the chance of selecting any other alternative compared to not changing the behaviour at all, except it increases the chance to change to public transportation, which can be described as odd. For age, we see that the category between 27 and 38 is likely to change their city and parking selection, while the other age categories are not correlated with any changes in behaviour.

5.5 Closing the parking facility

When the parking facility that a respondent chose is closed, it is apparent that continuing to use it is not an option. Therefore, this is probably the hypothetical scenario that is furthest from the current reality. It also means that another reference category is necessary, which now becomes the (perceived) smallest change in behaviour; 'changing the parking facility'.

Using public transport for future visits		Closing the parking facility	
	Variable	**B**	**Sig.**
	Sex	0.568	0.094
	Age1: 18-27	-0.493	0.286
	Age2: 28-37	-0.121	0.784
	City1: Geel	-1.784	0.001
	City2: Turnhout	-0.647	0.239
	Education	-0.419	0.208
	Subscription PT	2.018	0.000
	Fuel card	0.181	0.572
	Parking card	0.330	0.317

TABLE 23: Model analysis for decrease in spaces scenarios, for alternative using public transportation for future visits.

When looking into the closure of the parking facility we see that only two variables are significant; city selection and subscription to public transportation. Selecting Herentals/Antwerp decreases the chance of taking public transportation when the parking facility of choice is closed. In contrast, having a subscription to public transportation increases the chance of using it in the future by large margins.

Using a bicycle for future visits		Closing the parking facility	
	Variable	**B**	**Sig.**
	Sex	-0.010	0.975
	Age1: 18-27	0.248	0.524
	Age2: 28-37	-0.118	0.725
	City1: Geel	0.769	0.007
	City2: Turnhout	-0.802	0.066
	Education	-0.327	0.230
	Subscription PT	0.963	0.002
	Fuel card	-0.141	0.625
	Parking card	0.570	0.016

TABLE 24: Model analysis for decrease in spaces scenarios, for alternative using a bicycle for future visits.

Using the bicycle as an alternative when the selected parking facility is closed seems largely dependent on the selected alternative cities, having a public transportation subscription and having a parking card. Firstly, selecting Geel increases the likelihood of changing to the bicycle. The opposite is true when Herentals/Antwerp were selected. Having a subscription to public transportation increases the chance of using the bicycle as an alternative, while having a parking card does the same.

Postponing purchases		Closing the parking facility	
	Variable	**B**	**Sig.**
	Sex	0.725	0.039
	Age1: 18-27	-0.298	0.548
	Age2: 28-37	1.131	0.013
	City1: Geel	0.090	0.809
	City2: Turnhout	-0.763	0.155
	Education	-1.108	0.002
	Subscription PT	0.903	0.014
	Fuel card	-0.236	0.523
	Parking card	0.481	0.127

TABLE 25: Model analysis for decrease in spaces scenarios, for alternative postponing purchases.

For postponing the purchases, which is not a long-term solution, we see that a number of variables are influential. Firstly, men are more likely to postpone than women, and the same is true for people in the 28-37 age category. The level of education implies that who has a higher degree is less likely to postpone, while having a subscription on public transportation increases the chance of postponing. A fuel card or parking card have no effect.

Go to a different city		**Closing the parking facility**	
	Variable	**B**	**Sig.**
	Sex	1,059	0,000
	Age1: 18-27	-0,345	0,318
	Age2: 28-37	1,189	0,000
	City1: Geel	-0,318	0,233
	City2: Turnhout	0,174	0,557
	Education	-0,555	0,022
	Subscription PT	0,084	0,764
	Fuel card	-0,006	0,980
	Parking card	-0,704	0,003

TABLE 26: Model analysis for decrease in spaces scenarios, for alternative go to a different city.

Changing cities is the final coping strategy that we take into consideration, and we see that sex and age are once again influential. Men and people from the age category 28-37 are more likely to change their destination city. Respondents with a higher education were less likely to change their destination city, while having a parking card had a similar influence.

5.6 Conclusion

The point of this model analysis was that the factors which influenced reactions to particular measures could be identified. Using that information, decision makers can implement different parking measures if they want to attract more or less of a particular type of person. On that note, we can say that sex, age and level of education are only influential for postponing the shopping or switching cities. Men are more likely to do both in all cases than women. Selecting Geel as one of the possible destinations for non-weekly shopping increases the chance to use a bicycle while decreasing the chance to switch to public transportation. Additionally, the model analysis can also show whether particular governmental measures that exist are influential to particular choices. Having a fuel card is never influential, while having a parking card appears to increase the chance to use a bicycle and to switch cities.

6. CONCLUSION & REFLECTION

In this part of the report there will be focus on the conclusion of this study. Continuing from this, there are the recommendations to decision makers to create a more complete mobility plan. Lastly, there will be a reflection on the study and thoughts for research on this topic in the future.

6.1 Conclusion

This study issued two main research questions at the beginning of this report. Now, we will try to give an answer to those research questions with the information that was gathered with this study. These two research questions were:

- "What is the change in travel behaviour due to parking measures in the context of non-weekly shopping trip in urban environments, of inhabitants of Geel?"
- “Which individual characteristics are influential in causing these changes?”

The first research question is difficult to answer exhaustively. There is no one reaction to all of the different parking measures that can be implemented. Different people respond in different ways, depending on a number of characteristics that we have found, and some we have not (yet) identified. But there certainly is a reaction to implemented parking measures. This confirms the first hypothesis: ‘as parking measures dissuade parking in a city, road users might change their behaviour to evade the measures, such as choosing another parking site or travelling to other destinations.’

