The combined effect of shared mobility services on private vehicle ownership and usage

A case study in the Netherlands using latent class cluster analysis

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Date: July 2025

TU Delft

Kennisinstituut voor Mobiliteitsbeleid

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By

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In partial fulfilment of the requirements for the degree of:

Master of Science
in Transport, Infrastructure and Logistics

at the Delft University of Technology,
to be defended publicly on Monday July 14, 2025 at 16:00 PM.

Student number:	5348684	
Project duration:	February – July, 2025	
Involved faculties:	Technology, Policy and Management,	
	Civil Engineering and Geosciences	
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Preface

For the past six months, I have been working on this thesis research to fulfil the graduation requirements of the Master of Science (MSc) in Transport, Infrastructure and Logistics at Delft University of Technology. I began the Bachelor of Science (BSc) in Systems Engineering, Policy Analysis and Management (i.e., Technische Bestuurskunde) in 2020, during which I already chose the transport and logistics specialisation track. Consequently, my interest in transport and mobility has significantly increased, motivating me to continue with the master's programme in this specific research field. The graduation internship at the Netherlands Institute for Transport Policy Analysis (i.e., Kennisinstituut voor Mobiliteitsbeleid) has been a great opportunity and experience to end my master's degree.

I would like to thank my supervisors from the Delft University of Technology, Maarten Kroesen and Kees Maat, who provided me with assistance throughout the thesis period. As supervisors, they offered guidance on the research approach and methodology, as well as providing critical and valuable feedback on my thesis research. Maarten specifically contributed with his profound expertise of the research methodology, while Kees provided critical feedback on the report, including structural and formulation suggestions.

I would also like to thank my supervisor at the Institute for Transport Policy Analysis, Jan-Jelle Witte, who has been extremely helpful on the topic of shared mobility, as he has conducted extensive research on shared mobility within the Netherlands. During the entire research process, Jan-Jelle provided me with valuable assistance and critical feedback on my thesis. The numerous conversations and discussions on the approach of this study significantly enhanced the quality of the research.

Finally, I would like to thank my friends and family for their support and involvement during the graduation period. I really enjoyed the weekly on-campus meetings with fellow TIL students Sasha and Charlotte, where we worked on our thesis research. Furthermore, I enjoyed the thesis getaway weekend together with fellow students Milan, Nelene and Floor. As it was a weekend that combined productivity for thesis research with fun activities in the beautiful nature of the national park, the Veluwe. Special thanks also to my parents for reviewing the thesis report as a final check.

Ralf Hardy

Delft, July 2025

Summary

In recent years, shared mobility has rapidly emerged as a promising solution for more sustainable and efficient urban transportation. Shared mobility offers the potential to decrease private vehicle ownership and usage, optimise public space, and support climate and liveability goals. However, a comprehensive understanding of its effects, especially when multiple shared modalities are combined, remains limited. This study addresses this gap within the Dutch context by investigating which shared mobility user groups can be identified based on their use of different shared modes, and to what extent this affects households' ownership and use of private vehicles.

Existing research shows that each shared mobility mode has varying influence on private vehicle usage and ownership. Car sharing, especially station-based, is most effective in enabling households to reduce car ownership, while bicycle and moped sharing support first- and last-mile connectivity and serve as a replacement for shorter car trips. Additionally, cargo bike sharing serves unique needs for transporting goods and children. The literature also highlights that the most significant reductions in car dependency occur in cities with diverse, well-integrated shared mobility options, supported by local policy and infrastructure. However, the overall impact at the city or regional level remains modest, with system-wide effects limited by adoption rates, local context, and the continued dominance of private cars.

To address the research gap, this study combines binary logistic regression analyses with latent class cluster analysis (LCCA) by using an extensive national survey of Dutch shared mobility users. The regression models assessed the individual impact of various shared mobility modes on reductions in private vehicle ownership and usage. While the LCCA identified distinct user groups based on their shared mobility usage patterns and explored how socio-demographic and spatial factors define these groups. This analysis included the determination of the combined shared mobility effect, i.e. belonging to a specific cluster, on reductions in private vehicle ownership and usage.

The regression analyses revealed that frequent use of certain shared mobility services, particularly station-based car sharing, community car sharing, and OV-fiets, is significantly associated with reductions in both private car use and ownership. Other shared modes, such as free-floating car sharing, moped sharing, and shared e-bikes, also contribute to reductions, though their effects are generally more modest and context-dependent. The results further indicate that shared mobility can substitute for other private motorised modes and, to a lesser extent, public transport and active modes.

The LCCA identified six distinct shared mobility user groups in the Netherlands. These groups, visualised in Figure 1, differ in their preferred shared modes, socio-demographic characteristics, and travel behaviours. Notably, Station loyalists and Dedicated car sharers are more likely to reduce private vehicle ownership, while Occasional users and Moped adopters are less inclined to do so. Socio-demographic and spatial factors, including age, gender, education, income, urbanisation level, and proximity to train stations, play a significant role in shaping cluster membership and the likelihood of reducing private vehicle dependence.

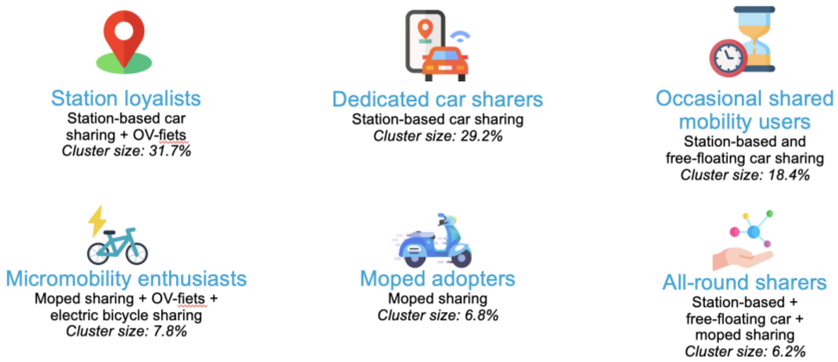

Figure 1. Overview of classes with characterising label, frequent shared mobility use mode and corresponding class size.

While the study found descriptive differences in reductions of private vehicle use and ownership across clusters, statistically significant differences in usage reduction were limited. However, class membership was a strong predictor of reductions in ownership for several transport modes, particularly private cars, leased cars, motorcycles, and bicycles.

The findings align with existing literature, confirming that shared mobility, especially station-based car sharing and integrated micromobility services, can support reductions in private vehicle ownership and use among active users. However, the overall impact at the population level remains modest, highlighting the need for targeted policy interventions and further research.

Key limitations of the study include the representativeness of the sample, the focus on shared mobility users rather than the general population, and the reliance on self-reported data. These limitations present opportunities for future research, such as including non-users, employing objective mobility data, and exploring attitudinal factors.

Policy recommendations arising from this research emphasise the importance of supporting shared mobility services in areas and among user groups with the highest potential for reducing private vehicle ownership. Efforts should focus on improving accessibility, multimodal integration, and targeted incentives, while also monitoring and minimising unintended shifts away from public transport and active modes.

In summary, this study advances the understanding of how shared mobility affects private vehicle ownership and usage in the Netherlands. It highlights the diversity of shared mobility users, the importance of socio-demographic and spatial context, and the need for integrated, evidence-based policies to maximise the sustainability benefits of shared mobility in urban transport systems.

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1 Introduction

1.1 Problem definition

Global climate change is nowadays an urgent problem. The effects are more and more visible in the form of gradually increasing temperatures and extreme weather events. According to the World Meteorological Organisation, climate change is primarily driven by the increasing levels of greenhouse gases emitted in the atmosphere due to human activities (WMO, 2025). And the increase of the concentration of carbon dioxide (CO2) within the atmosphere is the largest driver among all greenhouse gases (WMO, 2025), which means that reducing CO2 emissions is currently crucial to minimise the impact of global climate change.

One of the sectors in which the Netherlands must reduce its emissions is transport. Road traffic causes approximately one-fifth of the greenhouse gas emissions in the Netherlands (CBS, 2025a; Ministry of Infrastructure and Water Management, 2023b). And more than half of these emissions were emitted by passenger vehicles (CBS, 2025a, 2025b). As in the Netherlands, there are a total of almost 9.1 million passenger vehicles, while there are only 8.4 million households, which translates to an average of 1.08 vehicles per household (CBS, 2024a, 2024d). Seventy-four per cent of Dutch households own at least one car (CBS, 2021), and almost 50% of all trips are made by car (CBS, 2024b). Moreover, both the number of registered passenger vehicles and the vehicle kilometres have an upward trend (CBS, 2024c). This emphasises the reliance on the car as the primary mode of transportation for most people. Besides the negative environmental impact of this transport mode, it also leads to more traffic congestion, less traffic safety and higher levels of air and noise pollution within urban areas (Van Wee, 2013). All these impacts influence the environment, society, health and the economy.

In addition to the extensive environmental impact of travelling by car, private car ownership also has a social impact. As is often the case, cars are stationary 96% of the time (Zijlstra et al., 2022), occupying a valuable amount of space in public areas. This is especially problematic in dense urban areas, as the available space within these areas is already scarce. With the current population growth and housing shortage in the Netherlands, a solution is needed to aim for a liveable society that includes a sustainable mobility network.

Shared mobility is often one of the proposed solutions for a sustainable mobility system. The concept is defined as the shared use of any mode that enables users to gain temporal access to that form of transportation, only when needed, without long-term commitments or ownership involvement for the users (Machado et al., 2018; Santos, 2018; Shaheen et al., 2015; Shaheen et al., 2020). Therefore, it is an alternative to ownership, as private vehicles and their usage can be replaced by shared vehicles. Additionally, shared mobility vehicles are less often stationary and more likely to be electrically powered in comparison to private vehicles (Nicholas & Rajon Bernard, 2021). The extent to which the use of shared mobility contributes to a reduction in traffic emissions, congestion and the use of public space depends not only on the characteristics of the shared vehicle, as their role within the mobility network is also very important. Positive societal effects occur mainly if shared mobility services are used instead of owning and using private cars (FTA, 2016). This holds to a lesser extent for other modes of travel. When shared mobility is used as a substitute for public transport, active modes — such as walking or cycling — or for trips that were not previously undertaken, it can be beneficial for the individual user, but may have a different impact on society.

In the specific context of the Netherlands, there is for the first time a minor decline in the amount of shared vehicles after years of substantial growth (CROW, 2025). Mostly due to the decreased number of shared mobility operators. Many shared moped-style scooters disappeared, thanks to the negative impact of the introduction of helmet requirements and regulatory governmental policies on their usage. On the other hand, the fleets of several major operators nevertheless expanded. However, the availability of shared vehicles in the Netherlands is primarily concentrated in urban areas, as rising costs are forcing operators to focus only on profitable areas (CROW, 2025). However, the increasing interest of governments and businesses offers opportunities for the continued development of shared mobility. Even in rural areas, as public transport is becoming increasingly impoverished within these regions (Bastiaanssen & Breedijk, 2024).

All in all, uncertainty remains about the actual impact of shared mobility and the extent to which these services, either individually or collectively, have the potential to positively contribute to a sustainable and liveable society. Therefore, more insight is needed into the potential of extensive shared mobility networks to reduce the use of private vehicles and even replace their ownership.

1.2 Theoretical background, previous research and knowledge gaps

The theoretical background of shared mobility will first be discussed in this section, followed by a review of previous research to identify the resulting knowledge gaps in current literature.

1.2.1 Theoretical background

Shared mobility emerged as a new form of transportation due to the combination of the recent uptake of the so-called sharing economy and innovations in information technology. This created the possibility of using scarce public space in a more efficient and different way. As mentioned before, shared mobility is defined as the shared use of any mode that enables users to gain temporal access to that form of transportation, only when needed, without long-term commitments or ownership involvement for the users (Machado et al., 2018; Santos, 2018; Shaheen et al., 2015; Shaheen et al., 2020). An important note is that although there are some similarities between shared mobility and rental services, the user experiences and usage patterns are different. Registration and transactions are automated, shared mobility is available for a shorter period and is more evenly distributed in public spaces, creating more flexibility compared to rental vehicles (CROW, 2025).

The shared mobility concept encompasses car sharing, personal vehicle sharing, bicycle sharing, scooter sharing, ride sourcing, ride sharing, and microtransit as travel modes. Additionally, shared mobility also includes courier network services for transporting and delivering goods (Shaheen et al., 2015). Figure 1.1 presents an overview of these different types of shared mobility services.

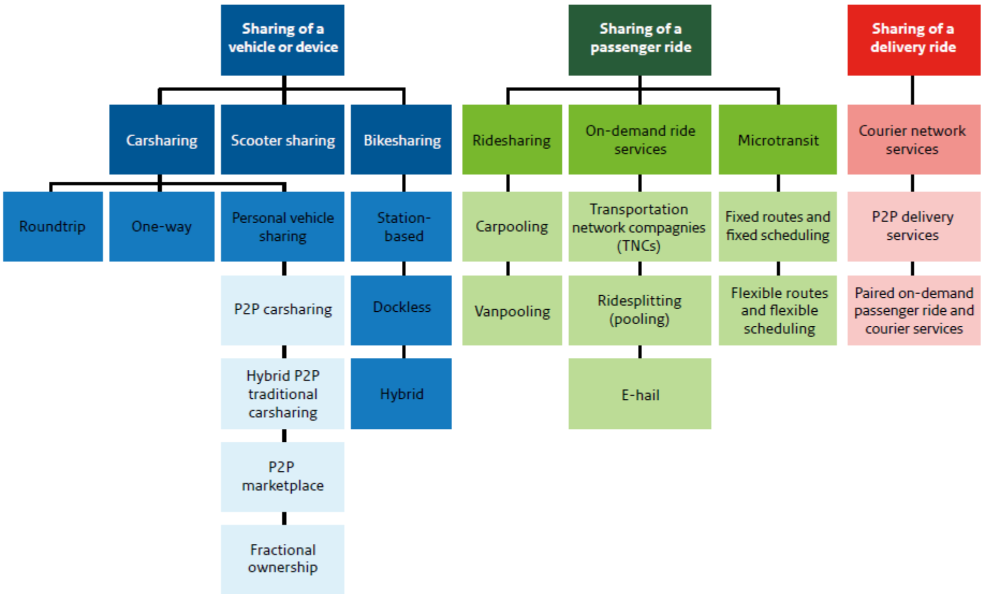

Figure 1.1. Overview of shared mobility services (Shaheen et al., 2020).

Three categories can be distinguished as not only vehicles can be shared, but also passenger and delivery rides. In the remainder of this section, these categories will be discussed, with a primary focus on vehicle sharing, as it is the main interest of this study. For vehicle sharing, each mode is separately discussed. These have different characteristics and vary in flexibility for the user.

Car sharing

There are many different systems for car sharing. Three general concepts can be distinguished (Jorritsma et al., 2021). First, Business-to-Consumer (i.e. B2C) in this concept a commercial business provides shared cars to consumers. Then, there is Consumer-to-Consumer (i.e. C2C) car sharing when a private vehicle is offered for shared use to other consumers. The last concept is Business-to-Business (i.e. B2B), which is corporate car sharing.

With B2C, the commercial business has ownership and full responsibility over the fleet of cars. B2C systems rely either on the concept of station-based or free-floating. With station-based car sharing, the vehicles have fixed designated parking spaces or locations. The two variants of station-based car sharing are round-trip and one-way. Round-trip means that the vehicle must return exactly to the start location, whereas one-way car sharing allows for single journeys between two designated locations. Free-floating is more flexible as it indicates that a shared car can be parked within an assigned area on public parking spaces.

C2C means that the vehicle is owned by a private individual. There are three main types of C2C car sharing. With Peer-to-Peer (i.e. P2P), an online car sharing platform is used by consumers. Secondly, there is community-based ownership, also known as shared ownership, which involves a fixed group of users who collectively own and maintain the shared vehicles. These are private groups such as neighbourhoods and communities. The last C2C type is hybrid car sharing, which indicates a partial ownership model, such as vehicle subscriptions.

With B2B, i.e. corporate car sharing, the vehicles are used flexibly only for business-related activities and trips. Such a shared car is used intermittently by different people within the company. Furthermore, these shared vehicles can be owned by the business itself, leased or provided by a third-party service company.

Scooter sharing

Shared scooter systems also exist in various forms, including standing and moped-style scooters, each with its own application and characteristics (Shaheen et al., 2020). An important note is that the definition of ‘scooter’ in English and Dutch differs, as ‘scooter’ in Dutch refers only to the moped-style scooter, while in English it also includes standing scooters (i.e., in Dutch, ‘step’). The availability of these scooter types varies by country, usually, one of the two is being offered. Both types of shared scooter systems are most often provided as free-floating. This means that the user can start and end a trip with a shared scooter at several parking locations within specified zones. Still, there are a few systems that use docking stations, allowing users to pick up a shared scooter at a fixed location with a docking station and return it at a wide range of other locations with docking stations. These are referred to as back-to-many systems.

Bicycle sharing

Shared bicycle systems are classified similarly to car sharing. Jorritsma et al. (2021) recognise station-based, free-floating or hybrid systems of bicycle sharing. This applies to both standard and electrically powered shared bicycles.

With station-based systems, bicycles have fixed locations for pick-up. There are also two variants of station-based bicycle sharing, namely round-trip and one-way. Round-trip station-based means that the bike must be returned to the same location where the user started using the shared bicycle. However, with one-way station-based bicycle sharing, it is possible to return the bike to another fixed pick-up location within a specified area.

Free-floating bicycle sharing systems allow users to start and end trips on shared bikes at a wide range of designated locations within specified zones. These parking zones are often designated in coordination with local authorities. Users are forced to comply with these zones as they are not able to end their trip by closing the lock outside the operating area.

The hybrid bicycle sharing systems are a combination of station-based and free-floating. These systems allow users to, for instance, pick up a shared bike at a fixed location with a docking station and return it at a wide range of locations without a docking station. These systems are also referred to as back-to-many due to the large number of return locations.

Cargo bike sharing

In addition to the shared mobility types mentioned by Shaheen et al. (2020), there are also shared cargo bike systems. These predominantly exist within Western European countries, such as Austria, Germany and the Netherlands. Most shared cargo bikes are electrically powered and operate in a station-based system. However, some free-floating systems of cargo bike sharing also exist.

Passenger and delivery ridesharing

Passenger ridesharing includes forms such as carpooling, organised rides through apps (such as Uber) and microtransit. Delivery services can also be shared through platforms that connect couriers with customers. Although relevant within the broader mobility landscape, these forms are beyond the scope of this study.

1.2.2 Previous research

Shared mobility can have a diverse impact, both positive and negative, on either the user or society. When it replaces the ownership and usage of private cars, there are several significant benefits. Shaheen and Cohen (2018) reveal positive societal effects of shared mobility in the form of reduced traffic emissions, increased accessibility and more environmental awareness. They and Marsden (2022) found both that shared mobility extends the catchment area of public transport by solving first-and-last-mile problems with access to the public transport network, particularly useful in rural areas. There is also potential for shared mobility to provide mobility benefits during uncommon operating hours, for instance, during midnight when there are very few public transport services operated (Marsden, 2022). Furthermore, accessibility is improved by shared mobility for households without access to a private car. And for the entire transport system, the energy efficiency can be improved with the introduction of car and bicycle sharing. As with these services, the total energy consumption can be substantially reduced in areas where demand is too low to support line-based public transportation (Becker et al., 2019). Lastly, Shaheen and Cohen (2018) estimated that car sharing replaces multiple privately owned vehicles. This reveals the potential of shared mobility to reduce the strain on public space in densely populated urban areas.

When shared mobility is used as a substitute for public transport, active modes, i.e. walking or cycling, or for trips not being undertaken before, it can be beneficial for the user but result in negative social effects. For users, shared mobility enables them to save on transport-related costs (Becker et al., 2019; Marsden, 2022). Because using shared vehicles is generally speaking less expensive than a privately owned car, mainly due to monthly fixed costs such as insurance, road taxes and maintenance. However, Knoope et al. (2025) emphasise the importance of considering which travel mode is replaced by shared mobility when assessing its social impact. They found that a change in environmental impact (i.e. CO_2 emission per kilometre travelled) depends on which travel mode the electric moped-style scooter substitutes. As the environmental impact increases when it replaces a previously cycling or walking trip. Furthermore, other social impacts of shared mobility are related to the use of urban space, traffic safety, vandalism and noise pollution (Knoope et al., 2025). Improvement on these factors is also highly dependent on which travel mode is substituted by shared mobility.

1.2.3 Knowledge gaps

While shared mobility services provide an alternative to private car use, their actual impact on society remains, for the most part, uncertain. Some studies reveal positive societal effects of shared mobility, while others suggest potential negative societal effects, depending on the specific travel mode being replaced. Although there is a sufficient amount of available studies about the adoption of shared mobility and its impacts, there are still knowledge gaps specific to the combination of multiple shared modalities that need to be addressed.

It remains uncertain to what extent shared mobility modes are being combined and how households potentially adapt their travel behaviour accordingly. Thus, the main gap in the literature is about the consequences of various combinations of shared mobility on people's private vehicle ownership and usage. In other words, whether shared mobility users adapt their travel behaviour due to using multiple shared mobility services.

Additionally, it is crucial to gain empirical insight into the specific user groups of shared mobility and to what extent they differently affect private vehicle ownership and use. These insights can enhance policy-making to maximise the potential of shared mobility services as a substitute for private cars.

1.3 Research objective and questions

This research aims to provide insights into the effect of combinations of shared mobility on private vehicle ownership and usage in the Netherlands.

Therefore, the main research question based on the research objectives is formulated as follows:

Which shared mobility user groups can be identified based on their combination of different modalities, and to what extent does this affect households' ownership and use of private vehicles?

The main research question is supported by the following sub-questions:

1. What impact do different shared mobility modes individually have on private vehicle ownership and use, according to current studies?
2. What clusters can be identified among shared mobility users based on their use pattern, and what characteristics distinguish these groups?
3. What effects do socio-demographic and environmental factors have on membership to a particular shared mobility user group?
4. To what extent does cluster membership affect households' ownership and use of private vehicles?

The sub-questions help to answer the main research question by first taking into account already revealed effects of individual shared mobility modes on private vehicle ownership in the current scientific literature. An overview of the individual effects of different shared mobility services will be created, as the different characteristics of each mode and system result in varying effects. Secondly, unique shared mobility user groups will be identified and compared with each other to indicate the variations. Then, the effects of socio-demographic and environmental factors on an individual's membership to a specific user group will be determined. Lastly, it will be identified if using shared mobility in any form leads to a change in the use and ownership of private vehicles. Differences between shared mobility users will be visible as it is analysed for each cluster.

1.4 Research approach and scope

Following the research definition presented in the previous sections, this section provides an overview of the entire research, including the research flow, in the research approach section below. This is directly followed by a section outlining the specific scope of this study.

1.4.1 Research approach

The research approach can be explained with the help of Figure 1.2, which presents an overview of the research process.

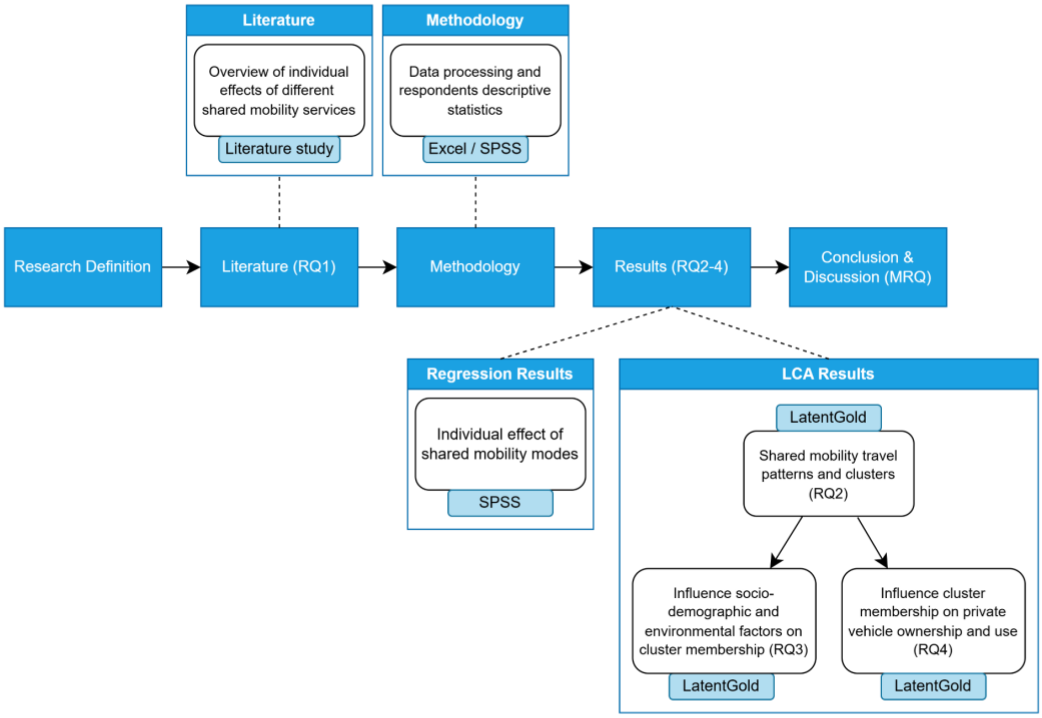

Figure 1.2. Research overview.

After the research definition within this entire introduction chapter, a literature study will be done to answer the first sub-question. As there is a sufficient amount of information available in literature about the effects of different shared mobility modes on private vehicle ownership and usage. Various studies will be used to determine the specific effects of individual shared mobility services. This will create an overview that provides insights into which shared modalities are (potentially) real substitutions for their private derivatives or other modes.

In the methodology chapter, insights into the dataset's respondents will be provided through descriptive statistics, and data processing steps will be discussed. Furthermore, the methodology for the Latent Class Analysis (LCA) will be outlined, along with the approach taken in this research.

Then, the results of the regression analysis of the individual effects of shared modes on private vehicle ownership and usage are presented. Followed by the LCA results, which identified the shared mobility use clusters, to answer the second sub-question. For the LCA, the Latent Gold software will be utilised, while SPSS Statistics software will be used for the regression analysis. Furthermore, the results of the analysis to determine the effects for the third and fourth sub-questions are also presented within this chapter.

Lastly, the findings will be concluded and discussed together with recommendations to answer the main research question.

1.4.2 Research scope

While the relevance of this research gap is global, this study will focus on the Netherlands as the area of interest. Mainly due to the operation of various shared mobility services in the Netherlands. In the Dutch transport and mobility system, four shared modalities are integrated, namely car sharing, shared bicycles, moped-style scooter sharing, and shared cargo bikes. These modalities are all included in a new, extensive dataset that has recently become available. In the remainder of this report, 'moped sharing' will be used to refer specifically to moped-style scooter sharing, to avoid any misunderstanding about this shared modality. Despite the focus of the research on the Dutch situation, other countries can gain crucial knowledge and potentially apply it to their context.

1.5 Policy relevance of shared mobility

In addition to the scientific importance of research into the effects of shared mobility, it is also significant for policy-making. The Dutch government, like other countries, has committed itself at both the national level and within the European Union to climate agreements. Furthermore, shared mobility has the potential to encourage a modal shift away from private cars, thereby enhancing the sustainability of the entire transport system by reducing both the environmental and spatial impacts of travel.

In the Netherlands, the Ministry of Infrastructure and Water Management has already promoted shared mobility through various initiatives as part of its government policy. It began with the Green Deal, which promoted car sharing, the City Deal Electric Shared Mobility to stimulate electric shared modalities within urban areas, and the Cycling Agenda, which aimed to promote bicycle sharing as an alternative for commuters by optimising the transfer to public transport (Jorritsma et al., 2021). This was followed by a newly formed national partnership programme, named Natuurlijk!Deelmobiliteit (N!D), in 2023. This initiative currently connects various government institutions, including municipalities, provinces, and ministries, to collectively gain insights into shared mobility through collaborative projects, shared expertise, and communication, as well as monitoring, evaluation, and debate (Ministry of Infrastructure and Water Management, 2023a).

This study will contribute by providing insights into the effects on a societal level of using shared mobility. Including all shared modalities in the research enables policy-makers to gain more understanding about the potential of the entire shared mobility system. All to effectively stimulate the transition to sustainable transport and steer towards a liveable society.

1.6 Reading guide

The structure of this research report is as follows: Chapter 2 begins with a literature review in the first section, which examines the current scientific literature on the individual effects of various shared mobility modes on private vehicle ownership and usage. Chapter 3, the methodology section, presents the research dataset and the methods employed for analysis. Following this, the analysis results are provided in Chapter 4. The report concludes with the conclusion, discussion, and recommendations in Chapters 5 to 7.

2 Literature

As mentioned earlier, shared mobility differs in terms of characteristics, such as the type of vehicle, operating concept and form of ownership. In this chapter, a literature review will be performed to examine the impacts of these different shared mobility services on private vehicle ownership and usage. First, the approach of the literature study is given together with the search strategy. Second, the literature is analysed and a synthesis of the results from these studies about shared mobility is provided, including an overview of the impact of different shared modalities on private vehicle ownership and usage.

