

Masterthesis

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# Flexible working hours, effective tool in reducing congestion?

*A qualitative research on the demand and motivation  
for/against flexible working hour measures*

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# Abstract

Congestion and optimizing the use infrastructure are hot topics in the Netherlands. To tackle this congestion problem different policies can be implemented. Seeing as the current predominately used anti-congestion measures seem to be ineffective in ensuring a high level of mobility in the long run, implementing flexible working hour initiatives on a large scale and thus spreading the need for transportation over the day could help to tackle the current congestion problem. This idea sound simple and effective, but how do the actual commuters, the employees stuck in traffic, react to these policies and why?

This thesis has been written with the aim of assessing the effectiveness of flexible working hour initiatives on the reduction of congestion from the employee's point of view. Data used in this thesis has been collected by conducting an online survey, which investigates the employee's use, demand and motivation for various flexible working hour initiatives. Based on the respondent specific aspects, demographic groups could be formed. Within these groups several chi-square tests have been conducted to check whether the distribution of data is independent of the variables. The results showed that, from the perspective of the employees, flexible working hour initiatives not effective. This conclusion has been derived from the fact that a large portion of the sample is already working with flexible working hours, additional flexibility is not desired, significant difference between demographic groups appear limited and initiatives to encourage public transport use in off peak hours also appear ineffective. In addition, advise has been given should one pursue to increase the demand for flexible working hours or increase the willingness to use public transport for work-related traveling in the off-peak hours.

# 1. Introduction

## 1.1 Congestion, why a problem?

Congestion and optimizing the infrastructure is a hot topic in the Netherlands. Due to the growing economy, the need for transporting goods and people has been growing in recent years. As a result, the congestion problem in the Netherlands keeps growing. The main cause of congestion can be derived from the fact that people make use of transport during similar times of the day. These time slots, usually in the morning between 6.30-9.00 and afternoon/evening between 15.30-19.00, are subsequently called rush hours (ANWB, 2018). This recurring congestion has negative impacts on the economy. Due to delays in transport, a lot of money is being lost by having trucks and other value carrying vehicles stand still in traffic jams. This makes for the fact that products will be delivered later to either the shops or another manufacturer and will therefore lead to a disruption in the whole supply chain. In the Netherlands this problem of congestion is a very serious issue. TNO, a well-known Dutch institute for applied scientific research, has calculated how much money is being lost by congestion. Based on their models they found that in 2016, the total costs the entire economy amounted to the astonishing number of 1,2 billion euros (RTLnieuws, 2017).

Certain regions in the Netherlands form severe bottlenecks in traffic according to this report. Especially the Prins Clausplein, a highway conjunction near The Hague, is the bottleneck where most money is being lost with a 19,3-million-euro price tag on an annual basis. In addition to the Prins Clausplein, the highways towards and from Rotterdam have a tendency of getting highly congested during the peak hours, which is mainly caused by people travelling either to or from their work. In a report written by the department of infrastructure and environment, it is estimated that the costs caused by congestion will rise to around 6 billion euro's in 2030 (Rijksoverheid, 2017).

To tackle this congestion problem different policies can be implemented. These policies come in various forms of which building extra high ways is the oldest and most well-known strategy to tackle congestion. Through the years measures related to road pricing and providing various sorts of monetary incentives were added to the arsenal of predominantly used anti-congestion measures. There is however, a lot of criticism on the traditional ways of tackling congestion. News agencies such as NOS (2018) and the Volkskrant (2006) claim that

these traditional policies are ineffective in ensuring a high level of mobility and minimizing the congestion costs in the long run. That's why in more recent years there has been an increasing emphasis on changing the travelling behaviour of people. Having (a part of the) daily commuters travel in off peak hours could really help in optimizing the current infrastructure while at the same time decrease congestion costs (Telegraaf, 2017). Therefore, different initiatives which help to spread the need for transportation over the entire day, instead of just the peak hours, could help to solve the congestion problem.

## **1.2 Research question**

One way to spread the use of the infrastructure over the day is by having flexible working hours implemented on a larger scale. Seeing as most people who are stuck in traffic are either travelling from home to work or vice versa, introducing flexible working hours could enable them to avoid the rush hours. In theory, this will relieve pressure of the highways during peak hours and will thus contribute to more efficient usage of the existing infrastructure. This idea sound simple and effective, but how do the actual commuters, the employees stuck in traffic, react to this policy? And is the appreciation and willingness to change working hours significant different between certain demographic groups such as; young vs old, low vs high educated employees and man vs female? How about a shift in transportation mode from car to public transport and what are the main motivation to either demand or rejects said initiatives? Taking all of this into account, this thesis will try to find an answer to the following question:

*How effective are the flexible working hour initiatives in reducing congestion from the employee's point of view?*

## **1.3 Aim of the research**

As this thesis is devoted to finding an answer to the question whether flexible working hour initiatives are effective from the point of view of the employees, the employees will be divided in demographic groups to see if they respond differently to initiatives related to flexible

working hours and the possibility to take public transport in the off-peak hours. The results obtained from this research can be used to optimize the effectiveness of new transport policies. These new policies could be especially aimed at getting certain groups, who may prove to be highly receptive to said initiatives, to travel out of the peak hours and have them preferably take the public transport as to optimize the mobility of the current infrastructure and thus to decrease the costs of congestion.

## **1.4 Sub-questions**

The main question of this thesis is comprised of several elements. To study the effectiveness of flexible working hours initiatives from the employee's point of view the demand for these initiatives has to be researched, while at the same time the motivation of said demand or the lack thereof has to be mapped out. In order to provide an answer to this research question three sub-questions have been formulated, each of which aimed at tackling a specific aspect of the main research question.

First of all, the main research question demands an answer on whether employees would be willing to change their traveling behaviour to a different timeslot during the day and whether there are significant differences to be found between the various demographic groups. The first sub-question will therefore be as followed:

*Does the demand and use for flexible working hours differ significantly between demographic groups?*

In addition to this most basic form flexible working hour initiatives, it will also be tested whether employees would be willing to change their mode of transport from car to public transport in off-peak hours when working with flexible working hours. Next to general results from the entire sample, this sub-question will be mainly focussed on testing whether there are significant differences in the willingness to make a modal switch to public transport in off-peak hours between various demographic groups. The second sub-question will therefore be formulated as follows:

*Does the willingness to travel by public transport in off-peak hours differ significantly between demographic groups?*

Finally, to provide a decent answer to the main research question, the motivations in favour of or against the use of flexible working hours and the modal shift towards public transport have to be mapped out. This part of the research question will be answered by making use of the third and final sub-question, which has been formulated as follows:

*What are the main motivations to either demand or reject flexible working hours and travelling with public transport in off-peak hours?*

## **1.5 Thesis structure**

The thesis has been written in the following structure. After this introductory chapter, the literature review will be discussed in chapter two. The literature review will delve deeper into the evolution of anti-congestion measures, elaborate on use and effectiveness of various forms and of these measures, current institutes working on the flow and mobility of traffic in the Netherlands as well as discussing research on flexible working hours. Chapter three will elaborate on the methodology used in this thesis, by discussing how the analysis of the collected data will be conducted. Following this, chapter four will be devoted to discussing the results of said analysis. In this chapter, the results which should enable us to answer the three sub-questions will be discussed in depth. This thesis will be concluded by chapter five in which the conclusions will be drawn based on the results obtained in chapter four. Besides providing a conclusion to this thesis, chapter five will also discuss limitations encountered in this thesis as well as provide suggestions for future research.



## 2. Literature review

### 2.1 Literature intro

Congestion poses a serious problem in many countries. For the average driver, congestion can evoke a lot of irritation seeing as one is limited in its mobility and precious (working) time is being lost. For the economy as a whole, congestion poses a far graver problem as was explained in the previous chapter. It has been calculated by TNO that current congestion levels cost the Dutch economy around 1,2 billion euros on an annual basis. These costs will increase to a staggering amount of 3 billion euros in 2030.

As this thesis is devoted to finding an answer to the question whether flexible working hour initiatives are effective from the point of view of the employees, the results of this research can be used to optimize the effectiveness of new transport policies. These new policies could be especially aimed at getting certain groups to travel out of the peak hours and have them preferably take the public transport as to optimize the mobility of the current infrastructure and thus to decrease the costs of congestion.

In order to be able to answer this question, one must first take notice of the history of congestion measures, various types of research projects and their results. This knowledge will be essential in order to truly understand the core of the congestion problem. This literature research will follow a certain structure; first of all, the history and evolution of anti-congestion measures worldwide will be discussed as well as their results. Following this evolution, the more contemporary research projects and institutions in the Netherlands, related to the topic of this thesis, will be discussed. Finally, I will delve deeper into research on flexible working hours and its general implications for the congestion problem as well as for the employee personally.

## 2.2 Evolution and effectiveness of anti-congestion measures

### 2.2.1 Building additional roads

Ever since cars and other motorised vehicles were produced on a massive scale, congestion became a problem. The first widely-used measure to solve this problem was by simply expanding the infrastructure network. In his research on the effect of expanding the infrastructure on the productivity in the United states, Fernald (1999) touches upon the US history with infrastructural problems. He states that due to the full highways, the productivity growth of several industries was limited. In order to boost the economy and alleviate pressure of the infrastructure, more roads had to be created. In the 1950's and 1960's, road-building accounted for a substantial fraction of capital formation in the United States (Fernald, 1999). This measure did however not have a significant effect on the productivity growth nor easing the pressure of congested roads.

Even though Fernald (1999) did not find a significant effect, building additional roads remained the general measure to fight the congestion problem. This same notion can be read in the paper of Vickrey (1969) on congestion theory and infrastructure investment. Increasing mobility and optimizing the transport infrastructure necessarily begins by large investments in the provision of new roads. These investments aimed to relieve congestion on existing routes (Vickrey, 1969).

As can be read above the measure of fighting congestion by building extra roads and thus increasing the infrastructure network is already being used for over more than half a century. Even in more recent times this measure is still being used despite its lack success in reducing congestion. In a study by Hartgen and Fields (2006), it is researched how many additional miles of roads have to be created in the United States over the coming years in order to ensure the mobility on the highways in next two decades. Their model showed that more than 228,000 miles of additional lanes need to be constructed to meet their mobility goal. The costs of this project would amount to approximately 840 billion dollars (Hartgen & Fields, 2006). A striking comment in their study suggests that in addition to the road expansions more anti-congestion measures need to be implemented, for expanding the infrastructure is not the optimal measure to fight congestion.

This notion that building more roads is no optimal measure or that it is not even an effective policy, is shared in the majority of the academic research concerning this subject. This line of reasoning is for example apparent in the study by Gordon and Richardson (2000) on the suburban sprawl of American cities. In their study they state that for cities to grow effectively, mobility plays an important role. When the (local) government tries to improve the mobility in and around a city by building extra roads, and thus fight congestion, the mobility is not significantly improved. In the typical case, increasing highway capacity attracts additional traffic equivalent to between one-third and one-half of the new capacity (Gordon & Richardson, 2000).

