Mobility as a Service applied in residential areas

Stated Choice experiment in the context of Dutch cities

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Mobility as a Service applied in residential areas: Stated choice experiment in the context of Dutch cities

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Preface

This report is the last part of the TU Delft master programme Complex System Engineering and Management. The thesis is commissioned by consultancy company APPM. In February 2020, I started with my research at APPM not knowing that the COVID19 pandemic will change the whole working situation from the half of March. During the last seven months I have learnt a lot of doing scientific research. Doing scientific research is hard and the required time is always too short. During the research I found multiple new findings and ways that I wanted to incorporate in the research. However, making choices is one of the most important parts of the research. A special thanks to Eric, who kept me on the right track during the research and for his useful support. Especially, your input with regard to the survey was very useful and also, in the data analysis part you gave me some important feedback with analysing the data and structuring the report. It helped me keeping overview and not getting lost in lots of sub-relations. Moreover, thanks to Gerdien, Erik and other APPM colleagues for checking my survey and helping me with improvements for the readability and visualisations. Last but not least, despite the COVID19 pandemic I really enjoyed my time at APPM and would thanks all APPM colleagues for all interesting conversations.

I really enjoyed my last challenge to finish my master programme at the TU Delft.

Enjoy the read,

Wouter Damen
Delft, August 2020

INHOUDSOPGAVE

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Summary

This research has the goal to analyse the influence of neighbourhood characteristics on people's willingness to adopt Mobility as a Service (MaaS) instead of the car for new residential areas. It estimated the influence of a reduced parking comfort, MaaS-hub availability and additional quality of the overall neighbourhood on the willingness to adopt MaaS instead of the car and the total attractiveness of new residential areas. It used a Stated Choice experiment and survey to estimate a MNL- and ML-model for both one and multiple car households. The results indicate that MaaS adoption rates are limited. MaaS only seems a niche market for people with multiple cars and as additional transportation option instead of a substitute of the car. Thereby, the hubs location is crucial and municipalities should build neighbourhoods with a larger hub at the border near public transport facilities combined with multiple small scale neighbourhood hubs with only shared cars and bikes.

Introduction

Due to the population growth Dutch cities face huge mobility challenges. The population will increase with 1,8 million residents till 2040, from which almost 50% will settle in the G4 region. The G4 region consists of the four biggest municipalities in The Netherlands, Amsterdam, The Hague, Rotterdam and Utrecht. This growth will pressurize their living environment and accessibility. Therefore, they build compact neighbourhoods within their city areas supported by subsequent mobility strategies.

Simultaneously, the concept "Mobility as a Service" (MaaS) is raising their interest. MaaS combines all transport modes, offers a customized mobility package and integrates the booking, reserving and paying process through an app. For every individual the MaaS-environment offers an overview of combinations of modes to travel from A to B for one integrated price next to single way tickets.

Combining MaaS with mobility hubs seems a promising strategy to enhance the G4's future accessibility while building more residences within their city areas. Then, MaaS might be an alternative for the car. There may be considerable opportunities for MaaS in combination with adjustments to the living environment as replacer for the car or instead of a second car, especially in the case of residential reallocation. Therefore, this research will answer the following main and sub-questions:

"*To what extent influence neighbourhood designs potential residents their choice to submit to Mobility as a Service (MaaS) subscriptions*?"

1. To what extent lead a reduced parking comfort, the availability of MaaS-hubs and additional neighbourhood characteristics to an increase in MaaS-subscriptions?
2. To what extent find people neighbourhoods with a MaaS-hub and additional neighbourhood characteristics instead of a reduced parking comfort attractive to live in?
3. Too what extent affect the current living environment, socio demographics and travel behaviour characteristics the relation between the neighbourhood's overall attractiveness and preference to subscribe to MaaS at the one hand and the neighbourhood's design at the other?
4. Too what extent can the municipality of Amsterdam use policies regarding a reduced parking comfort and the availability of MaaS-hubs to increase the liveability and accessibility in the "*Sluisbuurt*"?

Methodology

In order to explain the comparison between car and MaaS the conceptual model (see Figure 0.1) builds on the Random Utility Theory (RUT). It assumes that people compared the gained "*utility*" of each option with each other and choose the option with the highest experienced "*utility*". The utility depends on the mode's (i.e. car and MaaS) characteristics and the neighbourhood design. This experiment only varies the neighbourhood designs by lowering its parking comfort, while offering MaaS-hubs and an increased quality of the living environment. Also, personal characteristics as socio-demographics, travel behaviour and mobility costs might influence these relations. Varying mode attributes aren't part of this research's scope.

This research will explore the hypothesis that the combination of the availability of MaaS-hubs and an increased quality of the living environment can "*compensate*" for a reduction in parking comfort positively influence MaaS' adoption rates. By reducing the ease of use of the car, offering an easy accessible MaaS-hub and building "*greener*" neighborhoods with additional facilities, people could change or adapt their travel behavior after a reallocation.

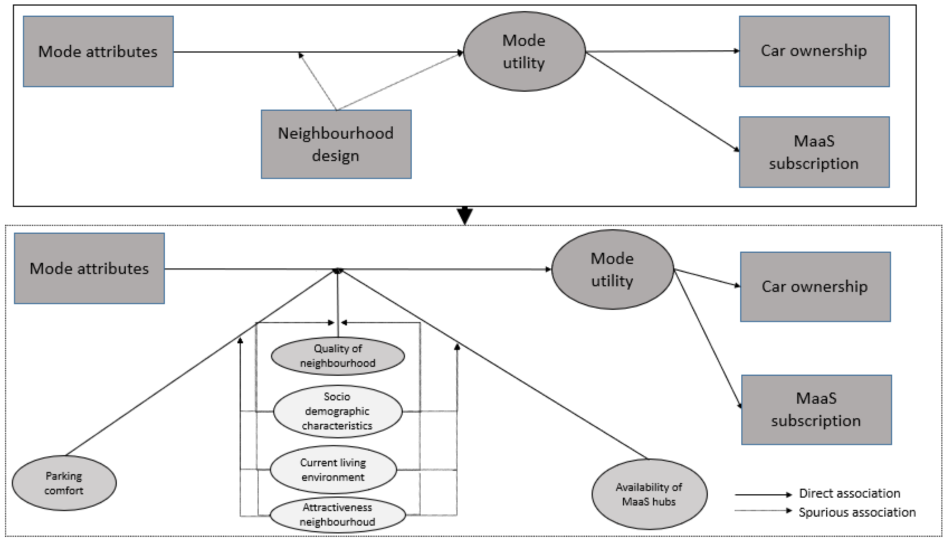

Figure 0.1: Conceptual model

Therefore, this experiment contains a context-dependent Stated Choice (SC) experiment which measures the trade-offs between the varied characteristics from Figure 0.1. It looks as follows: for each design respondents have to indicate the overall attractiveness and have to choose between owning a car or a MaaS-subscription. When they live in households with one car, they can choose between car, MaaS or a combination and when living in multiple car households, the experiment splits the combination option in the combination of one car and both cars and MaaS. Before the experiment they can choose between three different MaaS-subscriptions varying in mode's discount options and total costs.

The experiment is constructed as follows. It varies in total seven characteristics, called attributes, in three levels: walking time to and type of parking place and hub, street access by car, amount of facilities and urban green. The software program Ngene is used to generate an orthogonal design, which have the aim to reduce the correlation between attributes in the choice options. The design contained 18 choice sets, divided into two blocks of nine. All attributes are effect coded. A multiple linear regression model analyzes the influence of the varied characteristics on the neighborhoods attractiveness and both a MNL- and ML-model analyses its influences on the willingness to adopt MaaS.

Furthermore, one of MaaS main problems is that the costs' perception to use MaaS is relatively high for car users, because they don't consider the fixed costs. Therefore, this experiment estimates people's current mobility costs for car and PT, based on people's current car type, car costs estimations provided by Nibud and the possession of a PT-subscription. Participants compare their estimated mobility costs with the costs of the offered MaaS-subscriptions.

A survey was used to recruit participants. They should have access to a car or regularly use the car, which excludes people younger than 18 years. Also, they should live in more dense populated areas, so that they can imagine how it is to live in the proposed designs. Lastly, preferably they should consider a reallocation or buying a new car.

The survey measured respondents' travel behavior, mobility costs, current built environment characteristics and socio-demographics. In total 254 respondents participated in the survey. The amount of missing data was quite low and therefore pairwise deletion is applied assuming that this data is missing without any underlying relations. The sample consists of relatively many young people in their twenties and participants between 46 and 60 years old with a relatively high income and education level. Furthermore, frequent car users were overrepresented, while frequent PT-users were underrepresented. Also, participants live in relatively quieter suburban car-dense residential areas located in the "*Randstad*", where people can easily park or have an own parking place.

Neighbourhood's attractiveness

In general, it is questionable to what extent respondents are actually willing to live in the proposed designs. Respondents only found the minority of the designs attractive enough to take the neighbourhood into consideration of moving. The experiment showed that **the walking time to a parking place** is the most influential variable followed by the **walking time to the hub**. Walking times of two minutes contribute to an increase in overall attractiveness, while eight minutes result in a decrease.

Also, people find designs with a **wide variety of facilities**, such as entertainment venues, non-food and food shops, more attractive than designs with only a few local food shops. Only designs with a wide variety in shops and facilities positively affect people's attractiveness, while designs with only some non-food shops have a negative contribution. This is similar for the **regulation of streets**. People dislike streets which regulate street access or give bikers priority and prefer streets without access regulations.

Lastly, people find the **hub type** and **urban green** the least important attributes to determine a neighbourhood's total attractiveness. They prefer hubs located near a train station above hubs with only shared devices. Hubs near a train station facilitate the ease of use for train travellers to hire a shared bike in their first- or last-mile transport. Also, they prefer small parks divided through the neighbourhood over one big park or green grass zones. Especially, only some green grass zones decrease its attractiveness.

Willingness to adopt MaaS

This research estimates for one and multiple car households a MNL- and Panel-ML-model. The Panel-ML models nest the MaaS- and combination alternative, because it is plausible that unobserved correlation exists between people's preferences for both alternatives. Both options are new and therefore unknown for people. In total, MaaS adoption rates are limited. From the one car households most people stick to the car, while only 34% chose for MaaS and 19% for the combination alternative. MaaS seems only particularly interesting as replacer for the second car. People in multiple car households have on average a preference for the combination alternative, despite the variation in neighbourhood characteristics. From this group, almost 50% were willing to give up their second car for a MaaS-subscription, while almost 40% stick to the car. When people are living in one car households they have on average a preference for the car, despite the variation in neighbourhood characteristics.

Only the reduced parking comfort and hub availability characteristics influenced the willingness to adopt MaaS significantly. All other neighbourhood characteristics don't influence the choice for MaaS significantly. Especially, the **walking times to the hub** influences MaaS adoption rates, where a two minute walking time to the hub benefits to an increase in MaaS and an eight minute walking time to a decrease. People only consider an *additional* MaaS-subscription next to their car(s) when the hub is closely nearby independent of the walking time to the parking place.

Only when people are living in one car households the **walking times to the parking place** and **type of parking place and hub** have a statistical significant contribution. A walking time of eight minutes to the parking place positively benefits the willingness to adopt MaaS, while two minutes have a negative contribution. Logically, a **reserved parking place** makes choosing MaaS and the combination option less attractive in relation to the car. Also, a **hub closely to a train station** has a positive contribution to MaaS and the combination option.

Models explanatory power

The explanatory power of all models is limited, because there is much heterogeneity in the respondents' answers, especially for the multiple linear regression model. Due to the heterogeneity the model can't adequately estimate respondents neighbourhood attractiveness. The Panel ML-models have a reasonable explanatory power, especially for people living in multiple car households. These confirm that there is much unobserved heterogeneity in respondents' preferences between MaaS and car. An explanation for the heterogeneity is that both experiments contain many choice sets (almost 50%) where respondents chose the same modality in all designs independent of the variation in attributes.

Influence socio demographics and built environment

Especially travel behaviour characteristics, as car, train, bike and shared bike use, highly affect the designs' attractiveness and socio demographics influence MaaS adoption rates significantly. **Monthly train and daily bike users** find the designs in general more attractive to live in and are more willing to adopt MaaS. They use the car less frequently than non-monthly users and therefore experience more living comfort and enjoy the access to hubs. This is similar for **non-frequent car users**, while frequent car users aren't satisfied with longer distances to the parking place than they are used to and are less willing to subscribe to MaaS.

People with **experience of shared bikes** have a marginal preference for hubs near train stations in comparison with people without any experience. **Higher income groups** have a minor preference to live in neighbourhoods where the parking place is relative far away in comparison with lower income groups. Also, when they are living in multiple car households, they are less willing to adopt MaaS. At the one hand, they want to live in quieter neighbourhoods with more room for the living environment, but at the other hand they are used to a relatively high comfort level and therefore are less willing to give up their car and change to MaaS. They experience MaaS as a decrease in their transportation comfort. Also, there is no financial need to shift from an (mostly) more expensive car to cheaper MaaS-subscriptions.

The **amount of children per household** and **age** only influence MaaS-subscription rates for people living in multiple car households. When they have multiple children, they are less willing to choose MaaS, because they attach more value to the car's flexibility compared to people without children. Also, age has a positive but rather small contribution, meaning that older people seem slightly more willing to use MaaS. However, this effect is marginal in comparison with other discussed characteristics. Contradicting to the expectations beforehand, **people's mobility costs**, **possession of a PT-subscription** and **willingness to move** or **buy a new car** didn't have any influence on the neighbourhood's attractiveness and willingness to adopt MaaS.

With respect to the built environment only the **closeness to recreational areas** and the **neighbourhoods average household size** have a significant influence on the neighbourhood's attractiveness. Generally, people living further away from recreational areas find the designs more attractive to live in than people living closer to these areas despite the variation in characteristics.

Also, living in areas with a lower average household size (two or lower) has a positive influence on people's attractiveness than a higher average household size (three or higher). People living in areas with a higher household size mostly live in neighbourhoods with plenty of room for the car and therefore use the car quite more frequently than people living in neighbourhoods with lower household sizes. The lower average household group mostly lives in denser populated areas with less room for the car.

Furthermore, as expected beforehand people are more willing to purchase a MaaS-subscription when they find the total neighbourhood more attractive to live in. Subjective characteristics, as **parking effort**, **availability of parking places** and **neighbourhood quietness** weren't statistical significant.

Conclusion

In general, MaaS adoption rates are limited. MaaS only seems a niche market for people with multiple cars. They are willing to give up one car for a MaaS-subscription and thereby experience both the benefits of car and MaaS. Thereby, it is questionable whether lowering the parking comfort conditions in neighbourhoods and offering hubs is a suitable alternative to enhance cities accessibility. MaaS seems for them more as an additional transport modality instead of a substitute for the car.

Policy implications

These findings have general and case-specific policy implications with regard to the design process of attractive neighbourhoods to live in and whether MaaS is a suitable alternative as mobility option to apply in these neighbourhoods. In general, within the context of MaaS people prefer to live in neighbourhoods with lots of different facilities and shops and hub and parking places closely located from their houses. Hubs should be located closer to people houses and parking facilities at a moderate distance, at approximately five minutes walking. Also, they should be located near a train station, or otherwise a BTM-station near facilities as shops. This makes them only applicable for relatively **dense populated areas**.

Based on the case-study results to the *Sluisbuurt* in Amsterdam, municipalities should apply a combination of hub types divided through the neighbourhood with a "larger" hub at the neighbourhood's border near a bus or tram station and multiple smaller local hubs with only shared devices divided through the neighbourhood. Only, this is more costly from a financial perspective. Therefore, should realize that it is important how they are going to divide these costs between house owners, MaaS-providers and themselves.

Also, these designs are especially attractive for frequent PT-users. They find it more attractive to live at the border close to the hubs near the tram and bus station. The municipality can use this information in their housing marketing strategy to determine which kind of residents should be built near the tram and bus station. Building more expensive houses in the area near the tram and bus stations or central shopping street can results in higher returns for the municipality and contractors, knowing that these are more popular to sell. Other areas are more suitable social rental and student houses.

Limitations and further research recommendations

This research has the following research limitations. First of all, it is **questionable whether respondents behave in real life similarly as indicated in the experiment**. Also, the concept MaaS is still in an exploring phase and therefore people can find it hard to estimate what it actual means.

Secondly, this research didn't analyse people's **travel conditions and reasons** to choose car or MaaS in relation to their personal situation. This might explain people's choices and can be used to derive advices for adaptions to MaaS which might improve its adoption rates. Therefore, future research should take these travel reasons into consideration.

Furthermore, this research used general car cost estimations. Future research should try to estimate these **car costs** more precisely by making the survey more individual specific. Also, this research didn't take **people's working location** into consideration. An overall combined approach existing of changing neighbourhood characteristics and offering MaaS-subscriptions by the employer might be an interesting research direction.

Fifthly, the sample didn't exist of relatively many people that are willing to move between now and two years and **isn't representative for the Dutch population**. Lastly, a future research direction is to analyse the preferences for MaaS in relation to car in case of new constructed neighbourhoods on a **household level** by taking the influence of household characteristics into account.

1. Introduction

This research explores the willingness to subscribe to a new mobility concept "Mobility as a Service" (MaaS) in new residential areas. Firstly, this chapter introduces the subject. After that, it will address the problem statement and scientific relevance leading to the main research question and sub-questions (see Paragraph 1.1 and 1.2). Finally, it explains the societal relevance, the relation to CoSEM and the report structure (see Paragraph 1.3 till 1.5).

1.1 Introduction

Dutch cities face huge mobility challenges due to their population growth. The Dutch population will increase with 1,8 million residents till 2040, from which almost 50% will settle in the G4 region (APPM, 2020a). The G4 region consists of the four biggest municipalities in The Netherlands: Amsterdam, The Hague, Rotterdam and Utrecht. On average, these cities population's rate will grow with 15% in 2030, which pressurize their living environment and accessibility (CBS, 2016). In order to deal with this growth, the G4 chooses for policy designs of building compact neighbourhoods within their city areas supported by subsequent mobility strategies (Kwantes, 2019).

Within this strategy shared mobility and mobility hubs play an important role (Kwantes, 2019). The car has the image of a "waste of space" (Koningsbruggen, 2019). Therefore, as alternative for the car, shared mobility is emerging and has been researched in combination with reduced parking facilities as tool to guarantee cities' accessibility (APPM, 2020b). This seems a promising strategy to enhance the G4's future accessibility while building more residences within their city areas.

Next to that, the concept "Mobility as a Service" (MaaS) is raising their interest (Kwantes, 2019). MaaS combines all transport modes, offers a customized mobility package and integrates the booking, reserving and paying process through an app (Jittrapirom et al., 2017). For every individual the MaaS-environment offers an overview of combinations of modes to travel from A to B for one integrated price next to single way tickets (Gonzalez-Feliu, Pronello, & Salanova Grau, 2018).

Within this field, it is very interesting for the G4 to research the effects of MaaS within the living environment in combination with reduced parking facilities. MaaS might be an interesting alternative when policy designers combine its development within the spatial configuration and urban planning concepts, especially in the construction of new neighbourhoods (Dommeck, 2019). Furthermore, it could stimulate their goals in making people less dependent on the car and contributes to more and higher quality shared mobility platforms (Amsterdam, 2019).

1.2. Scientific relevance & Problem statement

From a scientific perspective, recent papers mostly used Stated Choice (SC) experiments to estimate MaaS' adoption rates. These experiments offered respondents the possibility to make trade-offs between different MaaS-subscriptions varying in costs and discount percentages of PT and shared devices. So far, it seems that no experiments exist taking the neighborhood design as goal of their research by analyzing the trade-off between the parking comfort, availability of mobility hubs and neighborhood characteristics to estimate the willingness to use MaaS.

Furthermore, there may be considerable opportunities for MaaS in combination with adjustments to the living environment, especially in the case of residential reallocation and as a replacer of a second car (see De Vliet (2019) and De Vos, Ettema & Witlox (2019)). The willingness to change travel habits and use of different modalities instead of owning a car (partly) based on adaptions to a new living environment aren't yet specified, especially not after a reallocation.

Also, in many inner-city centres residents commonly accept policy measures with the goal to reduce car traffic. Many cities design car-free or restricted city centres to increase both their accessibility and quality of life (Borgers, Snellen, Poelman, & Timmermans, 2008). However, research to residential parking policies seem rather scarce and the impact of restricted residential parking on short-term behaviour adaptions needs further research (Marsden, 2006). In such context the willingness of using MaaS is an interesting knowledge gap for further research.

Therefore, this research focuses at new residential areas designed in such a way to reduce the parking comfort in comparison to existing neighbourhoods while similarly placing "*MaaS-hubs*"[1]. These hubs offer shared bikes, -cars and access to local PT. For these new neighbourhoods it is interesting to clarify to what extent potential residents are willing to subscribe to MaaS and make trade-offs between the availability of MaaS-hubs and neighbourhood characteristics against the reduced parking comfort.

Within these contexts it is interesting to identify to what extent social demographics, current mobility costs, environmental layout and the current built environment influence these trade-offs. The literature identified different contradicting findings between these factors. Especially, the last two seems interesting, because residents might experience an improved street view, "quieter" streets, more space for children to play and a "greener" neighbourhood with increased traffic safety (Rubio, 2020).

Summarizing, the research focuses at a change in mobility behaviour from car to MaaS-subscriptions, especially for people who use the car regularly. Also, people moving to a new house, considering to buy a new or second car are possible target groups to switch to MaaS, because they are overthinking their travel behaviour and are more sensitive to adjust their travel habits (see De Vliet (2019) and Johansson, Henriksson & Envall (2019)).

1.3. Societal perspective

This research is especially relevant for the G4 municipalities in The Netherlands struggling with their future urban development design in combination with their accessibility. Due to their growing population, they face new challenges with respect to housing and offering attractive living areas in combination with innovative mobility solutions. Therefore, cities are designing new attractive neighborhoods to live in, but also have to assure the accessibility by offering new transport infrastructures.

Especially, nowadays the G4 is investigating different forms of shared mobility in combination with parking restrictions (APPM, 2020b). For example, Utrecht and The Hague are investigating new transportation concepts including the expansion of mobility hubs in combination with more space for bikers and walkers (NM-Magazine, 2016). Rotterdam focuses at new data driven transportation concepts as MaaS and Amsterdam tries to reduce "unnecessary use" of the living environment by stationary vehicles (Baron, 2016; NM-Magazine, 2016). This research can help them to determine their long term mobility strategies by estimating the impact of neighbourhood design characteristics on the subscription to MaaS. Therefore, it will applies its model results on a case study of the *Sluisbuurt* in Amsterdam.

Also, this research is interesting for MaaS providers and operators. They have to expand and design business plans to set up MaaS (Research, 2016). As newcomers to the market they have to find out their market segment and addressing the influence of built environment, personal and mobility cost characteristics can help them in finding their niche market.

Furthermore, MaaS in combination with mobility hubs could solve a "social" occupation problem in new residential areas. In neighbourhoods just being built PT-rates are quite low to operate an affordable PT-service. In their beginning phase, placing hubs with more individual shared mobility options as shared bikes and -cars can serve as alternative for PT till the construction of the

[1] Concrete cases/examples of neighbourhoods with plans to reduce number of parking places: The Hague *Binckhorst*, Rotterdam *Merwe-Vierhavens*, Amsterdam *Sluisbuurt* or Utrecht *Merwedekanaalzone*

whole neighbourhood is finished. Then, there are enough residents for an affordable and profitable PT-line through the neighbourhood.

1.4. Main research question

This research will answer the following main and sub-questions:

"To what extent influence neighbourhood designs potential residents their choice to submit to Mobility as a Service (MaaS) subscriptions?"

1. To what extent lead a reduced parking comfort, the availability of MaaS-hubs and additional neighbourhood characteristics to an increase in MaaS-subscriptions?
2. To what extent find people neighbourhoods with a MaaS-hub and additional neighbourhood characteristics instead of a reduced parking comfort attractive to live in?
3. Too what extent affect the current living environment, socio demographics and travel behaviour characteristics the relation between the neighbourhood's overall attractiveness and preference to subscribe to MaaS at the one hand and the neighbourhood's design at the other?
4. Too what extent can the municipality of Amsterdam use policies regarding a reduced parking comfort and the availability of MaaS-hubs to increase the liveability and accessibility in the "*Sluisbuurt"* in Amsterdam?

1.5. Relation to CoSEM

The master Complex Systems Engineering and Management (CoSEM) has as main objective to learn designing interventions in "socio-technical" systems, which exist of technical and social components focusing at the public and private domain (Knippenberg, 2019). In this research, the new neighborhood designs are the interventions within an institutional setting which have technical and social components. Operating MaaS-services in neighborhoods is an example of the technical component due to their complexity between multiple transportation systems. The social component exists of people's behavior change and whether they will make use of the new neighborhood hubs and MaaS-applications (Knippenberg, 2019).

Also, the MaaS-ecosystem exists of complex relations and interactions between technology systems offered by multiple MaaS-providers, existing transport providers and users. These are still in an innovative state (Gonzalez-Feliu et al., 2018). These neighborhood designs can solve social problems in the context of urbanization and accessibility and use helps with finding their niche market. Therefore, MaaS perfectly fits as designing in a "socio-technical" system. This research further explores the travel behaviour preferences in case that people live in such new designed neighbourhoods. Example of courses that are correlated with these issues are Statistical Analysis of Choice Behaviour (SEN1221) and Travel Behaviour Research (SEN1721).

1.6. Report structure

This report will have the following structure. Chapter 2 describes the current literature in accordance to MaaS, parking comfort, mobility hubs, neighborhood characteristics and the built environment. This chapter concludes with the conceptual model that specifies the relations between above described characteristics. Chapter 3 further outlines the experimental design and explains the operationalization of the conceptual variables. After that, Chapter 4 elaborates on the methodology. It explains the data analyzing models and the construction of the experiment and survey. Chapter 5 outlines the sample characteristics, where after Chapter 6 discusses the modelling results. Chapter 7 applies the models to the *Sluisbuurt* in Amsterdam to answer sub-question 4. Finally, Chapter 8 draws conclusions by answers the research questions and provides scientific and policy recommendations.

2. State of the art literature

This chapter has the goal to explain the research gap found in the literature with regard to MaaS. MaaS is a hot topic with lots of publications from the recent years and this chapter makes clear what specific parts of MaaS need further research. Also, it has the goal to explain the hypotheses from the introduction to make clear why these are important elements for further research from a scientific and social perspective. Therefore, this paragraph elaborates on characteristics of earlier research to MaaS, parking comfort, hub availability, neighbourhood and built environment. At the end, it summarizes the main findings in the conceptual model.

2.1. MaaS core concept

MaaS' main benefit is that it offers personal-based transport options by taking travelers' preferences into account through a common interface (Liyanage, Dia, Abduljabbar, & Bagloee, 2019; Mukhtar-Landgren, 2016). It combines travel planning, reservation and provides a ticket and payment procedure (Durand, 2019; Hasegawa, 2018). By combining all available data, including traffic jams and PT-delays, it can offer travelers an overview of journeys, called bundles, that helps them to choose the most appropriate or quickest transport mode(s) for their journey (Gonzalez-Feliu et al., 2018).

It has a numerous of advantages to offer these bundle within one package: it stimulates to travel by multiple modes and thereby allow travelers to use the existing infrastructure more efficiently, improves journeys reliability and predictability and increases travelers' accessibility (Durand, 2019; Liyanage et al., 2019). Also, it stimulates a more sustainable mobility system, because people don't need an own car anymore (Sperling, 2018). In a vision of the future owning an own car is outdated, because citizens have access to a "*range of transport alternatives packaged to their personal preferences*" (Christiaanse, 2019, p. 83). Lastly, travelers can compose their mobility packages dependent on their personal preferences and don't experience any "sunk costs", as memberships.

2.2. MaaS experiments & pilots

The amount of scientific literature with MaaS as subject has been growing during the last couple of years, but the amount of pilots is limited. A MaaS-pilot in Gothenburg (2013-2014), Sweden, focused on users' motives and barriers to use MaaS. It showed that MaaS was more attractive for people living in or near the city centre than in suburban areas (Strömberg, Karlsson, & Sochor, 2018). Another pilot in Vienna (2014-2015) showed that almost 90% of the users already used PT regularly and 77% possessed a bike. In total, the amount of users was limited: only 30% was using MaaS every week (Fioreze, de Gruijter, & Geurs, 2019). The Ministry of Infrastructure and Water management (I&W) has just started with seven pilots in The Netherlands to test MaaS in different contexts (Management, 2019). These pilots have a duration of two years and therefore first intermediate results aren't available before 2021

Because the amount of pilots is limited, most researches use SC-experiments to estimate MaaS' adoption rates and found that these were rather small. SC-experiments conducted in The Netherlands showed that respondents didn't adopt MaaS in large numbers and that they were very sensitive for the monthly price of the services (Caiati, Rasouli, & Timmermans, 2020). Similar, Fioreze et al. (2019) observed that only 20% of the residents was interested in using MaaS and stated that following-up researches need to better highlight MaaS' added value due to the unfamiliarity with the concept. The most recent SC-experiment conducted abroad (Australia and the UK) also found limited adoption rates (Ho, Mulley, & Hensher, 2020). Potential adopters believe in the economic potential of buying mobility services instead of possessing a car, but almost the majority of the population (nearly 50%) held on to the car. They concluded that the travelling public isn't willing to pay for a Maas-app, because they already have access to an advanced Australian PT-system.

2.3. MaaS from a financial perspective

MaaS' relative high cost component is one of the reasons for these limited adoption rates, especially in combination that Dutch travellers are very price conscious (De Vliet, 2019; Smit, 2019). Car users don't consider all kind of costs when owning a car (Turrentine & Kurani, 2007). They only have the variable costs in mind, as fuel costs, and forget the fixed costs (Scott & Axhausen, 2006). Also, it seems that people find it hard to imagine the situation when they don't have a car. Therefore, it is essential to outline the "real" monthly costs of having an own car (including insurance, taxes, depreciation and maintenance) to equally compare car ownership with MaaS-subscriptions. Monthly subscriptions, should make this comparison easier (De Vliet, 2019).

2.4. Parking comfort

The scientific literature with regard to car parking has grown during the past decade. This research especially focuses on the relation between parking comfort and the built environment (see Paragraph 2.4.1) and parking choice behavior in relative dense populated areas (see Paragraph 2.4.2).

2.4.1. Effects adaptions built environment

Recent studies emphasized the importance of adaptions in parking comfort to influence travel behavior. For example, Cao, Handy, and Mokhtarian (2006) concluded that policy programs with the goal to decrease car-traffic in neighbourhoods by reducing traffic speed might stimulate walking, which is in line with the findings from Frank and Engelke (2005). Stubbs (2002) emphasized that the parking place's security and distance between home and parking place are the most important design requirements and that residents only buy a house when the total parking quality is on point.

Furthermore, Christiansen, Fearnley, Hanssen, and Skollerud (2017) concluded that parking restrictions, as an increasing distance between home and home parking facilities, can reduce car use for home-work trips. Johansson (2019) reported quite similar conclusions by demonstrating a positive relationship between car ownership and parking availability. He highlighted that a package of mobility services, such as vehicle clubs, easy accessible and secured bicycle parking, subsidized monthly PT passes and restricting parking places, contribute to the growth of vehicle sharing and the use of PT. However, this didn't result in lower trip frequencies by car, but only to significant different modal shares (more walking and PT trips). Therefore, he recommended to evaluate flexible parking requirements in different contexts by varying the quality and availability of PT, parking prices and walking distance to local services.

Furthermore, Kirschner and Lanzendorf (2020) showed that parking requirements are a key element to manage private transport in urban neighbourhoods. They outlined that digital innovations, as MaaS, offer a possibility to reduce the amount of parking places. Similar, Sjöman, Ringenson, and Kramers (2020) suggested that MaaS can potentially support the transition to the usage of more sustainable transport modes in cities. Therefore, they advised to use quantitative modelling techniques to explore the relations between mobility services and urban form while including rules and regulations, such as speed limits and road restrictions. Also, Fioreze et al. (2019) concluded that the exact effects of a reduction in parking needs on travel behaviour is an interesting future research direction.

2.4.2. Car parking in cities

This sub-paragraph identifies the most influential characteristics influencing parking choice behavior in inner-cities (see Table 2.1 for a summary and Appendix A3 for a detailed overview).

Tsamboulas (2001) estimated drivers' parking behaviour and evaluated their trade-offs between different characteristics against hypothesized increases in parking fares to enhance a change from car to other modes. They concluded that especially **parking costs** and **walking times** are the most influential variables in people's parking choice decisions. Also, people's actual walking time to a parking place is on average five minutes and 50% of the drivers aren't willing to pay more when they have to park knowing that they face a walking time of ten minutes or more. People still use their car when the walking times increase with 50% in comparison with their current situation and only accept an increase in parking tariffs between 50% and 100% when they get a parking place relatively closely located to their homes.

Similar to Tsamboulas (2001), Bonsall and Palmer (2004) concluded that especially **parking tariffs** and **walking time** influence the parking choice. People with a higher income were less likely to choose parking places with longer walking times. Also, Khaliq, Van Der Waerden, and Janssens (2018) showed that logically **parking costs** was the most influential attribute and that a longer **distance between parking place and destination** had a negative effect on the parking choice. People were more willing to **park on-street** if security was available.

In his doctoral thesis, Van der Waerden (2012) developed a parking analysis model to visualize the role of parking facilities in drivers' decision process. The probability of considering a parking facility increases when it has lower **parking costs**, lower than average **egress time**, is more **favourable from home** and has a lower **distance to the nearest supermarket/store**.

Chaniotakis and Pel (2015) agreed with his results and concluded that **parking costs** and **probability of finding a free spot** were the most influential variables on people's parking choice decision. People searching a parking place in a monitored and secured parking facility had a lower maximum search time than drivers preferring a curb-side parking place. Also, they found heterogeneity in drivers' preferences in the appreciation of these characteristics, which are uncorrelated with any socio-demographic features. Also, Hai, Zhao, and Houn (2019) identified some kind of heterogeneity and agreed with the results from the previous discussed studies. Lastly, Chen et al. (2015) focused on people's preference of parking at P&R locations and similarly found that people based their parking decision on the **parking capacity**, **costs** and **search time**.

2.4.3. Conclusion parking comfort

The discussed research agree that MaaS could be a suitable alternative to reduce the amount of parking places in neighbourhoods. MaaS can help in this transition by combining its implementation with adaptions to the living environment. Parking restrictions and reducing parking availabilities are a tool to reduce car use. However, this relation need more research by varying different neighbourhood designs in facilities, availability of PT and parking context.

Researches to the parking choice behaviour in cities agrees that people choose a parking place mainly on the parking costs, walking distance to their destination and the certainty that the parking place is available. Also, trip purpose plays an important role in the search time for a free parking place. Therefore, these variables seem important to take into account while varying the different neighbourhood designs.

Table 2.1: Influential attributes parking choice behaviour

Research	Not influential attributes	Influential attributes	Research	Not influential attributes	Influential attributes
Tsamboulas (2001)	Trip purpose	Parking costs	**Van der Waerden (2012)**		Parking costs
		Walking time to destination			Egress time
Bonsall and Palmer (2004)	Access time	Parking tariffs			Walking time to destination
	Parking capacity	Walking time	**Chen et al. (2015)**		Parking capacity
	Trip purpose				Parking costs
Van Ommeren, Wentink, and Dekkers (2011)		Parking costs			Search time
De Vos & Van Ommeren (2018)		Walking time	**Khaliq et al. (2018)**	Type of parking place	Walking time to destination
		Occupancy rate	**Hai et al. (2019)**		Parking capacity
Chaniotakis and Pel (2015)	Socio-demographics	Parking costs			Parking costs
		Probability of free spot			Walking time to destination

2.5. MaaS-hubs

Mobility hubs are defined as "*multimodal transport nodes that facilitate intermodal transfers by providing different mobility options in close proximity*" (Miramontes, Pfertner, Rayaprolu, Schreiner, & Wulfhorst, 2017, p. 1325). They have the purpose to facilitate a multimodal lifestyle, especially for millennials born in the end of the twentieth century (Kuhnimhof, Buehler, Wirtz, & Kalinowska, 2012). MaaS is a relatively new mobility concept and therefore the literature on mobility hubs focused on MaaS are scarce. Therefore this paragraph will review the literature for mobility hubs in general (see Paragraph 2.5.1) and regarding the bike sharing hub systems (see Paragraph 2.5.2).

2.5.1. TOD typologies

In general, the literature distinguishes four types of mobility hubs depending on their significance scale: (1) nation-, (2) regional-, (3) local significance and (4) transfer points for PT-services (Top, 2020). This classification originates from the concept of Transit-Oriented Development (TOD) typology, where residential, commercial and business related spaces are located near PT-facilities to promote sustainable transport modes and reduce car usage (Cervero, 2004). Thereby, the "*five Ds*", design, diversity, density, diversity, destination and distance, have an important role to change travel behaviour by influencing the built environment (Ewing & Cervero, 2010).

Roughly, there exist two types of approaches to conceptualise and develop TOD typologies: a qualitative and quantitative approach (Higgins & Kanaroglou, 2016). The qualitative approach labels typologies based on geographical and functional neighbourhood characteristics, while the quantitative approach recognizes that TODs have different forms and that each neighbourhood is structured differently (Atkinson-Palombo & Kuby, 2011; Calthorpe, 1993). The qualitative approach distinguishes urban and neighbourhood TODs, where urban TODs are located in relatively high populated areas within approximately one kilometre from a rail or BTM-station and neighbourhood TODs in lower populated areas within ten minutes from a local BTM-station (Phani Kumar, Ravi Sekhar, & Parida, 2020). This study focuses on urban TODs in new residential areas (see Appendix A4.1 for complete overview).

Phani Kumar et al. (2020) made some important observations based on existing typology approaches. Mostly subjective approaches fail to quantify the urban structure, diversity and rely on little scientific support. Furthermore, policy makers prefer quantitative approaches, because these enable testing, comparisons and are more supportive in their long term planning process (Cervero & Murakami, 2009). Travel behaviour indicators as PT-use, mode share, kilometres travelled by car and car ownership should verify and validate the developing process of typologies (Austin et al., 2010).

However, one methodological problem exists. Researches analysing the relation between neighbourhood characteristics and type with linear regression analyses underestimate the coefficients' standard error and thereby overestimate the t-ratio significance (see Kim & Wang (2015)). Despite, limited studies used multiple linear regression models to examine the effects of the urban characteristics on individual travel behaviour for residents living in different urban types (Phani Kumar et al., 2020).

2.5.2. Bike sharing hubs

Multiple scholars researched bike ridership to identify attributes influencing the usage of hubs for shared bikes (see Scott & Ciuro (2019) for an overview). Multiple researches show that the hub flow increases when the hub contains **more bicycle facilities** and is positively correlated with the **population and job density** degree (Buck & Buehler, 2012; Faghih-Imani, Eluru, El-Geneidy, Rabbat, & Haq, 2014). Hubs located **relatively close to home** encourage people to use the hub (Bachand-Marleau, Lee, & El-Geneidy, 2012). El-Assi, Salah Mahmoud, and Nurul Habib (2017) concluded that the **number of hubs** significantly and positively influenced the **number of trips**. Also, they showed that **multiple stations** closed nearby with multiple options to park reduce the discomfort experienced when there aren't any shared bikes available at the station any more.

The literature is more divided about the **influence of facilities** nearby hubs. Maurer (2011) showed a negative correlation between the proximity to railway stations and flow rates, while Dadio (2012), Faghih-Imani and Eluru

(2015) and El-Assi et al. (2017) concluded that the proximity to shops, restaurants, universities, BTM-facilities and parks lead to higher flow rates. Lastly, **subscription members** favour a higher density of hubs with less capacity due to their daily usage, while customers with one day tickets favour fewer hubs with more capacity of bikes due to their recreational purpose (Faghih-Imani & Eluru, 2015).

2.6. Neighbourhood characteristics

In residential choice decisions neighbourhood and housing characteristics are significantly more important than accessibility considerations (Molin & Timmermans, 2003). Schirmer, Van Eggermond, and Axhausen (2014) classified multiple groups of residential location units used in residential location choice models (see Table 2.2). Researches operationalize these attributes in different ways (see Paragraph 2.6.1 and 2.6.2).

2.6.1. Characteristics car-free residential areas

Car-free neighbourhoods provide a (nearly) car-free environment, facilitate a change to modes other than car and limit the amount of parking facilities (Melia, 2014). In The Netherlands, policies aim to develop sustainable residential areas which should reduce the use of motorizes transportation modes while improving the overall quality of live (Borgers et al., 2008). These kind of residential areas should be located **two kilometres from the city centre**, **parking places nearby**, **excellent facilities** for bikes and walking (Borgers et al., 2008). However, concentrated car parks negatively influence the areas' attractiveness. Creating **excellent facilities** for non-motorised transport, **PT stops** within 500 metres from peoples' home and offering security at parking facilities can reduce their negative impact.

Quite similar, students seem to accept these car-free city centres when they have access over **separate bike lines** or bike lines combined with cars, with a distance of three to six minutes to the closest **PT-stop** and a guarded car-facility (Gundlach, Ehrlinspiel, Kirsch, Koschker, & Sagebiel, 2018).

Table 2.2: Overview residential location units by Schirmer et al. (2014)

Characteristics	Variables	Attributes	Characteristics	Variables	Attributes
Location attributes	Built environment	Built density	**Location attributes**	Socio economic environment	Population density
		Structural density			Household types
		Open space			Household origin and race
		Land use			Household income
	Points of interest	Education			Household costs
		School quality			Employment
		Service and retail			School quality
		Recreation and sport		Access and accessibility	Access
		Transportation facilities	**Housing unit attributes**		Costs, price, value
		Urban characteristics and centre			Unit size
Previous location and social network	Previous location				Housing type
	social network				Other features as number of garages

2.6.2. Evaluating urban green

The provision of urban green spaces benefits to an attractive residential image (Barbosa et al., 2007; Tu, Abildtrup, & Garcia, 2016). People associate improvements to open space and public areas, amount of outdoor community facilities and green routes with upgrading the visual appearance, stimulating the establishment of new businesses to the area and as substitutes of recreation areas (Barbosa et al., 2007).

However, data of the quality of environmental facilities are usually limited or only available as closeness to houses (Lanz & Provins, 2013). Therefore, applying SC-experiments have become popular for evaluating environmental goods and services, but these are still limited (Bertram, Meyerhoff, Rehdanz, & Wüstemann, 2017). This sub-section discusses the few SC-experiments found in the literature evaluating the benefits of urban green in cities.

Van Dongen & Timmermans (2019) found that **grass and flower sides** significantly influence the attractiveness of residential areas. Tu et al. (2016) found that generally people have a preference for houses with **a view on green spaces** preferably near or **closely located to parks** which is in line with earlier studies of Morancho (2003). However, in the study from Giergiczny and Kronenberg (2014) people weren't willing to pay extra local taxes to upgrade the environmental outline of streets.

Brander and Koetse (2011) concluded that the **value of urban open spaces** is positively correlated with the **population density**. Also, **urban parks** have the highest valuation in comparison with other types of urban spaces. Therefore, Bertram et al. (2017) specifically researched the differences in valuation of parks and concluded that the **extent of cleanliness**, **quality** and **maintenance** strongly benefits the parks' attractiveness. Playgrounds didn't statistically significant influence the choice of a urban park.

2.7. Relation usage of MaaS and socio demographics

Many researches with regard to MaaS' adoption rates include relations with socio demographic variables to determine which kind of groups are potentially more interested to use MaaS. However, the literature is divided to what extent these can predict or explain MaaS' adaption rates.

At the one hand, multiple researches show that travel habits and attitudes towards transport modes stronger affects MaaS adoption rates than socio demographics (Fioreze et al., 2019; Schikofsky, Dannewald, & Kowald, 2020). More research is needed to user perceptions to identify group characteristics (Schikofsky et al., 2020). Also, earlier research to car sharing and size of the activity space showed that travel behaviour indicators are better predictors (Ma, Gerber, Carpentier, & Klein, 2014; Münzel, Piscicelli, Boon, & Frenken, 2019).

At the other hand, recent SC-experiments found statistical significant relations between MaaS' adoption rates and socio-demographic variables (see Paragraph 2.7.1). Due to this contradictions, this research takes both socio demographics as travel behaviour characteristics into consideration.

2.7.1. Personal characteristics

Ho, Hensher, Mulley, and Wong (2018) concluded that **age** and **number of children** in the household influence the likeliness to subscribe to MaaS, while **gender**, the possession of **car-sharing memberships**, **household structure**, **size** and **car ownership** didn't. Especially, households with multiple children have lower adoption rates for MaaS in comparison with one-child households. The convenience of a private car increases when people have more children in the household.

Caiati et al. (2020) concluded that **gender**, **age**, **household situation**, **education-, income level** and **working status** have a significant influence on MaaS' adoption rates. For example, they found that younger people, specifically the age group between 18-25 and 25-35 are positively related to subscribe to MaaS in comparison with people aged between 51-65 and 65+. Ho et al. (2018) found similar results regarding these age groups, while Ho et al. (2020) found no differences in subscription forms based on socio-demographics.

Also similar to Ho et al. (2018), they found that younger adults still living with their parents, singles or households with children are more willing to adopt MaaS. Especially one-child households are more likely to subscribe to MaaS in comparison with households with multiple children. Surprisingly, people with the highest education rate have the lowest adoption rates, while mostly people with a middle level of education adopt MaaS. Due to the costs students, employed and retired people are more willing to subscribe to MaaS in comparison with unemployed people and job seekers. Similar, lower income classes has lower adoption rates for MaaS, while higher income people can easily afford MaaS (Caiati et al., 2020).

Lastly, MaaS seems especially interesting as substitute for the second car (Ho et al., 2018). Ho et al. (2020) found that car-sufficient households are more willing to subscribe to MaaS than car-negotiating household and concluded that MaaS may be a good alternative for the second car. Also, a recent master thesis from De Vliet (2019) found that people with a second car are more likely to use MaaS and to get rid of their second car. However, his sample wasn't representative for the Dutch population and therefore his findings should be interpreted carefully.

2.7.2. Travel behaviour characteristics

Multiple researches found an association between current travel behaviour and willingness to adopt MaaS. It seems that **frequent car users** are less willing to switch than infrequent users (Fioreze et al., 2019; Ho et al., 2018). Contradicting, in a later research Ho et al. (2020) found that the likelihood to subscribe to MaaS doesn't depend on households' car ownership levels. However, once subscribed their subscription preferences differ. Car negotiating household are more willing to adopt MaaS as a subscription member than as a "pay-as-you-go" user while for car sufficient households it is exactly the opposite.

On the other hand, **multi-modal oriented people** are more willing to subscribe to MaaS (Caiati et al., 2020; Ho et al., 2020; Jittrapirom et al., 2017). Also, people mainly travelling by bike are more willing to adopt MaaS (Caiati et al., 2020).

2.8. Changing travel behaviour and reallocation

Multiple papers concluded that "live events" trigger people to overthink their travel behaviour and habits. These introduce a "window of opportunity" for behaviour change. For example, a relocation could change their travel attitudes, due to different social norms in the new neighbourhood (Janke & Handy, 2019). Other examples are household thinking of buying or replacing a new car (see Johansson et al. (2019)).

However, studies with the main focus on the interaction between at the changes in the built environment and travel behaviour are limited (De Vos & Ettema, 2020), while existing papers show different conclusions. On the one hand, Zondag and Pieters (2005) concluded that accessibility have a moderate positive influence on residential location choice, while demographic developments, neighbourhood characteristics and especially housing attributes are more dominant explanatory variables for a reallocation.

On the other hand, De Vos et al. (2019) and De Vos & Ettema (2020) concluded that people moving to mixed-used neighbourhoods make more use of walking, cycling and PT and use the car less frequent in comparison to their previous neighbourhoods. People moving from the city to urban areas behave oppositely. Therefore, De Vos et al. (2019) advised policy makers to create more urban-style neighbourhoods to encourage even more the use of active travel and PT.

Similar, Zarabi, Manaugh, and Lord (2019) showed that mostly flexible travellers are willing to overthink their travel behaviour. They showed that individuals with strong habits to use public, active modes or car select themselves to live in a neighbourhood where they don't have to change their travel behaviour.

2.9. Influence of current living environment

Many studies found an association between people's living area and travel behaviour (Van Wee, De Vos, & Maat, 2019) and recognize the built environment as key factor to affect travel behaviour (Badoe & Miller, 2000). A common used example is that people living in cities use PT and slower modes (bike and walking) more frequently, while people living in quieter neighbourhoods use mostly the car.

2.9.1. Relation built environment and travel behaviour

Cao (2016) focused on the relation between the design of the built environment and their environmental characteristics in relation to the perceived accessibility and nuisance and life satisfaction. They concluded that the **share of open space** influenced the accessibility, while the **population density** didn't. Furthermore, households having multiple children experience a better accessibility, but were less content with their residential neighbourhoods.