2.1 Approach of literature study

With the systematic literature search strategy provided in this section, the impact of different shared mobility services can be identified and synthesised per mode. Various studies have been conducted about the effects of single shared mobility modes. For each shared modality (i.e. car sharing, shared bicycles, moped sharing and shared cargo bikes), the relevant findings on private vehicle ownership and usage will be presented.

The first step of the systematic literature search strategy is to find scientific articles in Scopus. It is a widely recognised and frequently used literature database that features many highly-ranked (transport-related) journals. In case of insufficient relevant articles, the Google Scholar database will also be consulted.

The general search process for each shared mode is presented in Figure 2.1 below. Followed by more detailed clarifications per shared modality.

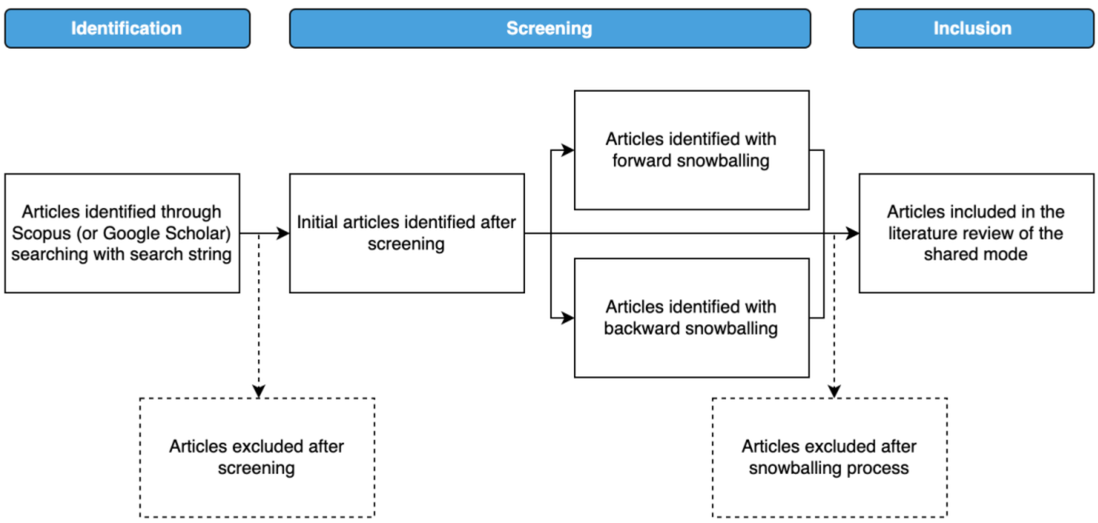

Figure 2.1. Overview of the general literature search process for each shared mode.

2.1.1 Car sharing

To determine the precise effect of car sharing on private vehicle ownership and usage, the following search string was used.

TITLE-ABS-KEY (Carsharing OR "car sharing" OR "shared cars") AND ("vehicle ownership" OR "car ownership" OR "vehicle use" OR "car use") AND (impact OR effect OR influence OR reduction OR substitution)

However, this resulted in an exceptionally high total of 326 scientific articles from the Scopus database. This is primarily because car sharing is the most researched mode among all types of shared mobility. Consequently, it was decided to predominantly utilise scientific literature that has already summarised the current research on the impact of car sharing on private vehicle ownership and usage. This led to eighteen meaningful research studies, which are included in the car sharing section of this literature chapter.

2.1.2 Bicycle sharing

Then, the search string for bicycle sharing needed to define its impact on private vehicle ownership and usage.

TITLE-ABS-KEY ("Bike sharing" OR "bicycle sharing" OR bikeshare) AND ("vehicle ownership" OR "car ownership" OR "vehicle use" OR "car use") AND (impact OR effect OR influence OR reduction OR substitution)

This search process yielded over fifty scientific articles from the Scopus database. To achieve a reasonable number of meaningful papers, only studies published in widely recognised scientific journals were included. For instance, *Transportation Research Part A: Policy and Practice, Part C: Emerging technologies, Part D: Transport and Environment, Transport Reviews* and *Transport Policy*. Ultimately, this resulted in twelve useful and meaningful research studies regarding the impacts of bicycle sharing.

2.1.3 Moped sharing

To assess the impact of moped sharing on private vehicle ownership and usage, the following search string was employed.

TITLE-ABS-KEY ("Scooter sharing" OR "moped sharing" OR "e-scooter sharing") AND ("vehicle ownership" OR "car ownership" OR "vehicle use" OR "car use") AND (impact OR effect OR influence OR reduction OR substitution)

This search process yielded ten scientific articles in the Scopus database. However, these included some studies about (standing) scooter sharing. Consequently, it was necessary to search the Google Scholar database as well. Ultimately, this resulted in five useful and meaningful research studies regarding the impacts of moped sharing.

2.1.4 Cargo bike sharing

Lastly, the search string below was utilised to determine the effect of shared cargo bikes on private vehicle ownership and usage.

TITLE-ABS-KEY ("Cargo bike sharing" OR "shared cargo bike") AND ("vehicle ownership" OR "car ownership" OR "vehicle use" OR "car use") AND (impact OR effect OR influence OR reduction OR substitution)

This search process yielded only two scientific articles in the Scopus database. Consequently, it was necessary to search the Google Scholar database as well. Ultimately, this resulted in eight useful and meaningful research studies regarding the impacts of cargo bike sharing.

2.2 Car sharing

Shared mobility can have a varying impact, both positive and negative, for either the user or society. While several studies agree that car sharing leads to a decrease in private car ownership when used as a direct substitute for the private car (Becker et al., 2017; Jochem et al., 2020; Jorritsma et al., 2021; Martin et al., 2010; Nehrke & Loose, 2018; Shaheen et al., 2020), potential negative effects arise when car sharing is either used as a substitute for public transport or active modes, or generates trips not taken before. Furthermore, the impact strongly depends on the specific car sharing operating network and households' characteristics. This section reviews empirical evidence on the impacts of car sharing, specifically on private car use, modal shift, and private car ownership, considering variations among major sharing models: station-based, free-floating, peer-to-peer, and community/cooperative systems.

2.2.1 Impact on private vehicle use

A substantial body of research finds that joining car sharing schemes leads to measurable reductions in private car use among participants. Studies from the Netherlands and other European countries report that car sharing users typically drive 15–20% fewer kilometres than they did prior to participation (Jorritsma et al., 2015; Nijland & van Meerkerk, 2017). These findings align with North American research, where reductions in vehicle kilometres travelled (VKT) of up to 43% have been observed (Martin & Shaheen, 2011). Similar outcomes are reported for the cities of Paris (45% reduction; Louvet, 2014) and London (Wu et al., 2019).

However, the mechanism underlying these changes is a complex modal shift rather than a straightforward one-to-one substitution. Evidence from Dutch and international contexts shows that, while many car sharing trips replace journeys previously made by private car, others substitute for travel previously undertaken by public transport, walking, or cycling, or even represent entirely new trips (Jorritsma et al., 2021; Nijland & van Meerkerk, 2017; Witte & Kolkowski, 2023). For instance, in the Netherlands, 34% of shared car kilometres replaced car journeys, but a higher proportion (41%) would otherwise have been made by train, with smaller fractions coming at the expense of cycling, walking, or previously untraveled trips (Nijland & van Meerkerk, 2017). Notably, about 15% of kilometres driven in shared cars represent induced demand, i.e. newly generated trips (Chapman et al., 2020; Nijland & van Meerkerk, 2017).

Recent Europe-wide work by Bucsky and Juhász (2022) offers a large-scale perspective, emphasising that while car sharing may moderate trends in car use growth in regions where it exists, the overall reduction in car travel and the modal shift away from cars are often far less dramatic than previously believed. Their empirical evidence, covering 129 European car sharing systems, indicates that although regions with car sharing experienced slightly slower growth in motorisation rates, the gap narrowed over time and did not result in substantial, broad-based reductions in total car use. Local factors such as public transport quality and urban prosperity may prove more influential in explaining modal shift than the presence of car sharing itself (Bucsky & Juhász, 2022).

Station-based car sharing

Station-based (or round-trip) car sharing, where vehicles are picked up and returned to fixed stations, consistently yields the greatest reductions in private car use and the most pronounced modal shift away from private car dependency (Nijland & van Meerkerk, 2017; Shaheen et al., 2018). Studies conducted in Paris (Louvet, 2014), Bremen, and Brussels (Rydén & Morin, 2005) report reductions in VKT of 28-45%. In these schemes, car sharing primarily replaces private car trips (particularly second or third car usage), although significant shifts from public transport and, to a lesser extent, cycling and walking are also observed. Dutch data suggest that these systems particularly reduce weekend and long-distance social trips (Jorritsma et al., 2021).

Free-floating car sharing

Free-floating car sharing, offered by companies like Car2Go, enables users to pick up and drop off cars at any location within a designated area. The environmental and behavioural benefits of free-floating systems tend to be smaller compared to station-based models. Several studies indicate that free-floating services result in only modest reductions in VKT (e.g., 4.7–16% of users reporting decreased use), and in some cases have led to increased overall car use, as these systems sometimes attract new users who previously relied on active modes or public transport (Namazu & Dowlatabadi, 2018; Nehrke & Loose, 2018; Shaheen et al., 2018). Particularly short urban trips that might have been walked, cycled, or not undertaken at all become more convenient with free-floating access (Jorritsma et al., 2021; Martin & Shaheen, 2016). Bucsky and Juhász (2022) also note that while the expansion of these models is often correlated with a slowing of car use growth, the absolute magnitude of the effect remains minimal at the city or regional level.

Peer-to-Peer car sharing

Peer-to-Peer (P2P) car sharing platforms facilitate vehicle rentals between private owners and other users. Empirical evidence from the Netherlands shows that P2P sharing yields significantly smaller reductions in car use compared to professional B2C station-based providers. This difference arises primarily because P2P participants are often car owners who utilise the system to supplement their own mobility options, rather than to replace ownership or reduce driving (Jorritsma et al., 2021; Nijland & van Meerkerk, 2017). This could indicate that car dependency still holds a significant role. Additionally, P2P use has been linked to even smaller modal shifts and environmental gains (Shaheen et al., 2018). Bucsky and Juhász (2022) confirmed similar results, finding that P2P platforms operate at a scale and utilisation that are insufficient to generate a measurable population-level impact.

Community/Cooperative car sharing

Community or cooperative schemes (local collectives or neighbourhood-based platforms) are studied less frequently in detail; however, available findings indicate they typically function similarly to station-based approaches, facilitating substantial reductions in car use primarily by pooling resources among like-minded users and prioritising efficiency over convenience (Meijkamp, 1998).

2.2.2 Impact on private vehicle ownership

Perhaps the most significant long-term impact of car sharing is its effect on the number of privately owned vehicles. Multiple studies indicate that participation in car sharing can lead to direct reductions in household vehicle ownership, particularly by facilitating the sale or disposal of second or third cars (Jorritsma et al., 2015, 2021; Nijland & van Meerkerk, 2017). Findings from the Netherlands highlight reductions in car ownership averaging around 19% (0.17 cars per household), and when considering “averted purchases” (i.e., cars that were not bought due to access to sharing), this figure rises to a 30% reduction (Nijland & van Meerkerk, 2017). Shaheen et al. (2018) note that international studies estimate that each shared vehicle removes around 4 to 11 privately owned cars from the roads.

A major empirical advance comes from Bucsky and Juhász (2022), who analysed aggregate vehicle registration data across 129 European car sharing systems, representing one of the most robust and geographically comprehensive studies to date. Their findings challenge the prevailing wisdom from earlier, smaller-scale or survey-based studies. While previous work, often built on user questionnaires, reported significant substitution of private ownership, Bucsky and Juhász (2022) found that the actual impact on aggregate car ownership is negligible in most European regions. The share of car sharing vehicles relative to the total vehicle fleet is exceedingly small (less than 0.04% of the car stock in regions with car sharing), and, crucially, the introduction and expansion of car sharing did not result in statistically significant reductions in private vehicle registrations. This can be attributed to the fact that car sharing users own significantly fewer cars than non-users (Jain et al., 2021). This raises the question whether shared cars can actually have a substantial effect on households’ private car ownership. In cities and regions with car sharing present, the growth rate of motorisation (cars per 1,000 population) slowed only very marginally compared to regions without car sharing, and this gap narrowed over time rather than widened (Bucsky & Juhász, 2022). Direct before-and-after comparisons revealed no significant difference in private car ownership trends associated with the rollout of a car sharing system. Furthermore, Bucsky and Juhász argue that case studies and self-reported survey analyses frequently overstate the population-level effect of car sharing on car ownership, and instead point to the importance of local factors, such as public transport quality, income levels, and urban structure, in shaping ownership trends.

Station-based car sharing

Car sharing in the form of station-based is the most effective at reducing car ownership, especially for frequent users. Dutch research indicates that individuals who use a shared car more than 30 times per year experience a decrease in private ownership of 61-70%, while those who use it less frequently see reductions of 27-41% (Jorritsma et al., 2021). Similar trends are observed in other European contexts, where 15–67% of station-based users sold a car after joining, and another 14–34% avoided a planned purchase (Shaheen et al., 2018).

Free-floating car sharing

The impact of free-floating car sharing on ownership is ambiguous. Some studies (e.g., Nehrke & Loose, 2018) find that exclusive free-floating users may actually increase their car ownership (up to 16%), especially as the service can provide convenient access to previously carless households, enhancing their accessibility. While not all studies report increases, the reductions are generally much smaller and less certain than those observed in station-based models (Shaheen et al., 2018).

Peer-to-Peer car sharing

P2P models often yield negligible or even slightly negative effects on car ownership, as they may incentivise owners to retain or even acquire cars for rental purposes (Jorritsma et al., 2021; Nijland & van Meerkerk, 2017).

Community/Cooperative car sharing

Although it is harder to generalise due to limited quantitative evidence, community and cooperative car sharing models typically lead to ownership reductions similar to those of station-based systems, particularly in densely populated urban contexts (Meijkamp, 1998).

2.2.3 Conclusion

In conclusion, existing empirical research consistently finds that car sharing contributes to substantial reductions in both private car use and car ownership, particularly among frequent users of station-based, business-to-consumer models. These effects are typically largest in urban contexts with robust alternatives and are amplified by supportive policies. Free-floating and peer-to-peer models exhibit more nuanced impacts. While they expand mobility options, their net environmental and behavioural benefits may be smaller or ambiguous if they substitute for non-car modes or induce new demand. Community and cooperative systems appear to align broadly with station-based outcomes, although more research is needed to determine their exact impact.

Nevertheless, Bucsky and Juhász (2022) demonstrate that while car sharing can support lower private car ownership among active users, its aggregate effect remains marginal at the city, region or national scale across Europe, given current levels of adoption and user numbers. Suggesting that policy ambitions should realistically be calibrated to reflect both local context and the empirical evidence on system-wide impact.

2.3 Bicycle sharing

In addition to car sharing, bicycle sharing systems have rapidly expanded globally in recent years, offering short-term access to bicycles through networks of docking stations or designated urban zones. These systems are commonly advertised as sustainable mobility solutions designed to reduce urban car dependence, greenhouse gas emissions, and congestion, while also enhancing public health and multimodal transportation connections (Fishman et al., 2014; Teixeira et al., 2020). This section provides a review of the literature on the impacts of shared bicycles on private vehicle ownership and usage.

2.3.1 Impact on private vehicle usage

A substantial body of research has demonstrated that bike sharing's direct impact on private car use and ownership is generally modest. Most studies report that the majority of bikeshare trips substitute for public transport or walking rather than car journeys (Fishman et al., 2014; Shaheen et al., 2011; Teixeira et al., 2020). For example, in cities like London and Washington D.C., car mode substitution rates are as low as 2–7%, while cities with higher initial car dependence such as Brisbane and Melbourne exhibit higher substitution rates, reaching up to 19–21% (Fishman et al., 2014; Shaheen et al., 2011). Nevertheless, some local surveys suggest that a significant proportion of car owners (up to 78% in Hangzhou, China) do utilise bikeshare for trips they would have otherwise taken by car, highlighting the context-dependent nature of the system's effectiveness (Shaheen et al., 2011).

The Delft case study by Ma et al. (2020) provides further insight, examining how various types of bicycle sharing systems (such as docked, dockless, and bicycle-lease) influence modal choice in a mature Dutch cycling city. They found that bike sharing primarily substituted for walking, private biking, and public transit, with a more limited impact on reducing car use (Ma et al., 2020). Modal shifts away from the car were more apparent for dockless systems and among users without a driving license, underscoring the importance of user characteristics and operating system type.

Beyond direct replacement, bikeshare can indirectly reduce private vehicle usage by enhancing other sustainable modes. Bikeshare is most effective as a first- and last-mile connector, extending the reach of public transport and mitigating so-called “transit deserts,” while supporting seamless multimodal trips (Ma & Knaap, 2019; Martin & Shaheen, 2014; Teixeira et al., 2020). Studies indicate that stations near major transit hubs experience higher usage, and that bikeshare availability can help alleviate congestion on overcrowded public transportation routes (Campbell & Brakewood, 2017; Murphy & Usher, 2013; Teixeira et al., 2020). This synergy is particularly pronounced in transit-sparse or suburban areas, where well-integrated bikeshare systems enable broader shifts toward multimodality and can meaningfully reduce car dependency (Basu & Ferreira, 2021; Ma et al., 2018; Teixeira et al., 2020). By filling gaps in the public transport network, bikeshare thus not only supports alternative travel choices but also underpins reductions in private car use across diverse urban contexts (Ma et al., 2020; Martin & Shaheen, 2014).

Moreover, the addition of electrically powered bicycles, i.e. e-bikes, within bicycle sharing fleets is providing further substitution effect, as it allows for longer trips and achieves higher car substitution rates than conventional bicycle sharing (Campbell et al., 2016; Teixeira et al., 2020). Case evidence from Delft supports the idea that e-bikes are particularly relevant for longer commutes and for broadening catchment areas in the operating system of shared bicycles (Ma et al., 2020).

2.3.2 Impact on private vehicle ownership

Bikeshare programmes can contribute modestly to a reduction in vehicle ownership, particularly in areas with robust multimodal infrastructure and high bikeshare accessibility (Basu & Ferreira, 2021). Longitudinal studies in North America demonstrate that the introduction of bicycle sharing is associated with a 2–3% decrease in household car ownership and a corresponding reduction in vehicle kilometres travelled (VKT) and CO_2 emissions, especially where bikeshare is closely integrated with mass transit (Basu & Ferreira, 2021). However, these impacts are highly context-specific and tend to be strongest in neighbourhoods with pre-existing demand for active travel options (Fishman et al., 2014; Teixeira et al., 2020). Studies regarding the impact of bicycle sharing on the ownership of private bicycles or mopeds are, to the researcher’s best knowledge, not yet conducted.

2.3.3 Conclusion

Despite its potential, the impact of bicycle sharing on private vehicle ownership and use is influenced by the quality of cycling infrastructure, perceived safety, system accessibility, and the degree of multimodal integration (Basu & Ferreira, 2021; Fishman et al., 2013; Ma et al., 2020). Persistent challenges include underrepresentation among disadvantaged social groups, safety concerns, infrastructure gaps, and operational issues, such as balancing bike availability throughout the system (Fishman et al., 2014; Ma et al., 2020). To maximise reductions in car use and ultimately ownership, policy should focus on integrating shared bicycles with public transit, investing in high-quality bike infrastructure, and improving accessibility and equity (Basu & Ferreira, 2021; Ma et al., 2018).

2.4 Moped sharing

Shared moped services provide electrically powered, typically free-floating two-wheelers that necessitate a motorcycle or car licence (within the Netherlands), are fully electric, and are intended for longer and more flexible urban journeys compared to bicycles. Shared mopeds offer greater flexibility in use due to larger storage capacity, such as under-seat compartments, making them more practical for shopping or carrying baggage (Aguilera-García et al., 2021). Notably, the adoption of such services is high in cities such as Madrid and Barcelona, with Spain holding one of the largest moped sharing fleets globally (Vega-Gonzalo et al., 2024; Aguilera-García et al., 2020). This section discusses insights into their impact on car use, modal shift, private vehicle ownership and intentions regarding car ownership.

2.4.1 Impact on private vehicle usage

A key finding across studies is that shared moped usage is associated with a measurable reduction in private car use. In an extensive modal split analysis, frequent moped sharing users reported that only 13.1% of their weekly trips were made by private car, compared to 17.4% among occasional users and 19.8% for those who do not use moped sharing (Aguilera-García et al., 2021). These results suggest a trend toward reduced car dependence as moped-sharing engagement increases, although the observed differences are not always statistically significant (Aguilera-García et al., 2021; Vega-Gonzalo et al., 2024). Underlying factors such as specific socio-demographic or spatial characteristics could explain this relationship. Therefore, there is not yet evidence of causality between the use of moped sharing and private vehicle usage.

Significantly, the exact substitution patterns differ by user segment. Studies show that occasional moped-sharing users are more likely to replace car trips with moped trips, acting as a direct alternative to car travel. In contrast, frequent users often substitute public transport or even active modes such as walking and cycling (Aguilera-García et al., 2021; Gilibert & Weymar, 2022; Vega-Gonzalo et al., 2024). The ability of moped sharing to act as a flexible car-like alternative is supported by the finding that 70.6% of moped-sharing trips are ridden alone, and that access to restricted parts of city centres, with limited car access, is a common trip purpose (Aguilera-García et al., 2020; Aguilera-García et al., 2021).

The expansion of service areas, particularly in less densely populated neighbourhoods, can further enhance the substitution effect and broaden the impact on overall car usage (Aguilera-García et al., 2020; Vega-Gonzalo et al., 2024). The policy context is also important: cities where complementary regulatory frameworks exist, such as parking privileges and integration with public transport, observe higher adoption rates and more pronounced modal shifts (Gilibert & Weymar, 2022; Vega-Gonzalo et al., 2024).

From a broader micromobility perspective, it is indicated that moped sharing is part of a larger range of shared electric vehicle options that, when properly integrated, can complement public transport for longer first and last-mile connections and enhance people's willingness to shift away from car dependency (Liao & Correia, 2020).

2.4.2 Impact on private vehicle ownership

Beyond the substitution of individual car trips, shared moped services are linked to changed attitudes and intentions regarding car ownership. In a comprehensive Spanish survey, 53.5% of moped-sharing users reported that they believe owning a private car will not be necessary in the future (Vega-Gonzalo et al., 2024). Notably, this sentiment is even stronger among both current and potential new users, with 69.4% of potential users and up to 81.6% of current users (depending on usage frequency) not foreseeing the need for car ownership, whereas only 53.3% of non-potential users shared this view (Aguilera-García et al., 2021).

For individuals who do not currently own a car, regular use of moped-sharing seems to discourage the acquisition of a private vehicle (Aguilera-García et al., 2021; Vega-Gonzalo et al., 2024). Modelling results also indicate that infrequent access to private cars is linked with higher moped-sharing usage and a stronger belief that car ownership will not be necessary in the future (Aguilera-García et al., 2021).

Broader factors also play a role. Studies highlight that the deterrent effect of moped sharing on car ownership is particularly notable among younger, highly educated, and urban-based groups, demographics that generally tend to be early adopters of shared mobility (Aguilera-García et al., 2020; Gilibert & Weymar, 2022). Environmental consciousness, comfort with technology, and lifestyle preferences further reinforce these trends (Liao & Correia, 2020; Vega-Gonzalo et al., 2024).

Research regarding the impact of moped sharing on the ownership of private mopeds or bicycles is, to the researcher's best knowledge, not yet conducted.

2.4.3 Conclusion

Synthesising across this literature, there is evidence that shared moped services can contribute to measurable reductions in private car use and play a significant role in reducing the perceived and actual necessity of car ownership. These effects are enhanced among frequent users, non-car owners, and cities with supportive policy frameworks. The observed numerical outcomes, such as the reduction in car trip share (13.1% for frequent moped users) and the high proportion of users seeing no need for future car ownership (up to 81.6%), highlight the promising potential of these services to promote sustainable, multimodal urban mobility. However, causality between the use of moped sharing and private vehicle use is not yet evident.

2.5 Cargo bike sharing

Lastly, the fourth shared mode, cargo bikes, is discussed within this literature chapter. Among the shared modalities, cargo bike sharing has attracted increasing attention for its potential to substitute car trips, particularly for transporting goods and children, trip purposes that are often inadequately addressed by conventional bike or moped sharing schemes. This section provides a review of the literature on the impacts of shared cargo bike services on private vehicle ownership and usage.

2.5.1 Impact on private vehicle usage

Cargo bikes, designed to carry heavy or bulky loads and passengers such as children, address a unique niche in urban mobility. Unlike shared bicycles or mopedsd, cargo bikes can fulfil many of the logistical needs that typically drive car use, especially for families and households with complex mobility demands (Marincek et al., 2024; Pernot & Weir, 2025). Empirical studies consistently demonstrate that a significant proportion of trips made with shared cargo bikes would otherwise have been undertaken by car. For example, Becker and Rudolf (2018) found that 46% of shared cargo bike users in Germany and Austria would have used a car in the absence of the service, while Pernot and Weir (2025) report that 38% to 55% of trips with the ‘Fietje’ cargo bike sharing service in Bremen would have been car trips.

These findings are supported by similar studies in Switzerland and Austria, which emphasise the significant substitution potential of cargo bike sharing compared to other shared mobility modes (Hess & Schubert, 2019; Dorner & Berger, 2020). Notably, the substitution effect is particularly strong for trip purposes such as shopping, transporting children, and carrying bulky items, activities for which conventional bikes or public transport are often impractical (Becker & Rudolf, 2018; Pernot & Weir, 2025). For instance, in the ‘Fietje’ study, 39% of users borrowed a cargo bike to transport bulky items, 37% to transport children, and 30% for weekly shopping (Pernot & Weir, 2025).

However, the same study highlights the importance of the operating design, as free or low-cost access is a critical factor for maximising car trip substitution. The introduction of a user fee, i.e., a charge of 10 to 20 euros per day, has been shown to increase car use by 14% to 18% of trips that would otherwise be shifted from car to shared cargo bikes (Pernot & Weir, 2025).

2.5.2 Impact on private vehicle ownership

Beyond the immediate substitution of car trips, shared cargo bike services have the potential to influence long-term mobility choices, including car ownership. Bissel and Becker (2024), in a large-scale survey of 2,590 cargo bike sharing users, estimate that cargo bike sharing reduces car ownership by 7.4% to 18.1% among active users, depending on the definition of causality. The primary mechanism involves not only the active dismissal of cars but also the decision to refrain from purchasing one, particularly among users who find that shared cargo bikes meet their occasional needs for transporting goods or children. Shared cargo bikes are primarily valued for their ability to facilitate trips that would otherwise be difficult or impossible without a car, such as transporting multiple children or large items. For many, the service acts as a complement to other mobility options, expanding the range of feasible car-free travel (Pernot & Weir, 2025).

The reduction in car ownership is significant when compared to the impacts of other shared mobility services, such as car sharing, which typically yield lower rates of car reduction (Firnkorn & Müller, 2011; Bissel & Becker, 2024). The literature suggests that cargo bike sharing is particularly effective in urban contexts where car ownership is already relatively low and where users are environmentally conscious and multimodal travellers (Becker & Rudolf, 2018; Hess & Schubert, 2019). However, the effect is not limited to car-free households; a substantial proportion of car owners report reducing their car use or considering giving up a second vehicle due to the availability of shared cargo bikes (Marincek et al., 2024).

2.5.3 Conclusion

The literature reviewed suggests that shared cargo bike services can play a significant role in reducing both car usage and ownership, particularly for trip purposes that are otherwise difficult to serve for families and households with complex mobility needs. By enabling them to meet their occasional transport needs without owning a car, cargo bike sharing contributes to the broader goals of urban sustainability, including reduced emissions, improved public health, and more equitable access to mobility (Becker & Rudolf, 2018; Zimmermann & Palgan, 2024). However, to the researcher's best knowledge, studies regarding the impact of cargo bike sharing on the ownership and usage of private cargo bikes or mopeds have not yet been conducted.

2.6 Combined impact & overall conclusion

While each mode of shared mobility has distinct mechanisms for influencing private vehicle usage and ownership, their combined deployment in urban mobility ecosystems produces broader, often complementary, effects. The limited collective evidence suggests that cities with diverse, multimodal shared mobility options experience the greatest reduction in car dependency, especially when these services are integrated, accessible, and supported by local policy and infrastructure (Coenegrachts et al., 2024; Luo et al., 2023; Tikoudis et al., 2021).

First, the presence of multiple shared mobility options enhances the substitution and deterrent effects each individual mode has. Car sharing directly supports situations where households can forgo car ownership or reduce their fleet, especially when combined with convenient alternatives for shorter trips, such as bike sharing, moped sharing, or cargo bikes (Coenegrachts et al., 2024). Bicycle and moped sharing are effective at supporting first- and last-mile connectivity and replacing short car trips, thereby reducing habitual car use and lowering the perceived need for a private car, particularly in densely populated or transit-rich areas (Luo et al., 2023). Cargo bike sharing serves a unique segment for trips involving heavy goods, groceries, or children, which otherwise would be undertaken with a private or shared car (Coenegrachts et al., 2024).