The trend that highways fill up again after expansion projects have been finished is also discussed by Downs (1992) in his work called 'Stuck in traffic – coping with peak hour traffic congestion'. His work can be related to Gordon and Richardson (2000), for the fact that that Downs brings up city expansion and economic growth as reasons that traffic, and thus the congestion problem, has been increasing for years. In simple terms his reasoning for this statement is as follows; expansion of cities and growing economies means more jobs and citizens, more jobs/citizens make for a higher need for transport, more transport causes more congestion. With this problem being apparent in many states in the USA, major infrastructural expansion projects have been undertaken such as Fernald (1999) has discussed. In this work, however, Downs has quantified the congestion in terms of average traffic jam length and waiting time within several American states. These variables are used to check whether the road expansions had a significant impact on the congestion in the long term. Downs concludes the same as Gordon and Richardson (2000), meaning that highways fill up with additional vehicles after the expansion, making building extra roads ineffective in the long run.

Also in the paper of Abram and Hagstrom (2004), Downs (2004) and Sherlock (1991) this same conclusion is made. Abram and Hagstrom (2004) go as far to say that more roads could make congestion even worse. In their research on the traffic flow in Sioux Falls (South Dakota, USA), they modelled the traffic flow in case of a road expansion. From this model they concluded that additional roads would attract more vehicles than it could physically handle. Based on these findings they opt for additional, non-expansion measures to fight congestion. This conclusion and advise is also given by Downs (2004) as he states building roads will not

eliminate current congestion, nor prevent it from arising on new roads. He suggests more measures to stimulate drivers not to travel during peak hours.

This problem of highways filling up after road expansion projects can be explained by microeconomic theory. Falcocchio and Levinson (2015) apply microeconomic theory to traffic in their paper on strategies for recurring congestion. When an infrastructure expansion project has been conducted, the supply of physical roads increases from  $S_0$  to  $S_1$  as can be seen in figure 1. This would improve the flow of traffic and decrease congestion levels seeing as the user cost per trip, which is affected by congestion levels, decreases to the interception point of the new supply function and the initial demand for traveling. However, due to the expanded infrastructure, the demand for traveling also increases over time from  $D_0$  to  $D_1$ . As can be seen in figure 1, the expanded infrastructure supply and the increased demand for traveling make for an even greater traffic volume and larger congestion problems, which are represented by the road user costs.

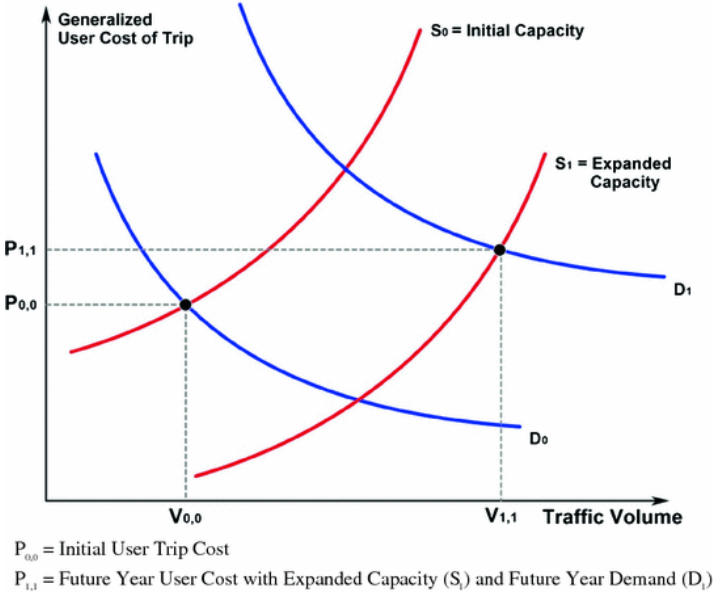


Figure 1: Microeconomic theory applied to traffic (source Falcocchio & Levinson (2015))

Where the papers in the section above mostly concern the United States, Sherlock (2004) writes in his paper on the congestion problems in the UK. It presents the case against the United Kingdom transport policies at that time, suggesting that the building of more roads will not rid the cities of traffic problems, but rather lead to more traffic congestion levels (Sherlock, 2004). The solution offered by Sherlock (2004) is the same as Abram & Hagstrom

(2004), Downs (2004), Fernald (1999), Gordon & Richardson (2000) and Hartgen & Fields (2006), which is that different anti-congestion measures and policies are needed to fight the problems on highways.

### **2.2.2 Road pricing**

All this research on the effectiveness of building additional roads to solve the congestion problem resulted in a different general policy against congestion: road pricing. Seeing as economists generally make use of pricing to solve economic issues, pricing in terms of road use was a considerable new policy besides increasing the road capacity. With the case of road use pricing, one either has to pay for driving on a particular road at a certain time or gets subsidies for not doing so. This policy has been proposed by various academic researchers such as Börjesson et al (2015), Downs (2004), Hensher & Puckett (2007) and Gordon & Richardson (2000), for it would encourage drivers to reschedule or reroute trips, try alternative modes of travel or make use of carpooling (MacKenzie, Dower and Chen, 1992).

In the academic literature concerning road pricing, some major categories of research can be distinguished on this type of anti-congestion measure (Knockaert et al., 2011).

In the first category, it is assumed that pricing according to theoretically optimal pricing models is not possible. This category which is often referred to as the so called 'second-best aspects of road pricing', makes use of an approximation when it comes to putting a price to transportation. In this line of research, it is also discussed that prices for driving a certain time can either be positive or negative. Positive prices in this case are represented by taxes, while negative prices take the form of subsidies for conforming to a desired type of traveling behaviour. An example of subsidizing/rewarding certain travel behaviour is the Dutch project 'Spitsmijden' which will be elaborated on in later sections of this literature review. Since psychological literature stresses to focus on incentives like punishments or rewards when focussing on voluntary behaviour, also socialization factors like communication and conformity are playing a role. Petty and Cacioppo (1986) state that when people recognize they have personal stakes in a matter, information which is provided about the matter is precise they are more likely to respond to a reward. However, due to the fact that congestion

is causes negative externalities, taxes would be more optimal according to the conclusions of Knockaert et al (2011), Small, Verhoef & Lindsey (2007) and Downs (2004).

Next to the more theoretical research on road pricing, the second category within this theme is more focussed on the quantitative research. It investigates the impacts of several transportation policies which make us of road pricing. Several studies have found behavioural impacts of transport pricing depending on several aspects like the level of prices, design of the policy and the local circumstances (Small & Gomez-Ibanez, 1998; Santos, 2004; Small & Verhoef, 2004; Jensen-Butler et al., 2008). In most papers, using road pricing to fight the congestion problem seemed quite effective as it causes significant variation in the choice of departure time (including the choice to travel on another day), mode or route over time (Hesher and Puckett, 2007). These studies do not only cover the USA, but also other places, like London and most relevant for this thesis, the Netherlands. From these papers, it can be stated that road pricing is an actual international trend to experiment with incentives to reduce the traffic congestion in rush hours.

Two of the most drastic experimental projects concerning road pricing have been set up in London and Stockholm. As Hesher & Puckett (2007) and Evans (2005) elaborate on in their papers, the measures taken to reduce congestion in both cities have had significant successes. The project in Stockholm made use of variable road user charges based on the time of traveling, to decrease congestion and encourage people to divert their travel to another time of the day. In London, the Congestion Charge project was set up in the early 2000's to reduce congestion in the inner city, improve air quality and encourage people to take public transport. The principle idea behind this project is that drivers have to pay a daily charge for entering the centre of London between 7am and 6pm from Monday to Friday. Besides a significant decrease in traffic this project has shown decreases of up to 25% in levels of NO<sub>x</sub> and particulates from vehicle exhausts, since the charge was introduced (Hesher and Puckett, 2007).

### **2.2.3 Behavioural change and Travel Demand Management**

Despite its successes in different cities all around the world, such as the previously discussed London Congestion Charge and the variable road user charge in Stockholm, congestion pricing

faces many hurdles (Orski, 1990). As a starter, implementing road pricing can be very expensive. In the case of London, the implementation costs of the Congestion Charge amounted to over 162 million pounds while the operating costs can easily exceed the 5 million pounds on an annual basis (Evans, 2007). Seeing as the London case makes use of positive road prices, their investment can be earned back. When the (local) government, however, decides to implement subsidies for driving during off-peak hours, the costs incurred for this project can put a lot of pressure on local budgets.

Moreover, Arnott, Rave and Schöb (2005) conclude in their work on alleviating urban traffic congestion that the average number of traffic delay hours cannot be decreased significantly by road pricing alone. Even after some successes with road pricing, which has been advocated by economists for years, this measure is encountering considerable political resistance (Arnott, Rave & Schöb, 2005)

Due to these reasons, a new form of anti-congestion measure had to be developed. The new and third major measure had to focus on changing the travel behaviour of daily commuters without incurring substantial costs. This has resulted in Travel Demand Management.

Travel Demand Management (TDM) is an umbrella term for a wide range of specialized policies, targeted programs and innovative mobility services that encourage people to use sustainable modes of transportation, rather than driving alone, or make fewer trips by car (Vaughan, 2017). At its basis, TDM provides drivers with information and incentives to guide them to a transportation choice which is preferable in optimizing the transportation system. Several researches on voluntary travel behaviour change state that providing exact information will have an influence on the probability of change (Taylor & Ampt, 2003; Stopher, 2004). TDM measures could be both traditional and innovative technology-based services to help people use public transport, ridesharing, telework and other initiatives to reduce congestion on the roads (Mobilitylab, 2018).

Research on the effectiveness of TDM policies is very broad. The paper by Meyer (1999) which investigates the effectiveness of numerous policies where carrots and sticks are used to influence a driver's travel behaviour, concludes that TDM can be effective when it is used in a mix of various anti-congestion measures. Even though most studies on TDM shows positive results in reducing congestion, the policies used in the investigated cases do not solely

make use of TDM measures as was the case in Meyer (1999). These measures are mostly a combination of TDM measures like providing additional traffic information and subsidies for public transport, but also road pricing-measures. A TDM program at individual employment sites could reduce vehicle trips by as much as 30–40%, when making use of additional anti-congestion measures (Meyer, 1997). The same conclusion can be found in the paper by Gärling and Schuitema (2007).

*“TDM measures alone are unlikely to be effective in reducing car use. Therefore, coercive TDM measures (road pricing initiatives) such as increasing cost for or prohibiting car use may be necessary but are difficult to implement because of public opposition and political infeasibility. If combined with TDM measures providing attractive travel alternatives and communicating the benefits of car-use reduction to the public, coercive TDM measures are likely to become more effective, acceptable, and politically feasible.”* (Gärling & Schuitema, 2007).

As can be read in this section of Gärling and Schuitema (2007), policies which make use of both TDM and measures like road pricing can have a greater effect in tackling congestion problems, while at the same time safeguarding public and political acceptance. Similarly, Orski (1990) states that TDM measures alone do not solve the congestion problem. TDM is not the magic solution, but it is a useful addition to our arsenal of traffic mitigation tools (Orski, 1990).

### **2.3 Congestion reduction & mobility optimization in The Netherlands**

Based on the emergence of building additional infrastructure, road pricing and TDM as the predominant measures to tackle the congestion problem, many projects and initiatives have been set up. As this thesis is devoted to finding an answer whether demographic groups of employees can be guided out of peak hour travel by use of flexible working hours and public transport in the Netherlands, it may wise to take a look at different contemporary Dutch initiatives on tackling the congestion problem.