Zang et al. (2019) analysed the influence of the built environment on the travel behaviour of elderly in public and private houses. The **amount of shops** in elderly's living environment significantly relates to the amount of walking for both groups, while the **land-use mix** was only a significant factor for those in public houses and **population density** and **urban greenness** only for those living in a private house. Also, they found that the **distance to the closest BTM-station** negatively influenced the number of trips for those in public houses.

2.9.2. Built environment and travel behaviour in relation with residential reallocation

Kährik, Leetmaa, and Tammaru (2012) analysed the motivations and satisfaction of households moving to new residential areas in suburban environments. They concluded that built environment reasons were more influential than the influence of life-event changes in decisions of residential reallocation. People gave much importance to residential factors as the **proximity** and **easy access to the city centre** and environmental aspects as **outdoor recreation opportunities**, the neighbourhood's **safety**. Due to a high level of car-based trips access to PT wasn't an important consideration. Also, social embeddedness, proximity to schools, food stores, supermarkets and playground for kids weren't influential factors.

Recently, Wang, Mao, and Wang (2020) distinguished subjective and objective neighbourhood environment indicators and only found significant impacts for the subjective indicators on travel satisfaction changes. This is in line with earlier research from Ettema and Schekkerman (2016). Travel satisfaction increases when people experience an improved accessibility, safety and more social interactions result in a higher level of travel satisfaction (see Appendix A.8.2).

2.10. Knowledge gap & conceptual model

This chapter showed that MaaS-adoption rates are limited and it has only potential as substitute for the second car. However, research suggested to combine MaaS with adaptions to the neighbourhood design as a potential successful policy design for MaaS. At the one side, these neighbourhoods should be attractive to live in, but at the other side they should have car restriction measures, as less parking places, and offer other MaaS-related transport opportunities. Furthermore, it showed that people especially reconsider their travel behaviour after a reallocation or when they have to buy a new car. However, the relation between changes to the built environment after a reallocation on a change in travel behaviour needs further research. Therefore, there is an opportunity for MaaS in creating new travel opportunities in case of residential reallocation. This research will combine both gaps.

In order to explain these relations the conceptual model (see Figure 2.1) builds on the Random Utility Theory (RUT) extended by McFadden. RUT assumes that people choose the travel option by comparing the experienced "*utility*" from each option (McFadden, 1986). It proposes that (1) observed and unobserved mode attributes, such as price, time and comfort, influence the mode's utility and (2) individuals are rationally and choose the travel option with the highest utility (Train, 2009). See Paragraph 4.2 for more explanation.

Besides transport mode attributes, contextual factors influence the mode's utility and thereby indirectly affect the mode's choice (Molin & Timmermans, 2010). The neighborhood designs change the influence of car's and MaaS' attributes (such as comfort and ease of use) and the mode's constants. The purpose is to test different neighborhood designs, while keeping the mode attributes constant. Varying modal attributes isn't part of this research's scope.

This model combines the reduced parking comfort, availability of MaaS-hubs, and quality of the neighborhood. In comparison with current "traditional" neighborhoods there is more space for additional neighborhood facilities, as parks or shopping facilities. Furthermore, the model hypothesizes that socio demographic variables, the current living environment and the extent that people find the design attractive to live in influence the relation between above characteristics and the willingness to adopt MaaS.

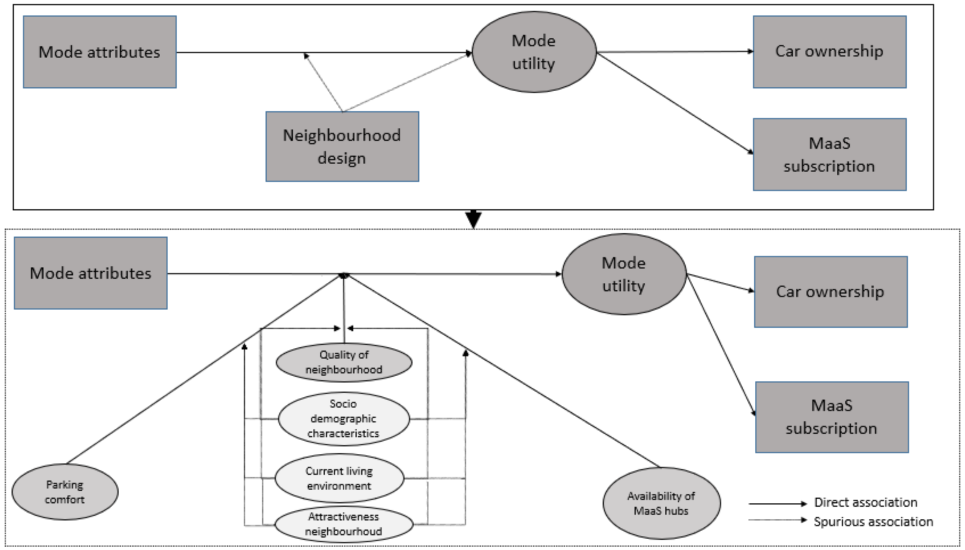

Figure 2.1: Conceptual model

3. Experimental design

This chapter discusses the experimental set-up to research the relations and MaaS' potential as proposed in the conceptual model. First, Paragraph 3.1 and 3.2 elaborates on respectively the research method, selected attributes and corresponding attribute levels. Then Paragraph 3.3 and 3.4 discusses the calculations of the current mobility costs and the built environmental factors. Finally, Paragraph 3.5 focuses on the social demographic variables.

3.1. Stated Choice experiment

The experiment contains a Stated Choice (SC) experiment. It is a widely applied method to measure individual preferences in the field of marketing and transportation. It gives designers insight in people's trade-off between the influence of different design effects on the residential areas attractiveness (Borgers et al., 2008).

3.1.1. Description of stated choice experiments

SC-experiments are a form of conjoint analysis, where characteristics describe services or goods and individuals can value these services based on the variation in levels of these characteristics (Ryan & Farrar, 2000). Stated preference theory postulates a link between the unobserved utility and the observed choice (see Louviere, Hensher & Swait (2000); Mark and Swait (2004)).

They work as follows (see for overview Appendix C1). Respondents weight different levels of characteristics against each other and choose their different preferred option. Designs vary these levels systematically. This offers the possibility to draw conclusions about people's preferences, their way of outweighing and dealing with trade-offs (Ratilainen, 2017). Also, they can take future, not yet existing, situations into account, which makes them suitable to estimate MaaS' adoption rates (Wittink, 2011).

3.1.2. Context dependent stated choice experiment

This experiment contains a context-dependent SC-experiment. The context describes the choice situation and assumptions that respondents have to take into consideration when making their choices (see Molin (2019)). It looks as follows: respondents judge different neighborhood designs based on the variation in neighborhood characteristics. For each design they have to indicate the overall attractiveness and have to choose between owning a car or a MaaS-subscription (see Chapter 4).

The designs don't vary the characteristics of MaaS-subscriptions as previous MaaS-experiments and therefore derive their characteristics (discount percentages, costs and mobility options) from these experiments (see Paragraph 3.3.2). However, there seems no reasons why the variety of respondents' preferences in MaaS-subscriptions would differ based on contextual factors. Therefore, respondents choose one of the proposed MaaS-subscriptions as their preferred and only choose between their preferred MaaS-subscription, the car (or multiple cars in case they have two or more cars) or both of them (see Chapter 4).

3.2. Selection of attributes

In total, the SC-experiment varies three conceptual factors: parking comfort, availability of MaaS-hubs and neighbourhood characteristics (see Table 3.1 for an overview). The studies discussed by Paragraph 2.4 concluded that the **type of parking place** and **walking time to home** are the most influential attributes influencing parking choice behaviour.

From bike-sharing hub literature there seems convenient evidence that the **hub type** and **distance to facilities** influence occupancy rates significantly. The hub type is combined with different PT-facilities, because the literature showed that bike sharing hubs near metro stations result in higher trip rates.

Also, earlier SC-experiments showed that the **urban green**, **facilities** within the neighbourhood and **street access regulation** are the most influential variables for people looking at the overall quality of residential areas.

3.2.1. Parking comfort

Reviewed studies operationalized the parking comfort by many attribute types, as an increasing distance between home and home parking facilities, availability of parking places, type of parking places and parking tariffs. All agrees in choosing the following attributes: distance between destination and parking place, type, capacity and costs. This experiment only takes the **distance** and **type** into consideration.

Table 3.1: Overview attributes and attribute levels

Conceptual factor	Attribute	Attribute level	Attribute	Attribute level
Parking comfort	Walking time home – parking place	2 min	Type of parking place	Reserved parking place at street
		5 min		Public parking area
		8 min		Public parking garage
Hub availability	Walking time home – MaaS-hub	2 min	Type of MaaS-hub	Hub with shared bikes and -cars
		5 min		Hub with shared bikes, -cars near BTM station
		8 min		Hub with shared bikes, -cars near BTM/train station
Quality neighbourhood	Urban green	Green grass zones besides street	Street access regulation	Streets accessible for cars
		Small parks		Streets prioritising bikers ("*Fietsstraten*")
		Big park		Streets inaccessible for cars
	Facilities	Food shops		
		Food + non-food shops		
		Food + non-food shops, theatres, restaurants, hotels		

This research doesn't take parking costs and capacity into account for the following reasons: firstly, nowadays in The Netherlands parking costs for residential parking only play a role in the city centre or areas closely located to the city centre. In neighbourhoods in suburban areas, parking is normally free. Also, there is mostly enough space to park nowadays and more car restrictions wouldn't benefit the attractiveness of the neighbourhoods. Thirdly, it seems hard for respondents to imagine new residential areas without enough room to park and therefore it is uncertain whether respondents can make plausible choices.

The walking time is used as proxy for the distance between home to parking place (similar as recent SC-experiments), according to an average speed of 1,5 minute per 100 meter. Generally, walking times give respondents a better approximation than a distance because people find it hard to distinguish the difference between distances in meters.

The attribute levels for the walking time are derived from multiple earlier conducted SC-experiments and varied within the following range (see Appendix B.1.1 for a detailed overview). In some studies the walking time was rather short, below the two or five minutes, while other studies took a longer walking time of eight to ten minutes into account. The attribute levels for the type of parking place are based on guidelines of the CROW, *Kennisinstituut Mobiliteitsbeleid* (KiM) and earlier SC-experiments. Parking at P&R's is out of scope, because these are mostly located outside cities to offer access to the inner-city area instead.

3.2.2. Availability of MaaS-hubs

This research focuses only at MaaS-hubs located in new residential areas with a lower to medium density degree relatively close to local PT. It varies between hubs located in the neighbourhood with only shared bikes and -cars and hubs near PT-services. The hub conceptualisation is relatively simple, because earlier research showed that mostly respondents are yet unaware of the meaning of MaaS and comprehends the idea of MaaS better when it includes less modes (Matyas & Kamargianni, 2019). Also, additional hub services seems not an influential attribute for the willingness to use MaaS, according to a recent published master thesis from Raijmakers (2019).

The **distances between home and hub** are derived from literature. The Mobility Hubs program from the Los Angeles Department of City Planning stated that the "ideal" distance between bike sharing stations is within a range of ¼- ½ mile (approximately 400 – 800 meter) (Planning, 2016). On average, people are likely to walk 400 meter to a hub. In the Netherlands, experts estimated the catchment area of mobility hubs around 300 to 500 meters (Rooij, 2020).

3.2.3. Quality of the neighbourhood

The attribute levels for **urban green** are derived from the reviewed SC-experiments. For example, Van Dongen & Timmermans (2019) found that grass and flower sides significantly influence the attractiveness of residential areas, while also urban parks have a high valuation as urban green (see Shao, Tian, and Fan (2018)).

Furthermore, they showed that the importance of **facilities** as neighbourhood characteristic in relation to residential reallocation and travel behaviour. The attribute levels for facility levels are derived from plans for new to build residential areas with a relative low parking norm in The Netherlands, such as "*Merwedekanaalzone*" in Utrecht (Merwede, 2020). These plans emphasized the importance of commercial and social-cultural facilities besides necessary facilities as supermarkets and schools. Examples are non-food shops, hotels, restaurants, cinemas, theatres and a sports hall.

The **street access regulation** attribute represents multiple neighbourhood characteristics, such as the safety for kids to play on streets, the accessibility for cars, experienced nuisance and accessibility perceptions. For example, streets where cars are forbidden offer more possibilities for kids to play outdoor and cause less nuisance.

3.3. Mobility costs

This paragraph explains the calculations of the costs for car, MaaS-subscriptions and PT. These estimations make respondents aware of their current monthly mobility costs before choosing a MaaS-subscription. These estimations represent the "real" monthly car costs, including insurance, tax, depreciation, maintenance and fuel costs.

3.3.1. Operationalization car costs

The car costs depend on the kind of car that respondents have: an own car, lease car with and without private use from the employer or own business and a private lease car. The costs of having an own car depend on the car class where the car belongs to, as denoted by the European Commission (4064/89, 17 March 1999): mini-, compact-, compact middle-, middle- and higher middle class. This research uses the most recent car costs estimations from the Nibud, the National Institute for Budgetary Information in The Netherlands (Nibud, 2020). These estimations don't include estimations for higher class cars and therefore their costs are presented as the minimal amount of middle class costs. Also, they get different examples per car class to avoid that they choose the wrong car class.

For the lease car excluding private use, this experiment assumes that the current car costs are €0, all on behalf of the employer. The costs of having a lease car with private use or private lease car depend on the additional tax liability ("*bijtelling*") that respondents have to pay. Respondents can choose between different categories divided per €100 (so from €0-€100, €100-€200 etc.) where the estimation is the average of this category. The private lease car costs are extended with an estimation for the fuel costs (see Appendix B.2.1 for a detailed explanation).

3.3.2. MaaS subscription packages

Respondents can choose between three different MaaS-subscriptions (see Figure 3.1), derived from recent experiments (see Appendix B.2.2 for detailed explanation). These only exists of train, BTM, shared car and -bike to keep them relatively simple for respondents to understand (see Matyas and Kamargianni (2019)). Prices and discount percentages per mode are in accordance with Caiati et al. (2020), Fioreze et al. (2019) and De Vliet (2019). The prices for shared car are based on existing prices of *Greenwheels*, national train operators' shared car service in The Netherlands, and are in line with Ratilainen (2017). Lastly, shared bikes have discount percentages derived from Fioreze et al. (2019) and Caiati et al. (2020)

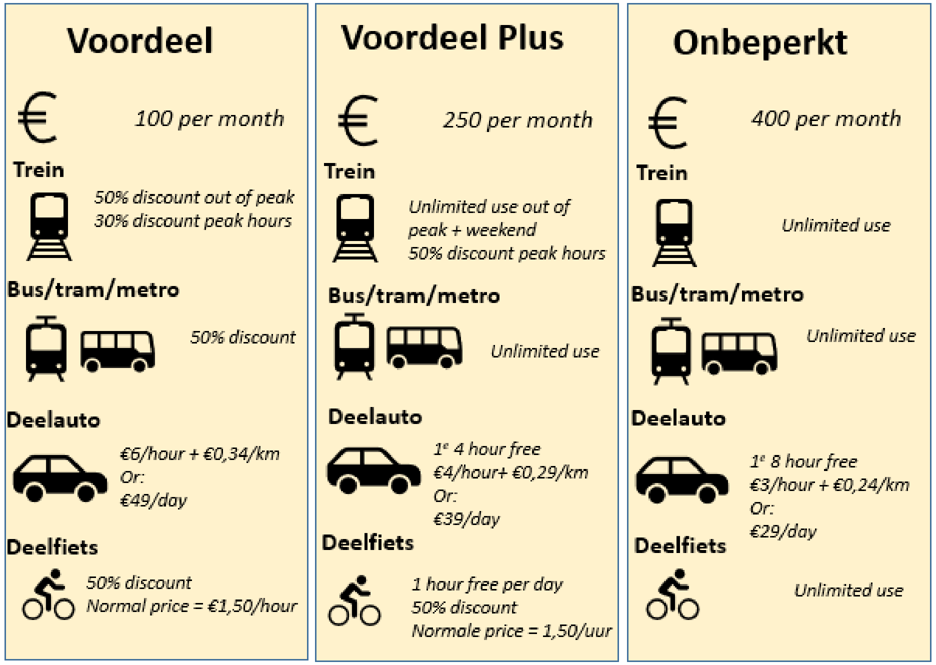

Figure 3.1: Three selected MaaS subscriptions

3.3.3. Operationalization PT-costs

The PT-costs are based on PT-subscription prices. Respondents can choose between nation-wide-, regional-, and NS-subscriptions (see Appendix B2.3 for an complete overview). If the price depends on the specific trajectory or respondents don't possess any of the described subscriptions, they give an indication of their monthly PT-costs divided in categories per €50 (i.e. €0-€49,99/€50-€99,99), where the average per category determines respondents' PT-costs.

In case that the employer is fully responsible for the costs or respondents have a student PT-subscription paid by the Ministry of Education, Culture and Science, the experiment assumes that their PT-costs are zero. In case that the employer only partly remunerates respondents' PT-costs, the experiment calculates the PT-costs dependent on the remuneration's average percentage, divided in categories per 20% (so 0-20%, 21-40% etc.).

3.4. Built environment indicators

This research takes different built environment indicators into account, according to the following sub-categories: **distance to local services**, **greenness** of the neighbourhood, **kind of residential area** and a **"remaining" category**. The kind of residential area is about the dwelling type and population density and the remaining category contains factors as "quietness" of the neighbourhood and amount of car traffic. Besides these factors, built environment factors with specific interest to the **parking context** are also interesting to take into consideration, such as the type of parking place, distance to public parking place and parking pressure in the neighbourhood.

This experiment applies both objective and subjective indicators to measure built environment indicators. The first method uses statistical data obtained from a national statistical office or government to calculate the indicators. The second method asks respondents with a survey where they can address their agreement on statements on a five or seven point scale. This experiment applies both methods.

The Dutch Central Statistical Office (CBS) provides population-, liveability-, motor vehicles-, surface- and urbanity factors per neighbourhood (see Statline (2020b)) and the "*Leefbaarometer*" measures the liveability of residential areas in The Netherlands, (Ministry of Internal Affairs, 2020). The six-digit postcodes provide access to the exact neighbourhood names. In case that respondents aren't willing to give their six-digit postcode, they got the options to give their four-digit postcode or residence. This offers at least the possibility to compare the characteristics per municipality.

Secondly, from built environment factors where the CBS and Leefbaarometer don't supply any statistics, the experiment uses statements with a five point scale to measure respondents' agreement. See Appendix B.3.2 for detailed explanation.

3.5. Socio-demographic variables

This experiment includes a broad range of socio-demographic variables: gender, age, household situation, amount of children and cars in the household, education and income level and working status, similar to the discussed SC-experiments. Travel behaviour indicators are measured based on the extent of car- (as driver and passenger), train, BTM, bike, shared car and -bike usage. Also, this part includes two additional socio-demographics questioning people's willingness to move and buy a new car (new, second-hand or (private) lease car) between now and five years. Appendix B.4 provides an overview of the exact categories for the survey.

4. Methodology

First, Paragraph 4.1 discusses the outline of the Stated Choice Experiment, which underlines different research methods. Paragraph 4.2, 4.3 and 4.4 elaborate respectively on the regression-, discrete choice-, and Integrated Hierarchical Information Integration model. Paragraph 4.5 and 4.6 respectively discuss the construction of the experiment and the survey design. Lastly, Paragraph 4.7, 4.8 and 4.9 explain the population-, data considerations and data preparation.

4.1. Outline Stated choice experiment

The experiment varies 18 designs with two questions (see Paragraph 4.5). The first question measures the overall attractiveness of the neighbourhood by a ten point scale. A regression analysis explores the total neighbourhood attractiveness (see Paragraph 4.2).

The second question focuses at the choice between the chosen MaaS-subscription and the car. This part distinguishes people living in households with one or multiple cars. People living in households with zero or one car choose between the chosen MaaS subscription, car or both MaaS and car. For the other group the combination option consists of the combination with one- or two-cars. This extension tests whether respondents are willing to give up their second car for a MaaS subscription. Discrete choice modelling analyses this experiment (see Paragraph 4.3). Lastly, the integrated Hierarchical Information Integration approach (HII) combines both experiments (see Paragraph 4.4).

4.2. Regression analysis

A regression model has the purpose to make inferences about the relationship of the dependent variable's mean in relation with the independent variables, see Appendix C.2 for a complete explanation (Freund, Wilson, & Sa, 2006).

4.2.1. Linear regression model

The linear regression model is the regression model's simplest form and has the following assumptions: (1) it adequately describes the data's behaviour and (2) the random error component (ε) is an independently and normally distributed (mean of zero and variance σ^2). It is written as follows (see Freund et al. (2006) for more details):

$$y = \beta_0 + \beta_1 x + \varepsilon \quad (1)$$

The parameters β_0 and β_1 represent the regression coefficients with β_0 as intercept and β_1 as slope. The random part of utility (ε) describes the responses' variability about the mean. The regression coefficients are estimated in such a way that the sum of squared deviations (SS) is minimized (see equation 2). The estimator β_1 represents the sum of cross products for the differences between the observed values and the mean for x and y divided by the squared differences of the x-values (see equation 3).

$$SS = \sum(y - \widehat{\mu_{y|x}})^2 = \sum(y - \widehat{\beta_0} - \widehat{\beta_1}x)^2 \quad (2)$$

$$\hat{\beta}_1 = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sum(x-\bar{x})^2} = \frac{SS_{xy}}{SS_{xx}} \quad (3)$$

4.2.2. Multiple linear regression model

The multiple linear regression model enhances multiple independent variables with relationships between each other (Freund et al., 2006). The equation looks quite similar as equation 1 with y as dependent variable, x_j as different independent variables, β_0 as intercept, β_j as corresponding partial regression coefficient and ε as random error component (see equation 4). The coefficients represent the effect of the average change of the independent variable on the dependent variable while keeping all other variables constant.

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_m x_m + \varepsilon \quad (4)$$

4.3. Discrete choice modelling

Discrete Choice model (DC) are commonly used models in the literature to estimate the Willingness To Pay (WTP) for not existing attributes and are therefore very useful to estimate the trade-offs between MaaS and car (Torres, Greene, & Ortúzar, 2013). They explain and predict choices between two or multiple discrete events and assume that individuals choose the option with the highest overall utility according to the random utility theory (see McFadden (1974)). Appendix C.3 shows a complete explanation of the whole method.

4.3.1. Multinominal Logit Model

When choosing between different options, both unobserved and observed attributes influence a certain behavior. The observed utility (V_i) exists of measured and observed attributes, while the unobserved utility (ε_i) consists of everything that influences the choices that isn't part of the observed variables (see equation 5). The weight of the observed attributes show the attribute's importance relative to other observed attributes and unobserved factors, see equation 6 (Hensher, Rose, & Greene, 2005). Additional Alternative Specific Constants (ASC) are estimated and represent the averaged utility from all unobserved attributes of an alternative's utility (Hensher et al., 2005).

$$U_i = V_i + \varepsilon_i \text{ (5)}$$

$$V_i = \sum_m^n \beta_m * x_{im} \text{ (6)}$$

The Multinominal Logit (MNL) model's non-random part is EV Type I distributed across the alternatives (Train, 2009). It follows the i.i.d. assumption and assumes that the error components from all alternatives have an equal probability distribution and are mutually independent distributed (Louviere et al., 2000). This allows for relatively easy computations with the current available software. If *J* denotes the number of alternatives within a choice set, the probability *P* that respondents choose alternative *i* from choice set *n* is the following:

$$P_i = \frac{\exp V_i}{\sum_{j=1}^{J} \exp V_j} \text{ (7)}$$

The Maximum Likelihood-principle is the underlying principle to estimate the data, which assumes that the estimated parameters are the most probable according to the statistical data (see equation 8). This principle underlies the calculation of the McFadden's rho square, representing the overall model fit (see equation 9). When the rho-squared results in respectively zero or one, the model isn't better than "throwing a dice" or there is a perfect fit. A satisfactory to good model fit accords with a rho-square between 0,2 and 0,3. Then the estimated model can optimize the neighborhood designs and the researcher can select the attribute levels that maximize the total utility (Borgers et al., 2008).

$$LL(\beta) = \sum_n \sum_i y_n * \ln(P_n(i|\beta)) \text{ (8)}$$

$$\rho^2 = 1 - \frac{LL_\beta}{LL_0} \text{ (9)}$$

4.3.2. Panel Mixed Logit model

However, MNL-models have a number of disadvantages. For example, the MNL-model can't capture nesting effects, while the MaaS only and the combination alternative have similarities, such as its novelty in cost perception and travel behavior. Because MaaS is relatively new, people might have an adverse against MaaS and a preference for the car, as shown by earlier researches (see for example Caiati et al. (2020) and Fioreze et al. (2019)). Therefore, a ML-model is estimated to capture the nesting effects between the car in one nest and MaaS and combination alternatives in the other nest. The ML-model adds an additional error term to its utility function which represents the utility of the alternatives' common unobserved factors in a nest. It calculates the choice probabilities as follows:

$$P(i) = \int_{\upsilon}^{n} [(P_i|\upsilon) * f(\upsilon) d\upsilon] \text{ (10)}$$

Lastly, the MNL-model assumes that there isn't any correlation between the choices from one respondent, while in reality these are correlated. Therefore, this research estimates a Panel ML-model, which can captures these correlations and calculate the choice probabilities as follows.

$$\oiint P(i) = \iint_{\upsilon,\beta}^{n} [\prod_{t=1}^{T} (P_i|\upsilon, \beta) * f(\upsilon)\, d\upsilon d\beta] \text{ (11)}$$

4.4. Integrated hierarchical information integration approach

The integrated Hierarchical Information Integration approach (HII) developed by Oppewal, Louviere, and Harry (1994) combines both the rating and choice experiment, which increases the experiment's validity (see Appendix C.4 for a total explanation). It consists of two questions: the first question asks to evaluation of a combination of attributes on a ten-point scale, similar as in conventional HII experiments. Only then, a second question follows asking to derive an overall evaluation of the whole alternative. This offers the possibility to take the attractiveness component into consideration in the choice model's utility function (Oppewal et al., 1994).

4.5. Construction of experiment

Appendix C.5 shows the theoretic overview of the experimental considerations, which is used to construct the experiment. Firstly, the experiment follows the attribute level balance property meaning that the design includes all attribute an an equal number of times (Rose & Bliemer, 2009). It allows to estimate non-linear effects.

Almost all attributes are categorical and therefore need a coding structure. This research applies effect-coding, which is a coding structure where the reference level is coded of only minus ones and the sum of all indicator variables is equal to zero (Bech & Gyrd-Hansen, 2005). Therefore, the estimated coefficients show the influence of each level compared to the average utility (Molin & Timmermans, 2010). The design considers the current neighborhood' situation as reference situation (see Table 4.1). Currently, walking times to parking places are rather small, while to a hub are relatively large. Most streets offer access for cars, while other variables have as reference level the least attractive attribute level containing the minimum amount of that attribute.

The experiment is constructed by an orthogonal design. These contain a subset of the full factorial design comprising all possible choice situations and have the aim to minimize correlations between attributes in the choice situations. They have the benefit that attributes don't correlate between all choice sets, so it combines each level of an attribute with each level of another attribute for an equal number of times (Molin, 2019). This results in the lowest possible standard errors for the estimated coefficients in case of estimation a linear model.

The software programme Ngene generated the choice sets for the orthogonal design. Ngene requires the specification of the number of rows and therefore Basic plan 4 is used as reference (see Molin (2017)). It offers the possibility to vary seven attributes varied in three levels, resulting in 18 choice sets. Alternatives and choice sets are created simultaneously (see Molin (2018b)).

Earlier research showed that respondents move from attribute based strategies to simpler strategies by focusing on the key attributes as price (Swait & Adamowicz, 2001). Therefore, nine to ten choice sets are the maximum number that respondents can handle (Caussade, Ortúzar, Rizzi, & Hensher, 2005). This resulted to split the design into two blocks (nine choice sets per block). Thereby, each block isn't orthogonal, but attribute level balanced. Appendix C.5.4 give an overview of Ngene's syntax and the generated design by Ngene.

The utility functions for the rating experiment have the following specification. Appendix C.5.2 shows the utility function for the rating model including interactions.

$$Rating_{designx} = Constant +$$
$$\beta_{Walktime\text{-}home\text{-}hub1} * \text{Walktime-home-hub1} + \beta_{Walktime\text{-}home\text{-}hub2} * \text{Walktime-home-hub2} +$$
$$\beta_{type\text{-}hub1} * \text{Type-hub1} + \beta_{type\text{-}hub2} * \text{Type-hub2} +$$
$$\beta_{walktime\text{-}home\text{-}PP1} * \text{Walktime-home-PP1} + \beta_{walktime\text{-}home\text{-}PP2} * \text{Walktime-home-PP2} +$$
$$\beta_{type\text{-}PP1} * \text{Type-PP1} + \beta_{type\text{-}PP2} * \text{Type-PP2} +$$
$$\beta_{green1} * \text{Green1} + \beta_{green2} * \text{Green2} +$$
$$\beta_{streets1} * \text{Streets1} + \beta_{streets2} * \text{Streets2} +$$
$$\beta_{facilities1} * \text{Facilities1} + \beta_{facilities2} * \text{Facilities2}$$

Table 4.1: Effect coding scheme neighbourhood design variables

Attribuut	Attribuut level	l_1	l_2
Walking time home – parking place	8 min	1	0
	5 min	0	1
	2 min	-1	-1
Type of parking place	Public parking garage	1	0
	Public parking area	0	1
	Reserved parking place besides the street	-1	-1
Walking time home –hub	2 min	1	0
	5 min	0	1
	8 min	-1	-1
Type of MaaS-hub	Hub with shared bikes, -cars near BTM/train station	1	0
	Hub with shared bikes, -cars near BTM station	0	1
	Hub with only shared bikes, -cars	-1	-1
Provision of green	Big park in the middle of neighbourhood	1	0
	Small parks divided through neighbourhood	0	1
	Green grass zones besides streets	-1	-1
Street access regulation	Streets inaccessible for cars	1	0
	Streets prioritising bikers ("*Fietsstraten*")	0	1
	Streets accessible for cars	-1	-1
Facilities	Necessary, non-necessary, entertainment facilities (theatres, restaurants, hotels)	1	0
	Necessary and non-necessary facilities (non-food shop)	0	1
	Necessary facilities (food shops and local school)	-1	-1

The utility functions for the choice experiment looks quite similar as the rating experiment. In total, it distinguishes four utility functions, i.e. for car, MaaS and combination with one and two cars. It only estimates an ASC instead of a rating constant (see example below). Appendix C5.3 shows a total overview of the specification of all other utility functions.

$$
\begin{aligned}
V_{MaaS} = {} & ASC_{MaaS} + \\
& \beta_{Walktime\text{-}home\text{-}hub1} * \text{Walktime-home-hub1} + \beta_{Walktime\text{-}home\text{-}hub2} * \text{Walktime-home-hub2} + \\
& \beta_{type\text{-}hub1} * \text{Type-hub1} + \beta_{type\text{-}hub2} * \text{Type-hub2} + \\
& \beta_{walktime\text{-}home\text{-}PP1} * \text{Walktime-home-PP1} + \beta_{walktime\text{-}home\text{-}PP2} * \text{Walktime-home-PP2} + \\
& \beta_{type\text{-}PP1} * \text{Type-PP1} + \beta_{type\text{-}PP2} * \text{Type-PP2} + \\
& \beta_{green1} * \text{Green1} + \beta_{green2} * \text{Green2} + \\
& \beta_{streets1} * \text{Streets1} + \beta_{streets2} * \text{Streets2} + \\
& \beta_{facilities1} * \text{Facilities1} + \beta_{facilities2} * \text{Facilities2}
\end{aligned}
$$

V_{car}	= utility car alternative
V_{MaaS}	= utility MaaS alternative
$V_{MaaS+1car}$	= utility combination with 1 car alternative
$V_{MaaS+2\,cars}$	= utility combination with 2 car alternative
$\beta_{walktime-home-hub1}$	= parameter for first component walking time between home and MaaS-hub
$\beta_{walktime-home-hub2}$	= parameter for second component walking time between home and MaaS-hub
$\beta_{type-hub1}$	= parameter for first component type of MaaS-hubs in neighbourhood
$\beta_{type-hub2}$	= parameter for second component type of MaaS-hubs in neighbourhood
$\beta_{walktime-home-PP1}$	= parameter for first component walking time between home and parking place
$\beta_{walktime-home-PP1}$	= parameter for second component walking time between home and parking place
$\beta_{type-PP1}$	= parameter for first component type of parking places in neighbourhood
$\beta_{type-PP2}$	= parameter for second component type of parking places in neighbourhood
β_{green1}	= parameter for first component urban green
β_{green2}	= parameter for second component urban green
$\beta_{streets1}$	= parameter for first component street access regulation
$\beta_{streets2}$	= parameter for second component street access regulation
$\beta_{facilities1}$	= parameter for first component facilities in neighbourhood
$\beta_{facilities2}$	= parameter for second component facilities in neighbourhood
ASC_{MaaS}	= parameter for alternative specific constant for MaaS alternative
$ASC_{carMaaS}$	= parameter for alternative specific constant for combination with 1 car alternative
$ASC_{2carMaaS}$	= parameter for alternative specific constant for combination with 2 car alternative
Walktime-home-hub1	= first component walking time between home and hub
Walktime-home-hub2	= second component walking time between home and hub
Type-hub1	= first component type of MaaS-hub in neighbourhood
Type-hub2	= second component type of MaaS-hub in neighbourhood
Walktime-home-PP1	= first component walking time between home and parking place
Walktime-home-PP2	= second component walking time between home and parking place
Type-PP1	= first component type of parking place in neighbourhood
Type-PP2	= second component type of parking place in neighbourhood
Green1	= first component urban green in neighbourhood

Green2	= second component urban green in neighbourhood
Streets1	= first component street access regulation in neighbourhood
Streets2	= second component street access regulation in neighbourhood
Facilities1	= first component facilities in neighbourhood
Facilities2	= second component facilities in neighbourhood

In total, the utility function requires the estimation of 17 parameters, i.e. 14 attribute parameters and three ASCs. The ASC for the combination with two cars is only estimated when people have two or more cars. Thereby, the minimum number of choice sets for people with respectively one or multiple cars is ten and nine and therefore the design is suitable to estimate all parameters.

4.6. Survey design and pilot survey testing phase

The survey consists of six parts: (1) introduction, (2) current mobility costs, (3) introduction to MaaS and experiment with nine choice situations, (4) characteristics of current living environment, (5) social demographic variables and (6) end text (see Appendix C6 for an complete overview and Appendix G for the final survey design). The survey starts with a short introduction considering the GDPR-requirements (see Paragraph 4.7.3).

In total, a convenience sample of 19 persons between 18 and 57 years old tested the survey to make sure that respondents will understand all questions and to optimize the neighbourhood design layout. The testing phase contained multiple test rounds due to multiple adjustments. This resulted in a shortened introduction text, reduced the amount of grammatical errors and improved the understanding of questions and statements.

Also, tester gave some feedback about the clearance of the varied attributes and the visualisation of the choice sets. The group tested the choice sets' visualisations intensively due to the potential advantages and disadvantages of visualisations described in the literature (see Jansen, Boumeester, Coolen, Goetgeluk, and Molin (2009) and Green and Srinivasan (1978) for an overview). After multiple test rounds, these still leaded to a difference in perception between researcher, respondents and respondents themselves. Therefore, a table format replaced the visualisations in the final version (see Figure 4.1).

1. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.
2. Stelt u zich voor dat u zou verhuizen naar bovenstaande wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement?

VB

Wijk		Looptijd huis – MaaS hub		Auto	
Groenvoorziening	Kleine parkjes verspreid door de wijk	**Looptijd huis – MaaS hub**	2 minuten	**Looptijd huis - parkeerplek**	8 minuten
Voorzieningen	(1) Noodzakelijk (food winkels + basisschool) (2) Niet-noodzakelijk voorzieningen (non-food winkels) (3) Uitgaansgelegenheden (horeca, theater, bioscoop)	**Type MaaS hub**	Hub met: (1) Deelfietsen (2) Deelauto's (3) Bus of tramhalte (4) Treinstation voor stoptreinen	**Type parkeerplek**	Openbare parkeerplaats op parkeerterrein
Inrichting straten	Fietsstraten waar de auto te gast is				

Figure 4.1: Example choice situation design

4.7. Population and recruitment procedure

Participants should meet three requirements to belong to the population. Firstly, participants should live in relative dense populated city areas in The Netherlands, so that they can imagine how it is to live in the proposed designs. Also, participants should have access to a car or make regularly use of the car to be able to compare MaaS with the car. This criterium excludes people younger than 18 years, because they can't independent drive in The Netherlands. Lastly, preferably people should consider a reallocation or buying a new car. This enables to estimate specific travel behaviour changes for people that are considering to move or buy a new car.

4.7.1. Recruitment of participants

The COVID-19 crisis complicated the recruiting process and therefore the survey is distributed in multiple ways. Firstly, I used my personal and APPM's network to further spread the survey. Thereby, social media as LinkedIn was the main source (see Paragraph 4.7.3 for ethical considerations). APPM consists of around 80 employees in the functions of consultants and process managers (junior and senior) working in fields as mobility, urban development, water, energy and infrastructure.

Also, via an APPM colleague a link of the survey is placed in a newsletter for potential interested buyers of houses in the new residential area "*Sluisbuurt*" in Amsterdam. It has a parking norm of 0,3 and therefore these people match well with the target group. Lastly, I recruited people by spreading the online link in the city centre of *Voorschoten*, my personal area. This took place after 19 May when the government decreased the strict quarantine rules. I selected two Fridays and Saturdays (22, 23, 29 and 30 May), because these were generally relative busy shopping days with the local market.

4.7.2. Reflecting on selectivity beforehand

This method has some disadvantages, because selectivity during the recruitment procedure can occur easily. This decreases the chance on a representative sample. Selectivity can influence people's response on certain questions and choice situations (see Molin (2018)). The recruitment process partly satisfies the selectivity requirement and may bias the sample in multiple ways. For example, all four methods invites relative high-educated people with a high income level.

LinkedIn has a big, nation-wide, reach and thereby it facilities the distribution to interested people in the field of mobility. A message is shared with the hashtags "*#MaaS*", "*#Mobility*" or "*#deelmobiliteit*". This is similar for using APPM's business network and the newsletter for "*Sluisbuurt*". Distributing the link in the city centre of *Voorschoten* contributes to recruit relatively high-income people due to the relatively high housing prices in comparison with the Dutch average (€340.000 versus €248.000 (Statline, 2020b)).

4.7.3. Ethical considerations

This research should take certain ethical considerations into account, because it approaches respondents to participate in a survey. The GDPR requirements are an important reference point (see HREC (2018) and Kormelink (2018)). Participants are partly recruited by LinkedIn. Their anonymity is guaranteed because they don't need to fill in personal data, except their postcode, but they have the option to refuse it.

Furthermore, the survey's introduction informs respondents about the research's purpose and that they could quit the survey at any time without mentioning a reason. Also, it states that the survey is fully voluntary, anonymous and treats and stores all data anonymously. Lastly, it describes the purpose of the data collection process, i.e. to publish an online master thesis.

Software packages Qualtrics and Microsoft Forms are used to distribute the survey, because they satisfy the GDPR requirements. Qualtrics is a TUD-license software package and uses the TUD-network drive to store the data (Kormelink, 2018). Microsoft Forms ensures data storage in Europe (Amsterdam).

4.8. Data considerations

In the context of SC-experiments, generally two data types exist: revealed preference (RP) and stated preference (SP) data. RP data contains data observations from real world situations, such as real-time travel data and SP data consists of data from observations in hypothetical controlled experiments (Van der Waerden, 2012).

This research uses SP data, because it controls the varied attributes and attributes ranges and thereby it offers the possibility to minimize the correlation between attributes and attribute levels. This increases the chance to obtain statistical significant estimates and requires less input data to obtain these estimates. Moreover, each respondent can deliver multiple observations, instead only one per observations for RP-data (Louviere, Hensher & Swait, 2000).

However, a basic problem is to what extent researchers can rely on the choices that respondents make in hypothetical situations. This systematic bias in SP response makes it difficult to carry out the SP task (Wardman, 1988). Will respondents actually do what they proposed in the choice sets and to what extent differ actual choices from the predicted choices?

4.9. Data preparation

Respondents could participate in the survey from 3 May till 1 June 2020. In total, 254 respondents participated, from which 127 completed the choice sets from block 1 and 127 from block 2. Block 1 and 2 had an average completion time of respectively 26 and 28 minutes.

The survey results contain a little amount of missing data. The most amount of data is missing in the six-digit postcode question. In total, 30% didn't fully answer this question from which 51% gave their four-digit postcode, 45% their residence and 4% refused to answer. Furthermore, questions with regard to age, education and income level contain respectively one, three and 44 missing values, because not all respondents were willing to share their income level. Pairwise deletion is applied due to the small amount of missing values assuming that the data are missing completely at random (see Appendix D1).

5. Descriptive statistics; insights into sample

This chapter describes the sample statistics. Firstly, Paragraph 5.1 describes the sample's representativeness, where after Paragraph 5.2 discusses the potential target group. Paragraph 5.3 and 5.4 respectively elaborates on its travel behaviour and mobility costs. Lastly, Paragraph 5.5 describes their built environment characteristics.

5.1. Representativeness sample

The sample's socio-demographics as gender, age, education rate, income, household size and amount of children per household are compared with the total Dutch population to determine whether the sample is representative for the Dutch population from 18 years and older (see Statline (2019a), Statline (2019b), Statline (2019c) and Statline (2020a)). Only for the working status there wasn't any data available for the Dutch population. Appendix D3 shows an overview of these tests.

As expected beforehand the sample isn't by far representative for the Dutch population. This might involve under- and overestimations due to the biased sample in comparison with the Dutch population. The sample consists of relatively many young people in their twenties who generally think more progressively about innovations and are mostly more willing to use them compared to older people (see Table 5.1). This might overestimate the willingness to adopt MaaS in relation to the more conservative population.

Also, the sample contains many respondents between 46 and 60 years old. They experienced the seventies where policymakers designed the urban environment to enhance car use. Motorways became wider, neighborhoods got more parking places and were easy accessible by car. Therefore, this generation might be more car-oriented leading to an underestimation of the MaaS adoption rate. Both under- and overestimations might fall away against each other or one can dominate over the other (see Paragraph 8.4).

Next to that, the sample's education and income level are relatively high (see Table 5.2 and 5.4). Thereby, respondents with a lower income level are mostly students who will earn more when applying for a job. This might result in an underestimation of the car costs, because people have enough money to spend and therefore car costs aren't a critical factor anymore in their modality choice.

Table 5.1: Descriptive statistics sample for gender and age

Variable	Category	Percentage sample	Percentage NL (CBS)
Gender	Men	56,3	49,7
	Woman	43,3	50,4
	Different	0,4	0
Age	18-20	2,8	3,8
	21-25	14,2	6,3
	26-30	10,7	6,5
	31-35	4,4	6,2
	36-40	5,1	6,0
	41-45	8,7	6,0
	46-50	11,9	7,4
	51-55	11,9	7,4
	56-60	11,5	7,0
	61-65	5,5	6,2
	66-70	4,4	5,7
	71-75	6,3	5,0
	76-80	1,6	3,3
	81+	1,2	4,1

Table 5.2: Descriptive statistics sample for education level

Category	Percentage sample	Percentage NL (CBS)	Category	Percentage sample	Percentage NL (CBS)
Primary school	0,0	9,1	**Havo, vwo**	12,6	9,6
Vmbo-b/k, mbo1	0,8	11,4	**Hbo-, wo-bachelor**	40,2	20,2
Vmbo-G/T, havo, vwo onderbouw	3,5	8,5	**Wo-master, doctor**	32,3	11,8
Mbo2/3	1,6	14,1	**Unknown**	1,2	1,5
Mbo4	7,9	13,9			

Table 5.3: Descriptive statistics sample for working status

Category	Percentage sample	Category	Percentage sample
Student	17,7	**Not working**	2,4
Retired	11,0	**Caregiver**	0,4
Job seeker	1,6	**Volunteer**	1,2
Working – fulltime (40+)	31,1	**Different**	0,4
Working – part-time (<40)	34,3		

* The CBS database don't have data available for the working status of the Dutch people

Table 5.4: Descriptive statistics sample for income level*

Category	Percentage sample	Percentage NL (CBS)	Category	Percentage sample	Percentage NL (CBS)
<€10.000	9,5	14,9	**€70.000-€79.999**	5,9	
€10.000-€19.999	5,1	25,1	**€80.000-€89.999**	3,5	
€20.000-€29.999	9,8	18,1	**€90.000-€99.999**	2,8	
€30.000-€39.999	13,8	14,5	**€100.000-€199999**	8,7	2,3
€40.000-€49.999	9,5	10,1	**€200.000 or more**	0,8	0,4
€50.000-€59.999	7,1		**I don't know**	17,3	0
€60.000-€69.999	6,3				

*The CBS database only consists of data for the category €50.000-€100.000 (in total 14,66% versus 25,59% in the sample)

Furthermore, the sample consists of relatively many multi-person households (especially four-person households), while single-persons are underrepresented. People don't only make mobility decisions on an individual-basis, but also on a household level (Bruch & Mare, 2012). The overrepresentation of multi-person households might underestimate the individual-based preferences, because respondents attach more importance to their current household situation than to their own individual-based preferences (see Paragraph 8.4). Lastly, the amount of children per household is representative for the Dutch population and thereby the sample contains approximately a similar percentage of households with children as the Dutch population.

Table 5.5: Descriptive statistics sample for household size and amount of children in household

Variable	Category	Percentage sample	Percentage NL (CBS)
Household Size	1	14,6	38,3
	2	37,4	32,6
	3	15,8	11,8
	4	25,2	12,1
	5+	7,1	5,1
Household children <18	0	68,5	67,1
	1	10,6	14,0
	2	17,3	13,6
	3+	3,5	5,2

5.2. Potential target group

This research is only partly able to show to the effects of neighbourhood characteristics on its attractiveness and willingness to choose MaaS for people who are actually overthink their travel behaviour with a certain urgency. The recruitment process didn't succeed in engaging many people that are willing to move. In total, only a quarter of the respondents is thinking to move within two years and almost the half within five years (see Appendix D2.1). Substantial more respondents are considering to buy a new car, two third within now and five years. Both groups combined results that almost half of the respondents is thinking to move or buy a new car within two years and 80% within five years (see Appendix D2.1).

5.3. Travel behaviour

Clearly, car is used most frequently, followed by bike, while respondents travel less frequent with PT (see Table 5.6). Most respondents use the car and bike every week, while using PT (train or BTM) on a monthly basis or only a few times a year. Especially, car drivers using the car multiple times a week travel only a few times a year with PT. Furthermore, most respondents don't have any experience with shared modalities. Shared car is hardly ever used while only a quarter have experienced a shared bike before.

Thereby, the overrepresentation of car-users can underestimate the willingness to adopt MaaS and change the car for a MaaS-subscription (see Paragraph 2.7.2). Respondents might stick to the convenience of their car, because they can't imagine the advantages of a MaaS-subscription.

5.4. Mobility costs

In line with the travel behaviour characteristics, most respondents have direct access to the car, while only 45% has a PT-subscription. In total, the average estimated car costs are €490 with a minimum of €150 and a maximum of €1000 . Most respondents have an own car, while only 15% has a lease or company car (see Appendix D2.2). Car owners and lease car drivers have similar average car costs, around €500. The average PT-costs are substantial lower (€25), because most of the respondents have a PT-subscription which is fully compensated by their employer or a student PT-subscription (see Appendix D2.2). Therefore, on average the car costs are higher than the highest offered MaaS-subscription and thereby this research is able to estimate quite well whether people switch to MaaS due to the lower car costs.

Table 5.1: Travel behaviour characteristics

Percent (%)	Car (driver)	Car (passenger)	Train	BTM	Bike	Shared car	Shared bike
Almost every day	21	2	2	2	38	0	0
5-6 days/week	12	2	4	2	14	0	0
3-4 days/week	20	3	9	4	15	0	0
1-2 days/week	23	31	7	7	17	0	0
1-3 days/month	9	33	15	16	8	1	6
6-11 days/year	5	12	16	20	3	2	3
1-5 days/year	4	12	31	27	2	2	11
<1 day/year	6	2	8	11	0	2	4
Never	0	3	8	11	3	93	76

5.5. Built environment characteristics

Most respondents live in the relatively busy and dense populated "*Randstad*", especially around the G4-municipalities (Amsterdam, The Hague, Rotterdam and Utrecht), while the rest lives near other medium-sized cities (see Appendix D2.3). Most respondents live in relative quieter suburban residential areas with a limited amount of car traffic. The minority lives near the city centre in relative busy neighbourhoods with lots of car traffic (see Table 5.7).