As these modes are integrated within a city's mobility ecosystem, their effects accumulate: car sharing reduces reliance on private vehicles for medium- and long-distance or occasional journeys; micromobility and cargo bike services address everyday short-distance needs. This synergy can demonstrate measurable shifts in modal split, decreased car usage, and a stronger cultural shift away from default car ownership, particularly among urban residents (Luo et al., 2023; Tikoudis et al., 2021).

However, the literature also warns about the limits and conditions of these effects. The overall reduction in car usage and ownership at the city or regional level remains modest in most European contexts, with population-wide impacts closely linked to the adoption rates and integrated design of shared systems (Coenegrachts et al., 2024; Tikoudis et al., 2021). For example, although nearly all shared modes promote reductions in reliance on cars, these reductions are greatest where urban policies support them, such as parking restrictions, investments in infrastructure, and dynamic pricing that accounts for the actual social costs of private driving (Luo et al., 2023; Tikoudis et al., 2021). Additionally, in areas that are highly dependent on cars or where shared modes compete directly with public transport and walking, the overall impacts tend to be less significant (Luo et al., 2023).

The overall conclusion from the literature is that, collectively, shared mobility services can reduce both ownership and usage of private vehicles among users and can meaningfully moderate car dependence across urban populations when implemented comprehensively and alongside enabling policies (Coenegrachts et al., 2024; Tikoudis et al., 2021). However, system-wide effects currently remain limited by the scale of adoption, local circumstances, and the continued dominance of private cars, requiring realistic policy expectations and a focus on integration, accessibility, and user diversity. Nonetheless, the limited amount of literature on the combined effects of shared mobility services restricts our ability to determine the overall impact. Therefore, a broader scope should be adopted, as many studies only focus on the impact of a single shared modality on private car ownership and usage. It is also important to define the effects on other private means of transport to assess the overall impact of the shared mobility system. The remainder of this research will address these effects of shared modalities on individuals' private vehicle ownership and usage.

3 Methodology

This section outlines how the research questions are addressed. It discusses the research data and the steps involved in processing the data, followed by the specific methods used to analyse the data.

3.1 Research data

Within this research, the extensive survey data is used that was collected among Dutch shared mobility users in October 2024. This dataset is the result of the ‘Landelijk gebruiksonderzoek deelmobiliteit’ and was collected by the independent research agency Ipsos I&O on behalf of the national partnership programme Natuurlijk!Deelmobiliteit (N!D). This initiative conducts annual monitoring and evaluation of shared mobility. One aspect of this monitoring and evaluation is the periodic survey of shared mobility users. Previously, the research was fragmented as municipalities and operators of shared mobility services did not cooperate. In order to optimise and standardise user research on shared mobility, the survey was organised collectively for the first time and will be repeated annually. Shared mobility operators were invited to distribute the survey to their customers; however, it remains unclear how each specific operator approached the users. Some used their newsletters to invite people, but operators were free to decide how they wished to engage with their customers and how actively they did so. Ultimately, a total of 5,946 respondents participated in the survey. The corresponding report by Groenhuis and Wolf (2024) provides more specific information about the research data collected in this survey, outlining the use patterns of shared mobility and offering insights into the developments between urban areas and modalities. Appendix A offers insight into the survey questions by providing the complete questionnaire that respondents filled out.

3.1.1 Data processing

Some adjustments were made to the original data to enhance its reliability and practicality. First, an adjustment in the types of shared mobility. The category ‘rental car’ is excluded due to the scope of this research, as mentioned earlier. Furthermore, some adjustments were made to include more meaningful categories of shared mobility services, which are discussed below:

1. **Car sharing P2P:** Peer-to-Peer car sharing is an important and unique category of car sharing. It was included in the broad category of car sharing via a platform, community or mutually outside own household. However, the decision was made to only include the first two types of car sharing. As only formal car sharing services were chosen to be included and car sharing mutually outside own household is an informal way of car sharing. Users of car sharing P2P were filtered by considering all respondents who identified themselves as users of the SnappCar platform.
2. **Car sharing cooperation/community:** Car sharing through cooperation or community is also a unique and meaningful category, representing a formal approach to car sharing. Users in this category were filtered by considering all respondents who identified themselves as users of the operator OnzeAuto, combined with individuals mentioning the general option of car sharing via cooperation or community, since many smaller cooperatives or community car sharing initiatives were initially not included in the answer categories.
3. **OV-fiets bicycle sharing:** The so-called ‘OV-fiets’ is a unique way of bicycle sharing due to the fixed locations at train stations and the round-trip characteristic. Therefore, it is included as

its own shared modality. The users of the OV-fiets were filtered by considering respondents who belonged to both the non-electric bicycle sharing category and the OV-fiets operator answer category. Additionally, some respondents mentioned their use of the OV-fiets only in the open answer option for other shared mobility types, as they did not report it under the non-electric bicycle sharing category; these respondents were also included. An important note is that in this research, the OV-fiets shared modality is referred to as a non-electric bicycle. Although an electric variant exists, it remains in the pilot phase. It is limited to a few test electric OV-fiets bicycles, available only at four train stations throughout the Netherlands (NS, n.d.).

4. **Other bicycle sharing:** The remaining respondents, i.e., users of non-electric shared bicycles who were not users of the OV-fiets, were grouped into a newly created category of other bicycle sharing users.
5. **Non-electric and electric cargo bike sharing:** Due to the relatively small number of non-electric shared cargo bike users in the dataset and the complete discontinuation of its availability in the Netherlands, this category is excluded from the analysis. It should be noted that some respondents classified themselves as non-electric shared cargo bike users when they should have been included in the category of electrically powered shared cargo bikes, given their answers about which shared mobility operators they have used in the past year. These respondents have been reassigned to the electric cargo bike category.

As a result, nine different types of shared mobility services were included in the analysis of this research. However, there are four main categories: car sharing, bicycle sharing, moped sharing, and cargo bike sharing. In the remainder of this report, 'moped sharing' will be used to refer to moped-style scooter sharing, correctly to prevent any misunderstanding about this shared modality. Figure 3.1 below visualises the classification for all types of shared mobility within this research.

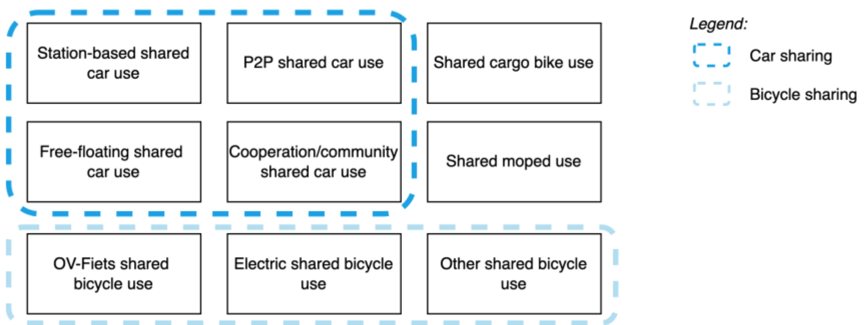

Figure 3.1. Classification of all different shared mobility types.

The variables for these nine shared mobility modes represent an individual's frequency of use over the past year. These were first coded as increasing use frequencies, ranging from 1 (less than once per year) to 8 (more than four times per month), while non-users had missing values. Nevertheless, non-users were included by adding a new category labelled with zero, to create a complete dataset with the following logical increasing order of use frequency:

0 = *Never*
1 = *Less than once a year*
2 = *1 – 2 times a year*
3 = *3 – 4 times a year*
4 = *5 – 6 times a year*

5 = *7 – 11 times a year*
6 = *1 – 2 times a month*
7 = *3 – 4 times a month*
8 = *More than 4 times a month*

Table 3.1 provides an overview of the travel behaviour among respondents. Non-users are excluded from the statistics of the specific shared modalities, as this offers a more meaningful insight into usage frequency, particularly for shared modalities with a smaller number of users within the dataset.

Table 3.1. Shared mobility travel behaviour statistics within the dataset.

Indicator	Mean	Median	SD	MIN	MAX	N	% of N
Different types of shared mobility	2.02	2	1.26	0	9	5946	-
Different operators shared mobility	2.26	2	1.54	0	12	5946	-
Station-based car sharing*	4.95	5	1.89	1	8	4409	74.2
Free-floating car sharing*	4.57	5	2.09	1	8	940	15.8
P2P car sharing*	2.59	2	1.24	1	8	624	10.5
Cooperation car sharing*	5.38	6	2.16	1	8	236	4.0
OV-fiets*	4.33	4	1.75	1	8	2054	34.5
Other bicycle sharing*	4.06	4	1.89	1	8	158	2.7
Electric bicycle sharing*	3.69	3	1.91	1	8	536	9.0
Moped sharing*	4.82	5	2.08	1	8	953	16.0
Electric cargo bike sharing*	3.55	3	1.79	1	8	572	9.6
**: data excluding non-users of that specific shared modality*							

These statistics indicate that most respondents utilise two shared modalities across two different operators. Moreover, the dataset includes some non-users and enthusiasts employing a variety of modalities and operators. The non-users can be explained by the fact that they have not used any form of shared mobility in the past year, but were registered with one of the operators as they had previously experienced shared mobility.

In addition to the statistics, Appendix B provides further insight into the usage distribution of each shared mobility mode among the respondents. Station-based car sharing is by far the most popular shared modality among the sample, with nearly 75% of respondents having used this type of car sharing in the past year. While it is evident that users of cooperation/community car sharing exhibit, on average, the highest frequency of use, and users of Peer-to-Peer car sharing generally display a relatively low frequency of use.

Additionally, some adjustments were necessary for the socio-demographic variables to facilitate the interpretation of the analysis results and improve comparability in the next section's data review.

First, the socio-demographic variable *'gender'* has been recoded into a binary variable, indicating only male or female.

The categories of the highest level of education completed were then reduced to three categories: low, intermediate, and high. Low represents primary education, the first years of secondary education, and secondary vocational education level 1 (i.e., MBO 1 in Dutch). Intermediate consists of the senior years of secondary education and secondary vocational education (i.e., MBO 2, 3 or 4 in

Dutch). Furthermore, high refers to higher vocational education (i.e., HBO in Dutch), a university bachelor's or master's degree, and a PhD.

Finally, the socio-demographic variable *gross monthly household income* has also been reduced to the three categories: low, intermediate, and high. In this case, 'low' refers to a gross monthly income of less than 2,600 euros per household. The intermediate category represents the Netherlands' most frequent gross monthly household income, ranging from 2,600 to 3,000 euros. And high means above this income threshold.

The dataset also features respondents' postal codes, enabling the inclusion of spatial variables in the analysis of this research. The Dutch statistics office, i.e. CBS, provides various datasets of spatial indicators, and this research includes the following three: degree of urbanisation, ratio of multi-family housing, and proximity to the nearest train station (CBS, 2023, 2024e). These variables were linked to the respondents in the dataset using their postal codes; Appendix C provides further elaboration on this method.

The degree of urbanisation is a categorisation of ambient address density. The ambient address density, i.e. 'omgevingsadressendichtheid' (OAD) in Dutch, determines the concentration of human activities such as living, working, and shopping within a specific area (CBS, 2025c). CBS calculates this parameter by dividing the number of addresses within a one-kilometre radius by the area of that circle, which means it is expressed in addresses per square kilometre. There are five urbanity classes defined, ranging from extremely urban, i.e. more than 2500 addresses per square kilometre, to non-urban, which is less than 500 addresses per square kilometre.

Secondly, the ratio of multi-family housing is included, as it is a spatial characteristic that could affect people's travel behaviour. CBS (2025c) states: 'A residence has the multifamily type when it is situated in a building together with other residences or business premises. For instance, apartments and flats. All other residences are of the single-family type.' The ratio thus gives insight into the living environment of a respondent by indicating the distribution between single-family and multi-family housing in that area.

At last, the proximity to the nearest train station is included, because it also has the potential to affect respondents' travel behaviour. It is defined as the average distance for residents of a specific postal code area to the nearest railway station, calculated by road in kilometres (CBS, 2025c).

Moreover, thirteen different types of (private) travel modes with their use frequency were included in the analysis of this research. The following modes are included: *private car, private lease car, corporate lease car, motorcycle, taxi, moped, bicycle, e-bike, cargo bike, e-cargo bike, train, BTM (i.e. Bus, Tram and Metro)* and *walking*. These will be used to describe potential clusters by examining how these variables might vary across the identified clusters. The variables for these modes represent an individual's frequency of use over the past year. These were first coded as decreasing use frequencies, ranging from 1 (daily use) to 6 (never or rarely), while non-users had missing values. Nevertheless, it was decided for consistency to switch to an increasing order, and non-users were included by adding a new category labelled with zero, to create a complete dataset with the following logical increasing order of use frequency:

0 = *Never or rarely*
1 = *Less than once a month*
2 = *Once a month*
3 = *Once a week*
4 = *Multiple times a week*
5 = *Daily use*

Finally, variables related to the reduction of ownership and usage of (private) travel modes due to shared mobility were included in this research analysis. For usage reduction, the thirteen travel modes are again considered. Conversely, for reduction in ownership, the nine modes that can be privately owned remain relevant. This data was collected by asking individuals whether their ownership and usage of these (private) travel modes changed due to shared mobility in general. Table 3.2 provides an overview of these reductions among respondents. For clarification, reduction of ownership refers to actual dismissals within the past year, while averted ownership indicates that an individual definitely no longer considers ownership of that private vehicle. Additionally, postponed ownership pertains to the temporary suspension of new ownership, and the total effect is the sum of these three forms of ownership reduction.

Table 3.2. Effects of shared mobility on (private) travel mode ownership and usage within the dataset.

Travel mode	**Reduction usage* [%]**	**Reduction ownership [%]**	**Averted ownership [%]**	**Postponed ownership [%]**	**Total effect ownership [%]**
Private car	40.0	18.1	23.6	18.0	59.8
Private lease car	22.9	3.7	12.6	6.5	22.8
Corporate lease car	28.8	3.2	8.8	3.7	15.6
Motorcycle	15.5	1.2	5.0	1.3	7.4
Moped	14.6	0.9	5.8	1.4	8.1
Bicycle	8.8	0.5	1.1	1.5	3.1
E-bike	7.4	0.5	3.3	2.7	6.5
Cargo bike	9.0	0.6	4.0	1.2	5.8
E-cargo bike	8.9	0.3	4.6	1.4	6.3
Train	26.9	-	-	-	-
BTM	31.2	-	-	-	-
Taxi	26.2	-	-	-	-
Walking	8.3	-	-	-	-

**: data excluding non-users of that specific travel mode*

Overall, the data shows that shared mobility has a mixed effect on reducing the usage of these travel modes, with decreases in car use as well as reductions in public transport and active travel. Furthermore, it indicates that shared mobility mainly influences different types of car ownership, with privately owned cars playing the largest role.

These ownership variables will be used to describe potential clusters by examining how ownership reduction might vary across the identified clusters. For this comparison, the three levels, postponed, averted, or actual reduction of ownership, are included. However, for the analysis of the individual and combined impact of shared mobility modes, it was decided to include only the actual reduction of ownership. This choice primarily improves analysis interpretation, as it effectively indicates a reduction in private vehicles from the current situation.

The ownership and usage reduction variables were therefore coded as binary variables to be included in the analysis. For both types of variables, a value of 1 indicates a reduction, either in ownership or usage of that specific (private) travel mode.

3.1.2 Data review

For the representativeness check of the used data sample, a comparison is made with data from the 'Landelijk Reizigers Onderzoek' (LRO) 2024. As mentioned earlier, the research data primarily includes users of shared mobility, as the survey was targeted at individuals registered with any of the shared mobility operators and only a few via municipalities. Thus, it is more beneficial to compare with LRO data, which allows for an analysis of the characteristics of the typical shared mobility user, rather than comparing them to the characteristics of the average Dutch citizen. The LRO dataset comprises both users and non-users of shared mobility; however, the 3,605 respondents included for this comparison are all users of shared mobility. The division among answer categories has been corrected to exclude the 'no answer' option, facilitating a better comparison between the research data and the LRO dataset.

Table 3.3. Socio-demographic data compared with LRO 2024 data for categorical indicators.

Indicator	**Category**	**Sample [%] (N = 5,946)**	**LRO [%] (N = 3,605)**
Gender	Male	59.1	48.2
	Female	40.9	51.8
Age	18 – 34 years	22.4	48.1
	35 – 49 years	34.0	25.5
	50 – 64 years	30.0	17.2
	65+	13.7	9.2
Educational level	Low	2.5	18.3
	Intermediate	11.9	19.7
	High	85.6	62.0
Gross monthly household income	Low (< €2,600)	12.1	-
	Intermediate	10.1	-
	High (> €3,000)	77.8	-
Province of residence	Groningen	2.4	3.8
	Friesland	0.4	3.0
	Drenthe	0.2	2.2
	Overijssel	2.7	7.1
	Flevoland	0.9	2.3
	Gelderland	8.8	11.3
	Utrecht	20.7	9.0
	Noord-Holland	30.3	18.2
	Zuid-Holland	25.3	22.7
	Zeeland	0.2	2.3
	Noord-Brabant	6.8	13.4
	Limburg	1.3	4.8
Degree of urbanisation	Extremely urban	67.6	38.7
	Highly urban	21.4	29.0
	Moderately urban	6.3	12.5
	Slightly urban	3.2	14.8
	Non-urban	1.6	5.0
Private car ownership	Yes	29.7	80.6
	No	70.3	19.4

Table 3.4. Travel behavioural and spatial data compared with LRO 2024 data for continuous indicators.

Indicator	Data	Mean	Median	SD	MIN	MAX	N
Different types of shared mobility [#]	Sample*	2.10	2	1.21	1	9	5,733
	LRO	1.76	1	1.12	1	10	3,605
Different operators of shared mobility [#]	Sample*	2.27	2	1.54	1	12	5,733
	LRO**	2.08	2	1.22	1	10	2,430
Ratio multi-family housing [%]	Sample	63.6	68.8	28.5	0.80	100	5,208
	LRO	-	-	-	-	-	-
Distance nearest train station [km]	Sample	2.44	1.80	2.08	0.50	36.4	5,215
	LRO	-	-	-	-	-	-

**: data excluding non-users of shared mobility*
***: available data limited to car sharing operators*

The comparison between the research sample and the representative LRO 2024 dataset reveals several notable differences. The research sample contains a higher proportion of men, older individuals, and highly educated respondents compared to the LRO data, which is more balanced in terms of gender and includes a larger share of younger and less-educated users. Additionally, the sample is strongly urban-oriented, with a significant overrepresentation of residents from highly urbanised provinces such as Utrecht and Noord-Holland, while rural and less urbanised areas are underrepresented.

Furthermore, the sample includes far fewer private car owners and a greater share of respondents who use multiple types and operators of shared mobility services, suggesting a more engaged or experienced user group. It is important to note that a comparison of income levels, the ratio of multi-family housing, and the proximity to the nearest train station is not possible, as this information was not included in the LRO data. The differences suggest that the research sample may not accurately represent the broader population of shared mobility users, particularly in terms of age, education, car ownership, and geographic distribution. This should be taken into account when interpreting the results and drawing conclusions from the research.

3.2 Research methodology

This section will discuss the applied research methods by first elaborating on the methodology of the regression models that estimate the individual impact of shared mobility modes on private vehicle ownership and usage. Followed by the specific methodology for the latent class cluster analysis.

3.2.1 Regression models

Firstly, the assessment of the individual impact of shared mobility modes on private vehicle ownership and the use of (private) travel modes is to be conducted. In total, 22 regression models will be estimated, of which nine will determine the impact of shared modalities on private vehicle ownership and 13 will assess their effect on the usage of (private) travel modes. The difference exists due to the inclusion of public transport, taxi and walking as travel modes.

Binary logistic regression is employed for all these analyses, as the dependent variables are binary indicators that signify whether an individual reduces their ownership or usage of a specific mode of travel. The enter method is applied because it incorporates all independent variables into the model, and these variables were intentionally selected for inclusion in this research.

The regression models are represented graphically in Figure 3.2 and 3.3. To obtain more manageable figures, the two general structures of the regression models are presented.

Figure 3.2. Graphical representation of the regression models for the impact of shared mobility modes on (private) travel modes.

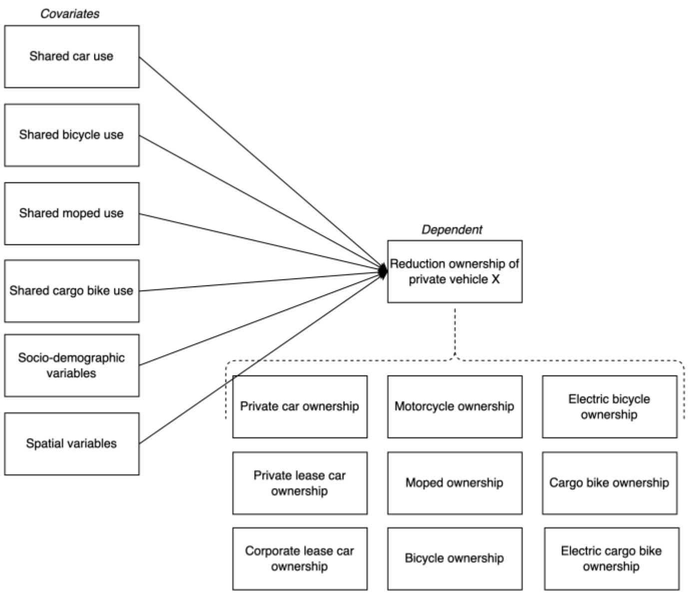

Figure 3.3. Graphical representation of the regression models for the impact of shared mobility modes on private vehicle ownership.

After initially estimating the individual effects, latent class cluster analysis will now be employed to estimate the combined effects of shared mobility.

3.2.2 Latent class cluster analysis

The third sub-question aims to identify the unique user groups among current shared mobility users in the Netherlands. Latent class cluster analysis (LCCA) is a suitable method, as it is a technique by which groups, i.e. clusters, are empirically derived from the data (Vermunt & Magidson, 2002). This means that clusters are not predetermined, but the most meaningful clusters are discovered from the dataset. It is a model-based method that assigns individuals to clusters probabilistically, while accounting for measurement error (Molin et al., 2015). During the analysis, the model will cluster in a way that the constructed clusters have the most explanatory power.

However, in this research, the three-step approach of the latent class cluster analysis will be used. This method ensures minimisation of clustering errors and maintains the independence between the clustering and covariates (Vermunt & Magidson, 2020). So, the main benefit of using the three-step approach for this research is that the cluster classification remains stable, while it is still possible to analyse the influence of explanatory variables on cluster membership and cluster membership on outcomes. This demonstrates that the three-step approach offers flexibility in testing relationships with external variables and mitigates disturbances in the clustering; therefore, it is a suitable method for this research.

Step 1: Estimate classes

The first step is to identify the latent classes based on the indicators without the direct effect of covariates, which ensures that clusters are formed purely based on patterns in the data. This analysis will be performed using the software package Latent Gold and is referred to as the measurement model. It is chosen to take all different types of shared mobility use as indicators on which the clusters are formed. Section 3.1.1. described these nine different variables and their corresponding value categories. Logically, these were included as ordinal indicators, due to their nature of increasing use frequency. Besides the indicators, inactive covariates are included in the estimation to gain an initial insight into their potential relationship with class membership, without influencing the formation of the latent classes themselves. The socio-demographic, spatial, (private) travel behaviour and reduction of private vehicle ownership and usage variables were all included as inactive covariates to describe and validate the classes. All these (inactive) covariates were included as numeric, due to their variable nature, except the socio-demographic *gender,* which was included as nominal. Using the Latent Gold software, between 1 and 10 classes were generated. The most important is to determine the optimal number of classes for further analysis. Various statistical indicators can serve as criteria to achieve the optimal number of clusters. These will be discussed shortly below, followed by a motivation for the application within this research.

The log likelihood (LL) is a measure used to determine how well the latent class model explains the observed data. Higher values (i.e., less negative) indicate a better model fit, so the LL needs to be maximised (Morgan, 2014). However, models with an increasing number of classes usually have a higher LL, due to the additional parameters and increased flexibility. A correction for complexity is needed.

The Bayesian Information Criterion (BIC) is such an indicator that penalises overly complex models. It needs to be minimised to obtain a better model fit (Nylund-Gibson & Choi, 2018), and is calculated as follows:

$$BIC = k \cdot \ln(n) - 2 \cdot \ln(L)$$

$$\begin{aligned} &\mathrm{k} = \text{number of parameters} \\ &\mathrm{n} = \text{number of respondents} \\ &\mathrm{L} = \text{likelihood} \end{aligned}$$

Furthermore, the BVR (i.e., bivariate residual) is the parameter that defines the interaction effects between indicators. The threshold value of the BVR is below 3.84, which indicates that no significant interaction effects occur in the dataset (Kroesen, 2018). However, some datasets have unavoidable interaction effects, so the interpretability of fewer classes may outweigh this (Molin et al., 2015).

There is also a rule of thumb for the minimum class size, set at a minimum of 5% of the research sample (Nylund-Gibson & Choi, 2018).

The BIC value is selected as the primary indicator to determine the optimal number of classes. However, the smallest class size and interpretability of each class are also considered. The final decision will be made after evaluating these indicators collectively.

Then the differences in characteristics between clusters, i.e., the second part of the third sub-question, will be determined by exploring the types of shared modalities individuals within a cluster use, their average frequency of use, sociodemographic and spatial characteristics, and their (private) travel mode use frequency. Analysing membership in a cluster and the effects of belonging to a specific cluster is the third and last step, which is discussed in step 3.

Step 2: Class assignment

Assigning individuals to clusters is the second step, i.e. the classification step. Based on the estimated latent classes from step 1, individuals can be classified into different classes using various methods (Vermunt & Magidson, 2020). The assignment can be performed using different methods, either modal, proportional, or random assignment (Vermunt, 2010). Assigning an individual to the class with the highest membership probability is a modal assignment, while proportional distribution of class probability is more even. Although modal and random assignment provide distinct assignments of individuals to classes, proportional assignment distributes class membership more smoothly (Vermunt, 2010). Therefore, proportional class assignment is used in the remainder of this analysis.

Additionally, there are correction methods aimed at improving the accuracy of classifying cluster membership. BCH (Block, Croon and Hagenaars) and ML (maximum likelihood) are two available adjustment methods. The preferred correction method depends on its usage, as ML is useful for exploring how covariates predict class membership (Vermunt, 2010), while the BCH method is favoured for distal outcomes, for instance behaviours or attitudes, that follow class assignment (Bakk & Vermunt, 2015). Therefore, both correction methods will be employed in this research, as both covariates and distal outcomes are addressed.

Step 3: Relationship class membership with covariates and distal outcomes

The last step of the three-step approach is about examining the relationship between clusters and external variables while accounting for classification errors introduced in the second step (Vermunt & Magidson, 2020). These external variables can either be covariates affecting clusters (Vermunt, 2010) or distal outcomes affected by the clusters (Bakk & Vermunt, 2015). The last two sub-questions will address both of these relationships.

The membership model will examine what socio-demographic and environmental factors influence the likelihood of someone belonging to a particular cluster. Gender, age, educational level, and income level are the socio-demographic variables considered. For spatial variables, the urbanity level, the ratio of multi-family housing and proximity to the nearest train station are included. Multinomial logistic regression (MNL) will be used (Vermunt & Magidson, 2020), as cluster membership is a categorical variable with more than two classes. The dependent variable will be the cluster an individual belongs to, while the independent variables are the socio-demographic and environmental variables. The output of the regression model will highlight which of those variables has a significant contribution to the probability of an individual belonging to a particular cluster.

Logistic regression analysis will also be used for the outcome model to answer the last sub-question. As it focuses on the impact of cluster membership on someone's household's ownership and use of (private) travel modes, which are both distal outcomes. For both, a binary logistic regression is used. Both variables, the reduction in private vehicle ownership and the reduction in the use of (private) travel modes, are defined as binary indicators that signify whether an individual reduces their ownership or usage of that specific travel mode. These models will thus determine how cluster membership affects the probability of a change in households' private vehicle ownership and usage.

The entire three-step latent class cluster model, as applied in this research, is performed using the Latent Gold software and is represented graphically in Figure 3.4. In this study, the categories of the latent class variable represent different shared mobility travel patterns, i.e. shared mobility user groups. These clusters are associated with the specific use of the four 'general' shared modalities, which are the indicators used in the measurement model. The relationships between the clusters, i.e. latent shared mobility travel patterns, and external variables are defined in the membership and outcome models. It is expected that at least some socio-demographic and environmental variables affect cluster membership. At the same time, it remains uncertain if belonging to a cluster affects private vehicle ownership and use of (private) travel modes. Consequently, these effects are presented with a dashed relationship.