A well-known Dutch initiative in reducing congestion is ‘Spitsmijden’. The ‘Spitsmijden’ project is based on rewarding frequent car users for avoiding the peak hours. This is a typical example of negative road pricing as discussed in the section ‘road pricing’. With this project, policymakers try to get the frequent car users to avoid peak hours by making use of monetary



incentives (Ben-Elia, Boeije, and Ettema, 2010). Since the Dutch highways are getting more and more congested, a group of universities, companies and government institutions established the 'Spitsmijden' project together. 'Spitsmijden' can be translated as avoiding the peak hour (Knockaert et al., 2011).

The first project of 'Spitsmijden' started in 2007. This project was only aimed at the A12 highway between Zoetermeer and The Hague. The project was deemed very effective, for the fact that 340 participants of the project reduced their number of trips in the peak hour by half (Knockaert et al., 2011). Since the Netherlands was one of the first countries which developed such a project, there were not much comparable experiments which they could use. Since they wanted to explore the concept further, they made a second 'Spitsmijden' project to test whether the rewards could also be durable over a longer time.

The organisations behind projects such as 'Spitsmijden' are numerous. In Rotterdam the 'Verkeersonderneming' has been set up to investigate and tackle regional traffic problems and thus to improve mobility in and around the region. Other institutions such as 'Bereik!' and 'Beter Benutten' have been established over the years to improve mobility on both highways, waterways and the inner city in the greater metropolitan area between Rotterdam and The Hague (Beter Benutten, 2018; Bereik, 2018). Where Bereik and Beter Benutten have been set up to tackle the more regional problems concerning traffic, the KiM, Kennis instituut voor Mobiliteitsbeleid (institute for mobility measures), monitors the trends and developments on the mobility in the Netherlands. In its yearly report the growth of traffic, problems with congestion and the development of public transport usage are represented to inform both policy makers and the general public on the current state of the Dutch infrastructure (KiM, 2018). All consulted institutions make use of one or more of the previously discussed dominant transport policies, especially TDM. The Dutch institution put a lot of emphasis on getting people to travel outside of peak hours on a structural basis, for it provides a sustainable improvement for the mobility of The Netherlands (Rijksoverheid, 2014).

## 2.4 Flexible working hours

Despite the fact that these institutions make use of TDM as part of their policy in tackling traffic issues, they do not focus that extensively on flexible working hours as a way of TDM to get people to change their travelling behaviour on a structural basis.

However, using flexible working hours can yield significant results in various aspects of transportation, according to Safavian and Mclean (1975). In their research on the benefits of flexible working hours, Safavian and Mclean analysed the effects of this low-cost project in Ottawa. In this project, 33.000 out of 70.000 people working in the inner city of Ottawa participated in a flexible working program. By collecting and analysing data on several points in time, both before and after the implementation of this project, Safavian and Mclean wanted to evaluate the effect of flexible working hours on various transportation aspects such as; transit time, congestion and the use of public transport. They found that the transit time of getting from home to work decreased significantly, while the use of public transport was significantly higher and its usage had a "flatter distribution" over the peak hours in both the morning and evening (Safavian and Mclean, 1975). These result state that flexible working hours can have a significant effect on congestion by having people travel in off-peak hours either by car or by using public transport. Similar results can be found in the literature of Harpez (2002). In this study Harpez states that reductions in environmental costs as well as savings in infrastructure can be made when flexible working hours are implemented, due to the reduction of traffic in peak hours.

Besides its effect on traffic, flexible working hours can provide additional benefits according to the consulted literature. First and foremost, flexible working hours can positively influence one's satisfaction and performance in his/her job (Papalexandris & Kramar, 1997). In their paper on the effects on flexible working hours on the employee's performance and wellbeing, Pierce and Newstrom (1980) state that due to a greater sense of autonomy, employees perform better. This notion is also shared in the study of Harpez (2002) by stating that companies in either the private or public sector stand to gain from the increased efficiency of its employees as a result of the flexible working hours.

In addition to that, the impact of flexible working hours on the employees' health and wellbeing receives substantial attention in literature. A study conducted by Ala-Mursula et al.

(2006) investigates the effects of flexible working hours on the cost of employee illness in Finland. By analysing the survey data of more than 25 thousand employees, working in the public sector, on their current working situation (flexible vs non-flexible hours) and their health absence, they find that a more flexible working situation resulted in less illness absence from work. In their conclusion they write: *“employee control over daily working hours may protect health and help workers successfully combine a full-time job with the demands of domestic work”* (Ala-Mursula et al., 2006). Pierce and Newstrom (1980) go a step further stating that flexible working hours can help harmonizing work with the human circadian rhythms and can thus contribute to work efficiency and personal wellbeing.

Personal wellbeing can also be linked to low levels of stress and a harmonization between work and private life. This aspect of wellbeing has been researched by Papalexandris and Kramar (1997). In their paper they elaborate on the reconciliation between work and private life in Greece. As they state that family life plays a vital role in the Greek culture, flexible working hours can prove very useful in harmonizing family life with work obligations, provided it takes family needs and parental obligations into consideration (Papalexandris & Kramar, 1997). Similar to Papalexandris and Kramar’s statements, Hill et al. (2010) and Kossek, Lewis & Hammer (2009) state in their papers that the flexible working hours decrease work/private life conflict as one has more autonomy to efficiently combine work with private obligations.

Due to these positive effects, the popularity of flexible working hours among employees has been increasing for years (Papalexandrix & Kramar, 1997). Also in the studies of Beers (2000) on the use of flexible working hours in the United States this notion is shared. It is stated that an increasing number of workers prefer schedules that allow greater flexibility in choosing the times they begin and end their workday (Beers, 2000).

The appreciation and demand for flexible working hours is, however, not universally shared among the working population. In a study Giuliano and Golob (1990) it is discussed that the demand for flexible working hours may differ between different demographic groups due to the household situation. When one’s working hours are embedded to a high extent in the household activity schedule, implementation of flexible working hours can thus affect all members of the household and causes social activities, childcare, children's activities, and other household related activities need to be rescheduled (Giuliano and Golob, 1990). Rau

and Hyland (2002) share this line of reasoning. In their study on the effectiveness of offering flexible working hours, Rau and Hyland challenge the popular assumption that companies who offer this flexibility are more appealing to jobseekers. As Rau and Hyland (2002) put it *“the attractiveness of this flexibility depends in part on job seekers' interrole conflict”*. In addition, Galea, Houkes and De Rijk (2013) conclude in their paper on the balance between flexible working hours and personal life that the appreciation and demand for flexible working hours differs between life stage.

Taking all the consulted literature on flexible working hours into account, it can be stated that this measure can be both effective in reducing congestion and improving efficiency. However, due to the demographic and social differences in the working population, flexible working hours may not be universally demanded. By studying these demographic differences in the demand for flexible working hours, this thesis can be used in the implementation or further improvement of existing policies which aim to reduce congestion by getting specific groups to change their traveling behaviour.

# 3. Methodology

## 3.1 Method: online survey

The previous two chapters delved deeper into the literature concerning congestion reduction measures and explained why studying the effectiveness of flexible working hours from the perspective of the employees is a necessary addition to the literature, for it could help to improve the effectiveness of new policies aimed at solving the congestion problem. This chapter on the other hand will elaborate on the methodology used and data collected in conducting this research.

Seeing as the research question is quite qualitative by nature, for it puts a lot of emphasis on the motivation people have in choosing their modality and traveling time, the research methodology used in this thesis is to conduct a survey. The survey data has been collected by using a survey tool called Qualtrics. Qualtrics is an online survey tool which allows for collecting both qualitative and quantitative data, it also offers its users sophisticated statistical methods to analyse said data. Using an online survey allows us to measure qualitative data such as the motivation people have to either agree or refuse a certain proposal concerning flexible working hours, while at the same time enables us to spread the survey on a larger scale when compared to the old-fashioned way of conducting surveys on the street. By spreading the survey through various types of social media, collecting the data can be done in a fast and efficient way.

## 3.2 Survey design

### 3.2.1 Possibility for and interest in flexible working hours

The survey used in this research had to fulfil certain requirements before it could be distributed. First of all, the questions in the survey had to be clear to any possible respondent seeing as misunderstood questions could yield distorted results. Secondly, seeing as this thesis tries to contribute to solving the Dutch congestion problem, the survey had to be in Dutch as to avoid miscommunication and language barriers. Thirdly, the flow of the survey has to adapt to the respondent. This basically means that certain questions are conditional and are thus only shown to respondents who provide a certain answer. This conditional survey flow enables

us to avoid asking respondents question which do not apply to them, to delve deeper into the motivation of people as to why they make a certain decision and to check whether this behaviour could be changed should an additional incentive be applied.

In the following subsections, I will walk through the survey and explain the reasoning behind its (conditional) questions by delving deeper into the various consecutive sections of the survey. The survey starts off with a notification which clearly states the purpose of the research, ensures the confidentiality of the data to be obtained and provides the respondent with contact information should the need arise to ask questions on the intent of the research or handling of the data. The sections following this notification are each designed to contribute to answering of one of the sub-questions stated in chapter 1. A complete translated overview as well as the flow of the survey can be found in appendix II.

### **3.2.1 Possibility for and interest in flexible working hours**

As can be seen in appendix III the first two questions of the survey ask the respondent on their current weekly travelling frequency from home to work as well as the average traveling distance one has to travel to reach either home or work on a single trip. The answers of these questions could be used to check whether the choice to use the car differs significantly between traveling frequency or distance.

Following these introductory questions, the respondent is asked in question 3 about the possibility in his or her situation to work with flexible working hours. This question has been incorporated into the survey in order to test whether there are significant differences between demographics, especially between industries, in the possibility to blend flexibility into their jobs.

Based on their answer in question 3, the respondents are presented one of either two question sets. Should the respondents (sometimes) have the possibility to work flexible, questions 5 and 6 are asked, which delve deeper into the current flexibility enjoyed by the respondents in their job and their wish to expand said flexibility. When the flexibility in question 3 is non-existing or unknown, one is presented with question 4, which asks about the wish to start working with flexible hours. The answers to these questions could help to

determine where growth of flexible hours is demanded and thus where related policies could be considerably more effective.

Whichever path of questions the respondents takes, they will all be confronted with question 7. This question which asks what other type of flexibility employees would like to see in their job, has been added to the survey to check which types of flexibility are most desired and whether they differ significantly between demographic groups.

### **3.2.2 Motivation for/against flexible working hours**

Following the questions on whether employees enjoy flexible hours in their jobs and whether expansion or incorporation of said flexibility is desired, the second section of the survey is designed to detect the reasoning behind the interest in flexible working hours.

Question 8, which has to be answered by all respondents, asks what the most important reason is to demand flexible working hours. Four answer options are provided, which consist of; (a) *greater degree of freedom/command over one schedule*, (b) *the possibility to avoid traveling in peak hours*, (c) *an improved balance between work and private life* and (d) *different*. The option '*different*' has been added to several questions in the rest of the survey which ensure that people are not limited in their answer options. As this question asks for the most important reason to accept flexibility, question 9 investigates the reason to reject flexible working hours. Besides the option '*different*', the most common reasons to reject altered hours are presented as a fixed option, for example '*working with flexible working hours does not match with the schedule of partner/children*' or '*I appreciate fixed working hours for it provides stability*'.