The survey succeeded to recruit many respondents that live in busier environments and know what living in or near cities includes, because almost all neighbourhoods have a relatively high urbanisation grade. Therefore, respondents are able to imagine what the designs qua facilities and neighbourhood layout look like.

Also, these are relatively car-dense neighbourhoods, because most respondents can park their car easily or have an own parking place. Furthermore, respondents live in relative expensive houses due to their relatively high income level. The average housing price on a neighbourhood level is €334.000 compared to the national average of €248.000 (CBS, 2019).

Table 5.6: Neighbourhood characteristics

Variable	Category	Percent (%)	Variable	Category	Percent (%)
Residential environment	Centre-urban	11	**Urbanity**	Very urban	28
	Urban outside-centre	15		Urban	33
	Green-urban	27		Moderate urban	17
	Village centre	40		Little urban	4
	Rural living	7		Very little urban	3
Car traffic	No car traffic	2	**Parking effort**	Own parking place	33
	Little car traffic	34		Very little effort	20
	Little/some car traffic	23		Little effort	23
	Some car traffic	23		Some effort	18
	Lots of car traffic	18		(Very) much effort	5

6. Results

This chapter gives insight to what extent a reduced parking comfort, the availability of MaaS-hubs and additional neighbourhood facilities influence the total neighbourhoods attractiveness and MaaS' adoption rates (see respectively Paragraph 6.1 and 6.2). Also, it discusses the influences of personal and built environment characteristics on these relations (see Paragraph 6.3). Furthermore, it elaborates on the influence of the neighbourhoods attractiveness on the willingness to adopt MaaS. Finally, Paragraph 6.4 summarizes the main findings.

6.1. Overall attractiveness

A multiple regression model estimates the (independent) influence of the varied characteristics on the neighbourhood's attractiveness (see Table 6.1). SPSS is used to conduct the analysis. Almost all attributes influence the overall neighbourhoods attractiveness on a 5% significance level, except the type of parking place. The sample contains too much heterogeneity in preferences to prove a relation between the hub type and overall attractiveness that also exists on an aggregate population level. Before discussing the results, it is important to note that it is questionable to what extent respondents are actually willing to live in the proposed designs. Only 42% of the proposed designs had attractive score high enough for the majority of the respondents (91%) to take the neighbourhood into consideration of moving.

6.1.1. Influence per characteristic

The estimated coefficients allow to calculate the utility contributions per attribute. Table 6.2 presents the importance per attribute level relative to their importance in comparison with other attribute levels. It shows that the **walking time to a parking place** is by far the most influential variable followed by the **walking time to the hub**. A small increase in walking time results in a relative high decrease in the overall attractiveness compared to other attributes. Walking times of two minutes contribute to an increase in overall attractiveness while eight minutes result in a decrease.

Furthermore, people find designs with a **wide variety of facilities**, such as entertainment venues, luxury and (non)-food shops, more attractive than designs with only a few local food shops. Only designs with a wide variety in shops and facilities positively affect the neighbourhood's attractiveness, while designs with less variety have a negative contribution. This emphasizes the importance of a broad range of facilities in neighbourhoods where the parking comfort is reduced in comparison with current neighbourhoods. It is in line with research from Borgers et al. (2008), who similarly found that people prefer a neighbourhood located two kilometres from the city centre with PT and parking facilities close to their home.

Table 6.1: Estimated coefficients multiple regression model

Attribute	Variables	Unstandardized coefficients	Standard deviation	Standardized coefficients	T-value	Sig.
	Constant	5,76	0,04		135,34	0,00
Parking comfort	$\beta_{walktime-home-PP1}$	-0,44	0,06	-0,17	-7,30	0,00
	$\beta_{walktime-home-PP1}$	-0,04	0,06	-0,01	-0,64	0,52
	$\beta_{type-PP1}$	-0,06	0,06	-0,02	-0,95	0,34
	$\beta_{type-PP2}$	-0,03	0,06	-0,01	-0,57	0,57
Hub availability	$\beta_{walktime-home-hub1}$	0,31	0,06	0,12	5,21	0,00
	$\beta_{walktime-home-hub2}$	-0,06	0,06	-0,02	-1,05	0,29
	$\beta_{type-hub1}$	0,17	0,06	0,06	2,79	0,01
	$\beta_{type-hub2}$	0,02	0,06	0,01	0,34	0,73
Quality neighbourhood	β_{green1}	0,01	0,06	0,00	0,17	0,87
	β_{green2}	0,13	0,06	0,05	2,24	0,03
	$\beta_{streets1}$	-0,26	0,06	-0,10	-4,33	0,00
	$\beta_{streets2}$	0,14	0,06	0,05	2,35	0,02
	$\beta_{facilities1}$	0,25	0,06	0,10	4,14	0,00
	$\beta_{facilities2}$	0,12	0,06	0,05	2,02	0,04

This is similar with respect to the **regulation of streets** within the neighbourhood. People dislike streets which regulate street access or give bikers priority and prefer streets without access regulations. This is in contrast with the finding of Gundlach et al. (2018).

Moreover, **hub type** and **urban green** are the least important attributes to determine a neighbourhood's total attractiveness. People prefer hubs located near a train station above hubs with only shared devices, because these facilitate the ease of use for train travellers to hire a shared bike in their first- or last-mile transport. Especially in The Netherlands, people walk or bike to and from the train station. However, most people don't have an own bike available at their destination. Then they could perfectly use a shared bike, as the increase in demand to the "*OV-fiets*" confirms (Jacobs, 2018).

Lastly, people prefer small parks divided through the neighbourhood over one big park or green grass zones. This is in line with Brander and Koetse (2011) that urban parks have the highest valuation in comparison with other types of urban spaces.

6.1.2. Model fit

The model has a relatively low model fit, because it declares only 7,5% of the data variance. It indicates that there is much heterogeneity in respondents' answers and the model declares the data to a very limited extent. Therefore, the model results have a limited explanatory power and the results should be interpreted carefully.

6.2. MaaS adoption rates

In total, two different MNL-and Panel ML-models are estimated, according to the amount of cars in the household (see Paragraph 4.1). The analysis had the goal to examine the level of influence for each attribute on the willingness to subscribe to MaaS instead of or in combination with the car. Biogeme is used to conduct the model estimations. The ASCs are coded in that the coefficients present the differences for the MaaS and combination alternatives compared to the car.

Table 6.2: Utility contribution attribute levels*

Attribuut	Attribuut level	Utility
Walking time home – parking place	2 min	0,46
	5 min	0
	8 min	-0,46
Walking time home – hub	2 min	0,28
	5 min	0
	8 min	-0,28
Facilities	Theatres, restaurants, hotels, (non) food shops	0,25
	Luxury and (non)-food shop	-0,14
	Only food shops and primary school	-0,39
Street access regulation	Streets inaccessible for cars	-0,26
	Streets prioritising bikers ("*Fietsstraten*")	-0,14
	Streets accessible for cars	0,12
Type of MaaS-hub	Hub with shared bikes, -cars near BTM/train station	0,18
	Hub with shared bikes, -cars near BTM station	0
	Hub with only shared bikes, -cars	-0,18
Urban green	Big park in the middle of neighbourhood	0
	Small parks divided through neighbourhood	0,14
	Green grass zones besides streets	-0,14
Type of parking place*	Public parking garage	0
	Public parking area	0
	Reserved parking place besides the street	0
Constant		5,76

* Type of parking place isn't statistically significant at 5% significance level

6.2.1. One car households

In total, 47% chose for the car, 34% for MaaS and 19% for the combination alternative over all choice situations. Therefore, most respondents stick to their car and only a small group is willing to give up MaaS. This is a bit higher than the most recent two conducted SC-experiments in The Netherlands from Caiati et al. (2020) and Fioreze et al. (2019), where respectively 17% and 20% were willing to adopt MaaS.

Only the **walking times to the hub** for the MaaS-alternative are statistically significant in both models (at a 5% level), while the **walking times to and type of hub and parking place** are statistically significant in the Panel ML-model and the ASCs in the MNL-model (see Table 6.3). Therefore, there is a strong relation between the adoption of MaaS and at hub and reduced parking comfort characteristics that holds on an aggregate population level. All other neighbourhood characteristics don't influence the choice for MaaS significantly. This contradicts with the findings to bike sharing hubs that the proximity to shops, restaurants, universities and parks lead to higher flow rates (El-Assi et al., 2017; Faghih-Imani & Eluru, 2015).

Table 6.3: Parameter estimations one car households*

			MNL-model			Panel-ML-model		
Variable	**Attribute**	**Parameter**	**Value**	**R std err**	**R t-test**	**Value**	**R std err**	**R t-test**
ASC and sigma	ASC	ASC_{MaaS}	**-0.324***	0.0622	-5.21	-0.237	0.447	-0.53
		$ASC_{carMaaS}$	**-0.915***	0.0749	-12.22	-0.831	0.455	-1.83
	Sigma	σ_{MaaS}				**4.88***	0.559	8.73
Hub availability	Walking time hub	$\beta_{\text{walktime-home-hub1\_MaaS}}$	**0.322***	0.0866	3.72	**0.934***	0.148	6.33
		$\beta_{\text{walktime-home-hub1\_carMaaS}}$	0.193	0.106	1.82	**0.813***	0.148	5.47
		$\beta_{\text{walktime-home-hub2\_MaaS}}$	0.0884	0.0869	1.02	0.196	0.143	1.37
		$\beta_{\text{walktime-home-hub2\_carMaaS}}$	0.0492	0.106	0.47	0.163	0.141	1.16
	Type hub	$\beta_{\text{type-hub1\_MaaS}}$	0.129	0.0870	1.48	**0.387***	0.156	2.48
		$\beta_{\text{type-hub1\_carMaaS}}$	0.129	0.105	1.24	**0.399***	0.156	2.55
		$\beta_{\text{type-hub2\_MaaS}}$	0.0112	0.0880	0.13	0.00771	0.118	0.07
		$\beta_{\text{type-hub2\_carMaaS}}$	-0.00988	0.106	-0.09	-0.0209	0.130	-0.16
Parking comfort	Walking time PP	$\beta_{\text{walktime-home-PP1\_MaaS}}$	**0.199***	0.0859	2.32	**0.454***	0.161	2.82
		$\beta_{\text{walktime-home-PP1\_carMaaS}}$	-0.0436	0.108	-0.41	0.219	0.168	1.30
		$\beta_{\text{walktime-home-PP2\_MaaS}}$	-0.00829	0.0876	-0.09	-0.0810	0.130	-0.62
		$\beta_{\text{walktime-home-PP2\_carMaaS}}$	-0.00984	0.105	-0.09	-0.0900	0.135	-0.66
	Type PP	$\beta_{\text{type-PP1\_MaaS}}$	0.0695	0.0881	0.79	**0.300***	0.114	2.62
		$\beta_{\text{type-PP1\_carMaaS}}$	0.113	0.105	1.07	**0.359***	0.113	3.16
		$\beta_{\text{type-PP2\_MaaS}}$	0.00585	0.0876	0.07	-0.00235	0.144	-0.02
		$\beta_{\text{type-PP2\_carMaaS}}$	0.0425	0.105	0.40	0.0451	0.155	0.29
Quality neighbour-hood	Green	$\beta_{\text{green1\_MaaS}}$	0.0321	0.0878	0.37	0.148	0.134	1.10
		$\beta_{\text{green1\_carMaaS}}$	0.0975	0.105	0.93	0.226	0.142	1.59
		$\beta_{\text{green2\_MaaS}}$	-0.0810	0.0881	-0.92	-0.246	0.142	-1.74
		$\beta_{\text{green2\_carMaaS}}$	-0.0396	0.105	-0.38	-0.221	0.163	-1.36
	Streets	$\beta_{\text{streets1\_MaaS}}$	-0.0311	0.0882	-0.35	-0.0948	0.142	-0.67
		$\beta_{\text{streets1\_carMaaS}}$	-0.108	0.107	-1.01	-0.194	0.139	-1.40
		$\beta_{\text{streets2\_MaaS}}$	0.0757	0.0870	0.87	0.205	0.138	1.48
		$\beta_{\text{streets2\_carMaaS}}$	0.108	0.105	1.03	0.251	0.142	1.77
	Facilities	$\beta_{\text{facilities1\_MaaS}}$	-0.0196	0.0885	-0.22	-0.000798	0.166	-0.00

		$\beta_{facilities1\_carMaaS}$	-0.00171	0.106	-0.02	0.0166	0.173	0.10
		$\beta_{facilities2\_MaaS}$	0.0975	0.0874	1.12	0.247	0.117	2.11
		$\beta_{facilities2\_carMaaS}$	0.0434	0.106	0.41	0.193	0.127	1.52

* Estimations in bold are statistically significant at 5% level

Similar as for the total neighbourhoods' attractiveness, the walking times to parking places and hub are the most influential attributes, where two minute walking times to hub results in an utility increase for MaaS and eight minutes in a decrease. This is the other way around for the walking times to the parking place. These estimates are quite certain due to the small standard errors. People don't have a stronger preference for shorter or longer walking time.

Furthermore, only **the walking time to the hub** is statistical significant for the combination alternative and quite confident due to the low standard error. Similarly, a two minute walking time to the hub benefits the choice for the combination alternative, while eight minutes decrease its utility. People only consider an *additional* MaaS-subscription when the hub is close nearby independent of the walking time to the parking place. It agrees with earlier research to bike sharing hubs (Bachand-Marleau et al., 2012).

A **hub close to a train station** has a positive contribution to MaaS and the combination option (see Table 6.4). As discussed in Paragraph 6.1.1 a train station increases its ease of use for the last-mile transport to their destination. Similarly, bike sharing hub literature showed that hub flows increase when the hub contains more facilities (Buck & Buehler, 2012; Faghih-Imani et al., 2014). Logically, a **reserved parking place** makes choosing MaaS and the combination option less attractive in relation to the car, while a public parking garage gains utility for the MaaS and combination alternative.

The **ASC for car** is fixed and therefore the **ASCs for MaaS and the combination alternative** present the average utility associated with factors other than the varied characteristics relative to car. According to the MNL-model, people have on average a preference for the car and experience more advantages with the car, such as flexibility and freedom to use it whenever they need it. Also, people have a strong aversion to buy an *additional* MaaS-subscription besides their car. This is in line with earlier research of Ho et al. (2018), Caiati et al. (2020) and Ho et al. (2020), showing that car-users are less likely to switch to MaaS than PT-users.

Table 6.4: Utility contributions one car households

			MNL-model		Panel ML-model	
Variable	**Attribute**	**Attribute level**	**MaaS**	**1 car + MaaS**	**MaaS**	**1 car + MaaS**
	ASC		-0,32	-0,92	-*	-*
Hub availability	Walking time hub	2 min	0,32	-*	0,93	0,81
		5 min	0	-*	0	0
		8 min	-0,32	-*	-0,93	-0,81
	Hub type	Train	-*	-*	0,39	0,40
		BTM	-*	-*	0	0
		Shared only	-*	-*	-0,39	-0,40
Parking comfort	Walking time PP	2 min	-0,20	-*	-0,45	-*
		5 min	0	-*	0	-*
		8 min	0,20	-*	0,45	-*
	Type of PP	Public parking garage	-*	-*	0,30	0,36
		Public parking place	-*	-*	0	0
		Reserved parking place	-*	-*	-0,30	-0,36

* Not statistical significant at 5% level

6.2.1. Multiple car households

MaaS adoption rates are substantial higher for people living in multiple car households, especially for the combination with one car alternative. In total, 48% of the respondents chose this alternative, 37% stick to both their cars, 8% buys an *additional* subscription next to their cars and 6% chose to give up both cars for MaaS.

Only the **walking times to the hub** were statistically significant in both MNL- and ML-model (see Table 6.5). All other characteristics are statistically insignificant. Similar as one car households, two minutes walking to the hub have a positive benefit to MaaS' utility, while an eight minute walking time affects both alternatives negatively. Logically, it has a relatively stronger effect on the MaaS-only option in comparison with the combination alternatives. People with two cars *only* purchase an additional MaaS-subscription when the hub is located at two minutes walking (see Table 6.6). This emphasizes the importance of the hub's location choice very close to people's home.

Similarly to the one car model, the **ASC for car** is fixed. The ASCs show that people have on average a preference for the **combination with one car** based on factors other than the varied characteristics. Therefore, they are willing to give up their second car for a MaaS-subscription which is in line with previous research of Ho et al. (2020) and De Vliet (2019). Similarly as the one-car model, the ASCs for the other alternatives are negative in the MNL-model and insignificant in the Panel ML-model.

Table 6.5: Parameter estimation multiple car households

			MNL-model			Panel-ML model		
Attribute	**Variable**	**Parameter**	**Value**	**R std err**	**R t-test**	**Value**	**R std err**	**R t-test**
ASC and sigma	ASC	$ASC_{2carMaaS}$	**-1.54***	0.130	-11.89	-0.184	0.715	-0.26
		ASC_{MaaS}	**-1.95***	0.166	-11.73	-0.595	0.713	-0.83
		$ASC_{carMaaS}$	**0.259***	0.0721	3.59	**1.62***	0.660	2.45
	Sigma	σ_{MaaS}				**5.80***	0.961	6.04
Hub availability	Walking time hub	$\beta_{walktime\text{-}home\text{-}hub1\_2carMaaS}$	0.279	0.182	1.53	**1.02***	0.224	4.57
		$\beta_{walktime\text{-}home\text{-}hub1\_MaaS}$	**0.802***	0.203	3.94	**1.54***	0.298	5.18
		$\beta_{walktime\text{-}home\text{-}hub1\_carMaaS}$	**0.231***	0.104	2.22	**0.970***	0.211	4.61
		$\beta_{walktime\text{-}home\text{-}hub2\_2carMaaS}$	-0.217	0.187	-1.16	**-0.356***	0.161	-2.22
		$\beta_{walktime\text{-}home\text{-}hub2\_MaaS}$	-0.133	0.237	-0.56	-0.271	0.221	-1.23
		$\beta_{walktime\text{-}home\text{-}hub2\_carMaaS}$	-0.00814	0.101	-0.08	-0.142	0.146	-0.98
	Type hub	$\beta_{type\text{-}hub1\_2carMaaS}$	0.00837	0.183	0.05	0.166	0.199	0.83
		$\beta_{type\text{-}hub1\_MaaS}$	-0.0621	0.219	-0.28	0.107	0.273	0.39
		$\beta_{type\text{-}hub1\_carMaaS}$	-0.000254	0.102	-0.00	0.155	0.185	0.84
		$\beta_{type\text{-}hub2\_2carMaaS}$	-0.108	0.187	-0.58	-0.110	0.196	-0.56
		$\beta_{type\text{-}hub2\_MaaS}$	0.0896	0.233	0.38	0.0870	0.241	0.36
		$\beta_{type\text{-}hub2\_carMaaS}$	0.0586	0.102	0.58	0.0615	0.167	0.37
Parking comfort	Walking time PP	$\beta_{walktime\text{-}home\text{-}PP1\_2carMaaS}$	0.0247	0.182	0.14	0.129	0.294	0.44
		$\beta_{walktime\text{-}home\text{-}PP1\_MaaS}$	0.200	0.202	0.99	0.313	0.329	0.95
		$\beta_{walktime\text{-}home\text{-}PP1\_carMaaS}$	-0.0380	0.103	-0.37	0.0680	0.251	0.27
		$\beta_{walktime\text{-}home\text{-}PP2\_2carMaaS}$	-0.0169	0.183	-0.09	-0.0430	0.171	-0.25
		$\beta_{walktime\text{-}home\text{-}PP2\_MaaS}$	-0.0941	0.239	-0.39	-0.116	0.271	-0.43
		$\beta_{walktime\text{-}home\text{-}PP2\_carMaaS}$	0.0541	0.102	0.53	0.0284	0.156	0.18

	Type PP	$\beta_{type-PP1\_2carMaaS}$	-0.00539	0.183	-0.03	0.0438	0.238	0.18
		$\beta_{type-PP1\_MaaS}$	0.0109	0.227	0.05	0.0699	0.279	0.25
		$\beta_{type-PP1\_carMaaS}$	0.0108	0.102	0.11	0.0618	0.200	0.31
		$\beta_{type-PP2\_2carMaaS}$	-0.0712	0.182	-0.39	-0.195	0.160	-1.21
		$\beta_{type-PP2\_MaaS}$	0.00463	0.224	0.02	-0.116	0.195	-0.59
		$\beta_{type-PP2\_carMaaS}$	-0.0507	0.102	-0.50	-0.174	0.142	-1.22
	Facilities	$\beta_{facilities1\_2carMaaS}$	0.122	0.180	0.68	0.268	0.248	1.08
		$\beta_{facilities1\_MaaS}$	-0.138	0.252	-0.55	0.00321	0.297	0.01
		$\beta_{facilities1\_carMaaS}$	0.0540	0.103	0.53	0.200	0.203	0.98
		$\beta_{facilities2\_2carMaaS}$	-0.123	0.188	-0.65	-0.111	0.200	-0.55
		$\beta_{facilities2\_MaaS}$	0.301	0.219	1.37	0.317	0.207	1.53
		$\beta_{facilities2\_carMaaS}$	-0.00772	0.102	-0.08	0.00475	0.177	0.03
	Green	$\beta_{green1\_2carMaaS}$	0.106	0.180	0.59	0.186	0.183	1.01
Quality neighbour-hood		β_{green1_MaaS}	0.299	0.216	1.39	0.381	0.221	1.72
		$\beta_{green1\_carMaaS}$	-0.0282	0.103	-0.27	0.0506	0.168	0.30
		$\beta_{green2\_2carMaaS}$	0.000822	0.181	0.00	-0.00615	0.175	-0.04
		β_{green2_MaaS}	-0.0400	0.236	-0.17	-0.0431	0.226	-0.19
		$\beta_{green2\_carMaaS}$	0.00385	0.102	0.04	0.000743	0.174	0.00
	Streets	$\beta_{streets1\_2carMaaS}$	0.00684	0.185	0.04	0.119	0.216	0.55
		$\beta_{streets1\_MaaS}$	0.373	0.217	1.71	0.483	0.267	1.81
		$\beta_{streets1\_carMaaS}$	0.0252	0.103	0.25	0.132	0.183	0.72
		$\beta_{streets2\_2carMaaS}$	0.0290	0.180	0.16	0.0772	0.155	0.50
		$\beta_{streets2\_MaaS}$	-0.132	0.227	-0.58	-0.0740	0.226	-0.33
		$\beta_{streets2\_carMaaS}$	-0.00517	0.102	-0.05	0.0462	0.154	0.30

Table 6.6: Utility contributions one car households

			MNL-model			Panel ML-model		
Variable	**Attribute**	**Attribute level**	**MaaS**	**1 car + MaaS**	**2 car + MaaS**	**MaaS**	**1 car + MaaS**	**2 car + MaaS**
	ASC		-1,95	0,259	-1,54		1,62	-*
Hub availability	Walking time hub	2 min	0,802	0,231	-*	1,54	0,97	1,02
		5 min	0	0	-*	0	0	-0,356
		8 min	-0,802	-0,231	-*	-1,54	-0,97	-0,664

* Not statistical significant at a 5% population level

6.2.3. Explanatory power models

The model fit between the MNL-models for people living in one or multiple car households differ. The first model only explains 7,2% of the initial uncertainty (rho-square of 0,072), while the second model explains 22,1% of the initial uncertainty (see Table 6.7). Therefore, the MNL-model's explanatory power for one car households is quite low and the heterogeneity between respondents choices quite high. The MNL-model for two car households explains the data to a reasonable extent.

Both Panel ML-models outperform the MNL-models due to a large drop in overall loglikelihood (respectively 421 and 293). These drops are statistically significant at a 1% significance level according to the Likelihood Ratio Statistic (LRS). Therefore, the Panel-ML models explain more of the initial uncertainty, respectively 18,7% and 33,9% for one and multiple car households. This indicates that the one-car model declares the data reasonable and the second-model declares the data reasonable well.

Table 6.7: Estimation report MNL- and Panel-ML models

	One car MNL-model	One car Panel ML-model	Two car MNL-model	Two car Panel ML-model
Number of draws		500		500
Estimated parameters	30	31	45	46
Sample size	1359	1359	927	927
Final log likelihood	-1385.349	-964.309	-1001.006	-708.351
Rho-square	0.072	0.187	0.221	0.339
Adjusted rho-square	0.052	0.160	0.186	0.296

Furthermore, the hit rates validate the models' predictive capabilities. It compares the model's predicted choice with each observation and specifies the model's choice as the choice with the highest utility. It shows similar to the reported rho-squares that the Panel ML-model for people living in multiple car households declares the data the best (see Table 6.8). It can estimate almost half of the responses. The Panel ML-model for people living in one car households declares only one third of the choice situations. This is quite similar for the MNL-models, only the other way around.

Thereby, the models explanatory power is quite limited. In more than half of the choices all models can't predict the right choices due to the variety in respondents' answers. An explanation is that both experiments contain many choice sets (approximately) where respondents chose the same modality for all designs independent of the variation in attributes.

Table 6.8: Hit rates

Model	Hit rate	Model	Hit rate
One-car MNL-model	46,95%	**Two-car MNL-model**	37,43%
One-car Panel ML-model	31,35%	**Two-car Panel ML-model**	49,84%

6.2.4. Heterogeneity between respondents

The estimated sigma's for both Panel ML-models show that there is a very high level of heterogeneity in preferences between the car and MaaS. In the one-car Panel ML-model both ASCs were statistically insignificant. Figure 6.1 shows the probability density function for the **ASC of MaaS** and Appendix E1 for **ASC of the combination with one car**. These show that people have on average a preference for the car (for both MaaS and the combination alternative) and that the amount of utility associated with other than the varied characteristics has a very wide range with both negative and positive values.

Figure 6.2 shows it probability density function for the **ASC of the combination with one car** (see Appendix E1 for the probability density functions of the insignificant ASCs). Similar as to the one car model it shows that the amount of utility associated with other than the varied characteristics has a very wide range with both negative and positive values. Therefore, there is much difference between respondents, but overall people prefer to give up one of their cars for a MaaS-subscription

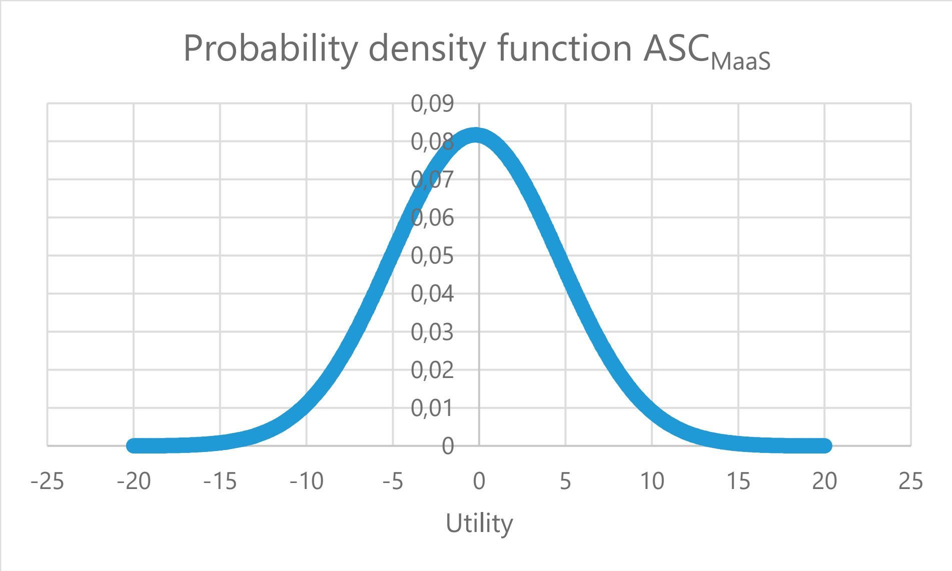

Figure 6.1: Probability density function ASC_{MaaS} one-car households

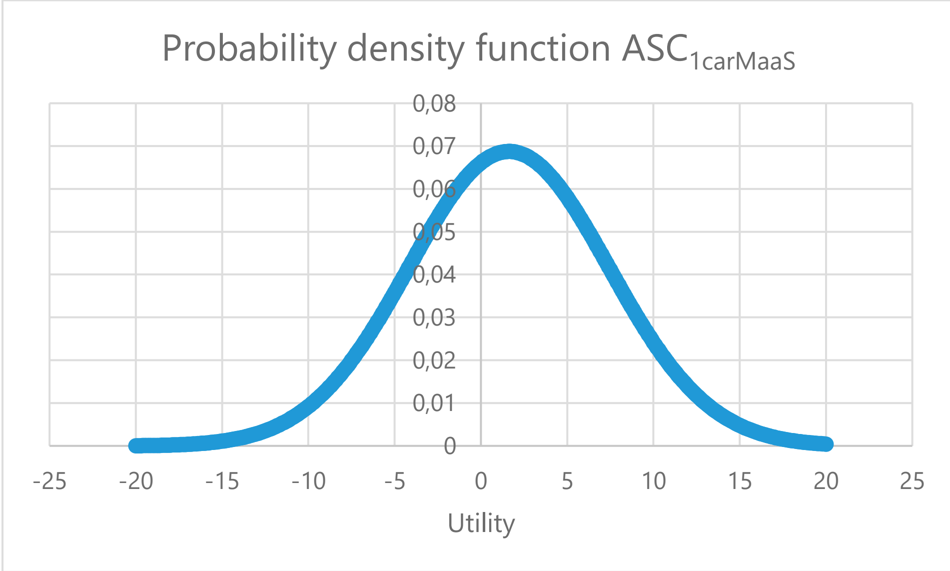

Figure 6.2: Probability density function ASC_{MaaS} one-car households

6.3. Influence attractiveness, current built environment and personal characteristics

All models are elaborated with personal and current built environment characteristics to analyse to what extent these characteristics influence the neighbourhoods attractiveness. The MNL- and Panel-ML models are elaborated, inclusive the neighbourhoods attractiveness.

The elaborated regression model shows a statistical significant (5% level) increase of 7% in declared variance (14,8% total). However, it still declares the data to a very limited extent due to the variety in the answers between respondents. Both extended MNL- and ML models are statistical significant at a 1% level according to the LRS test (see Appendix E3). The MNL-model declares 13,6% and 33,0% of the initial uncertainty and Panel ML-models 19,7% and

36,0% for respectively one and multiple car households. The sigma's of the elaborated Panel ML-models are still relatively high. Therefore, there is much heterogeneity between people's unobserved preferences between MaaS and car.

6.3.1. Personal characteristics on neighbourhood's attractiveness

The final model includes only the significant interaction variables (see Table 6.9). Especially travel behaviour characteristics, as **car**, **train**, **bike** and **shared bike use** have a huge influence on the designs' attractiveness where people's **mobility costs** and **possession of a PT-subscription** don't have any influence. Contradicting to the expectations beforehand, the **willingness to move** or **buy a new house** don't affect the attractiveness significantly.

Monthly train users find the designs in general more attractive to live in despite the variation in parking comfort, hub and neighbourhood characteristics. They use the car less frequently than **non-monthly users** (see Table 6.10). Therefore, they experience more comfort due to a generally increased living environment and less hinder from the decrease in parking comfort compared to non-monthly users travelling more often by car.

The model shows a similar effect between frequent and less frequent car users travelling maximal two times a week per car, only the effect is smaller and the other way around. **Frequent car users** generally find the designs less attractive to live in due to a longer distance to the parking place than they are used to. These findings are in line with earlier research from Ho et al. (2018) and Fioreze et al. (2019) who found that more infrequent car users are more willing to switch to MaaS. Similarly, Ho et al. (2020) found that the likelihood to subscribe to MaaS increases when people use the PT more often. Thereby, less frequent car users and more frequent PT-users find the neighbourhoods more attractive to live, because they know beforehand that the neighbourhoods congruent with their current travel behaviour. Therefore, they know beforehand that they would use the hub more often instead of the car.

Table 6.9: Estimated coefficient multiple regression model with interactions

Attribute	Variables	Unstandardized coefficients	Standard deviation	Standardized coefficients	T-value	Sig.
	(Constant)	5,739	,056		102,660	,000
Hub availability	$\beta_{walktime-home-hub1}$	,298	,051	,115	5,873	,000
	$\beta_{type-hub1}$	,253	,059	,098	4,309	,000
Parking comfort	$\beta_{walktime-home-PP1}$	-,445	,052	-,172	-8,576	,000
Quality neighbour-hood	β_{green2}	,121	,050	,047	2,408	,016
	$\beta_{streets1}$	-,152	,065	-,059	-2,320	,020
	$\beta_{streets2}$	,138	,058	,053	2,382	,017
	$\beta_{facilities1}$	,249	,058	,096	4,306	,000
	$\beta_{facilities2}$	,122	,058	,047	2,104	,036
Built environment	$\beta_{recreational\ area}$	-,288	,042	-,137	-6,932	,000
	$\beta_{household\ size}$	-,150	,050	-,059	-2,983	,003
Socio-demo-graphic	$\beta_{income+walking\ home-PP1}$	-,146	,051	-,056	-2,879	,004
Travel behaviour	$\beta_{train\ users}$	,239	,046	,109	5,242	,000
	$\beta_{bike\ users}$	,157	,048	,072	3,241	,001
	$\beta_{car\ users}$	-,135	,052	-,060	-2,585	,010
	$\beta_{shared\ bikes*street\ layout1}$	,206	,059	,080	3,506	,000
	$\beta_{shared\ bike\ use*hub\ type1}$	,149	,059	,058	2,539	,011
	$\beta_{bike*\ walking\ home-PP1}$	,126	,052	,049	2,423	,015

Also similar, **daily bikers** find the designs more attractive to live in than **non-daily bikers**. Also, they give slightly more importance to a smaller distance to the parking place than non-daily bikers. Daily bikers also use the car quite frequently and therefore attach more importance to a smaller distance to the parking place than non-daily bikers. Furthermore, people having **experienced shared bikes** before have a marginal preference for hubs near train stations in comparison with people without any experience. These hubs increase its ease of use and offer a solution for people's first- or last-mile transport.

Lastly, **higher income groups** earning more than twice the modal income (€70.000) have a minor preference to live in neighbourhoods where the parking place is relative far away in comparison with lower income groups earning less than twice the modal income. This is in contrast with research from Bonsall and Palmer (2004) who found that people with a higher income level were less likely to choose a parking place with a longer walking time. Apparently, this sample find the outline of the neighbourhood in general more important than a reduction in car comfort. Another explanation is that earlier research showed that people with a higher income are more likely to choose MaaS (Caiati et al., 2020). Thereby, higher income groups find the neighbourhoods more attractive, because they are congruent with their travel behaviour preferences. They know beforehand they would choose MaaS if they would live in these neighbourhoods.

Table 6.10: Utility contributions multiple regression model with interactions

Group	Attribute	Attribute level	Utility
	Constant		5,74
Parking comfort	Walking time home – parking place	2 min	0,45
		5 min	0
		8 min	-0,45
Hub availability	Walking time home –hub	2 min	0,30
		5 min	0
		8 min	-0,30
	Type of MaaS-hub	Near BTM/train station with shared devices	0,25
		Near BTM station with shared devices	0
		Only with shared bikes and -cars	-0,25
Quality neighbourhood	Facilities	Theatres, restaurants, hotels, (non) food shops	0,25
		Luxury and (non)-food shop	-0,12
		Only food shops and primary school	-0,37
	Street access regulation	Streets inaccessible for cars	-0,15
		Streets prioritising bikers ("*Fietsstraten*")	-0,14
		Streets accessible for cars	0,014
	Urban green	Big park	0
		Small parks	0,12
		Green grass zones besides street	-0,12
Built environment	Closeness to recreational area	Living close to recreational area	-0,29
		Living far away from recreational area	0,29
	Household size	Household size higher than 3	-0,15
		Household size equal or lower than 2	0,15

	Train use	Monthly train users	0,24
		Non-monthly train users	-0,24
	Bike use	Daily bikers	0,16
		Non-daily bikers	-0,16
	Car use	Weekly car users	-0,14
		Non-weekly car users	0,14
	Experience of shared bike on street layout	Streets inaccessible for cars	-0,03
		Streets prioritising bikers ("*Fietsstraten*")	-0,14
		Streets accessible for cars	-0,11
	No experience of shared bike on street layout	Streets inaccessible for cars	0,03
Travel behaviour		Streets prioritising bikers ("*Fietsstraten*")	-0,14
		Streets accessible for cars	-0,17
	Experience of shared bike on hub type	Hub with shared bikes, -cars near BTM/train station	0,02
		Hub with shared bikes, -cars near BTM station	-0,14
		Hub with shared bikes and -cars	-0,16
	No experience of shared bike on hub type	Hub with shared bikes, -cars near BTM/train station	-0,02
		Hub with shared bikes, -cars near BTM station	-0,14
		Hub with shared bikes and -cars	-0,12
	Daily bikers on walking time home-PP1	2 min	0,19
		5 min	0,00
		8 min	-0,19
	Non- daily bikers on walking time home-PP1	2 min	-0,19
		5 min	0,00
		8 min	0,19
	High income (>€70.000) on walking time home-PP1	2 min	-0,04
		5 min	0,00
Socio-demographics		8 min	0,04
	Low income (<€70.000) on walking time home-PP1	2 min	0,04
		5 min	0,00
		8 min	-0,04

6.3.2. Built environment characteristics on neighbourhoods attractiveness

Only two built environment characteristics influence people's neighbourhoods attractiveness significantly. Firstly, people living further away from **recreational areas** find the designs in general more attractive to live in than people living closer to these areas despite the variation in characteristics. This contradicts with the expectations beforehand. It was expected that people living closer to recreational areas find the quality of the living environment more important and therefore attach more value to the designs.

Secondly, people living in neighbourhoods with on **average a household size of three** find the designs in general less attractive to live in than people with an average household size of two or lower. An explanation is that the **higher household size group** mostly live in neighbourhoods with plenty of room for the car and therefore use the car more frequently than people in lower household sizes. Lower household sizes generally live in more dense populated areas with less room for the car. They don't like a decrease in car comfort and aren't satisfied with more facilities or a "greener" neighbourhood instead.

Also, **larger households** mostly live together with their children. Earlier research concluded that the convenience of a private car increases with the number of children in a household (see Ho et al. (2018)). Also, both Ho et al. (2018) and Caiati et al. (2020) found that especially one child households are more likely to subscribe to MaaS in comparison with those with multiple children. Therefore, people living in smaller households might find the designs also more attractive to live in, because the designs are more congruent with their travel preferences. **Higher household sizes** attach more importance to the flexibility of an own car.

In line with the influence of the travel behaviour characteristics it might be logical that the **closeness to a train station** in the current neighbourhood influence people's attractiveness to the designs. However, this isn't. Also, the **urbanity degree**, **population density** or **living quality** of the current neighbourhood don't influence the degree of attractiveness that respondents assign to the design. This is similar for **parking characteristics** in the current living area, as the parking effort or amount of car traffic. These findings are in contrast with findings from Brander and Koetse (2011) who showed that the value of urban open spaces is positively related to the population density.

6.3.3. Attractiveness and personal characteristics on change to MaaS

The **neighbourhood's attractiveness**, **age**, **income level**, **amount of children per household** and travel behaviour characteristics as **train** and **car use** influence the adoption of MaaS significantly (see Appendix E2 and E3). Contradicting to the expectations, the **willingness to move**, **purchase a new car** or **actually live the neighbourhood** don't have any influence.

People using the **car less frequently** are more willing to choose MaaS or the combination alternative than more frequent car users who travel almost every day by car. This is similar for **frequent train users** in comparison with people nearly travelling by train. These findings agree with the findings from Ho et al. (2018) and Fioreze et al. (2019) who found that less frequent car-users were the most willing to adopt MaaS, while frequent car users had the lowest intention rate to switch. Also, they agree with De Vliet (2019), Caiati et al. (2020) and Ho et al. (2020) who concluded that people travelling currently by bike or PT are more willing to switch to MaaS.

These influences are quite similar for people living in households with multiple cars. Also, the **number of children per household**, **income level** and **age** significantly influence MaaS adoption rates for people living in multiple households. For example, **households with multiple children** are less willing to choose MaaS than people living in households with no children. They attach more value to the flexibility of the car in relation to people without children. This agrees with research of Ho et al. (2018) and Ho et al. (2020).

Also, **higher income people** living in households with multiple cars are less willing to choose MaaS or one of the combination alternatives than lower income people. They are used to a higher comfort level and thereby attach more value to the flexibility and freedom of the car. Also, they might own bigger cars offering more space for children. Furthermore, there is no need to purchase MaaS, because their income is high enough to effort a more expensive car. These findings are in contrast with Caiati et al. (2020) showing exactly the opposite. Lastly, **older people** seem slightly more willing to use MaaS. However, this effect is marginal in comparison with the other personal characteristics.

At the one hand, these findings are partly in accordance with Caiati et al. (2020). They showed that gender, age, household situation, education level, income groups and working status have a significant influence on MaaS' adoption rates. This research only shows significant relations between MaaS-subscription rates and age, income and the amount of children in a household.

But, at the other hand these findings are fully in coherence with the findings of Ho et al. (2018) that age and amount of children in the household influence the likelihood to subscribe to MaaS, while gender, the possession of car-sharing memberships, household structure, size and car ownership didn't.

This can be explained by the differences in the sample between these SC-experiments. Firstly, the sample from Caiati et al. (2020) comprised more females than men and an overrepresentation in PT-users, while this sample has more men instead and an underrepresentation in PT-users. The sample from Ho et al. (2018) had an equally balanced household size, while this sample comprised an overrepresentation of household with four or more persons. Similar with Caiati et al. (2020), people between 26 and 35 years old were underrepresented in my sample. Lastly, all three sample consist of relatively many daily and high frequent car-users.

The overrepresentation of relatively older people can be a reason that Caiati et al. (2020) found a significant influence between age and MaaS' adoption rates. Therefore, they could find that specifically the age group between 18-25 and 25-35 are positively related to subscribe to MaaS in comparison with people aged between 51-65 and 65+, while this experiment indicates the opposite.

6.3.4. Attractiveness and built environment on MaaS adoption rates

Only the **total attractiveness** had a significant influence on the willingness to subscribe to MaaS. All four models has the expect sign. Both people living in one or multiple car households who find the neighbourhood more attractive to live in are generally more willing to adopt MaaS. It confirms the expectations beforehand that people are more likely to switch, when they like the neighbourhood in general. This is in line with research from Badoe and Miller (2000) and Van Wee et al. (2019) showing a relation between the built environment and urban design on travel behaviour.

All other significant built environment characteristics from the rating model are statistically insignificant. That means that the **distance to recreational areas**, **average neighbourhood household size**, **urbanity degree**, **population density**, **living quality** and **parking characteristics** don't influence the willingness to adopt MaaS significantly. This is in line with Cao (2016) who didn't find a relationship between population density and accessibility.

6.4. Conclusions

This chapter had the goal to analyse the influence of a reduced parking comfort, availability of MaaS-hubs and additional neighbourhood facilities on the total neighbourhood's attractiveness and willingness to adopt MaaS. Also, it analysed the influence of personal and built environment characteristics on these relations and the influence of the neighbourhood's attractiveness on MaaS adoption rates.

Firstly, MaaS adoption rates are limited. MaaS only seems a niche market for people with multiple cars. They are willing to give up one car for a MaaS-subscription and thereby experience both the benefits of car and MaaS. Thereby, it is questionable whether lowering the parking comfort conditions in neighbourhoods and offering hubs is a suitable alternative to enhance cities accessibility. MaaS seems for them more as an additional transport modality instead of an substitute for the car. This is in line with earlier results of the MaaS-pilots in Göthenburg (2013-2014) and Vienna (2014-2015) which showed that the amount of users was limited, maximal 30% (Fioreze et al., 2019). Recently in The Netherlands conducted SC-experiments showed similar results (Caiati et al., 2020; Fioreze et al., 2019).

It showed that the **walking times to the hub and parking place** have the strongest influence on people's overall attractiveness. Longer walking times to hub and parking place lower its attractiveness. A similar strong relation applies for the **variety in facilities**, where more variety results in a higher attractiveness. Furthermore, people prefer streets where the municipality doesn't regulate car access and **hubs close to a train station**. The **environmental layout** has only a small effect on its attractiveness, whereby people clearly prefer multiple small parks divided through the neighbourhood instead of one big park or some green grass zones.

Furthermore, the **walking times to the hub and parking place** and **type of hub and parking place** influence MaaS' adoption rates significantly. MaaS is more attractive to use in comparison with the car when the hub is close nearby and the parking place is located at an eight minute walking distance. Also, a hub located near a train station increases its adoption rates. Therefore, the exact location of the hub is crucial for people to adopt MaaS. Additional neighbourhood characteristics don't influence the likeliness to adopt MaaS significantly.

Especially, travel behaviour and socio demographics influence the neighbourhood attractiveness and MaaS adoption rates significantly, while the influence of built environmental characteristics is limited. For example, **frequent train and bike users** find the designs in general more attractive than frequent car users. Similar, **lower income groups** are more satisfied with the designs than higher income people. Furthermore, switching to MaaS is more attractive for **people without children**. When they have multiple children, they attach more value to the flexibility and freedom of the car. **Older people** seem slightly more willing to adopt MaaS, however this effect is rather small.

With regard to the current built environment, only the **closeness to a recreational area** and the **neighbourhoods average household size** influence the neighbourhood's attractiveness significantly. People living further away from recreational areas find the designs in general more attractive to live in than people living closer to these areas. This is similar for people living in neighbourhoods with an average household size equal or lower than two. Only the **neighbourhood's attractiveness** influences MaaS-adoption rates significantly. The more attractive people find the neighbourhood to live in, the more willing people are to buy a MaaS-subscription instead or besides their car.

Lastly, it is important to note that all models' explanatory power are limited due to the unobserved heterogeneity between people which depends on other than the varied parking comfort, hub availability and neighbourhood characteristics. Overall, people have a preference for car over MaaS. Only people living in households with multiple cars have on average a preference for the combination alternative with one car and thereby are willing to give up one car.

Also, it is questionable whether people are actually willing to live in the proposed designs. Especially, this car-based sample seems not willing to live in these designs. Therefore, it is good to realize that these neighbourhoods should attract other people. Chapter 7 discusses this point in more detail.

7. Case study Sluisbuurt Amsterdam

The model results are used to analyse the influence of hub an parking locations on MaaS subscription rates and the neighbourhood's attractiveness for the Sluisbuurt in Amsterdam. This is a neighbourhood under construction with the goal to realize a parking norm of 0,3. Therefore is very suitable to analyse the influence of multiple scenarios where hub and parking locations vary. First, Paragraph 7.1 and 7.2 introduces respectively its characteristics and scenario design. Then, Paragraph 7.3 discusses the scenario results and Paragraph 7.4 elaborates on the conclusions.

7.1. Introduction Sluisbuurt Amsterdam

The *Sluisbuurt* in Amsterdam is located at the border of the city centre. The city centre is easily accessible by bike. The plan is to build a new neighbourhood with maximal 5640 new residences, lots of facilities, but a minimal amount of parking places (Amsterdam, 2018). Figure 7.1 shows the area design with the facilities shown in pink, environmental zones in green and building blocks for houses in white.

Figure 7.1: Design Sluisbuurt Amsterdam (Landscape, 2020)

This neighbourhood will be constructed for people who are less dependent of the car and use their bike or PT to travel to the city centre. Instead of the car, the municipality wants to extend the PT-facilities and give walkers and bikers priority on streets. The main PT-facilities are tram connection from the city centre to *Zeeburgereiland* and the plan is to construct a new bus line at the other side of the neighbourhood (Amsterdam, 2018). Congruent to their norms, the tram line has an operating area of 800 meters due to its high frequency (15 trams an hour in peak hours) and the bus line of 400 meters. Respectively 90% and 87% of the addresses are located within this area, see Figure 7.2 (Amsterdam, 2018).

Figure 7.2: Operating area tram (orange) and bus line (red) (Amsterdam, 2017)

Furthermore, the neighbourhood has a wide amount of facilities, such as primary schools, shops, playgrounds and an university. The plan is to construct a central shopping street ("*Hoofdstraat*") with potential for restaurants, smaller business, supermarkets and *Hogeschool Inholland*. Also, there is space for some terraces at the street. Figure 7.3 shows the locations of these facilities in dark red.

Figure 7.3: Facilities located in one main street (Amsterdam, 2017)

According to the Amsterdam parking norms, the total neighbourhood should have 1565 to 4286 parking places, which is equal to a parking norm of 0,28 to 0,76 (APPM, 2019). However, the municipality has the goal to reduce the amount of parking places to 2250 or 1600, which correspond with parking norms of respectively 0,4 and 0,3 per residence. Therefore, they aim to construct maximal 1920 parking places (Amsterdam, 2018). It means that shared modalities and PT should solve 37% of the parking demand (APPM, 2019). Figure 7.4 shows a possible implementation strategy with a few outside parking areas and multiple small scale parking garages through the neighbourhood. This chapter will explore three scenarios within this context.