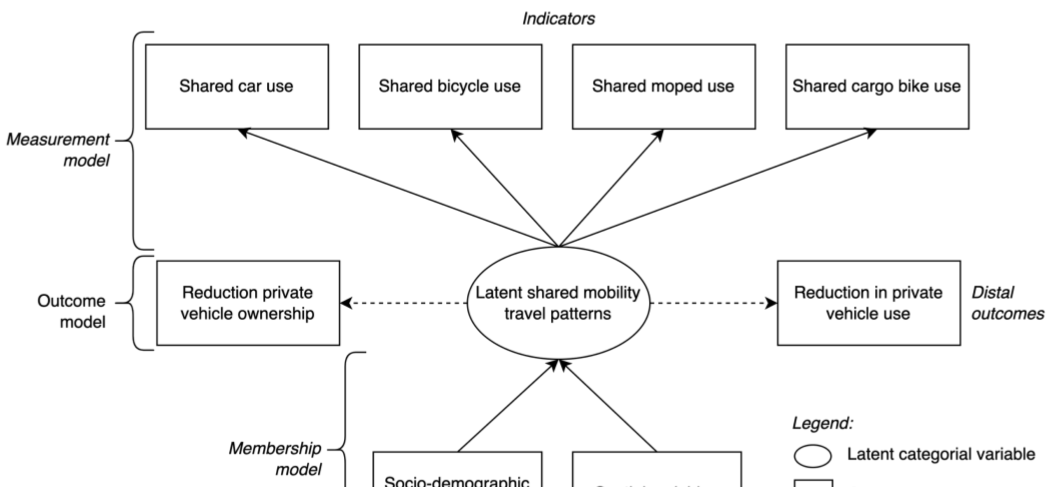

Figure 3.4. Graphical representation of the three-step latent class cluster model.

4 Results

This section includes the research results of the regression models and the latent class cluster analysis. First, it discusses the results of the regressions determining the impact on (private) travel modes, followed by the results related to the impact on private vehicle ownership. Afterwards, the LCCA results are presented, including the optimal number of clusters selection and interpretation of each class. Lastly, the relationship of class membership with the covariates and distal outcomes is presented.

4.1 Travel behaviour regression models

As indicated in the methodology section, 13 binary logistic regressions are estimated to assess the impact of shared mobility modes on the use of (private) travel modes. Appendix D presents the complete output of these models, including non-significant effects, constants and measures of model fit. To present the results of these regression models, they were divided into sections for motorised transport modes, public transport, and micromobility combined with walking. Only the results of the regression models for the private lease car and e-cargo bike are absent from this section due to the lack of any significant effects. Whilst only significant effects are shown, these were estimated within a model that included more variables as mentioned in the methodology section. Appendix D shows the complete output of these regressions.

4.1.1 Reduction in the use of motorised transport modes

For each motorised private transport mode (private car, private/corporate lease car and motorcycle), a separate binary logistic regression model was estimated. The dependent variable indicates whether usage of that mode was reduced, possibly in response to the use of shared mobility options. These models examine which shared mobility modes (e.g., station-based cars, e-cargo bikes, OV-fiets) have a significant impact on reducing private mode usage. Only significant predictors (p-value < 0.05) are reported in Table 4.1.

Table 4.1 presents the significant predictors for the likelihood of reducing the use of motorised private transport modes, based on shared mobility usage. Socio-demographic and spatial variables were included to control for alternative explanations, ensuring that the effects attributed to shared mobility use are not due to differences in individual characteristics or spatial context. Since all shared mobility use frequencies are coded from 0 (“never”) to 8 (“more than 4 times per month”), the reported odds ratios reflect the effect of each unit increase in usage frequency.

Private car usage
Several shared mobility modes are associated with a higher likelihood of reducing private car use. Specifically, more frequent use of station-based cars (odds ratio = 1.084, $p = .010$), free-floating cars (odds ratio = 1.114, $p = .024$), cooperation cars (odds ratio = 1.267, $p < .001$), OV-fiets (odds ratio = 1.244, $p < .001$), e-cargo bikes (odds ratio = 1.233, $p < .001$), and mopeds (odds ratio = 1.111, $p = .002$) each significantly increases the odds of reduced private car use. For example, someone using an OV-fiets “1–2 times per month” (code 6) instead of “less than once a year” (code 1) has substantially higher odds of reporting reduced car use. These findings suggest that more frequent use of various

shared or lightweight mobility options may substitute for private car trips. However, the community/cooperation car sharing, OV-fiets and E-cargo bike sharing show the highest impact.

Table 4.1. Regression models output of significant effects for motorised private transport modes.

Dependent	Predictor	B	S.E.	Wald	p-value	Exp(B)
Private car	Station-based car	0.081	0.032	6.574	0.010	1.084
	Free-floating car	0.108	0.048	5.096	0.024	1.114
	Cooperation car	0.236	0.062	14.728	<0.001	1.267
	OV-fiets	0.218	0.036	35.996	<0.001	1.244
	E-cargo bike	0.209	0.051	16.662	<0.001	1.233
	Moped	0.105	0.034	9.847	0.002	1.111
Corporate lease car	Other bike	0.785	0.362	4.705	0.030	2.192
	Distance to nearest train station [km]	0.271	0.116	5.494	0.019	1.312
Motorcycle	Station-based car	0.497	0.155	10.225	0.001	1.643
	Free-floating car	0.411	0.147	7.849	0.005	1.509
	Moped	0.462	0.136	11.611	<.001	1.588

Corporate lease car usage
Two variables significantly predict a reduction in corporate lease car use. More frequent use of other (non-electric) bicycles (odds ratio = 2.192, p = .030) strongly increases the odds of reduction. And greater distance to the nearest train station (odds ratio = 1.312, p = .019) increases this likelihood, possibly reflecting that individuals further from rail stations rely more on other (car) alternatives when available, or that commuting constraints push them toward other travel modes.

Motorcycle usage
In this model, shared mobility use is also linked to reduced motorcycle use. More frequent use of station-based cars (odds ratio = 1.643, p = .001), free-floating cars (odds ratio = 1.509, p = .005), and mopeds (odds ratio = 1.588, p < .001) each significantly increases the odds of reduced motorcycle use. This may reflect substitution within similar modal categories (i.e., motorised two-wheelers vs. shared motorised options), indicating overlapping user needs or purposes.

4.1.2 Reduction in public transport use

Additionally, Table 4.2 presents the significant predictors for the likelihood of increased use of three public transport modes (train, Bus/Tram/Metro, and taxi), based on the frequency of shared mobility use and spatial or socio-demographic characteristics. Due to the nature of the shared mobility use variables, positive coefficients indicate that more frequent use of a shared mode is associated with a higher likelihood of decreased public transport use and vice versa.

Table 4.2. Regression models output of significant effects for public transport modes.

Dependent	Predictor	B	S.E.	Wald	p-value	Exp(B)
Train	Station-based car	0.125	0.015	71.778	<.001	1.134
	Free-floating car	0.093	0.018	25.186	<.001	1.097
	OV-fiets	-0.107	0.017	42.177	<.001	0.898
	Moped	0.084	0.021	15.951	<.001	0.919
	Age	-0.315	0.041	58.796	<.001	0.729
	Educational level	0.221	0.102	4.660	0.031	1.247
	Ratio multi-family housing [%]	0.007	0.002	16.058	<.001	1.007
BTM	Free-floating car	0.040	0.018	4.869	0.027	1.041
	OV-fiets	0.089	0.015	36.058	<.001	1.093
	E-bike	0.072	0.027	7.172	0.007	1.074
	Moped	0.104	0.018	33.200	<.001	1.109
	Age	-0.319	0.040	64.535	<.001	0.727
Taxi	Station-based car	0.045	0.019	5.734	0.017	1.046
	Free-floating car	0.157	0.021	54.818	<.001	1.170
	OV-fiets	0.074	0.020	13.489	<.001	1.077
	Moped	0.103	0.022	21.804	<.001	1.109
	Age	-0.235	0.055	18.588	<.001	0.790
	Urbanisation	0.190	0.091	4.353	0.037	1.210
	Ratio multi-family housing [%]	0.011	0.002	21.563	<.001	1.011

Train usage

Several shared mobility modes are significantly associated with a shifted probability of train use. More frequent use of station-based cars (odds ratio = 1.134, $p < .001$) and free-floating cars (odds ratio = 1.097, $p < .001$) increases the odds of reduced train use. In contrast, the higher use of OV-fiets (a bike-sharing service typically used in combination with train usage) decreases the likelihood of less train use (odds ratio = 0.898, $p < .001$), suggesting it serves as a complement to the public transport system. The use of shared mopeds has a similar effect (odds ratio = 0.919, $p < .001$).

In terms of socio-demographics, younger age is associated with a greater reduction in train use due to shared mobility (odds ratio = 0.729, $p < .001$), as older age categories are coded at higher values. Moreover, a higher educational level also increases the probability of reduced train use (odds ratio = 1.247, $p = .031$). A higher percentage of multi-family housing in one's residential area slightly increases the odds of decreased train use (odds ratio = 1.007, $p < .001$), suggesting possible correlations with urban density and public transportation accessibility.

BTM usage

More frequent use of free-floating cars (odds ratio = 1.041, p = .027), OV-fiets (odds ratio = 1.093, p < .001), e-bikes (odds ratio = 1.074, p = .007), and mopeds (odds ratio = 1.109, p < .001) is associated with a slightly decreased likelihood of BTM use. This suggests that these shared mobility modes are potentially serving as a substitute for bus, tram or metro systems.

Again, age has a strong effect (odds ratio = 0.727, p < .001), indicating that younger people are more likely to decrease their BTM use due to shared mobility usage.

Taxi usage

Taxi use is affected by the use of various shared modes. The use of station-based cars (odds ratio = 1.046, p = .017), free-floating cars (odds ratio = 1.170, p < .001), OV-fiets (odds ratio = 1.077, p < .001), and mopeds (odds ratio = 1.109, p < .001) all significantly increases the odds of less taxi use. These results reflect the possibility of substituting taxi trips with shared mobility, a primary factor could be the match in flexibility of these modes.

Again, younger age is associated with a reduction in taxi use (odds ratio = 0.790, p < .001). Urbanisation level predicts taxi use in such a way that residents of more urbanised areas are more likely to substitute taxis for shared mobility (odds ratio = 1.210, p = .037). Higher multi-family housing density also slightly decreases the likelihood of taxi use (odds ratio = 1.011, p < .001), consistent with a more urban residential setting.

4.1.3 Reduction in the use of micromobility and walking

Table 4.3 presents the regression results for the likelihood of reducing the use of various micromobility transport modes (bicycle, e-bike, cargo bike, and moped) and walking, with several predictors.

Table 4.3. Regression models output of significant effects for micromobility transport modes.

Dependent	Predictor	B	S.E.	Wald	p-value	Exp(B)
Bicycle	E-bike	0.150	0.037	16.154	<.001	1.162
	Moped	0.311	0.025	159.676	<.001	1.364
	Age	-0.295	0.075	15.531	<.001	0.745
	Urbanisation	0.326	0.113	8.389	0.004	1.386
	Ratio multi-family housing [%]	0.012	0.003	13.544	<.001	1.012
E-bike	Moped	0.141	0.058	6.008	0.014	1.152
	E-cargo bike	0.236	0.086	7.474	0.006	1.267
Cargo bike	Moped	0.614	0.309	3.936	0.047	1.847
	E-cargo bike	0.702	0.242	8.436	0.004	2.017
Moped	Moped	0.223	0.103	4.741	0.029	1.250
Walking	Station-based car	-0.081	0.023	12.841	<.001	0.922
	Cooperation car	-0.295	0.112	6.880	0.009	0.745
	OV-fiets	0.164	0.023	50.751	<.001	1.179
	Moped	0.159	0.024	45.050	<.001	1.173
	Age	-0.258	0.065	15.527	<.001	0.773
	Income	-0.190	0.083	5.289	0.021	0.827

Bicycle usage

Shared e-bike and moped use are associated with a higher probability of reducing regular (private) bicycle use (odds ratio = 1.162, $p < .001$, odds ratio = 1.364, $p < .001$), indicating substitution effects.

While older age reduced the likelihood of reducing bike use (odds ratio = 0.745, $p < .001$), indicating that younger individuals are more likely to reduce bike usage. Lower urbanisation levels were associated with a greater chance of reducing bike use (odds ratio = 1.386, $p = 0.004$). And a higher proportion of multi-family housing in people's neighbourhood is slightly associated with a reduction in (private) bicycle use (odds ratio = 1.012, $p < .001$).

E-bike usage

Private e-bike reduction was more likely among those who also used shared mopeds (odds ratio = 1.152, $p = .014$) or e-cargo bikes (odds ratio = 1.267, $p = .006$), possibly indicating substitution effects between these modes.

Cargo bike usage

A significant positive association was found with moped (odds ratio = 1.847, $p = .047$) and e-cargo bike use (odds ratio = 2.017, $p = .004$), both of which predicted a higher likelihood of reducing cargo bike use with higher use frequencies of these shared modes.

Moped usage

The likelihood of reducing (private) moped use is positively associated with the use frequency of shared moped (odds ratio = 1.250, $p = .029$). Suggesting that frequent moped users potentially switch their usage from their privately owned moped to a shared one.

Walking

Several factors influenced the likelihood of individuals decreasing their walking activity. More frequent use of a station-based car (odds ratio = 0.922, $p < .001$) and cooperation/community car (odds ratio = 0.745, $p = .009$) were associated with lower odds of reducing walking. In contrast, the use of the OV-fiets (odds ratio = 1.179, $p < .001$) and mopeds (odds ratio = 1.173, $p < .001$) increased the odds of a walking activity reduction.

Furthermore, older individuals were less likely to reduce walking (odds ratio = 0.773, $p < .001$), while those from higher-income levels also had lower odds of walking reduction (odds ratio = 0.827, $p = .021$).

4.2 Private vehicle ownership regression models

As indicated in the methodology section, nine binary logistic regressions are estimated to assess the impact of shared mobility modes on the reduction of private vehicle ownership. Appendix E presents the complete output of these models, including non-significant effects and measures of model fit. To present the results of these regression models, it was chosen to divide them into sections on motorised transport modes and micromobility. Only the results of the regression for the standard private bicycle are absent from this section because there were no significant effects. This may indicate that the regular bicycle is a strong and entrenched mode of transport in the Netherlands, and therefore, people would not just dismiss their bicycles.

4.2.1 Reduction in ownership of motorised transport modes

For each motorised private transport mode (private car, private/corporate lease car and motorcycle), a separate binary logistic regression model was estimated. The dependent variable indicates whether ownership of that mode was reduced due to the use of shared mobility. These models examine which shared mobility modes (e.g., station-based cars, e-cargo bikes, OV-fiets) have a significant impact on reducing private vehicle ownership. Only significant predictors (p-value < 0.05) are reported in Table 4.4.

Table 4.4. Regression models output of significant effects for motorised private transport modes.

Dependent	Predictor	B	S.E.	Wald	p-value	Exp(B)
Private car	Station-based car	0.127	0.017	55.645	<.001	1.136
	Cooperation car	0.166	0.030	31.275	<.001	1.181
	OV-fiets	0.056	0.018	9.413	0.002	1.057
	Moped	-0.101	0.033	9.450	0.002	0.904
	Age	0.720	0.050	210.663	<.001	2.055
	Income	0.169	0.076	4.887	0.027	1.184
	Urbanisation	-0.147	0.073	4.085	0.043	0.863
	Ratio multi-familiy housing [%]	-0.008	0.002	13.975	<.001	0.992
Private lease car	Station-based car	0.076	0.036	4.572	0.033	1.079
	Free-floating car	0.112	0.040	7.848	0.005	1.118
	Gender	0.567	0.183	9.566	0.002	1.764
	Age	0.821	0.103	63.930	<.001	2.273
Corporate lease car	Age	0.617	0.103	36.251	<.001	1.854
	Educational level	0.935	0.344	7.388	0.007	2.548
	Distance to nearest train station [km]	-0.189	0.073	6.656	0.010	0.828
Motorcycle	Free-floating car	0.158	0.070	5.117	0.024	1.172
	Age	1.012	0.186	29.662	<.001	2.751

Private car ownership

Increased use of station-based car sharing (odds ratio = 1.136, p < .001), community/cooperation car sharing (odds ratio = 1.181, p < .001), and OV-fiets (odds ratio = 1.057, p = .002) is significantly associated with a greater likelihood of giving up private car ownership. Conversely, frequent moped use is linked to a reduced likelihood of giving up a private car (odds ratio = 0.904, p = .002).

Age demonstrates a strong positive effect (odds ratio = 2.055, p < .001), indicating that older individuals are more likely to give up their private cars. A higher income slightly increases this likelihood (odds ratio = 1.184, p = .027). In contrast, lower levels of urbanisation (odds ratio = 0.863, p = .043) and a higher ratio of multi-family housing (odds ratio = 0.992, p < .001) are associated with decreased odds of dismissing a private car.

Private lease car ownership
Giving up private lease cars is positively associated with the use of station-based car sharing (odds ratio = 1.079, $p = .033$) and free-floating car sharing (odds ratio = 1.118, $p = .005$).

Additionally, age is a strong predictor (odds ratio = 2.273, $p < .001$), and women are more likely to give up private lease cars than men (odds ratio = 1.764, $p = .002$) after using shared mobility.

Corporate lease car ownership
For corporate lease cars, older individuals are more likely to dismiss their vehicle (odds ratio = 1.854, $p < .001$), as are people with higher educational levels (odds ratio = 2.548, $p = .007$). A greater distance to the nearest train station is logically associated with a lower likelihood of reducing the ownership of a corporate lease car (odds ratio = 0.828, $p = .010$).

Motorcycle ownership
Finally, more frequent use of free-floating car sharing increases the odds of giving up the ownership of a motorcycle (odds ratio = 1.172, $p = .024$), and age has a particularly strong effect (odds ratio = 2.751, $p < .001$), showing that older individuals are much more likely to give up motorcycle ownership.

4.2.2 Reduction in ownership of micromobility

Table 4.5 displays the regression results regarding the likelihood of reducing ownership of various micromobility transport modes (e-bike, cargo bike, and moped), alongside several predictors.

Table 4.5. Regression models output of significant effects for micromobility transport modes.

Dependent	Predictor	B	S.E.	Wald	p-value	Exp(B)
E-bike	Age	0.535	0.264	4.099	0.043	1.707
Cargo bike	Other bicycle	0.286	0.145	3.907	0.048	1.331
	E-cargo bike	0.291	0.089	10.681	0.001	1.337
	Age	0.696	0.236	8.709	0.003	2.006
	Distance to nearest train station [km]	0.153	0.069	4.892	0.027	1.166
E-cargo bike	Other bicycle	0.385	0.174	4.881	0.027	1.470
	Age	1.010	0.343	8.664	0.003	2.745
Moped	Free-floating car	0.191	0.066	8.423	0.004	1.210
	OV-fiets	-0.430	0.153	7.857	0.005	0.650
	Age	0.520	0.190	7.503	0.006	1.683

E-bike ownership
For e-bike ownership, age is a significant predictor (odds ratio = 1.707, $p = .043$), indicating that older individuals are more likely to give up their e-bike ownership due to shared mobility usage.

Cargo bike ownership
With regard to regular cargo bikes, the more frequent use of other shared bicycles (odds ratio = 1.331, $p = .048$) and e-cargo bikes (odds ratio = 1.337, $p = .001$) is associated with an increased likelihood of giving up the ownership of a cargo bike. This suggests that these shared modalities serve as substitutes for the traditional (non-electric) cargo bike, potentially offering greater flexibility and convenience.

Additionally, older individuals (odds ratio = 2.006, $p = .003$) and those living further from train stations (odds ratio = 1.166, $p = .027$) are also more likely to give up cargo bike ownership, probably due to the greater distances to be covered in combination with the physical activity required to use a regular cargo bike.

E-cargo bike ownership
For e-cargo bikes, increased use of other shared bicycles (odds ratio = 1.470, $p = .027$) and age (odds ratio = 2.745, $p = .003$) are both positively associated with giving up ownership. This suggests substitution effects between types of bikes and a tendency among older users to reduce their private ownership of e-cargo bikes.

Moped ownership
When it comes to private moped ownership, more frequent use of free-floating cars (odds ratio = 1.210, $p = .004$) is linked to a higher likelihood of giving up their moped. Interestingly, greater utilisation of the OV-fiets is associated with a lower likelihood of moped reduction (odds ratio = 0.650, $p = .005$), possibly indicating complementary usage or significant dependence on their moped.

Age again plays a significant role (odds ratio = 1.683, $p = .006$), suggesting that older individuals are more inclined to reduce their private moped ownership.

4.3 Shared mobility usage LCCA

As mentioned in the methodology chapter, the LCCA was conducted using the nine shared mobility use frequencies as indicators. Table 4.6 presents the statistics of the models with different numbers of clusters. With an increasing number of classes, the log likelihood and BIC value decrease. However, this reduction stabilises after the model with seven clusters, indicating that there is no further increase in model fit. Nonetheless, the six-cluster model is preferred because it has the smallest class size above the 5% threshold and provides better interpretability. The seven-cluster model splits one meaningful cluster into two and does not offer a more valuable interpretation.

Table 4.6. Latent class cluster analysis statistics with different number of clusters.

	LL	BIC(LL)	Npar	Max. BVR	Class.Err.	Entropy R^2	Smallest class size
1-Cluster	-39850	80326	72	267.6	0.000	1.000	1.000
2-Cluster	-39533	79778	82	119.8	0.173	0.410	0.388
3-Cluster	-39304	79407	92	34.3	0.171	0.561	0.203
4-Cluster	-39220	79326	102	69.3	0.189	0.593	0.084
5-Cluster	-39148	79270	112	23.9	0.232	0.559	0.052
6-Cluster	**-39090**	**79240**	**122**	**45.5**	**0.229**	**0.587**	**0.062**
7-Cluster	-39043	79233	132	29.5	0.264	0.563	0.042
8-Cluster	-39004	79243	142	18.5	0.265	0.575	0.032
9-Cluster	-38975	79272	152	16.7	0.321	0.556	0.027
10-Cluster	-38939	79286	162	4.5	0.314	0.545	0.012

After estimating the classes, an interpretation of each cluster will be provided. Table 4.7 presents the mean indicators used for these interpretations. The complete profile output of these indicators (i.e. not only their mean) and the graphical visualisation are provided in Appendix F. Furthermore, the socio-demographic, spatial and (private) travel mode variables, which were included as inactive covariates, are shown in Tables 4.8 and 4.9 and used for the cluster interpretation.

Table 4.7. Indicators for cluster membership with the mean in each cluster.

	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6	Overall
Cluster Size	0.317	0.292	0.184	0.078	0.068	0.062	
Indicators mean							
Station-based car sharing	4.46	4.93	1.60	1.68	0.52	5.87	3.67
Free-floating car sharing	0.67	0.02	0.98	1.36	0.41	3.08	0.72
P2P car sharing	0.39	0.03	0.31	0.43	0.08	0.71	0.27
Cooperation/Community car sharing	0.22	0.26	0.28	0.06	0.00	0.19	0.21
OV-fiets	3.94	0.04	0.01	2.82	0.03	0.19	1.50
Other shared bicycle	0.00	0.06	0.20	0.01	0.37	0.47	0.11
Electric shared bicycle	0.40	0.00	0.04	1.63	0.60	0.48	0.33
Shared moped	0.36	0.03	0.15	2.93	4.19	1.77	0.77
Electric shared cargo bike	0.45	0.03	0.55	0.93	0.01	0.27	0.34

Cluster 1: Station loyalists

The largest cluster accounts for 31.7% of the sample. It is characterised by the predominant use of station-based car sharing and OV-fiets bicycle sharing. This group prefers station-based sharing services, as they exhibit a higher usage frequency compared to the average user of these two shared modalities. On all socio-demographic and spatial variables, they are (almost) the average of the sample. However, they live, on average, the closest to a train station, which corresponds with the (private) travel mode use frequencies that show above-average use of their private bicycle, train, and BTM, in combination with lower-than-average use of a privately owned car.

Cluster 2: Dedicated car sharers

Consists of 29.2% of the sample and is characterised by only using station-based car sharing. On average, these individuals are slightly older and live in areas with fewer multi-family housing. Moreover, their use of (private) travel modes is around average.

Cluster 3: Occasional shared mobility users

The third cluster accounts for 18.4% of the sample and is identified by their relatively low use frequency of all shared modalities. When they use shared mobility, the different types of car sharing are the modalities they use most often. These individuals also live, on average, in areas with fewer multi-family housing and reside almost half a kilometre further away from the nearest train station. This matches their less-than-average score on urbanity level. Furthermore, they demonstrate an above-average frequency of use for motorised travel modes, including all types of private cars and motorcycles.

Cluster 4: Micromobility enthusiasts

Consists of 7.8% of the sample and is characterised by using above-average shared micromobility. So a combination of moped sharing, OV-fiets and e-bike sharing. They are generally younger and reside in more urban areas, as indicated by the urbanity level, the ratio of multi-family housing, and proximity to a train station. Additionally, these individuals use their private bicycles and public transport options, including both trains and BTM, slightly more often.

Cluster 5: Moped adopters

The fifth cluster represents 6.8% of the sample and is characterised by its high frequency of shared moped usage. On average, they are younger and more likely to be male. Additionally, they exhibit an above-average frequency of use for motorised travel modes, including all types of private cars, motorcycles, and private mopeds.

Cluster 6: All-round sharers

Consists of 6.2% of the sample and is identified by using above-average multiple shared modalities. This cluster exhibits the highest frequency of use for station-based and free-floating car sharing, as well as above-average use of peer-to-peer (P2P) car sharing, the other category of shared bicycles, e-bike sharing, and moped sharing. On average, they are more likely to be male and live in areas with higher urbanity levels. Additionally, they show an above-average frequency of use for BTM and taxis.

Table 4.8. Socio-demographic and spatial variables (inactive covariates) with the mean in each cluster.

	Station loyalists	Ded. car sharers	Occasional users	Micromobility enthousiasts	Moped adopters	All-round sharers	Overall
Gender (= male)	0.53	0.53	0.59	0.61	0.68	0.68	0.57
Gender (= female)	0.42	0.43	0.38	0.35	0.29	0.29	0.39
Age	2.21	2.67	2.52	1.82	2.00	2.13	2.35
Educational level	2.92	2.79	2.79	2.87	2.68	2.81	2.83
Income	2.76	2.61	2.60	2.60	2.43	2.76	2.65
Urbanisation	1.42	1.56	1.66	1.37	1.51	1.33	1.50
Ratio of multi-family housing [%]	63.81	61.74	60.61	69.51	64.58	71.57	63.59
Distance to nearest train station [km]	2.14	2.51	2.84	2.31	2.66	2.42	2.44

Table 4.9. (Private) travel behaviour variables as inactive covariates with the mean in each cluster.

	Station loyalists	Ded. car sharers	Oc. users	Micromobility enth.	Moped adopters	All-round sh.	Overall
Private car	0.52	0.72	1.42	1.24	1.97	0.49	0.90
Private lease car	0.04	0.06	0.12	0.10	0.22	0.05	0.08
Corporate lease car	0.08	0.10	0.19	0.25	0.35	0.09	0.14
Motorcycle	0.06	0.09	0.14	0.16	0.16	0.10	0.10
Moped	0.06	0.10	0.12	0.17	0.26	0.24	0.11
Bicycle	4.27	3.51	3.37	3.74	2.76	3.48	3.69
E-bike	0.80	1.10	1.10	0.89	0.77	0.94	0.95
Cargo bike	0.12	0.09	0.10	0.06	0.04	0.10	0.10
E-cargo bike	0.16	0.12	0.15	0.15	0.13	0.16	0.14
Train	3.05	2.21	2.09	2.74	2.03	2.41	2.49
BTM	2.46	2.22	2.10	2.61	2.28	2.64	2.33
Taxi	0.30	0.30	0.35	0.54	0.55	0.74	0.37
Walking	4.63	4.57	4.48	4.64	4.42	4.67	4.57

After the initial interpretations of each cluster, Figure 4.1 provides an overview of the six different clusters, including their characteristic labels, frequent shared mobility use, and corresponding class sizes.

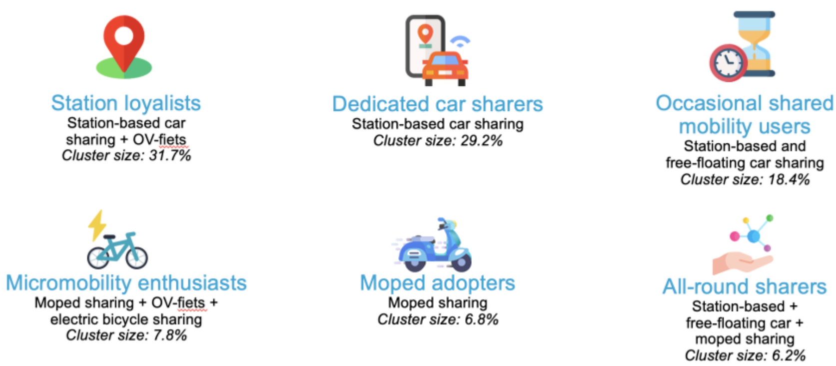

Figure 4.1. Overview of classes with characterising label, frequent shared mobility use mode and corresponding class size.