### **3.2.3 Modal switch to off-peak PT use and motivations for doing so**

The third section is aimed at assessing the willingness to switch to another mode of transport, especially public transport, when working with flexible working hours. This section basically starts with question 10, which asks respondents what their usual mode of transport is when traveling to their work. When respondents state that they mostly use the car or motorcycle as transportation mode to their work, they will be presented with question 11. This question is

used assess whether people would be willing to change to public transport when being provided with free travelling options in the off-peak hours. When respondents do not make use of either car or motorcycle, question 11 will be omitted. Following this, question 12, which is mandatory for every respondent, goes one step further and asks whether employees would be willing to change their transport mode if they had complete control over their working flexibility. Should they be willing to make this change, and only then, they will consequently be asked which transportation mode they switch to in question 13. In case they do not want to switch, they are directed to question 14.

The motivation for and against the use of public transport are assessed by question 14 and 15 as can be seen in appendix III. Among the reasons in favour of using public transport are the environmental aspects, the personal time it grants its users and the option '*different*' to formulate an own specific reason. The reasons against the use of public transport are based on the common criticisms on for example the NS, Dutch railway company. These fixed answer options entail among others; the price of PT use, the time spent travelling, the information supply concerning transit possibilities and the overall image due to system failures.

Should respondents state among their reasons that the long distance from station to work/house stops them from using public transport, they are proposed a different situation in question A1 and A2. Based on suggestions from the Verkeersondering, which has been discussed in the chapter 2.3, a small test on the first mile/last mile issue has been added to the survey. This part has been designed to investigate the distance from station to work and the willingness to make use of public transport should a rental bike, free of charge, should be provided to bridge this first mile/last mile distance. The data obtained from these questions could be used to check whether providing or promoting such initiatives significantly impacts the transportation shift towards public transport.

Despite being asked these alternative questions, all respondents are asked to consider a final proposal in question 16 which makes use of the same principle as the earlier discussed 'spitsmijden' project. Question 16 asks the respondents if they would be willing to change from car/motorcycle use to free public transport use in off-peak hours, when also be given a monetary compensation for the presumed extra traveling time. Should they consider making the switch, they will consequently be asked in question 17 for which monetary compensation they would be willing to make this modal switch.



### **3.2.4 Demographics**

The final section of the survey asks respondents for some personal information. These personal questions are only used to form groups based on demographics which will be used to test whether certain behaviour or reasoning is significantly larger/plays a significantly greater role in a specific group. The demographic variables chosen in this survey are type of industry in which one currently works, the age group, gender, highest education level and composition of household.

### **3.3 Distribution channels and data collection**

As already discussed in section 3.1, using an online survey tool allows for quick and efficient distribution. This survey has been distributed through various channels.

First of all, this survey has been distributed through LinkedIn. LinkedIn is the world's largest social network with millions of members aimed at connecting professionals, building up business communities and spreading ideas and knowledge. Several members have shared an online link to the survey on their own professional pages, as to boost the number of respondents and thus improving the reliability of the results. In addition, I have called upon my own personal network, which consists of a great number of people with various demographic aspects, to contribute to this research by filling in the survey. Finally, this survey has been shared on various internet forums related to infrastructure, congestion and mobility in the Netherlands. Of these forums, Wegenforum.nl is the one of the most frequently visited and has the largest number of active members, which consists of a nearly five thousand.

Distributing the survey through the various channels stated above, have contributed to a response of 189 Respondents. This number is sufficient to test the data on significance using statistical methods.

### 3.4 Data analysis method

The data collected through the various channels described in the section above must be analysed in order to answer the main research question. Seeing as the survey is to a large extent focussed on the motivations of respondents to do (not) make use of flexible working hours and change their transportation mode to public transport, the data that will be obtained is qualitative by nature.

This does limit us, to some extent, in using a wide range of statistical methods. The variables obtained such as age class, transportation mode and industry are nearly all categorical. In addition to this lack in diversity in variable types, there is not a single dependent variable to which an OLS model could be built in order to answer either the sub-questions or the main research question. Also, the data on 189 respondents could be too few in creating a meaningful and trustworthy model. Therefore, building an OLS model, which is the most common used statistical models, is not a viable option in analysis of this thesis.

This thesis will make use of the Chi-square test as the main statistical tool to determine whether there are significant differences in the reasoning between the demographic groups and the sample as a whole. The choice for using the Chi-square test comes down to the fact that this test is designed to analyse categorical data such as the ones to be obtained from the survey. Using this statistical method, one can test how likely it is that a certain observed distribution of data, in this case the demand for flexible working hour initiatives and the reasoning behind it, is purely due to chance. The formula to determine the Chi-square is as follows:

$$x^2 = \sum_{i=1}^n \frac{(O_i - E_i)^2}{E_i}$$

$x^2$  = Chi-square

$O_i$  = Observed frequency

$E_i$  = Expected frequency

This simple and yet effective formula of the Chi-square test is often called a 'goodness of fit' model, for it statistically measures how well the observed distribution of data fits with the distribution that is expected should the variables be independent of each other. In other

words, this statistical method tests the null hypothesis which states that the two variables in question are independent of each other. Whenever the observed data deviates more from the expected distribution, the Chi-square increases. This makes for the fact that the likelihood of the variables in question being dependent on each other becomes greater.

This thesis will work with a significance level of 5% in analysing the data. This means that there is a 5 percent change that the null hypothesis, which states the variables are independent, will be rejected while this may not be the case. This error, which is called the type 1 error, makes for the fact that when the null hypothesis cannot be rejected, it does not necessarily mean that there is no connection between the variable in question, but only a lack of evidence that the null hypothesis should be accepted.

The p-value, which showcases the significance, is determined by two factors in this model. Next to the previously discussed Chi-square, the degrees of freedom play an important role in calculating the probability (p-value) of independence. This, in essence, means that should the degrees of freedom increase, for more categories are tested, the Chi-square obtained in the testing of numerous variables should be sufficiently large before being branded as significantly different.

## 4. Results

### 4.1 Descriptive statistics

In order to answer the question on whether flexible working hour initiatives are an effective tool in reducing congestion from the employee's point of view, the analysis described in chapter 3 has been conducted. This chapter of the thesis will discuss the results obtained from this analysis. The results are ordered in various sections, each of which is related to a specific sub-question. This basically means that the results which should enable us to answer the first sub-question, whether the demand for and use of flexible working hours differs significantly between demographic groups, will be discussed in the first section, followed by sections on the results of sub-questions two and three. Besides reporting on the testing for significant differences between demographic groups, the main trends and clear preferences/motivations of the entire sample will be discussed in the related sections.

Before jumping straight into the results of the analysis, the descriptive statistics will be briefly touched upon. The data collection yielded a balanced database, seeing as the respondents of the survey have various demographic characteristics. Appendix II tables 1-5, provides a clear overview of the respondents' demographics. It shows that the distribution between men and women is fairly equal, while respondents are active in a great number of industries. In addition, each age class and household type is represented by numerous respondents. All of this contributes to the reliability of the obtained results.

When investigating the descriptive statistics a little further, it can be seen in appendix II figure 1, that the car is the predominantly used mode of transport, with no demographic group deviating from this trend. Although this might suggest that the dataset is distorted as opposed to what is stated in the previous paragraph, having an extensive amount of car users is not considered as a pitfall in this research, seeing as car users are of specific interest when it comes to getting people out of peak hour traveling. The work-related travel frequency which is displayed in appendix II figure 2, shows that an equal share of part-time and fulltime workers is represented in the data set. Among the various demographic groups, only gender and age class show significant differences. Figures 3 and 4 in appendix II show that both men and people in the lower age classes partake significantly more often in work-related travel. The traveling distance, on the other hand, did not provide any significant insights.

## 4.2 Demand for and use of flexible working hours

To assess the demand and use of flexible working hours, various questions have been asked to the respondents. Questions on the respondent's current working situation and desires for the future, both related to flexible working, are leading in answering the first sub-question.

When looking at the sample as a whole, most of the respondents of this survey state that working with flexible hours is, to some extent, possible. As can be seen in figure 2 a little over 65% of the respondents are able or have the possibility to integrate some form of flexibility in their jobs. A little under a quarter of the respondents reluctantly answer 'No' on the question whether working with flexible hours is possible in their job, while 10 % does not know whether this is possible or otherwise offered within their jobs.

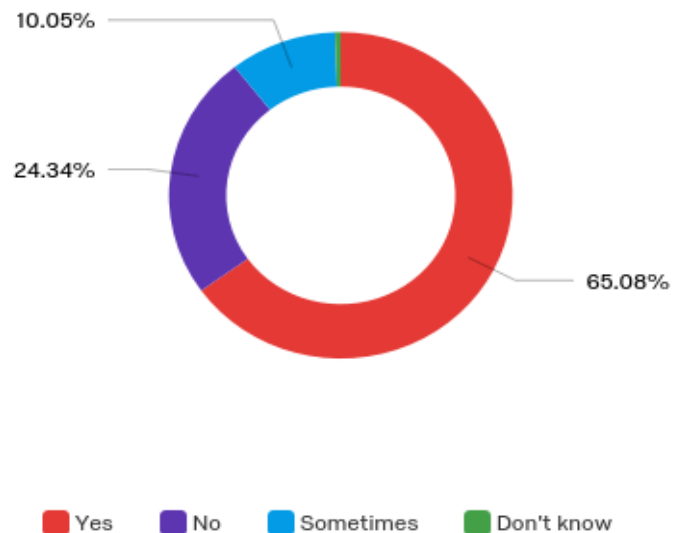


Figure 2: Possibility to work flexible among sample

Only two of the demographic groups do show significant differences when it comes to working with flexible hours. First of all, the industry in which one is currently working highly affects whether flexibility could be merged into the job. With a p-value of 0,00 (see appendix I table 1) the null hypothesis that the variables are independent is rejected, meaning that there

are significant differences in flexibility between the various industries. Figure 3, shows that flexible working hours could be highly applicable in various sectors, such as IT, consultancy and media & telecommunication. There are a few exceptions however. Industries such as 'healthcare & social assistance' and 'education, culture & science'

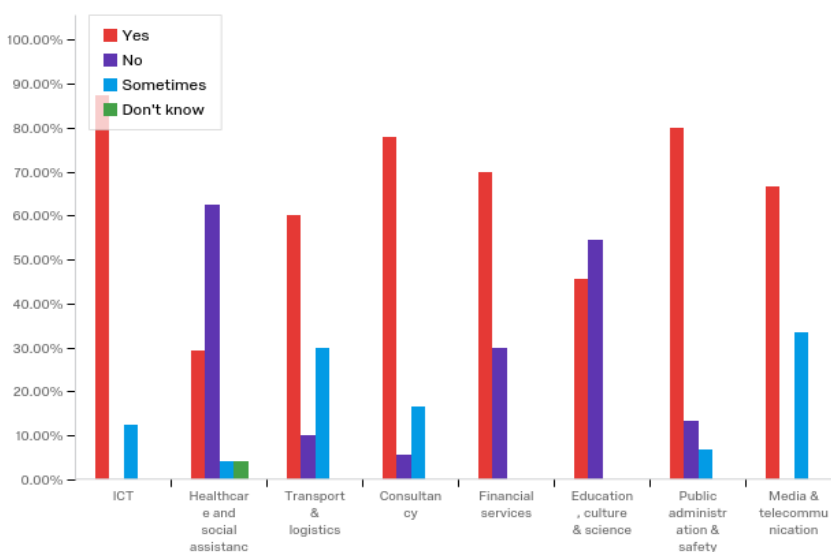


Figure 3: Flexibility among industries

show that in relatively high share of jobs in these industries do not have the possibility to work flexible. This could be quite intuitively explained by the fact that patient and doctor do have to meet at certain fixed hours, the same line of reasoning applies for teacher and student.