7.2. Scenario design

In total, this chapter will explore a basis, hub and mixed scenario, derived from an earlier study to the application of shared mobility hubs and parking places in the *Sluisbuurt* (see APPM (2019)). The basis scenario assumes that there are a small number of local parking garages distributed through the neighbourhood. The hubs are located within these parking garages, see Figure 7.4 where garages in green are only for private use and in orange for public use (including visitors). Many building blocks have the possibility to park the car within their block. However, the amount of parking places per block and available shared cars and bikes are limited.

The hub scenario has two large scale hubs located at the border of the neighbourhood near the tram and bus station (see Figure 7.2 for their location). These hubs have many shared bikes and cars available to reduce the parking demand with 37%. Similar, there are few large scale parking garages divided through the neighbourhood (see orange blocks Figure 7.5).

The mixed scenario is a combination between the hub and basis scenario. It consists of one large scale hub located near the tram station at the border of the neighbourhood and therefore people living at the North has to walk eight minutes to this hub with access to PT. Also, it contains some small scale parking places and hubs divided through the neighbourhood with only some shared cars and bikes, similar as in the basis scenario (see Figure 7.6).

The scenarios only vary the hub and parking characteristics (type and walking times). All scenarios have similar neighbourhood characteristics derived from the overall neighbourhood description from Paragraph 7.1 (see Appendix F1 for more details).

Figure 7.4: Basis scenario design with private parking garages in green and public garages in orange (APPM, 2019)

Figure 7.5: Hub scenario design (APPM, 2019)

7.3. Scenario results

The earlier study from APPM (2019) showed that the hub scenario is the overall best scenario followed by the mixed and basis scenario due to its affordability, reliability and overall comfort. It organizes parking places and shared mobility in the most efficient way. Also, the mixed scenario had relative good scores due to the multiple small scale hubs dived through the neighbourhood, but scored substantial lower on financial criteria. This chapter adds some interesting findings to these results (see Appendix F2 and F3 for a total overview).

Figure 7.6: Mixed scenario design (APPM, 2019)

7.3.1. Hub versus basis scenario

These scenarios based on the overall attractiveness and willingness to adopt MaaS show that people in general find the basis scenario more attractive to live in compared to the hub scenarios due to closely located hubs and parking places, despite some travel behaviour specific groups (see Table 7.1). Monthly train users and daily bikers find hubs near the tram or bus station more interesting, because it increases their accessibility to other PT-stations. More interesting, even weekly car users find the hub scenario more attractive, despite the higher walking times to the parking place. This is in line with the vision of mobility advisers in the Netherlands, who emphasises the importance of facilities nearby hubs (Rottier, 2020).

Also, slightly more people are willing to subscribe to MaaS in the hub scenario when they live only two minutes away from the hub, while MaaS loses market share to the car when the hub is further located from home (see Figure 7.7 and 7.8). This applies especially for people living in one car households, while the drop for the combination alternative with one car for multi-car households is substantial smaller. Therefore, people in multi-car households are less sensitive for the distance to the hub in comparison to the car.

Table 7.1: Attractiveness per group for hub vs. basis scenario

Group	Basis	Hub 2 min	Hub 5 min	Hub 8 min
Reference	**6,6**	**6,2**	**5,9**	**5,6**
Monthly train users	5,5	6,4	6,1	5,8
Non-monthly train users	5,1	5,9	5,9	5,6
Daily bikers	5,8	6,3	6,0	5,7
Non-daily bikers	5,0	6,0	5,9	5,6
Weekly car users	5,2	6,0	5,7	5,4
Non-weekly car users	5,4	6,3	5,9	5,6
Household size >2	5,2	6,0	5,7	5,4
Household size <2	5,5	6,3	5,9	5,6

Furthermore, the biggest disadvantage of the hub scenario is that especially people living in the north of the neighbourhood experience a relative long walking distance to the hub (eight minutes to the tram and five to the bus station), see Figure 7.2. Especially these people are less willing to adopt MaaS compared to people living more closely nearby. Therefore, the basis scenario seems a better applicable neighbourhood design for the total neighbourhood. These results are in line with earlier research to bike sharing hubs, where hubs located relatively close to home encourage people to use the hub (Bachand-Marleau et al., 2012) and that subscription members favour a higher density of hubs with less capacity due to their daily usage (Faghih-Imani & Eluru, 2015).

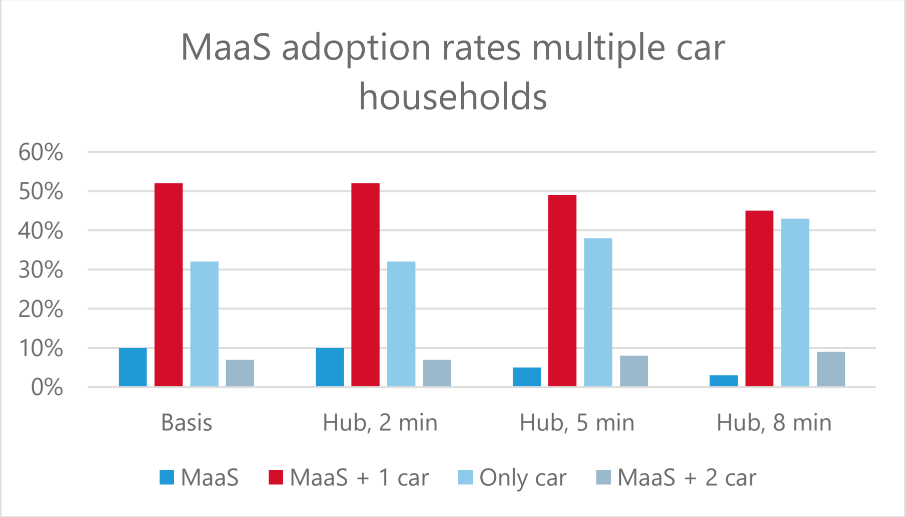

Figure 7.7: MaaS adoption rates hub vs. basis scenario

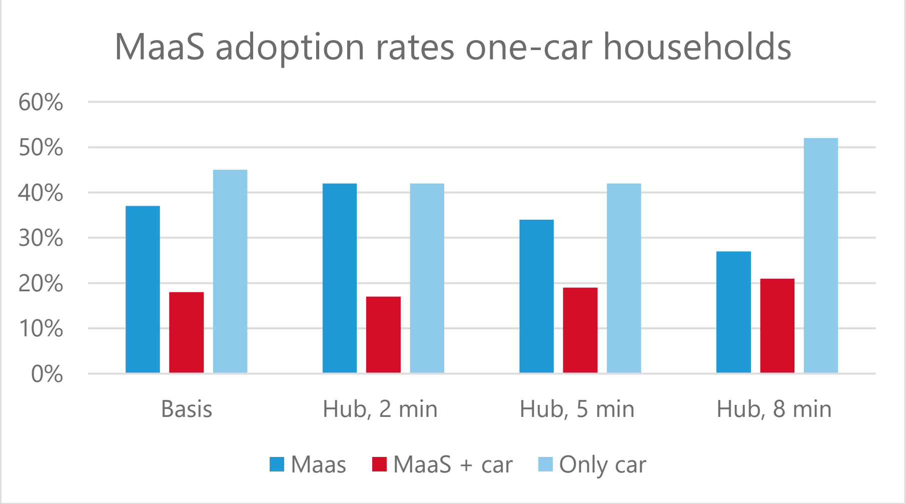

Figure 7.8: MaaS adoption rates hub vs. basis scenario

7.3.2. Mixed scenarios

Similar to the hub scenarios, the mixed scenarios have significant lower scores for the attractiveness and willingness to adopt MaaS compared to the basis scenario, except for people living at two minutes from the tram (near the *Piet Hein tunnel*) or new to build bus station (near the *Zeeburgerweg*), see Table 7.2.

Table 7.2: Attractiveness per group for hub vs. mixed scenarios

Characteristic	Attribute	Basis	Mixed				
Hub availability	Walking time to hub	2 min	2 min	2 min	2 min	5 min	5 min
	Hub type	Near tram or bus station	Near tram or bus station	Shared bikes & cars	Shared bikes & cars	Near tram or bus station	Near tram or bus station
Parking comfort	Walking time to PP	2 min	5 min	2 min	5 min	2 min	5 min
	PP type	Public parking garage	Public parking garage	Public parking garage	Public parking garage	Public parking garage	Public parking garage
	Reference	6,6	6,2	6,4	5,9	6,3	5,9
	Monthly train users	6,8	6,4	6,6	6,1	6,5	6,1
	Non-monthly train users	6,4	5,9	6,1	5,7	6,1	5,6
	Daily bikers	6,8	6,3	6,5	6,3	6,5	6,0
	Non-daily bikers	7,0	6,5	6,7	5,6	6,1	5,7
	Weekly car users	6,3	5,8	6,0	5,8	6,2	5,7
	Non-weekly car users	6,7	6,3	6,5	6,0	6,4	6,0
	Household size >2	6,5	6,0	6,2	5,8	6,2	5,7
	Household size <2	6,8	6,3	6,5	6,1	6,5	6,0

They find the hub scenario approximately even attractive to live in compared to the basis scenario. Also, they prefer houses closely to hub with only shared bike and cars compared to facing longer walking distance for the hubs near the tram and bus station (see Appendix F1). This applies even for monthly train users, while it might be expected beforehand that they are more willing to prefer houses with a longer walking time to a "larger" hub with direct PT-access.

Similar results apply for MaaS' adoption rates (see Figure 7.9 and 7.10). Only people living close the tram and bus station are slightly more willing to adopt MaaS compared to the basis scenario. In other cases with longer walking times to hub and parking place people prefer more closely located hubs, also when they only contain some shared cars and bikes. The willingness to adopt MaaS is approximately equal for the hub and mixed scenarios.

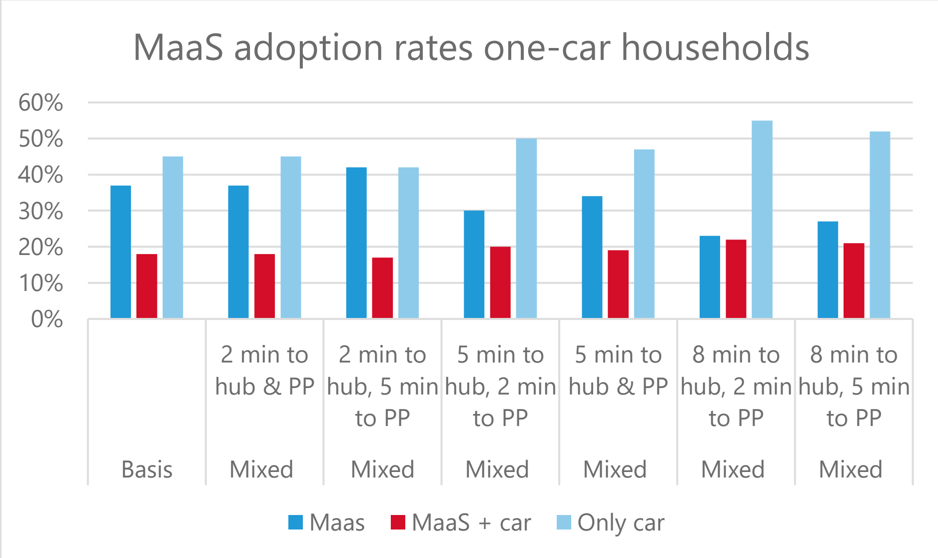

Figure 7.9: MaaS adoption rates mixed vs. basis scenario

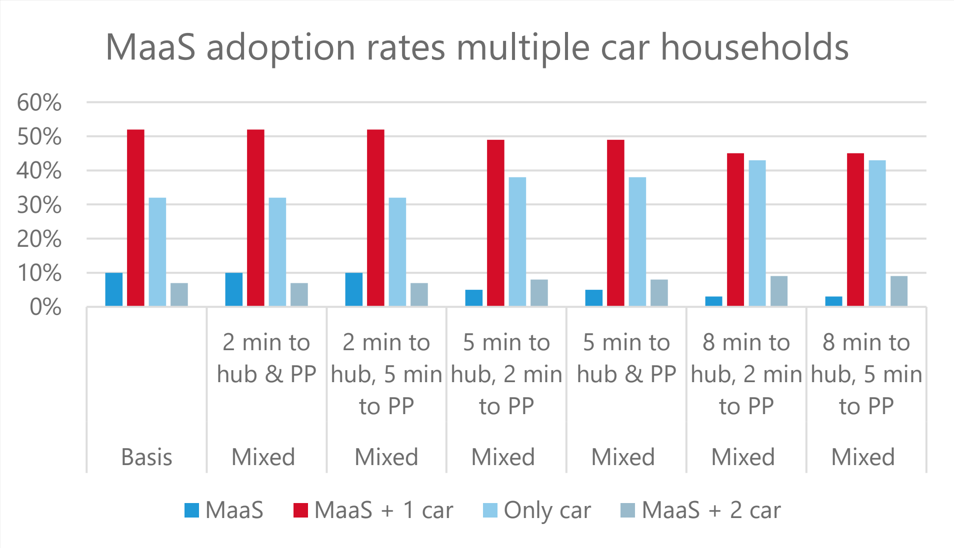

Figure 7.10: MaaS adoption rates mixed vs. basis scenario

7.4. Conclusion scenarios

This chapter showed that the basis alternative is in general the best applicable design with the highest overall neighbourhood's attractiveness and MaaS adoption rates. Only people find the hub design more attractive to live and are slightly more willing to adopt MaaS when they live at the border near the tram and bus station, near the *Piet Hein tunnel* or *Zeeburgerweg*. When they live more closely to the facilities (near the "*Hoofdstraat*"), people prefer more, but smaller, hubs and parking garages divided through the neighbourhood.

This contradicts with the earlier study from APPM (2019). This study concluded that the hub design is the theoretically optimum from a financial and governance perspective. They emphasized the advantage of scale benefits from the clustering of parking cars and hubs. Despite, they advised the mixed scenario, because it is the most flexible to apply and can adapt relatively easily to a changing parking demand. This chapter supports such an approach, but it is advisable to apply it in a slightly different way. This includes building two larger hubs near the tram and bus station combined with multiple smaller hubs divided through the neighbourhood. Thereby, people at the border can use the larger hubs more easily, while people near the shopping street still have plenty of smaller hubs to choose.

However, from a financial perspective it is more costly (see APPM (2019) for financial calculations). Therefore, the municipality should realize that it is important how they are going to divide these costs between house owners, MaaS-providers and themselves. Also, new residents will especially travel by PT, bike or walking and use only a shared car when they need it (APPM, 2019). These scenarios confirm that especially monthly train and bike users find it more attractive to live at the border close to the hubs near the tram and bus station. The municipality can use this information in their housing marketing strategy to determine which kind of residents should be built near the tram and bus station. For example, building more expensive houses in the area near the tram and bus stations can results in higher returns for the municipality and contractors, knowing that these are more popular to sell. Similar applies for houses near the central shopping line. The municipality can use other areas in the neighbourhood for social rental and student houses.

8. Conclusion and discussion

This chapter summarizes the results and answers the research question: "Too what extent influence neighbourhood designs potential residents their choice to submit to Mobility as a Service (MaaS) subscriptions?"

Paragraph 8.1 summarizes the main findings by answering the first three sub-questions. Paragraph 8.2 elaborates on the policy implications and answers sub-question four, while Paragraph 8.3 places the findings in a broader context by comparing them to earlier research. Lastly, Paragraph 8.4 provides the discussion, limitations and future research recommendations.

8.1. Main findings

This research had the aim to analyse the influence of neighbourhood characteristics on people's willingness to switch from car to Mobility as a Service (MaaS) in new constructed residential areas. It researched the potential to subscribe to MaaS in combination with adaptations to the living environment, while focussing at the case of residential reallocation or people that are going to buy a new car. Its purpose was to explore whether a reduction in parking comfort in combination with offering MaaS-hubs and (environmental) neighbourhood facilities contribute to MaaS adoption rates.

A Stated Choice (SC) experiment is used to analyze people's trade-off between a reduction in parking comfort, availability of MaaS-hubs and other neighborhood facilities. This was applied to the context of the four major cities in The Netherlands (Amsterdam, Rotterdam, The Hague and Utrecht), because their growing population raises new challenges with respect to housing and offering attractive living areas. Therefore, they are experimenting with shared mobility solutions and have a raising interest in MaaS. The survey offered multiple neighborhood designs varying in parking comfort, hub and neighborhood characteristics. It measured their total attractiveness, people's willingness to switch to MaaS and their travel-, built environment- and personal characteristics. In total 254 completed the survey.

Furthermore, it distinguished two types of experiments based on the amount of cars in the household. When people were living in households with zero or only one car, they were divided to the one-car experiment and multiple car households to the multiple car experiment. Each experiment had the option between MaaS, car or a combination between MaaS and car, where the multiple car experiment split the last option in a combination between one car and both cars with MaaS. This paragraph will answer the research-question step by step by answering the sub-questions.

8.1.1. Influence of neighborhood on MaaS-subscriptions

In general, MaaS adoption rates are limited. MaaS only seems a niche market for people with multiple cars. They are willing to give up one car for a MaaS-subscription and thereby experience both the benefits of car and MaaS (see Paragraph 8.3). Thereby, it is questionable whether lowering the parking comfort conditions in neighbourhoods and offering hubs is a suitable alternative to enhance cities accessibility. MaaS seems for them more as an additional transport modality instead of an substitute for the car.

It showed that there is a strong relation between the choice for MaaS and parking and hub characteristics. People in one car households prefer to choose MaaS in neighbourhoods where the **walking time to the parking place** is eight minutes, while it is only two minutes walking the hub. When it is the other way around, people prefer the car. People in multiple car households prefer to combine MaaS with one ca instead. They only think to buy an additional MaaS-subscription besides both their cars when the hub is at two minutes walking from their house. This isn't attractive in case that the walking time is five or eight minutes.

Furthermore, it shows that a **hub closely located to a train station** increases the attractiveness to choose MaaS, especially as substitute and addition to the car. Hubs located near a BTM-station or local hubs offering only shared devices in a neighbourhood lowers the attractiveness to choose MaaS. In The Netherlands, people mostly travel by bike or walking to the train station and can use its shared devices for the last-mile transport to their destination. The influence of the **type of parking place** is rather small. Only in designs with a reserved parking place people seem not willing to give up their car for a MaaS-subscription, while a public parking garage contributes to the willingness to switch to MaaS.

The **neighbourhood and environmental layout characteristics** didn't influence MaaS' adoption rates significantly. Therefore, it is unlikely that the variety in shops and entertainment facilities, streets with car access regulations and the provision of green facilities influence MaaS' adoption rates on a population level.

Lastly, the ML-models showed much unobserved heterogeneity in respondents' preferences between MaaS and car. Therefore, people highly differ in their preferences for MaaS and car regarding the variation in parking comfort, hub and neighbourhood characteristics.

8.1.2. Influence of neighborhood on its attractiveness

Similarly, the multiple regression model reveals that the **distances to parking place and hub** are the most important characteristics for people's attractiveness, where a lower distance increases the neighborhood's attractiveness. People find the distance to the parking place more important than to the hub, because they are used to the car and therefore attach more value to the parking comfort than hub availability. Furthermore, a **wide variety of facilities**, such as entertainment venues, luxury, food and non-food shops, benefit to its attractiveness. Only designs with a wide variety in shops and facilities positively affect the neighbourhood's attractiveness, while designs with less variety have a negative contribution. This is similar for **car's street regulation**. People dislike streets regulating car access or giving bikers priority and prefer streets without any regulations.

Furthermore, people find the **hub type** and **urban green** the least important attributes to determine the neighbourhood's total attractiveness. They prefer hubs located near a train station above hubs with only shared bikes and cars, because it facilitates the ease of use for train travellers to hire a shared bike in their first- or last-mile transport. Also, they prefer multiple small parks divided through the neighbourhood over one big park or some green grass zones besides streets. Lastly, the type of parking place don't have a significant effect on the total neighbourhoods attractiveness.

Most importantly, the model has a relatively low model fit due to much heterogeneity in the respondents' answers. Therefore, the model declares the data to a very limited extent and has a limited explanatory power. Therefore, these results should be interpreted carefully (see Paragraph 8.4).

8.1.3. Influence current living environment

Only the **closeness to recreational areas** and the **neighbourhoods average household size** have a significant influence on the neighbourhood's attractiveness. Generally, people living further away from recreational areas find the designs more attractive to live in than people living closer to these areas despite the variation in characteristics.

Also, living in areas with a lower average household size (two or lower) has a positive influence on people's attractiveness than a higher average household size (three or higher). People living in areas with a higher household size mostly live in neighbourhoods with plenty of room for the car and therefore use the car quite more frequently than people living in neighbourhoods with lower household sizes. The lower average household group mostly lives in denser populated areas with less room for the car.

Furthermore, as expected beforehand people are more willing to purchase a MaaS-subscription when they find the total neighbourhood more attractive to live in. Subjective characteristics, as **parking effort**, **availability of parking places** and **neighbourhood quietness** weren't statistical significant.

8.1.4. Influence personal characteristics

Especially travel behaviour characteristics, as car, train, bike and shared bike use, affect the designs' attractiveness and the willingness to adopt MaaS. **Monthly train and daily bike users** find the designs in general more attractive to live in and are more willing to adopt MaaS. Contradicting, **frequent car users** aren't satisfied with longer distances to the parking place than they are used to and are less willing to subscribe to MaaS.

People with **experience of shared bikes** have a marginal preference for hubs near train stations in comparison with people without any experience. At the one hand, **higher income groups** have a minor preference to live in neighbourhoods where the parking place is relative far away in comparison with lower income groups, but at the other hand they are used to a relatively high comfort level and therefore are less willing to give up their car and change to MaaS. Also, there is no financial need to shift from a (mostly) more expensive car to cheaper MaaS-subscriptions

The **amount of children per household** and **age** only influence MaaS-subscription rates for people living in multiple car households. When they have multiple children, they are less willing to choose MaaS, because they attach more value to the car's flexibility compared to people without children. Also, age has a positive but rather small contribution, meaning that older people seem slightly more willing to use MaaS.

8.2. Policy implications and recommendations

These findings have general and case-specific policy implications with regard to the design process of attractive neighbourhoods to live in and whether MaaS is a suitable alternative to apply in these neighbourhoods. In general, within the context of MaaS people prefer to live in neighbourhoods with lots of different facilities and shops and hub and parking places closely located from their houses. Hubs should be located closer to people houses and parking facilities at a moderate distance, at approximately five minutes walking. Also, they should be located near a train station, or otherwise a BTM-station near facilities as shops. This makes them only applicable for relatively **dense populated areas**.

Therefore, this research applied its findings on the *Sluisbuurt* in Amsterdam. This is a new to build neighbourhood in Amsterdam with lots of facilities, closely located to the city centre and a parking norm of 0,3. In total, three scenarios were analysed. The combination between two large scale hubs at the border of the neighbourhood near a tram and bus station and multiple small scale hubs divided through the neighbourhood resulted in the highest adoption rates for MaaS. However, financially this is more costly. Therefore, the municipality should realize that it is important how they are going to divide these costs between house owners, MaaS-providers and themselves.

Also, these designs are especially attractive for frequent PT-users. They find it more attractive to live at the border close to the hubs near the tram and bus station. The municipality can use this information in their housing marketing strategy to determine which kind of residents should be built near the tram and bus station. For example, building more expensive houses in the area near the tram and bus stations can results in higher returns for the municipality and contractors, knowing that these are more popular to sell. Similar applies for houses near the central shopping street. The municipality can use other areas in the neighbourhood for social rental and student houses.

8.3. Conclusions in broader context and in relation to earlier research

The expectations beforehand were higher than the results show. Similar, recent experiments conducted in The Netherlands concluded that MaaS adoption rates were limited (Caiati et al., 2020; De Vliet, 2019; Fioreze et al., 2019; Knijn, 2020). Also, experiment conducted in Australia and the UK reported similar results (Ho et al., 2018; Ho et al., 2020). These researches agrees that **especially PT-users** are more willing to switch to MaaS than car users.

These findings reason questions to the potential of MaaS. It seems that MaaS has only some potential for people living in **multiple car households**. They are willing to give up maximal their second car, as also indicated by Ho et al. (2020) and De Vliet (2019). However, it is questionable how many people own multiple cars in dense populated city areas.

Therefore, it is important for municipalities to realize what the exact goals are for these new constructed neighbourhoods. When the goal is to offer MaaS as replacer for the car and therefore limit the attractiveness for cars, it seems that people aren't willing to live there and subscribe to MaaS. But, when it is to reduce the amount of cars by replacing some cars for MaaS, then MaaS can be a solution. Then, it seems more attractive to build houses suitable for multi-person households.

Thereby, they should take into account that this and earlier researches show that especially **households with one child** are more willing to subscribe to MaaS than households with multiple children (Caiati et al., 2020; Ho et al., 2018). Therefore, these new constructed neighbourhoods should exists of houses suitable for households with maximal one child. It seems better to build more and smaller houses than houses suitable for households with multiple children. Thereby, municipalities should realize that they still need to offer enough parking places for at least one car per household. Then, residents can use MaaS as additional service besides their car instead of using two cars.

Also, they should realize these neighbourhoods in more dense populated areas. This and earlier research and pilots showed that MaaS was more attractive for those living in the city centre than those living in suburban areas (Fioreze et al., 2019). Similar, research to car free cities showed that people prefer to live in neighbourhoods located two kilometres from the city centre with PT and parking facilities close to their home (Borgers et al., 2008).

On the other hand, this research differs with earlier research at some points. Caiati et al. (2020) showed that higher income people were more willing to subscribe to MaaS due to the high cost component, while this research indicated that they were less willing to subscribe. Similar, Bonsall and Palmer (2004) concluded that they were less likely to choose a parking place with a longer walking time, while this research indicated that it is the other way around.

Furthermore, Caiati et al. (2020) concluded that gender, age, education level and working status have a significant influence on MaaS' adoption rates. Besides the above discussed relations, this research only shows a relation between MaaS-subscription rates and age. Also, Ho et al. (2018) couldn't find these relations. This makes clear that the samples differed (see Paragraph 8.4 for limitations).

8.4. Discussion, research limitations and future research direction

This research has the following limitations. First, it is questionable whether respondents behave in real life similarly as indicated in the experiment. Also, people can find it hard to estimate what MaaS actual means due to its exploring phase. Furthermore, respondents gave some important feedback points, which showed that they struggled to make a well-explained, substantiated choice and to stay concentrated due to the long completion time of the survey (on average 30 minutes). The designs were in general too complex and repetitive due to the variation of seven neighbourhood characteristics.

Another limitation is that this research didn't analyse people's **travel conditions and reasons** to choose car or MaaS in relation to their personal situation. Therefore, this research can't answer why a majority of people prefer the car or MaaS. Also, it isn't able to advise some adaptions to MaaS which might improve its adoption rates. Therefore, future research should take these travel reasons into consideration. Schikofsky et al. (2020) concluded similarly that future research should focus on perceptions to identify group characteristics in more detail. For example, some respondents indicated to choose the car due to the missing flexibility of the car in the weekends and during vacations or due to their personal situation, as a physical disability or poor mobility situation by elderdom

Furthermore, this research didn't succeed in showing people that MaaS isn't that costly as what they mostly think in relation to car. Respondents didn't believe the car costs estimations were correct, because they are based on average estimations, as the car class, average amount of driven kilometres and depreciation time. Therefore, future research should try to estimate these **car costs** more precisely by making the survey more individual specific.

Also, this research didn't take **people's working location** into consideration. Therefore, this research can't analyse to what extent people's working location play a role in their mobility choice to switch to MaaS. For example, multiple respondents indicated that their mobility choices depend on their working location. A working location near a train station in the city centre with a direct connection to the "home" station encourages travelling with PT, while a direct access to the highway without direct PT-connection enhances to choose the car. Thereby, this research can't advice whether applying these designs in collaboration with employees supporting MaaS is an attractable alternative for municipalities. The recent master thesis from Knijn (2020) showed that MaaS submission rates are still limited when only the employee supports MaaS financially. An overall combined approach existing of changing neighbourhood characteristics and offering MaaS-subscriptions by the employer might be an interesting research direction.

Another research implication is that the sample didn't exist of relatively many people that are willing to move between now and two years. Thereby, this research contribution to the relation between MaaS adoption rates and a residential reallocation is limited. Furthermore, the sample isn't representative for the Dutch population. It contains an overrepresentation of high-educated people with a relatively high income level. Both reasons may explain the insignificant relation between mobility costs and MaaS adoption rates.

Also, car-users were over- and PT-users underrepresented, while PT-users seems more willing to switch to MaaS. This might underestimate the willingness to switch to MaaS and explain the limited explanatory power of the estimated models. Therefore, a future research direction is to repeat the research design with a representative sample for the Dutch population in case of a reallocation.

Moreover, a future research direction is to analyse the preferences for MaaS in relation to car in case of new constructed neighbourhoods on a **household level**. This research analysed people's mobility preferences on an individual-basis, while people mostly make these choices on a household level. This research didn't measure household characteristics as households income level and the travel attitudes from the total households to verify this.

Lastly, this research showed that especially people without children are more willing to switch to MaaS. However, this research couldn't indicate that they find these neighbourhoods attractive enough to actually live in. Therefore, an interesting research option is to analyse under which circumstances these people are willing to live in these neighbourhoods and use MaaS.

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A. Literature review

This appendix elaborates on the all conducted literature during this research. Paragraph A.1 and A.2 discuss the search process and financial incentives to MaaS. After that, Paragraph A.3, A.4, A.5 elaborates on the variables varied in the SC-experiment, i.e. parking choice behaviour, MaaS-hubs and neighbourhood characteristics. Paragraph A.6 considers the socio-demographics in the context of MaaS and Paragraph A.7 focuses on the change in travel behaviour. Lastly, Paragraph A.8 elaborates on the influence of the current living environment.

A.1. Search process

During the search process, Scopus and Web of Science are uses as search engine with example search terms as "Mobility as a Service", "MaaS concept", "parking comfort", "mobility hubs", "neighborhood characteristics" AND "travel behavior" and "built environment" AND "travel behavior". In the beginning, I selected only the most recent papers in order to collect the most recent state of art with regard to MaaS. This selection exists of a combination of review papers, qualitative and quantitative papers and from there the waterfall approach leaded to other relevant case studies and experiments.

A.2. Financial incentives MaaS

Different studies examined the effects of financial incentives for shared mobility. However, this is a challenging task due to multiple reasons. First of all, travellers don't regard the short term rental of shared cars as attractive alternative for car ownership, because it is not suitable for daily usage. Secondly, the value of time differs between business trips and recreational trips which challenges the calculation of the amount of incentives needed. Furthermore, price isn't the only factor influencing mode choice. For example, waiting time has a higher weight due to passengers' impatience (Santos, 2018).

Therefore, the exact effects of incentives to promote shared mobility including their effectiveness from the perspective of the government and society aren't yet clear and is an interesting knowledge gap (Santos, 2018). This was in line with the conclusion by Inturri et al. (2019). They concluded that pricing strategies and public subsidies need further testing to increase the service effectiveness of shared mobility services. This is quite similar for car sharing. Münzel et al. (2019) found that measures to convince people to use shared cars and to make them more attractive is an interesting knowledge gap. They recommended preferential driving lanes and parking places for only shared cars as potential measures to increase its usage. Also, they highlighted the need for special attendance to study how car sharing can become more attractive for lower income groups.

A.3. Parking choice behavior

Parking choice behavior in cities is a wide researched topic. In the beginning of the 2000s, Tsamboulas (2001) estimated drivers' parking behaviour and evaluated their trade-offs between current parking fares in comparison with hypothesized increases to enhance a shift from the private car to other modes. Thereby, they focused on the walking time to location/destination, parking tariffs and trip purpose. They concluded that especially parking costs and walking times are the most influential variables in people's parking choice decisions. Also, they found that the actual walking time to a parking place is on average five minutes and that 50% of the drivers aren't willing to pay more for a parking place with a walking time of ten minutes or more.

Furthermore, they compared the parking prices and walking times with people's actual situation and concluded that people still uses their car when the walking times increases with 50% in comparison with their current situation. Also they only accept an increase in parking tariffs between 50% and 100% when they get a parking place more closely located to their homes. Finally, they proposed to apply their model in other cities to research whether variations exist in drivers' behaviour and suggested to extend their model by including real time information of parking locations' availability for drivers (Tsamboulas, 2001).

Bonsall and Palmer (2004) took this recommendation into consideration with a simulation study. They used the PARKIT parking choice simulator to investigate drivers parking choices where test persons got different parking choice situations varied in parking costs, walking distance, access time, parking capacity and trip purpose. Similar to Tsamboulas (2001), they concluded that especially parking tariffs and walking time influence the parking choice. Higher income people were less likely to choose a parking place with a longer walking time.

Khaliq et al. (2018) extended the PARKIT model with a Discrete Choice (DC) model and focused on people's parking choice behaviour with regard to on-street parking. They showed that logically parking costs was the most influential attribute and that a longer distance between parking place and destination had a negative effect on the parking choice. Also, people were more willing to park on-street if security was available.

In his doctoral thesis, Van der Waerden (2012) developed a parking analysis model to visualize the role of parking facilities in the parking choice decision making process for travellers with a weekly and non-weekly shopping purpose. He concluded that the probability of considering a parking facility increases when it has lower parking costs, lower than average egress time, is more favourable from home and has a lower distance to the nearest supermarket/store. Also, he highlighted that weekly-shoppers find a parking place closer to their destination more important than non-weekly shoppers

In another SC-experiment in the context of shopping Chaniotakis and Pel (2015) researched parking location choice behaviour with a two to three hour parking duration. The parking costs and probability of finding a free spot were the most influential variables on people's parking choice decision. People searching a parking place in a monitored and secured parking facility had a lower maximum search time than drivers preferring a curb-side parking place. Also, they found heterogeneity in drivers' preferences in the appreciation of these characteristics. These are uncorrelated with any socio-demographic features. These results were in line with Van der Waerden (2012). Later, Hai et al. (2019) identified some kind of heterogeneity between respondents and found that parking costs, capacity and walking distance significantly influence the parking choice behaviour, similar as previous discussed studies.

Instead of shopping, Chen et al. (2015) focused on people's preference of parking at P&R locations. They found that people based their parking decision at P&Rs on the parking capacity, costs and search time. Also, they showed that the effect of variation for the search time wasn't significant. They indicated respondents may display risk aversion for variation in search times.

Lastly, based on real-time data Van Ommeren et al. (2011) concluded that the sum of search and walking costs for residents with a private parking place (on-street) are non-negligible and around €1,15 per day in Amsterdam. Also, with their case-study in Amsterdam De Vos & Van Ommeren (2018) calculated that in order to find a free parking place residents walk on average 15,7 meter further after arriving in streets with an occupancy rate between 85% and 90% in comparison with streets with an occupancy rate lower than 50%. They estimated residents are willing to pay around €10 for daily parking tickets and argued that this is more than what they are currently paying, but lower than the tariffs paid by non-residents (Inci, 2015).

A.4. MaaS-hubs

Mobility hubs are defined as "*multimodal transport nodes that facilitate intermodal transfers by providing different mobility options in close proximity*" (Miramontes et al., 2017, p. 1325). Mobility hubs have the purpose to facilitate a multimodal lifestyle, especially for millennials born in the end of the twentieth century (Kuhnimhof et al., 2012). MaaS is a relatively new mobility concept and therefore the literature on mobility or TOD hubs with respect to MaaS are scarce. Therefore this paragraph will review the literature to mobility hubs in general (see Paragraph 2.5.1) and regarding the bike sharing hub systems (see Paragraph 2.5.2).

A.4.1. TOD-typology

In general, the literature distinguishes four types of mobility hubs depending on their significance scale: (1) nation-, (2) regional-, (3) local significance and (4) transfer points for PT-services (Top, 2020). This classification originates from the concept of Transit-Oriented Development (TOD) typology, where residential, commercial and business related spaces are located near PT-facilities to promote sustainable transport modes and reduce car usage (Cervero, 2004). An urban strategy combining multiple dimensions of urban structures stimulates "positive travel behaviour", such as transit ridership (Kamruzzaman, Baker, Washington, & Turrell, 2016). Thereby, the "*five Ds*", density, diversity, design, distance and destination accessibility, play an important role to change travel behaviour by influencing the built environment (Ewing & Cervero, 2010).

A huge amount of TOD applications exists with different purposes per country making them very context-sensitive (Thomas et al., 2018). For example, in the US TODs focus on centralizing facilities and houses around transit stops, while European cities use TODs to stimulate active transport modes as biking and walking (Cervero, 2002; Knowles, 2012). Asian cities use TODs to distribute metropolitan growth along transit corridors, while specifically in India TODs are part of the sustainable strategy to reduce traffic congestion and pollution in urban areas (Cervero & Murakami, 2009; Phani Kumar et al., 2020).

Multiple studies used existing urban characteristics to identify typologies (Higgins & Kanaroglou, 2016; Phani Kumar, Ravi Sekhar, & Parida, 2018). The literature defines a TOD typology as a segmentation of neighbourhoods with similar urban structures (Phani Kumar et al., 2020). Such typologies help policy makers with achieving comprehensive TOD-benefits in the long term planning and therefore they use them worldwide in policy documents as explanation for policy strategies (Austin et al., 2010). Table A.1 distinguishes different TOD-typologies used by the Ministry of Urban Development in India.

Roughly, there exist two types of approaches to conceptualise and develop TOD typologies: a qualitative and quantitative approach (Higgins & Kanaroglou, 2016). The qualitative approach labels typologies based on geographical and functional neighbourhood characteristics (Calthorpe, 1993). This approach distinguishes urban and neighbourhood TODs, where urban TODs are located in relatively high populated areas within approximately one kilometre from a rail or BTM-station and neighbourhood TODs in lower populated areas within ten minutes from a local BTM-station. Also, it distinguishes multiple sub-divisions within these two typologies, such as suburban centre, suburban, urban downtown, neighbourhood transit zone and commuter town centre (Phani Kumar et al., 2020).

The quantitative approach recognizes that TODs have different forms and that each neighbourhood has a different structure (Atkinson-Palombo & Kuby, 2011). An example is the "Node-Place model" classifying the position of neighbourhoods based on calculations with regard to the accessibility, intensity and diversity of transport supply, diversity of activities in the area, number of residents and workers in the area and a degree of functional mix (see Bertolini (1999) for more details). The model integrates transportation and the urban structure and specifies five types of TOD conditions: (1) balanced or accessibility, (2) stress, (3) dependency, (4) unsustained transportation places and (5) unsustained urban structure.

Phani Kumar et al. (2020) made some important observations based on existing typology approaches. Mostly subjective approaches fail to quantify the urban structure, diversity and rely on little scientific support. Furthermore, policy makers prefer quantitative approaches, because these enable testing, comparisons and are more supportive in their long term planning process (Cervero & Murakami, 2009). Lastly, more verification and validation by travel behaviour indicators as PT-use, mode share, kilometres travelled by car and car ownership should verify and validate the developing process of typologies (Austin et al., 2010). Therefore, the causal effects between the urban structure and travel behaviour within different neighbourhood types need further research (Higgins & Kanaroglou, 2016).

However, one methodological problem exists. Researches analysing the relation between neighbourhood characteristics and type with ordinary linear regression models underestimate the standard error of the coefficient and thereby over-estimate the t-ratio significance (see Kim & Wang (2015)). Despite, limited studies used multiple linear regression models to examine the effects of the urban characteristics on individual travel behaviour for residents living in different urban types (Phani Kumar et al., 2020).

Table A.1: TOD typologies used in India (source: MoUD (2016))

Station area typologies	Station area characteristics	Land use mix and density	Planning and development challenges	Land availability
Intermodal gateways	Transport hubs with commercial and informal activities	Moderate to high residential density and mixed-use	Integration of housing and employment uses	Moderate
Employment centres	Employment and community activities	Moderate to high employment density	Introducing housing into employment use	Less
Destination nodes	Unique destinations	Moderate to low residential density	Accommodation of peak travel demand	Less
Transit neighbourhoods	Residential districts with good accessibility to transit	High residential density	Affordable housing	Less
Urban core	Economic, community and cultural activities	High density and mix-use	Accessibility to transit	Retrofitting and infill
Infill neighbourhoods	Residential districts outside the city core with no proper accessibility to transit	Moderate to high residential density	Accessibility to offers	Very less
New residential areas	Residential districts outside the city core with good accessibility to transit	Moderate to high residential density and mixed uses	Expansion of retail opportunities	Moderate

A.4.2. Bike sharing hubs

Multiple scholars researched bike ridership to identify determinants influencing bike-sharing hub usage. Examples of determinants are the influence of the bike and transportation network infrastructure, land use, urban design and time characteristics (see Scott & Ciuro (2019) for an overview). For example, multiple researches show that the hub flow increases when the hub contains more bicycle facilities and is positively corelated with the population and job density degree (Buck & Buehler, 2012; Faghih-Imani et al., 2014). El-Assi et al. (2017) concluded that the number of stations within a 200 meter buffer area was significantly and positively correlated with the number of trips. Also, they showed that multiple stations closed nearby with multiple options to park reduce the discomfort experienced when there aren't any shared bikes available at the station any more.

Similar, Maurer (2011) showed a positive correlation between the number of available bikes per hub and amount of travellers, but a negative correlation between the proximity to railway stations and flow rates. However, Dadio (2012) concluded that trip flows were positively correlated with the proximity to shops and metro stations. Similar, Faghih-Imani and Eluru (2015) stated that BTM-stations, restaurants and universities nearby the bike share hub increase its usage. Also, El-Assi et al. (2017) confirmed the attractiveness of hubs around universities and complemented that hubs closer to parks have higher flow ratings.

Furthermore, some studies focused on the user perspective, socio demographics and travel behaviour characteristics. Faghih-Imani and Eluru (2015) concluded that people with annual subscriptions favour a higher density of hubs with less capacity while customers with one day tickets favour fewer hubs with more capacity of bikes. Subscription members use the hub daily and have a commuter purpose, while people without subscription have a recreational purpose. Also logically, hubs located relatively close to home encourage people to use the hub (Bachand-Marleau et al., 2012).

A.5. Neighborhood characteristics

In residential choice decisions neighbourhood and housing characteristics are significantly more important than accessibility considerations (Molin & Timmermans, 2003). Schirmer et al. (2014) proposed a classification for location variables and classified multiple groups of residential location units used in residential location choice models. They distinguished housing unit attributes, location attributes, points of interests, access and accessibility and previous locations and social networks (see Table A.2). Researches operationalize these attributes in different ways, for example open space as share of open water or unbuilt space, urban character as distance to urban centre and sport and recreation as density to sport activity centres and natural recreation centres.

A.5.1. Characteristics car-free residential areas

Car-free residential areas provide a (nearly) car-free environment, facilitate a change to modes other than car and limit the amount of parking facilities (Melia, 2014). In The Netherlands, policies aim to develop sustainable residential areas which from a transportation point of view should reduce the use of motorizes transportation modes while improving the overall quality of live (Borgers et al., 2008).

These kind of residential areas are widely researched. For example, Borgers et al. (2008) concluded that people prefer a neighbourhood located two kilometres from the city centre, closely to parking, excellent facilities for non-motorized transport and free secured bike parking facilities. However, concentrated car parks negatively influence the the areas' attractiveness. Creating excellent facilities for non-motorised transport, PT stops within 500 metres from peoples' home and offering security at parking facilities can reduce their negative impact.

Table A.2: Overview residential location units by Schirmer et al. (2014)

Characteristics	Variables	Attributes	Characteristics	Variables	Attributes
Location attributes	Built environment	Built density	**Location attributes**	Socio economic environment	Population density
		Structural density			Household types
		Open space			Household origin and race
		Land use			Household income
	Points of interest	Education			Household costs
		School quality			Employment
		Service and retail			School quality
		Recreation and sport		Access and accessibility	Access
		Transportation facilities	**Housing unit attributes**		Costs, price, value
		Urban characteristics and centre			Unit size
Previous location and social network	Previous location				Housing type
	social network				Other features as number of garages

Gundlach et al. (2018) analysed students' acceptance of car-free city centres in Germany. They found that students are willing to accept these centres when they have access over separate bike lines or bike lines combined with cars, with a distance of three to six minutes to the closest PT-stop, a guarded car-facility and an increase in the availability of residential areas. Also, they concluded that students are willing to pay respectively between €42 to €65 and €52 to €8 extra for their monthly PT-subscription for bikeways next to the road and for a separate bike.

A.5.2. Evaluating urban green

Parks and other types of green areas within cities provide a large variety of environmental and recreational benefits depending on their characteristics as cleanliness, available facilities as playgrounds and size (Bertram et al., 2017). The provision of urban green spaces benefits to an attractive residential image (Barbosa et al., 2007; Tu et al., 2016). People associate improvements to open space and public areas, amount of outdoor community facilities, street cleanliness and green routes with upgrading the visual appearance and stimulating the establishment of new businesses to the area. Also, gardens and public "green spaces" are regarded as substitutes of recreation areas (Barbosa et al., 2007).

However, data of the quality of environmental facilities are usually limited or only available as closeness to houses (Lanz & Provins, 2013). Therefore, applying DC-experiments have become popular for evaluating environmental goods and services, however the amount of applied DC-experiments to value the benefits of urban green is limited (Bertram et al., 2017). This sub-section discusses the few DC and SC-experiments found in the literature evaluating the benefits of urban green in cities.

Giergiczny and Kronenberg (2014) estimated the economic value of trees on streets in the city centre and concluded that people weren't willing to pay extra local taxes to upgrade the environmental outline of streets. People found that there were already too many trees in cities. Also, Van Dongen & Timmermans (2019) analysed to what extent various small scale natural element in residential areas influence residents' preferences for these streets. They found that grass and flower sides significantly influence the attractiveness of residential areas.

Tu et al. (2016) valued urban green space in relation with their residential choice for the population in Nancy. In general, people have a preference for larger, less expensive houses with a view on green spaces preferably near or closely located to parks which is in line with earlier studies of Morancho (2003). They found that the housing price drops with €1800 for every 100 meter farther away of a green area in Castellon, Spain. Also, Dehring and Dunse (2006) concluded that housing prices increase with 0,02% per meter closer to urban parks.

Torres et al. (2013) studied the locational preferences of new central business district residents in Santiago de Chile. They concluded that people find the streets' cleanliness and accessibility to a highway the most important criteria to rank new neighbourhoods in their residential location choice. Also, they contributed that the size of green areas and the availability of pool and cultural services were the least important attributes.

Shao et al. (2018) focused on the environmental protection and calculated the effect of income on residents' Willingness To Pay (WTP) for environmental protection at a macro and micro economic level. They concluded that the urban environmental quality and the population density significantly influence the WTP for environmental protection. People living in more polluted cities give significantly more value to environmental protection. This was in line with Brander and Koetse (2011). They concluded that there is a positive and significant relationship between the value of urban open spaces and population density. Therefore, they concluded that scarcity and crowdedness matter. Also, urban parks have the highest valuation in comparison with other types of urban spaces.

Therefore, Bertram et al. (2017) specifically researched the differences in valuation of parks within cities between weekdays and weekends. They concluded that the extent of cleanliness, quality and maintenance strongly benefits the parks' attractiveness. Especially on weekdays, cleanliness seems more important than maintenance and habitat quality. Playgrounds didn't statistically significant influence the choice of a urban park, while picnic places and sanitary facilities had a relatively small influence in comparison with cleanliness, maintenance and habitat quality. Also, they found that during the week people are more satisfied with a medium park, while in weekends it seems that people prepare to go to larger parks.

A.6. Influence socio demographics

Many researches with regard to MaaS' adoption rates include relations with socio demographic variables to determine which kind of groups are potentially more interested to use MaaS. However, the literature is divided to what extent these can predict or explain MaaS' adaption rates. At the one hand, recent SC-experiment found statistical significant relations between MaaS' adoption rates and socio-demographic variables (see Paragraph A.6.1). At the other hand, multiple researches stated that socio demographics are a weak predictor to predict MaaS' adaption rates (see Paragraph A.6.2). Therefore travel behaviour characteristics seem a better prediction (see Paragraph A.6.3). Due to this disagreement this research takes both socio demographics as travel behaviour characteristics into consideration.

A.6.1. Personal characteristics

In their SC-experiment in Australia, Ho et al. (2018) concluded that age and number of children in the household influence the likelihood to subscribe to MaaS, while gender, the possession of car-sharing memberships, household structure, size and car ownership didn't. Especially, households with multiple children were less willing to subscribe to MaaS in comparison with one-child households. This is in line with their conclusion that the convenience of a private car increases with the number of children in a household.