What we can also say is that the largest reactions are achieved by closing a parking facility, but that’s very intuitive. What is not very intuitive is that decreasing the amount of available spaces evokes a stronger reaction than a monetary cost increase. This actually tackles the second hypothesis of the study: ‘Parking pricing is considered the most effective way of pushing car users to alternative locations or modes.’

Another thing this study has shown is that car use is very widespread in the sample, as could have been predicted. Although this seems to make it easy to formulate an answer to the third hypothesis: ‘Changing transportation mode will not be as popular to avoid these measures.’ It is actually less simple to solve. The answer largely depends on which city is under scrutiny. In the hometown of the respondents, were using a bicycle is more likely an alternative, it was actually very popular as an alternative. But when you combine all other alternative answers, they add up to a large majority. For a city with a large diversity in shops that’s well connected by train, public transportation is a popular alternative to suffering higher costs or a smaller parking facility. But when all other alternatives add up, continuing the use of a car is actually also more popular. This leads to the conclusion that the third hypothesis is correct.

The second research question is also not straightforward to answer. The characteristics that influence the different coping strategies largely depend on those coping strategies and the type of measure that is implemented. None of the variables have been proven to be influential in all of those distinct cases.

But what has become apparent by this study is that the more intense the measure is, the more intense the reaction will be. As tariffs rise, the aversion of using that parking facility will rise with it, making more car users change their behaviour to compensate. The same is also true for a stronger decrease in the amount of spaces available at a parking facility.

6.2 Recommendations

Following from the analysis of results and broader conclusions there are many things that decision makers could do to change travel behaviour in their city, concerning non-weekly shopping. Since this study focused on residents of Geel, the recommendation are applicable for policy makers in Geel, but also for other cities. It is unlikely that neighbouring cities or other Flemish cities will respond wildly different. Additionally, using this study, decision makers from other cities can take measures to increase the amount of shoppers from Geel. First and foremost, we have to acknowledge that decision makers can have different goals. Depending on those goals, there can be different recommendations. It is logical that a decision maker who wants to make his/her city centre as popular as possible should take different measures than who wants to dissuade car use as much as possible. But there could also be goals in between these distinct goals, combining a wish for increased popularity, but not at the cost of the city centre.

6.2.1 Dissuading car use

There are a number of things decision makers can do if they are seeking to dissuade the use of the private car. A first is to make sure that public transportation is existent and accessible, but also to make it cheaper by providing subscriptions for specific demographics or the entire population. Decisions regarding public transportation in its entirety are not (commonly) up to the policy makers of one city, but of a higher level in government; and even then the necessary funds may not be available. But of all studied factors, this one shows strong results. When looking at demographics, it seems that especially men and the 28-37 age category change their behaviour by changing parking facilities or city when parking measures are adopted, so the target demographic for additional measures should be those categories.

6.2.2 Switch to other parking facility

In order to push car users from one parking facility to another, without affecting sales in the respective region too much, decision makers can close parking facilities in the centre, but this is not without risk. The results of this study show that a significant portion of people who adapt their behaviour adapt it by changing destination cities. Shoppers from the immediate area itself switch to bicycle as well as to different parking facilities, but a higher percentage shifts away from the city than to another parking facility. Only small changes; a €0.20 increase and 20% decrease in available spaces, change little to the city destination.

6.2.3 Increasing popularity

Arguably, making a city more popular as a shopping destination by making it more car friendly may be considered an unwise decision. However, if policy makers deem it necessary, it appears that creating more parking spaces does the job, as well as making it larger and cheaper to park. Alternatively, public transportation and bike use can be increased by providing subscriptions to public transportation. Increasing tariffs to fund these costs may result in zero gain, since a portion changes destination cities as a reaction to that tariff increase.

6.2.4 Increasing revenue

There is no clear cut answer for policy makers whose sole goal is to increase revenue. The results demonstrate that a smaller increase in tariff is preferable over a larger one, which results in a bigger change to different cities, parking facilities or even modes. But even the small increase in tariff can make car users change parking facilities or cities. Increasing the tariffs for all parking facilities at once was not specifically researched in this study, but it is believable that more people would respond by changing destination cities more often.

6.3 Reflection

This final part of the research report will focus on reflections on the work that was done, the topic of the research and for future research.

6.3.1 Response

When considering the work that has been done there are a few things which could have gone better. Firstly, it is regrettable that so few respondents were reached in the time frame. It may have been a good alternative to set out a survey before looking into all of the available literature, although this is mostly only possible if one is already well-versed in the research area. A longer period of time may also be a solution, but it might as well not have been. This brings us to another point of reflection; that of response rate. Even if all of the respondents are counted as fully having finished the survey (which they didn't) and all respondents were reached with the main method of mailing flyers (which is also not the case); less than 100 respondents out of 2000 flyers is a very poor response rate indeed. Bearing in mind the two suppositions, it's barely a 5% response rate. It is regrettable indeed that a snowball-sample technique had to be used in order to gain a larger sample of the population; despite it being the lesser of two evils. It might be interesting to know what went particularly wrong in this respect. Is this method not effective in itself? Or was something wrong with the make-out of the flyer? Would using coloured print have evoked a better response rate? Was the timing off, with the holiday season around the corner? Is it too difficult for a respondent to get a flyer and to manually copy a URL that is printed on it? Or was it just a matter of available time? These are all valid questions to which there is no answer, since no comparison can be made between sets of data. But these are very interesting questions that should get answers. If the used administration method is not effective or efficient, it would be good to know this for the sake of future research.