Besides the initial cluster interpretations, it is also crucial to gain an initial understanding of how reductions in private vehicle ownership and usage relate within the clusters, as these variables were included as inactive covariates. Tables 4.10 and 4.11 provide further insights into the six identified clusters. Reduction in ownership again refers to actual dismissals within the past year, while the total effect is the combined impact of postponed, averted, and reduced ownership.

Table 4.10. Effects of shared mobility on private travel mode ownership in each cluster.

		Station loyalists	**Ded. car sharers**	**Oc. users**	**Micromobility enth.**	**Moped adopters**	**All-round sh.**	**Overall**
Private car	*Reduction ownership*	0.211	0.216	0.126	0.102	0.049	0.173	0.175
	Total effect ownership	0.709	0.616	0.430	0.462	0.234	0.662	0.576
Private lease car	*Reduction ownership*	0.034	0.044	0.030	0.023	0.021	0.051	0.035
	Total effect ownership	0.253	0.223	0.175	0.187	0.110	0.338	0.220
Corporate lease car	*Reduction ownership*	0.037	0.037	0.020	0.019	0.009	0.035	0.030
	Total effect ownership	0.188	0.141	0.109	0.144	0.081	0.218	0.151
Motorcycle	*Reduction ownership*	0.009	0.014	0.011	0.008	0.007	0.016	0.011
	Total effect ownership	0.072	0.076	0.061	0.073	0.051	0.102	0.072
Moped	*Reduction ownership*	0.004	0.008	0.009	0.007	0.015	0.024	0.008
	Total effect ownership	0.078	0.066	0.056	0.117	0.102	0.121	0.078
Bicycle	*Reduction ownership*	0.002	0.004	0.003	0.009	0.014	0.005	0.005
	Total effect ownership	0.022	0.028	0.020	0.054	0.065	0.043	0.030
E-bike	*Reduction ownership*	0.005	0.004	0.003	0.006	0.004	0.013	0.005
	Total effect ownership	0.068	0.047	0.044	0.111	0.061	0.096	0.062
Cargo bike	*Reduction ownership*	0.006	0.005	0.004	0.008	0.006	0.006	0.006
	Total effect ownership	0.068	0.045	0.044	0.081	0.033	0.077	0.056
E-cargo bike	*Reduction ownership*	0.003	0.003	0.004	0.004	0.003	0.005	0.003
	Total effect ownership	0.071	0.047	0.060	0.088	0.036	0.077	0.061

The distribution of reductions in private vehicle ownership across the six identified clusters reveals apparent differences in how shared mobility use relates to changes in private vehicle ownership. For private cars, the highest rates of actual ownership reduction in the past year are found among Dedicated car sharers and Station loyalists, indicating that these groups are most likely to have dismissed their private cars, likely due to their strong engagement with car sharing services. In contrast, Moped adopters show the lowest reduction in private car ownership, suggesting that their adoption of shared mobility is less likely to substitute for car ownership. When considering the broader measure of total effect ownership, which includes not only actual reductions but also cases where ownership was averted or postponed, the same two clusters, Dedicated car sharers and Station loyalists, again stand out with the highest proportions, but all clusters show a higher total effect than reduction alone, reflecting the broader impact of shared mobility on ownership decisions beyond just current vehicle dismissal.

For private lease cars and corporate lease cars, reductions in ownership are generally low across all clusters. However, the total effect on ownership is somewhat higher, especially among All-round sharers and Station loyalists. This pattern indicates that while few people have actually reduced ownership of lease cars, a notable share have either avoided acquiring them or postponed such decisions, particularly in clusters with more diverse or intensive shared mobility use. The pattern for motorcycles and mopeds is similar, with very low reduction rates and modest total effects, suggesting that shared mobility has a limited impact on ownership of these modes, except for a slightly higher effect among All-round sharers and Moped adopters for mopeds.

Examining bicycles, e-bikes, cargo bikes, and e-cargo bikes, reductions in ownership are minimal across all clusters, with slightly higher figures among Micromobility enthusiasts and Moped adopters for certain modes. The total effect ownership for these modes remains relatively low, but is somewhat higher among Micromobility enthusiasts, indicating that for these users, shared mobility may occasionally replace private ownership of two-wheeled vehicles, although the effect is limited.

Overall, the data suggest that the impact of shared mobility on reducing or preventing private vehicle ownership is most significant for private cars, especially among those clusters most involved in car sharing, while the effect on other modes remains generally modest. This emphasises the complex relationship between shared mobility adoption and private vehicle ownership, with the strongest substitution effects seen among the more active shared mobility users and for private cars, whereas for other modes, shared mobility appears to serve a more complementary or marginal role in travel.

Furthermore, the distribution of reductions in private travel mode usage due to shared mobility adoption, shown in Table 4.11, also reveals clear patterns across the six identified clusters. For private car usage, the biggest reductions are seen among Micromobility enthusiasts and Moped adopters, suggesting these groups are most likely to have reduced their dependence on privately owned cars, possibly replacing car trips with shared micromobility options. Conversely, Station loyalists, Dedicated car sharers, and All-round sharers report smaller reductions in private car usage, indicating that even among those active in shared mobility, the move away from private cars is not consistent and may vary depending on the shared modes they prefer.

Reductions in the use of private lease cars and corporate lease cars are generally quite low across all clusters, with only slightly higher values among Micromobility enthusiasts and Moped adopters. This indicates that shared mobility has a limited effect on leased vehicle usage, possibly due to contractual obligations or the specific needs of users who depend on these modes for work or long-distance travel. Similarly, decreases in motorcycle and moped usage are modest, with marginally higher figures among All-round sharers, Micromobility enthusiasts, and Moped adopters, suggesting that, for some users, shared mobility options can partly replace these two-wheeled motorised modes, but the overall impact remains limited.

Table 4.11. Reduction (private) travel mode usage due to shared mobility in each cluster.

	Station loyalists	Ded. car sharers	Oc. users	Micromobility enth.	Moped adopters	All-round sh.	Overall
Private car	0.078	0.060	0.100	0.167	0.153	0.061	0.088
Private lease car	0.003	0.003	0.005	0.011	0.010	0.003	0.004
Corporate lease car	0.008	0.006	0.010	0.024	0.027	0.008	0.010
Motorcycle	0.004	0.004	0.003	0.014	0.010	0.011	0.005
Moped	0.003	0.001	0.004	0.010	0.013	0.014	0.005
Bicycle	0.055	0.035	0.048	0.203	0.172	0.134	0.072
E-bike	0.012	0.010	0.018	0.035	0.043	0.023	0.017
Cargo bike	0.003	0.001	0.004	0.006	0.000	0.005	0.003
E-cargo bike	0.003	0.003	0.001	0.002	0.008	0.004	0.003
Train	0.253	0.274	0.213	0.220	0.128	0.354	0.247
BTM	0.346	0.200	0.209	0.435	0.304	0.353	0.283
Taxi	0.168	0.089	0.116	0.268	0.172	0.266	0.149
Walking	0.105	0.034	0.049	0.185	0.163	0.090	0.083

Regarding active modes, such as bicycles and e-bikes, the most noticeable declines occur among Micromobility enthusiasts and Moped adopters, with Micromobility enthusiasts exhibiting particularly high reductions in bicycle use. This trend indicates that for these clusters, shared micromobility services may be replacing some traditional cycling trips, signifying a shift within the broader category of non-motorised transport. For cargo bikes and e-cargo bikes, declines in usage are minimal across all groups, suggesting that shared mobility has little impact on these specific modes.

Examining public transport and other non-private modes, reductions in train, bus/tram/metro (BTM), and taxi use are substantial in all clusters, but especially noticeable among All-round sharers, Micromobility enthusiasts, and Station loyalists. This indicates that shared mobility not only replaces private vehicle use but also accounts for a large portion of public transport and taxi trips, particularly among those most actively engaged with various shared mobility options. Decreases in walking are also most evident among Micromobility enthusiasts and Moped adopters, suggesting that for some users, shared mobility might even substitute for walking trips.

Overall, the data show that the impact of shared mobility on decreasing the use of traditional travel modes is most notable for public transport and taxi services, followed by private car use, with the strongest effects seen among clusters that are highly involved with micromobility and moped sharing. The effect on active modes like cycling and walking is also evident in these clusters, indicating a complicated pattern of substitution where shared mobility can replace both motorised and non-motorised trips, depending on the user group and the specific shared modes adopted. This emphasises the diverse role of shared mobility in changing travel behaviour, with different implications for various segments of the population and different types of travel modes.

4.4 Estimation of class membership

This section presents the results of the third step of the LCCA. This means that first, the impacts of various covariates on class membership are determined, followed by an assessment of the influence of class membership itself on distal outcomes.

4.4.1 Impact of covariates

Table 4.12 displays the results of a multinomial logistic regression that estimates the effect of socio-demographic and spatial covariates on the probability of membership in the six latent classes: Station loyalists, Dedicated car sharers, Occasional users, Micromobility enthusiasts, Moped adopters, and All-round sharers. The Wald statistic and associated p-values demonstrate the overall significance of each covariate across the identified classes.

Table 4.12. Model for impact of covariates on class membership.

	Station loyalists	Ded. car sharers	Oc. users	Micro mob. enth.	Moped adopters	All-round sh.	Wald	p-value
Intercept	-0.55	0.61	0.63	0.38	2.38	-3.45	22.29	0.00046
Covariates								
Gender (= male)	-0.26	-0.35	-0.13	0.11	0.21	0.42	75.11	8.8e-15
Gender (= female)	0.26	0.35	0.13	-0.11	-0.21	-0.42	-	-
Age	0.25	0.90	0.64	-1.25	-0.31	-0.23	311.61	3.2e-65
Educational level	0.76	-0.15	-0.27	0.51	-0.50	-0.36	62.44	3.8e-12
Income	0.30	-0.14	-0.15	-0.35	-0.40	0.74	49.70	1.6e-9
Urbanisation	-0.20	0.03	0.20	-0.08	0.03	0.02	19.01	0.0019
Ratio multi-family housing [%]	-0.02	-0.01	-0.01	0.01	-0.00	0.03	48.60	2.7e-9
Distance to nearest train station [km]	-0.18	-0.06	0.04	0.03	0.06	0.12	47.50	4.5e-9

Gender is a highly significant predictor of class membership (Wald = 75.11, $p < .001$). Men are significantly more likely to belong to the All-round sharers and Moped adopters groups (with coefficients of 0.42 and 0.21, respectively), while they are less likely to be found in the Station loyalists, Dedicated car sharers, or Occasional users groups. Women, coded as the reference category, are more prevalent in the latter three classes.

Then age shows a powerful association with class membership (Wald = 311.61, $p < .001$). Older individuals are more likely to belong to classes such as Station loyalists, Dedicated car sharers, and Occasional users, whereas younger individuals are more prominently represented among

Micromobility enthusiasts, Moped adopters, and All-round sharers. For instance, the coefficient for age is strongly negative in the Micromobility enthusiast class (coefficient of -1.25), indicating that younger individuals are overrepresented in this group.

Educational level also significantly influences class membership (Wald = 62.44, $p < .001$). Higher education is positively associated with the Station loyalists and Micromobility enthusiasts classes, while it is negatively linked to Dedicated car sharers, Moped adopters, and All-round sharers.

Income is positively associated with being a Station loyalist or an All-round sharer, and negatively associated with Micromobility enthusiasts and Moped adopters (Wald = 49.70, $p < .001$). This suggests that higher-income individuals are more likely to remain committed to traditional modes or adopt a wide range of shared options. In contrast, lower-income individuals are more likely to adopt niche shared alternatives, such as mopeds.

Urbanisation (Wald = 19.01, $p = .0019$) demonstrates a modest yet significant impact. Individuals living in less urbanised areas are slightly more likely to be Occasional users, while Station loyalists and Micromobility enthusiasts are somewhat more common in more urbanised regions.

The ratio of multi-family housing is significantly related to class membership (Wald = 48.60, $p < .001$); however, it shows a modest effect on class membership. Individuals living in areas with slightly higher shares of multi-family housing are marginally more likely to belong to the All-round sharers class and less likely to be Station loyalists. However, the magnitude of these effects is small, suggesting a relatively subtle association rather than a strong driver of class differentiation.

The distance to the nearest train station is also significant (Wald = 47.50, $p < .001$). Living closer to a station increases the likelihood of being a Station loyalist or Dedicated car sharer, whereas those living further away are more likely to be All-round sharers or Moped adopters.

4.4.2 Impact on distal outcomes

Table 4.13 and 4.14 display the results of two separate binary logistic regressions that estimate the effect of class membership in the six latent classes on the two types of distal outcomes: first, the impact of class membership on the reduction of (private) travel modes usage, followed by the results regarding the effect of class membership on the reduction of private vehicle ownership. The Wald statistic and associated p-values demonstrate the overall significance of each covariate across the identified classes. Appendix G provides further statistical output of this analysis.

Travel modes usage

To examine whether class membership is associated with reductions in private transport usage, a multinomial logistic regression model was estimated. The results show that class membership does not significantly predict reductions in any of the included transport modes. All Wald statistics are relatively low, and all p-values are well above conventional significance thresholds, indicating no statistically significant differences across the six identified clusters.

However, Table 4.13 presents the cluster distributions of reduction behaviour and reveals descriptive differences that imply potential practical relevance of class membership, despite these not being statistically significant in the regression model.

Table 4.13. Model for impact of class membership on dependent (usage) variables.

Dependents	Station loyalists	Ded. car sharers	Oc. users	Micro mob. enth.	Moped adopters	All-round sh.	Wald	p-value
Private car	-0.18	0.21	-1.98	-0.46	2.18	0.22	1.81	0.87
Corporate lease car	0.02	-0.25	-3.02	1.65	1.82	-0.22	4.70	0.45
Taxi	0.02	-0.25	-3.02	1.65	1.82	-0.22	4.70	0.45
Motorcycle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
Bike	-0.44	-0.18	1.87	-1.75	0.69	-0.19	1.26	0.94
E-bike	-0.44	-0.18	1.87	-1.75	0.69	-0.19	1.26	0.94
Train	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
BTM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
Walking	-0.18	0.21	-1.98	-0.46	2.18	0.22	1.81	0.87

Moped adopters show the highest rates of reduction in various private modes. Meanwhile, Station loyalists show virtually no reduction, indicating they rely on private modes just as much as before. These descriptive results highlight distinct behavioural patterns per class, even though the regression analysis did not statistically confirm them. This discrepancy may be due to low statistical power, low variability within some classes, or a lack of spread in responses for specific modes.

Furthermore, it is important to note that several modes of transport were excluded from the analysis due to insufficient data. Private lease cars, mopeds, cargo bikes, and e-cargo bikes were excluded because fewer than 200 respondents reported using them, which violated the minimum data requirements of the Latent Gold software package used to estimate this model. The modes of motorcycle, train, and BTM yielded no variation in responses, as none of the respondents reported reduced usage and were therefore dropped from the regression output.

Private vehicle ownership

Table 4.14 presents the results of binary logistic regressions examining the impact of latent class membership on the reduction of ownership of various private transport modes. Similar to the usage analysis, each row shows the model estimates per class for a given transport mode, along with the Wald statistic and corresponding p-value indicating overall statistical significance. Appendix G (Table G.3) provides intercept estimates and further test statistics.

Table 4.14. Model for impact of class membership on dependent (ownership) variables.

Dependents	Station loyalists	Ded. car sharers	Oc. users	Micro mob. enth.	Moped adopters	All-round sh.	Wald	p-value
Private car	1.23	1.56	-1.02	-1.45	-1.00	0.67	10.88	0.05
Private lease car	1.22	1.96	-4.27	1.80	-2.58	1.87	21.16	<0.01
Corporate lease car	1.44	2.06	-3.16	-1.90	0.80	0.75	7.95	0.16
Motorcycle	0.05	1.03	-4.51	1.68	0.63	1.11	12.22	0.03
Moped	-0.63	1.26	-0.87	-0.97	-0.41	1.62	6.53	0.26
Bicycle	-0.28	0.88	-4.91	1.23	1.62	1.46	14.25	0.01
E-bike	-0.95	1.56	-0.75	2.00	-4.23	2.36	7.72	0.17
Cargo bike	0.65	1.14	-2.98	1.47	-0.25	-0.03	2.04	0.84
E-cargo bike	0.43	1.90	-0.22	1.96	-4.04	-0.03	7.74	0.17

The results show mixed effects of class membership on the reduction of ownership. Several transport modes yield statistically significant associations between class membership and reduction in ownership, while others do not.

Ownership reduction of private cars appears to be marginally associated with class membership (Wald = 10.88, $p = 0.054$), suggesting some, but limited, evidence for differences between the six latent classes. In contrast, reduction in ownership of private lease cars is clearly significant (Wald = 21.16, $p < 0.01$), as is the case for motorcycles (Wald = 12.22, $p = 0.03$) and bicycles (Wald = 14.25, $p = 0.01$). These results suggest that for these private vehicles, class membership is a strong predictor of reduction in ownership. For other modes such as corporate lease cars, e-bikes, mopeds, and (electric) cargo bikes, the differences are not statistically significant at the 5% level.

A closer look at the class-specific estimates reveals which clusters are associated with higher likelihoods of various ownership reductions. Station loyalists and Dedicated car sharers are more inclined to reduce private car ownership than clusters such as Occasional users and Micromobility enthusiasts. A similar pattern appears for corporate lease cars, where Clusters 3 and 4 again show lower logits, while Clusters 1 and 2 display higher values. For private lease cars, only Occasional users and Moped adopters are not inclined to reduce their ownership.

Regarding motorcycle ownership, a similar pattern emerges, where Occasional users have a much lower likelihood of reducing ownership than all other classes, who reflect almost all a strong tendency towards reduction.

Although mopeds do not yield a significant overall model ($p = 0.26$), descriptive differences can still be observed. Clusters 2 and 6 (Dedicated Car Sharers and All-round Sharers) have the highest logits (1.26 and 1.62), while other clusters are less likely to reduce ownership.

Furthermore, strong effects are also observed for bicycles, with Cluster 3 again showing a strong negative logit (–4.91), indicating resistance to reduction. By contrast, Clusters 2, 4, and 6 show more willingness to reduce ownership (logits of 0.88, 1.23 and 1.46). A similar, though slightly weaker, pattern appears for electric bicycles.

While results for cargo and electric cargo bikes are not statistically significant, the logits do reveal some tendencies. The clusters Dedicated car sharers and Micromobility enthusiasts show a moderate inclination to reduce (electric) cargo bike ownership, while Occasional users for the regular cargo bike and Moped adopters for electric cargo bike stand out with notably negative values, indicating a low likelihood of reduction.

In summary, the findings suggest that Clusters 1 (Station loyalists), 2 (Dedicated car sharers), 4 (Micromobility enthusiasts), and 6 (All-round sharers) are more consistently associated with higher probabilities of ownership reduction, particularly for private cars, private lease vehicles, motorcycles, and bicycles. In contrast, Clusters 3 (Occasional Users) and 5 (Moped Adopters) tend to exhibit lower likelihoods of reducing ownership, with Cluster 3 being the most resistant to reducing ownership across multiple modes.

4.5 Comparison individual and combined impact

The results of the analyses offer a detailed understanding of how shared mobility affects private vehicle use and ownership, both for individual shared modes (examined through regression models) and across different user groups (identified by latent class analysis). Combining these insights is essential for drawing robust conclusions about the magnitude and distribution of shared mobility's impacts, and for placing these findings within the broader academic context.

The regression analyses in sections 4.1 and 4.2 demonstrate that, at the individual level, increased use of several shared mobility modes, particularly station-based car sharing, community/cooperation car sharing, and OV-fiets, significantly raises the likelihood of reducing both private car use and ownership. These findings align with a substantial body of research indicating that car sharing, especially station-based, is associated with measurable reductions in private car use and ownership among participants (Becker et al., 2017; Jorritsma et al., 2021; Shaheen et al., 2020). The effects observed for other shared modes, such as free-floating car sharing, moped sharing, and shared e-bikes, are more modest and context-dependent, consistent with previous studies that highlight the limited or ambiguous impact of these services on car use and ownership (Nehrke & Loose, 2018; Bucsky & Juhász, 2022; Aguilera-García et al., 2021).

However, the latent class analysis in section 4.4 reveals that while there are clear descriptive differences in the magnitude of reductions in private vehicle usage and ownership across clusters, these differences are not always statistically significant when tested directly. This distinction is crucial: the absence of significant differences between clusters does not imply that shared mobility has no overall effect on private vehicle use or ownership. Instead, it indicates that the effect is present across all clusters to a similar extent, or that the variation within clusters is too small to produce significant contrasts. For example, the regression models indicate that shared mobility use is associated with reduced car ownership and use, but the cluster analysis implies this effect is spread relatively evenly across different user types, with only modest variation in size. This finding aligns with recent large-scale studies (Bucsky & Juhász, 2022), which question the extent to which car sharing and other shared modes lead to substantial reductions in car ownership at a population level, especially when adoption rates remain low and user groups are fairly homogeneous in travel behaviour.

The combined interpretation of the regression and cluster analyses thus offers a more comprehensive understanding. On one hand, there is strong evidence that shared mobility use, especially frequent use of station-based car sharing and certain micromobility services, can lead to reductions in private car use and ownership at the individual level. On the other hand, the distribution of these effects across user clusters is less varied than might be expected, indicating that the transformative potential of shared mobility is not limited to a single user group but is instead spread across a wide range of users. This pattern aligns with existing literature, which shows that while car sharing and other shared modes can support lower private car ownership among active users, their overall impact at the city or regional level remains modest due to limited reach and the continued dominance of private cars (Bucsky & Juhász, 2022; Luo et al., 2023).

Moreover, the findings for other private modes, such as bicycles, e-bikes, and mopeds, indicate that shared mobility's substitution effects are generally weaker and more context-dependent. The regression models reveal only limited significant effects for these modes, and the cluster analysis confirms that reductions in ownership and use are minimal and not strongly differentiated by user type. This aligns with previous research on bike sharing and moped sharing, which typically finds that these services substitute more for public transport and active modes than for private car use, and that their impact on private vehicle ownership is modest (Fishman et al., 2014; Ma et al., 2020; Aguilera-García et al., 2021).

Notably, the combined analysis also highlights the potential for shared mobility to substitute for public transport and active modes, not just private cars. The regression results indicate that increased use of shared cars, mopeds, and bikes is associated with reduced use of public transport and, to a lesser extent, walking and cycling. This finding confirms the concerns raised in the literature that shared mobility can sometimes compete with, rather than complement, sustainable modes, potentially undermining broader policy goals if not carefully integrated into the urban mobility system (Jorritsma et al., 2021; Teixeira et al., 2020).

In summary, combining individual-level regression results and cluster-based analyses shows that shared mobility has a measurable impact on reducing private vehicle use and ownership, especially for cars. However, these effects are distributed relatively evenly across different user groups and are generally modest. This pattern aligns with recent empirical studies that highlight the limited overall influence of shared mobility on car ownership and use, particularly in areas where adoption remains low and private car dominance continues. The findings also highlight the importance of considering the wider modal context, as shared mobility can substitute for a range of travel modes, not all of which are equally desirable from a sustainability perspective. Future research and policy should therefore aim to maximise the substitution of private car trips while reducing unintended shifts away from public transport and active modes, and on integrating shared mobility services into a comprehensive, multimodal urban transport strategy.

5 Conclusion

In recent years, shared mobility has emerged as a new form of transportation driven by the recent uptake of the so-called sharing economy and innovations in information technology. This created the possibility of using scarce public space in a more efficient and different way. However, a comprehensive understanding of the effects of combining multiple shared modalities in the Netherlands was needed. This research aims to provide a comprehensive understanding of how the use of multiple shared mobility modalities in the Netherlands affects private vehicle ownership and usage, with a particular focus on identifying distinct user groups and the socio-demographic and spatial factors that shape their mobility choices. By combining regression analyses with latent class cluster analysis, this study offers new insights into the diversity of shared mobility users and the extent to which their engagement with shared modes translates into changes in private travel behaviour.

To evaluate the direct effects of shared mobility on private vehicle ownership and usage, a series of binary logistic regression analyses were conducted for each shared mode. These analyses offer detailed insights into which shared mobility options are most strongly associated with reductions in the use and ownership of private vehicles, while accounting for socio-demographic and spatial factors.

The results indicate that increased usage of several shared mobility options, especially station-based car sharing, cooperation/community car sharing, and OV-fiets, notably enhances the chances of reducing both private car use and ownership. For instance, frequent utilisation of station-based car sharing and OV-fiets is associated with higher odds of reporting decreased private car use, and these same modes are also linked to a greater likelihood of abandoning private car ownership. Free-floating car sharing, e-cargo bike sharing, and moped sharing also contribute to reductions in private car use, although their impact on ownership tends to be more limited.

The analysis further reveals that shared mobility can replace other private motorised modes. Increased use of shared cars and mopeds is associated with a decline in motorcycle and corporate lease car usage. However, the effect on private lease car ownership remains limited, with only station-based and free-floating car sharing showing significant associations.

For public transport, the findings indicate that increased use of shared cars, mopeds, and e-bikes is associated with a decrease in train, bus/tram/metro, and taxi usage, indicating that shared mobility can serve as a substitute for certain public transport trips. However, OV-fiets use complements train travel, as it was found that higher usage is linked to a lower likelihood of reducing train use.

In the domain of micromobility and active modes, the results are more nuanced. Shared e-bike and moped use are associated with a greater likelihood of decreasing private bicycle use, while shared moped and e-cargo bike use are linked to reductions in cargo bike ownership. However, the impact of shared mobility on the ownership and use of regular bicycles remains limited, reflecting the significant role of cycling in the Dutch transportation network.

Socio-demographic and spatial factors also significantly determine behaviour. Older people are generally more likely to reduce ownership of private vehicles, including cars, motorcycles, and e-bikes. Higher income and education levels, as well as proximity to train stations, further affect the likelihood of reducing private vehicle ownership and usage.

In summary, the regression analyses show that the individual impact of shared mobility is most significant for private car use and ownership, especially through station-based car sharing and OV-fiets. The effects on other private modes and public transport are evident but generally weaker or more context-dependent.

Furthermore, the latent class cluster analysis conducted in this study provides valuable insights into patterns of shared mobility usage within the Netherlands. By analysing nine shared mobility use frequencies, the LCCA identified six distinct user groups, each with unique mobility behaviours and socio-demographic characteristics. In the results section, Figure 4.1 provided an overview of the six clusters.

The largest group, Station loyalists (31.7% of the sample), are notable for their frequent use of station-based car sharing and OV-fiets bicycle sharing. These users tend to live closest to train stations and display a strong preference for multimodal travel, often combining shared mobility with private cycling and public transport. Their reliance on private cars is lower than average, reflecting a lifestyle oriented around sustainable and integrated mobility options.

Dedicated car sharers make up 29.2% of the sample and are defined by their exclusive use of station-based car sharing. This group is slightly older on average and tends to reside in areas with less multi-family housing. Their use of other private travel modes is around the sample average, suggesting that while they have embraced car sharing, they have not fully transitioned to a broader range of shared options.

The Occasional shared mobility users, comprising 18.4% of respondents, are characterised by their infrequent use of all shared mobility services. When they do utilise shared modes, car sharing is their preferred option. These individuals typically live further from train stations and in less urbanised areas, relying more heavily on private motorised vehicles, including cars and motorcycles, than other clusters.

A smaller yet distinct group, the Micromobility enthusiasts (7.8% of the sample), stands out for their above-average use of shared micromobility services such as moped sharing, OV-fiets, and e-bike sharing. Generally younger and residing in highly urbanised neighbourhoods, these users also frequently utilise private bicycles and public transport, reflecting a flexible and multimodal approach to urban mobility.

Moped adopters account for 6.8% of the sample and are characterised by their high frequency of shared moped use. This group is generally younger and more likely to be male, displaying a strong inclination towards motorised travel, which includes frequent use of private cars, motorcycles, and mopeds.

Finally, the All-round sharers (6.2% of the sample) are the most versatile users, engaging with a wide range of shared mobility options. They report high usage rates for station-based and free-floating car sharing, peer-to-peer car sharing, various types of shared bicycles, e-bikes, and mopeds. These users are more likely to be male, live in urban areas, and also make above-average use of public transport and taxis, indicating a highly multimodal and flexible travel behaviour.

These six clusters illustrate the diversity of shared mobility users, ranging from those who focus on a single mode to those who embrace a broad spectrum of shared and sustainable travel options.

Following the class assignment, this study found that socio-demographic and spatial characteristics have a significant influence on the class membership of shared mobility users. Gender, age, educational level, income level, degree of urbanisation, ratio of multi-family housing, and proximity to train stations all affect the likelihood of belonging to specific shared mobility user clusters.

While regression analysis did not find statistically significant differences in reductions of private vehicle use across clusters, descriptive patterns suggest that Station loyalists and Occasional users are more likely to reduce their use of private modes. In contrast, Micromobility enthusiasts and Moped adopters demonstrate little reduction, indicating continued reliance on private vehicles.