Also, Caiati et al. (2020) found opposite results. They concluded that gender, age, household situation, education level, income groups and working status have a significant influence on MaaS' adoption rates. For example, they found that younger people, specifically the age group between 18-25 and 25-35 are positively related to subscribe to MaaS in comparison with people aged between 51-65 and 65+. Ho et al. (2018) found similar results regarding these age groups, while Ho et al. (2020) found no differences in subscription forms based on socio-demographics, except people older than 65 years preferred a monthly subscriptions and didn't choose the "pay-as-you-go" option. A possible explanation is that the older people have been travelling with the private care for years and don't want to use their travel habits or aren't keen in using their smartphone.

Moreover, they found that people living together with their parents and singles or households with children are more likely to use MaaS. Especially one-child households are more likely to subscribe to MaaS in comparison with those with two or more children. This is in line with Ho et al. (2018). Surprisingly, people with the highest education rate have the lowest adoption rates, while mostly people with a middle level of education adopt MaaS. With respect to the working status, students, employed and retired people are more likely to subscribe to MaaS in comparison with unemployed people and job seekers who are less willing to subscribe. A possible explanation is the relatively high cost component of MaaS. Therefore, lower income classes are less likely to join MaaS, while higher income people can easily afford MaaS (Caiati et al., 2020).

Lastly, multiple papers mention the potential for MaaS as substitute for the second car for people living in households with multiple cars. For example, Ho et al. (2018) already considered the opportunity for MaaS as replacer for the second car instead for all cars in the current fleet. In a later research Ho et al. (2020) found that car-sufficient households are more willing to subscribe to MaaS than car-negotiating household. Therefore, they concluded that MaaS may be a good alternative for the second car. Also, a recent master thesis from De Vliet (2019) found that people with a second car are more willing to use

MaaS and to get rid of their second car. However, his model estimations were based on a sample which wasn't representative for the Dutch population and therefore his findings should be interpreted carefully.

A.6.2. Personal characteristics or travel habits and travel behaviour characteristics?

Fioreze et al. (2019) stated that socio demographics are a weak predictor to predict MaaS' adaption rates, because travel habits and attitudes towards transport modes are stronger predictors for the up-take of MaaS than socio demographics as education level or household income (Fioreze et al., 2019). Beforehand, they expected that older people would be less interested in MaaS, but that was not the case, (partly) declared by specific characteristics of the case study area. Also, Schikofsky et al. (2020) concluded that socio demographic data alone isn't sufficient to describe the heterogeneity between the user of MaaS. They stated that further research to user perceptions is necessary to identify group characteristics.

These results are in accordance with earlier research to car sharing. Münzel et al. (2019) concluded that gender and income don't have a significant effect on car sharing, but could characterize car sharing adopters by their travel behavior. Therefore, they concluded that it is more efficient for policy designers to focus on favourable conditions for a connected and high comfort multi-model transport system facilitating the use of PT and shared cars/bicycles. Similar, Ma et al. (2014) stated that socio demographics have little influence on the size of the activity space. Further study should include factors that take the spatial perception and measurements related to mode use and accessibility into account (Ma et al., 2014).

A.6.3. Travel behaviour characteristics

Multiple researches found an association between the current travel behaviour and the willingness to adopt MaaS. For example, Ho et al. (2018) found that infrequent car-users were the most willing to subscribe to MaaS, while frequent car users had the lowest intention rate to switch. Similar, Fioreze et al. (2019) found that people who don't use the car frequently were more likely to adopt MaaS while car-oriented people were unlikely to do so.

In a later research Ho et al. (2020) found that the likelihood to subscribe to MaaS doesn't depend on households' car ownership levels when controlling for the frequency of car use. However, once subscribed their subscription preferences differ. Car negotiating household are more likely to subscribe to MaaS as a subscription user than as a "pay-as-you-go" user while for car sufficient households it is exactly the opposite.

On the other hand, researchers expect that multi-modal oriented people are more willing to subscribe to MaaS. De Vliet (2019) clustered five groups based on their current travel behaviour and predicted the extent that travellers are willing to switch to MaaS for different MaaS-subscriptions varying in price and attribute levels for train, bus/train/metro (BTM), shared car, -bike and taxi. Not surprisingly, he found that frequent car users and people travelling mostly by car or PT have the lowest intention rate, while bikers and PT-users were most willing to switch.

Also, he showed variations between people's subscription preferences. Bike and PT-users prefer an unlimited and free peak & weekend option for train, while people travelling by car and PT favour an unlimited option for BTM. With the car they travel to the city borders, where they park and change to BTM to travel to their destination inside the city.

Lastly, Caiati et al. (2020) found that people mainly travelling by walking, bike or car (as driver) are less willing to adopt MaaS, while people travelling by PT, train or car as passenger are more willing to adopt MaaS. Their findings are similar to the findings of Jittrapirom et al. (2017) who found that car drivers and bikers are less willing to switch to MaaS. Also, Ho et al. (2020) concluded that the likelihood to subscribe to MaaS increases with a higher frequency in PT-use.

A.7. Changing travel behavior

Multiple papers concluded that "live events" trigger people to overthink their travel behaviour and habits. Examples are familial key events (birth of a child) or workplace relocation (Zarabi et al., 2019). These live events introduce a "window of opportunity" for behaviour change. People could deliberatively overthink alternatives and break with routines. Also, a relocation could change their travel attitudes, due to different social norms in the new neighbourhood (Janke & Handy, 2019). Johansson et al. (2019) identified three possibilities as window of opportunity: (1) when moving for a house and therefore adjusting travel habits, (2) when households are thinking of buying a new car and (3) when households need to buy a new or replace their current car.

On the one hand, Zondag and Pieters (2005) concluded that accessibility have a modest positive influence on residential location choice, but noted that findings vary between different study areas or research methodologies. They investigated households' move/stay decision and concluded that demographic developments, neighbourhood characteristics and especially housing attributes are more dominant explanatory variables for the residential location choice than accessibility. This is in line with results from Molin & Timmermans (2003).

On the other hand, De Vos & Ettema (2020) concluded that residential reallocation has an important effect on people's travel behaviour. People moving to mixed-used neighbourhoods make more use of walking, cycling and PT and travel less by car in comparison to their previous neighbourhoods, while oppositely people moving from the city to urban areas travel more frequently by car due to increased travel distances and change in household car ownership. These findings were in accordance with De Vos et al. (2019). They showed that moving to urban areas is related with lower car use, a reduced travel distance, but also an improved travel satisfaction. Moving to suburban areas results in an increased travel distance with more car use and a lower travel satisfaction. Therefore, they advised policy makers to create more urban-style neighbourhoods to encourage even more the use of active travel and PT.

Similar, Zarabi et al. (2019) showed that travel considerations can play a prominent role when moving between house locations. Mostly flexible travellers are willing to overthink their travel behaviour, while especially travellers with strong environmental concerns show a stronger tendency to act similar to their personal values after reallocation. Therefore, they are less flexible to change their travel behaviour. Furthermore, they showed that individuals with strong habits to use public, active modes or car select themselves to live in a neighbourhood where they don't have to change their travel behaviour.

Also, this domain needs further research. Studies focusing on the interaction between changes in the built environment (caused when for example moving houses) and travel behaviour, attitudes and satisfaction are limited (De Vos & Ettema, 2020). Moreover, Zarabi et al. (2019) concluded to invest more time in finding the right people at the right time during the moving process. One possibility is to link transportation planners with real estate agents so that movers can participate in short surveys to analyse whether their travel behaviour is congruent with the neighbourhood where they want to live in. Also, research should focus on creating new travel opportunities with for example MaaS in the case of residential relocation (De Vos & Ettema, 2020).

A.8. Influence current living environment

Associations exist between attitudes, the built environment and travel behaviour. The interaction between socioeconomics and urban design is very important to understand travel behaviour, because studies recognize the built environment as key factor to affect travel behaviour (Badoe & Miller, 2000). The influence of the built environment on travel behaviour have been a wide researched topic during the past decades and many studies found an association between people's living area and travel behaviour (Van Wee et al., 2019). A common used example is that people living in cities or dense urban areas use PT and slower modes (bike and walking) more frequently, while people living in quieter suburban areas or countryside use mostly the car.

Also, a majority of studies found a relation between travel-related attitudes and the built environment. Van Wee et al. (2019, p. 1) defines attitudes as "*the degree to which the evaluation of a certain object, person or behaviour is favourable or unfavourable*". The literature distinguishes travel-related and mode specific attitudes. Travel-related attitudes are about the extent of importance that people assign to travel time and mode-specific attitudes are about people's preferred transportation modes, such as car- or PT minded travellers (Kitamura, Mokhtarian, & Laidet, 1997).

A.8.1. Relation built environment and travel behaviour

Cao (2016) focused on the relation between density, diversity and design of the built environment, environmental characteristics and residents' perceptions in relation to accessibility and nuisance and life satisfaction. They tested a Structural Equation Model (SEM) which assumes that objective built environment characteristics influence life satisfaction by its perceived characteristics and residential satisfaction. They concluded that the share of open space influenced the accessibility, while the population density didn't. Furthermore, they found that households with multiple children were likely to experience a better accessibility, but were less content with their residential neighbourhoods. Seniors were less likely to perceive nuisance, but were more satisfied with their neighbourhood.

Zang et al. (2019) analysed to what extent the built environment influences the travel behaviour of elderly in public and private houses. With a multilevel logistic regression model they tested relations between the built environment attributes and likelihood of walking, walking time and total number of trips and travel distance. They found that the amount of shops in elderly's living environment significantly relates to the amount of walking for both groups, while the land-use mix was only a significant factor for those in public houses and population density and urban greenness only for those living in a private house.

For the association with the number of trips, they found that the distance to the closest BTM-station negatively influenced the number of trips for those in public houses, while population density affected only elderly living in private houses negatively. The population density, amount of shops and distance to BTM-station had only a significant influence on elderly with a private house.

A.8.2. Built environment and travel behaviour in relation with residential reallocation

Multiple studies examine the influence between the built environment and residential allocation. For example, Kährik et al. (2012) analysed the motivations and satisfaction of households moving to new residential areas in suburban environments. They found that the influence of life-event changes (such as job changes) was limited in the decision to move to new suburban neighbourhoods. Built environment reasons were more influential, such as the desire to have an own house with a good level of privacy and land in an area with enough room for children to grow up.

Furthermore, people gave much importance to residential factors as the proximity and easy access to the city centre. Due to a high level of car-based trips access to PT wasn't an important consideration. Also, social embeddedness, proximity to schools, food stores, supermarkets and playground for kids weren't influential factors. People attach more importance to environmental aspects as outdoor recreation opportunities, safety of the neighbourhood and the perception of privacy and relations with others.

In a very recent published paper, Wang et al. (2020) focused on the relation of changing between residential areas and the level of travel satisfaction. With longitudinal data from a sample in Beijing they compared the level of travel satisfaction before and after reallocation and concluded that travel-related relocation resulted in more satisfied daily travelling. They distinguished subjective and objective neighbourhood environment indicators and only found significant impacts for the subjective indicators on travel satisfaction changes.

This is in line with earlier research from Ettema and Schekkerman (2016).

Also, they concluded that travel satisfaction increases when people experience an improved accessibility. Thereby, reduced noise, improved safety and more social interactions result in a higher level of travel satisfaction. This was also in accordance with earlier research (see Kim, Park & Lee (2014)). Moreover, all household and personal characteristics were insignificant for the motivation of residential relocation, similar to findings from Bergstad et al. (2011). They showed that the influence of socio-economic characteristics on travel satisfaction is limited.

B. Operationalisation attributes

This appendix discusses the selection of attributes which are taken into consideration in the conceptual model. Paragraph B.1 discusses the selection of attributes and attribute levels varied in the SC-experiment. After that, Paragraph B.2 explains how the mobility costs are estimated. Paragraph B.3 and B.4 elaborates on the operationalisation of the built environment indicators and socio-demographics.

B.1. Selection of attributes

In total, the SC-experiment varies three conceptual factors: parking comfort, availability of MaaS-hubs and neighbourhood characteristics. Studies discussed by Paragraph 2.4 operationalised the parking comfort by multiple kind of attributes, distinguished as follows: type, capacity and availability of the parking place, park and search time and walking time to home. From these, earlier experiments shows that the type of parking place and walking time to home or destination are the most influential attributes in the parking choice behaviour. Furthermore, in order to keep the experiment relative simple for respondents it assumes that there is always enough place to park. Only in city centres or neighbourhoods around city centres parking places are scarce, while in more quiet neighbourhood there is enough place to park.

The amount of studies with regard to mobility hubs for MaaS are limited. From bike-sharing hubs literature there seems convenient evidence that the hub type and distance to facilities influence occupancy rates significantly. Therefore, the distance between home and hub and type of hub represents the availability of MaaS-hubs. The hub type is combined with different PT-facilities, because the literature showed that bike sharing hubs near metro stations result in higher trip rates.

Also, the literature divides a broad range of neighbourhood characteristics, such as environmental, accessibility, facility and social characteristics. Examples of environmental characteristics are the area's greenness, amount of open space and recreational facilities, such as urban parks. The closeness to PT, shops and city centre are examples for the accessibility, while social characteristics distinguishes the "kind" of neighbourhood, such as house type and population density.

This SC-experiment only focuses on the environmental layout and the facilities in the neighbourhood. Earlier SC-experiments showed that the urban green, facilities within the neighbourhood and street layout are the most influential variables for people looking at the overall quality of residential areas. The accessibility and social characteristics are factors measuring the current built environment (see Paragraph 3.4).

B.1.1. Parking comfort

Reviewed studies operationalized the parking comfort by many attribute types, such as "restrictions" in the built environment as an increasing distance between home and home parking facilities (see Christiansen et al. (2017)), attributes in city car parking situations as availability of parking places (see Johansson, Henriksson & Envall (2019)), type of parking places (see Khaliq et al. (2018)), parking tariffs (see Tsamboulas (2001)) and attributes regarding P&R users' station choice (see Chen et al. (2015)).

All agrees in choosing the following attributes: distance between destination and parking place, type, capacity and costs. For example, Tsamboulas (2001) showed a positive relation between walking time from destination to parking place and car usage in cases where walking time increases till 50% in comparison with people's current situation. Bonsall and Palmer (2004) found that parking tariffs and walking time were the two major attributes affecting parking choice and more recently, Khaliq et al. (2018) contributed that the type of parking place and parking location are the two major sub-choices in the parking choice decision process. This experiment doesn't take the parking costs into consideration. Nowadays, in The Netherlands parking costs for residential parking only play a role in the city centre or areas closely located to the city centre. In neighbourhoods in suburban areas, parking is normally free.

The uncertainty of a parking place isn't part of this research's scope for the following reasons. First of all, Khaliq et al. (2018) emphasised that mainly the type of parking place and parking location affect the parking choice. Furthermore, this research focuses at residential areas where mostly is enough space to park nowadays and more car restrictions wouldn't benefit the attractiveness of the neighbourhoods. Also, it seems hard for respondents to imagine new residential areas without enough room to park and therefore it is uncertain whether respondents can make plausible choices.

The walking distance is used as proxy for the distance between home to parking place, according to an average speed of 1,5 minute per 100 meter. Generally, walking times give respondents a better approximation than a distance because people find it hard to distinguish the difference between distances in meters. Also, recent SC-experiments used the walking time instead to present the walking distance.

The attribute levels for the walking time are derived from multiple earlier conducted SC-experiments. In some studies the walking time was rather short, below the five minutes (see Van der Waerden (2012) and Khaliq et al. (2018)), while other studies took a longer walking time of eight to ten minutes into account (see Chaniotakis and Pel (2015) and Hai et al. (2019)). For example, Christiansen et al. (2017) found that people are willing to accept on average 155 meter between home and home parking, which approximates a walking time of two minutes. Van der Waerden, Timmermans & De Bruin-Verhoeven (2017) found that the maximum walking distance for car drivers between parking place and location that car drivers are willing to walk from parking place to their location is maximal 50, 100 and 500 meters for respectively work, shopping and non-shopping purposes.

Similarly, Pan, Liang, and Chen (2019) found that car owners are most likely to abandon driving when the walking distance between car and destinations is more than 400 meter, while Kittelson and Associates (2003) concluded that people are willing to walk maximal 700 meters to the closest BTM-station based on studies about catchment areas of local urban PT. Based on all these studies, it seems reasonable to vary the walking time from home to parking place within this range, so between two, five and eight minutes.

The attribute levels for the type of parking place are based on guidelines of the CROW, *Kennisinstituut Mobiliteitsbeleid* (KiM) and earlier SC-experiments. The CROW offers advice in parking norms based on neighbourhoods' housing types and prices as guideline for municipalities (CROW, 2012). The CROW takes four types into consideration: on-, off-street parking, parking in public parking garages and parking besides P&R's (see CROW (2017) for more details). Also, KiM adviced municipalities about their parking policies and distinguished three kind of parking places: parking besides streets, public parking garages and parking at a P&R (see Kansen (2018)). Similarly, reviewed SC-experiments take on-street, off-street and parking in public parking garages into consideration (see Van der Waerden (1993) or Hai et al. (2019)).

The variation in above described documents results in the following attribute level selection for the type of parking place: reserved parking place, parking off-street at a public parking area and parking in public parking garages. Parking at P&R's is out of scope, because these are mostly located outside cities to offer access to the inner-city area instead.

B.1.2. MaaS-hubs

This research focuses only at MaaS-hubs located in neighbourhoods used by their residents and as transfer points with PT. These hubs are located in new residential areas with a lower to medium density degree relatively close to local PT. Therefore, this experiment varies three different MaaS-hubs: hubs with (1) only shared bikes and -cars, (2) shared bikes, -cars and a BTM station and (3) hubs with these facilities and a train station for at least slower-speed trains ("*Sprinters*").

Hubs are combined with PT, because earlier research showed that bicycle hub usage increases when hubs are located near metro stations (see Faghih-Imani and Eluru (2015) and Dadio (2012)). Also, this is a relatively simplified hub conceptualisation, because earlier research showed that mostly respondents are yet unaware of the meaning of MaaS and comprehends the idea of MaaS better when it includes less modes (Matyas & Kamargianni, 2019).

The distances between home and hub are derived from literature with regard to bicycle hubs, because the availability of literature about the accessibility of trips with slow modes and short distances is limited (Van Wee, 2016). Most research has been focussing on the accessibility of motorised transport modes (Hamidi, Camporeale, & Caggiani, 2019).

The Mobility Hubs program from the Los Angeles Department of City Planning stated that the "ideal" distance between bike sharing stations is within a range of ¼- ½ mile (approximately 400 – 800 meter) (Planning, 2016). On average, they found that people are willing to walk 400 meter to a hub. Also, Rooij (2020) conducted interviews with six experts such as a project developer in shared mobility, a business developer responsible for the strategic implementation of hubs and a researcher and expert in the field of shared mobility and MaaS. Based on these interviews he concluded that the distance that people want to travel to hubs is related to the used mode and trip purpose. More expensive, faster modes and a longer travel distance will probably increase the willingness to further away located hubs. These experts concluded that the catchment area of mobility hubs is around the 300 t0 500 meters (Rooij, 2020).

Furthermore, he concluded that hubs should offer additional services (as shops or postal service) or ideally hubs are located nearby these services. These findings are line with Faghih-Imani and Eluru (2015) and Dadio (2012) who found that bicycle hubs nearby shops have higher trip volumes. However, another recent published master thesis about estimating influential factors in transition to MaaS didn't find a significant statistical relation between the willingness to use MaaS-hubs and hub facilities (Raijmakers, 2019). Therefore, hubs facilities aren't part of the scope.

B.1.3. Quality of the neighbourhood

The provision of green spaces benefits to an attractive recreational image and public green spaces are regarded as substitutes for recreational areas. Example of operationalised urban green attributes are "an *additional recreational area*" (Gundlach et al., 2018, p. 681), "*improvements to areas of open space*" (Lanz & Provins, 2013, p. 109)) and "*scenic view of green spaces*" (Tu et al., 2016, p. 22). Moreover, Van Dongen & Timmermans (2019) found that grass and flower sides significantly influence the attractiveness of residential areas, while also urban parks have a high valuation as urban green (see Shao et al. (2018)). Therefore, (1) green zones besides streets, (2) small parks diffused through the neighbourhood and (3) a big park in the middle of the neighbourhood represent the urban green variable in this experiment.

Furthermore, the reviewed papers showed that the importance of facilities as neighbourhood characteristic in relation to residential reallocation and travel behaviour. The attribute levels for facility levels are derived from plans for new to build residential areas with a relative low parking norm in The Netherlands, such as "*Merwedekanaalzone*" in Utrecht (Merwede, 2020). This area is located in Utrecht near the central train station ("*Utrecht Centraal*") with a parking norm of 0,3 and therefore is considered as comparable car-restricted area.

These plans emphasized the importance of commercial and social-cultural facilities besides necessary facilities as supermarkets and schools. Examples of commercial and social-cultural facilities are non-food shops, hotels, restaurants, cinemas, theatres and a sports hall. Therefore, the following attribute levels represent the facilities in the neighbourhood: (1) only necessary facilities as food shops and a primary school, (2) necessary and non-necessary facilities as non-food shops and (3) necessary, non-necessary facilities and entertainment venues.

The attribute "layout of streets" represents an overall value for multiple neighbourhood characteristics, such as the safety for kids to play on streets, the accessibility for cars, experienced nuisance and accessibility perceptions. For example, streets where cars are forbidden offer more possibilities for kids to play outdoor and cause less nuisance, while streets accessible for cars induce more nuisance and parents have to pay more attention on their (especially young) children to guarantee their safety. A recent study from Wang et al. (2020) indicated that these subjective neighbourhood characteristics influence the change in travel satisfaction in residential areas. Also, Kährik et al. (2012) found that the safety of the neighbourhood was an influential factor to live in a neighbourhood.

These studies assess the importance of a safe and quiet neighbourhood with relative low nuisance. Therefore, the following attributes represent the street layout in relation with car access in the neighbourhood: (1) streets accessible for cars, (2) "*fietsstraten*" accessible for cars and bikes, but bikes have priority and (3) streets where access by car is prohibited.

B.2. Mobility costs

This paragraph explains the calculations of the costs for car, MaaS-subscriptions and PT. Respondents will see these estimations before they choose a MaaS-subscription to make them aware of their current monthly mobility costs. These estimations represent the "real" monthly car costs, including insurance, tax, depreciation, maintenance and fuel costs.

B.2.1. Operationalization car costs

The costs of having a car depend on the kind of car that respondents have, see the following options: an own car, lease car with and without private use from the employer or own business and a private lease car. The costs of having an own car depend on the car class where the car belongs to, as denoted by the European Commission (4064/89, 17 March 1999): mini-, compact-, compact middle-, middle- and higher middle class. Nibud, the National Institute for Budgetary Information in The Netherlands, provides the most recent car costs estimations per car class (see Table B.1). These estimations don't include estimations for higher class cars and therefore their costs are presented as the minimal amount of middle class costs. The higher car class users get the estimation of a middle class car while indicating that their travel costs are probably higher. Also, they get different examples per car class to avoid that they choose the wrong car class (see Table B.2).

For the lease car excluding private use (both from employer and own business), this experiment assumes that the current car costs are €0, all on behalf of the employer. The costs of having a lease car with private use (both from employer and own business) depend on the additional tax liability ("*bijtelling*") that respondents have to pay. These are derived from the monthly costs' calculations for the most popular lease cars (SalarisNet, 2018). Respondents can choose between different categories divided per €100 (so from €0-€100, €100-€200 etc.) where the estimation is the average of this category. For example, when they indicate that their additional tax liability ("*bijtelling*") is between €100-€200, they get the indication of a monthly car costs of €150.

The cost calculation of having a private lease car are similar and only extended with an estimation for the fuel costs. This is based on the average total driven kilometres per year in The Netherlands, 13.000 km (see (CBS, 2018)) and a fuel price of €1,63 per liter, in accordance with the calculations of Nibud (2020). These calculations don't consider the decreased fuel prices caused by the COVID-19.

Table B.1: Estimation car costs (see Nibud (2020))

	Mini class	Compact class	Small middle class	Middle class
Fixed costs	€165	€218	€280	€398,50
Depreciation	€58,50	€84	€119,50	€195
Insurance	€65,50	€79	€93	€120
Taxes ("Motorrijtuigen-belasting")	€20	€34	€46,50	€62,40
Maintenance	€21	€21	€21	€21
Variable costs	€138	€170,50	€206	€250,50
Depreciation	€21	€31,50	€40,50	€63,50
Maintenance + reparations	€39,50	€44	€54,50	€70,50
Fuel	€77,50	€95	€111	€116,50
Total	€303	€388,50	€486	€649

*Calculation is based on 10 years and respectively 9000, 10.000, 11.500 and 11.00 km per year

** In order to calculate the fuel price, benzine is considered as fuel with a price of €1,63 per liter

Table B.2: Examples of cars per class (source: (InfoNu.nl, 2015))

Mini class	Compact class	Small middle class	Middle class	Higher middle class
Chevrolet Matiz	Audi A1	Audi A3	Audi A4/A5	Audi A6/A7/100
Fiat Panda	Citroën C3	Citroën C4	BMW 3-serie	BMW 5-serie
Ford Ka	Fiat Punto	Ford Focus	Citroën C5	Citroën C6/ DS
Opel Agila	Ford Fiesta	Honda Civic	Ford Mondeo	Ford Scorpio /Granada
Peugeot 107	Mini Cooper	Mazda 3	Mazda 6	Honda Legend
Renault Twingo	Nissan Micra	Opel Astra	Mercedes-Benz C-Klasse	Jaguar XF
Toyota Aygo	Opel Corsa	Peugeot 308	Opel Vectra / Insignia	Lexus ES / GS
Volkswagen Fox/Lupo/ Up	Peugeot 206/207/208	Renault Mégane	Peugeot 407	Mercedes-Benz CLS-klasse / E-klasse
	Renault Clio	Seat Leon	Peugeot 508	Opel Omega/ Commodore
	Seat Ibiza	Skoda Octavia	Renault Laguna	Peugeot 605 /607
	Suzuki Swift	Toyota Auris/Corolla/ Prius	Skoda Octavia	Rover 75
	Volkswagen Polo	Volkswagen Golf/Jetta	Toyota Avensis	Saab 9-5/ 9000
		Volvo C30/S40/V40/ V50	Volkswagen Passat	Toyota Camry
			Volvo V60	Volvo S60/S80 /V70

B.2.2. MaaS subscription packages

Respondents can choose between three different MaaS-subscriptions, derived from recent experiments. Caiati et al. (2020) conducted a special choice experiment. They could compose their favorite MaaS-subscription by choosing their preferred level per transportation modes. They varied monthly prices between €150 till €240 per month, PT between 20% discount to unlimited, e-bike sharing between 50% discount to unlimited and e-car sharing between 20% discount to 300 minutes per month included. They concluded that PT is the most preferred option over all chosen subscriptions, while taxi and car rental were the least preferred modes. This is in line with Matyas and Kamargianni (2019) stating that people get a better understanding of MaaS when it doesn't include too many modes. Therefore, the MaaS-subscriptions exists of train, BTM, shared car and -bike. The taxi option isn't taken into consideration.

The MaaS-subscriptions have prices of €100, €250 and €400 in line with recent SC-experiments, who all found that that price significantly influence the subscription rates . For example, Fioreze et al. (2019) offered four subscriptions with a price of €0, €50, €100 and €400, while De Vliet (2019) varied prices between €50, €175, €300 and €425 and Caiati et al. (2020) between €150 till €240 per month. Also, Ratilainen (2017) varied the price between €105, €210 and €315.

The mobility packages of train and BTM are in accordance with existing subscriptions of NS, HTM, RET and earlier research. Caiati et al. (2020) concluded that people prefer subscriptions with unlimited access for PT instead of discount percentages, while De Vliet (2019) found that people prefer unlimited use and free-off peak and weekend use for train. Similar, Fioreze et al. (2019) offered four similar subscriptions for all PT options with discounts of 0%, 20% in rush hour + free off peak hour, 40% in rush hour + free off peak hour and 100%. Therefore, mobility packages costing €250 or more have unlimited access to bus/tram/metro included. This seems realistic, because HTM offers a monthly unlimited options (six star maximum subscription) of €257 per month.

The prices for shared car are based on existing prices of *Greenwheels*, national train operators' shared car service in The Netherlands, and are in line with Ratilainen (2017), who varied between "not included", 4 and 8 hour free usage. Furthermore, the prices of Greenwheels seem to be consistent with De Vliet (2019) offering car sharing for €4/hour + €0,29/km and €3/hour + €0,24/km, where only the minimum level was statistically significant. The bike sharing options are in accordance with Fioreze et al. (2019), offering €1,50 per hour or unlimited as options, and Caiati et al. (2020) including 0% discount, 50% discount, 1 free hour a day and unlimited rides, where only the 50% discount options was statistically significant.

B.2.3. Operationalization PT-costs

Earlier SC-experiments showed that people using PT on a regularly basis were more willing to subscribe to MaaS (see Fioreze et al. (2019)). Therefore, respondents gets questions whether they possess a PT-subscription and so yes which kind of PT-subscription they possess and to what extent they are responsible for the costs. The PT-costs are based on PT-subscription prices. In case that the employer is fully responsible for the costs or respondents have a student PT-subscription paid by the Ministry of Education, Culture and Science, the experiment assumes that their PT-costs are zero. Thereby, it assumes that students graduate within ten years and then their PT-subscription is totally free. In case that the employer only partly remunerates respondents' PT-costs, the experiment calculates the PT-costs dependent on the remuneration's average percentage, divided in categories per 20% (so 0-20%, 21-40% etc.).

Respondents can choose between nation-wide-, regional-, and NS-subscriptions (see the survey in Appendix C for an complete overview). If the price depends on the specific trajectory or respondents don't possess any of the described subscriptions, they give an indication of their monthly PT-costs divided in categories per €50 (i.e. €0-€49,99/€50-€99,99). The average per category determines respondents' PT-costs.

B.3. Built environment indicators

Sub-paragraph B.3.1 discusses the selection of built environment indicators and B.3.2 discusses two methods to measure these indicators.

B.3.1. Selection of built environment indicators

According to the literature review, different sub-categories can classify the built environment indicators: distance to local services, greenness of the neighbourhood, kind of residential area and a "remaining" category. The first category consists of distances to the nearest PT-station, access to the highway, local supermarket or shops for daily groceries and city centre. Greenness of the neighbourhood consists of factors about the share of green and proximity to parks. The kind of residential area category is about the dwelling type and population density. Finally, the remaining category contains factors as "quietness" of the neighbourhood and amount of car traffic.

Besides these factors, built environment factors with specific interest to the parking context are also interesting to take into consideration. For example, people with an own parking place seem less willing to replace their car by a MaaS-subscription, while people living in a busy city centre could be more willing to buy a MaaS-subscription due to accessibility problems with car in cities. Examples of those factors are the type of parking place, distance to public parking place and parking pressure in the neighbourhood.

B.3.2. Methods in relation to built environment

The reviewed studies measure built environment indicators by an objective or subjective method. The first method uses statistical data obtained from a national statistical office or government to calculate the indicators. Examples are the closeness to a PT-station, primary school or shops (see Visser (2006) for an example). The second method asks respondents with a survey where they can address their agreement on statements on a five or seven point scale. Example statements are "PT is too far to walk to", "shops are too far to walk to" or "local park is nearby" (see Humpel, Owen, Iverson, Leslie, and Bauman (2004)).

This experiment applies both methods, similar as Wang et al. (2020). The Dutch Central Statistical Office (CBS) provides population-, liveability-, motor vehicles-, surface- and urbanity factors per neighbourhood (see Table B.3). In order to derive the name of respondents' neighbourhood, respondents get the question to give their six-digit postcode (see Paragraph 4.5.1). The six-digit postcode gives access to the address via Google Maps. Software programme QGIS (open source geographical information system) can combine the neighbourhood layout provided by the CBS with respondents' addresses (see CBS (2020)). Thereby, it provides the neighbourhood where each respondent lives. After that, the Statline database provides access to the statistics of each neighbourhood (see Statline (2020b)). In case that respondents are not willing to give their six-digit postcode, they got the options to give their four-digit postcode or residence. This makes the neighbourhood characteristics less precise but offers at least the possibility to compare the characteristics per municipality.

Furthermore, the "*Leefbaarometer*" measures the liveability of residential areas in The Netherlands, (Ministry of Internal Affairs, 2020). It defines the liveability as extent that residential areas match with the requirements and needs that people set and uses 100 indicators divided in five dimensions to obtain an overall liveability score (houses, residents, facilities, safety and physical environment (Overheid.nl, 2020). Similar as for the CBS database, the "*Leefbaarometer*" gives scores on a neighbourhood and municipality level.

These approaches have two major advantages. First of all, it limits the amount of questions for respondents and thereby the survey time. Furthermore, the statistics are objective information, so the subjectivity of respondents don't play a role here. For example, every respondent have a different perception and understanding about terms of "closely related" or "well accessible" used in statements, while living in the same neighbourhood. Secondly, these data are recently published (26 February 2020) and updated annually by the CBS which increases their reliability. The "*Leefbaarometer*" data is only from 2018, because the 2020 data isn't yet available.

Table B.3: Neighbourhood factors obtained from CBS (see Statline (2020b))

Population	Liveability	Motor vehicles	Urbanity
Total residents	Total houses	Total cars	Urbanity grade
Total residents 0-15 years	Average housing price	Average cars per household	Address density
Total residents 15-25 years	% 1 family houses	Average cars per km^2	
Total residents 25-45 years	% 1+ family houses		
Total residents 45-65 years	% owner-occupied houses		
Total residents 65+ years	% rental houses		
Total households	% houses rent by housing associations		
Total households_1person	% houses rent remaining		
Total households_1+person	% houses built before 2000		
Total households with children	% houses built after 2000		
Total households without children			
Average household size			
Population density			

Table B.4: Attributes living environment operationalised as questions on a five point scale

Distance to local services	Greenness of the neighbourhood	Remaining	Experimental factors
Nearest train station	Share of green and trees	"Quietness"	Type of parking place
Nearest BTM station	Proximity to park	Safety to walk	Distance to public parking place
Nearest access to highway	Proximity to recreational area	Safety to play outside	Extent of sufficient parking places / parking pressure
Local supermarket	Proximity to playground		Presence of shared cars
City centre			Presence of shared bikes

B.4.Socio-demographic variables

The literature identified some disagreement in the scientific literature about the influence of socio-demographic factors on MaaS' subscriptions (see Paragraph 2.7). Therefore, this experiment includes a broad range of socio-demographic variables: gender, age, household situation, number of children in the household, amount of cars in household, education and income level and working status, similar to the discussed SC-experiments..

Also, the reviewed literature made clear that the experiment should include people's current travel behaviour and therefore the survey includes questions to the extent of car (as driver and passenger), train, BTM, bike, shared car and -bike use. Respondents can choose between nine categories to indicate their pre-corona travel behaviour: (1) (almost) every day, (2) five to six days a week, (3) three to four days a week, (4) one to two days a week, (5) one to three days a month, (6) six to eleven days a year, (7) one to five days a year, (8) less than one day a year and (9) never used before.

This part includes two additional socio-demographics questioning people's willingness to move and buy a new car (new, second-hand or (private) lease car) between now and five years. Respondents could choose between eight categories. These are: (1) between now and 0,5 year, (2) over 0,5 till 1 year, (3) over 1 till 1,5, (4) over 1,5 till 2, (5) over 2 till 3, (6) over 3 till 4, (7) over 4 till 5 years and (8) not think about moving or buying a car between now and five years.

C. Methodology

This appendix describes the discussed research methodologies in more detail. First, Paragraph C.1 describes the conjoint analysis and SC-experiment in general. Secondly, Paragraph C.2, C.3 and C.4 respectively elaborates on the regression-, discrete choice- and Integrated Hierarchical Information Integration model. Then, Paragraph C.5 explains the construction of the experiment and finally Paragraph C6 discusses the final survey design.

C.1. Conjoint analysis

Conjoint analysis is a data collection method that is especially useful to explore people's trade-offs between different neighborhood characteristics (Molin, 2011). It is useful to apply if people have potentially differ in their preference for attributes and corresponding attribute levels and if they combine all attribute levels together to determine an overall preference for an alternative (Louviere, Flynn & Carson, 2010). This method constructs hypothetical profiles by varying characteristics influencing the residential environment. Respondents rate each profile on an X-point scale or choose between two or multiple profiles. Regression or logit models derive the part-worth utilities for each attribute level and an overall utility per profile (Molin, 2011).

The utility function gives the following insights. Firstly, the part-worth utilities show each attribute level's contribution to the overall utility function and thereby provides insight into their relative importance in comparison with other attributes within the range of the varied attribute levels. Thereby, it gives insights in the trade-offs between residential attributes. Secondly, it allows to test for main and interaction effects. Main-effects are the utility contribution of each attribute level independent of the influence of other attribute levels, while interaction effects indicate that the effect of specific combinations between two attribute levels have different effects on the total utility than the sum of both main effects. Thirdly, utility functions offer the possibility to derive an overall utility per neighborhood design based on the sum of the part-worth utilities. Lastly, it enables to estimate a choice model if the experiment enhances a choice task (Molin, 2011).

C.1.1. (Dis)advantages Stated Choice experiments

Stated Choice (SC) experiments are a form of conjoint analysis, where characteristics describe services or goods and individuals can value these services based on the variation in levels of these characteristics (Ryan & Farrar, 2000). Its most important advantage is that hypothetical attributes and characteristics are under control of the researcher. SC-experiments offer the possibility to vary hypothetical situations along one or more dimensions and give individuals an array of different hypothetical configurations (Bruch & Mare, 2012). Therefore, their main advantage is that it can estimate people's behavior in future, not yet existing, situations (Wittink, 2011).

However, it is questionable whether respondents behavior is similar as the SC-experiment estimates (Ben-Akiva, McFadden, & Train, 2019). Secondly, respondents may express socially desirable preferences. Also, they judge the hypothetical situations on an individual level while they make mobility choices within their household, on a household level (Bruch & Mare, 2012). Lastly, when including new not-yet-existing concepts people have no experience with the new mobility options and therefore it is questionable whether people will behave as expected after experiencing the concept in real-life (Bruch & Mare, 2012). This is especially related to MaaS-researches.

C.1.2. Context dependent stated choice experiment

This experiment contains a context-dependent SC-experiment. The context is the "*physical, socioemotional, and mental setting in which behavior takes place*" (Eric Molin, 2019, p. 3) and therefore describes the choice situation and assumptions that respondents have to take into consideration when making their choices. It looks as follows: respondents judge different neighborhood designs based on the variation in neighborhood characteristics. For each design they have to indicate the overall attractiveness and have to choose between owning a car or a MaaS-subscription (see Chapter 4).

The designs don't vary the characteristics of MaaS-subscriptions as previous MaaS-experiments and therefore derives their characteristics (discount percentages, costs and mobility options) from these experiments (see Paragraph 3.3.2). Respondents can choose between three different MaaS-subscriptions with different discount options and total costs, because every person has different mobility preferences and income level. Thereby, it isn't the goal to find the optimal MaaS package (that is out of scope), but researching the influence of the trade-off between the availability of MaaS-hubs, reduced parking comfort and neighborhood characteristics on the adoption rate of MaaS.

However, there seems no reasons why the variety of respondents' preferences in MaaS-subscriptions would differ based on contextual factors. Therefore, respondents choose one of the MaaS-subscriptions as their preferred one before they fill in the choice situations. Respondents only choose between their preferred MaaS-subscription, the car (or multiple cars in case they have two or more cars) or both of them.

C.2. Regression analysis

A regression model analyses the neighbourhood's overall attractiveness. It is an application of a linear model where a dependent variable with numeric values depends on one or more quantitative independent variables (Freund et al., 2006). Its purpose is to make inferences about the relationship of the dependent variable's mean in relation with the independent variables. Therefore, the dependent variable should have at least an interval or ratio measurement scale.

A correlation model reports the strength of a relationship between two random variables measured by the correlation coefficients with values between -1 and 1. A correlation of +1 and -1 defines respectively an exact direct and inverse relation between the dependent and independent variables and a correlation of zero implies that there is no relation at all. Furthermore, the correlation coefficient is symmetric and doesn't depend on the measurement unit of either variable.

Regression analysis have the following limitations. First of all, a found regression relationship between an independent and dependent variable doesn't imply that x causes y. This is only the case when no other variable involves the relationship between x and y, so x causes y in case that all other parameters are constant. Secondly, linear regression models are only suitable for interpolation, not for extrapolation. Thereby, they can only derive statements within the range of the observed independent variables. Also, outliers can cause difficulties. Outliers are unusual expectations that can bias regression analysis negatively and result in incorrect standard errors and significance levels.

Multiple regression analysis (see Paragraph C.2.2) have some additional features, such as hidden extrapolation. This occurs when values of individual independent variables are within the range of the observed variables, but a combination of two or more variables doesn't occur. The chance of a cause-effect relationship increases when the model includes more independent variables, but causes multi-collinearity. That is the existence of strong correlations between independent variables resulting in more significant relations with coefficients that have signs that doesn't satisfy the expectations beforehand.

C.2.1. Linear regression model

The linear regression model is the regression model's simplest form and has the following assumptions: (1) the model adequately describes the data's behaviour and (2) the random error component (ε) is an independently distributed following the normal distribution (mean of zero and variance σ^2). It is written as follows (see Freund et al. (2006) for more details):

$y = \beta_0 + \beta_1 x + \varepsilon$ (1)

The parameters β_0 and β_1 represent the regression coefficients with β_0 as intercept and β_1 as slope. The random part of utility (ε) describes the responses' variability about the mean. The regression coefficients are estimated is such a way that it minimizes the sum of squared deviations (SS) (see equation 2). The estimator β_1 represents the sum of cross products for the differences between the observed values and the mean for x and y divided by the squared differences of the x-values (see equation 3).

$$SS = \sum(y - \widehat{\mu_{y|x}})^2 = \sum(y - \widehat{\beta_0} - \widehat{\beta_1} x)^2 \quad (2)$$

$$\hat{\beta}_1 = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sum(x-\bar{x})^2} = \frac{SS_{xy}}{SS_{xx}} \quad (3)$$

The mean square (MSE) is the estimated variance, which indicates the variance of the dependent variable (y) after fitting a regression model for the independent variable (x). It is the sum of squared differences from the mean (SSE) divided by the degrees of freedom (see equation 4). The degrees of freedom is the difference between the number of elements in the sum of squares and estimated parameters. The F-statistic represents the division between the difference between the restricted and unrestricted model error sums of squares, the $SS_{hyptohesis}$, and unrestricted model error sum of squares (see equation 5).

$$MSE = \frac{SSE}{df} = \frac{\sum(y-\widehat{\mu_{y|x}})^2}{df} \quad (4)$$

$$F = \frac{SS_{hypothesis}}{MSE_{unrestricted}} \quad (5)$$

C.2.2. Multiple linear regression model

The multiple linear regression model extends the linear regression model and enhances multiple independent variables with relationships between each other (Freund et al., 2006). The equation looks quite similar as equation 1 with y as dependent variable, x_j as different independent variables, β_0 as intercept, β_j as corresponding partial regression coefficient and ε as random error component (see equation 6). The multiple linear regression model differs from linear regression models with regard to the interpretation of the regression coefficients, called partial regression coefficients in this case. These represent the effect of the average change of the independent variable on the dependent variable while keeping all other variables constant and depend on the correlation efficient (r) between dependent and independent variables (see equation 7).

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_m x_m + \varepsilon \quad (6)$$

$$\beta_1 = \frac{r_{yx1} - (r_{x1x2})(r_{yx2})}{1 - {r_{x1x2}}^2} \quad (7)$$

C.3. Discrete choice modelling

This research estimates a Discrete Choice model (DC) to make statements about the trade-off between the reduced parking comfort, the availability of MaaS-hubs and the increased quality of the living environment. DC-models are commonly used models in the literature to estimate the Willingness To Pay (WTP) for not existing attributes and are therefore very useful to estimate the trade-offs between MaaS and car (Torres et al., 2013). They explain and predict choices between two or multiple discrete events by using the random utility theory which assumes that individuals choose the option with the highest overall utility (see McFadden (1974)).

When choosing between different options, both unobserved and observed attributes influence a certain behavior. Alternative i (e.g. modality option) has the following utility (U_i): the observed utility by the analyst (V_i) and the unobserved utility (ε_i) (see equation 14). The observed utility exists of measured and observed attributes, while the unobserved utility consists of everything that influences the choices that isn't part of the observed variables. The DC-model estimates the weight of the observed attributes that show the importance of the attribute relative to other observed attributes and unobserved factors, see equation 15 (Hensher et al., 2005). In case of labelled alternatives (see Paragraph 4.4) an additional Alternative Specific Constant (ASC) represents the averaged utility from all unobserved sources of utility of an alternative (Hensher et al., 2005).

$$U_i = V_i + \varepsilon_i \quad (14)$$

$$V_i = \sum_m^n \beta_m * x_{im} \quad (15)$$

DC-models assume that respondents choose alternative A_i when its overall utility is higher than that of alternative A_j (see equation 16) (Ortúzar & Willumsen, 2011):

$$U_{iq} > U_{jq} \forall A_j \in A_q \rightarrow V_{iq} - V_{jq} > \varepsilon_{jq} - \varepsilon_{iq} \; \forall A_j \in A_q \quad (16)$$

C.3.1. Multinominal Logit Model

One of the well-known DC-models is the Multinominal Logit (MNL) model, which exists of a non-random and random part. The non-random part follows the definition from equation 15 and the random part is EV Type I distributed across the alternatives (Train, 2009). Thereby, the error components from all alternatives have the same probability distribution and are mutually independent distributed, known as the i.i.d. assumptions (Louviere et al., 2000). This allows for relatively easy computations with the current available software. If *J* denotes the number of alternatives within a choice set, the probability *P* that respondents choose alternative *i* from choice set *n* is the following:

$$P_i = \frac{\exp V_i}{\sum_{j=1}^{j} \exp V_j} \quad (17)$$

The Maximum Likelihood-principle is the underlying principle to estimate the data, which assumes that according to this statistical data the estimated parameters are the most probable (see equation 18). This principle underlies the calculation of the McFadden's rho square, representing the overall model fit (see equation 19). When the rho-squared results in respectively zero or one, the model isn't better than "throwing a dice" or there is a perfect fit. A satisfactory to good model fit accords with a rho-square between 0,2 and 0,3. Then the estimated model can optimize the neighbourhood designs and the researcher can select the attribute levels that maximize the total utility (Borgers et al., 2008).

$$LL(\beta) = \sum_n \sum_i y_n * \ln(P_n(i|\beta)) \quad (18)$$

$$\rho^2 = 1 - \frac{LL_\beta}{LL_0} \quad (19)$$

MNL-models have the advantage that choice-based sampling doesn't occur and it defines the units of analysis well, because the choices observed in SC-experiments are rather small (Bruch & Mare, 2012). Furthermore, these models can incorporate both existing mobility options as new non-existing options, so respondents can compare their current mobility with a new (hypothetical) option.

C.3.2. Mixed Logit model

However, MNL-models have a number of disadvantages. For example, the MNL-model can't capture nesting effects, while the MaaS only and the combination alternative have similarities, such as its novelty in cost perception as in travel behavior. Therefore, a ML-model is estimated to capture this heterogeneity. It nests both alternatives and adds an additional error term to its utility function. This error term represents the utility of the alternatives' common unobserved factors in a nest. It calculates the choice probabilities as follows:

$$P(i) = \int_{v}^{n} [(P_i|v) * f(v) dv] \quad (20)$$

Also, earlier researches to MaaS showed heterogeneity in the response options between respondents. The MNL-model can't capture these heterogeneities due to the i.i.d. assumption. ML-models can vary the parameters across individuals with density f(β) and calculates the choice probabilities as follows:

$$\oiint P(i) = \iint_{v,\beta}^{n} [(P_i|v,\beta) * f(v) \, dv d\beta] \quad (21)$$

Lastly, the MNL-model assumes that choices made by the same individual are uncorrelated, while it is realistic to assume that these are. Therefore, this research estimates a Panel ML-model, which can captures these correlations and calculate the choice probabilities as follows.

$$\oiint P(i) = \iint_{v,\beta}^{n} [\prod_{t=1}^{T} (P_i|v,\beta) * f(v) \, dv d\beta] \quad (22)$$

C.4. Integrated hierarchical information integration approach

The integrated Hierarchical Information Integration approach (HII) developed by Oppewal et al. (1994) combines both the rating and choice experiment. SC-experiments have the practical limitation that the experimental design's size and complexity increase exponentially with an increase in the number of attributes and attribute levels (see Molin & Timmermans (2009)). HII assumes that decision makers use a multistage hierarchical decision strategy in complex choice situations. They simplify choices by categorising many attributes into subsets, called constructs, and compare these constructs with each other (Keuchel & Richter, 2011).

C.4.1. Conventional HII approach

The conventional HII approach requires two experiments representing his hierarchical component. First, it requires an experiment which measures people's trade-off between the attributes per construct. This is a rating experiment for each construct where respondents express their evaluation on a X-point scale. This enables the researcher to define the extent that each combination of attribute levels within the construct has on the overall definition of the construct and is analysed by a regression model (Louviere & Timmermans, 1990).