6.3.2 Dropout rate

Another point that can be reflected upon besides the low level of response is the high drop-out rate; 33 people who ceased the survey out of 100 total respondents. Admittedly, some cases have been identified by mail to have been cancelled because the respondent didn't know the survey was for people of Geel only. This was possible due to the fact that the opening statement did not contain this information because it was designed to only be available to people living in Geel in the first place since the main method was flyering. The amount of these cases is estimated to be rather low, since the overall number of people that started the questionnaire using the second method was low as well. Before that method was used, already 67 respondents had reacted. We'll briefly outline what appears to be the reason for some drop-outs. This is information that might be relevant for future research, as they might hold potential pitfalls. 11 of the 33 drop-outs did not fill in anything. Perhaps the actual topic of the research did not appeal to them, or they found themselves not willing to fill in the survey after all. 7 of 33 dropped out halfway through the questions regarding their first city. Stating that the survey was too long for them would be grossly overstating since at that point it couldn't have been lasting longer than a few minutes. 2 stopped after completing their 2nd city and another shortly after all city blocks, at the block of demographical questions. This could imply they found the questionnaire too long. 2 respondents dropped out after question one and two (which cities do you visit and do you sometimes use a car to do that?). 4 also dropped out when they reached the question where in Geel they lived. This indicates most likely that they did not live in Geel and therefore closed the survey. Within the block of demographics, 1 respondent dropped out at tanking card, limitation and sex respectively. This could be caused by finding the particular question offensive, despite an option being available that made clear they did not want to answer. All in all, we can say that it is a good idea to stress the target demographic in the opening statement of a web-based survey, as well as keeping it as short as possible. Although, defining what exactly is 'as short as possible' may prove difficult and variable depending on the topic or characteristics of the respondent.

6.3.3 Research in the future

When conducting research, in order to make it workable, one has to introduce a level of simplification. Research on parking measures is largely new ground in which there is still much to learn. Different cultures might have different transportation habits and may respond differently to a change in parking situations. The same can be said for the same researched population under different conditions, for instance weather and climate. There are also a number of different variables which were not asked in our research out of fear for having drop-outs such as level of income (despite level of education being a proxy for said variable), number of children or even the number of traffic violations in the past year. So far, no answers have been given to the question if these variables influence the reaction to parking measures. Identifying all influential factors is very relevant due to the effectiveness and efficiency of parking measures. Knowing who is easily affected and who isn't can open the door to different measures or differentiated applications so that more car users are affected, which is the main goal of the parking measures in the first place. Dissuading car use on a large scale should start with this knowledge, and until now it has been carried out largely in

the dark. Additionally, there are other parking measures which can be taken to affect the use of particular parking facilities. Pull measures were not investigated in this research project, but may (or may not) provide stronger than push factors in particular settings. For instance, beautifying a particular parking, or making one very cheap or free might pull car users to that particular parking, away from where policy makers don't want them to be. Would the inclusion of these options have yielded different results? Lastly, this research did not study the effects of trade-off bargaining. Concretely, car users might find it perfectly acceptable if a parking facility is adapted in a negative way as long as something else is given in return. For example; making a parking facility more expensive, but granting better infrastructure such as enhance security, better lighting and/or bathrooms may be a perfectly reasonable trade-off for some car users. In this research project, no hypothetical cases were offered that investigated this phenomenon, and as such it can only comment on isolated parking measures. In future research, it may prove enlightening to investigate what reasonable trade-offs are, to better understand the needs and rationale of car users.

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ANNEX

The leaflet, as it appeared in the mailbox of inhabitants. This features the first of two URL's that were used. Both were identical except this minor difference.

Below is the full questionnaire as it was featured in printed form for respondents to fill in at doctor's and dentist's waiting rooms. There are only minor differences with the online version, which aim to increase the readability. The lay-out of the printed version was problematic at times, since it could not be edited after being exported by Qualtrics. There were no errors in completion due to this fact.

Inleiding

Hartelijk bedankt voor uw deelname aan dit onderzoek.

Omwille van de aard van het onderzoek, moet u minstens 18 jaar oud zijn en in Geel wonen om deel te nemen aan dit onderzoek.

Om een goed resultaat van het onderzoek te bekomen, antwoordt u best zo waarheidsgetrouw mogelijk op de vragen. Het is de bedoeling uw eigenlijke gedrag zoveel mogelijk te benaderen, ongeacht wat dat gedrag zou zijn. Er zijn geen foute antwoorden.

De enquête zal ongeveer een kwartier van uw tijd innemen.

Indien u wenst deel te nemen aan de tombola voor een duo filmtickets, laat dan uw emailadres achter op het einde van de enquête.

De informatie die u meegeeft met deze enquête wordt zeer discreet behandeld met respect voor uw privacy.

Inleidende vragen

Dit onderzoek gaat over niet-wekelijkse aankopen.
Deze zijn meer uitzonderlijk, en minder systematisch dan wekelijkse aankopen. Typische niet-wekelijkse aankopen omvatten onder meer kleding, schoeisel, elektro,...
(Indien u dit type aankopen toch wekelijks zou verrichten, beantwoordt u dan ook de vragenlijst zo getrouw mogelijk)

1) Welke steden bezoekt u zoal voor uw niet-wekelijkse aankopen? (Meerdere antwoorden zijn mogelijk)

Geel	Turnhout	Herentals	Antwerpen	Andere
☐	☐	☐	☐	☐

2) Gebruikt u daarbij al eens de auto?