However, class membership is a strong predictor of reductions in ownership across several transport modes, particularly private and corporate lease cars, motorcycles, bicycles, and cargo bikes. Station loyalists, Dedicated car sharers, Micromobility enthusiasts, and All-round sharers are consistently more likely to reduce their ownership of these vehicles. In contrast, Occasional users and Moped adopters are less likely to do so, with Occasional users showing the most significant resistance.

In summary, socio-demographic and spatial factors are key determinants of shared mobility adoption patterns, which, in turn, influence the likelihood of reducing private vehicle ownership. The most substantial reductions in ownership are observed among clusters with high engagement in shared mobility, while more traditional or occasional users remain less likely to shift away from dependence on private vehicles. These insights highlight the importance of targeted policy interventions that consider both user characteristics and local context to maximise the impact of shared mobility on sustainable urban transport.

These insights highlight the importance of targeted policy interventions to maximise the impact of shared mobility on sustainable urban transport. First, policies should focus on supporting and expanding shared mobility services in areas and among user groups where the potential for reducing private vehicle ownership is highest, particularly among Station loyalists, Dedicated car sharers, and All-round sharers. This could include investments in station-based car sharing infrastructure, the integration of shared mobility within the public transport network, and incentives for frequent users to further reduce or avoid private vehicle ownership.

Second, to reach user groups that are less likely to reduce private vehicle ownership, such as Occasional users and Moped adopters, policies should address barriers to shared mobility adoption. This may involve improving the accessibility and convenience of shared services in less urbanised areas, increasing awareness of shared mobility options, and designing services that better meet the needs of users who currently rely on their private vehicles.

Third, urban planning and transport policy should prioritise multimodal integration, ensuring that shared mobility services are seamlessly connected with public transport, cycling infrastructure, and pedestrian networks. This approach can help reinforce the shift away from dependence on private vehicles and support the development of sustainable, flexible urban mobility systems.

Finally, ongoing monitoring and evaluation are crucial for assessing the effectiveness of shared mobility policies and to adapt strategies as user needs and urban contexts evolve. Policymakers should also leverage data-driven insights, such as those provided by this study, to inform evidence-based decision-making and to ensure that shared mobility contributes meaningfully to broader sustainability and liveability goals within the transport and mobility sector.

In conclusion, this research demonstrates that shared mobility has the potential to reduce private vehicle ownership, particularly among highly engaged user groups, but that its impact on private vehicle usage is more nuanced and varies across clusters. Socio-demographic and spatial factors play a crucial role in shaping both the adoption of shared mobility and its impact on private travel behaviour. To fully realise the benefits of shared mobility for sustainable urban transport, policies must be tailored to the diverse needs and contexts of different user groups, with a focus on integration, accessibility, and targeted incentives.

6 Discussion

This study offers new insights into the relationship between shared mobility and private vehicle ownership and usage in the Netherlands, using both regression analysis and latent class cluster analysis. While the findings offer a valuable contribution to the understanding of shared mobility's role in shaping travel behaviour, it is crucial to reflect on the study's limitations and their implications for future research. Some limitations have only a minor impact, whereas others allow for future research with either entirely new or somewhat complementary research aims.

The first limitation relates to the representation of the research data. It is important to note that the distribution of gender, age, educational level, urbanisation level, car ownership, and the number of used types and operators of shared mobility in the sample differs from the representative LRO data on shared mobility users. Some groups are not adequately represented in the research data; for instance, young and less-educated individuals, as well as residents from less urban areas, are underrepresented. This may have influenced the observed patterns of shared mobility adoption and its effects. Nevertheless, the current sample provides a robust foundation for identifying key trends and relationships, and future research with a more representative sample could further refine and expand these insights.

Furthermore, it is important to highlight that the indicators of the LCCA, the nine shared mobility usage frequencies, were coded in such a way that all non-users had a value of zero, indicating they never used that specific shared mode. However, some included shared modalities had only a limited number of users, which may have affected the stability of the cluster means. This highlights an opportunity for future studies to explore alternative coding strategies or to focus on shared modes with higher adoption rates, potentially yielding even more nuanced cluster profiles.

The study's focus on shared mobility users, rather than the general population, is both a strength and a limitation. By targeting users, the research captures the specific travel behaviour of those most engaged with shared mobility. However, this approach limits the ability to compare findings with the entire Dutch population. Including non-users in future research would allow a more comprehensive assessment of the societal impact of shared mobility and help identify barriers to adoption among different demographic groups.

Additionally, only the impacts of socio-demographic and spatial variables on class membership were examined. Nonetheless, the use frequencies of (private) travel modes could also be included in the analysis. These variables were currently included as inactive covariates to aid in interpreting the identified clusters, but their effect on class membership was not evaluated. Including them could offer further insights into the clusters and the interaction between private and shared mobility.

Lastly, there are some limitations regarding the variables of private vehicle ownership and usage reduction, as well as their analysis. The main limitation is that these reductions were self-reported by the respondents in the research data. This raises questions about the reliability of the data, as it is unknown whether all respondents provided accurate answers. It also complicates the understanding of what effect shared mobility actually has on household travel behaviour and vehicle ownership. Future studies could complement survey data with objective measures, such as travel diaries or mobility tracking, to validate and enrich the findings.

Moreover, the survey only measured whether an individual indicated a reduction in (private) travel mode usage, the magnitude of the reduction remains unknown. Exploring the extent of the reduction in usage would provide further insight into the impact of shared mobility.

Attitudes and perceptions towards, for instance, sustainability and sharing economies could also have been considered as additional influencing factors for households' reduction in private vehicle ownership and usage. This research did not include such attitudes or perceptions, but this could provide meaningful insights. These may play a more significant role in explaining motivations and barriers underlying mobility choices.

Finally, the reduction of private vehicle ownership, variable used in the analysis, is defined as a household or individual that has dismissed a specific private vehicle in the past year due to using shared mobility services. However, different or broader definitions of ownership reduction could have been used. It was also possible to include individuals who are no longer planning to buy this vehicle, have temporarily postponed their purchase, or are considering the disposal of their vehicle. Applying a different definition could have led to other insights.

Despite these limitations, the study's findings align with existing literature. The regression analyses confirmed that frequent use of certain shared mobility modes, especially station-based car sharing, community car sharing, and OV-fiets, significantly increases the likelihood of reducing both private car use and ownership, echoing previous research that highlights the effectiveness of these services in promoting sustainable travel behaviour (Becker et al., 2017; Jorritsma et al., 2021; Shaheen et al., 2020). The more modest and context-dependent effects observed for other shared modes, such as free-floating car sharing, moped sharing, and shared e-bikes, are also consistent with earlier studies (Nehrke & Loose, 2018; Bucsky & Juhász, 2022; Aguilera-García et al., 2021). Importantly, the latent class analysis reveals that while reductions in private vehicle use and ownership are present across all user groups, the differences between clusters are generally modest, supporting recent findings that the overall impact of shared mobility on car ownership remains limited at the population level (Bucsky & Juhász, 2022; Luo et al 2023).

The study also highlights the complex modal shifts associated with shared mobility. While shared modes can substitute for private car trips, they may also replace public transport or active modes, a pattern noted in the literature and one that underscores the need for careful integration of shared mobility into broader urban transport strategies (Jorritsma et al., 2021; Teixeira et al., 2020). These findings suggest that maximising the sustainability benefits of shared mobility will require policies that encourage substitution of private car trips while minimising unintended shifts away from public and active transport.

Briefly, this research not only advances the understanding of shared mobility's impact on private vehicle ownership and usage but also identifies several promising directions for future studies. By addressing the limitations outlined above and drawing connections to existing literature, future studies can further clarify the role of shared mobility in facilitating the transition to more sustainable urban transportation systems.

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Appendix A: Questionnaire data-set

Vragenlijst gebruikersonderzoek deelmobiliteit

Introductietekst

Welkom bij deze vragenlijst over deelvervoer. Wij zijn benieuwd naar uw gebruik van deelvervoer en stellen u daarom enkele vragen. Het invullen van de vragenlijst duurt maximaal 10 minuten.

Alvast bedankt voor uw deelname!

Blok A: Gebruik deelvervoer

1 Van welk(e) type(n) deelvervoer heeft u het afgelopen jaar gebruik gemaakt?
Meerdere antwoorden mogelijk
- a Deelauto (vaste plek) *
- b Deelauto (free-floating) **
- c Deelauto (via een platform, community of onderling buiten eigen huishouden)
- d Deelfiets (zonder trapondersteuning)
- e Deelfiets (elektrisch)
- f Deelscooter
- g Deelbakfiets (zonder trapondersteuning)
- h Deelbakfiets (elektrisch)
- i Huurauto
- j Anders, namelijk...
- k Ik heb het afgelopen jaar geen gebruik gemaakt van deelvervoer [naar Blok A1]

* = Een deelauto die je enkel kunt parkeren op aangewezen (vaste) plekken of zones.
** = Een deelauto die je overal kunt parkeren binnen het servicegebied.

Indien V1 = deelauto (a, b en/of c)

1b Als u gebruik maakt van een deelauto heeft u dan een voorkeur voor...
- a Een benzine auto
- b Een elektrische auto
- c Een hybride (elektrisch/benzine) auto
- d Een hybride (elektrisch/diesel) auto
- e Geen voorkeur

2 Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?
Gridvraag
[Enkel tonen gekozen deelmodaliteiten V1]

Minder dan 1 keer per jaar	1-2 keer per jaar	3-4 keer per jaar	5-6 keer per jaar	7-11 keer per jaar	1-2 keer per maand	3-4 keer per maand	Meer dan 4 keer per maand

a Deelauto (vaste plek)
b Deelauto (free-floating)
c Deelauto (via een platform, community of onderling buiten eigen huishouden)
d Deelfiets (zonder trapondersteuning)
e Deelfiets (elektrisch)
f Deelscooter
g Deelbakfiets (zonder trapondersteuning)
h Deelbakfiets (elektrisch)
i Huurauto
j Anders, namelijk...

3 Van welke aanbieders van deelvervoer heeft u het afgelopen jaar gebruik gemaakt?
Meerdere antwoorden mogelijk
[Enkel aanbieders tonen op basis van V1: auto, fiets, scooter, bakfiets]
a MyWheels
b Greenwheels
c Cargoroo
d Tier
e Baqme
f Check
g Felyx
h Go Sharing
i SHARE NOW
j OnzeAuto
k OV-fiets
l SIXT Share
m GreenMobility
n Donkey Republic
o SnappCar
p Bolt
q Deelfiets Nederland
r Ik regel dit via een coöperatie, buurtinitiatief of onderling
s Anders, namelijk...
t Geen van deze [uitsluitend]

Indien V3 = Ik regel dit via een coöperatie, buurtinitiatief of onderling
3b Op welke manier maakt u gebruik van deelmobiliteit?
a Via een coöperatie
b Via een buurtinitiatief
c Ik regel het zelf onderling, buiten mijn eigen huishouden
d Anders namelijk....

4 Hoe vaak maakte u het <u>afgelopen jaar</u> gebruik van de aanbieders van deelvervoer?
Gridvraag
[Enkel tonen gekozen antwoordopties V3]

Minder dan 1 keer per jaar	1-2 keer per jaar	3-4 keer per jaar	5-6 keer per jaar	7-11 keer per jaar	1-2 keer per maand	3-4 keer per maand	Meer dan 4 keer per maand

a [Gekozen antwoordopties vraag 3]

5 Hoe lang maakt u al gebruik van deelvervoer in Nederland?
Gridvraag
[Enkel tonen gekozen deelmodaliteiten V1]

Minder dan 1 jaar	Tussen de 1 en 3 jaar	Tussen de 3 en 5 jaar	Tussen de 5 en 10 jaar	Langer dan 10 jaar	Weet ik niet

a [Gekozen antwoordopties vraag 1]

6 In welke gemeente(n) heeft u het afgelopen jaar gebruik gemaakt van deelvervoer?
Is dit meer dan 1 gemeente? Kies dan de gemeente waar u deelvervoer het meest gebruikt eerst. Kies vervolgens de gemeente waar u daarna het meest gebruikt.
A Deelvervoer het meest gebruikt in:
a Drop-down met alle provincies
b Drop-down per gekozen provincie met alle gemeenten die deelvervoer aanbieden

B Deelvervoer daarna het meest gebruikt in: << met optie ik gebruik deelvervoer maar in één gemeente >>
c Drop-down met alle provincies
d Drop-down per gekozen provincie met alle gemeenten die deelvervoer aanbieden

<Blok A1 alleen voorleggen indien V1 = Ik heb het afgelopen jaar geen gebruik gemaakt van deelvervoer>

Blok A1: Niet-gebruik deelvervoer

A1.1. U geeft aan het afgelopen jaar geen gebruik te hebben gemaakt van deelvervoer. Kunt u uitleggen waarom u geen gebruik heeft gemaakt?

[ ] Weet niet

A1.2. Van welk(e) type(n) deelvervoer heeft u in het verleden gebruik gemaakt?
Meerdere antwoorden mogelijk
- Deelauto (vaste plek) *
- Deelauto (free-floating) **
- Deelauto (via een platform, community of onderling buiten eigen huishouden)
- Deelfiets (zonder trapondersteuning)
- Deelfiets (elektrisch)
- Deelscooter
- Deelbakfiets (zonder trapondersteuning)

- Deelbakfiets (elektrisch)
- Huurauto
- Anders, namelijk…
- Weet ik niet meer
- Ik heb in het verleden geen gebruik gemaakt van een deelvervoermiddel

* = Een deelauto die je enkel kunt parkeren op aangewezen (vaste) plekken of zones.
** = Een deelauto die je overal kunt parkeren binnen het servicegebied.

<indien A1.2. =/= 'Ik heb in het verleden geen gebruik gemaakt van een deelvervoermiddel'>

A1.3. In welke gemeente(n) heeft u in het verleden gebruik gemaakt van deelvervoer?
Is dit meer dan 1 gemeente? Kies dan de gemeente waar u deelvervoer het meest heeft gebruikt eerst. Kies vervolgens de gemeente waar u daarna het meest heeft gebruikt.

- Drop-down met alle provincies
- Drop-down per gekozen provincie met alle gemeenten die deelvervoer aanbieden

<indien A1.2. =/= 'Weet ik niet meer'>

A1.3. Bent u van plan om in de komende 12 maanden (weer) gebruik te gaan maken van één of meerdere deelvervoermiddelen?
Gridvraag

Ja	Nee	Weet ik niet

- Deelauto (vaste plek) *
- Deelauto (free-floating) **
- Deelauto (via een platform, community of onderling)
- Deelfiets (zonder trapondersteuning)
- Deelfiets (elektrisch)
- Deelscooter
- Deelbakfiets (zonder trapondersteuning)
- Deelbakfiets (elektrisch)
- Huurauto
- Anders, namelijk…

* = Een deelauto die je enkel kunt parkeren op aangewezen (vaste) plekken of zones.
** = Een deelauto die je overal kunt parkeren binnen het servicegebied.

➔ Naar V12, V13, V15, V17, V18, V19 en dan Blok E: Achtergrondkenmerken.

Blok B: Motief

7 Wat zijn voor u doorgaans de belangrijkste reisdoelen om gebruik te maken van deelvervoer in [meest gebruikte gemeente V6]?
Gridvraag
[Enkel tonen gekozen deelmodaliteiten V1]
Meerdere antwoorden mogelijk

Deelauto (vaste plek)	*Deelauto (free-floating)*	*Deelfiets (gewoon)*	*Deelfiets (elektrisch)*	*Deelscooter (elektrisch)*	*Deelbakfiets (gewoon)*	*Deelbakfiets (elektrisch)*	*Huurauto*	*Anders, namelijk*

a (Dagelijkse) boodschappen/Winkelen/Voorzieningen
b Bezoeken van vrienden/familie, dagje uit of evenementen
c Woon-werkverkeer *
d Overige (werk gerelateerde) zakelijke ritten **
e Sport en/of hobby
f Kinderen halen/brengen
g Goederen halen/brengen ***
h Anders, namelijk...
i Dit deelvervoermiddel gebruik ik niet in [meest gebruikte gemeente V6] [uitsluitend]

* = Dit zijn ook ritten van/naar school, studie en stage.
** = Een reis die je maakt voor een zakelijke afspraak die niet op je vaste werklocatie plaatsvindt.
*** = Het vervoeren van zware of grote spullen die je anders zelf niet kan vervoeren.

Indien V6 = > 1 gemeente
7b Wat zijn voor u doorgaans de belangrijkste reisdoelen om gebruik te maken van deelvervoer in [andere gemeente V6]?
Gridvraag
[Enkel tonen gekozen deelmodaliteiten V1]
Meerdere antwoorden mogelijk

Deelauto (vaste plek)	*Deelauto (free-floating)*	*Deelfiets (gewoon)*	*Deelfiets (elektrisch)*	*Deelscooter (elektrisch)*	*Deelbakfiets (gewoon)*	*Deelbakfiets (elektrisch)*	*Huurauto*	*Anders, namelijk*

a. (Dagelijkse) boodschappen/Winkelen/Voorzieningen
b. Bezoeken van vrienden/familie, dagje uit of evenementen
c. Woon-werkverkeer *
d. Overige (werk gerelateerde) zakelijke ritten **
e. Sport en/of hobby
f. Kinderen halen/brengen
g. Goederen halen/brengen ***
h. Anders, namelijk...
i. Dit deelvervoermiddel gebruik ik niet in [andere gemeente V6] [uitsluitend]

* = Dit zijn ook ritten van/naar school, studie en stage.
** = Een reis die je maakt voor een zakelijke afspraak die niet op je vaste werklocatie plaatsvindt.
*** = Het vervoeren van zware of grote spullen die je anders zelf niet kan vervoeren.

8 Wat zijn voor u de belangrijkste redenen om gebruik te maken van deelvervoer? Gridvraag
[Enkel tonen gekozen deelmodaliteiten V1]
Meerdere antwoorden mogelijk

Deelauto (vaste plek)	*Deelauto (free-floating)*	*Deelfiets (gewoon)*	*Deelfiets (elektrisch)*	*Deelscooter (elektrisch)*	*Deelbakfiets (gewoon)*	*Deelbakfiets (elektrisch)*	*Huurauto*	*Anders, namelijk*

a Reistijd
b Goedkoper
c Eenvoudig te regelen
d Beschikbaarheid van het deelvervoermiddel
e Gunstige voorwaarden
f Combinatie met het OV
g Loopafstand tot ophaalpunt
h Flexibiliteit *
i Reisgemak/comfort
j Veiligheid
k Duurzaamheid
l Vervoermiddel niet zelf onderhouden
m Hygiëne
n Elektrisch
o Omdat ik het zelf niet bezit
p Vermijden parkeerkosten
q Vinden van een parkeerplaats kost me te veel moeite
r Dat ik van deur tot deur kan komen met deelvervoer
s Anders, namelijk...

* = De vrijheid om te reizen wanneer je wilt, waarheen je wilt.

9 Als u uw rit met deelvervoer combineert. Hoe reist u meestal <u>voordat</u> u deelvervoer gebruikt? Gridvraag
[Enkel tonen gekozen deelmodaliteiten V1]

Deelauto (vaste plek)	*Deelauto (free-floating)*	*Deelfiets (gewoon)*	*Deelfiets (elektrisch)*	*Deelscooter (elektrisch)*	*Deelbakfiets (gewoon)*	*Deelbakfiets (elektrisch)*	*Huurauto*	*Anders, namelijk*

a Eigen auto als bestuurder
b Meerijden in de auto van iemand anders
c Eigen motor
d Eigen brommer of scooter
e Eigen fiets
f Lopend
g Trein
h Tram, bus of metro
i Taxi
j Anders, namelijk...
k Ik combineer mijn rit met deelvervoer niet [uitsluitend]

9a Als u uw rit met deelvervoer combineert. Hoe reist u meestal verder <u>nadat</u> u deelvervoer gebruikt?
Gridvraag
[Enkel tonen gekozen deelmodaliteiten V1]

Deelauto (vaste plek)	*Deelauto (free-floating)*	*Deelfiets (gewoon)*	*Deelfiets (elektrisch)*	*Deelscooter (elektrisch)*	*Deelbakfiets (gewoon)*	*Deelbakfiets (elektrisch)*	*Huurauto*	*Anders, namelijk*

a Eigen auto als bestuurder
b Meerijden in de auto van iemand anders
c Eigen motor
d Eigen brommer of scooter
e Eigen fiets
f Lopend
g Trein
h Tram, bus of metro
i Taxi
j Anders, namelijk...
k Ik combineer mijn rit met deelvervoer niet [uitsluitend]

10 U reist wel eens met [antwoord(en) V1]. Hoe zou u uw reis maken als de [antwoorden(en) V1] niet beschikbaar zou(den) zijn?
Gridvraag
[Enkel tonen gekozen deelmodaliteiten V1]

Deelauto (vaste plek)	*Deelauto (free-floating)*	*Deelfiets (gewoon)*	*Deelfiets (elektrisch)*	*Deelscooter (elektrisch)*	*Deelbakfiets (gewoon)*	*Deelbakfiets (elektrisch)*	*Huurauto*	*Anders, namelijk*

a Eigen auto als bestuurder
b Meerijden in de auto van iemand anders
c Eigen brommer of scooter
d Eigen fiets
e Lopend
f Trein
g Tram, bus of metro
h Taxi
i Met de deelauto [weglaten in deelauto kolom]
j Met de deelfiets [weglaten in deelfiets kolom]
k Met de deelbakfiets [weglaten in deelbakfiets kolom]
l Met de deelscooter [weglaten in deelscooter kolom]
m Met een huurauto [weglaten in huurauto kolom]
n Anders, namelijk...
o Dan had ik deze reis/rit niet gemaakt

11 Hoe lang bent u maximaal bereid om te reizen (inclusief lopen) naar het deelvervoer?
Gridvraag
[Enkel tonen gekozen deelmodaliteiten V1]

Deelauto (vaste plek)	*Deelauto (free-floating)*	*Deelfiets (gewoon)*	*Deelfiets (elektrisch)*	*Deelscooter (elektrisch)*	*Deelbakfiets (gewoon)*	*Deelbakfiets (elektrisch)*	*Huurauto*	*Anders, namelijk*

a Minder dan 1 minuut
b 1 tot 5 minuten
c 5 tot 10 minuten
d 10 tot 15 minuten
e 15 tot 30 minuten
f Meer dan 30 minuten

Blok C: Deelvervoer en autobezit

12 Welke vervoermiddelen bezit uw huishouden?
Meerdere antwoorden mogelijk
a Auto (eigendom)
b Auto (private lease)
c Auto (zakelijke lease)
d Motor
e Brommer/scooter
f Fiets
g Elektrische fiets
h Bakfiets
i Elektrische bakfiets
j Mijn huishouden bezit geen van de bovenstaande vervoermiddelen [uitsluitend]

Indien V12 = Auto (a, b en/of c)
13 Hoeveel auto’s (zowel eigendom als privé en zakelijke lease) bezit uw huishouden?
a 1
b 2
c 3
d Meer dan 3

14 Heeft deelvervoer invloed (gehad) op uw bezit van vervoermiddelen?
Gridvraag

Auto eigendom	*Auto private lease*	*Auto zakelijke lease*	*Motor*	*Brommer/ scooter*	*Fiets*	*Elektrische fiets*	*Bakfiets*	*Elektrische bakfiets*

a Ja, ik heb de aankoop van dit vervoermiddel uitgesteld
b Ja, ik ben niet meer van plan om dit vervoermiddel te kopen
c Ja, ik heb dit vervoermiddel reeds weggedaan
d Ja, ik overweeg dit vervoermiddel weg te doen
e Ja, ik overweeg dit vervoermiddel aan te schaffen
f Ja, ik heb dit vervoermiddel aangeschaft
g Nee, het heeft geen invloed
h Niet van toepassing

15 Hoe vaak heeft u het <u>afgelopen jaar</u> gebruik gemaakt van de volgende (eigen) vervoermiddelen?
Gridvraag

Dagelijks	Meerdere keren per week	Eén keer per week	Eén keer per maand	Minder dan één keer per maand	Nooit of bijna nooit	Weet ik niet

a Auto (eigendom) [enkel tonen indien bezit V12]
b Auto (private lease) [enkel tonen indien bezit V12]
c Auto (zakelijke lease) [enkel tonen indien bezit V12]
d Motor [enkel tonen indien bezit V12]
e Brommer/scooter [enkel tonen indien bezit V12]
f Fiets [enkel tonen indien bezit V12]
g Elektrische fiets [enkel tonen indien bezit V12]
h Bakfiets [enkel tonen indien bezit V12]
i Elektrische bakfiets [enkel tonen indien bezit V12]
j Trein
k Tram, bus of metro
l Taxi
m Lopend

16 Welke invloed heeft deelvervoer op uw gebruik van de volgende (eigen) vervoermiddelen?
Gridvraag

Meer	Minder	Geen verschil	Gebruik ik niet

a Auto (eigendom) [enkel tonen indien bezit V12]
b Auto (private lease) [enkel tonen indien bezit V12]
c Auto (zakelijke lease) [enkel tonen indien bezit V12]
d Motor [enkel tonen indien bezit V12]
e Brommer/scooter [enkel tonen indien bezit V12]
f Fiets [enkel tonen indien bezit V12]
g Elektrische fiets [enkel tonen indien bezit V12]
h Bakfiets [enkel tonen indien bezit V12]
i Elektrische bakfiets [enkel tonen indien bezit V12]
j Trein
k Tram, bus of metro
l Taxi
m Lopend

Indien V12 = Auto (a, b en/of c)
17 Welke aspecten spelen voor u (meestal) een rol in het gebruik van het vervoermiddel?
Gridvraag

Auto (eigendom)	Auto (private lease)	Auto (zakelijke lease)

[Enkel tonen gekozen vervoermiddelen V12]
Meerdere antwoorden mogelijk
a Reistijd
b Goedkoper
c Eenvoudig te regelen
d Beschikbaarheid van het deelvervoermiddel
e Gunstige voorwaarden
f Combinatie met het OV
g Loopafstand tot ophaalpunt
h Flexibiliteit *
i Reisgemak/comfort
j Veiligheid
k Duurzaamheid
l Vervoermiddel niet zelf onderhouden
m Hygiëne
n Elektrisch
o Omdat ik het zelf niet bezit
p Vermijden parkeerkosten
q Vinden van een parkeerplaats kost me te veel moeite
r Dat ik van deur tot deur kan komen met deelvervoer
s Fiscale voordelen
t Anders, namelijk...

* = De vrijheid om te reizen wanneer je wilt, waarheen je wilt.

18 Welke aspecten moeten er worden verbeterd voordat u (volledig) over zal gaan op deelvervoer en uw auto weg zou doen?
[laatste deel van de vraag enkel tonen indien autobezitter (V12=a, b en/of c)]
a Het aanbod van deelvervoer
b De kwaliteit van het aangeboden deelvoertuig
c Gebruiksvriendelijkheid van de app
d Parkeermogelijkheden
e Prijs/kosten
f Bereikbaarheid *
g Beschikbaarheid **
h Duidelijkheid
i Gebruiksvriendelijkheid vervoermiddel
j Betere aansluiting van deelvervoer op het OV-netwerk
k Anders, namelijk
l Geen, ik overweeg niet om verder over te gaan op deelvervoer

* = Maximale afstand tot een beschikbaar voertuig.
** = Garantie op een voertuig op het moment dat ik het nodig heb.

Indien V18 = Geen (l)
19 Wat houdt u tegen om verder over te gaan op deelvervoer?
Open + ‘weet niet’

Blok D: Eigen input (maximaal 3 vragen)

- Er is ruimte voor eigen input, maar het liefst zo min mogelijk per gemeente. Er is enkel ruimte voor vragen over flankerend beleid dat relatie heeft met deelvervoer en dat net is ingevoerd of bijna wordt ingevoerd. Bijvoorbeeld het uitbreiden van betaald parkeren, effect van parkeerhubs en vergunningen. Dit moet in relatie staan tot deelvervoer en of dit bijvoorbeeld zorgt voor vaker of minder gebruik van deelvervoer.
- De vragenlijst bevat daarnaast één of meerdere wisselvragen. Deze zijn per jaar/editie gelijk en wijzigen ieder jaar. Bijvoorbeeld een centraal gestelde vraag over het effect van de helmplicht.

Aanvullende vragen gemeenten

Amsterdam

Steeds meer gemeenten overwegen het invoeren van een uitstootvrije zone voor bromfietsen, snorfietsen en scooters. Dat betekent dat deze voertuigen alleen nog in (een deel) van de gemeente mogen rijden als ze elektrisch zijn. Vaak geldt er een overgangsperiode, waarbij bestaande niet-elektrische voertuigen nog een paar jaar mogen rondrijden, en daarna ook niet meer zijn toegestaan. Dit gebeurt om luchtvervuiling te verminderen.