Secondly, it requires an experiment to measure the trade-off between the constructs on the overall choice (Molin & Timmermans, 2009). This is mostly a choice model, where the scale number of the rating experiment determines the levels of each construct. Thirdly, he can convert both models (rating and choice model) under the assumption that each subset has an error distribution with a mean of zero and there aren't any correlations between the error distributions of the other decision process (Louviere & Timmermans, 1990).

However, conventional HII approaches have a number of potential limitations (Oppewal et al., 1994). First of all, it doesn't offer the possibility to estimate an overall model directly and thereby it isn't possible to directly relate the final choice to the varied attribute levels in each rating experiment. Secondly, respondents have to evaluate the constructs on ratings obtained from the rating experiment which complicates the overall validity. Lastly, it is impossible to estimate interaction effects between attributes from different constructs.

C.4.2. Integrate HII approach

Integrated HII experiments can solve these limitations (see Molin & Timmermans (2009)). This approach offers the possibility to combine attributes levels of one construct with evaluation ratings of other constructs. In order to familiarize respondents with the ratings of constructs, the experiment consists of two questions. The first question asks to evaluation of a construct on a ten-point scale, similar as in conventional HII experiments. Only then, a second question follows asking to derive an overall evaluation of the whole alternative. This offers the possibility to offer validity tests.

The integrated HII experiment overcomes the limitations from the convention method (see Molin & Timmermans (2009)). Firstly, the total profile evaluation represents an overall evaluation at the level of the complete decision alternative by the combination of the constructs with rating and their original values. Secondly, each profile specifies all constructs which increases parameters' reliability. Thirdly, a second experiment isn't longer necessary due to the combination of the constructs with rating and constructs with their original values a second experiment and it enables the estimation of interaction effects. Lastly, it offers the possibility to test the validity of the HII process and to design all sub-experiments as choice experiments.

C.5. Construction of experiment

The procedure from Rose and Bliemer (2009) is followed to generate the experimental design. They distinguish experiments with labelled and unlabelled alternatives. Unlabelled alternatives have names which only convey their relative order of appearance and labelled alternatives use names which have a substantial meaning to respondents such as train or car. Labelled alternatives require the estimation of ASCs. A second consideration is the attribute level balance property meaning that each attribute level of all included attributes appears an equal number of times in the design (Rose & Bliemer, 2009). It ensures that the DC-model can estimate the model parameters well for all attribute ranges.

The third consideration is the number of attribute levels. Attributes varied between two variables only offer the possibility to estimate linear effects, while attributes varied in three or more levels allow to estimate non-linear effects. However, it requires the estimation of more parameters and thereby requires more choice sets. Fourthly, it is preferable to use a wide range over a narrow range, because it results in better parameter estimations due to smaller standard errors and offers the possibility to derive statements and conclusions within a wider range. Therefore, this experiment varies each attribute between three levels to estimate non-linear effects and for attribute level balanced reasons the distance between the attribute levels is coherent.

Furthermore, the literature distinguishes different design types. A full factorial design comprises all possible choice situations. This design can estimate both main and interaction effects. However, it often results in too many choice sets. Therefore, fractional factorial designs comprise only a subset of choice situations from the full factorial design. One of the common used fractional factorial designs are orthogonal designs which have the aim to minimize the correlation between attributes in the choice situations. They have the benefit that attributes don't correlate between all choice sets, so it combines each level of an attribute with each level of another attribute for an equal number of times (Molin, 2019). This results in the lowest possible standard errors for the estimated coefficients in case of estimation a linear model.

However, researchers estimating a MNL model may use orthogonal designs but these won't result in the most efficient designs (Molin, 2019). Generally, the property of orthogonal designs may conflict with many desirable properties of logit models, because these aren't linear (Rose & Bliemer, 2009).

Therefore, several researches suggest efficient designs. These designs have the aim to find the statistically most efficient design with the lowest predicted standard errors to estimate the parameters' value. These designs maximize the information gained from each choice situations and construct choice sets which maximize the information gathered from trade-offs between attributes (Molin, 2019). Therefore, it excludes dominant alternatives which give no information about these trade-offs. A dominant alternative has at least one better score for one attribute and an equal score for all other attributes (Molin, 2019). The software package Ngene supports the construction of efficient designs.

The last consideration is about the minimum required number of choice sets, which depends on the degrees of freedom. The estimation of one parameter requires one degree of freedom. When choosing between two, three or four alternatives, each choice sets adds respectively one, two and three degrees of freedom. The design should apply that the degrees of freedom are higher than the number of parameters. Therefore, it requires that the number of parameters divided by the number of alternatives per choice sets minus one is lower than the number of choice sets (see Molin (2018a)).

C.5.1. Coding scheme

This experiment contains only labelled alternatives, i.e. MaaS, car, or both of them and therefore the utility functions include ASCs. The utility functions include the neighborhood designs variables, which are almost all categorical and therefore need a coding structure. The most widely applied coding technique is dummy-coding, which codes X levels by X-1 indicator variables. Dummy coding has the disadvantage that an estimated constant (in this case alternative-specific) then coincides with the utility of the reference variable which are all coded zero (Molin & Timmermans, 2010). Effects coding is an alternative coding scheme where the reference variable has a code consisting of only minus ones instead of zeros for all indicators (Bech & Gyrd-Hansen, 2005). Therefore, the estimated coefficients for the indicator variables show to what extent the utility contribution of each level differs from the average utility (Molin & Timmermans, 2010). Therefore, this experiment applies effect coding.

The design codes the attribute levels and considers the neighborhood' situation as reference situation into account. In general, the walking time to the parking place is relatively small in current existing neighborhoods, maximal two minutes or people have an own parking place. The walking time to a hub is relatively long, because the application of MaaS-hubs are rather scarce. Also, most streets in current existing neighborhoods offer access for cars and therefore those streets are the reference level for the street layout. Furthermore, the reference levels of the provision of green and facilities consist of the attribute level with respectively the least amount of provision and facilities, i.e. green grass besides streets and only necessary facilities.

C.5.2. Utility functions rating experiment

The utility functions for the rating experiment, including and excluding interaction effects, have the following specification.

$$Rating_{designx} = Constant \; +$$

$\beta_{\text{Walktime-home-hub1}}$ * Walktime-home-hub1 + $\beta_{\text{Walktime-home-hub2}}$ * Walktime-home-hub2 +
$\beta_{\text{type-hub1}}$ * Type-hub1 + $\beta_{\text{type-hub2}}$ * Type-hub2 +
$\beta_{\text{walktime-home-PP1}}$ * Walktime-home-PP1 + $\beta_{\text{walktime-home-PP2}}$ * Walktime-home-PP2 +
$\beta_{\text{type-PP1}}$ * Type-PP1 + $\beta_{\text{type-PP2}}$ * Type-PP2 +
β_{green1} * Greenareas1 + β_{green2} * Greenareas2 +
$\beta_{\text{layout-streets1}}$ * Layout-streets1 + $\beta_{\text{layout-streets2}}$ * Layout-streets2 +
$\beta_{\text{facilities1}}$ * Facilities1 + $\beta_{\text{facilities2}}$ * Facilities2

$$Rating_{designx} =$$

$\beta_{\text{Walktime-home-hub1}}$ * Walktime-home-hub1 + $\beta_{\text{Interaction\_walktime-home-hub1}}$ * Group * Walktime-home-hub1 +
$\beta_{\text{Walktime-home-hub2}}$ * Walktime-home-hub2 + $\beta_{\text{Interaction\_walktime-home-hub2}}$ * Group * Walktime-home-hub2 +
$\beta_{\text{type-hub1}}$ * Type-hub1 + $\beta_{\text{Interaction\_type-hub1}}$ * Group * Type-hub1 +
$\beta_{\text{type-hub2}}$ * Type-hub2 + $\beta_{\text{Interaction\_type-hub2}}$ * Group * Type-hub2 +
$\beta_{\text{walktime-home-PP1}}$ * Walktime-home-PP1 + $\beta_{\text{Interaction\_walktime-home-PP1}}$ * Walktime-home-PP1 * Group +
$\beta_{\text{walktime-home-PP2}}$ * Walktime-home-PP2 + $\beta_{\text{Interaction\_walktime-home-PP2}}$ * Walktime-home-PP2 * Group +
$\beta_{\text{type-PP1}}$ * Type-PP1 + $\beta_{\text{Interaction\_type-PP1}}$ * Type-PP1 * Group +
$\beta_{\text{type-PP2}}$ * Type-PP2 + $\beta_{\text{Interaction\_type-PP2}}$ * Type-PP2 * Group +
β_{green1} * Greenareas1 + $\beta_{\text{Intersection\_green1}}$ * Greenareas1 * Group +
β_{green2} * Greenareas2 + $\beta_{\text{Intersection\_green2}}$ * Greenareas2 * Group
$\beta_{\text{layout-streets1}}$ * Layout-streets1 + $\beta_{\text{Intersection\_layout-streets1}}$ * Layout-streets1 * Group
$\beta_{\text{layout-streets2}}$ * Layout-streets2 + $\beta_{\text{Intersection\_layout-streets2}}$ * Layout-streets2 * Group
$\beta_{\text{facilities1}}$ * Facilities1 + $\beta_{\text{Intersection\_facilities1}}$ * Facilities1 * Group
$\beta_{\text{facilities2}}$ * Facilities2 + $\beta_{\text{Intersection\_facilities2}}$ * Facilities2 * Group
β_{group} * Group

C.5.3. Utility functions choice experiment

The utility functions for the choice experiment looks quite similar as the rating experiment. In total, it distinguishes four utility functions, i.e. for car, MaaS, combination with one car and two cars and only estimates an additional ASC for MaaS and the combination alternatives instead of a constant (see example below).

$V_{\text{MaaS}} = ASC_{\text{MaaS}}$ +
$\beta_{\text{Walktime-home-hub1}}$ * Walktime-home-hub1 + $\beta_{\text{Walktime-home-hub2}}$ * Walktime-home-hub2 +
$\beta_{\text{type-hub1}}$ * Type-hub1 + $\beta_{\text{type-hub2}}$ * Type-hub2 +
$\beta_{\text{walktime-home-PP1}}$ * Walktime-home-PP1 + $\beta_{\text{walktime-home-PP2}}$ * Walktime-home-PP2 +
$\beta_{\text{type-PP1}}$ * Type-PP1 + $\beta_{\text{type-PP2}}$ * Type-PP2 +
β_{green1} * Greenareas1 + β_{green2} * Greenareas2 +
$\beta_{\text{layout-streets1}}$ * Layout-streets1 + $\beta_{\text{layout-streets2}}$ * Layout-streets2 +
$\beta_{\text{facilities1}}$ * Facilities1 + $\beta_{\text{facilities2}}$ * Facilities2

V_{car} = ASC_{car}
$\beta_{walktime-home-hub1}$ * Walktime-home-hub1 + $\beta_{walktime-home-hub2}$ * Walktime-home-hub2 +
$\beta_{type-hub1}$ * Type-hub1 + $\beta_{type-hub2}$ * Type-hub2 +
$\beta_{walktime-home-PP1}$ * Walktime-home-PP1 + $\beta_{walktime-home-PP2}$ * Walktime-home-PP2 +
$\beta_{type-PP1}$ * Type-PP1 + $\beta_{type-PP2}$ * Type-PP2 +
β_{green1} * Greenareas1 + β_{green2} * Greenareas2 +
$\beta_{layout-streets1}$ * Layout-streets1 + $\beta_{layout-streets2}$ * Layout-streets2 +
$\beta_{facilities1}$ * Facilities1 + $\beta_{facilities2}$ * Facilities2

$V_{MaaS + 1 car}$ = $ASC_{carMaaS}$
$\beta_{Walktime-home-hub1}$ * Walktime-home-hub1 + $\beta_{Walktime-home-hub2}$ * Walktime-home-hub2 +
$\beta_{type-hub1}$ * Type-hub1 + $\beta_{type-hub2}$ * Type-hub2 +
$\beta_{walktime-home-PP1}$ * Walktime-home-PP1 + $\beta_{walktime-home-PP2}$ * Walktime-home-PP2 +
$\beta_{type-PP1}$ * Type-PP1 + $\beta_{type-PP2}$ * Type-PP2 +
β_{green1} * Greenareas1 + β_{green2} * Greenareas2 +
$\beta_{layout-streets1}$ * Layout-streets1 + $\beta_{layout-streets2}$ * Layout-streets2 +
$\beta_{facilities1}$ * Facilities1 + $\beta_{facilities2}$ * Facilities2

$V_{MaaS + 2 cars}$ = $ASC_{MaaS2car}$ +
$\beta_{walktime-home-hub1}$ * Walktime-home-hub1 + $\beta_{walktime-home-hub2}$ * Walktime-home-hub2 +
$\beta_{type-hub1}$ * Type-hub1 + $\beta_{type-hub2}$ * Type-hub2 +
$\beta_{walktime-home-PP1}$ * Walktime-home-PP1 + $\beta_{walktime-home-PP2}$ * Walktime-home-PP2 +
$\beta_{type-PP1}$ * Type-PP1 + $\beta_{type-PP2}$ * Type-PP2 +
β_{green1} * Greenareas1 + β_{green2} * Greenareas2 +
$\beta_{layout-streets1}$ * Layout-streets1 + $\beta_{layout-streets2}$ * Layout-streets2 +
$\beta_{facilities1}$ * Facilities1 + $\beta_{facilities2}$ * Facilities2

V_{car}	= utility car alternative
V_{MaaS}	= utility MaaS alternative
$V_{MaaS+1car}$	= utility MaaS and 1 car alternative
$V_{MaaS+2\ cars}$	= utility MaaS and 2 car alternative
$\beta_{walktime-home-hub1}$	= parameter for first component walking time between home and MaaS-hub
$\beta_{walktime-home-hub2}$	= parameter for second component walking time between home and MaaS-hub
$\beta_{type-hub1}$	= parameter for first component type of MaaS-hubs in neighbourhood
$\beta_{type-hub2}$	= parameter for second component type of MaaS-hubs in neighbourhood
$\beta_{walktime-home-PP1}$	= parameter for first component walking time between home and parking place
$\beta_{walktime-home-PP1}$	= parameter for second component walking time between home and parking place
$\beta_{type-PP1}$	= parameter for first component type of parking places in neighbourhood
$\beta_{type-PP2}$	= parameter for second component type of parking places in neighbourhood
β_{green1}	= parameter for first component provision of green
β_{green2}	= parameter for second component provision of green
$\beta_{layout-streets1}$	= parameter for first component layout of streets
$\beta_{layout-streets2}$	= parameter for second component layout of streets
$\beta_{facilities1}$	= parameter for first component facilities in neighbourhood
$\beta_{facilities2}$	= parameter for second component facilities in neighbourhood
ASC_{MaaS}	= parameter for alternative specific constant for MaaS alternative
$ASC_{carMaaS}$	= parameter for alternative specific constant for both MaaS and 1 car alternative
$ASC_{2carMaaS}$	= parameter for alternative specific constant for both MaaS and 2 car alternative
Walktime-home-hub1	= first component walking time between home and hub
Walktime-home-hub2	= second component walking time between home and hub
Type-hub1	= first component type of MaaS-hub in neighbourhood
Type-hub2	= second component type of MaaS-hub in neighbourhood
Walktime-home-PP1	= first component walking time between home and parking place
Walktime-home-PP2	= second component walking time between home and parking place
Type-PP1	= first component type of parking place in neighbourhood
Type-PP2	= second component type of parking place in neighbourhood
Greenareas1	= first component provision of green in neighbourhood
Greenareas2	= second component provision of green in neighbourhood
Layout-streets1	= first component layout of streets in neighbourhood
Layout-streets2	= second component layout of streets in neighbourhood
Facilities1	= first component facilities in neighbourhood
Facilities2	= second component facilities in neighbourhood

In total, the utility function requires the estimation of 17 parameters, i.e. 14 attribute parameters and three ASCs. The ASC for the combination between MaaS and two cars is only estimated when people have two or more cars. Thereby, the minimum number of choice sets for people with respectively one or multiple cars is ten and nine.

C.5.4. Design generation

The software programme Ngene generated the choice sets for the efficient designs. Ngene requires the specification of the number of rows and therefore as reference point Basic plan 4 is used (see Molin (2017)). Basic plan 4 offers the possibility to vary seven attributes varied in three levels, resulting in 18 choice sets. Also, it uses the simultaneous construction method which constructs alternatives and choice sets simultaneously due to the labelled alternatives (see Molin (2018b)). Figure C.1 gives an overview of the Ngene syntax.

```
design
;alts = ctx,c
;rows = 18
;orth = sim
;block = 2
;model:
U(ctx) =
a1.effects[|] * Walktime-home-hub[2,5,8] +
a2.effects[|] * Type-hub[1,2,3] +
a3.effects[|] * Walktime-home-PP[8,5,2] +
a4.effects[|] * Type-PP[1,2,3] +
a5.effects[|] * Greenareas[1,2,3] +
a6.effects[|] * Layout-streets[1,2,3] +
a7.effects[|] * Facilities[1,2,3]
$
```

Figuur C.1: Ngene syntax

Type-hub level 1 = hub near train station
Type-hub level 2 = hub near BTM station
Type-hub level 3 = hub with only shared bikes and cars
Type-PP level 1 = public parking garage
Type-PP level 2 = public parking area
Type-PP level 3 = reserved parking place besides streets
Green areas level 1 = big park
Green areas level 2= small park
Green areas level 3 = green grass zones besides streets
Layout-streets level 1 = streets inaccessible for cars
Layout-street level 2 = "fietsstraten"
Layout-street level 3 = streets accessible for cars
Facilities level 1 = necessary, non-necessary, entertainment shops
Facilities level 2 = necessary + non-necessary facilities
Facilities level 3 = only necessary facilities

Earlier research showed that respondents move from attribute based strategies to simpler strategies by focusing on the key attributes as price (Swait & Adamowicz, 2001). Therefore, nine to ten choice sets are the maximum number that respondents can handle (Caussade et al., 2005). Therefore, the design is separated into two blocks, resulting in nine choice sets per block. Thereby, each block isn't orthogonal, but attribute level balanced. Figure C.2 gives an overview of the generated design by Ngene.

Choice set	Walk time home-hub	Type MaaS-hub	Walking time home-PP	Type of parking place	Provision of green	Layout of streets	Facilities	Block
1	2	Hub near train station	8	Public parking garage	Big park	Streets inaccessible for cars	Necessary + non-necessary + entertainment facilities	1
2	5	Hub near BTM station	5	Public parking area	Small park	Streets with priority for bikers	Necessary + non-necessary + entertainment facilities	1
3	8	Hub shared bikes+cars	2	Reserved parking	Gras	Streets accessible for cars	Necessary + non-necessary + entertainment facilities	1
4	8	Hub shared bikes+cars	5	Public parking area	Big park	Streets inaccessible for cars	Necessary + non-necessary facilities	1
5	2	Hub near train station	2	Reserved parking	Small park	Streets with priority for bikers	Necessary + non-necessary facilities	1
6	5	Hub near BTM station	8	Public parking garage	Gras	Streets accessible for cars	Necessary + non-necessary facilities	1
7	8	Hub near BTM station	2	Public parking garage	Small park	Streets inaccessible for cars	Only necessary facilities	1
8	2	Hub shared bikes+cars	8	Public parking area	Gras	Streets with priority for bikers	Only necessary facilities	1
9	5	Hub near train station	5	Reserved parking	Big park	Streets accessible for cars	Only necessary facilities	1
10	2	Hub near BTM station	5	Reserved parking	Gras	Streets inaccessible for cars	Necessary + non-necessary + entertainment facilities	2
11	5	Hub shared bikes+cars	2	Public parking garage	Big park	Streets with priority for bikers	Necessary + non-necessary + entertainment facilities	2
12	8	Hub near train station	8	Public parking area	Small park	Streets accessible for cars	Necessary + non-necessary + entertainment facilities	2
13	5	Hub shared bikes+cars	8	Reserved parking	Small park	Streets inaccessible for cars	Necessary + non-necessary facilities	2
14	8	Hub near train station	5	Public parking garage	Gras	Streets with priority for bikers	Necessary + non-necessary facilities	2
15	2	Hub near BTM station	2	Public parking area	Big park	Streets accessible for cars	Necessary + non-necessary facilities	2
16	5	Hub near train station	2	Public parking area	Gras	Streets inaccessible for cars	Only necessary facilities	2
17	8	Hub near BTM station	8	Reserved parking	Big park	Streets with priority for bikers	Only necessary facilities	2
18	2	Hub shared bikes+cars	5	Public parking garage	Small park	Streets accessible for cars	Only necessary facilities	2

Figure C.2: Design generated by Ngene

C.6. Survey design

The survey consists of five parts. The first part consists of a short introduction considering the GDPR-requirements. It explains that respondents can participate entirely voluntary, they aren't obligated to answer each question and it only uses their data to publish a master thesis online. Respondents agree with these requirements by participating with the survey.

The survey's second part contains question to respondents' travel behaviour, car ownership and PT-subscriptions. First of all, respondents got seven questions with regard to their current travel behaviour to distinguish different type of travellers characterized by their travel behaviour. Secondly, this part has the goal to estimate respondents current mobility costs. Therefore, respondents have to fulfil two choice menus to estimate these costs. Therefore, respondents have to fulfil a choice menu (see Figure C.3).

First, they get the question whether they have access to a car by themselves, with consultation within or without the household. In case that they have access to a car with consultation outside t the household or don't have a car they move directly to part 1B (PT-costs). When respondents indicate that they have access to a car by themselves or with consultation within the household, they go to the next question about the kind of car within their household. They could choose between an own car, private lease car, lease car (both including and excluding private use) or neither of them. In case that they have a lease- or private lease car, they could indicate their lease contract expires (normally after three or four years), in categories per half year.

Dependent on their answer on the first question, they got a next second. When they chose the own car option, they could indicate the kind of car class where their mostly used car belongs to. Dependent on the car class, they got an indication of their monthly car costs including insurance, depreciation, taxes, maintenance and fuel. When they choose the lease or private lease option without private use, they got the indication that their current car costs were €0 and that they can assume that their employer pays the costs for the MaaS subscriptions for a proportional amount. And when they choose these options including private use, they could indicate their category where their additional tax liability ("*bijtelling*") belongs to. After choosing the right category, respondents get the indication of their mobility costs necessary for the comparison in the fourth part. For the private lease riders these costs include fuel costs.

The second sub-part consists of the calculation of PT-costs and also contains a choice menu (see Figure C.4). First of all, respondents can indicate whether they possess a PT-subscription paid by themselves, full or partly paid by their employer or have a student PT-subscription. When they have a PT-subscription fully paid by their employer or student PT-subscription, their transportation costs are €0 and they get a screen telling them that they can assume that their employer pays the costs for the MaaS subscriptions for a proportional amount. In case that the employer party pays the subscription costs respondents can indicate the percentage of the total price paid by the employer.

When respondents indicate that they have a PT-subscription paid by their own or partly by their employer, they could choose between all nation-wide subscriptions as "*Altijd Korting Jaar/Maand*", "*Net abonnement Jaar/Maand*", "*Net abonnement Jaar/Maand 65+*", NS-subscription or none of them. When they select the NS subscription, they can select their precise NS subscription, such as "*NS Dal Voordeel*", "*NS Weekend Voordeel*", "*NS Altijd Voordeel Maand*", "*NS Altijd Voordeel Jaar*", "*NS Weekend Vrij 2e klasse*", "*NS Weekend Vrij 1e klasse*", "*NS Dal Vrij 2e klasse*", "*NS Dal Vrij 1e klasse*", "*NS Altijd Vrij Maand 2e klasse*", "*NS Altijd Vrij Jaar 2e klasse*", "*NS Altijd Vrij Maand 1e klasse*", "*NS Altijd Vrij Jaar 1e klasse*" and "*NS Traject Vrij*". When selecting the "*NS Traject Vrij*" subscription they can select their monthly subscription costs divided in categories per €50 (i.e. €0-€49,99/€50-€99,99). Lastly, when respondents don't possess any of these subscriptions, they also give an indication of their monthly PT-costs divided in categories per €50 (i.e. €0-€49,99/€50-€99,99). After choosing the right PT subscription, respondents get the explanation that the costs as indicated with the subscription are important for the rest of the experiment and are necessary to compare the costs of the new MaaS subscriptions. In case that respondents neither possess a car or PT-subscription, they continue with the second part of the survey.

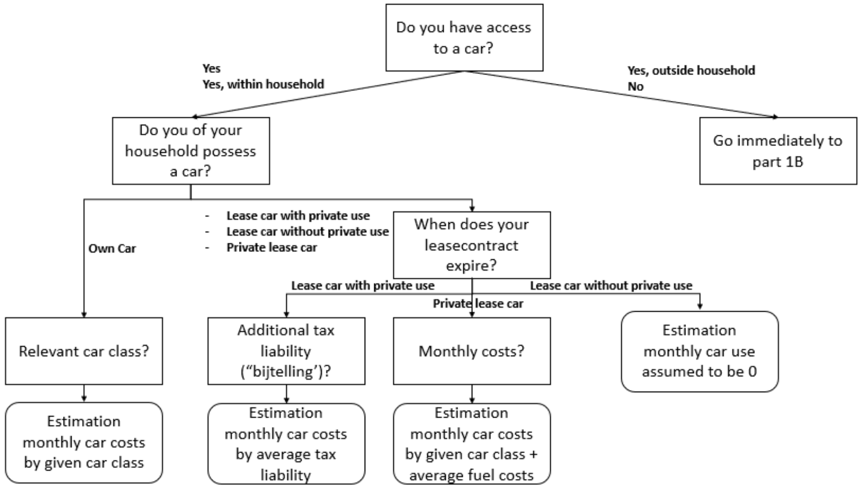

Figure C.3: Choice menu part 1A monthly car costs

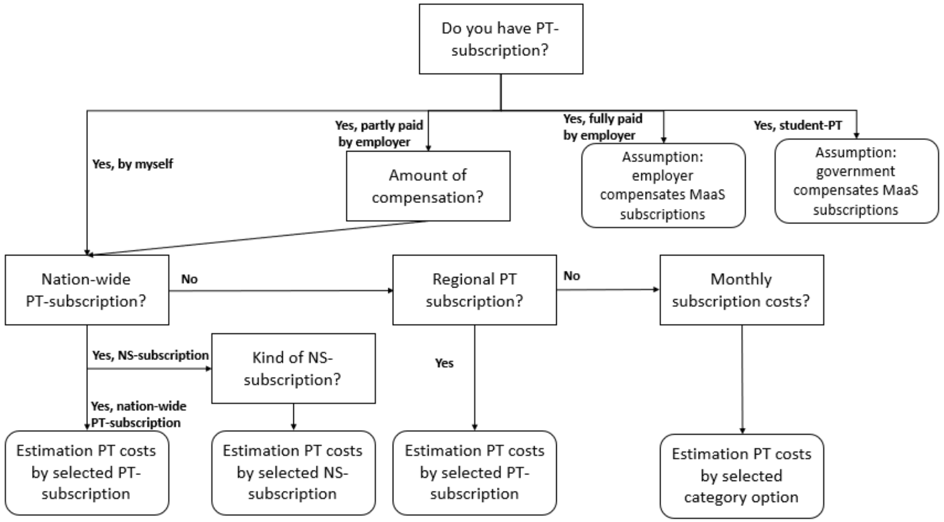

Figure C.4: Choice menu part 1B monthly PT costs

The third part explains MaaS and the choice situations by multiple steps. The first step introduced the concept of MaaS and highlighted its added value. It introduces MaaS as new mobility concept with access to all kind of mobilities, such as PT, shared bike and -cars. Furthermore, it explains that the MaaS environment calculates the "ideal" journey from A to B depending on personal preferences as cycling. Also, the MaaS environment can plan a new journey due to unexpected circumstances, as traffic jams and takes care of the reservation and payment procedure. People can subscribe to these service by purchasing a subscription.

The second step introduces respondents to MaaS-hubs as places in the new designed neighbourhood where people can pick up shared bikes and cars. In case that these MaaS-hubs are located near bus, tram or train stations, users also have access to PT. Also, it shows examples so that respondents get a better understanding of their properties and how it looks like.

Thirdly, respondents can choose between their preferred MaaS-subscription. This part shows the costs and discount percentages per mode for each subscription and finishes with a question to the amount of cars that their household possess. Dependent on their answer the survey divides them into the one of multiple car experiment. If their household possess one car, they continue with the one-car experiment and in case of two or more cars they continue with the second-car experiment.

The last part introduces the choice situations as neighbourhood designs for new constructed residential areas in cities as Amsterdam, Rotterdam, The Hague and Utrecht with car parking restrictions and MaaS-hubs. These neighbourhoods have no space for an own parking place for the front-door and have a higher walking time to the parking place in comparison with existing neighbourhoods. It presents the choice situations in table format with a distinction between neighbourhood, MaaS and car characteristics. Each choice situation consists of two questions. The first question measures the neighbourhood's attractiveness and the second question contains the choice between MaaS, car or both of them.

Before respondents started with the experiment, they got an example question showing the maximum variation between attribute levels as much as possible, so that the order of choice situations influence respondents' choices as little as possible. During the experiment respondents can learn about the varied attribute levels and thereby give different answers compared to the situation if they have known that beforehand. After the example questions, respondents continued with the nine choice situations (18 questions in total). This part ends with a question about the minimum number that the attractiveness of the neighbourhood must have to consider moving to that neighbourhood.
The fourth part consists of questions to respondents' current living environment. The first question is about their six-digit postcode to obtain the built

environment indicators from the CBS and Leefbaarometer. If respondents are not willing to give that, they can enter their four-digit postcode or residence.

Secondly, respondents can give an indication of their neighbourhood environment based on the typology from ABF Research which divides neighbourhoods in city centre, urban out-of-centre, green urban, village centre, rural environment and industry terrain (Rijksoverheid, 2020). After that, they can indicate on a five-point scale (from very bad accessible to very good accessible) their accessibility to the closest train-, bus station and city centre by food and bike, highway access, recreational area, park and shared bike and car facilities. Thirdly, they can point out by an indication on a five-point scale (from very bad to very good) to what extent the following facilities are available in their neighbourhood: green areas, playgrounds for kids, park, parking places and recreational areas. Lastly, they got three questions about the neighbourhood where they can express the amount of nuisance, car traffic and parking pressure. Also here, they can express them on a five-point scale ranging from very little to very much.

The final part of the survey contained ten questions about the respondents' socio-demographics. The survey includes gender, age, household situation, number of children in the household, amount of cars in household, education and income level and working status. This part ends with two questions to determine whether they belong to the population. These questions are about the extent that they have plans to move to a new resident and are thinking of buying a new car between now and five years. Lastly, there is room for additional comments about the survey.

D. Data preparation and sample characteristics

This appendix describes the data preparation and the missing data procedure (see Paragraph D.1). Paragraph D.2 describes the sample characteristics and Paragraph D.3 shows the representative tests.

D.1. Missing data

The first step of the analysis consists of checking the data on missing values. Missing data reduces the amount of data, because it isn't incorporated in the analysis. The researcher can apply different methods to handle missing data, dependent on their amount. In general, there are two methods of deletion: deletion and imputation. Three methods characterizes the deletion option: (1) listwise deletion, (2) pairwise deletion and (3) dropping variables (Soley-Bori, 2013).

Firstly, listwise deletion removes all data for an observation that has one or multiple missing values. This is especially suitable for data with only a small number of missing cases. Pairwise deletion analyses all cases in which the variables are present and thus maximizes all available data. This method assumes that the missing data are missing completely at random (MCAR), so the fact that a certain value is missing has nothing to do with its hypothetical value and with the values of other variables. Lastly, the research drops variables if data are missing for more than 60% of the observation, but only if that variable is insignificant (Soley-Bori, 2013).

The survey results contain a little amount of missing data. The most amount of data is missing about the six-digit postcode question. In total, 30% didn't fully answer this question from which 51% gave their four-digit postcode, 45% their residence and 4% refused to answer. Furthermore, questions with regard to age, education and income level contain respectively one, three and 44 missing values, because not all respondents were willing to share their income level. Pairwise deletion is applied due to the small amount of missing values assuming that the data are missing completely at random.

D.2. Sample characteristics

Sub-paragraph D2.1 describes the target group by their willingness to move or buy a new car, where after sub-paragraph D2.2 shows the mobility costs characteristics. Lastly, Paragraph D2.3 shows the sample's living area.

D.2.1. Willingness to move or buy a new car

Table D.1: Results combination willingness to move and purchasing a new car

		Willingness to purchase a new car								
		0-0,5 year	0,5-1 year	1-1,5 year	1,5-2 years	2-3 years	3-4 years	4-5 years	Not	Total
Willingness to move	0-0,5 year	0	0	3	2	0	2	1	4	12
	0,5-1 year	0	2	1	1	2	1	1	7	15
	1-1,5 year	1	2	7	2	5	2	2	3	24
	1,5-2 years	1	3	0	3	2	3	2	4	18
	2-3 years	3	1	1	3	6	2	1	5	22
	3-4 years	0	0	1	1	0	3	1	7	13
	4-5 years	0	1	1	0	2	1	1	7	13
	Not	5	12	9	10	21	17	16	47	137
	Total	10	21	23	22	38	31	25	84	254

D.2.2. Mobility costs characteristics

Table D.2: Car cost calculation results

Category	Sub-category	Frequency	Percent	Cumulative percent
Lease car	€150	1	0,50	0,50
Lease car	€250	3	1,51	2,01
Car owned by yourself	€303,00	24	12,06	14,07
Lease car	€350	3	1,51	15,58
Private lease car	€366,50	1	0,50	16,08
Car owned by yourself	€388,50	44	22,11	38,19
Lease car	€450	3	1,51	39,70
Private lease car	€466,50	2	1,01	40,70
Car owned by yourself	€486	56	28,14	68,84
Lease car	€550	2	1,01	69,85
Car owned by yourself	€649	37	18,59	88,44
Car owned by yourself	>€649	17	8,54	96,98
Lease car	€750	3	1,51	98,49
Lease car	€950	2	1,01	99,50
Lease car	€1000 or more	1	0,50	100,00
Total		199		

Table D.3: PT cost calculation results (114 in total)

Subscription	Compensation	Price (including compensation)	Frequency	Percent
100% compensated by employer	100%	€0,00	26	22,81
Student OV	100%	€0,00	30	26,32
NS Dal Voordeel	70%	€ 1,40	1	0,88
Altijd Korting Maand	90%	€1,95	1	0,88
NS Weekend Voordeel		€ 2,00	1	0,88
NS Dal Voordeel	50%	€ 2,34	1	0,88
NS Dal Voordeel		€ 4,67	16	14,04
Altijd Korting Jaar	70%	€4,88	1	0,88
Altijd Korting Maand	50%	€9,75	1	0,88
Altijd Korting Jaar		€16,25	5	4,39
NS Traject Vrij		€ 25,00	2	1,75
Other €0-€49,99		€ 25,00	22	19,30
NS Weekend Vrij 2e klasse		€34,00	1	0,88
Other €50-€99,99		€ 75,00	2	1,75
Other €100-€149,99	30%	€ 87,50	1	0,88
NS Dal Vrij 2e klasse		€105,00	1	0,88
Other €100-€149,99		€125,00	1	0,88
Net abonnement Jaar 65+		€166,96	1	0,88

D.2.3. Living area respondents

Figure D.2: Respondents' living environment

Figure D.1: Respondents living near The Hague

Figure D.4: Respondents living near Amsterdam

Figure D.3: Respondents living near Utrecht

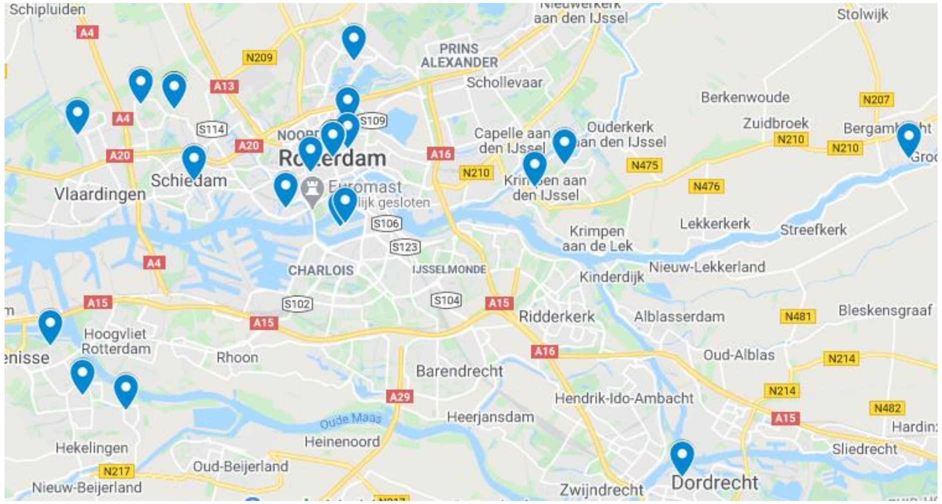

Figure D.5: Respondents living near Rotterdam

D.3. Representative tests

Table D.4: Observed and expected frequencies for gender

Variable	Category	Observed	Expected	Residual
Gender	Men	143	126	17
	Woman	110	128	-18
	Different	1	0	1

Table D.5: Observed and expected frequencies for age

Variable	Category	Observed	Expected	Residual
Age	18-20	7	12	-5
	21-25	36	20	16
	26-30	27	20	7
	31-35	11	19	-8
	36-40	13	19	-6
	41-45	22	19	3
	46-50	30	23	7
	51-55	30	23	7
	56-60	29	22	7
	61-65	14	19	-5
	66-70	11	18	-7
	71-75	16	16	0
	76-80	4	10	-6
	81+	3	13	-10

Table D.6: Observed and expected frequencies for education level

Variable	Category	Observed	Expected	Residual
Education	Primary school	2	32	-30
	Vmbo-b/k, mbo1	9	24	-15
	Vmbo-G/T, havo, vwo onderbouw	4	39	-35
	Mbo2/3	20	39	-19
	Mbo4	32	27	5
	Havo, vwo	102	56	46
	Hbo-, wo-bachelor	82	33	49
	Wo-master, doctor	3	4	-1
	Unknown	254	0	0

Table D.7: Observed and expected frequencies for household size

Variable	Category	Observed	Expected	Residual
Household size	1	37	97	-60
	2	95	83	12
	3	40	30	10
	4	64	31	33
	5+	18	13	5

Table D.8: Observed and expected frequencies for household with children

Variable	Category	Observed	Expected	Residual
Household with children	0	174	171	3
	1	27	36	-9
	2	44	35	9
	3+	9	13	-4

Table D.9: Observed and expected frequencies for gender for income level

Variable	Category	Observed	Expected	Residual
Income	<€10.000	24	38	-14
	€10.000 till €19.999	13	64	-51
	€20.000 till €29.999	24	46	-22
	€30.000 till €39.999	35	37	-2
	€40.000 till €49.999	24	26	-2
	€50.000 till 99.999	66	37	29
	€100.000 till €199.999	22	6	16
	€200.000 or more	2	1	1
	Unknown	44	0	44

Table D.10: Chi-square test results per socio-demographic variable

	Gender	Age	Education level	Income level	Household size	Household with children
Chi-Square	42,164[a]	45,451[b]	189,452[c]	76264,582[d]	80,248[e]	6,028[f]
df	2	13	7	8	4	3
Asymp. Sig.	0,000	0,000	0,000	0,000	0,000	0,110

a. 1 cells (33,3%) have expected frequencies less than 5. The minimum expected cell frequency is ,0.
b. 0 cells (0,0%) have expected frequencies less than 5. The minimum expected cell frequency is 10,3.
c. 1 cells (12,5%) have expected frequencies less than 5. The minimum expected cell frequency is 4,2.
d. 2 cells (22,2%) have expected frequencies less than 5. The minimum expected cell frequency is ,0.
e. 0 cells (0,0%) have expected frequencies less than 5. The minimum expected cell frequency is 13,0.
f. 0 cells (0,0%) have expected frequencies less than 5. The minimum expected cell frequency is 13,2.

Table D.11: One sample t-test results for age

	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)	Mean difference
Age	45,7352	16,91027	1,06314	3,513	252	0,001	3,73518

E. Results

This appendix shows the probability density functions of the non-significant ASCs (see Paragraph E1). Also, it shows the elaborated MNL- and Panel ML-model results with interactions for people living in one car and multiple car households (see respectively Paragraph E2 and E3).

E.1. Probability density functions

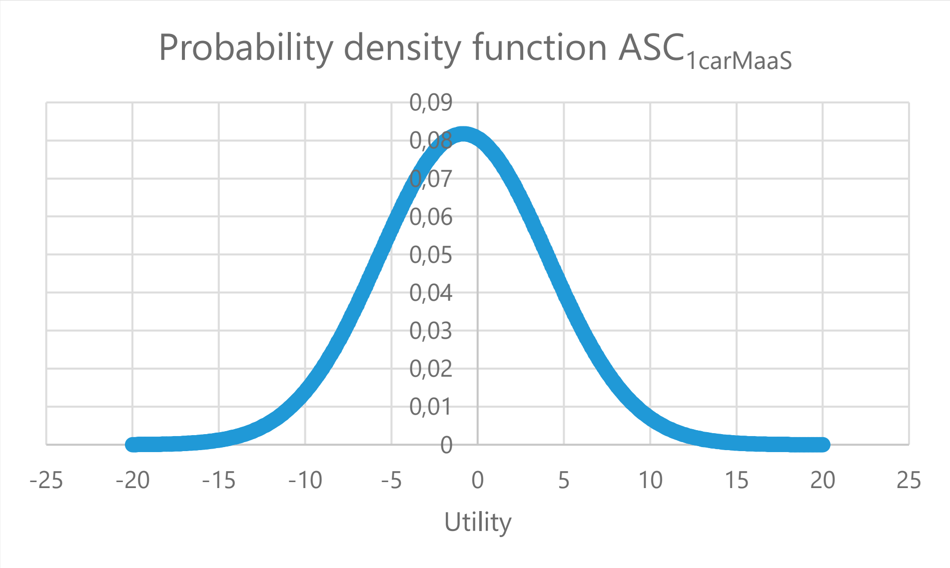

Figure E.1: Probability density function $ASC_{1carMaaS}$ one car Panel ML-model

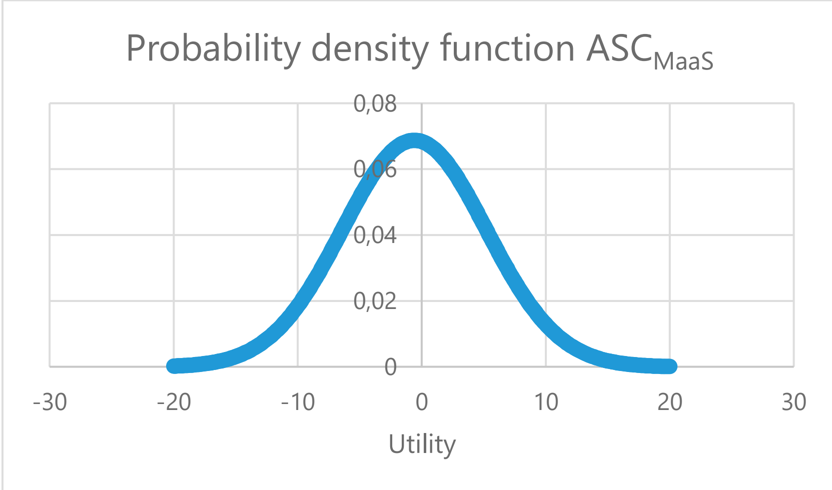

Figure E.2: Probability density function ASC_{MaaS} two car Panel ML-model

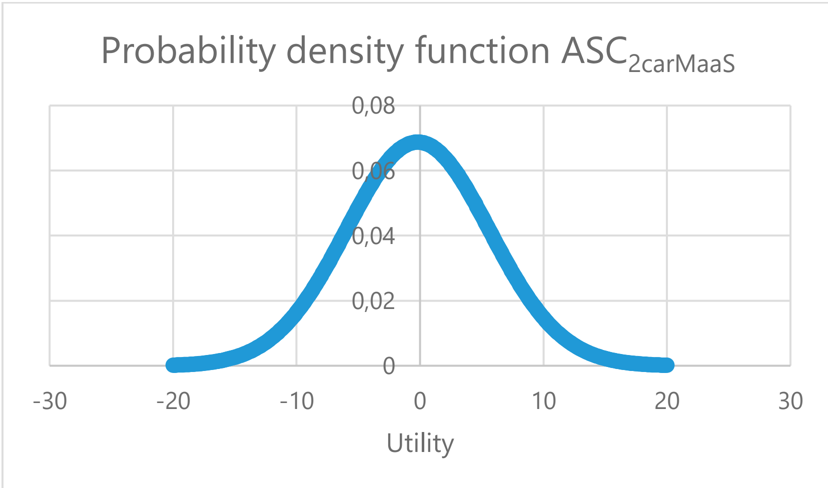

Figure E.3: Probability density function $ASC_{2carMaaS}$ two car Panel ML-model

E.2. Model results one car households inclusive interactions

Table E.1: MNL- and Panel ML-model estimations one car households inclusive interactions

			MNL-model			Panel-ML-model		
Variable	**Attribute**	**Parameter**	**Value**	**R std err**	**R t-test**	**Value**	**R std err**	**R t-test**
ASC and sigma	ASC	ASC_{MaaS}	-0.363	0.350	-1.04	-0.902	1.65	-0.55
		$ASC_{carMaaS}$	**-0.950***	0.357	-2.66	-1.49	1.65	-0.91
	Sigma	σ_{MaaS}				**4.15***	0.494	8.40
Hub availability	Walking time hub	$\beta_{\text{walktime-home-hub1\_MaaS}}$	**0.325***	0.0906	3.59	**0.790***	0.149	5.29
		$\beta_{\text{walktime-home-hub1\_carMaaS}}$	0.183	0.113	1.63	**0.654***	0.155	4.21
		$\beta_{\text{walktime-home-hub2\_MaaS}}$	0.0624	0.0908	0.69	0.147	0.150	0.99
		$\beta_{\text{walktime-home-hub2\_carMaaS}}$	0.0558	0.112	0.50	0.143	0.149	0.96
	Type hub	$\beta_{\text{type-hub1\_MaaS}}$	0.109	0.0901	1.20	0.290	0.152	1.91
		$\beta_{\text{type-hub1\_carMaaS}}$	0.0989	0.112	0.88	0.287	0.158	1.82
		$\beta_{\text{type-hub2\_MaaS}}$	0.00699	0.0916	0.08	-0.00117	0.125	-0.01
		$\beta_{\text{type-hub2\_carMaaS}}$	-0.00414	0.112	-0.04	-0.0184	0.136	-0.14
Parking comfort	Walking time PP	$\beta_{\text{walktime-home-PP1\_MaaS}}$	**0.234***	0.0916	2.55	**0.597***	0.161	3.70
		$\beta_{\text{walktime-home-PP1\_carMaaS}}$	0.0160	0.115	0.14	**0.384***	0.162	2.36
		$\beta_{\text{walktime-home-PP2\_MaaS}}$	-0.0156	0.0905	-0.17	-0.0978	0.135	-0.72
		$\beta_{\text{walktime-home-PP2\_carMaaS}}$	-0.00534	0.111	-0.05	-0.0937	0.144	-0.65
	Type PP	$\beta_{\text{type-PP1\_MaaS}}$	0.0933	0.0916	1.02	**0.321***	0.112	2.87
		$\beta_{\text{type-PP1\_carMaaS}}$	0.146	0.112	1.30	**0.382***	0.113	3.38
		$\beta_{\text{type-PP2\_MaaS}}$	0.00222	0.0911	0.02	-0.00132	0.144	-0.01
		$\beta_{\text{type-PP2\_carMaaS}}$	0.0566	0.112	0.51	0.0590	0.156	0.38
Quality neighbour-hood	Green	$\beta_{\text{green1\_MaaS}}$	0.0410	0.0917	0.45	0.145	0.131	1.11
		$\beta_{\text{green1\_carMaaS}}$	0.119	0.111	1.06	0.229	0.134	1.71
		$\beta_{\text{green2\_MaaS}}$	-0.143	0.0925	-1.55	**-0.397***	0.138	-2.87
		$\beta_{\text{green2\_carMaaS}}$	-0.109	0.113	-0.97	**-0.373***	0.158	-2.36
	Streets	$\beta_{\text{streets1\_MaaS}}$	-0.0283	0.0920	-0.31	-0.0714	0.148	-0.48
		$\beta_{\text{streets1\_carMaaS}}$	-0.101	0.114	-0.89	-0.159	0.143	-1.11
		$\beta_{\text{streets2\_MaaS}}$	0.0437	0.0905	0.48	0.0990	0.130	0.76
		$\beta_{\text{streets2\_carMaaS}}$	0.0731	0.111	0.66	0.138	0.132	1.04
	Facilities	$\beta_{\text{facilities1\_MaaS}}$	-0.0383	0.0922	-0.42	-0.0686	0.149	-0.46
		$\beta_{\text{facilities1\_carMaaS}}$	-0.0182	0.113	-0.16	-0.0483	0.158	-0.31
		$\beta_{\text{facilities2\_MaaS}}$	0.0712	0.0908	0.78	0.128	0.115	1.11
		$\beta_{\text{facilities2\_carMaaS}}$	0.00837	0.113	0.07	0.0647	0.128	0.51
Attractiveness		$\beta_{\text{attractiveness}}$	**0.124***	0.0322	3.84	**0.347***	0.0914	3.80
Travel characteristics	Car use	$\beta_{\text{car-use}}$	**0.197***	0.0292	6.72	**0.583***	0.186	3.14
	Train use	$\beta_{\text{train-use}}$	**-0.275***	0.0382	-7.20	**-0.709***	0.229	-3.10