Ja	Neen, nooit
○	○

Indien u op vraag 1 'Geel' antwoordde, vult u het gedeelte over Geel in (vanaf vraag 3)
Indien u op vraag 1 'Turnhout' antwoordde, vult u het gedeelte over Turnhout in (vanaf vraag 17)
Indien u op vraag 1 'Herentals' antwoordde, vult u het gedeelte over Herentals in (vanaf vraag 31)
Indien u op vraag 1 'Antwerpen' antwoordde, vult u het gedeelte over Antwerpen in (vanaf vraag 45)
Indien u enkel 'andere' antwoordde, ga verder met vraag 59.

Indien u op vraag 2 'neen, nooit' antwoordde, ga verder naar vraag 59.

Blok Geel

Dit is het blok vragen over GEEL. Beantwoord deze vragen alleen als u deze stad al eens bezoekt voor uw niet-wekelijkse aankopen.

3) Bij het meest recente bezoek voor niet-wekelijkse aankopen in Geel, hoe lang duurde dat bezoek ongeveer?

- ○ Minder dan 30 minuten
- ○ Tussen 30 minuten en 2 uur
- ○ Meer dan 2 uur
- ○ Weet het niet

4) Hoe vaak gaat u naar Geel voor uw niet-wekelijkse aankopen?

- ○ Meer dan een keer per week
- ○ Meer dan een keer per maand
- ○ Een keer per maand
- ○ minder dan een keer per maand

5) Bij een typisch bezoek aan Geel voor uw niet-wekelijkse aankopen, welk vervoermiddel neemt u?

Rangschik de vervoermiddelen naar gebruik waarbij u het meest gebruikte vervoermiddel op 1 en het minst gebruikte vervoermiddel op 6 zet.

Indien u een bepaald vervoermiddel nooit gebruikt duidt u deze niet aan.

	1	2	3	4	5	6
Auto (Bestuurder of passagier)	○	○	○	○	○	○
Bus	○	○	○	○	○	○
Trein	○	○	○	○	○	○
Fiets	○	○	○	○	○	○
Te voet	○	○	○	○	○	○
Andere _____	○	○	○	○	○	○

6) Bij een typisch bezoek aan Geel, welke parking gebruikt u? Rangschik de parkings naar gebruik waarbij u de meest gebruikte parking op 1 en de minst gebruikte parking op 7 zet.

Indien u een bepaalde parking nooit gebruikt duidt u deze niet aan.

	1	2	3	4	5	6	7
Parking Nieuwstraat	○	○	○	○	○	○	○
Parking Pas/Zwembad	○	○	○	○	○	○	○

Ondergrondse Parking Gheelodroom	○	○	○	○	○	○	○
Parking Werft	○	○	○	○	○	○	○
Parking Vakschool/Stationstraat	○	○	○	○	○	○	○
Rozendaal	○	○	○	○	○	○	○
Andere	○	○	○	○	○	○	○

7) Stel u voor dat de parking die u het meeste gebruikt duurder wordt, het tarief stijgt met €0.20 per uur. Wat zou u doen?

(indien de parking gratis was, bedraagt het tarief nu €0.20 per uur).

- ○ Gekozen parking blijven gebruiken
- ○ Het openbaar vervoer nemen bij toekomstige aankopen
- ○ De fiets nemen bij toekomstige aankopen
- ○ De aankopen uitstellen
- ○ Naar een andere stad gaan
- ○ Naar een andere parking gaan
- ○ Andere

8) Hoe zeker bent u ervan dat u echt uw gedrag zo zou aanpassen?

- ○ Zeer zeker
- ○ Vrij zeker
- ○ Noch zeker noch onzeker
- ○ Onzeker
- ○ Zeer onzeker

9) Stel u voor dat de parking die u het meeste gebruikt duurder wordt, het tarief stijgt met €0.50 per uur. Wat zou u doen?

(indien de parking gratis was, bedraagt het tarief nu €0.50 per uur).

- ○ Gekozen parking blijven gebruiken
- ○ Het openbaar vervoer nemen bij toekomstige aankopen
- ○ De fiets nemen bij toekomstige aankopen
- ○ De aankopen uitstellen
- ○ Naar een andere stad gaan
- ○ Naar een andere parking gaan
- ○ Andere

10) Hoe zeker bent u ervan dat u echt uw gedrag zo zou aanpassen?

- ○ Zeer zeker
- ○ Vrij zeker
- ○ Noch zeker noch onzeker
- ○ Onzeker
- ○ Zeer onzeker

11) Stel u voor dat de parking die u het meest gebruikt 20% kleiner wordt (1/5de van de parkeerplaatsen verdwijnen),

en de kans dus kleiner is dat u een lege plek vindt wanneer u aankomt. Wat zou u doen?

- ○ Gekozen parking blijven gebruiken
- ○ Het openbaar vervoer nemen bij toekomstige aankopen
- ○ De fiets nemen bij toekomstige aankopen
- ○ De aankopen uitstellen
- ○ Vroeger vertrekken om de aankopen te doen
- ○ Naar een andere stad gaan
- ○ Naar een andere parking gaan
- ○ Andere

12) Hoe zeker bent u ervan dat u echt uw gedrag zo zou aanpassen?