Welke deelvervoermiddelen gaat u vaker gebruiken als gemeente Amsterdam een uitstootvrije zone voor scooters, brom- en snorfietsen invoert?
Meerdere antwoorden mogelijk

- Ik bezit geen privé scooter en word niet geraakt door de uitstootvrije zone [uitsluitend]
- Deelauto (vaste plek) *
- Deelauto (free-floating) **
- Deelauto (via een platform, community of onderling)
- Deelfiets (zonder trapondersteuning)
- Deelfiets (elektrisch)
- Deelscooter
- Deelbakfiets (zonder trapondersteuning)
- Deelbakfiets (elektrisch)
- Huurauto
- Geen van deze [uitsluitend]
- Anders, namelijk…

* = Een deelauto die je enkel kunt parkeren op aangewezen (vaste) plekken of zones.
** = Een deelauto die je overal kunt parkeren binnen het servicegebied.

Rotterdam

Op een schaal van 1 tot 10, hoe tevreden bent u met het parkeren van uw deel(bak)fiets en/of – scooter in de vervoershubs in gemeente Rotterdam?

Zeer ontevreden – Zeer tevreden (10-pt schaal)

Heeft u verbeterpunten of wilt u nog iets anders kwijt over de vervoershubs in gemeente Rotterdam?
Open

Enschede

De gemeente Enschede heeft het afgelopen jaar op meerdere plekken in de stad deelmobiliteithubs geplaatst. Dit is een afgebakende parkeerplek voor deelscooters en -fietsen. De gemeente is benieuwd naar uw mening over deze hubs en het gebruik van deelscooters en -fietsen.

1. Hoe tevreden bent u over het gebruik van de hub?
- Zeer ontevreden
- Een beetje ontevreden
- Neutraal
- Een beetje tevreden
- Zeer tevreden
- Weet ik niet / niet van toepassing

2. Is uw gebruik van een deelfiets of deelscooter veranderd door de komst van deze hubs?
- Ja, ik ben hierdoor meer gebruik gaan maken van een deelfiets of deelscooter
- Ja, ik ben hierdoor minder gebruik gaan maken van een deelfiets of deelscooter
- Nee, mijn gebruik is hierdoor niet veranderd
- Weet ik niet / niet van toepassing

3. Waarom bent u (meer / minder afhankelijk van vorige vraag) gebruik gaan maken van deelfiets of deelscooter door de komst van deze hubs?
Open

Amersfoort

De gemeente Amersfoort heeft nog enkele aanvullende vragen over uw gebruik van deelmobiliteit in de gemeente.

1. Welke van de volgende deelauto varianten heeft uw voorkeur?
   a. Een deelauto die je enkel kunt parkeren op aangewezen (vaste) plekken (vast)
   b. Een deelauto die je overal kunt parkeren binnen een zone (enkele straten) (free-zone-floating)
   c. Een deelauto die je kunt parkeren (afsluiten) waar je maar wilt (ook buiten de gemeente) (free-floating)
   d. Geen voorkeur

2. Welke type deelvervoer zou u willen gebruiken maar is er niet in Amersfoort?
Meerdere antwoorden mogelijk
   a. Deelfiets
   b. Elektrische deelfiets
   c. Elektrische deelbakfiets
   d. Elektrische deelstep
   e. Busje

f. Anders, namelijk...

3. Hoe vaak komt het voor dat u een deelauto in uw buurt wilt pakken, maar dat die niet beschikbaar is?

a. Nooit
b. Zelden
c. Soms
d. Vaak
e. Altijd

Utrecht

Moet u betalen om een auto bij uw huis te parkeren?

- Ja
- Nee
- Weet ik niet

U moet betalen voor het parkeren van een auto bij uw huis. Wat is op u van toepassing? [Enkel tonen indien eerste vraag = nee]

Meerdere antwoorden mogelijk

a. Ik heb hiervoor een parkeervergunning
b. Ik sta op de wachtlijst voor een parkeervergunning
c. Ik heb geen parkeervergunning
d. Ik huur een parkeerplaats bij mijn wooncomplex
e. Ik heb een parkeerplaats bij mijn wooncomplex gekocht
f. Er zijn tegen betaling parkeerplaatsen bij mijn wooncomplex, maar ik huur deze niet of heb deze niet gekocht
g. Anders, namelijk ...

Waarom hoeft u niet te betalen voor het parkeren van een auto bij uw huis? [Enkel tonen indien eerste vraag = nee]

Meerdere antwoorden mogelijk

a. Je kunt hier op straat gratis parkeren
b. Ik kan op mijn eigen terrein (oprit of garage) gratis parkeren
c. Het is bij mij in de buurt niet mogelijk om te parkeren.
d. Anders, namelijk ...

Den Haag

1a. Bent u bekend met de Mobility Hub Q-Park Centrum aan de Amsterdamse Veerkade in Den Haag? In de Mobility Hub Q-Park Centrum kun je verschillende vormen van deelmobiliteit vinden (deelfiets, deelbakfiets, deelscooter en deelauto) en gebruik maken van het Shell Café.

a. Ja, ik ben bekend met de hub en heb er gebruik van gemaakt.
b. Ja, ik ben bekend met de hub, maar heb er geen gebruik van gemaakt.
c. Nee, ik ben niet bekend met de hub.

1b. Welke faciliteiten heeft u vanuit de Mobility Hub Q-Park Centrum gebruikt? [Enkel tonen indien 1a = a]

Meerdere antwoorden mogelijk

a. Deelfiets
b. Deelbakfiets

c. Deelscooter
d. Deelauto
e. Snellaadvoorziening
f. Faciliteiten van het Shell Café (het café, de winkel, werk- en vergaderplekken, wasservice en stomerij)

2. Bent u op de hoogte van Park+Beach in Den Haag? Met Park+Beach reserveer je een parkeerplaats bij een van de deelnemende garages buiten Scheveningen: Q-Park CS New Babylon, Q-Park Malieveld, Q-Park P+R Hoornwijck of World Forum A. Vandaar kun je verder met de tram of, indien beschikbaar, met een deel(bak)fiets tegen een gereduceerd tarief.
a. Ja, maar niet gebruikt
b. Ja, en in het afgelopen jaar ook gebruik van gemaakt
c. Nee, ben er niet mee bekend.

Blok E: Achtergrondkenmerken

20 Wat is uw geslacht?
a Man
b Vrouw
c Anders
d Geen antwoord

21 Wat is uw leeftijd?

__ __
Geen antwoord

22 Wat is op dit moment uw hoogst voltooide opleiding?
a Geen opleiding afgerond
b Lagere school/basisschool, speciaal (basis) onderwijs
c Lager beroepsonderwijs (LBO, VBO, VSO, MBO niveau 1, praktijkonderwijs)
d VMBO
e MAVO, MULO, ULO
f Middelbaar beroepsonderwijs (MBO niveau 2, 3 of 4)
g HAVO, MMS
h VWO, Gymnasium Atheneum, HBS
i Hoger beroepsonderwijs (HBO), associate degree, HBO-bachelor, WO-bachelor
j Wetenschappelijk onderwijs/universiteit/master, HBO-master, WO-master, PhD
k Een andere (bedrijfs-)opleiding of cursus, namelijk
l Geen antwoord

23 Hoe is uw huishouden samengesteld?
a Alleenstaand, zonder kinderen
b Alleenstaand, met thuiswonende kinderen
c Alleenstaand, met uitwonende kinderen
d Samenwonend, zonder kinderen
e Samenwonend, met thuiswonende kinderen
f Samenwonend, met uitwonende kinderen

g Anders, namelijk...
h Geen antwoord

Indien V23 = b of e (thuiswonende kinderen)
25a Wat is de leeftijd van uw jongste thuiswonende kind?

a. Jonger dan 6 jaar
b. 6 tot 12 jaar
c. 12 tot 18 jaar
d. 18 jaar en ouder
e. Geen antwoord

24 Wat is de 4-cijferige postcode van uw woonadres?

_ _ _ _
+ Geen antwoord

25 Welke beschrijving past het beste bij uw huidige situatie?

a Student
b Alleen op locatie werken *
c Alleen thuis werken
d Zowel op locatie als thuis werken
e Gepensioneerd
f Momenteel geen betaald werk
g Geen antwoord

* = Dit kan een kantoor of andere (vaste of wisselende) werkplek buiten het huis zijn.

26 Wat is uw totale bruto huishoudinkomen per maand?

a Minimum (minder dan € 1.600 per maand)
b Beneden modaal (€ 1.600 tot € 2.600 per maand)
c Modaal (€ 2.600 tot € 3.000 per maand)
d Anderhalf keer modaal (€ 3.000 tot € 4.000 per maand)
e Twee keer modaal (€ 4.000 tot € 8.000 per maand)
f Meer dan 2x modaal (8.000 per maand of meer)
g Dat weet ik niet/wil ik niet zeggen

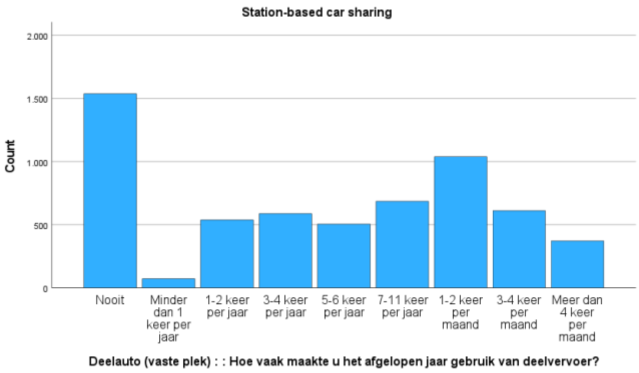
27 Is er nog iets wat u kwijt wilt over de vragenlijst of over het onderwerp deelvervoer?
Open + ‘Nee'

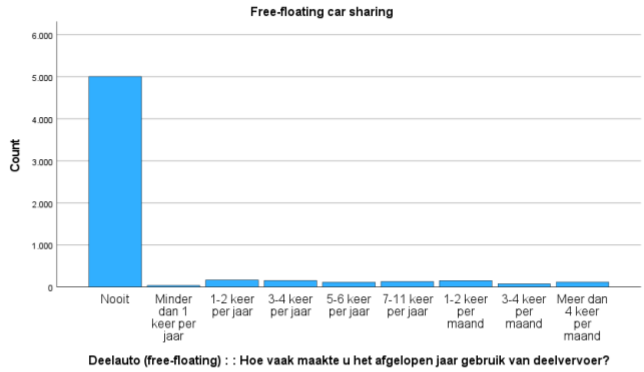
Afsluiting

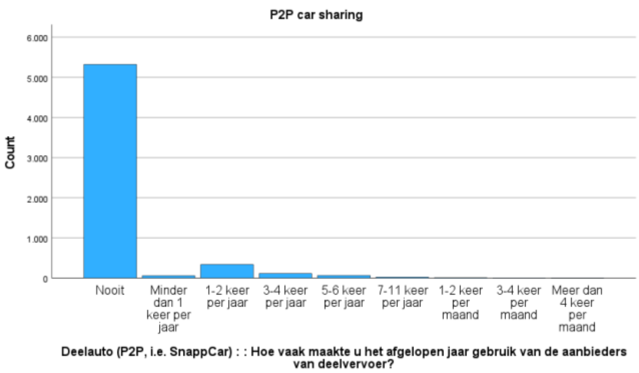
Bedankt voor het invullen van de vragenlijst. Klik nog eenmaal op volgende om uw antwoorden op te slaan.

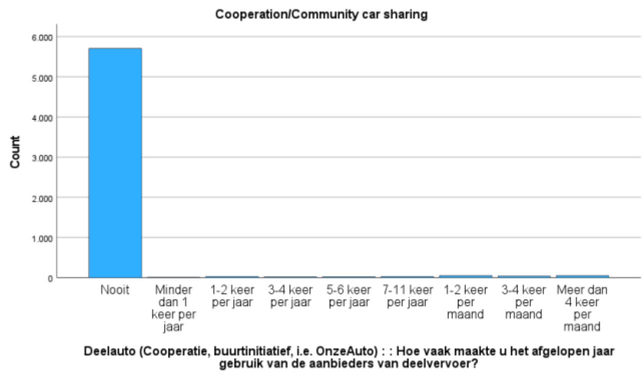
Appendix B: Shared mobility use frequency

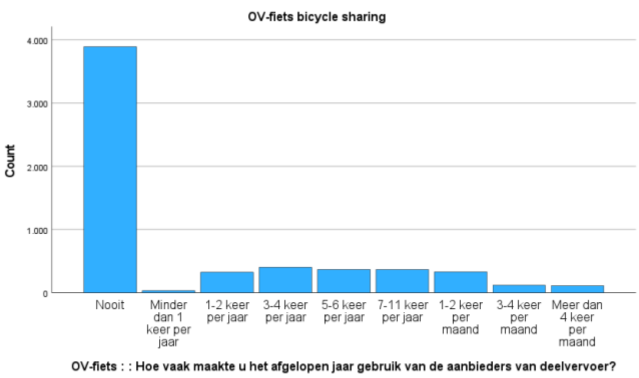
This appendix illustrates the frequency of use of the nine shared modalities employed in this research by visualising their distribution within the dataset.

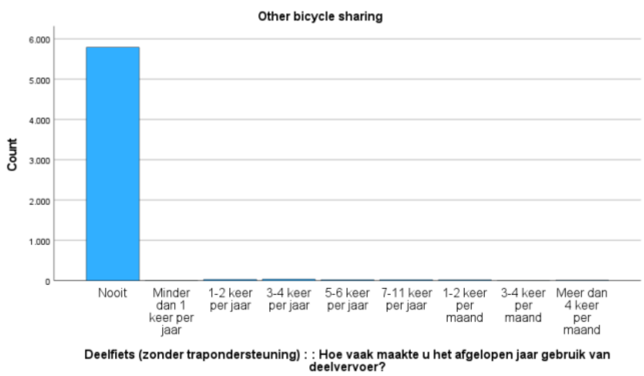


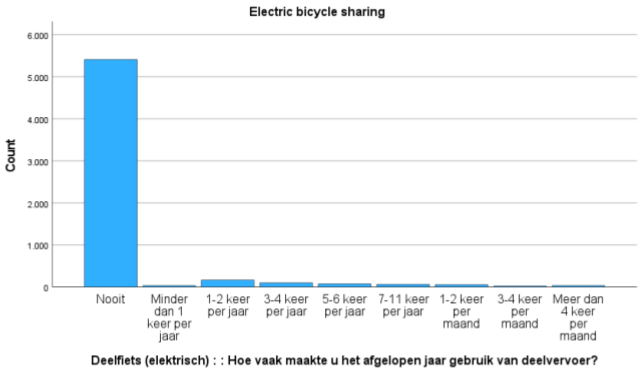


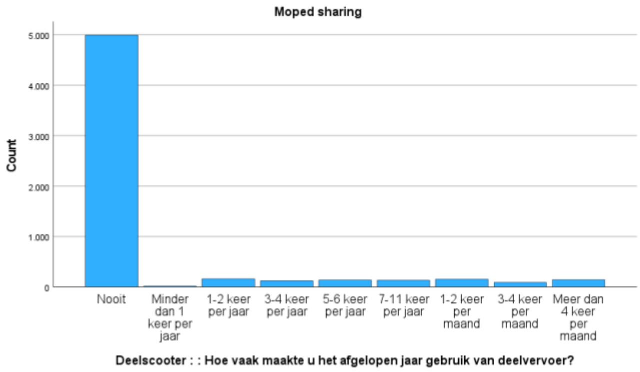


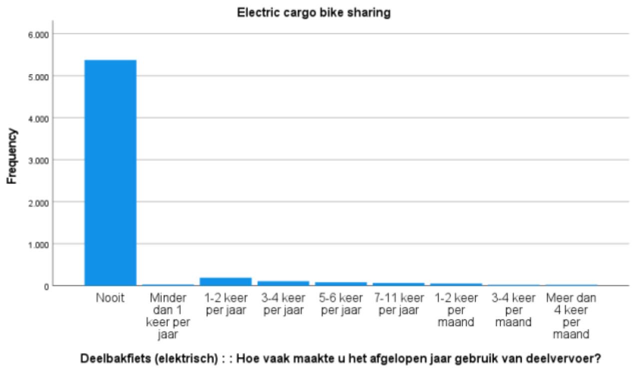












Figures B.1 – B.9. Distribution of use frequency of the shared modalities.

Appendix C: Merging spatial variables

This appendix contains the Python code used to combine two datasets based on postal codes. The code links spatial variables, such as the degree of urbanisation, the ratio of multifamily housing, and proximity to the nearest train station, to respondents. For further analysis, the data is merged into one dataset and eventually implemented into the SPSS dataset. The specific code below merges the data to create the proximity to train station spatial variable; however, the other spatial variables were also created in this manner.

“
```
#!/usr/bin/env python3
# -*- coding: utf-8 -*-
"""
Created on Wed May 6 13:48:27 2025

@author: ralfhardy
"""

import pandas as pd

# Laad beide datasets
main_df = pd.read_csv('/Users/ralfhardy/Desktop/Stedelijkheid_postcode.csv' , sep=';')
treinnabijheid_df = pd.read_csv('/Users/ralfhardy/Desktop/pc4_treinnabijheid.csv', sep=';')

# Zorg dat postcodes strings zijn
main_df['postcode'] = main_df['postcode'].astype(str)
treinnabijheid_df['postcode'] = treinnabijheid_df['postcode'].astype(str)

# Merge op postcode
merged_df = pd.merge(main_df, treinnabijheid_df, on='postcode', how='left')

merged_df.to_csv('output_treinnabijheid.csv', index=False)
```
“

Appendix D: Output usage regression models

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1156,399[a]	,098	,132

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than ,001.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,081	,032	6,574	1	,010	1,084
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,108	,048	5,096	1	,024	1,114
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,012	,096	,015	1	,903	,988
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,236	,062	14,728	1	<,001	1,267
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,218	,036	35,996	1	<,001	1,244
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,069	,119	,334	1	,563	,934
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,081	,056	2,124	1	,145	,922
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,105	,034	9,847	1	,002	1,111
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,209	,051	16,662	1	<,001	1,233
	geslacht (man, vrouw)	-,299	,154	3,780	1	,052	,741
	leeftijd	,120	,083	2,087	1	,149	1,128
	opleiding	,271	,177	2,354	1	,125	1,311
	inkomen	,089	,133	,443	1	,506	1,093
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	-,119	,105	1,280	1	,258	,888
	Percentage meergezinswoningen [%]	-,004	,004	1,084	1	,298	,996
	Nabijheid dichtsbezijnde treinstation in [km]	,009	,033	,071	1	,790	1,009
	Constant	-1,882	,650	8,391	1	,004	,152

Private car

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	76,186[a]	,229	,336

a. Estimation terminated at iteration number 20 because maximum iterations has been reached.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,050	,140	,125	1	,724	,952
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,362	,202	3,211	1	,073	1,437
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,473	,458	1,065	1	,302	,623
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,102	,298	,118	1	,731	1,108
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,180	,173	1,090	1	,297	1,198
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-15,983	4862,651	,000	1	,997	,000
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,339	,315	1,159	1	,282	,713
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,171	,135	1,601	1	,206	1,186
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,216	,269	,641	1	,423	1,241
	geslacht (man, vrouw)	,142	,693	,042	1	,838	1,153
	leeftijd	,464	,419	1,231	1	,267	1,591
	opleiding	,630	,667	,893	1	,345	1,878
	inkomen	-1,176	,671	3,070	1	,080	,308
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	,503	,514	,958	1	,328	1,654
	Percentage meergezinswoningen [%]	,032	,017	3,515	1	,061	1,033
	Nabijheid dichtsbezijnde treinstation in [km]	,146	,182	,647	1	,421	1,158
	Constant	-3,978	3,308	1,446	1	,229	,019

Private lease car

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	156,869[a]	,185	,266

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,130	,092	1,976	1	,160	1,139
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,148	,117	1,605	1	,205	1,160
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,105	,211	,249	1	,617	,900
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,223	,217	1,048	1	,306	,800
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,053	,106	,249	1	,618	1,054
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,785	,362	4,705	1	,030	2,192
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,084	,119	,497	1	,481	1,087
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,095	,097	,953	1	,329	1,099
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,265	,142	3,468	1	,063	1,303
	geslacht (man, vrouw)	-,674	,452	2,220	1	,136	,510
	leeftijd	-,184	,293	,394	1	,530	,832
	opleiding	1,180	,978	1,455	1	,228	3,253
	inkomen	-1,079	,605	3,182	1	,074	,340
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	-,391	,352	1,232	1	,267	,677
	Percentage meergezinswoningen [%]	-,016	,012	1,756	1	,185	,984
	Nabijheid dichtsbezijnde treinstation in [km]	,271	,116	5,494	1	,019	1,312
	Constant	-,714	3,021	,056	1	,813	,489

Corporate lease car

Taxi

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	2789,427[a]	,086	,124

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than ,001.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,045	,019	5,734	1	,017	1,046
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,157	,021	54,818	1	<,001	1,170
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,007	,048	,024	1	,876	1,007
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,076	,053	2,077	1	,150	,926
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,074	,020	13,489	1	<,001	1,077
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,088	,056	2,426	1	,119	1,092
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,057	,034	2,820	1	,093	1,058
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,103	,022	21,804	1	<,001	1,109
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,027	,036	,567	1	,451	1,028
	geslacht (man, vrouw)	-,165	,100	2,727	1	,099	,848
	leeftijd	-,235	,055	18,588	1	<,001	,790
	opleiding	,194	,135	2,076	1	,150	1,214
	inkomen	-,024	,080	,090	1	,764	,976
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	,190	,091	4,353	1	,037	1,210
	Percentage meergezinswoningen [%]	,011	,002	21,563	1	<,001	1,011
	Nabijheid dichtsbezijnde treinstation in [km]	,029	,027	1,181	1	,277	1,030
	Constant	-2,610	,495	27,790	1	<,001	,074

Motorcycle

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	92,404[a]	,199	,358

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,497	,155	10,225	1	,001	1,643
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,411	,147	7,849	1	,005	1,509
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,339	,273	1,550	1	,213	,712
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,093	,286	,105	1	,746	1,097
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,010	,139	,005	1	,942	,990
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-8,728	5983,867	,000	1	,999	,000
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,246	,251	,959	1	,327	1,279
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,462	,136	11,611	1	<,001	1,588
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,137	,189	,528	1	,468	1,147
	geslacht (man, vrouw)	-,620	,783	,627	1	,428	,538
	leeftijd	,554	,346	2,566	1	,109	1,740
	opleiding	1,426	,790	3,261	1	,071	4,162
	inkomen	-,697	,492	2,002	1	,157	,498
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	,881	,485	3,296	1	,069	2,414
	Percentage meergezinswoningen [%]	,016	,015	1,066	1	,302	1,016
	Nabijheid dichtsbezijnde treinstation in [km]	,012	,155	,006	1	,936	1,012
	Constant	-10,601	3,391	9,772	1	,002	,000

Moped

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	101,292[a]	,125	,211

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,030	,099	,095	1	,758	1,031
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,124	,110	1,272	1	,259	1,132
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,361	,285	1,607	1	,205	,697
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,007	,285	,001	1	,981	1,007
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,184	,194	,903	1	,342	,832
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,346	,282	1,496	1	,221	1,413
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,004	,152	,001	1	,981	,996
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,223	,103	4,741	1	,029	1,250
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,226	,227	,990	1	,320	1,253
	geslacht (man, vrouw)	,033	,611	,003	1	,957	1,033
	leeftijd	-,301	,352	,732	1	,392	,740
	opleiding	-,274	,484	,322	1	,571	,760
	inkomen	-,326	,356	,838	1	,360	,722
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	,042	,428	,010	1	,921	1,043
	Percentage meergezinswoningen [%]	-,003	,013	,060	1	,806	,997
	Nabijheid dichtsbezijnde treinstation in [km]	-,098	,107	,835	1	,361	,907
	Constant	,060	1,896	,001	1	,975	1,061

Cargo bike

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	39,350[a]	,246	,544

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,082	,220	,139	1	,710	1,085
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,279	,285	,959	1	,327	,756
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,070	,315	,049	1	,825	1,072
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-6,931	2621,194	,000	1	,998	,001
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,225	,229	,962	1	,327	1,252
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-12,170	6449,412	,000	1	,998	,000
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,404	,493	,672	1	,412	1,498
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,614	,309	3,936	1	,047	1,847
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,702	,242	8,436	1	,004	2,017
	geslacht (man, vrouw)	-,402	1,151	,122	1	,727	,669
	leeftijd	,797	,794	1,009	1	,315	2,219
	opleiding	19,316	9359,620	,000	1	,998	244854712,18
	inkomen	,262	,939	,078	1	,780	1,299
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	,697	1,659	,176	1	,675	2,007
	Percentage meergezinswoningen [%]	,047	,035	1,770	1	,183	1,048
	Nabijheid dichtsbezijnde treinstation in [km]	,337	,332	1,028	1	,311	1,400
	Constant	-70,172	28078,861	,000	1	,998	,000

E-cargo bike

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	74,593[a]	,088	,196

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,098	,136	,523	1	,470	,906
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,246	,194	1,609	1	,205	,782
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,315	,366	,739	1	,390	,730
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,049	,352	,019	1	,889	,952
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,144	,137	1,104	1	,293	1,155
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,621	,557	1,244	1	,265	1,860
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,252	,292	,749	1	,387	1,287
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,230	,178	1,672	1	,196	1,258
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,115	,224	,265	1	,607	1,122
	geslacht (man, vrouw)	-,353	,805	,192	1	,661	,703
	leeftijd	-,116	,638	,033	1	,855	,890
	opleiding	-,888	1,061	,699	1	,403	,412
	inkomen	18,068	8047,542	,000	1	,998	70282706,818
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	,200	,467	,183	1	,669	1,221
	Percentage meergezinswoningen [%]	,002	,015	,020	1	,887	1,002
	Nabijheid dichtsbezijnde treinstation in [km]	,072	,136	,282	1	,595	1,075
	Constant	-54,221	24142,627	,000	1	,998	,000

Bike

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1908,431[a]	,087	,192

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,013	,024	,298	1	,585	,987
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,027	,030	,803	1	,370	1,027
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,016	,063	,066	1	,798	1,016
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,005	,059	,008	1	,931	,995
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,031	,028	1,241	1	,265	,970
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,125	,096	1,700	1	,192	,883
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,150	,037	16,154	1	<,001	1,162
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,311	,025	159,676	1	<,001	1,364
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,049	,044	1,233	1	,267	1,050
	geslacht (man, vrouw)	,038	,132	,081	1	,775	1,038
	leeftijd	-,295	,075	15,531	1	<,001	,745
	opleiding	,085	,175	,235	1	,628	1,089
	inkomen	-,168	,094	3,236	1	,072	,845
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	,326	,113	8,389	1	,004	1,386
	Percentage meergezinswoningen [%]	,012	,003	13,544	1	<,001	1,012
	Nabijheid dichtsbezijnde treinstation in [km]	,022	,035	,413	1	,521	1,023
	Constant	-3,295	,624	27,880	1	<,001	,037

E-bike

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	454,302[a]	,039	,103

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,097	,052	3,499	1	,061	,908
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,063	,063	1,008	1	,315	1,066
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,005	,146	,001	1	,974	,995
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,161	,138	1,361	1	,243	,851
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,016	,065	,059	1	,808	,984
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,095	,118	,651	1	,420	1,100
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,097	,080	1,457	1	,227	1,101
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,141	,058	6,008	1	,014	1,152
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,236	,086	7,474	1	,006	1,267
	geslacht (man, vrouw)	-,188	,287	,428	1	,513	,829
	leeftijd	-,187	,151	1,533	1	,216	,829
	opleiding	-,241	,302	,636	1	,425	,786
	inkomen	,069	,226	,093	1	,760	1,072
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	,211	,200	1,117	1	,291	1,235
	Percentage meergezinswoningen [%]	,004	,006	,483	1	,487	1,004
	Nabijheid dichtsbezijnde treinstation in [km]	-,044	,072	,378	1	,539	,957
	Constant	-2,147	1,117	3,691	1	,055	,117

Train

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	4618,786[a]	,058	,084

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than ,001.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,125	,015	71,778	1	<,001	1,134
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,093	,018	25,186	1	<,001	1,097
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,033	,038	,762	1	,383	1,034
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,018	,032	,324	1	,569	,982
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,107	,017	42,177	1	<,001	,898
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,089	,053	2,831	1	,092	,915
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,034	,030	1,272	1	,259	1,034
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,084	,021	15,951	1	<,001	,919
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,008	,030	,069	1	,792	,992
	geslacht (man, vrouw)	-,035	,075	,210	1	,647	,966
	leeftijd	-,315	,041	58,796	1	<,001	,729
	opleiding	,221	,102	4,660	1	,031	1,247
	inkomen	-,040	,059	,461	1	,497	,961
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	-,026	,068	,145	1	,703	,975
	Percentage meergezinswoningen [%]	,007	,002	16,058	1	<,001	1,007
	Nabijheid dichtsbezijnde treinstation in [km]	,028	,022	1,706	1	,191	1,029
	Constant	-1,616	,368	19,304	1	<,001	,199

BTM

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	4833,510[a]	,067	,094

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than ,001.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,008	,014	,338	1	,561	1,008
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,040	,018	4,869	1	,027	1,041
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,033	,037	,791	1	,374	1,034
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,051	,033	2,326	1	,127	,951
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,089	,015	36,058	1	<,001	1,093
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,056	,047	1,394	1	,238	1,057
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,072	,027	7,172	1	,007	1,074
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,104	,018	33,200	1	<,001	1,109
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,038	,027	1,966	1	,161	1,039
	geslacht (man, vrouw)	-,072	,073	,975	1	,323	,930
	leeftijd	-,319	,040	64,535	1	<,001	,727
	opleiding	,171	,100	2,960	1	,085	1,187
	inkomen	,017	,057	,088	1	,767	1,017
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	-,036	,065	,304	1	,581	,965
	Percentage meergezinswoningen [%]	,003	,002	2,239	1	,135	1,003
	Nabijheid dichtsbezijnde treinstation in [km]	,014	,021	,436	1	,509	1,014
	Constant	-1,055	,354	8,879	1	,003	,348

Walking

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	2311,781[a]	,049	,110

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than ,001.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,081	,023	12,841	1	<,001	,922
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,039	,031	1,570	1	,210	,962
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,076	,053	2,041	1	,153	1,079
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,295	,112	6,880	1	,009	,745
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,164	,023	50,751	1	<,001	1,179
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,086	,072	1,401	1	,237	1,089
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,012	,037	,108	1	,742	1,012
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,159	,024	45,050	1	<,001	1,173
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,028	,041	,469	1	,493	1,029
	geslacht (man, vrouw)	-,129	,119	1,176	1	,278	,879
	leeftijd	-,258	,065	15,527	1	<,001	,773
	opleiding	-,092	,144	,406	1	,524	,912
	inkomen	-,190	,083	5,289	1	,021	,827
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	,189	,100	3,570	1	,059	1,208
	Percentage meergezinswoningen [%]	,004	,003	2,360	1	,124	1,004
	Nabijheid dichtsbezijnde treinstation in [km]	,016	,030	,279	1	,597	1,016
	Constant	-1,808	,520	12,090	1	<,001	,164

Tables D.1 – D.13. Output SPSS usage regression models.