The second demographic group which showed significant results in the chi-square test is the education level of employees. With a p-value of 0,00 (see appendix I table 2) the independence of integrating flexibility among different education levels is rejected. The graphical representation of the flexibility use between the various educational levels are depicted in figure 4. This figure depicts a clear pattern in which can be seen that the **lower educated people have a relatively higher share of inflexibility in working hours.** When moving up the Dutch educational level, from intermediate vocational to higher vocational to university, the possibility of integrating flexibility in one’s job displays an increasing trend.

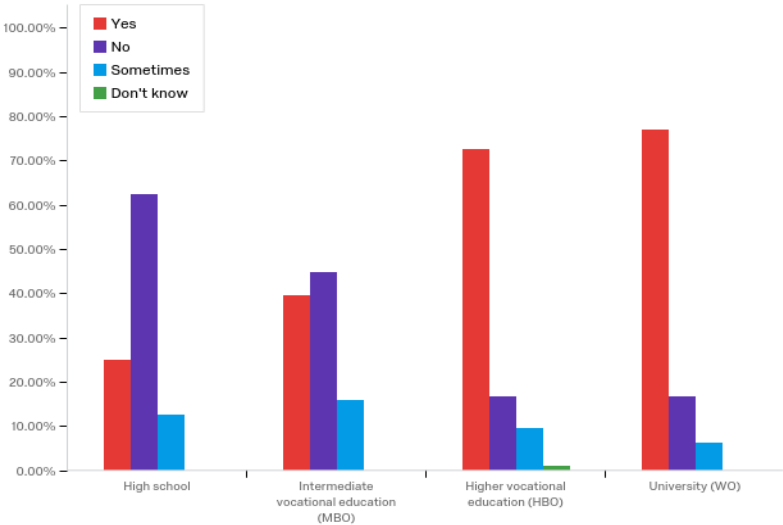


Figure 4: Flexibility among employees of various educational levels

In addition to the educational level being one of the two demographic variables in which independence of working hour flexibility rejected, it is the only demographic group that shows significant differences in the amount of flexibility to be incorporated in the working hours. Where the tests on the other consulted demographic groups did not provide any significant results to reject the null hypothesis, the test on educational level provided an p-value of 0,00 (appendix I table 3). These results enable us to state that distribution of data is not due to chance. The result of the chi-square test on the distribution of flexibility level on education, together with the graphical

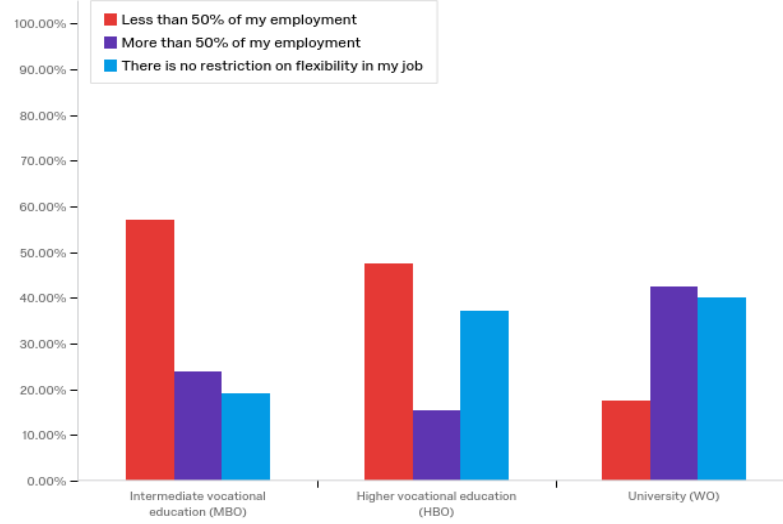


Figure 5: Extent of flexibility among employees of various educational levels

representation of this distributions is shown in figure 5. This figure shows that when it comes to working with flexible hours, the higher educated employee can incorporate significantly more flexibility in their jobs. This could be explained by the fact that lower educated people perform jobs in which presence is needed to conduct the work, seeing as jobs in industries such as retail, physical appearance and construction all meet these two aspects.

In addition to the analysis on the use of flexible workings hours, the demand, for either expansion of this flexibility or the integration flexibility when none is present in the current situation, has been assessed. It must be said that no significant differences have been found among the demographic groups when it comes to the need for expanding or incorporating flexibility. Appendix II figures 5 and 6 does however show the results of the need for (more) flexibility among the entire sample. These figures show that **only one third of the people who currently enjoy flexible working hours would want to expand said flexibility, while the demand of people who do not have this opportunity is over 55 %.**

Finally, the demand for other forms of flexibility beside the flexible working hours have been assessed. The data obtained from the respondents did not provide significant differences between the demographic groups and will therefore leave us unable to state whether one demographic group prefers a certain type of flexibility over the others. Should we look at all the respondents together, the option to work at home is most valued by this sample. Being able to work at another location or working while travelling is less valued as can be seen in appendix II figure 7. What is remarkable about these results is the fact that a large section of the respondents does not wish any other type of flexibility besides the possibility of flexible working hours.

### **4.3 Willingness to travel by public transport in off peak hours**

Following the assessment of the use and demand for flexible working hours among the various demographic groups, this section will discuss the results on whether people would be willing to make a modal switch to public transport, should various flexible working hour initiatives be offered. The results discussed in this section are all used in answering the second sub-question of this thesis.

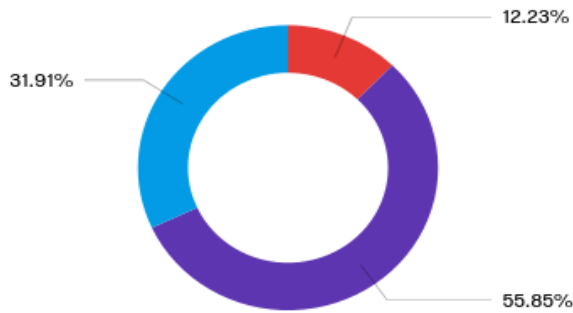
As already discussed in the methodology chapter, the respondents have been asked whether they would be willing to make a modal switch if they had full control over the flexibility in their job. The response on this question is displayed in appendix II figure 8. It shows that **people generally do not want to make a modal switch when the flexibility in their job is unlimited**. Only 6,88 % of the respondents would be willing to make a modal switch in this situation. Taking a closer look at this part of the respondents would be wise, for it could be the case that people who used the preferable public transport when traveling to their work will now change to using the car, when being unlimited in their work-related flexibility. This test could however not be conducted, for such an analysis in this case would not yield reliable results due to the low number of respondent willing to make this change.

Even though a relatively high number of respondents would not be willing to make a modal switch when solely being offered flexible working hours, this study investigates various other measures related to flexible working hours which aim at getting employees to make a modal switch towards public transport. As already elaborated on in chapter three, offering free public transport in the off-peak hours could be an option in attracting car users to public transport and thus relieving pressure on the highways in peak hours. When assessing the willingness to change to public transport in off-peak hours, the general responds on this initiative was a resounding no. As can be seen in appendix II figure 9 nearly 80% of the respondents is unwilling to accept this offer. The other 20% of the respondent is either willing or is still having doubts as to accept.

Among the different demographic groups there we not show significant differences in accepting the offer of free public transport in the off-peak hours, except for the industry one currently works in. Even though the main trend in nearly all the consulted industries is to reject this offer, a small share of the employees working in transport & logistics, consultancy and media & telecommunication would be willing to accept this offer. The results of the chi-square test performed as well as the graphical representation is displayed in appendix II figure 10.

Despite the respondents resounding rejection of both offers concerning flexible working hours and free public transport in return for a modal switch to public transport, a final offer has been proposed to the respondents. This final offer makes use of the monetary compensation aspect of the Dutch 'Spitsmijden' project. In this proposition, employees have been offered a monetary compensation for each km travelled with public transport on top of





■ Yes
 ■ No
 ■ Maybe, depends on the compensation

Figure 6: Willingness to accept compensation offer among sample

the free public transport card in off peak hours. The results of the whole sample, displayed in figure 6, show that the willingness to make the modal switch increases to around 12 %, while 32 % would be willing to make this switch should the compensation be high enough.

Among the different demographic groups, significant differences have only been found in the educational level and age class of the respondents. First a closer look will be taken at the difference in accepting this final offer between the educational level. The chi-square test, represented in appendix 1 table 4, provides a p-value of 0,00, which enables us to reject the null hypothesis that the distribution of accepting this offer is independent of educational level. Having excluded that chance does not influence this distribution, it can be seen in figure 7 that **higher educated employees, who studied either at the university or followed higher vocational education, have a higher acceptance rate of this proposition or would be considering accepting should the compensation be high enough.**

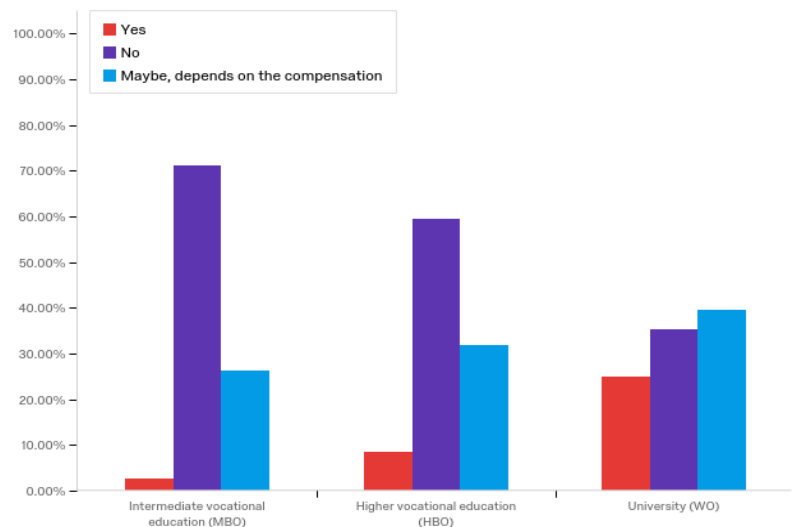


Figure 7: Willingness to accept compensation offer by education level

The age class is the second and final demographic group in which significant differences have been found in accepting the final proposition. Here again, the p-value of 0,02 (see appendix I table 5) allows for the rejection of the null hypothesis, meaning that independence among the age classes could not be proven. Figure 8, which is displayed on the next page shows the graphical representation of the data collected. The only striking result