- ○ Zeer zeker
- ○ Vrij zeker
- ○ Noch zeker noch onzeker
- ○ Onzeker
- ○ Zeer onzeker

13) Stel u voor dat de parking die u het meest gebruikt 50% kleiner wordt (de helft van de parkeerplaatsen verdwijnt),

en de kans dus kleiner is dat u een lege plek vindt wanneer u aankomt. Wat zou u doen?

- ○ Gekozen parking blijven gebruiken
- ○ Het openbaar vervoer nemen bij toekomstige aankopen
- ○ De fiets nemen bij toekomstige aankopen
- ○ De aankopen uitstellen
- ○ Vroeger vertrekken om de aankopen te doen
- ○ Naar een andere stad gaan
- ○ Naar een andere parking gaan

- Andere

14) Hoe zeker bent u ervan dat u echt uw gedrag zo zou aanpassen?

- Zeer zeker
- Vrij zeker
- Noch zeker noch onzeker
- Onzeker
- Zeer onzeker

15) Stel u voor dat die parking volledig gesloten wordt. Wat zou u doen?

- Het openbaar vervoer nemen bij toekomstige aankopen
- De fiets nemen bij toekomstige aankopen
- De aankopen uitstellen
- Naar een andere stad gaan
- Naar een andere parking gaan
- Andere

16) Hoe zeker bent u ervan dat u echt uw gedrag zo zou aanpassen?

- Zeer zeker
- Vrij zeker
- Noch zeker noch onzeker
- Onzeker
- Zeer onzeker

Blok Turnhout

Dit is het blok vragen over TURNHOUT. Beantwoord deze vragen alleen als u deze stad al eens bezoekt voor uw niet-wekelijkse aankopen.

17) Bij het meest recente bezoek voor niet-wekelijkse aankopen in Turnhout, hoe lang duurde dat bezoek ongeveer?

- Minder dan 30 minuten
- Tussen 30 minuten en 2 uur

- Meer dan 2 uur
- Weet het niet

18) Hoe vaak gaat u naar Turnhout voor uw niet-wekelijkse aankopen?

- Meer dan een keer per week
- Meer dan een keer per maand
- Een keer per maand
- minder dan een keer per maand

19) Bij een typisch bezoek aan Turnhout voor uw niet-wekelijkse aankopen, welk vervoermiddel neemt u?

Rangschik de vervoermiddelen naar gebruik waarbij u het meest gebruikte vervoermiddel op 1

en het minst gebruikte vervoermiddel op 6 zet.

Indien u een bepaald vervoermiddel nooit gebruikt duidt u deze niet aan.

	1	2	3	4	5	6
Auto (Bestuurder of passagier)	○	○	○	○	○	○
Bus	○	○	○	○	○	○
Trein	○	○	○	○	○	○
Fiets	○	○	○	○	○	○
Te voet	○	○	○	○	○	○
Andere	○	○	○	○	○	○

20) Bij een typisch bezoek aan Turnhout, welke parking gebruikt u? Rangschik de parkings naar gebruik

waarbij u de meest gebruikte parking op 1 en de minst gebruikte parking op 7 zet.

Indien u een bepaalde parking nooit gebruikt duidt u deze niet aan.

	1	2	3	4	5	6	7
Parking Station	○	○	○	○	○	○	○
Parking Snollaert (Stadspark)	○	○	○	○	○	○	○
Parking Boomgaardplein	○	○	○	○	○	○	○
Parking Paterstraat	○	○	○	○	○	○	○
Parking Hema	○	○	○	○	○	○	○
Parking Hotel Viane (Victoriestraat)	○	○	○	○	○	○	○
Andere	○	○	○	○	○	○	○

21) Stel u voor dat de parking die u het meeste gebruikt duurder wordt, het tarief stijgt met €0.20 per uur. Wat zou u doen?

(indien de parking gratis was, bedraagt het tarief nu €0.20 per uur).

- Gekozen parking blijven gebruiken
- Het openbaar vervoer nemen bij toekomstige aankopen

- ○ De fiets nemen bij toekomstige aankopen
- ○ De aankopen uitstellen
- ○ Naar een andere stad gaan
- ○ Naar een andere parking gaan
- ○ Andere

22) Hoe zeker bent u ervan dat u echt uw gedrag zo zou aanpassen?

- ○ Zeer zeker
- ○ Vrij zeker
- ○ Noch zeker noch onzeker
- ○ Onzeker
- ○ Zeer onzeker

23) Stel u voor dat de parking die u het meeste gebruikt duurder wordt, het tarief stijgt met €0.50 per uur. Wat zou u doen?

(indien de parking gratis was, bedraagt het tarief nu €0.50 per uur).

- ○ Gekozen parking blijven gebruiken
- ○ Het openbaar vervoer nemen bij toekomstige aankopen
- ○ De fiets nemen bij toekomstige aankopen
- ○ De aankopen uitstellen
- ○ Naar een andere stad gaan
- ○ Naar een andere parking gaan
- ○ Andere

24) Hoe zeker bent u ervan dat u echt uw gedrag zo zou aanpassen?

- ○ Zeer zeker
- ○ Vrij zeker
- ○ Noch zeker noch onzeker
- ○ Onzeker
- ○ Zeer onzeker

25) Stel u voor dat de parking die u het meest gebruikt 20% kleiner wordt (1/5de van de parkeerplaatsen verdwijnen),

en de kans dus kleiner is dat u een lege plek vindt wanneer u aankomt. Wat zou u doen?