Appendix E: Output ownership regression models

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	3546,851[a]	,110	,170

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,127	,017	55,645	1	<,001	1,136
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,013	,025	,271	1	,603	1,013
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,044	,049	,840	1	,359	,956
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,166	,030	31,275	1	<,001	1,181
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,056	,018	9,413	1	,002	1,057
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,048	,058	,684	1	,408	1,049
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,025	,039	,407	1	,524	1,025
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,101	,033	9,450	1	,002	,904
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,018	,040	,210	1	,647	,982
	geslacht (man, vrouw)	,015	,088	,029	1	,865	1,015
	leeftijd	,720	,050	210,663	1	<,001	2,055
	opleiding	,124	,115	1,163	1	,281	1,132
	inkomen	,169	,076	4,887	1	,027	1,184
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	-,147	,073	4,085	1	,043	,863
	Percentage meergezinswoningen [%]	-,008	,002	13,975	1	<,001	,992
	Nabijheid dichtsbezijnde treinstation in [km]	-,025	,025	,985	1	,321	,975
	Constant	-3,810	,439	75,324	1	<,001	,022

Private car

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	974,142[a]	,053	,127

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,076	,036	4,572	1	,033	1,079
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,112	,040	7,848	1	,005	1,118
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,088	,104	,714	1	,398	,916
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,087	,066	1,754	1	,185	1,091
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,036	,041	,757	1	,384	,965
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,009	,132	,005	1	,945	1,009
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,002	,088	,001	1	,981	,998
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,012	,056	,042	1	,838	,989
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,003	,082	,002	1	,967	,997
	geslacht (man, vrouw)	,567	,183	9,566	1	,002	1,764
	leeftijd	,821	,103	63,930	1	<,001	2,273
	opleiding	,077	,223	,121	1	,728	1,080
	inkomen	,270	,164	2,706	1	,100	1,310
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	-,010	,165	,004	1	,950	,990
	Percentage meergezinswoningen [%]	,002	,004	,232	1	,630	1,002
	Nabijheid dichtsbezijnde treinstation in [km]	-,084	,064	1,736	1	,188	,919
	Constant	-6,048	,917	43,498	1	<,001	,002

Private lease car

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	904,794[a]	,055	,122

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,068	,038	3,317	1	,069	1,071
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,071	,042	2,915	1	,088	1,074
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,031	,089	,122	1	,727	1,031
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,121	,068	3,154	1	,076	1,129
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,044	,037	1,435	1	,231	1,045
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,046	,154	,089	1	,765	,955
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,191	,120	2,528	1	,112	,826
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,059	,060	,979	1	,323	,943
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,020	,081	,061	1	,804	,980
	geslacht (man, vrouw)	,115	,192	,358	1	,550	1,122
	leeftijd	,617	,103	36,251	1	<,001	1,854
	opleiding	,935	,344	7,388	1	,007	2,548
	inkomen	,133	,175	,579	1	,447	1,142
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	,165	,159	1,075	1	,300	1,179
	Percentage meergezinswoningen [%]	,005	,004	1,081	1	,299	1,005
	Nabijheid dichtsbezijnde treinstation in [km]	-,189	,073	6,656	1	,010	,828
	Constant	-7,404	1,209	37,522	1	<,001	,001

Corporate lease car

Motorcycle

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	358,071[a]	,047	,186

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,009	,061	,022	1	,881	1,009
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,158	,070	5,117	1	,024	1,172
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,084	,184	,207	1	,649	,920
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,093	,139	,449	1	,503	1,098
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,001	,073	,000	1	,987	,999
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,225	,134	2,822	1	,093	1,253
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,137	,120	1,300	1	,254	1,147
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,256	,150	2,921	1	,087	,774
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-12,615	1140,777	,000	1	,991	,000
	geslacht (man, vrouw)	,619	,321	3,717	1	,054	1,857
	leeftijd	1,012	,186	29,662	1	<,001	2,751
	opleiding	,106	,352	,091	1	,763	1,112
	inkomen	-,046	,232	,038	1	,844	,955
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	-,363	,295	1,516	1	,218	,696
	Percentage meergezinswoningen [%]	-,004	,007	,324	1	,569	,996
	Nabijheid dichtsbezijnde treinstation in [km]	-,134	,121	1,224	1	,269	,874
	Constant	-5,362	1,494	12,872	1	<,001	,005

Moped

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	300,107[a]	,026	,132

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,024	,066	,129	1	,719	1,024
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,191	,066	8,423	1	,004	1,210
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,155	,124	1,557	1	,212	1,168
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-10,741	1546,418	,000	1	,994	,000
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,430	,153	7,857	1	,005	,650
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,003	,180	,000	1	,987	,997
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,069	,140	,243	1	,622	1,071
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,048	,072	,451	1	,502	1,049
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,342	,336	1,038	1	,308	,710
	geslacht (man, vrouw)	-,078	,410	,037	1	,848	,925
	leeftijd	,520	,190	7,503	1	,006	1,683
	opleiding	,487	,445	1,195	1	,274	1,627
	inkomen	-,139	,267	,272	1	,602	,870
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	,051	,339	,023	1	,880	1,052
	Percentage meergezinswoningen [%]	,002	,009	,058	1	,809	1,002
	Nabijheid dichtsbezijnde treinstation in [km]	-,102	,123	,688	1	,407	,903
	Constant	-5,931	1,742	11,592	1	<,001	,003

Bike

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	233,530[a]	,006	,089

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,081	,088	,854	1	,355	,922
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,085	,098	,747	1	,387	1,088
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,076	,210	,132	1	,716	1,079
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-8,465	893,184	,000	1	,992	,000
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,125	,125	,993	1	,319	,883
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,140	,214	,425	1	,514	1,150
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,141	,201	,493	1	,483	,869
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,153	,083	3,381	1	,066	1,166
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,372	,404	,847	1	,357	,689
	geslacht (man, vrouw)	-,608	,531	1,309	1	,253	,545
	leeftijd	-,074	,247	,089	1	,766	,929
	opleiding	-,001	,483	,000	1	,998	,999
	inkomen	-,489	,288	2,887	1	,089	,613
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	-,562	,492	1,304	1	,253	,570
	Percentage meergezinswoningen [%]	-,008	,010	,548	1	,459	,992
	Nabijheid dichtsbezijnde treinstation in [km]	,061	,100	,378	1	,538	1,063
	Constant	-2,106	1,813	1,349	1	,245	,122

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	215,024[a]	,007	,080

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,066	,091	,518	1	,472	1,068
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,127	,094	1,848	1	,174	1,136
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,229	,154	2,215	1	,137	1,258
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,121	,125	,939	1	,332	1,128
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,091	,096	,890	1	,345	1,095
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,255	,163	2,449	1	,118	1,290
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,019	,168	,012	1	,911	1,019
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,115	,169	,467	1	,494	,891
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,084	,175	,230	1	,631	1,088
	geslacht (man, vrouw)	-,814	,579	1,971	1	,160	,443
	leeftijd	,535	,264	4,099	1	,043	1,707
	opleiding	,104	,591	,031	1	,860	1,110
	inkomen	-,009	,412	,000	1	,983	,991
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	,021	,335	,004	1	,950	1,021
	Percentage meergezinswoningen [%]	-,004	,011	,147	1	,701	,996
	Nabijheid dichtsbezijnde treinstation in [km]	,056	,092	,372	1	,542	1,058
	Constant	-6,889	2,285	9,086	1	,003	,001

E-bike

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	241,639[a]	,015	,101

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,056	,083	,454	1	,501	1,057
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,032	,109	,085	1	,770	,969
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-,002	,217	,000	1	,991	,998
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	-12,241	1463,520	,000	1	,993	,000
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,038	,086	,196	1	,658	1,039
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,286	,145	3,907	1	,048	1,331
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,021	,154	,018	1	,894	1,021
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,001	,115	,000	1	,996	,999
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,291	,089	10,681	1	,001	1,337
	geslacht (man, vrouw)	,064	,439	,021	1	,884	1,066
	leeftijd	,696	,236	8,709	1	,003	2,006
	opleiding	,248	,556	,198	1	,656	1,281
	inkomen	-,020	,365	,003	1	,957	,980
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	-,254	,406	,392	1	,531	,775
	Percentage meergezinswoningen [%]	-,002	,010	,025	1	,873	,998
	Nabijheid dichtsbezijnde treinstation in [km]	,153	,069	4,892	1	,027	1,166
	Constant	-6,932	2,151	10,387	1	,001	,001

Cargo bike

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	134,185[a]	,011	,119

a. Estimation terminated at iteration number 9 because parameter estimates changed by less than ,001.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Deelauto (vaste plek) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,107	,113	,890	1	,346	,899
	Deelauto (free-floating) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,050	,142	,125	1	,724	1,052
	Deelauto (P2P, i.e. SnappCar) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,172	,226	,580	1	,446	1,188
	Deelauto (Cooperatie, buurtinitiatief, i.e. OnzeAuto) : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,263	,155	2,876	1	,090	1,301
	OV-fiets : : Hoe vaak maakte u het afgelopen jaar gebruik van de aanbieders van deelvervoer?	,036	,126	,081	1	,776	1,036
	Deelfiets (zonder trapondersteuning) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,385	,174	4,881	1	,027	1,470
	Deelfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,054	,186	,083	1	,773	1,055
	Deelscooter : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	-,092	,199	,214	1	,644	,912
	Deelbakfiets (elektrisch) : : Hoe vaak maakte u het afgelopen jaar gebruik van deelvervoer?	,118	,153	,593	1	,441	1,125
	geslacht (man, vrouw)	,013	,653	,000	1	,984	1,013
	leeftijd	1,010	,343	8,664	1	,003	2,745
	opleiding	,119	,737	,026	1	,872	1,126
	inkomen	-,011	,466	,001	1	,982	,989
	stedelijkheidsgraad (CBS); 5 categorieen op basis van omgevingsadressendichtheid	-,383	,594	,415	1	,519	,682
	Percentage meergezinswoningen [%]	-,001	,014	,006	1	,937	,999
	Nabijheid dichtsbezijnde treinstation in [km]	-,140	,217	,414	1	,520	,869
	Constant	-6,743	3,119	4,674	1	,031	,001

E-cargo bike-bike

Tables E.1 – E.9. Output SPSS ownership regression models.

Appendix F: Profile output LCCA

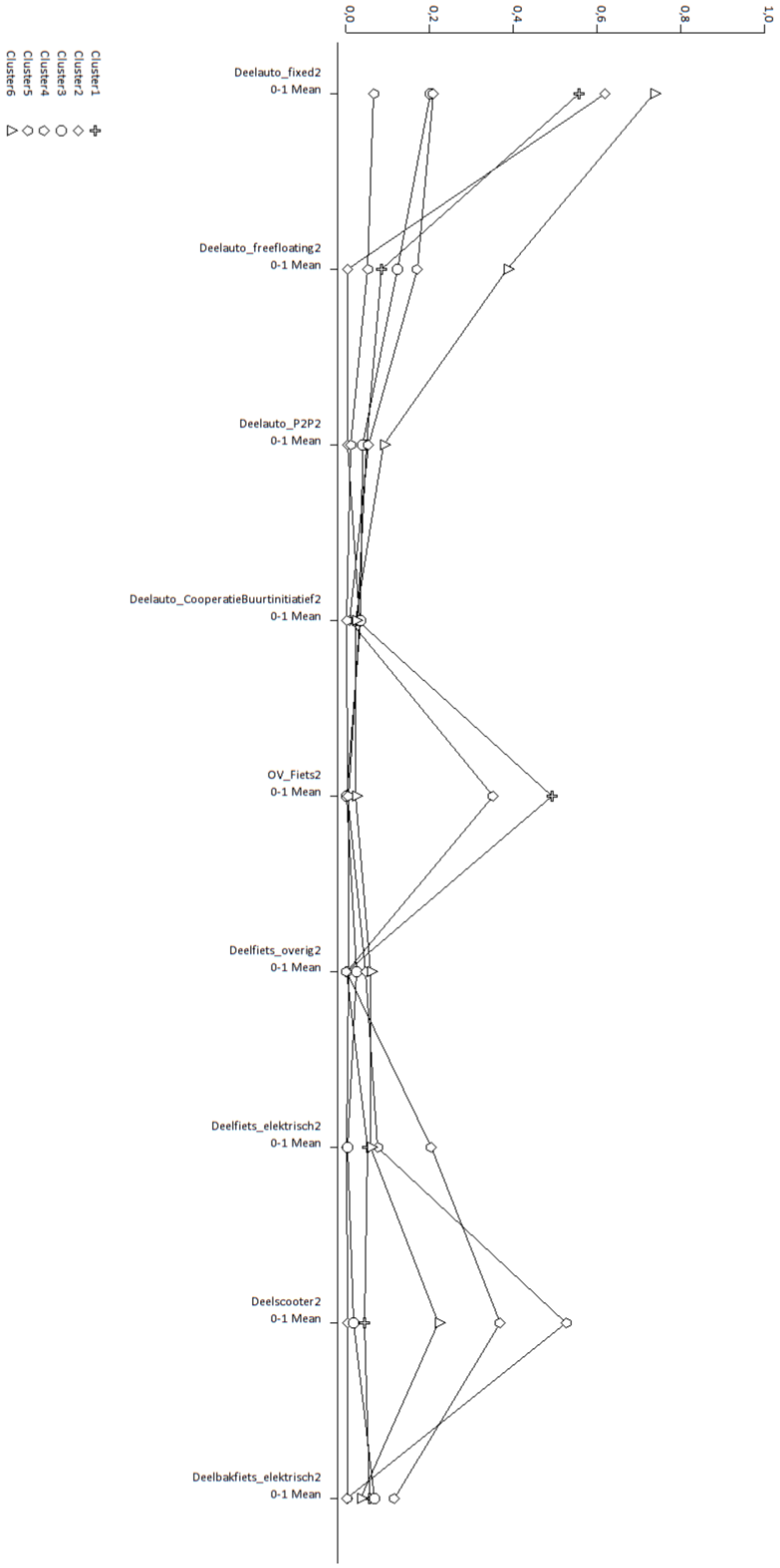


Figure F.1. Graphical profile output LCCA.

Table F.1. Full profile output LCCA.

Indicator / Category	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Overall
Cluster Size	0.32	0.29	0.18	0.08	0.07	0.06	
Deelauto_fixed2							
Nooit	0.12	0.08	0.54	0.53	0.80	0.02	0.26
Minder dan 1 keer per jaar	0.01	0.01	0.02	0.02	0.02	0.00	0.01
1-2 keer per jaar	0.09	0.07	0.14	0.14	0.09	0.03	0.09
3-4 keer per jaar	0.11	0.10	0.11	0.11	0.05	0.05	0.10
5-6 keer per jaar	0.11	0.10	0.06	0.07	0.02	0.07	0.08
7-11 keer per jaar	0.15	0.15	0.05	0.06	0.01	0.14	0.12
1-2 keer per maand	0.22	0.25	0.05	0.05	0.01	0.29	0.17
3-4 keer per maand	0.12	0.15	0.02	0.02	0.00	0.22	0.10
Meer dan 4 keer per maand	0.07	0.10	0.01	0.01	0.00	0.17	0.06
Mean	4.46	4.93	1.60	1.68	0.52	5.87	3.67
Deelauto_freefloating2							
Nooit	0.84	0.99	0.78	0.72	0.89	0.45	0.84
Minder dan 1 keer per jaar	0.01	0.00	0.01	0.01	0.01	0.01	0.01
1-2 keer per jaar	0.04	0.01	0.04	0.04	0.03	0.04	0.03
3-4 keer per jaar	0.03	0.00	0.04	0.04	0.02	0.05	0.03
5-6 keer per jaar	0.02	0.00	0.03	0.04	0.01	0.05	0.02
7-11 keer per jaar	0.02	0.00	0.03	0.04	0.01	0.08	0.02
1-2 keer per maand	0.02	0.00	0.04	0.05	0.01	0.11	0.03
3-4 keer per maand	0.01	0.00	0.02	0.02	0.00	0.07	0.01
Meer dan 4 keer per maand	0.01	0.00	0.02	0.04	0.01	0.13	0.02
Mean	0.67	0.02	0.98	1.36	0.41	3.08	0.72
Deelauto_P2P2							
Nooit	0.85	0.98	0.88	0.84	0.96	0.76	0.90
Minder dan 1 keer per jaar	0.01	0.00	0.01	0.01	0.01	0.01	0.01
1-2 keer per jaar	0.08	0.01	0.07	0.09	0.03	0.11	0.06
3-4 keer per jaar	0.03	0.00	0.02	0.03	0.00	0.05	0.02
5-6 keer per jaar	0.02	0.00	0.01	0.02	0.00	0.03	0.01
7-11 keer per jaar	0.01	0.00	0.00	0.01	0.00	0.02	0.00
1-2 keer per maand	0.00	0.00	0.00	0.00	0.00	0.01	0.00
3-4 keer per maand	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Meer dan 4 keer per maand	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Mean	0.39	0.03	0.31	0.43	0.08	0.71	0.27
Deelauto_Cooperatie2							
Nooit	0.96	0.95	0.95	0.99	1.00	0.96	0.96
Minder dan 1 keer per jaar	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-2 keer per jaar	0.00	0.01	0.01	0.00	0.00	0.00	0.00

Indicator / Category	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Overall
3-4 keer per jaar	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-6 keer per jaar	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-11 keer per jaar	0.00	0.01	0.01	0.00	0.00	0.00	0.00
1-2 keer per maand	0.01	0.01	0.01	0.00	0.00	0.01	0.01
3-4 keer per maand	0.01	0.01	0.01	0.00	0.00	0.01	0.01
Meer dan 4 keer per maand	0.01	0.01	0.01	0.00	0.00	0.01	0.01
Mean	0.22	0.26	0.28	0.06	0.00	0.19	0.21
OV_Fiets2							
Nooit	0.13	0.98	0.99	0.28	0.99	0.92	0.65
Minder dan 1 keer per jaar	0.01	0.01	0.00	0.01	0.00	0.01	0.01
1-2 keer per jaar	0.11	0.01	0.00	0.15	0.01	0.05	0.05
3-4 keer per jaar	0.16	0.00	0.00	0.18	0.00	0.02	0.07
5-6 keer per jaar	0.16	0.00	0.00	0.14	0.00	0.00	0.06
7-11 keer per jaar	0.17	0.00	0.00	0.12	0.00	0.00	0.06
1-2 keer per maand	0.15	0.00	0.00	0.09	0.00	0.00	0.06
3-4 keer per maand	0.06	0.00	0.00	0.03	0.00	0.00	0.02
Meer dan 4 keer per maand	0.05	0.00	0.00	0.02	0.00	0.00	0.02
Mean	3.94	0.04	0.01	2.82	0.03	0.19	1.50
Deelfiets_overig2							
Nooit	1.00	0.98	0.95	0.99	0.92	0.90	0.97
Minder dan 1 keer per jaar	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-2 keer per jaar	0.00	0.01	0.01	0.00	0.01	0.01	0.01
3-4 keer per jaar	0.00	0.00	0.01	0.00	0.02	0.02	0.01
5-6 keer per jaar	0.00	0.00	0.01	0.00	0.01	0.02	0.00
7-11 keer per jaar	0.00	0.00	0.01	0.00	0.01	0.02	0.00
1-2 keer per maand	0.00	0.00	0.01	0.00	0.01	0.02	0.00
3-4 keer per maand	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Meer dan 4 keer per maand	0.00	0.00	0.00	0.00	0.01	0.01	0.00
Mean	0.00	0.06	0.20	0.01	0.37	0.47	0.11
Deelfiets_elektrisch2							
Nooit	0.88	1.00	0.98	0.64	0.83	0.86	0.91
Minder dan 1 keer per jaar	0.01	0.00	0.00	0.01	0.01	0.01	0.01
1-2 keer per jaar	0.04	0.00	0.01	0.07	0.05	0.05	0.03
3-4 keer per jaar	0.03	0.00	0.00	0.05	0.03	0.03	0.02
5-6 keer per jaar	0.02	0.00	0.00	0.05	0.02	0.02	0.01
7-11 keer per jaar	0.01	0.00	0.00	0.05	0.02	0.02	0.01
1-2 keer per maand	0.01	0.00	0.00	0.05	0.02	0.01	0.01
3-4 keer per maand	0.00	0.00	0.00	0.03	0.01	0.00	0.00
Meer dan 4 keer per maand	0.00	0.00	0.00	0.04	0.01	0.00	0.01

Indicator / Category	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Overall
Mean	0.40	0.00	0.04	1.63	0.60	0.48	0.33
Deelscooter2							
Nooit	0.90	0.99	0.95	0.45	0.28	0.63	0.84
Minder dan 1 keer per jaar	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-2 keer per jaar	0.03	0.01	0.02	0.05	0.04	0.05	0.03
3-4 keer per jaar	0.02	0.00	0.01	0.06	0.05	0.05	0.02
5-6 keer per jaar	0.02	0.00	0.01	0.08	0.08	0.06	0.02
7-11 keer per jaar	0.01	0.00	0.00	0.09	0.11	0.06	0.02
1-2 keer per maand	0.01	0.00	0.00	0.11	0.15	0.06	0.03
3-4 keer per maand	0.00	0.00	0.00	0.06	0.10	0.03	0.01
Meer dan 4 keer per maand	0.00	0.00	0.00	0.10	0.18	0.04	0.02
Mean	0.36	0.03	0.15	2.93	4.19	1.77	0.77
Deelbakfiets_elektrisch2							
Nooit	0.87	0.99	0.85	0.77	1.00	0.91	0.90
Minder dan 1 keer per jaar	0.01	0.00	0.01	0.01	0.00	0.01	0.00
1-2 keer per jaar	0.04	0.01	0.05	0.06	0.00	0.04	0.03
3-4 keer per jaar	0.03	0.00	0.03	0.04	0.00	0.02	0.02
5-6 keer per jaar	0.02	0.00	0.02	0.04	0.00	0.01	0.01
7-11 keer per jaar	0.01	0.00	0.02	0.03	0.00	0.01	0.01
1-2 keer per maand	0.01	0.00	0.02	0.03	0.00	0.01	0.01
3-4 keer per maand	0.00	0.00	0.01	0.01	0.00	0.00	0.00
Meer dan 4 keer per maand	0.00	0.00	0.01	0.01	0.00	0.00	0.00
Mean	0.45	0.03	0.55	0.93	0.01	0.27	0.34

Appendix G: Distal outcomes output

Table G.1. Intercepts for impact of class membership on dependent (usage) variables.

Dependent	Category	Overall	Wald	p-value
Gebruik_Auto_Eigendom	Geen reductie	0.46	0.33	0.56
	Reductie	-0.46		
Gebruik_Auto_ZakelijkeLease	Geen reductie	-0.47	0.36	0.55
	Reductie	0.47		
Gebruik_Taxi	Geen reductie	-0.47	0.36	0.55
	Reductie	0.47		
Gebruik_Motor	Geen reductie	.	.	.
	Reductie	.		
Gebruik_Fiets	Geen reductie	-0.45	0.29	0.59
	Reductie	0.45		
Gebruik_Fiets_elektrisch	Geen reductie	-0.45	0.29	0.59
	Reductie	0.45		
Gebruik_Trein	Geen reductie	.	.	.
	Reductie	.		
Gebruik_BTM	Geen reductie	.	.	.
	Reductie	.		
Gebruik_Lopen	Geen reductie	0.46	0.33	0.56
	Reductie	-0.46		

Table G.2. Cluster distribution of dependent (usage) variables.

Overall		0.67	0.33	0.33	0.33	0.67	0.67	0.33	0.67	0.67
Cluster 6	0.00	0.67	0.33	0.33	0.33	0.67	0.67	0.33	0.67	0.67
Cluster 5	0.29	0.22	0.78	0.78	0.06	0.94	0.94	0.06	0.94	0.94
Cluster 4	0.35	0.80	0.20	0.20	0.07	0.93	0.93	0.07	0.93	0.93
Cluster 3	0.30	0.95	0.05	0.05	0.89	0.11	0.11	0.89	0.11	0.11
Cluster 2	0.00	0.67	0.33	0.33	0.34	0.66	0.66	0.34	0.66	0.66
Cluster 1	0.05	0.75	0.25	0.25	0.28	0.72	0.72	0.28	0.72	0.72
Type		Geen reductie	Reductie	Mean	Geen reductie	Reductie	Mean	Geen reductie	Reductie	Mean
Variable	**Cluster Size**	**Gebruik_Auto_Eigendom**			**Gebruik_Auto_ZakelijkeLease**			**Gebruik_Taxi**		

1.00	0.00	0.33	0.67	0.67	0.33	0.67	0.67	1.00	0.00	1.00
1.00	0.00	0.33	0.67	0.67	0.33	0.67	0.67	1.00	0.00	1.00
1.00	0.00	0.17	0.83	0.83	0.17	0.83	0.83	1.00	0.00	1.00
1.00	0.00	0.70	0.30	0.30	0.70	0.30	0.30	1.00	0.00	1.00
1.00	0.00	0.06	0.94	0.94	0.06	0.94	0.94	1.00	0.00	1.00
1.00	0.00	0.33	0.67	0.67	0.33	0.67	0.67	1.00	0.00	1.00
1.00	0.00	0.39	0.61	0.61	0.39	0.61	0.61	1.00	0.00	1.00
Geen reductie	Mean	Geen reductie	Reductie	Mean	Geen reductie	Reductie	Mean	Geen reductie	Mean	Geen reductie
Gebruik_ Motor		**Gebruik_ Fiets**			**Gebruik_ Fiets_ele ktrisch**			**Gebruik_ Trein**		**Gebruik_ BTM**

0.00	0.67	0.33	0.33
0.00	0.67	0.33	0.33
0.00	0.22	0.78	0.78
0.00	0.80	0.20	0.20
0.00	0.95	0.05	0.05
0.00	0.67	0.33	0.33
0.00	0.75	0.25	0.25
Mean	Geen reductie	Reductie	Mean
	Gebruik_ Lopen		

Table G.3. Intercepts for impact of class membership on dependent (ownership) variables.

Dependent	Category	Intercept	Wald	p-value
Bezit_Auto_Eigendom	Geen reductie	1.70	56.51	5.6e-14
	Reductie	-1.70		
Bezit_Auto_PrivateLease	Geen reductie	2.79	34.29	4.7e-9
	Reductie	-2.79		
Bezit_Auto_ZakelijkeLease	Geen reductie	2.63	46.14	1.1e-11
	Reductie	-2.63		
Bezit_Motor	Geen reductie	2.41	156.70	6.0e-36
	Reductie	-2.41		
Bezit_BrommerScooter	Geen reductie	2.40	54.93	1.2e-13
	Reductie	-2.40		
Bezit_Fiets	Geen reductie	2.64	184.35	5.4e-42
	Reductie	-2.64		
Bezit_Fiets_elektrisch	Geen reductie	3.02	29.10	6.9e-8
	Reductie	-3.02		
Bezit_Bakfiets	Geen reductie	2.65	26.55	2.6e-7
	Reductie	-2.65		
Bezit_Bakfiets_elektrisch	Geen reductie	2.98	57.72	3.0e-14
	Reductie	-2.98		