* Estimations in bold are statistically significant at a 5% significance level

E.3. Model results multiple car households inclusive interactions

Table E.2: MNL- and Panel ML-model estimations multiple car households inclusive interactions

			MNL-model			Panel-ML model		
Attribute	**Variable**	**Parameter**	**Value**	**R std err**	**R t-test**	**Value**	**R std err**	**R t-test**
ASC and sigma	2 car + MaaS	$ASC_{2carMaaS}$	**-1.37***	0.481	-2.85	1.19	2.73	0.44
	MaaS	ASC_{MaaS}	**-1.77***	0.489	-3.62	0.789	2.73	0.29
	1 car + MaaS	$ASC_{carMaaS}$	0.425	0.456	0.93	2.99	2.71	1.10
	Sigma	σ_{MaaS}				**4.44***	0.771	5.76
Hub availability	Walking time hub	$\beta_{walktime-home-hub1\_2carMaaS}$	0.283	0.192	1.47	**0.864***	0.216	4.00
		$\beta_{walktime-home-hub1\_MaaS}$	**0.834***	0.205	4.06	**1.41***	0.288	4.90
		$\beta_{walktime-home-hub1\_carMaaS}$	0.228	0.120	1.90	**0.808***	0.201	4.03
		$\beta_{walktime-home-hub2\_2carMaaS}$	-0.213	0.194	-1.09	-0.303	0.171	-1.78
		$\beta_{walktime-home-hub2\_MaaS}$	-0.141	0.246	-0.57	-0.231	0.235	-0.98
		$\beta_{walktime-home-hub2\_carMaaS}$	0.00248	0.116	0.02	-0.0858	0.153	-0.56
	Type hub	$\beta_{type-hub1\_2carMaaS}$	0.0231	0.192	0.12	0.118	0.205	0.57
		$\beta_{type-hub1\_MaaS}$	-0.0524	0.225	-0.23	0.0477	0.277	0.17
		$\beta_{type-hub1\_carMaaS}$	0.0154	0.119	0.13	0.110	0.193	0.57
		$\beta_{type-hub2\_2carMaaS}$	-0.119	0.196	-0.61	-0.110	0.187	-0.59
		$\beta_{type-hub2\_MaaS}$	0.0643	0.244	0.26	0.0726	0.235	0.31
		$\beta_{type-hub2\_carMaaS}$	0.0538	0.118	0.45	0.0640	0.163	0.39
Parking comfort	Walking time PP	$\beta_{walktime-home-PP1\_2carMaaS}$	0.193	0.192	1.01	0.341	0.278	1.23
		$\beta_{walktime-home-PP1\_MaaS}$	**0.405**	0.205	1.97	0.556	0.305	1.82
		$\beta_{walktime-home-PP1\_carMaaS}$	0.127	0.120	1.06	0.276	0.234	1.18
		$\beta_{walktime-home-PP2\_2carMaaS}$	-0.00246	0.194	-0.01	0.0155	0.181	0.09
		$\beta_{walktime-home-PP2\_MaaS}$	-0.0926	0.249	-0.37	-0.0727	0.282	-0.26
		$\beta_{walktime-home-PP2\_carMaaS}$	0.0710	0.119	0.60	0.0888	0.168	0.53
	Type PP	$\beta_{type-PP1\_2carMaaS}$	0.0391	0.194	0.20	0.119	0.225	0.53
		$\beta_{type-PP1\_MaaS}$	0.0470	0.234	0.20	0.132	0.271	0.49
		$\beta_{type-PP1\_carMaaS}$	0.0592	0.119	0.50	0.140	0.191	0.73
		$\beta_{type-PP2\_2carMaaS}$	-0.0838	0.191	-0.44	-0.190	0.163	-1.16
		$\beta_{type-PP2\_MaaS}$	0.0241	0.228	0.11	-0.0810	0.191	-0.42
		$\beta_{type-PP2\_carMaaS}$	-0.0676	0.119	-0.57	-0.173	0.146	-1.19
Quality neighbour-hood	Facilities	$\beta_{facilities1\_2carMaaS}$	0.0719	0.187	0.38	0.152	0.231	0.66
		$\beta_{facilities1\_MaaS}$	-0.204	0.255	-0.80	-0.126	0.274	-0.46
		$\beta_{facilities1\_carMaaS}$	0.00597	0.117	0.05	0.0860	0.181	0.48
		$\beta_{facilities2\_2carMaaS}$	-0.148	0.197	-0.75	-0.136	0.199	-0.68
		$\beta_{facilities2\_MaaS}$	0.267	0.223	1.20	0.281	0.209	1.35
		$\beta_{facilities2\_carMaaS}$	-0.0297	0.118	-0.25	-0.0178	0.178	-0.10

	Green	$\beta_{green1\_2carMaaS}$	0.121	0.191	0.64	0.223	0.185	1.21
		β_{green1_MaaS}	0.301	0.224	1.35	0.404	0.221	1.83
		$\beta_{green1\_carMaaS}$	-0.0116	0.119	-0.10	0.0892	0.170	0.53
		$\beta_{green2\_2carMaaS}$	-0.0235	0.193	-0.12	-0.0372	0.183	-0.20
		β_{green2_MaaS}	-0.0777	0.246	-0.32	-0.0892	0.228	-0.39
		$\beta_{green2\_carMaaS}$	-0.0153	0.119	-0.13	-0.0275	0.184	-0.15
	Streets	$\beta_{streets1\_2carMaaS}$	0.166	0.197	0.84	0.334	0.243	1.38
		$\beta_{streets1\_MaaS}$	**0.516***	0.229	2.25	**0.684***	0.296	2.31
		$\beta_{streets1\_carMaaS}$	0.182	0.123	1.48	0.349	0.214	1.63
		$\beta_{streets2\_2carMaaS}$	0.0137	0.189	0.07	0.0484	0.149	0.32
		$\beta_{streets2\_MaaS}$	-0.110	0.228	-0.48	-0.0721	0.216	-0.33
		$\beta_{streets2\_carMaaS}$	-0.0231	0.117	-0.20	0.0128	0.148	0.09
Attractiveness		$\beta_{attractiveness}$	**0.272***	0.0398	6.82	**0.350***	0.149	2.34
Socio demo graphics	Age	β_{age}	**0.0636***	0.00709	8.98	**0.166***	0.0390	4.26
	Income	β_{income}	**-0.105***	0.0220	-4.79	-	-	-
	Amount children	$\beta_{persons18}$	**-0.267***	0.0816	-3.27	-	-	-
Travel behaviour	Train use	$\beta_{train\text{-}use}$	**-0.542***	0.0549	-9.87	**-1.75***	0.377	-4.64

* Estimations in bold are statistically significant at a 5% significance level

Table E.3: Estimation report one- and two-car MNL- and Panel-ML-model with interactions

	One car MNL-model	One car Panel ML-model	Two car MNL-model	Two car ML-model
Number of draws		500		500
Number of estimated parameters	33	34	50	49
Sample size	1350	1350	927	927
Final log likelihood	-1281,712	-946,795	-861.226	-685.907
Rho-square	0,136	0.197	0.330	0.360
Adjusted rho-square	0,114	0.169	0.291	0.314

F. Scenarios Amsterdam *Sluisbuurt*

This appendix explains the scenario design (see Paragraph 7.1) and shows the overall attractiveness and willingness to adopt MaaS for the three mixed scenario based on walking distance to the hub and parking place (see Paragraph 7.2).

F.1. Scenario design

The scenario design is as follows. All scenarios have similar neighbourhood characteristics. They contain a wide variety of facilities, streets prioritising bikers and some small parks divided through the neighbourhood. Thereby, the scenarios only vary the hub and parking characteristics (type and walking times).

The basis scenario has only shared cars and bikes divided through the neighbourhood. They are all accessible within two minutes. Similarly, walking times to the parking place are also within two minutes, where people can choose between outside public parking areas or public parking garages.

The hub scenario is the opposite. It has only two hubs near the tram (near the "*Piet Hein tunnel*") and bus station (near the "*Zeeburgerweg*"). However, the walking times vary dependent on where people live in the neighbourhood. For example, people living in the north has to walk around eight minutes to the hub, while people in the middle or at the border only have to walk two or five minutes. Parking places are accessible within a range of five minutes.

Lastly, the mixed scenario combine the basis and hub scenario. People have to walk between two to eight minutes to the hub, dependent on the kind of hub they want to go to and where they live in the neighbourhood. Parking garages are accessible within a range of five or two minutes, also dependent on the location of their house.

F.2. Mixed scenario results

Table F.1: Mixed vs. basis scenario for walking times to hub of two minutes

Characteristic	Attribute	Basis	Mixed			
Hub availability	Walking time to hub	2 min	2 min	2 min	2 min	2 min
	Hub type	Shared bikes & cars	Near tram or bus station	Near tram or bus station	Shared bikes & cars	Shared bikes & cars
Parking comfort	Walking time to PP	2 min	2 min	5 min	2 min	5 min
	PP type	Public parking garage	Public parking garage	Public parking garage	Public parking garage	Public parking garage
	Attractiveness	6,6	6,7	6,3	6,6	6,1
One car households	Maas	37%	37%	42%	37%	42%
	MaaS + car	18%	18%	17%	18%	17%
	Only car	45%	45%	42%	45%	42%
Multiple car households	MaaS	21%	10%	10%	10%	10%
	MaaS + 1 car	61%	52%	52%	52%	52%
	MaaS + 2 car	13%	7%	7%	7%	7%
	Only car	5%	32%	32%	32%	32%

Table F.2: Mixed vs. basis scenario for walking times to hub of five minutes

Characteristic	Attribute	Basis	Mixed			
Hub availability	Walking time to hub	2 min	5 min	5 min	5 min	5 min
	Hub type	Shared bikes & cars	Near tram or bus station	Near tram or bus station	Shared bikes & cars	Shared bikes & cars
Parking comfort	Walking time to PP	2 min	2 min	5 min	2 min	5 min
	PP type	Public parking garage	Public parking garage	Public parking garage	Public parking garage	Public parking garage
	Attractiveness	6,6	6,5	6,0	6,3	5,8
One car households	Maas	37%	30%	34%	30%	34%
	MaaS + car	18%	20%	19%	20%	19%
	Only car	45%	50%	47%	50%	47%
Multiple car households	MaaS	21%	28%	28%	28%	28%
	MaaS + 1 car	61%	37%	37%	37%	37%
	MaaS + 2 car	13%	6%	6%	6%	6%
	Only car	5%	28%	28%	28%	28%

Table F.3: Mixed vs. basis scenario for walking times to hub of eight minutes

Characteristic	Attribute	Basis	Mixed			
Hub availability	Walking time to hub	2 min	8 min	8 min	8 min	8 min
	Hub type	Shared bikes & cars	Near tram or bus station	Near tram or bus station	Shared bikes & cars	Shared bikes & cars
Parking comfort	Walking time to PP	2 min	2 min	5 min	2 min	5 min
	PP type	Public parking garage	Public parking garage	Public parking garage	Public parking garage	Public parking garage
	Attractiveness	6,6	6,2	5,7	6,0	5,5
One car households	Maas	37%	23%	27%	23%	27%
	MaaS + car	18%	22%	21%	22%	21%
	Only car	45%	55%	52%	55%	52%
Multiple car households	MaaS	21%	17%	17%	17%	17%
	MaaS + 1 car	61%	38%	38%	38%	38%
	MaaS + 2 car	13%	8%	8%	8%	8%
	Only car	5%	37%	37%	37%	37%

Table F.4: Attractiveness mixed vs. hub scenario for walking times of two minutes

Characteristic	Attribute	Basis	Mixed			
Hub availability	Walking time to hub	2 min	2 min	2 min	2 min	2 min
	Hub type	Shared bikes & cars	Near tram or bus station	Near tram or bus station	Shared bikes & cars	Shared bikes & cars
Parking comfort	Walking time to PP	2 min	2 min	5 min	2 min	5 min
	PP type	Public parking garage	Public parking garage	Public parking garage	Public parking garage	Public parking garage
	Reference	**6,6**	6,6	6,2	6,4	5,9
	Monthly train users	5,5	6,8	6,4	6,6	6,1
	Non-monthly train users	5,1	6,4	5,9	6,1	5,7
	Daily bikers	5,8	6,8	6,3	6,5	6,3
	Non-daily bikers	5,0	7,0	6,5	6,7	5,6
	Weekly car users	5,2	6,3	5,8	6,0	5,8
	Non-weekly car users	5,4	6,7	6,3	6,5	6,0
	Household size >2	5,2	6,5	6,0	6,2	5,8
	Household size <2	5,5	6,8	6,3	6,5	6,1

Table F.5: Attractiveness mixed vs. hub scenario for walking times of five minutes

Characteristic	Attribute	Basis	Mixed			
Hub availability	Walking time to hub	2 min	5 min	5 min	5 min	5 min
	Hub type	Shared bikes & cars	Near tram or bus station	Near tram or bus station	Shared bikes & cars	Shared bikes & cars
Parking comfort	Walking time to PP	2 min	2 min	5 min	2 min	5 min
	PP type	Public parking garage	Public parking garage	Public parking garage	Public parking garage	Public parking garage
	Reference	**6,6**	6,3	5,9	6,1	5,6
	Monthly train users	5,5	6,5	6,1	6,3	5,8
	Non-monthly train users	5,1	6,1	5,6	5,8	5,4
	Daily bikers	5,8	6,5	6,0	6,2	5,8
	Non-daily bikers	5,0	6,1	5,7	5,9	5,4
	Weekly car users	5,2	6,2	5,7	5,9	5,5
	Non-weekly car users	5,4	6,4	6,0	6,2	5,7
	Household size >2	5,2	6,2	5,7	5,9	5,5
	Household size <2	5,5	6,5	6,0	6,2	5,8

Table F.6: Attractiveness mixed vs. hub scenario for walking times of eight minutes

Characteristic	Attribute	Basis	Mixed			
Hub availability	Walking time to hub	2 min	8 min	8 min	8 min	8 min
	Hub type	Shared bikes & cars	Near tram or bus station	Near tram or bus station	Shared bikes & cars	Shared bikes & cars
Parking comfort	Walking time to PP	2 min	2 min	5 min	2 min	5 min
	PP type	Public parking garage	Public parking garage	Public parking garage	Public parking garage	Public parking garage
	Reference	**6,6**	6,0	5,6	5,8	5,3
	Monthly train users	5,5	6,2	5,8	6,0	5,5
	Non-monthly train users	5,1	5,8	5,3	5,5	5,1
	Daily bikers	5,8	6,0	5,5	5,7	5,3
	Non-daily bikers	5,0	6,0	5,6	5,8	5,3
	Weekly car users	5,2	5,9	5,4	5,6	5,2
	Non-weekly car users	5,4	6,1	5,7	5,9	5,4
	Household size >2	5,2	5,9	5,4	5,6	5,2
	Household size <2	5,5	6,2	5,7	5,9	5,5

F.3. Hub scenario results

Table F.7: MaaS adoption rates hub vs. basis alternative

Characteristic	Attribute	Basis	Hub		
Hub availability	Walking time to hub	2 min	2 min	5 min	8 min
	Hub type	Shared bikes & cars	Near tram or bus station	Near tram or bus station	Near tram or bus station
Parking comfort	Walking time to PP	2 min	5 min	5 min	5 min
	PP type	Public parking garage	Public parking garage	Public parking garage	Public parking garage
	Attractiveness	6,6	6,3	6,0	5,7
One car households	Maas	37%	42%	34%	27%
	MaaS + car	18%	17%	19%	21%
	Only car	45%	42%	42%	52%
Multiple car households	MaaS	10%	10%	5%	3%
	MaaS + 1 car	52%	52%	49%	45%
	MaaS + 2 car	7%	7%	8%	9%
	Only car	32%	32%	38%	43%

G. Survey

This appendix presents the final survey design.

Vragenlijst Mobility as a Service

Survey Flow

Standard: Introductie (1 Question)
Standard: Block 1A Vervoerskosten (43 Questions)
Standard: Deel 1B OV-abonnement (9 Questions)
Standard: Deel 2A Introductie MaaS (1 Question)
Standard: Deel 2B MaaS-hubs (1 Question)
Standard: Deel 2C MaaS-abonnementen (2 Questions)

BlockRandomizer: 1 -

Block: Deel 3 Wijkontwerpen (45 Questions)
Block: Block 9 (45 Questions)

Standard: Deel 4: Kenmerken woonomgeving (10 Questions)
Standard: Einde (2 Questions)

Page Break

Start of Block: Introductie

Q2.1 Beste respondent,

Deze enquête is onderdeel van mijn afstudeeronderzoek aan de Technische Universiteit Delft, in samenwerking met APPM, over een nieuw vervoersconcept "Mobility as a Service" (MaaS). In de rest van de enquête zal MaaS als afkorting gebruikt worden.

Uw deelname aan deze vragenlijst is geheel vrijwillig en anoniem en u kunt de vragenlijst op ieder moment verlaten. Uw data blijft vertrouwelijk en wordt volledig geanonimiseerd opgeslagen. De uitkomsten worden gebruikt voor het schrijven en online publiceren van mijn masterscriptie.

Deze enquête duurt ongeveer 15 minuten.

Mocht u enige vragen hebben over de enquête of het verwerken van uw data, neem dan gerust contact met mij op via damen@appm.nl.

Alvast veel dank voor uw bijdrage aan dit onderzoek!

Met vriendelijke groet,

Wouter Damen

End of Block: Introductie

Start of Block: Block 1A Vervoerskosten

Q3.1 **Deel 1A: De eerste vragen gaan over uw gebruikelijke reisgedrag (dus voor de Corona tijd) met de bedoeling om uw huidige vervoerskosten te berekenen.**

Q3.3 1.Hoe vaak maakt u gebruik van de auto (als bestuurder)?

(Vrijwel) elke dag (1)
5-6 dagen per week (2)
3-4 dagen per week (3)
1-2 dagen per week (4)
1-3 dagen per maand (5)
6-11 dagen per jaar (6)
1-5 dagen per jaar (7)
Minder dan 1 dag per jaar (8)
Nooit (9)

Q3.4 3. Hoe vaak maakt u gebruik van de trein?

(Vrijwel) elke dag (1)
5-6 dagen per week (2)
3-4 dagen per week (3)
1-2 dagen per week (4)
1-3 dagen per maand (5)
6-11 dagen per jaar (6)
1-5 dagen per jaar (7)
Minder dan 1 dag per jaar (8)
Nooit (9)

Q3.3 2.Hoe vaak maakt u gebruik van de auto (als passagier)?

(Vrijwel) elke dag (1)
5-6 dagen per week (2)
3-4 dagen per week (3)
1-2 dagen per week (4)
1-3 dagen per maand (5)
6-11 dagen per jaar (6)
1-5 dagen per jaar (7)
Minder dan 1 dag per jaar (8)
Nooit (9)

Q3.5 4. Hoe vaak maakt u gebruik van de bus, tram of metro?

(Vrijwel) elke dag (1)
5-6 dagen per week (2)
3-4 dagen per week (3)
1-2 dagen per week (4)
1-3 dagen per maand (5)
6-11 dagen per jaar (6)
1-5 dagen per jaar (7)
Minder dan 1 dag per jaar (8)
Nooit (9)

Q3.6 5. Hoe vaak maakt u gebruik van een deelauto (zoals GreenWheels, SnappCar, ConnectCar, Car2Go etc.)?
(Vrijwel) elke dag (1)
5-6 dagen per week (2)
3-4 dagen per week (3)
1-2 dagen per week (4)
1-3 dagen per maand (5)
6-11 dagen per jaar (6)
1-5 dagen per jaar (7)
Minder dan 1 dag per jaar (8)
Nooit (9)

Q3.7 6. Hoe vaak maakt u gebruik van de eigen fiets?
(Vrijwel) elke dag (1)
5-6 dagen per week (2)
3-4 dagen per week (3)
1-2 dagen per week (4)
1-3 dagen per maand (5)
6-11 dagen per jaar (6)
1-5 dagen per jaar (7)
Minder dan 1 dag per jaar (8)
Nooit (9)

Q3.8 7. Hoe vaak maakt u gebruik van een deelfiets (zoals OV fiets, Mobike, DonkeyRepublic etc.)?
(Vrijwel) elke dag (1)
5-6 dagen per week (2)
3-4 dagen per week (3)
1-2 dagen per week (4)
1-3 dagen per maand (5)
6-11 dagen per jaar (6)
1-5 dagen per jaar (7)
Minder dan 1 dag per jaar (8)
Nooit (9)

Q149 8. Heeft u de beschikking over een auto?

- Ja, ik beschik over een eigen auto (1)
- Ja, alleen in overleg met mensen binnen mijn huishouden (2)
- Ja, alleen in overleg met mensen buiten mijn huishouden (3)
- Nee, (vrijwel) nooit (4)

Skip To: Q3.10 If 7. Heeft u de beschikking over een auto? = Ja, ik beschik over een eigen auto

Skip To: Q3.10 If 7. Heeft u de beschikking over een auto? = Ja, alleen in overleg met mensen binnen mijn huishouden

Skip To: End of Block If 7. Heeft u de beschikking over een auto? = Ja, alleen in overleg met mensen buiten mijn huishouden

Skip To: End of Block If 7. Heeft u de beschikking over een auto? = Nee, (vrijwel) nooit

Q3.10 9. Wat voor soort auto heeft u of uw huishouden in het bezit? In het geval dat u of uw huishouden meerdere auto's bezit, kies dan de optie die van toepassing is op de auto die u het meest gebruikt.

- Auto in eigen bezit (1)
- Auto van de zaak (2)
- Private lease auto (3)
- Lease auto (4)

Skip To: Q3.33 If 8. Wat voor soort auto heeft u of uw huishouden in het bezit? In het geval dat u of uw huishouden... = Auto van de zaak

Skip To: Q3.11 If 8. Wat voor soort auto heeft u of uw huishouden in het bezit? In het geval dat u of uw huishouden... = Private lease auto

Skip To: Q3.11 If 8. Wat voor soort auto heeft u of uw huishouden in het bezit? In het geval dat u of uw huishouden... = Lease auto

Skip To: Q3.13 If 8. Wat voor soort auto heeft u of uw huishouden in het bezit? In het geval dat u of uw huishouden... = Auto in eigen bezit

Q3.11 10. Wanneer loopt het huidige leasecontract van deze leaseauto ongeveer af?

- Binnen nu t/m 6 maanden (1)
- Binnen 7 t/m 12 maanden (2)
- Binnen 13 t/m 18 maanden (3)
- Binnen 19 t/m 24 maanden (4)
- Binnen 25 t/m 30 maanden (5)
- Binnen 31 t/m 36 maanden (6)
- Binnen 37 t/m 42 maanden (7)
- Binnen 43 t/m 48 maanden (8)
- Langer dan 49 maanden (9)

Skip To: Q3.12 If 9. Wanneer loopt het huidige leasecontract van deze leaseauto ongeveer af? = Binnen nu t/m 6 maanden

Skip To: Q3.12 If 9. Wanneer loopt het huidige leasecontract van deze leaseauto ongeveer af? = Binnen 7 t/m 12 maanden

Skip To: Q3.12 If 9. Wanneer loopt het huidige leasecontract van deze leaseauto ongeveer af? = Binnen 13 t/m 18 maanden

Skip To: Q3.12 If 9. Wanneer loopt het huidige leasecontract van deze leaseauto ongeveer af? = Binnen 19 t/m 24 maanden

Skip To: Q3.12 If 9. Wanneer loopt het huidige leasecontract van deze leaseauto ongeveer af? = Binnen 25 t/m 30 maanden

Skip To: Q3.12 If 9. Wanneer loopt het huidige leasecontract van deze leaseauto ongeveer af? = Binnen 31 t/m 36 maanden

Skip To: Q3.12 If 9. Wanneer loopt het huidige leasecontract van deze leaseauto ongeveer af? = Binnen 37 t/m 42 maanden

Skip To: Q3.12 If 9. Wanneer loopt het huidige leasecontract van deze leaseauto ongeveer af? = Binnen 43 t/m 48 maanden

Skip To: Q3.12 If 9. Wanneer loopt het huidige leasecontract van deze leaseauto ongeveer af? = Langer dan 49 maanden

---

Q3.12 11. Wat voor soort lease auto heeft u of uw huishouden in het bezit?

- Lease auto via een werkgever zonder privégebruik (1)
- Lease auto via een werkgever met privégebruik (2)
- Lease auto via een eigen onderneming zonder privégebruik (3)
- Lease auto via een eigen onderneming met privégebruik (4)
- Private lease auto (5)

Skip To: Q3.33 If 10. Wat voor soort lease auto heeft u of uw huishouden in het bezit? = Lease auto via een werkgever zonder privégebruik

Skip To: Q3.14 If 10. Wat voor soort lease auto heeft u of uw huishouden in het bezit? = Lease auto via een werkgever met privégebruik

Skip To: Q3.33 If 10. Wat voor soort lease auto heeft u of uw huishouden in het bezit? = Lease auto via een eigen onderneming zonder privégebruik

Skip To: Q3.15 If 10. Wat voor soort lease auto heeft u of uw huishouden in het bezit? = Lease auto via een eigen onderneming met privégebruik

Skip To: Q3.16 If 10. Wat voor soort lease auto heeft u of uw huishouden in het bezit? = Private lease auto

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Display This Question:

If 8. Wat voor soort auto heeft u of uw huishouden in het bezit? In het geval dat u of uw huishouden... = Auto in eigen bezit

Q3.13 10. Tot welke autoklasse behoort uw eigen auto of de auto die uw huishouden in het bezit heeft? Met onderstaande voorbeelden kunt u de juiste klasse inschatten.

In het geval dat u meerdere auto's bezit, kies dan de optie die van toepassing is op de auto die u het meest gebruikt.

- Mini klasse (A) (1)
- Compact klasse (B) (2)
- Kleine midden klasse (C) (3)
- Midden klasse (D) (4)
- Hogere middel klasse of hoger (E) (5)

Skip To: Q3.17 If 9. Tot welke autoklasse behoort uw eigen auto of de auto die uw huishouden in het bezit heeft? Me... = Mini klasse (A)

Skip To: Q3.18 If 9. Tot welke autoklasse behoort uw eigen auto of de auto die uw huishouden in het bezit heeft? Me... = Compact klasse (B)

Skip To: Q3.19 If 9. Tot welke autoklasse behoort uw eigen auto of de auto die uw huishouden in het bezit heeft? Me... = Kleine midden klasse (C)

Skip To: Q3.20 If 9. Tot welke autoklasse behoort uw eigen auto of de auto die uw huishouden in het bezit heeft? Me... = Midden klasse (D)

Skip To: Q3.21 If 9. Tot welke autoklasse behoort uw eigen auto of de auto die uw huishouden in het bezit heeft? Me... = Hogere middel klasse of hoger (E)

Display This Question:

If 10. Wat voor soort lease auto heeft u of uw huishouden in het bezit? = Lease auto via een werkgever met privégebruik

Q3.14 12. Tot welke categorie behoort ongeveer uw bruto bijtelling per maand?

- €0 - €99,99 (1)
- €100 - €199,99 (2)
- €200 - €299,99 (3)
- €300 - €399,99 (4)
- €400 - €499,99 (5)
- €500 - €599,99 (6)
- €600 - €699,99 (7)
- €700 - €799,99 (8)
- €800 - €899,99 (9)
- €900 - €999,99 (10)
- €1.000 of meer (11)

Skip To: Q137 If 11. Tot welke categorie behoort ongeveer uw bruto bijtelling per maand? = €0 - €99,99

Skip To: Q138 If 11. Tot welke categorie behoort ongeveer uw bruto bijtelling per maand? = €100 - €199,99

Skip To: Q139 If 11. Tot welke categorie behoort ongeveer uw bruto bijtelling per maand? = €200 - €299,99

Skip To: Q140 If 11. Tot welke categorie behoort ongeveer uw bruto bijtelling per maand? = €300 - €399,99

Skip To: Q141 If 11. Tot welke categorie behoort ongeveer uw bruto bijtelling per maand? = €400 - €499,99

Skip To: Q142 If 11. Tot welke categorie behoort ongeveer uw bruto bijtelling per maand? = €500 - €599,99

Skip To: Q143 If 11. Tot welke categorie behoort ongeveer uw bruto bijtelling per maand? = €600 - €699,99

Skip To: Q144 If 11. Tot welke categorie behoort ongeveer uw bruto bijtelling per maand? = €700 - €799,99

Skip To: Q145 If 11. Tot welke categorie behoort ongeveer uw bruto bijtelling per maand? = €800 - €899,99

Skip To: Q146 If 11. Tot welke categorie behoort ongeveer uw bruto bijtelling per maand? = €900 - €999,99

Skip To: Q147 If 11. Tot welke categorie behoort ongeveer uw bruto bijtelling per maand? = €1.000 of meer

Display This Question:

If 10. Wat voor soort lease auto heeft u of uw huishouden in het bezit? = Lease auto via een eigen onderneming met privégebruik

Q3.15 12. Tot welke categorie behoren ongeveer de maandelijkse kosten van uw lease auto, inclusief uw leasetermijn en brandstof?

- €0 - €99,99 (1)
- €100 - €199,99 (2)
- €200 - €299,99 (3)
- €300 - €399,99 (4)
- €400 - €499,99 (5)
- €500 - €599,99 (6)
- €600 - €699,99 (7)
- €700 - €799,99 (8)
- €800 - €899,99 (9)
- €900 - €999,99 (10)
- €1.000 of meer (11)

Skip To: Q137 If 11. Tot welke categorie behoren ongeveer de maandelijkse kosten van uw lease auto, inclusief uw l... = €0 - €99,99

Skip To: Q138 If 11. Tot welke categorie behoren ongeveer de maandelijkse kosten van uw lease auto, inclusief uw l... = €100 - €199,99

Skip To: Q139 If 11. Tot welke categorie behoren ongeveer de maandelijkse kosten van uw lease auto, inclusief uw l... = €200 - €299,99

Skip To: Q140 If 11. Tot welke categorie behoren ongeveer de maandelijkse kosten van uw lease auto, inclusief uw l... = €300 - €399,99

Skip To: Q141 If 11. Tot welke categorie behoren ongeveer de maandelijkse kosten van uw lease auto, inclusief uw l... = €400 - €499,99

Skip To: Q142 If 11. Tot welke categorie behoren ongeveer de maandelijkse kosten van uw lease auto, inclusief uw l... = €500 - €599,99

Skip To: Q143 If 11. Tot welke categorie behoren ongeveer de maandelijkse kosten van uw lease auto, inclusief uw l... = €600 - €699,99

Skip To: Q144 If 11. Tot welke categorie behoren ongeveer de maandelijkse kosten van uw lease auto, inclusief uw l... = €700 - €799,99

Skip To: Q145 If 11. Tot welke categorie behoren ongeveer de maandelijkse kosten van uw lease auto, inclusief uw l... = €800 - €899,99

Skip To: Q146 If 11. Tot welke categorie behoren ongeveer de maandelijkse kosten van uw lease auto, inclusief uw l... = €900 - €999,99

Skip To: Q147 If 11. Tot welke categorie behoren ongeveer de maandelijkse kosten van uw lease auto, inclusief uw l... = €1.000 of meer

Display This Question:

If 10. Wat voor soort lease auto heeft u of uw huishouden in het bezit? = Private lease auto

Q3.16 12. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease maatschappij (exclusief brandstofkosten)?

- €0 - €99,99 (1)
- €100 - €199,99 (2)
- €200 - €299,99 (3)
- €300 - €399,99 (4)
- €400 - €499,99 (5)
- €500 - €599,99 (6)
- €600 - €699,99 (7)
- €700 - €799,99 (8)
- €800 - €899,99 (9)
- €900 - €999,99 (10)
- €1.000 of meer (11)

Skip To: Q3.22 If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €0 - €99,99

Skip To: Q3.23 If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €100 - €199,99

Skip To: Q3.24 If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €200 - €299,99

Skip To: Q3.25 If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €300 - €399,99

Skip To: Q3.26 If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €400 - €499,99

Skip To: Q3.27 If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €500 - €599,99

Skip To: Q3.28 If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €600 - €699,99

Skip To: Q3.29 If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €700 - €799,99

Skip To: Q3.30 If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €800 - €899,99

Skip To: Q3.31 If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €900 - €999,99

Skip To: Q3.32 If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €1.000 of meer

---

Display This Question:

If 9. Tot welke autoklasse behoort uw eigen auto of de auto die uw huishouden in het bezit heeft? Me... = Mini klasse (A)

Q3.17 Het bezitten van een auto kost u ongeveer €303,00 per maand (inclusief afschrijving, verzekering, belasting, onderhoud, reparaties en brandstof). U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €303,00

Skip To: End of Block If Het bezitten van een auto kost u ongeveer €303,00 per maand (inclusief afschrijving, verzekering,... Is Displayed

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Display This Question:

If 9. Tot welke autoklasse behoort uw eigen auto of de auto die uw huishouden in het bezit heeft? Me... = Compact klasse (B)

Q3.18 Het bezitten van een auto kost u ongeveer €388,50 per maand (inclusief verzekering, belasting, onderhoud en brandstof). U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €388,50

Skip To: End of Block If Het bezitten van een auto kost u ongeveer €388,50 per maand (inclusief verzekering, belasting, on... Is Displayed

---

Display This Question:

If 9. Tot welke autoklasse behoort uw eigen auto of de auto die uw huishouden in het bezit heeft? Me... = Kleine midden klasse (C)

Q3.19 Het bezitten van een auto kost u ongeveer €486,00 per maand (inclusief verzekering, belasting, onderhoud en brandstof). U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €486,00

Skip To: End of Block If Het bezitten van een auto kost u ongeveer €486,00 per maand (inclusief verzekering, belasting, on... Is Displayed

---

Display This Question:

If 9. Tot welke autoklasse behoort uw eigen auto of de auto die uw huishouden in het bezit heeft? Me... = Midden klasse (D)

Q3.20 Het bezitten van een auto kost u ongeveer €649,00 per maand (inclusief afschrijving, verzekering, belasting, onderhoud en brandstof). U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €649,00

Skip To: End of Block If Het bezitten van een auto kost u ongeveer €649,00 per maand (inclusief afschrijving, verzekering,... Is Displayed

---

Display This Question:

If 9. Tot welke autoklasse behoort uw eigen auto of de auto die uw huishouden in het bezit heeft? Me... = Hogere middel klasse of hoger (E)

Q3.21 Het bezitten van een auto kost u minimaal €649,00 per maand (inclusief afschrijving, verzekering, belasting, onderhoud en brandstof). U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand >= €649,00

Skip To: End of Block If Het bezitten van een auto kost u minimaal €649,00 per maand (inclusief afschrijving, verzekering,... Is Displayed

Display This Question:

If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €0 - €99,99

Q3.22 Uw autokosten bedragen ongeveer €166,50 per maand (inclusief brandstof). U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €166,50

Skip To: End of Block If Uw autokosten bedragen ongeveer €166,50 per maand (inclusief brandstof). U kunt uitgaan van deze... Is Displayed

Display This Question:

If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €100 - €199,99

Q3.23 Uw autokosten bedragen ongeveer €266,50 per maand (inclusief brandstof). U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €266,50

Skip To: End of Block If Uw autokosten bedragen ongeveer €266,50 per maand (inclusief brandstof). U kunt uitgaan van deze... Is Displayed

Display This Question:

If 11. Tot welke categorie behoren ongeveer de maandelijkse kosten van uw lease auto, inclusief uw l... = €200 - €299,99

Q3.24 Uw autokosten bedragen ongeveer €366,50 per maand (inclusief brandstof). U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €366,50

Skip To: End of Block If Uw autokosten bedragen ongeveer €366,50 per maand (inclusief brandstof). U kunt uitgaan van deze... Is Displayed

Display This Question:

If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €300 - €399,99

Q3.25 Uw autokosten bedragen ongeveer €466,50 per maand (inclusief brandstof). U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €466,50

Skip To: End of Block If Uw autokosten bedragen ongeveer €466,50 per maand (inclusief brandstof). U kunt uitgaan van deze... Is Displayed

Display This Question:

If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €400 - €499,99

Q3.26 Uw autokosten bedragen ongeveer €566,50 per maand (inclusief brandstof). U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €566,50

Skip To: End of Block If Uw autokosten bedragen ongeveer €566,50 per maand (inclusief brandstof). U kunt uitgaan van deze... Is Displayed

Display This Question:

If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €500 - €599,99

Q3.27 Uw autokosten bedragen ongeveer €666,50 per maand (inclusief brandstof). U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €666,50

Skip To: End of Block If Uw autokosten bedragen ongeveer €666,50 per maand (inclusief brandstof). U kunt uitgaan van deze... Is Displayed

Display This Question:

If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €600 - €699,99

Q3.28 Uw autokosten bedragen ongeveer €766,50 per maand (inclusief brandstof). U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €766,50

Skip To: End of Block If Uw autokosten bedragen ongeveer €766,50 per maand (inclusief brandstof). U kunt uitgaan van deze... Is Displayed

Display This Question:

If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €700 - €799,99

Q3.29 Uw autokosten bedragen ongeveer €866,50 per maand (inclusief brandstof). U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €866,50

Skip To: End of Block If Uw autokosten bedragen ongeveer €866,50 per maand (inclusief brandstof). U kunt uitgaan van deze... Is Displayed

Display This Question:

If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €800 - €899,99

Q3.30 Uw autokosten bedragen ongeveer €966,50 per maand (inclusief brandstof). U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €966,50

Skip To: End of Block If Uw autokosten bedragen ongeveer €966,50 per maand (inclusief brandstof). U kunt uitgaan van deze... Is Displayed

Display This Question:

If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €900 - €999,99

Q3.31 Uw autokosten bedragen ongeveer €1.066,50 per maand (inclusief brandstof). U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €1.066,50

Skip To: End of Block If Uw autokosten bedragen ongeveer €1.066,50 per maand (inclusief brandstof). U kunt uitgaan van dez... Is Displayed

Display This Question:

If 11. Tot welke categorie behoort het maandelijkse vaste bedrag dat u betaalt aan uw private lease... = €1.000 of meer

Q3.32 Uw autokosten bedragen ongeveer €1.166,50 per maand (inclusief brandstof). U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €1.166,50

Skip To: End of Block If Uw autokosten bedragen ongeveer €1.166,50 per maand (inclusief brandstof). U kunt uitgaan van dez... Is Displayed

Q3.33

Vervoerskosten via werkgever auto

Uw werkgever betaalt op dit moment uw vervoerskosten. U kunt er vanuit gaan dat uw werkgever hetzelfde bedrag vergoedt voor de reiskosten van MaaS als nu het geval is (zie uitleg MaaS in deel 2).

Skip To: End of Block If Vervoerskosten via werkgever auto Uw werkgever betaalt op dit moment uw vervoerskosten. U kunt... Is Displayed

---

Q137

Uw autokosten bedragen gemiddeld €50,00 per maand. U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €50,00

Skip To: End of Block If Uw autokosten bedragen gemiddeld €50,00 per maand. U kunt uitgaan van deze kosteninschatting voor... Is Displayed

---

Q138

Uw autokosten bedragen gemiddeld €150,00 per maand. U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €150,00

Skip To: End of Block If Uw autokosten bedragen gemiddeld €150,00 per maand. U kunt uitgaan van deze kosteninschatting voo... Is Displayed

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Q139 Uw autokosten bedragen gemiddeld €250,00 per maand. U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €250,00

Skip To: End of Block If Uw autokosten bedragen gemiddeld €250,00 per maand. U kunt uitgaan van deze kosteninschatting voo... Is Displayed

---

Q140

Uw autokosten bedragen gemiddeld €350,00 per maand. U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €350,00

Skip To: End of Block If Uw autokosten bedragen gemiddeld €350,00 per maand. U kunt uitgaan van deze kosteninschatting voo... Is Displayed

---

Q141

Uw autokosten bedragen gemiddeld €450,00 per maand. U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €450,00

Skip To: End of Block If Uw autokosten bedragen gemiddeld €450,00 per maand. U kunt uitgaan van deze kosteninschatting voo... Is Displayed

---

Q142 Uw autokosten bedragen gemiddeld €550,00 per maand. U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €550,00

Skip To: End of Block If Uw autokosten bedragen gemiddeld €550,00 per maand. U kunt uitgaan van deze kosteninschatting voo... Is Displayed

---

Q143

Uw autokosten bedragen gemiddeld €650,00 per maand. U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €650,00

Skip To: End of Block If Uw autokosten bedragen gemiddeld €650,00 per maand. U kunt uitgaan van deze kosteninschatting voo... Is Displayed

---

Q144
Uw autokosten bedragen gemiddeld €750,00 per maand. U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €750,00

Skip To: End of Block If Uw autokosten bedragen gemiddeld €750,00 per maand. U kunt uitgaan van deze kosteninschatting voo... Is Displayed

Q145 Uw autokosten bedragen gemiddeld €850,00 per maand. U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €850,00

Skip To: End of Block If Uw autokosten bedragen gemiddeld €850,00 per maand. U kunt uitgaan van deze kosteninschatting voo... Is Displayed

Q146
Uw autokosten bedragen gemiddeld €950,00 per maand. U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand = €950,00

Skip To: End of Block If Uw autokosten bedragen gemiddeld €950,00 per maand. U kunt uitgaan van deze kosteninschatting voo... Is Displayed

Q147
Uw autokosten bedragen minimaal €1.000 per maand. U kunt uitgaan van deze kosteninschatting voor de auto in het tweede deel.

Gemiddeld autokosten per maand >= €1.000,00

Skip To: End of Block If Uw autokosten bedragen minimaal €1.000 per maand. U kunt uitgaan van deze kosteninschatting voor... Is Displayed

End of Block: Block 1A Vervoerskosten

Start of Block: Deel 1B OV-abonnement

Q151 **OV-abonnement**

Q4.1 1. Heeft u (naast uw auto) een OV-abonnement in uw bezit? Dit zijn verschillende abonnementen en reisproducten die u op uw OV-chipkaart kunt laden.

- Ja, aangeschaft door mijzelf (1)
- Ja, voor 100% vergoed of aangeschaft door mijn werkgever (2)
- Ja, deels vergoed door mijn werkgever (3)
- Ja, studenten OV (4)
- Nee (5)

Skip To: Q4.3 If 1. Heeft u (naast uw auto) een OV-abonnement in uw bezit? Dit zijn verschillende abonnementen en... = Ja, aangeschaft door mijzelf

Skip To: Q4.8 If 1. Heeft u (naast uw auto) een OV-abonnement in uw bezit? Dit zijn verschillende abonnementen en... = Ja, voor 100% vergoed of aangeschaft door mijn werkgever

Skip To: Q4.2 If 1. Heeft u (naast uw auto) een OV-abonnement in uw bezit? Dit zijn verschillende abonnementen en... = Ja, deels vergoed door mijn werkgever

Skip To: End of Block If 1. Heeft u (naast uw auto) een OV-abonnement in uw bezit? Dit zijn verschillende abonnementen en... = Ja, studenten OV

Skip To: End of Block If 1. Heeft u (naast uw auto) een OV-abonnement in uw bezit? Dit zijn verschillende abonnementen en... = Nee

Display This Question:

If 1. Heeft u (naast uw auto) een OV-abonnement in uw bezit? Dit zijn verschillende abonnementen en... = Ja, deels vergoed door mijn werkgever

Q4.2 1b. In hoeverre vergoedt uw werkgever uw OV-abonnement?

- 0% t/m 20% (1)
- 21% t/m 40% (2)
- 41% t/m 60% (3)
- 61% t/m 80% (4)
- 81% t/m 99% (5)
- 100% (6)

Q4.3 2. Heeft u een landelijk OV-abonnement in uw bezit voor bijvoorbeeld de trein, bus, tram of metro?

- Altijd Korting Jaar --> €16,25 per maand (1)
- Altijd Korting Maand --> €19,50 per maand (2)
- Net Abonnement Maand --> €303,55 per maand (3)
- Net Abonnement Jaar --> €252,96 per maand (4)
- Net Abonnement Maand 65+ --> €200,35 per maand (5)
- Net Abonnement Jaar 65+ --> €166,96 per maand (6)
- NS abonnement (7)
- Nee (8)

Skip To: Q4.7 If 2. Heeft u een landelijk OV-abonnement in uw bezit voor bijvoorbeeld de trein, bus, tram of metro? = Altijd Korting Jaar --> €16,25 per maand

Skip To: Q4.7 If 2. Heeft u een landelijk OV-abonnement in uw bezit voor bijvoorbeeld de trein, bus, tram of metro? = Altijd Korting Maand --> €19,50 per maand

Skip To: Q4.7 If 2. Heeft u een landelijk OV-abonnement in uw bezit voor bijvoorbeeld de trein, bus, tram of metro? = Net Abonnement Maand --> €303,55 per maand

Skip To: Q4.7 If 2. Heeft u een landelijk OV-abonnement in uw bezit voor bijvoorbeeld de trein, bus, tram of metro? = Net Abonnement Jaar --> €252,96 per maand

Skip To: Q4.7 If 2. Heeft u een landelijk OV-abonnement in uw bezit voor bijvoorbeeld de trein, bus, tram of metro? = Net Abonnement Maand 65+ --> €200,35 per maand

Skip To: Q4.7 If 2. Heeft u een landelijk OV-abonnement in uw bezit voor bijvoorbeeld de trein, bus, tram of metro? = Net Abonnement Jaar 65+ --> €166,96 per maand

Skip To: Q4.4 If 2. Heeft u een landelijk OV-abonnement in uw bezit voor bijvoorbeeld de trein, bus, tram of metro? = NS abonnement

Skip To: Q4.5 If 2. Heeft u een landelijk OV-abonnement in uw bezit voor bijvoorbeeld de trein, bus, tram of metro? = Nee

Display This Question:

If 2. Heeft u een landelijk OV-abonnement in uw bezit voor bijvoorbeeld de trein, bus, tram of metro? = NS abonnement

Q4.4 3. NS abonnement: welk abonnement van de NS heeft u in uw bezit?

- NS Dal voordeel --> €4,67 per maand (1)
- NS Weekend Voordeel --> €2 per maand (2)
- NS Altijd Voordeel Maand --> €28 per maand (3)
- NS Altijd Voordeel Jaar --> €23 per maand (4)
- NS Weekend Vrij 2e klasse --> €34 per maand (5)
- NS Weekend Vrij 1e klasse --> €40 per maand (6)
- NS Dal Vrij 2e klasse --> €105 per maand (7)
- NS Dal Vrij 1e klasse --> €133 per maand (8)
- NS Altijd Vrij Maand 2e klasse --> €431,20 per maand (9)
- NS Altijd Vrij Jaar 2e klasse --> €351 per maand (10)
- NS Altijd Vrij Maand 1e klasse --> €728,70 per maand (11)
- NS Altijd Vrij Jaar 1e klasse --> €592 per maand (12)
- NS Traject Vrij, per traject afhankelijk (13)

Skip To: Q4.7 If 3. NS abonnement: welk abonnement van de NS heeft u in uw bezit? = NS Dal voordeel --> €4,67 per maand

Skip To: Q4.7 If 3. NS abonnement: welk abonnement van de NS heeft u in uw bezit? = NS Weekend Voordeel --> €2 per maand

Skip To: Q4.7 If 3. NS abonnement: welk abonnement van de NS heeft u in uw bezit? = NS Altijd Voordeel Maand --> €28 per maand

Skip To: Q4.7 If 3. NS abonnement: welk abonnement van de NS heeft u in uw bezit? = NS Altijd Voordeel Jaar --> €23 per maand

Skip To: Q4.7 If 3. NS abonnement: welk abonnement van de NS heeft u in uw bezit? = NS Weekend Vrij 2e klasse --> €34 per maand

Skip To: Q4.7 If 3. NS abonnement: welk abonnement van de NS heeft u in uw bezit? = NS Weekend Vrij 1e klasse --> €40 per maand

Skip To: Q4.7 If 3. NS abonnement: welk abonnement van de NS heeft u in uw bezit? = NS Dal Vrij 2e klasse --> €105 per maand

Skip To: Q4.7 If 3. NS abonnement: welk abonnement van de NS heeft u in uw bezit? = NS Dal Vrij 1e klasse --> €133 per maand

Skip To: Q4.7 If 3. NS abonnement: welk abonnement van de NS heeft u in uw bezit? = NS Altijd Vrij Maand 2e klasse --> €431,20 per maand

Skip To: Q4.7 If 3. NS abonnement: welk abonnement van de NS heeft u in uw bezit? = NS Altijd Vrij Jaar 2e klasse --> €351 per maand

Skip To: Q4.7 If 3. NS abonnement: welk abonnement van de NS heeft u in uw bezit? = NS Altijd Vrij Maand 1e klasse --> €728,70 per maand

Skip To: Q4.7 If 3. NS abonnement: welk abonnement van de NS heeft u in uw bezit? = NS Altijd Vrij Jaar 1e klasse --> €592 per maand

Skip To: Q4.6 If 3. NS abonnement: welk abonnement van de NS heeft u in uw bezit? = NS Traject Vrij, per traject afhankelijk

Display This Question:

If 2. Heeft u een landelijk OV-abonnement in uw bezit voor bijvoorbeeld de trein, bus, tram of metro? = Nee

Q4.5 4. Tot welke categorie behoren uw maandelijkse kosten van uw regionale OV-abonnement?