- ○ Gekozen parking blijven gebruiken
- ○ Het openbaar vervoer nemen bij toekomstige aankopen
- ○ De fiets nemen bij toekomstige aankopen
- ○ De aankopen uitstellen
- ○ Vroeger vertrekken om de aankopen te doen
- ○ Naar een andere stad gaan
- ○ Naar een andere parking gaan
- ○ Andere

26) Hoe zeker bent u ervan dat u echt uw gedrag zo zou aanpassen?

- ○ Zeer zeker
- ○ Vrij zeker
- ○ Noch zeker noch onzeker
- ○ Onzeker
- ○ Zeer onzeker

27) Stel u voor dat de parking die u het meest gebruikt 50% kleiner wordt (de helft van de parkeerplaatsen verdwijnt),

en de kans dus kleiner is dat u een lege plek vindt wanneer u aankomt. Wat zou u doen?

- ○ Gekozen parking blijven gebruiken
- ○ Het openbaar vervoer nemen bij toekomstige aankopen
- ○ De fiets nemen bij toekomstige aankopen
- ○ De aankopen uitstellen
- ○ Vroeger vertrekken om de aankopen te doen
- ○ Naar een andere stad gaan
- ○ Naar een andere parking gaan
- ○ Andere

28) Hoe zeker bent u ervan dat u echt uw gedrag zo zou aanpassen?

- ○ Zeer zeker
- ○ Vrij zeker
- ○ Noch zeker noch onzeker
- ○ Onzeker
- ○ Zeer onzeker

29) Stel u voor dat die parking volledig gesloten wordt. Wat zou u doen?

- ○ Het openbaar vervoer nemen bij toekomstige aankopen
- ○ De fiets nemen bij toekomstige aankopen
- ○ De aankopen uitstellen
- ○ Naar een andere stad gaan
- ○ Naar een andere parking gaan
- ○ Andere

30) Hoe zeker bent u ervan dat u echt uw gedrag zo zou aanpassen?

- ○ Zeer zeker
- ○ Vrij zeker
- ○ Noch zeker noch onzeker
- ○ Onzeker
- ○ Zeer onzeker

Blok Herentals

Dit is het blok vragen over HERENTALS. Beantwoord deze vragen alleen als u deze stad al eens bezoekt voor uw niet-wekelijkse aankopen.

31) Bij het meest recente bezoek voor niet-wekelijkse aankopen in Herentals, hoe lang duurde dat bezoek ongeveer?

- ○ Minder dan 30 minuten
- ○ Tussen 30 minuten en 2 uur
- ○ Meer dan 2 uur
- ○ Weet het niet

32) Hoe vaak gaat u naar Herentals voor uw niet-wekelijkse aankopen?

- ○ Meer dan een keer per week
- ○ Meer dan een keer per maand
- ○ Een keer per maand
- ○ minder dan een keer per maand

33) Bij een typisch bezoek aan Herentals voor uw niet-wekelijkse aankopen, welk vervoermiddel neemt u?

Rangschik de vervoermiddelen naar gebruik waarbij u het meest gebruikte vervoermiddel op 1

en het minst gebruikte vervoermiddel op 6 zet.

Indien u een bepaald vervoermiddel nooit gebruikt duidt u deze niet aan.

	1	2	3	4	5	6
Auto (Bestuurder of passagier)	○	○	○	○	○	○
Bus	○	○	○	○	○	○
Trein	○	○	○	○	○	○
Fiets	○	○	○	○	○	○
Te voet	○	○	○	○	○	○
Andere	○	○	○	○	○	○

34) Bij een typisch bezoek aan Herentals, welke parking gebruikt u? Rangschik de parkings naar gebruik

waarbij u de meest gebruikte parking op 1 en de minst gebruikte parking op 7 zet.

Indien u een bepaalde parking nooit gebruikt duidt u deze niet aan.

	1	2	3	4	5	6	7
Parking Stationplein	○	○	○	○	○	○	○
Parking Colruyt	○	○	○	○	○	○	○
Parking Markt	○	○	○	○	○	○	○
Parking Nonnenvest	○	○	○	○	○	○	○
Parking Kerkstraat	○	○	○	○	○	○	○
Molenvest	○	○	○	○	○	○	○
Andere	○	○	○	○	○	○	○

35) Stel u voor dat de parking die u het meeste gebruikt duurder wordt, het tarief stijgt met €0.20 per uur. Wat zou u doen?

(indien de parking gratis was, bedraagt het tarief nu €0.20 per uur).

- ○ Gekozen parking blijven gebruiken
- ○ Het openbaar vervoer nemen bij toekomstige aankopen
- ○ De fiets nemen bij toekomstige aankopen
- ○ De aankopen uitstellen
- ○ Naar een andere stad gaan
- ○ Naar een andere parking gaan
- ○ Andere

36) Hoe zeker bent u ervan dat u echt uw gedrag zo zou aanpassen?

○

Zeer zeker

- Vrij zeker
- Noch zeker noch onzeker
- Onzeker
- Zeer onzeker

37) Stel u voor dat de parking die u het meeste gebruikt duurder wordt, het tarief stijgt met €0.50 per uur. Wat zou u doen?

(indien de parking gratis was, bedraagt het tarief nu €0.50 per uur).

- Gekozen parking blijven gebruiken
- Het openbaar vervoer nemen bij toekomstige aankopen
- De fiets nemen bij toekomstige aankopen
- De aankopen uitstellen
- Naar een andere stad gaan
- Naar een andere parking gaan
- Andere

38) Hoe zeker bent u ervan dat u echt uw gedrag zo zou aanpassen?