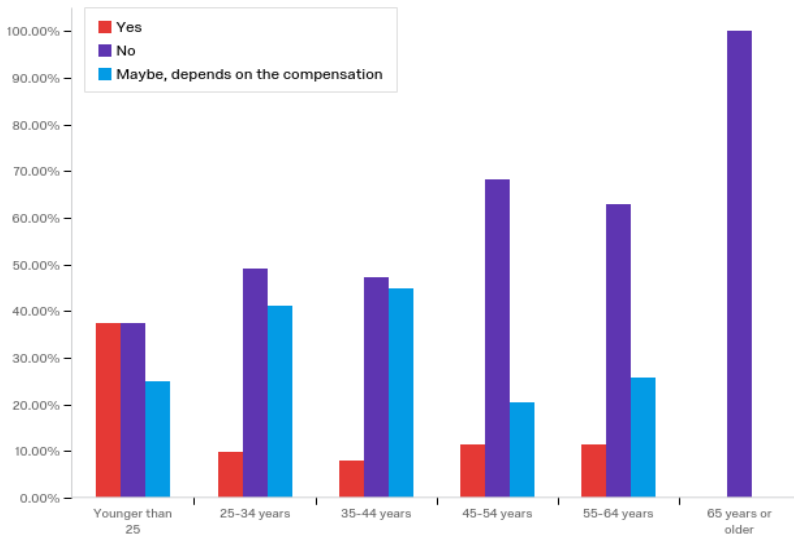


Figure 8: Willingness to accept compensation offer by age

that can be spotted from this graph is the fact that young people, **people under the age of 25, have a relatively higher acceptance rate** when it comes to this final proposal. It could be that young people have a higher valuation of money and would therefore be more eager to accept an offer when a monetary compensation is offered.

The final results related to the willingness of employees to make a modal switch to public transport, has to do with the previously discussed monetary compensation. The results showed that for a relatively high number of respondents in this sample, the value of the monetary compensation could persuade them to accept this offer. Based on various chi-square test, no significant differences could be found among the demographic groups used in this thesis. Therefore, the null hypothesis of independence could not be rejected, which makes it impossible to state preferences among the various groups. When taking a look at the answers of the entire sample, there is one remarkable result. As can be seen in figure 9, **up to 65 % of the respondents would be willing to make the switch towards public when a similar compensation as car use is being offered.** One might have expected that, due to the presumed extra traveling time, the amount of compensation demanded for accepting the proposition would be higher than the currently used monetary compensation per kilometre travelled by car in work-related traveling.

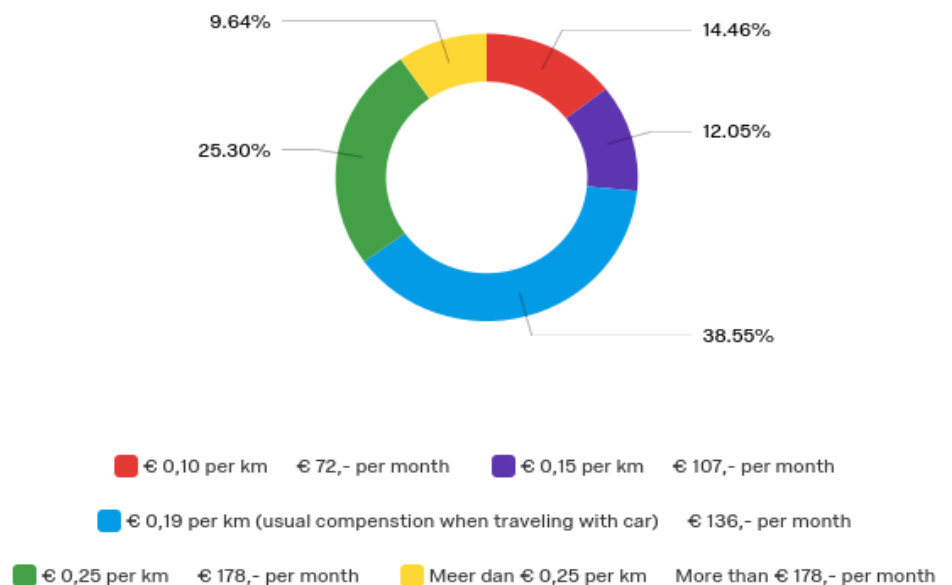


Figure 9: Compensation demanded among sample

## 4.4 Motivations for and against flexible working hour measures

Finally, the motivations for and against the various flexible working hours measures have been analysed. This section aims to present the results on these motivations in a structured manner. Therefore, several subsections have been created each of which is dedicated to discussing both the results of the entire sample and the significant findings within the demographic groups.

### 4.4.1 Pro flexible working hours

First of all, the motivation employees have to demand or use flexible working has been assessed. The results for the both general sample and the group specific results will be discussed in this subsection. The results on the reasoning behind the acceptance or need for (more) flexibility can be found in figure 10. As can be seen in this figure the most important reason to accept flexible working hours is either to have more control over one's own schedule or the fact that it would provide an improved balance between work and private life. **The possibility to avoid traveling in peak hours, which from the perspective of policymakers is the main reason to introduce or expand flexibility in working hours, is not an important**

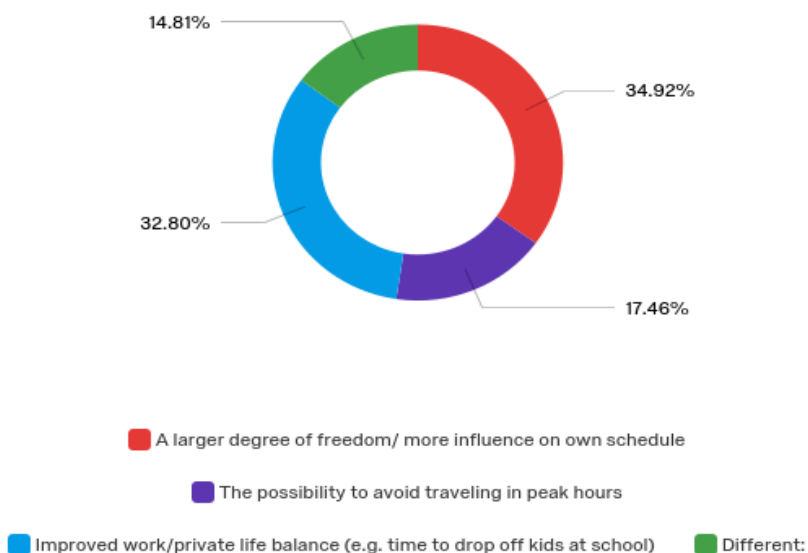


Figure 10: Motivation to demand flexibility among sample

**motivation among the respondents** according to the results. Only 17,46 % of the respondents see avoiding the daily congestion as an important reason to demand more flexibility. In addition, the respondents who choose the option different generally state that they do not see any reason at all in favour of flexible working hours.

The testing on difference in motivation within the various demographic groups only yielded significant results in household type and age class. The graph which displays the reasoning between household types are represented in figure 11, while the results of this chi-square test are depicted in appendix I table 6. It clearly indicates that **employees from a multiple-person household with small children (i.e. children under the age of 12), are mostly eager for flexible working hours seeing as it would enable them to combine their work with the parental duties they have to perform, the improvement of work/private life balance.**

Employees who do not have to worry about the caretaking of small children generally see the increasing influence over their own schedule and the larger amount of perceived freedom as the main driver as to demand flexibility. The possibility to avoid peak-hour travelling is lacking behind

just as the results of the general sample already indicated.

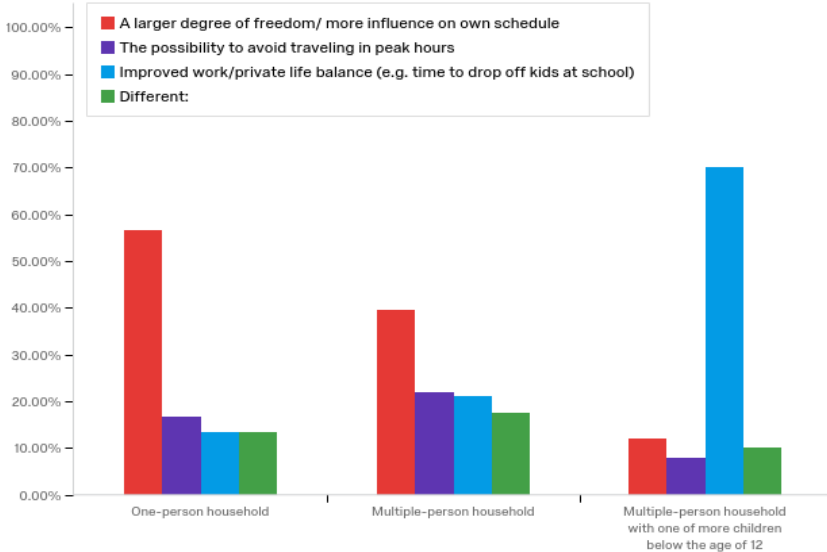
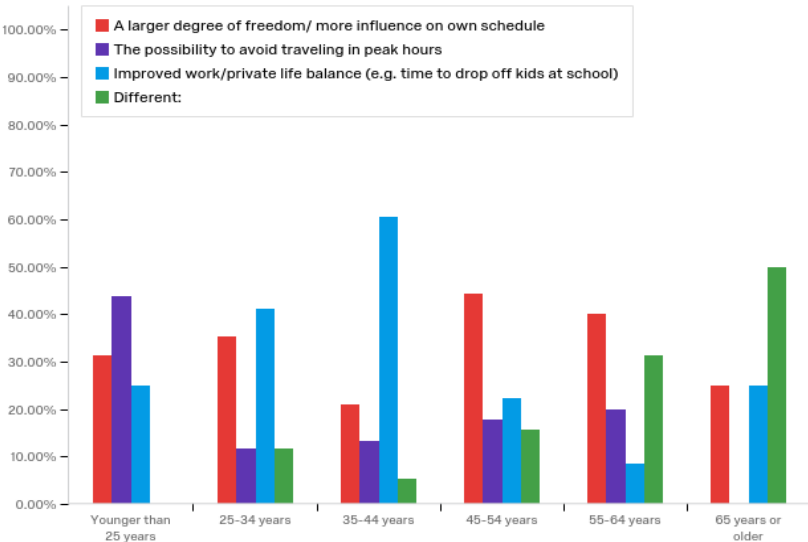


Figure 11: Motivation to demand flexibility by household type

Within the second group who displayed significant differences within the motivation in favour of flexible working hours, the possibility to avoid peak hours does play an important role however. The age classes and its corresponding reasoning have been displayed in figure



12 (results chi-square see appendix I table 7). In comparison to the general results, **the youngest group of employees, under the age of 25, see the possibility to avoid peak hour as an important motivation to make use of said flexibility.** When looking at the age classes

Figure 12: Motivation to demand flexibility by age

between 25 and 44 it can be seen that the main reason to demand flexible working hours is the improved balance between work and private life. Seeing as these are the general age classes in which employees are parents of young children, these results are in line with those we have seen in the household type as they both see the possibility to integrate parental duties into their working schedule as an important motivator.