- €0 - €49,99 (1)
- €50 - €99,99 (2)
- €100 - €149,99 (3)
- €150 - €199,99 (4)
- €200 - €249,99 (5)
- €250 - €299,99 (6)
- €300 - €349,99 (7)
- €350 - €399,99 (8)
- €400 - €449,99 (9)
- €450 of meer (10)

Skip To: Q4.7 If 4. Tot welke categorie behoren uw maandelijkse kosten van uw regionale OV-abonnement? = €0 - €49,99

Skip To: Q4.7 If 4. Tot welke categorie behoren uw maandelijkse kosten van uw regionale OV-abonnement? = €50 - €99,99

Skip To: Q4.7 If 4. Tot welke categorie behoren uw maandelijkse kosten van uw regionale OV-abonnement? = €100 - €149,99

Skip To: Q4.7 If 4. Tot welke categorie behoren uw maandelijkse kosten van uw regionale OV-abonnement? = €150 - €199,99

Skip To: Q4.7 If 4. Tot welke categorie behoren uw maandelijkse kosten van uw regionale OV-abonnement? = €200 - €249,99

Skip To: Q4.7 If 4. Tot welke categorie behoren uw maandelijkse kosten van uw regionale OV-abonnement? = €250 - €299,99

Skip To: Q4.7 If 4. Tot welke categorie behoren uw maandelijkse kosten van uw regionale OV-abonnement? = €300 - €349,99

Skip To: Q4.7 If 4. Tot welke categorie behoren uw maandelijkse kosten van uw regionale OV-abonnement? = €350 - €399,99

Skip To: Q4.7 If 4. Tot welke categorie behoren uw maandelijkse kosten van uw regionale OV-abonnement? = €400 - €449,99

Skip To: Q4.7 If 4. Tot welke categorie behoren uw maandelijkse kosten van uw regionale OV-abonnement? = €450 of meer

Display This Question:

If 3. NS abonnement: welk abonnement van de NS heeft u in uw bezit? = NS Traject Vrij, per traject afhankelijk

Q4.6 4. Tot welke categorie behoren uw maandelijkse kosten van uw NS Traject Vrij abonnement?

- €0 - €49,99 (1)
- €50 - €99,99 (2)
- €100 - €149,99 (3)
- €150 - €199,99 (4)
- €200 - €249,99 (5)
- €250 - €299,99 (6)
- €300 - €349,99 (7)
- €350 - €399,99 (8)
- €400 - €449,99 (9)
- €450 of meer (10)

Skip To: Q4.7 If 4. Tot welke categorie behoren uw maandelijkse kosten van uw NS Traject Vrij abonnement? = €0 - €49,99

Skip To: Q4.7 If 4. Tot welke categorie behoren uw maandelijkse kosten van uw NS Traject Vrij abonnement? = €50 - €99,99

Skip To: Q4.7 If 4. Tot welke categorie behoren uw maandelijkse kosten van uw NS Traject Vrij abonnement? = €100 - €149,99

Skip To: Q4.7 If 4. Tot welke categorie behoren uw maandelijkse kosten van uw NS Traject Vrij abonnement? = €150 - €199,99

Skip To: Q4.7 If 4. Tot welke categorie behoren uw maandelijkse kosten van uw NS Traject Vrij abonnement? = €200 - €249,99

Skip To: Q4.7 If 4. Tot welke categorie behoren uw maandelijkse kosten van uw NS Traject Vrij abonnement? = €300 - €349,99

Skip To: Q4.7 If 4. Tot welke categorie behoren uw maandelijkse kosten van uw NS Traject Vrij abonnement? = €350 - €399,99

Skip To: Q4.7 If 4. Tot welke categorie behoren uw maandelijkse kosten van uw NS Traject Vrij abonnement? = €400 - €449,99

Skip To: Q4.7 If 4. Tot welke categorie behoren uw maandelijkse kosten van uw NS Traject Vrij abonnement? = €450 of meer

Q4.7

Maandelijkse kosten OV-abonnement

Achter het door u geselecteerde abonnement kunt u het bedrag vinden dat u maandelijks voor dit abonnement betaalt. U kunt uitgaan van deze kosteninschatting voor uw OV-abonnement in het tweede deel.

Via de pijltjes "terug" kunt u dit bedrag nogmaals zien.

Skip To: End of Block If Maandelijkse kosten OV-abonnement Achter het door u geselecteerde abonnement kunt u het bedrag... Is Displayed

Display This Question:

If 1. Heeft u (naast uw auto) een OV-abonnement in uw bezit? Dit zijn verschillende abonnementen en... = Ja, voor 100% vergoed of aangeschaft door mijn werkgever

Q4.8

Vervoerskosten via werkgever OV

Uw werkgever betaalt op dit moment uw vervoerskosten. U kunt er vanuit gaan dat uw werkgever hetzelfde bedrag vergoedt voor de reiskosten van MaaS als nu het geval is (zie uitleg MaaS in het volgende scherm).

End of Block: Deel 1B OV-abonnement

Start of Block: Deel 2A Introductie MaaS

Q57

Deel 2A Introductie MaaS

MaaS staat voor een mobiliteitsconcept, waarbij u gebruik maakt van verschillende transportmiddelen via één abonnement, zoals deelfiets, deelauto, trein, tram, metro en bus. Het MaaS-concept koppelt al deze verschillende diensten naadloos aan elkaar op één platform, bijvoorbeeld een app of website.

U hoeft zich hierbij niet meer druk te maken over de benodigde reserveringen, betalingen en tussentijdse aanpassingen (bij uitval van openbaar vervoer of files). Mocht er file staan, dan kan de app een alternatieve reis aanbieden met bijvoorbeeld de trein en deelfiets. U dient alleen uw beginbestemming, eindbestemming en persoonlijke voorkeuren in te vullen. Zo kan bijvoorbeeld de snelste reis gepland worden, maar ook rekening gehouden worden met uw voorkeuren, bijvoorbeeld dat u liever fietst dan dat u met het OV gaat. Hierdoor draagt MaaS bij aan meer reisgemak en wordt u compleet ontzorgd. MaaS kan daardoor een aantrekkelijk alternatief zijn voor de eigen auto. In plaats dat u een eigen auto bezit, kunt u ook een MaaS abonnement aanschaffen.

End of Block: Deel 2A Introductie MaaS

Start of Block: Deel 2B MaaS-hubs

Q58

Deel 2B MaaS-hubs

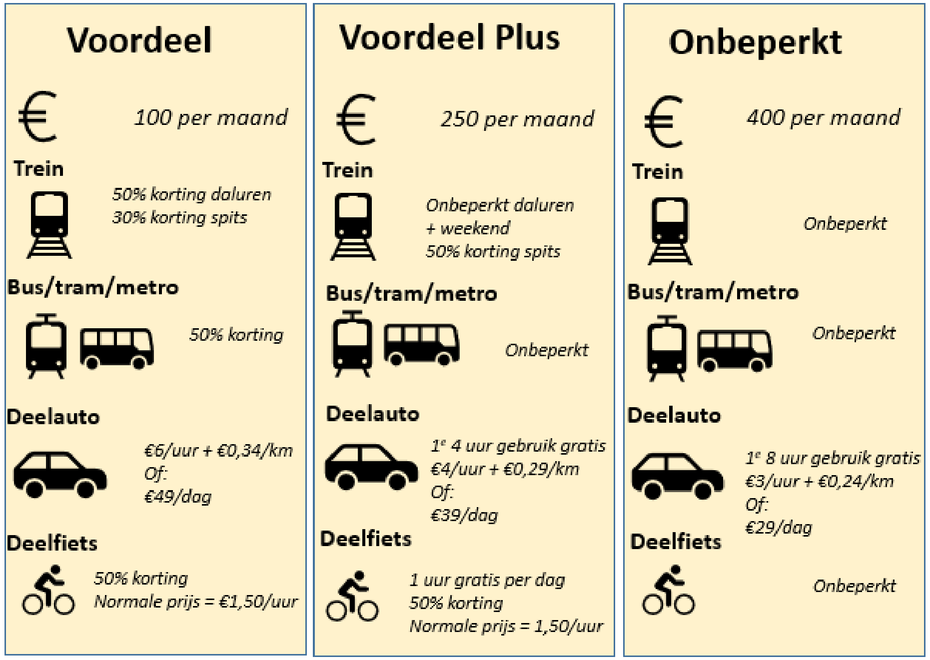
Deze vragenlijst richt zich op het plaatsen van "MaaS-hubs" in nieuwbouwwijken in of nabij grote steden als Amsterdam, Den Haag, Rotterdam en Utrecht. Dit zijn speciale plekken waar u de van te voren gereserveerde deelfietsen en deelauto's kunt ophalen en inleveren. Wanneer deze MaaS-hubs liggen bij bus, tram, metro-haltes en/of treinstations, dan kunt u ook gebruik maken van het openbaar vervoer. Zie de verschillende voorbeelden hieronder.

De MaaS-hub in de linkerbovenhoek bevat voornamelijk deelfietsen en deelauto's. De hubs op de andere afbeeldingen hebben ook een bushalte. Diverse varianten van deze MaaS-hubs komen in deze vragenlijst aan bod.

End of Block: Deel 2B MaaS-hubs

Start of Block: Deel 2C MaaS-abonnementen

Q59 **Deel 2C MaaS-abonnementen**
Er zijn vele soorten MaaS-abonnementen. Om de keuze voor u te vergemakkelijken krijgt u de keuze tussen onderstaande drie MaaS-abonnementen met verschillende prijzen en verschillende kortingsniveaus voor trein, bus/tram/metro, deelauto's en deelfietsen.
Ga er vanuit dat u deze abonnementen kunt gebruiken bij alle OV-aanbieders.



Q60 Stel dat u gebruik zou willen maken van MaaS. Welk van de drie MaaS-abonnementen zou uw voorkeur hebben?
U kunt hierbij uw huidige auto- en/of OV-kosten zoals berekend in het vorige deel als referentie voor uw huidige auto en/of OV-kosten gebruiken.

- Voordeel abonnement €100 per maand (1)
- Voordeel Plus abonnement €250 per maand (2)
- Onbeperkt abonnement €400 per maand (3)

End of Block: Deel 2C MaaS-abonnementen

Start of Block: Deel 3 Wijkontwerpen

Q130 Hoeveel auto's heeft u of uw huishouden in het bezit? Dit is inclusief eigen auto's, lease en private lease auto's.

- 0 auto's (1)
- 1 auto (2)
- 2 auto's (3)
- 3 of meer auto's (4)

Skip To: Q132 If Hoeveel auto's heeft u of uw huishouden in het bezit? Dit is inclusief eigen auto's, lease en pri... = 0 auto's

Skip To: Q132 If Hoeveel auto's heeft u of uw huishouden in het bezit? Dit is inclusief eigen auto's, lease en pri... = 1 auto

Skip To: Q176 If Hoeveel auto's heeft u of uw huishouden in het bezit? Dit is inclusief eigen auto's, lease en pri... = 2 auto's

Skip To: Q176 If Hoeveel auto's heeft u of uw huishouden in het bezit? Dit is inclusief eigen auto's, lease en pri... = 3 of meer auto's

Q132
Deel 3A Uitleg Wijkontwerpen
U dient zich voor te stellen dat u gaat verhuizen naar een nieuwbouwwijk in of nabij Amsterdam, Den Haag, Rotterdam of Utrecht. In deze wijk is geen ruimte voor een eigen parkeerplek voor de deur en is de afstand tot een parkeerplek groter. Wel beschikt de wijk over deze “MaaS-hubs”.
U krijgt negen ontwerpen voorgelegd waarbij telkens de aantrekkelijkheid van de MaaS-hub, het parkeren van de auto en een aantal wijkkenmerken worden gevarieerd. De wijkkenmerken (groenvoorziening en inrichting straten) zijn van toepassing op de hele wijk. Dat betekent dat een wijk bestaat uit één soort straatinrichting en groenvoorziening. Per ontwerp stellen wij u twee vragen:
a. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.
b. Stelt u zich voor dat u zou verhuizen naar onderstaande wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement? Dat betekent dat u niet meer de maandelijkse kosten voor de auto en/of OV-abonnement (zie vorige deel) hoeft te dragen, maar alleen nog maar gebruik maakt van de vervoersmiddelen via uw MaaS-abonnement.
Hieronder volgt een voorbeeld.

Q134
Voorbeeld vraag (deze telt niet mee):

VB

Wijk		Looptijd huis – MaaS hub		Auto	
Groenvoorziening	Kleine parkjes verspreid door de wijk	**Looptijd huis – MaaS hub**	2 minuten	**Looptijd huis - parkeerplek**	8 minuten
Voorzieningen	(1) Noodzakelijk (food winkels + basisschool) (2) Niet-noodzakelijk voorzieningen (non-food winkels) (3) Uitgaansgelegenheden (horeca, theater, bioscoop)	**Type MaaS hub**	Hub met: (1) Deelfietsen (2) Deelauto's (3) Bus of tramhalte (4) Treinstation voor stoptreinen	**Type parkeerplek**	Openbare parkeerplaats op parkeerterrein
Inrichting straten	Fietsstraten waar de auto te gast is				

a. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.

0	1	2	3	4	5	6	7	8	9	10

Q136 Voorbeeld vraag (deze telt niet mee):
b. Stelt u zich voor dat u zou verhuizen naar bovenstaande wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement?
Dat betekent dat u niet meer de maandelijkse kosten voor de auto en/of OV-abonnement (zie vorige deel) hoeft te dragen, maar alleen nog maar gebruik maakt van de vervoersmiddelen via uw MaaS-abonnement.

- Auto + MaaS --> Het zojuist gekozen MaaS abonnement met behoud eigen auto (1)
- MaaS --> Het zojuist gekozen MaaS abonnement zonder behoud eigen auto (2)
- Auto --> Ik behoud alleen mijn eigen auto (3)

Q138 **Deel 3B: 9 wijkontwerpen**
U krijgt nu 9 wijkinrichtingen net zoals in het voorbeeld.

1

Wijk		Looptijd huis – MaaS hub		Auto	
Groenvoorziening	Eén groot centraal park midden in de wijk	**Looptijd huis – MaaS hub**	2 minuten	**Looptijd huis - parkeerplek**	8 minuten
Voorzieningen	(1) Noodzakelijk (food winkels + basisschool) (2) Niet-noodzakelijk voorzieningen (non-food winkels) (3) Uitgaansgelegenheden (horeca, theater, bioscoop)	**Type MaaS hub**	Hub met: (1) Deelfietsen (2) Deelauto's (3) Bus of tramhalte (4) Treinstation voor stoptreinen	**Type parkeerplek**	Openbare parkeerplaats in parkeergarage
Inrichting straten	Autoloze straten ontoegankelijk voor de auto				

Q140 1a. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.

0	1	2	3	4	5	6	7	8	9	10

Q142 1b. Stelt u zich voor dat u zou verhuizen naar bovenstaande wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement?
Dat betekent dat u niet meer de maandelijkse kosten voor de auto en/of OV-abonnement (zie vorige deel) hoeft te dragen, maar alleen nog maar gebruik maakt van de vervoersmiddelen via uw MaaS-abonnement.

- Auto + MaaS --> Het zojuist gekozen MaaS abonnement met behoud eigen auto (1)
- MaaS --> Het zojuist gekozen MaaS abonnement zonder behoud eigen auto (2)
- Auto --> Ik behoud alleen mijn eigen auto (3)

2

Wijk		Looptijd huis – MaaS hub		Auto	
Groenvoorziening	Kleine parkjes verspreid door de wijk	**Looptijd huis – MaaS hub**	5 minuten	**Looptijd huis - parkeerplek**	5 minuten
Voorzieningen	(1) Noodzakelijk (food winkels + basisschool) (2) Niet-noodzakelijk voorzieningen (non-food winkels) (3) Uitgaansgelegenheden (horeca, theater, bioscoop)	**Type MaaS hub**	Hub met: (1) Deelfietsen (2) Deelauto's (3) Bus of tramhalte	**Type parkeerplek**	Openbare parkeerplaats op parkeerterrein
Inrichting straten	Fietsstraten waar de auto te gast is				

Q140 1a. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.

0	1	2	3	4	5	6	7	8	9	10

Q142 1b. Stelt u zich voor dat u zou verhuizen naar bovenstaande wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement?
Dat betekent dat u niet meer de maandelijkse kosten voor de auto en/of OV-abonnement (zie vorige deel) hoeft te dragen, maar alleen nog maar gebruik maakt van de vervoersmiddelen via uw MaaS-abonnement.

- Auto + MaaS --> Het zojuist gekozen MaaS abonnement met behoud eigen auto (1)
- MaaS --> Het zojuist gekozen MaaS abonnement zonder behoud eigen auto (2)
- Auto --> Ik behoud alleen mijn eigen auto (3)

3

Wijk		Looptijd huis – MaaS hub		Auto	
Groenvoorziening	Groene grasstroken in de wijk	**Looptijd huis – MaaS hub**	8 minuten	**Looptijd huis - parkeerplek**	2 minuten
Voorzieningen	(1) Noodzakelijk (food winkels + basisschool) (2) Niet-noodzakelijk voorzieningen (non-food winkels) (3) Uitgaansgelegenheden (horeca, theater, bioscoop)	**Type MaaS hub**	Hub met: (1) Deelfietsen (2) Deelauto's	**Type parkeerplek**	Gereserveerde parkeerplek langs de straat
Inrichting straten	Straten toegankelijk voor auto's				

Q148 3a. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.

0	1	2	3	4	5	6	7	8	9	10

Q150 3b. Stelt u zich voor dat u zou verhuizen naar bovenstaande wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement?
Dat betekent dat u niet meer de maandelijkse kosten voor de auto en/of OV-abonnement (zie vorige deel) hoeft te dragen, maar alleen nog maar gebruik maakt van de vervoersmiddelen via uw MaaS-abonnement.

- Auto + MaaS --> Het zojuist gekozen MaaS abonnement met behoud eigen auto (1)
- MaaS --> Het zojuist gekozen MaaS abonnement zonder behoud eigen auto (2)
- Auto --> Ik behoud alleen mijn eigen auto (3)

4

Wijk		Looptijd huis – MaaS hub		Auto	
Groenvoorziening	Eén groot centraal park midden in de wijk	**Looptijd huis – MaaS hub**	8 minuten	**Looptijd huis - parkeerplek**	5 minuten
Voorzieningen	1) Noodzakelijke (food winkels + basisschool) (2) Niet-noodzakelijke voorzieningen (non-food winkels)	**Type MaaS hub**	Hub met: (1) Deelfietsen (2) Deelauto's	**Type parkeerplek**	Parkeren op openbaar parkeerterrein
Inrichting straten	Autoloze straten ontoegankelijk voor de auto				

Q152 4a. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.

0	1	2	3	4	5	6	7	8	9	10

Q154 4b. Stelt u zich voor dat u zou verhuizen naar bovenstaande wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement?
Dat betekent dat u niet meer de maandelijkse kosten voor de auto en/of OV-abonnement (zie vorige deel) hoeft te dragen, maar alleen nog maar gebruik maakt van de vervoersmiddelen via uw MaaS-abonnement.

- Auto + MaaS --> Het zojuist gekozen MaaS abonnement met behoud eigen auto (1)
- MaaS --> Het zojuist gekozen MaaS abonnement zonder behoud eigen auto (2)
- Auto --> Ik behoud alleen mijn eigen auto (3)

5

Wijk		Looptijd huis – MaaS hub		Auto	
Groenvoorziening	Kleine parkjes verspreid door de wijk	**Looptijd huis – MaaS hub**	2 minuten	**Looptijd huis - parkeerplek**	2 minuten
Voorzieningen	1) Noodzakelijke (food winkels + basisschool) (2) Niet-noodzakelijke voorzieningen (non-food winkels)	**Type MaaS hub**	Hub met: (1) Deelfietsen (2) Deelauto's (3) Bus of tramhalte (4) Treinstation voor stoptreinen	**Type parkeerplek**	Gereserveerde parkeerplek langs de straat
Inrichting straten	Fietsstraten waar de auto te gast is				

Q156 5a. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.

0	1	2	3	4	5	6	7	8	9	10

Q158 5b. Stelt u zich voor dat u zou verhuizen naar bovenstaande wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement?
Dat betekent dat u niet meer de maandelijkse kosten voor de auto en/of OV-abonnement (zie vorige deel) hoeft te dragen, maar alleen nog maar gebruik maakt van de vervoersmiddelen via uw MaaS-abonnement.

- Auto + MaaS --> Het zojuist gekozen MaaS abonnement met behoud eigen auto (1)
- MaaS --> Het zojuist gekozen MaaS abonnement zonder behoud eigen auto (2)
- Auto --> Ik behoud alleen mijn eigen auto (3)

6

Wijk		Looptijd huis – MaaS hub		Auto	
Groenvoorziening	Groene grasstroken in de wijk	**Looptijd huis – MaaS hub**	5 minuten	**Looptijd huis - parkeerplek**	8 minuten
Voorzieningen	1) Noodzakelijke (food winkels + basisschool) (2) Niet-noodzakelijke voorzieningen (non-food winkels)	**Type MaaS hub**	Hub met: (1) Deelfietsen (2) Deelauto's (3) Bus of tramhalte	**Type parkeerplek**	Openbare parkeerplaats in parkeergarage
Inrichting straten	Straten toegankelijk voor auto's				

Q160 6a. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.

0	1	2	3	4	5	6	7	8	9	10

Q162 6b. Stelt u zich voor dat u zou verhuizen naar bovenstaande wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement?
Dat betekent dat u niet meer de maandelijkse kosten voor de auto en/of OV-abonnement (zie vorige deel) hoeft te dragen, maar alleen nog maar gebruik maakt van de vervoersmiddelen via uw MaaS-abonnement.

- Auto + MaaS --> Het zojuist gekozen MaaS abonnement met behoud eigen auto (1)
- MaaS --> Het zojuist gekozen MaaS abonnement zonder behoud eigen auto (2)
- Auto --> Ik behoud alleen mijn eigen auto (3)

7

Wijk		Looptijd huis – MaaS hub		Auto	
Groenvoorziening	Kleine parkjes verspreid door de wijk	**Looptijd huis – MaaS hub**	8 minuten	**Looptijd huis - parkeerplek**	2 minuten
Voorzieningen	Noodzakelijke (food winkels + basisschool)	**Type MaaS hub**	Hub met: (1) Deelfietsen (2) Deelauto's (3) Bus of tramhalte	**Type parkeerplek**	Openbare parkeerplaats in parkeergarage
Inrichting straten	Autoloze straten ontoegankelijk voor de auto				

Q164 7a. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.

0	1	2	3	4	5	6	7	8	9	10

Q166 7b. Stelt u zich voor dat u zou verhuizen naar bovenstaande wijk. Zou u het wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement?
Dat betekent dat u niet meer de maandelijkse kosten voor de auto en/of OV-abonnement (zie vorige deel) hoeft te dragen, maar alleen nog maar gebruik maakt van de vervoersmiddelen via uw MaaS-abonnement.

- Auto + MaaS --> Het zojuist gekozen MaaS abonnement met behoud eigen auto (1)
- MaaS --> Het zojuist gekozen MaaS abonnement zonder behoud eigen auto (2)
- Auto --> Ik behoud alleen mijn eigen auto (3)

8

Wijk		Looptijd huis – MaaS hub		Auto	
Groenvoorziening	Groene grasstroken in de wijk	**Looptijd huis – MaaS hub**	2 minuten	**Looptijd huis - parkeerplek**	8 minuten
Voorzieningen	Noodzakelijke (food winkels + basisschool)	**Type MaaS hub**	Hub met: (1) Deelfietsen (2) Deelauto's	**Type parkeerplek**	Openbare parkeerplaats op parkeerterrein
Inrichting straten	Fietsstraten waar de auto te gast is				

Q168 8a. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.

0	1	2	3	4	5	6	7	8	9	10

Q170 8b. Stelt u zich voor dat u zou verhuizen naar bovenstaande wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement?
Dat betekent dat u niet meer de maandelijkse kosten voor de auto en/of OV-abonnement (zie vorige deel) hoeft te dragen, maar alleen nog maar gebruik maakt van de vervoersmiddelen via uw MaaS-abonnement.

- Auto + MaaS --> Het zojuist gekozen MaaS abonnement met behoud eigen auto (1)
- MaaS --> Het zojuist gekozen MaaS abonnement zonder behoud eigen auto (2)
- Auto --> Ik behoud alleen mijn eigen auto (3)

9

Wijk		Looptijd huis – MaaS hub		Auto	
Groenvoorziening	Eén groot centraal park midden in de wijk	**Looptijd huis – MaaS hub**	5 minuten	**Looptijd huis - parkeerplek**	5 minuten
Voorzieningen	Noodzakelijke (food winkels + basisschool)	**Type MaaS hub**	Hub met: (1) Deelfietsen (2) Deelauto's (3) Bus of tramhalte (4) Treinstation voor stoptreinen	**Type parkeerplek**	Gereserveerde parkeerplek langs de straat
Inrichting straten	Straten toegankelijk voor auto's				

Q172 9a. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.

0	1	2	3	4	5	6	7	8	9	10

Q174 9b. Stelt u zich voor dat u zou verhuizen naar bovenstaande wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement?
Dat betekent dat u niet meer de maandelijkse kosten voor de auto en/of OV-abonnement (zie vorige deel) hoeft te dragen, maar alleen nog maar gebruik maakt van de vervoersmiddelen via uw MaaS-abonnement.

- Auto + MaaS --> Het zojuist gekozen MaaS abonnement met behoud eigen auto (1)
- MaaS --> Het zojuist gekozen MaaS abonnement zonder behoud eigen auto (2)
- Auto --> Ik behoud alleen mijn eigen auto (3)

Q182 **Deel 3B: 9 wijkontwerpen**

U krijgt nu 9 wijkinrichtingen net zoals in het voorbeeld.

1

Wijk		Looptijd huis – MaaS hub		Auto	
Groenvoorziening	Eén groot centraal park midden in de wijk	**Looptijd huis – MaaS hub**	2 minuten	**Looptijd huis - parkeerplek**	8 minuten
Voorzieningen	(1) Noodzakelijk (food winkels + basisschool) (2) Niet-noodzakelijk voorzieningen (non-food winkels) (3) Uitgaansgelegenheden (horeca, theater, bioscoop)	**Type MaaS hub**	Hub met: (1) Deelfietsen (2) Deelauto's (3) Bus of tramhalte (4) Treinstation voor stoptreinen	**Type parkeerplek**	Openbare parkeerplaats in parkeergarage
Inrichting straten	Autoloze straten ontoegankelijk voor de auto				

Q184 1a. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.

0	1	2	3	4	5	6	7	8	9	10

Q186 1b. Stelt u zich voor dat u zou verhuizen naar bovenstaande wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement?
Dat betekent dat u niet meer de maandelijkse kosten voor de auto en/of OV-abonnement (zie vorige deel) hoeft te dragen, maar alleen nog maar gebruik maakt van de vervoersmiddelen via uw MaaS-abonnement.

- 2+ Auto's + MaaS -->Het zojuist gekozen MaaS abonnement met behoud eigen auto's (1)
- 1 Auto + MaaS --> Het zojuist gekozen MaaS abonnement met behoud van 1 auto (2)
- MaaS --> Het zojuist gekozen MaaS abonnement zonder behoud van auto's (3)
- Auto --> Ik behoud alleen mijn auto's (4)

2

Wijk		Looptijd huis – MaaS hub		Auto	
Groenvoorziening	Kleine parkjes verspreid door de wijk	**Looptijd huis – MaaS hub**	5 minuten	**Looptijd huis - parkeerplek**	5 minuten
Voorzieningen	(1) Noodzakelijk (food winkels + basisschool) (2) Niet-noodzakelijk voorzieningen (non-food winkels) (3) Uitgaansgelegenheden (horeca, theater, bioscoop)	**Type MaaS hub**	Hub met: (1) Deelfietsen (2) Deelauto's (3) Bus of tramhalte	**Type parkeerplek**	Openbare parkeerplaats op parkeerterrein
Inrichting straten	Fietsstraten waar de auto te gast is				

Q188 2a. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.

0	1	2	3	4	5	6	7	8	9	10

Q190 2b. Stelt u zich voor dat u zou verhuizen naar bovenstaande wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement?
Dat betekent dat u niet meer de maandelijkse kosten voor de auto en/of OV-abonnement (zie vorige deel) hoeft te dragen, maar alleen nog maar gebruik maakt van de vervoersmiddelen via uw MaaS-abonnement.

- 2+ Auto's + MaaS -->Het zojuist gekozen MaaS abonnement met behoud eigen auto's (1)
- 1 Auto + MaaS --> Het zojuist gekozen MaaS abonnement met behoud van 1 auto (2)
- MaaS --> Het zojuist gekozen MaaS abonnement zonder behoud van auto's (3)
- Auto --> Ik behoud alleen mijn auto's (4)

3

Wijk		Looptijd huis – MaaS hub		Auto	
Groenvoorziening	Groene grasstroken in de wijk	**Looptijd huis – MaaS hub**	8 minuten	**Looptijd huis - parkeerplek**	2 minuten
Voorzieningen	(1) Noodzakelijk (food winkels + basisschool) (2) Niet-noodzakelijk voorzieningen (non-food winkels) (3) Uitgaansgelegenheden (horeca, theater, bioscoop)	**Type MaaS hub**	Hub met: (1) Deelfietsen (2) Deelauto's	**Type parkeerplek**	Gereserveerde parkeerplek langs de straat
Inrichting straten	Straten toegankelijk voor auto's				

Q192 3a. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.

0	1	2	3	4	5	6	7	8	9	10

Q194 3b. Stelt u zich voor dat u zou verhuizen naar bovenstaande wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement?
Dat betekent dat u niet meer de maandelijkse kosten voor de auto en/of OV-abonnement (zie vorige deel) hoeft te dragen, maar alleen nog maar gebruik maakt van de vervoersmiddelen via uw MaaS-abonnement.

- 2+ Auto's + MaaS -->Het zojuist gekozen MaaS abonnement met behoud eigen auto's (1)
- 1 Auto + MaaS --> Het zojuist gekozen MaaS abonnement met behoud van 1 auto (2)
- MaaS --> Het zojuist gekozen MaaS abonnement zonder behoud van auto's (3)
- Auto --> Ik behoud alleen mijn auto's (4)

4

Wijk		Looptijd huis – MaaS hub		Auto	
Groenvoorziening	Eén groot centraal park midden in de wijk	**Looptijd huis – MaaS hub**	8 minuten	**Looptijd huis - parkeerplek**	5 minuten
Voorzieningen	1) Noodzakelijke (food winkels + basisschool) (2) Niet-noodzakelijke voorzieningen (non-food winkels)	**Type MaaS hub**	Hub met: (1) Deelfietsen (2) Deelauto's	**Type parkeerplek**	Parkeren op openbaar parkeerterrein
Inrichting straten	Autoloze straten ontoegankelijk voor de auto				

Q196 4a. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.

0	1	2	3	4	5	6	7	8	9	10

Q198 4b. Stelt u zich voor dat u zou verhuizen naar bovenstaande wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement?
Dat betekent dat u niet meer de maandelijkse kosten voor de auto en/of OV-abonnement (zie vorige deel) hoeft te dragen, maar alleen nog maar gebruik maakt van de vervoersmiddelen via uw MaaS-abonnement.

- 2+ Auto's + MaaS -->Het zojuist gekozen MaaS abonnement met behoud eigen auto's (1)
- 1 Auto + MaaS --> Het zojuist gekozen MaaS abonnement met behoud van 1 auto (2)
- MaaS --> Het zojuist gekozen MaaS abonnement zonder behoud van auto's (3)
- Auto --> Ik behoud alleen mijn auto's (4)

5

Wijk		Looptijd huis – MaaS hub		Auto	
Groenvoorziening	Kleine parkjes verspreid door de wijk	**Looptijd huis – MaaS hub**	2 minuten	**Looptijd huis - parkeerplek**	2 minuten
Voorzieningen	1) Noodzakelijke (food winkels + basisschool) (2) Niet-noodzakelijke voorzieningen (non-food winkels)	**Type MaaS hub**	Hub met: (1) Deelfietsen (2) Deelauto's (3) Bus of tramhalte (4) Treinstation voor stoptreinen	**Type parkeerplek**	Gereserveerde parkeerplek langs de straat
Inrichting straten	Fietsstraten waar de auto te gast is				

Q200 5a. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.

0	1	2	3	4	5	6	7	8	9	10

Q202 5b. Stelt u zich voor dat u zou verhuizen naar bovenstaande wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement?
Dat betekent dat u niet meer de maandelijkse kosten voor de auto en/of OV-abonnement (zie vorige deel) hoeft te dragen, maar alleen nog maar gebruik maakt van de vervoersmiddelen via uw MaaS-abonnement.

- 2+ Auto's + MaaS -->Het zojuist gekozen MaaS abonnement met behoud eigen auto's (1)
- 1 Auto + MaaS --> Het zojuist gekozen MaaS abonnement met behoud van 1 auto (2)
- MaaS --> Het zojuist gekozen MaaS abonnement zonder behoud van auto's (3)
- Auto --> Ik behoud alleen mijn auto's (4)

6

Wijk		Looptijd huis – MaaS hub		Auto	
Groenvoorziening	Groene grasstroken in de wijk	**Looptijd huis – MaaS hub**	5 minuten	**Looptijd huis - parkeerplek**	8 minuten
Voorzieningen	1) Noodzakelijke (food winkels + basisschool) (2) Niet-noodzakelijke voorzieningen (non-food winkels)	**Type MaaS hub**	Hub met: (1) Deelfietsen (2) Deelauto's (3) Bus of tramhalte	**Type parkeerplek**	Openbare parkeerplaats in parkeergarage
Inrichting straten	Straten toegankelijk voor auto's				

Q204 6a. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.

0	1	2	3	4	5	6	7	8	9	10

Q206 6b. Stelt u zich voor dat u zou verhuizen naar bovenstaande wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement?
Dat betekent dat u niet meer de maandelijkse kosten voor de auto en/of OV-abonnement (zie vorige deel) hoeft te dragen, maar alleen nog maar gebruik maakt van de vervoersmiddelen via uw MaaS-abonnement.

- 2+ Auto's + MaaS -->Het zojuist gekozen MaaS abonnement met behoud eigen auto's (1)
- 1 Auto + MaaS --> Het zojuist gekozen MaaS abonnement met behoud van 1 auto (2)
- MaaS --> Het zojuist gekozen MaaS abonnement zonder behoud van auto's (3)
- Auto --> Ik behoud alleen mijn auto's (4)

7

Wijk		Looptijd huis – MaaS hub		Auto	
Groenvoorziening	Kleine parkjes verspreid door de wijk	**Looptijd huis – MaaS hub**	8 minuten	**Looptijd huis - parkeerplek**	2 minuten
Voorzieningen	Noodzakelijke (food winkels + basisschool)	**Type MaaS hub**	Hub met: (1) Deelfietsen (2) Deelauto's (3) Bus of tramhalte	**Type parkeerplek**	Openbare parkeerplaats in parkeergarage
Inrichting straten	Autoloze straten ontoegankelijk voor de auto				

Q208 7a. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.

0	1	2	3	4	5	6	7	8	9	10

Q210 7b. Stelt u zich voor dat u zou verhuizen naar bovenstaande wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement?
Dat betekent dat u niet meer de maandelijkse kosten voor de auto en/of OV-abonnement (zie vorige deel) hoeft te dragen, maar alleen nog maar gebruik maakt van de vervoersmiddelen via uw MaaS-abonnement.

- 2+ Auto's + MaaS -->Het zojuist gekozen MaaS abonnement met behoud eigen auto's (1)
- 1 Auto + MaaS --> Het zojuist gekozen MaaS abonnement met behoud van 1 auto (2)
- MaaS --> Het zojuist gekozen MaaS abonnement zonder behoud van auto's (3)
- Auto --> Ik behoud alleen mijn auto's (4)

8

Wijk		Looptijd huis – MaaS hub		Auto	
Groenvoorziening	Groene grasstroken in de wijk	**Looptijd huis – MaaS hub**	2 minuten	**Looptijd huis - parkeerplek**	8 minuten
Voorzieningen	Noodzakelijke (food winkels + basisschool)	**Type MaaS hub**	Hub met: (1) Deelfietsen (2) Deelauto's	**Type parkeerplek**	Openbare parkeerplaats op parkeerterrein
Inrichting straten	Fietsstraten waar de auto te gast is				

Q212 8a. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.

0	1	2	3	4	5	6	7	8	9	10

Q214 8b. Stelt u zich voor dat u zou verhuizen naar bovenstaande wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement?
Dat betekent dat u niet meer de maandelijkse kosten voor de auto en/of OV-abonnement (zie vorige deel) hoeft te dragen, maar alleen nog maar gebruik maakt van de vervoersmiddelen via uw MaaS-abonnement.

- 2+ Auto's + MaaS -->Het zojuist gekozen MaaS abonnement met behoud eigen auto's (1)
- 1 Auto + MaaS --> Het zojuist gekozen MaaS abonnement met behoud van 1 auto (2)

9

Wijk		Looptijd huis – MaaS hub		Auto	
Groenvoorziening	Eén groot centraal park midden in de wijk	**Looptijd huis – MaaS hub**	5 minuten	**Looptijd huis - parkeerplek**	5 minuten
Voorzieningen	Noodzakelijke (food winkels + basisschool)	**Type MaaS hub**	Hub met: (1) Deelfietsen (2) Deelauto's (3) Bus of tramhalte (4) Treinstation voor stoptreinen	**Type parkeerplek**	Gereserveerde parkeerplek langs de straat
Inrichting straten	Straten toegankelijk voor auto's				

Q216 9a. Hoe aantrekkelijk vindt u deze wijk om in te wonen? U kunt dit uitdrukken in een rapportcijfer van 1 tot 10, waarbij 1 staat voor zeer onaantrekkelijk en 10 voor zeer aantrekkelijk.

0	1	2	3	4	5	6	7	8	9	10

Q218 9b. Stelt u zich voor dat u zou verhuizen naar bovenstaande wijk. Zou u het bezitten van een eigen auto opgeven en kiezen voor het zojuist gekozen MaaS-abonnement?
Dat betekent dat u niet meer de maandelijkse kosten voor de auto en/of OV-abonnement (zie vorige deel) hoeft te dragen, maar alleen nog maar gebruik maakt van de vervoersmiddelen via uw MaaS-abonnement.

- 2+ Auto's + MaaS -->Het zojuist gekozen MaaS abonnement met behoud eigen auto's (1)
- 1 Auto + MaaS --> Het zojuist gekozen MaaS abonnement met behoud van 1 auto (2)
- MaaS --> Het zojuist gekozen MaaS abonnement zonder behoud van auto's (3)
- Auto --> Ik behoud alleen mijn auto's (4)

End of Block: Deel 3 Wijkontwerpen

Start of Block: Deel 4: Kenmerken woonomgeving

Q107 **Deel 4: Kenmerken woonomgeving**
In dit deel volgen acht vragen met de betrekking tot uw huidige woonomgeving.

Q108 U heeft zojuist diverse wijken beoordeeld met een rapportcijfer. Welk cijfer dient de wijk minimaal te hebben voordat u overweegt om daar te gaan wonen?

0	1	2	3	4	5	6	7	8	9	10

Q115 Wat is uw volledige postcode, inclusief de letters?
- Uw postcode inclusief letters is: (1) ____
- Deze wil ik liever niet geven (2)

Skip To: Q116 If Wat is uw volledige postcode, inclusief de letters? = Deze wil ik liever niet geven

Skip To: Q119 If Wat is uw volledige postcode, inclusief de letters? = Uw postcode inclusief letters is:

Display This Question:

If Wat is uw volledige postcode, inclusief de letters? = Deze wil ik liever niet geven

Q116 Wat is uw viercijferige postcode?
- Uw viercijferige postcode is: (1) ____
- Deze wil ik liever niet geven (2)

Skip To: Q117 If Wat is uw viercijferige postcode? = Deze wil ik liever niet geven

Skip To: Q119 If Wat is uw viercijferige postcode? = Uw viercijferige postcode is:

Display This Question:

If Wat is uw viercijferige postcode? = Deze wil ik liever niet geven

Q117 Wat is uw huidige woonplaats?

____

Q118 Hoe zou u uw woonomgeving beschrijven?
- Centrum-stedelijk (1)
- Stedelijk buiten-centrum (2)
- Groen-stedelijk (3)
- Centrum-dorps (4)
- Landelijk-wonen (5)
- Werkgebied (6)

Q119 In hoeverre kunt u de volgende voorzieningen gemakkelijk bereiken vanaf uw huidige woning? Een 1 geeft aan dat deze zeer slecht te bereiken zijn, terwijl een 5 aangeeft dat deze zeer goed te bereiken zijn.

	1 --> Zeer slecht (1)	2 --> Slecht (2)	3 --> Neutraal (3)	4 --> Goed (4)	5 --> Zeer goed (5)
Dichtstbijzijnde treinstation lopend (1)					
Dichtstbijzijnde treinstation fietsend (2)					
Dichtstbijzijnde bushalte lopend (3)					
Dichtstbijzijnde bushalte fietsend (4)					
Centrum van uw woonplaats lopend (5)					
Centrum van uw woonplaats fietsend (6)					
Dichtstbijzijnde op- en afrit van een snelweg (7)					
Dichtstbijzijnde voorziening waar u deelauto's kunt huren (8)					
Dichtstbijzijnde voorziening waar u deelfietsen kunt huren (9)					
Dichtstbijzijnde recreatiegebied (10)					
Dichtstbijzijnde park of plantsoen (11)					

Q120 Wat vindt u van de volgende voorzieningen in uw wijk? Een 1 geeft aan dat u deze zeer slecht vindt, terwijl een 5 aangeeft dat u deze zeer goed vindt (in aanwezigheid, onderhoud of bereikbaarheid).

	1 --> Zeer slecht (1)	2 --> Slecht (2)	3 --> Neutraal (3)	4 --> Goed (4)	5 --> Zeer goed (5)
Aanwezigheid van groenvoorzieningen (1)					
Onderhoud van groenvoorzieningen (2)					
Aanwezigheid van speelvoorzieningen (3)					
Aanwezigheid van park/plantsoen (4					
Aanwezigheid van parkeerplekken (5)					
Bereikbaarheid parkeerplek vanaf uw woning (6)					

Q121 Hoe omschrijft u uw wijk in termen van verkeersdrukte en geluidsoverlast?

- 1 --> Zeer rustig (1)
- 2 --> Rustig (2)
- 3 --> Soms rustig/ soms druk (3)
- 4 --> Druk (4)
- 5 --> Zeer druk (5)

Q122 In hoeverre bevat uw wijk veel autoverkeer?

- 1 --> Helemaal geen autoverkeer (1)
- 2 --> Weinig autoverkeer (2)
- 3 --> Soms weinig autoverkeer/ soms een beetje autoverkeer (3)
- 4 --> Een beetje autoverkeer (4)
- 5 --> Veel autoverkeer (5)

Q123 In hoeverre ervaart u moeite om uw auto te parkeren in uw buurt?

- Geen moeite, ik heb een eigen parkeerplek (1)
- 1 --> Zeer weinig moeite (2)
- 2 --> Weinig moeite (3)
- 3 --> Soms weinig moeite/ soms veel moeite (4)
- 4 --> Veel moeite (5)
- 5 --> Zeer veel moeite (6)

End of Block: Deel 4: Kenmerken woonomgeving

Start of Block: Deel 5 Sociaal-demografische gegevens

Q124 Het laatste gedeelte van deze vragenlijst stelt nog negen vragen betreffende uw persoonskenmerken.

Q125 Wat is uw geslacht?

- Man (1)
- Vrouw (2)
- Anders (3)

Q126 Wat is uw geboortejaar?

Q127 Wat is uw hoogst genoteerde opleiding? Dit is dus uw hoogst afgeronde opleiding waarvan u een diploma in het bezit heeft.

- Basisonderwijs (1)
- Vmbo-b, vmbo-k, mbo1 (2)
- Vmbo-g, vmbo-t (mavo), havo-, vwo-onderbouw (3)
- Mbo2, mbo3 (4)
- Mbo4 (5)
- Havo, vwo (6)
- Hbo-, wo-bachelor (7)
- Wo-master, doctor (8)
- Weet niet of onbekend (9)

Q128 Tot welke categorie behoort ongeveer uw eigen jaarlijkse bruto besteedbaar inkomen? Dit is het loon van het gehele jaar zonder aftrek van belastingen en pensioenpremies.

- Minder dan €10.000 (1)
- €10.000 tot €19.999 (2)
- €20.000 tot €29.999 (3)
- €30.000 tot €39.999 (4)
- €40.000 tot €49.999 (5)
- €50.000 tot €59.999 (6)
- €60.000 tot €69.999 (7)
- €70.000 tot €79.999 (8)
- €80.000 tot €89.999 (9)
- €90.000 tot €99.999 (10)
- €100.000 tot €199.999 (11)
- €200.000 of meer (12)
- Weet niet (13)

Q129 Uit hoeveel personen bestaat uw huishouden (inclusief uzelf)?

- 1 persoon (1)
- 2 personen (2)
- 3 personen (3)
- 4 personen (4)
- 5 personen of meer (5)

Q130 Hoeveel personen uit de vorige vraag zijn er jonger dan 18 jaar?

- 0 (1)
- 1 (2)
- 2 (3)
- 3 of meer (4)

Q131 Wat is uw voornaamste dagelijkse bezigheid?

- Student (1)
- Gepensioneerd (2)
- Werkzoekend, op zoek naar een betaalde baan (3)
- Werkend, fulltime (40 uur of meer per week) (4)
- Werkend, parttime (minder dan 40 uur per week) (5)
- Niet werkend (6)
- Mantelzorger (7)
- Vrijwilliger (8)
- Anders (9)

Q132 In hoeverre verwacht u te zullen verhuizen?

- Tussen nu en 0,5 jaar (1)
- Over 0,5 tot 1 jaar (2)
- Over 1 tot 1,5 jaar (3)
- Over 1,5 tot 2 jaar (4)
- Over 2 tot 3 jaar (5)
- Over 3 tot 4 jaar (6)
- Over 4 tot 5 jaar (7)
- Ik verwacht niet binnen nu en 5 jaar te verhuizen (8)

Q133 In hoeverre verwacht u een auto aan te schaffen? Hieronder valt een nieuwe, tweedehands auto en (private) lease auto.

- Tussen nu en 0,5 jaar (1)
- Over 0,5 tot 1 jaar (2)
- Over 1 tot 1,5 jaar (3)
- Over 1,5 tot 2 jaar (4)
- Over 2 tot 3 jaar (5)
- Over 3 tot 4 jaar (6)
- Over 4 tot 5 jaar (7)
- Ik verwacht niet binnen nu en 5 jaar een nieuwe auto te zullen aanschaffen (8)

End of Block: Deel 5 Sociaal-demografische gegevens

Start of Block: Einde

Q134 **Einde**

Dit is het einde van deze vragenlijst! Met de knop "volgende" kunt u de vragenlijst inleveren.
Mocht u enige vragen hebben, neem dan gerust contact met mij op via damen@appm.nl.
Veel dank voor uw bijdrage aan dit onderzoek!

Met vriendelijke groet,

Wouter Damen

Q136 Wilt u aan het einde van het onderzoek informatie ontvangen over de resultaten van het onderzoek? Zo ja, dan kunt u hieronder uw e-mail adres achterlaten. Wanneer het onderzoek is afgerond, zal ik u op de hoogte brengen van de resultaten.
Heeft u nog vragen en/of opmerkingen? Zo ja, dan kunt u deze ook hieronder achterlaten.

____

End of Block: Einde