- Zeer zeker
- Vrij zeker
- Noch zeker noch onzeker
- Onzeker
- Zeer onzeker

39) Stel u voor dat de parking die u het meest gebruikt 20% kleiner wordt (1/5de van de parkeerplaatsen verdwijnen),

en de kans dus kleiner is dat u een lege plek vindt wanneer u aankomt. Wat zou u doen?

- Gekozen parking blijven gebruiken
- Het openbaar vervoer nemen bij toekomstige aankopen
- De fiets nemen bij toekomstige aankopen
- De aankopen uitstellen
- Vroeger vertrekken om de aankopen te doen
- Naar een andere stad gaan
- Naar een andere parking gaan
- Andere

40) Hoe zeker bent u ervan dat u echt uw gedrag zo zou aanpassen?

- ○ Zeer zeker
- ○ Vrij zeker
- ○ Noch zeker noch onzeker
- ○ Onzeker
- ○ Zeer onzeker

41) Stel u voor dat de parking die u het meest gebruikt 50% kleiner wordt (de helft van de parkeerplaatsen verdwijnt),

en de kans dus kleiner is dat u een lege plek vindt wanneer u aankomt. Wat zou u doen?

- ○ Gekozen parking blijven gebruiken
- ○ Het openbaar vervoer nemen bij toekomstige aankopen
- ○ De fiets nemen bij toekomstige aankopen
- ○ De aankopen uitstellen
- ○ Vroeger vertrekken om de aankopen te doen
- ○ Naar een andere stad gaan
- ○ Naar een andere parking gaan
- ○ Andere

42) Hoe zeker bent u ervan dat u echt uw gedrag zo zou aanpassen?

- ○ Zeer zeker
- ○ Vrij zeker
- ○ Noch zeker noch onzeker
- ○ Onzeker
- ○ Zeer onzeker

43) Stel u voor dat die parking volledig gesloten wordt. Wat zou u doen?

- ○ Het openbaar vervoer nemen bij toekomstige aankopen
- ○ De fiets nemen bij toekomstige aankopen
- ○ De aankopen uitstellen
- ○ Naar een andere stad gaan
- ○ Naar een andere parking gaan
- ○ Andere

44) Hoe zeker bent u ervan dat u echt uw gedrag zo zou aanpassen?

- Zeer zeker
- Vrij zeker
- Noch zeker noch onzeker
- Onzeker
- Zeer onzeker

Blok Antwerpen

Dit is het blok vragen over ANTWERPEN. Beantwoord deze vragen alleen als u deze stad al eens bezoekt voor uw niet-wekelijkse aankopen.

45) Bij het meest recente bezoek voor niet-wekelijkse aankopen in Antwerpen, hoe lang duurde dat bezoek ongeveer?

- Minder dan 30 minuten
- Tussen 30 minuten en 2 uur
- Meer dan 2 uur
- Weet het niet

46) Hoe vaak gaat u naar Antwerpen voor uw niet-wekelijkse aankopen?

- Meer dan een keer per week
- Meer dan een keer per maand
- Een keer per maand
- minder dan een keer per maand

47) Bij een typisch bezoek aan Antwerpen voor uw niet-wekelijkse aankopen, welk vervoermiddel neemt u?

Rangschik de vervoermiddelen naar gebruik waarbij u het meest gebruikte vervoermiddel op 1

en het minst gebruikte vervoermiddel op 6 zet.

Indien u een bepaald vervoermiddel nooit gebruikt duidt u deze niet aan.

	1	2	3	4	5	6
Auto (Bestuurder of passagier)	○	○	○	○	○	○
Bus	○	○	○	○	○	○
Trein	○	○	○	○	○	○
Fiets	○	○	○	○	○	○

Te voet							
Andere							

48) Bij een typisch bezoek aan Antwerpen, welke parking gebruikt u? Rangschik de parkings naar gebruik

waarbij u de meest gebruikte parking op 1 en de minst gebruikte parking op 7 zet.

Indien u een bepaalde parking nooit gebruikt duidt u deze niet aan.

	1	2	3	4	5	6	7
Parking Kaai							
Ondergrondse parking Astridplein/Keyserlei							
Ondergrondse parking Rooseveltplaats							
Frankrijklei							
Gedempte zuiderdokken (Vlaamse kaai)							
Ondergrondse parking Groenplaats							
Andere							

49) Stel u voor dat de parking die u het meeste gebruikt duurder wordt, het tarief stijgt met €0.20 per uur. Wat zou u doen?

(indien de parking gratis was, bedraagt het tarief nu €0.20 per uur).

- Gekozen parking blijven gebruiken
- Het openbaar vervoer nemen bij toekomstige aankopen
- De fiets nemen bij toekomstige aankopen
- De aankopen uitstellen
- Naar een andere stad gaan
- Naar een andere parking gaan
- Andere

50) Hoe zeker bent u ervan dat u echt uw gedrag zo zou aanpassen?

- Zeer zeker
- Vrij zeker
- Noch zeker noch onzeker
- Onzeker
- Zeer onzeker

51) u voor dat de parking die u het meeste gebruikt duurder wordt, het tarief stijgt met €0.50 per uur. Wat zou u doen?

(indien de parking gratis was, bedraagt het tarief nu €0.50 per uur).

- Gekozen parking blijven gebruiken
- Het openbaar vervoer nemen bij toekomstige aankopen
- De fiets nemen bij toekomstige aankopen
- De aankopen uitstellen
- Naar een andere stad gaan
- Naar een andere parking gaan
- Andere

52) Hoe zeker bent u ervan dat u echt uw gedrag zo zou aanpassen?