#### 4.4.2 Against flexible working hours

Where the subsection above delved deeper into the motivations to demand flexible working hours, this section will discuss the results on reasoning to reject said flexibility.

Appendix II figure 11, which shows the reasoning of the entire sample to reject working with flexible working hours. It shows that the **most important reason against incorporating flexibility in one's current job, is the fact that said flexibility might blur the line between work and private life**. It might indicate that employees are generally scared that private life and their jobs will become mixed, that their privacy will be diminished due to the fact that their homes might become another working place. This may lead to impression that there is no place where work-related problems can be moved aside and that the time to relax or enjoy family life is thereby limited.

Within the various demographic groups there were almost no significant differences to be found between the reasoning to reject flexibility, except for educational level. A p-value of 0,03 (see appendix I table 8) indicates that the independence of the variables in the null hypothesis is rejected. Figure 13 shows that the only striking result within this demographic groups is the fact that lower educated employees attach more value to fixed working hours when compared to higher educated people. Beside this result, the general motivation to reject flexibility follows the line of reasoning as described in the previous paragraph of this subsection.

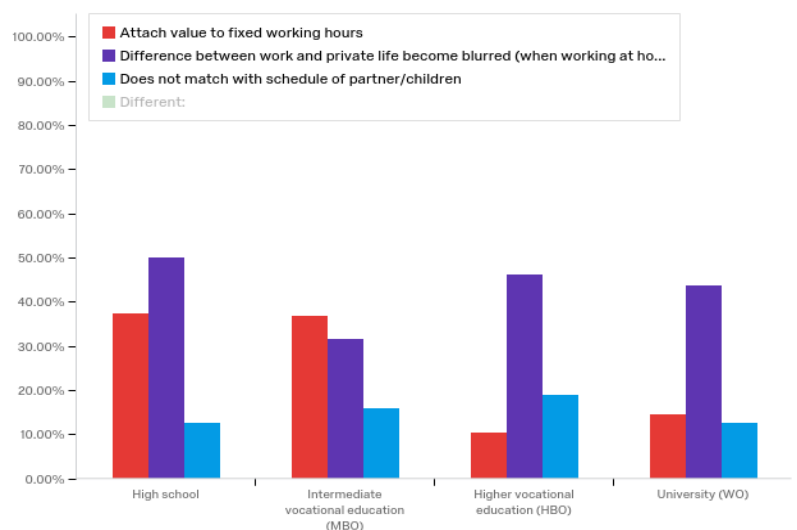


Figure 13: Motivation to reject flexibility by education level

#### 4.4.3 Pro PT use in off-peak hours

Besides offering the respondents flexible working hours, various other options have been proposed which involve the travelling with public transport in off peak hours as already discussed in the methodology. The results on the reasoning in favour of public transport use have been displayed in appendix II figure 12. It can be seen that among the entire sample, the **most common reason to choose public transport is the benefits it brings to the environment**, with 24,68% of the respondents stating this as their most important reason to choose public transport. The extra personal time it offers its travellers and the price cannot be seen as drivers for choosing public transport as it only accounts for respectively 14,72% and 6,06% of the answers. Of all respondents who had a different option for choosing public transport over car use, only 6 replied that it enables them to avoid congestion. The tests on significant differences within the demographic groups did not yield any usable results. The insignificant test results force us to accept the null hypothesis, meaning that the motivation in favour of using public transport is independent within the demographic groups.

#### 4.4.4 Against PT use in off-peak hours

The results on the motivation against the use of public transport in the off-peak hours yielded much clearer results both in the general sample as in the various consulted demographic groups. As can be seen in appendix II figure 13, the **main reason not to choose the public transport lies in the fact that the car is perceived to be faster and more versatile**. Furthermore, the distance between station and home/work being too long accounts for roughly 17% of the response. When consequently being asked whether these respondents would be willing to change to public transport if a rental bike, free of charge, would be offered to bridge this long distance, 65 % rejected, as show in appendix II figure 14. While only 13% would be willing to change, the rest of the respondents didn't know yet as they would make the change. Exploring this data further seemed to be impossible seeing as the sample size proved to be too small to test for significant difference within the various groups.

Testing on the differences in motivation against public transport use within the demographic groups yielded interesting results. First of all, the motivation between the education level differs significantly. Due to a p-value of 0,01 (see appendix I table 9), independence of variables is rejected. As can be seen in figure 14, lower educated people state relatively more that unfamiliarity with public transport stops them from using it, when

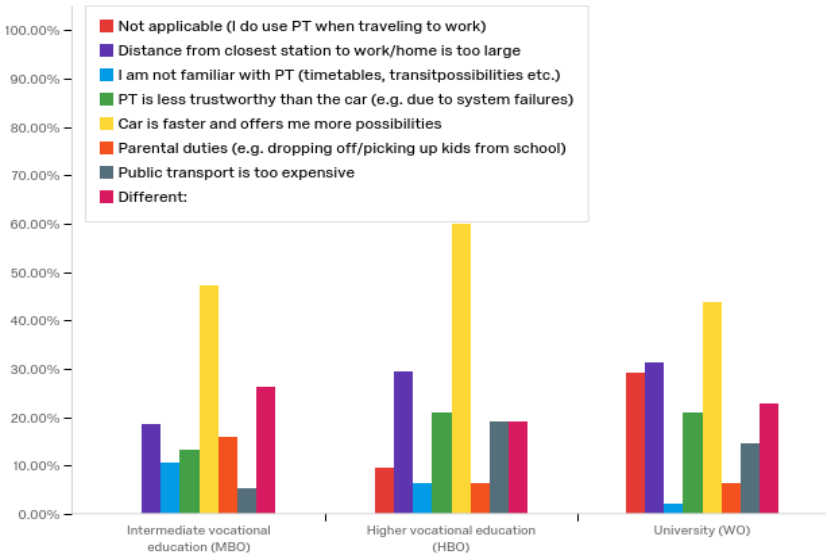


Figure 14: Motivation against PT use by education level

compared to the employees who enjoyed higher forms of education. Besides this difference, the motivations within the educational levels show a similar pattern with the car being faster and more versatile as the most influence not to use public transport.

A second demographic group which showed significant differences (see appendix I table 10) in motivation against public transport use is the age classes. As can be seen in figure 15, the most striking difference in motivation among the age classes lies in the fact that employees under the age of 35 state to a large extent that public transport is less trustworthy when compared to other modes of transport, due to system failures.

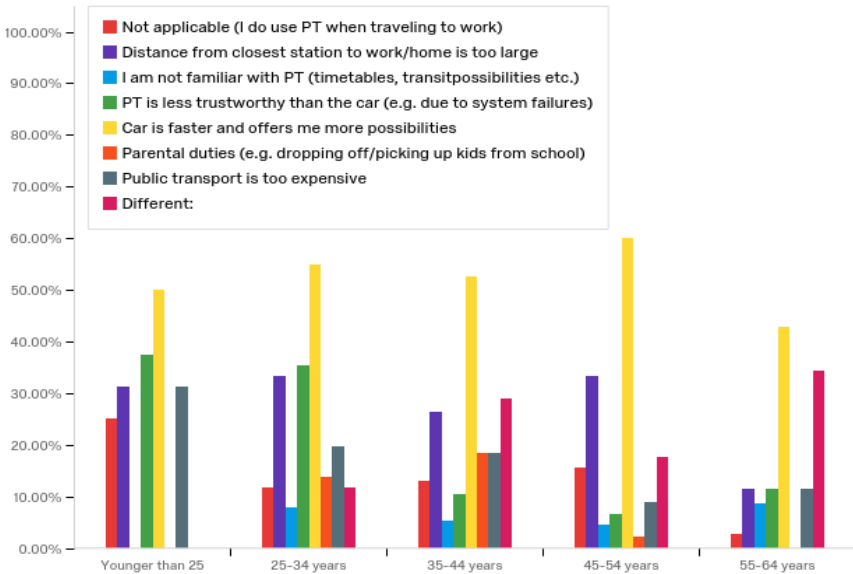
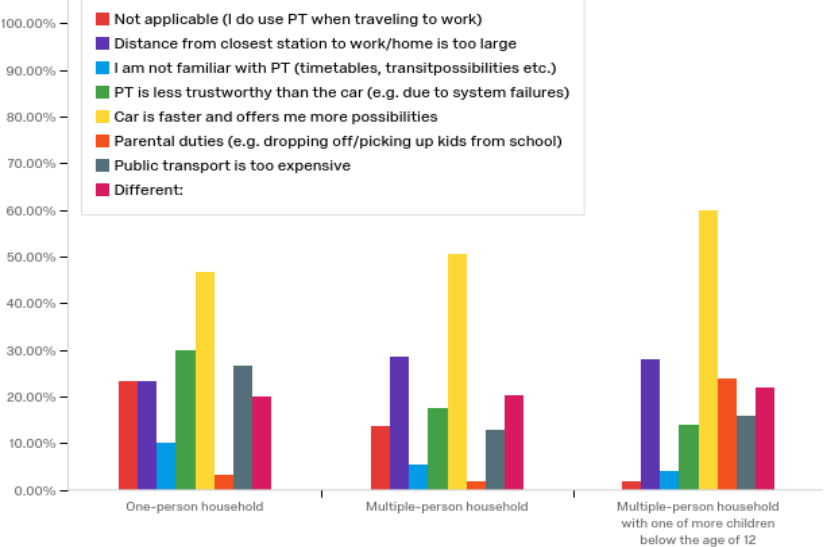


Figure 15: Motivation against PT use by age

Finally, the various household types showed significant differences in motivation against the use of public transport. With a chi-square test yielding an p-value of 0,00 (see appendix I table 11) the null hypothesis of independence in motivation is rejected. Both the graphical representation of the motivations between household type as well as the test results can be seen in figure 16. The figure shows one striking results, namely the fact that households with young children see the inability to perform parental duties such as bringing the kids from



and to school as an important reason not to use PT. These results are consistent with the line of reasoning of this groups, that we have already touched upon in earlier sections of this chapter. Besides this difference the graph does not provide us with other striking results.

Figure 16: Motivation against PT use by household type



# 5. Conclusion and recommendations

## 5.1 Conclusion

This thesis has tried to find an answer to the question whether flexible working hour-related initiatives are effective tools in reducing congestion from the perspective of the employees. In order to provide a proper answer, three sub-questions have been formulated. The answers to the three sub-questions have to be formulated before being able to answer the main research question.

The first sub-question was formulated as follows: *'does the demand and use for flexible working hours differ significantly between demographic groups?'*. The results of the analysis showed that a lot of respondents already work with flexible working hours, especially in sectors where no physical presence is needed to perform a job. In addition, higher educated people who mostly work jobs in which physical presence is not mandatory to perform a job have a high tendency to work with flexibility. **Expansion of flexible working hours is little demanded across the entire sample** seeing as less than one third of the respondents would want to see their flexibility in their working hours expanded. No significant differences have been found in demand for extra flexible working hours within the selected demographic groups. It can therefore be concluded that demand for additional flexibility in working hours is rather low. Significant differences among demographic groups, on the other hand, could merely be found in the fact that flexible working hours are only possible to be incorporated in jobs for highly educated employees, within certain sectors.