- Zeer zeker
- Vrij zeker
- Noch zeker noch onzeker
- Onzeker
- Zeer onzeker

53) Stel u voor dat de parking die u het meest gebruikt 20% kleiner wordt (1/5de van de parkeerplaatsen verdwijnen),

en de kans dus kleiner is dat u een lege plek vindt wanneer u aankomt. Wat zou u doen?

- Gekozen parking blijven gebruiken
- Het openbaar vervoer nemen bij toekomstige aankopen
- De fiets nemen bij toekomstige aankopen
- De aankopen uitstellen
- Vroeger vertrekken om de aankopen te doen
- Naar een andere stad gaan
- Naar een andere parking gaan
- Andere

54) Hoe zeker bent u ervan dat u echt uw gedrag zo zou aanpassen?

- Zeer zeker
- Vrij zeker
- Noch zeker noch onzeker
- Onzeker
- Zeer onzeker

55) Stel u voor dat de parking die u het meest gebruikt 50% kleiner wordt (de helft van de parkeerplaatsen verdwijnt),

en de kans dus kleiner is dat u een lege plek vindt wanneer u aankomt. Wat zou u doen?

- ○ Gekozen parking blijven gebruiken
- ○ Het openbaar vervoer nemen bij toekomstige aankopen
- ○ De fiets nemen bij toekomstige aankopen
- ○ De aankopen uitstellen
- ○ Vroeger vertrekken om de aankopen te doen
- ○ Naar een andere stad gaan
- ○ Naar een andere parking gaan
- ○ Andere

56) Hoe zeker bent u ervan dat u echt uw gedrag zo zou aanpassen?

- ○ Zeer zeker
- ○ Vrij zeker
- ○ Noch zeker noch onzeker
- ○ Onzeker
- ○ Zeer onzeker

57) Stel u voor dat die parking volledig gesloten wordt. Wat zou u doen?

- ○ Het openbaar vervoer nemen bij toekomstige aankopen
- ○ De fiets nemen bij toekomstige aankopen
- ○ De aankopen uitstellen
- ○ Naar een andere stad gaan
- ○ Naar een andere parking gaan
- ○ Andere

58) Hoe zeker bent u ervan dat u echt uw gedrag zo zou aanpassen?

- ○ Zeer zeker
- ○ Vrij zeker
- ○ Noch zeker noch onzeker
- ○ Onzeker
- ○ Zeer onzeker

Finale vragen

Het volgende blok vragen gaat over persoonsgerelateerde kenmerken. Deze kenmerken zijn belangrijk voor het onderzoek om 2 redenen:
- zo weten we welke groepen mensen de enquête invulden.
- het stelt ons in staat om analyses per groep uit te voeren.

59) Over welke vervoersmiddelen, abonnementen en/of voordeeltarieven beschikt u? (Meerdere antwoorden zijn mogelijk)

- [ ] Auto
- [ ] Fiets
- [ ] Bus (abonnement/ voordeeltarief)
- [ ] Trein (abonnement/ voordeeltarief)
- [ ] Andere

60) Tot welke leeftijdscategorie behoort u?

- ( ) 18-27
- ( ) 28-37
- ( ) 38-47
- ( ) 48-57
- ( ) 57+

61) Wat is uw geslacht?

- ( ) Man
- ( ) Vrouw
- ( ) Wens niet te antwoorden

62) Wat is de hoogste diploma waarover u beschikt?

- [ ] Geen
- [ ] Lager onderwijs
- [ ] Secundair onderwijs
- [ ] Hoger onderwijs (Bachelor of Master)
- [ ] Doctoraat
- [ ] Andere

63) Heeft u een beperking? Zo ja, welke? (meerdere antwoorden zijn mogelijk)

- [ ] Geen beperking
- [ ] Auditieve beperking (gehoor)
- [ ] Visuele beperking (zicht)
- [ ] Lichamelijke beperking toegestaan voertuig te besturen
- [ ] Lichamelijke beperking niet toegestaan voertuig te besturen
- [ ] Wens niet te antwoorden

64) Beschikt u over een tankkaart?
(Een tankkaart wordt aangeboden door uw werkgever, die ermee alle of gedeeltelijk uw brandstofkosten van uw private wagen of bedrijfswagen op zich neemt)

Ja	Nee	Wens niet te antwoorden
○	○	○

65) Beschikt u over een speciale parkeerkaart?

Parkeerkaart voor tijdens arbeidsuren	Parkeerkaart gelimiteerd parkeren uitgegeven door lokale overheid	Mindervalide kaart	Andere	Geen
☐	☐	☐	☐	☐

66) In welke gedeelte van de stad Geel woont u?

(Ten Aard, Winkelomheide, Larum, Stelen, Zammel, Holven, Centrum,....)

Indien u wenst deel te nemen aan de tombola voor bioscooptickets, gelieve uw e-mailadres hier achter te laten.
Deze informatie wordt altijd met de nodige zorg en discretie behandeld, en wordt niet blootgesteld aan derden.

Heeft u nog opmerkingen of bedenkingen?

Dank voor uw deelname!

Auteursrechtelijke overeenkomst

Ik/wij verlenen het wereldwijde auteursrecht voor de ingediende eindverhandeling:
Environmental Impact of Parking Measures

Richting: **Master of Transportation Sciences-Mobility Management**
Jaar: **2015**

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Voor akkoord,

Martens, Johannes

Datum: **2/06/2015**