The second sub-question had the following form: *'Does the willingness to travel by public transport in off-peak hours differ significantly between demographic groups?'*. The results showed that people generally do not want to make a modal switch when the flexibility in their job is unlimited. Also, **when free public transport in the off-peak hours is offered the acceptance rate is very low**. In both instances there were no significant differences to be found within the demographic groups. When being offered a monetary compensation, the acceptance rate rises a little, especially in demographic groups of education and age class. Both young and highly educated employees are more receptive to accepting off-peak public

transport use when being provided with a monetary compensation. However, taking the results of all proposed initiatives to get employees to travel by public transport in mind, it can be concluded that the willingness to make a modal switch is very low and differences in willingness to do so, within the demographic groups, can only be found when providing a monetary compensation.

The third and final sub-question was formulated as follows: ***'What are the main motivations to either demand or reject flexible working hours and travelling with public transport in off-peak hours?'*** The results show that the most important reason to accept flexible working hours is either to have more control over one's own schedule or the fact that it would provide an improved balance between work and private life. **The possibility to avoid peak-hour traveling, which is the general idea behind the implementation of flexible working hours, is of little interest to all but the young employees.** In addition, the age classes in which employees generally have little children, see the ability to improve the balance between work and performing parental duties as the most important driver in favour of flexible working hours. The main motivation against more flexibility in one's job is the fact that employees are generally scared that private life and their jobs become mixed. The motivation in favour of using public transport mostly lies in the fact that public transport is perceived as being environmental friendly, while no significant differences between demographic have been found. The reasons not to use public transport mostly state that the car is faster and more versatile in terms of transportation. Testing on significant differences in motivations against using public transport yielded results which stated that lower educated people are relatively more unfamiliar with public transport use, younger employees see public transport as unreliable, while employees with small children see the inability to perform parental duties as a main reason to not travel by public transport.

Having answered all three sub-questions, we are now able to formulate an answer for the main research question whether flexible working hour initiatives are effective tools in reducing congestion from the perspective of the employees. Taking the answers of the sub-question above into account it can be concluded that, from the perspective of the employees, **flexible working hour initiatives are not effective. The conclusion can be derived from the fact that a large portion of the sample is already working with flexible working hours,**

**additional flexibility is not desired, significant difference between demographic groups appear limited and initiatives to encourage public transport use in off peak hours appear ineffective.**

## **5.2 Policy advise**

Should one attempt to increase the willingness of employees in accepting expanded forms of flexibility is it advised to focus more on the aspect of being in control of one's own schedule instead of focussing extensively on the possibility to avoid peak hours as is done in the current situation. As already discussed in chapter 4, the possibility to avoid peak hours is a lot less appealing than a greater sense of freedom/control over own schedule.

In addition, to increase the willingness to travel by public transport in off-peak hours it is also advised to improve the information provision on the speed, versatility and transit possibilities of public transport use, seeing as the main motivation to reject the form of transport can be found in the fact that the car is perceived to be faster and more versatile. At the same time, more emphasis could be put on the environmental aspect of traveling by public transport.

When attempting to increase said willingness in the selected demographic groups it is advised to focus on employees below the age of 45 for their motivation for and acceptance of flexible working hour initiatives differs significantly according to the statistical test used on various occasions in this thesis. The results on this demographic group showed that their **most important reason to either accept or reject various initiatives concerns the fact that the integration of parental duties would be either improved or diminished by said initiatives.** It could therefore be wise to anticipate on these motivators. Another reason to focus on this demographic group can be found in the fact that young employees are one of the few groups who see avoiding peak hours as an important reason to accept flexible working hours.

## 5.2 Limitations and suggestions for future research

This research has been subject to a couple of limitations. First of all, the sample size in this research is relatively small. Though the number of responses collected, enabled us to perform some statistical test on the various demographic groups, more elaborate and deeper analyses, for example the test on the modality change of employees who accepted full flexibility, were impossible to conduct due to the low number of respondents. This low number also made for the fact that the first mile/last mile problem could not be properly investigated.

A second limitation, which this thesis is subject to, is the fact that the data collected for this research was almost entire qualitative. Due to the extensive amount of qualitative data, sophisticated analytical models could not be created. Even though these models were eventually not needed in the analysis, the fact that a wide range of statistical tests could not be used due to the qualitative aspects of the collected data, can be seen as a limitation in this thesis.

Taking the limitations stated above into account, it is advised that future research should base its analysis on larger sample size. Seeing as this research was unable to investigate the modal switch further due to the lack of data, it would be well advised start looking into how and to what modality employees switch when being provided with increased flexibility within their jobs. It could be the fact that employees who are currently traveling by public transport could make the change to car use when being provided with flexible working hour measures. In that case the flexibility related anti-congestion measures would have a reverse effect and would thus increase pressure on the Dutch highways. In addition, it could be advised to investigate additional aspects such as geographical location, household income when conducting research on this subject. Researching certain aspect could provide additional insight in the reasoning for accepting or refusing various anti congestion measures. Finally, more research could be conducted on the first mile/last mile problem for various initiatives such as the provision of electrical bicycles to bridge the distance from station to work might persuade people to choose public transport over regular car using in work-related travelling.

# List of reference

Abrams, R. A., & Hagstrom, J. N. (2006). Improving traffic flows at no cost. In *Mathematical and Computational Models for Congestion Charging* (pp. 1-22). Springer, Boston, MA.

Ala-Mursula, L., Vahtera, J., Kouvonen, A., Väänänen, A., Linna, A., Pentti, J., & Kivimäki, M. (2006). Long hours in paid and domestic work and subsequent sickness absence: does control over daily working hours matter?. *Occupational and environmental medicine*, 63(9), 608-616.

Arnott, R., Rave, T., & Schöb, R. (2005). Alleviating urban traffic congestion. *MIT Press Books*, 1.

Beers, T. M. (2000). Flexible schedules and shift work: replacing the 9-to-5 workday. *Monthly Lab. Rev.*, 123, 33.

Ben-Elia, E., Boeije, H., & Ettema, D. (2010). Qualitative analysis of commuters' responses to rewards for rush-hour avoidance.

Bereik (2018). *Over bereik*. Retrieved on 27<sup>th</sup> of May from: <https://bereiknu.nl/over-bereik>

Beter Benutten (2018). *Over ons*. Retrieved on 27<sup>th</sup> of May from: <https://www.beterbenutten.nl/overons>

Börjesson, M., Hamilton, C. J., Näsman, P., & Papaix, C. (2015). Factors driving public support for road congestion reduction policies: Congestion charging, free public transport and more roads in Stockholm, Helsinki and Lyon. *Transportation Research Part A: Policy and Practice*, 78, 452-462.

Downs, A. (2000). *Stuck in traffic: Coping with peak-hour traffic congestion*. Brookings Institution Press.

Downs, A. (2004). Why traffic congestion is here to stay.... and will get worse.

Ernst Kossek, E., Lewis, S., & Hammer, L. B. (2010). Work—life initiatives and organizational change: Overcoming mixed messages to move from the margin to the mainstream. *human relations*, 63(1), 3-19.

Evans, J. (2005). London congestion charging scheme and technology trials. In *Road Transport Symposium, 2005. The IEE (Ref. No. 2005/11272)*(pp. 4-4). IET.

Evans, R. (2007). Central London congestion charging scheme-ex-post evaluation of the quantified impacts of the original scheme.

Falocchio, J. C., & Levinson, H. S. (2015). Adaptation Strategies for Managing Recurring Congestion—Adding New Capacity. In *Road Traffic Congestion: A Concise Guide* (pp. 245-280). Springer, Cham.

Fernald, J. G. (1999). Roads to prosperity? Assessing the link between public capital and productivity. *American Economic Review*, 89(3), 619-638.

Galea, C., Houkes, I., & De Rijk, A. (2014). An insider's point of view: how a system of flexible working hours helps employees to strike a proper balance between work and personal life. *The International Journal of Human Resource Management*, 25(8), 1090-1111.

- Gärling, T., & Schuitema, G. (2007). Travel demand management targeting reduced private car use: effectiveness, public acceptability and political feasibility. *Journal of Social Issues*, 63(1), 139-153.
- Giuliano, G., & Golob, T. F. (1990). *Staggered work hours for traffic management: a case study*. Institute of Transportation Studies, University of California, Irvine.
- Gordon, P., & Richardson, H. W. (2000). Defending suburban sprawl. *Public interest*, (139), 65.
- Harpaz, I. (2002). Advantages and disadvantages of telecommuting for the individual, organization and society. *Work Study*, 51(2), 74-80.
- Hartgen, D. T., Fields, M. G., & Poole, R. W. (2006). *Building Roads to Reduce Traffic Congestion in America's Cities: How Much and at what Cost?* (No. Policy Study 346). Los Angeles, CA: Reason Foundation.
- Hensher, D. A., & Puckett, S. M. (2007). Congestion and variable user charging as an effective travel demand management instrument. *Transportation Research Part A: Policy and Practice*, 41(7), 615-626.
- Hill, E. J., Erickson, J. J., Holmes, E. K., & Ferris, M. (2010). Workplace flexibility, work hours, and work-life conflict: Finding an extra day or two. *Journal of Family Psychology*, 24(3), 349.
- Jensen-Butler, C., Sloth, B., Larsen, M. M., Madsen, B., & Nielsen, O. A. (2008). *Road pricing, the economy and the environment*. Springer Science & Business Media.
- Kennisinstituut voor Mobiliteitsbeleid (2018). *Mobiliteitsbeeld*. Retrieved on 27<sup>th</sup> of May: <https://www.kimnet.nl/mobiliteitsbeeld>
- Knockaert, J., Bakens, J., Ettema, D., & Verhoef, E. (2011). Rewarding peak avoidance: the Dutch 'Spitsmijden' projects. In *Transitions towards sustainable mobility* (pp. 101-118). Springer Berlin Heidelberg.
- MacKenzie, J. J., Dower, R. C., & Chen, D. D. (1992). *The going rate: what it really costs to drive*. Washington, DC: World Resources Institute.
- Meyer, D. M. (1997). A toolbox for alleviating traffic congestion and enhancing mobility.
- Meyer, M. D. (1999). Demand management as an element of transportation policy: using carrots and sticks to influence travel behavior. *Transportation Research Part A: Policy and Practice*, 33(7-8), 575-599.
- Mobilitylab (2018). *What is TDM*. Retrieved on 29<sup>th</sup> of May from: <https://mobilitylab.org/about-us/what-is-tdm/>
- NOS (2018). *Advies: bouw niet meer wegen, maar beperk rijden tijdens de spits*. Retrieved on 20<sup>th</sup> of June from: <https://nos.nl/artikel/2233163-advies-bouw-niet-meer-wegen-maar-beperk-rijden-tijdens-de-spits.html>
- Omroep West (2018). *Aantal files stijgt flink A4 in top vijf van ochtend- en avondspits*. Retrieved 26<sup>th</sup> of May 2018 from: <https://www.omroepwest.nl/nieuws/3611368/Aantal-files-stijgt-flink-A4-in-top-vijf-van-ochtend-en-avondspits>
- Orski, C. (1990). Can management of transportation demand help solve our growing traffic congestion and air pollution problems?. *Transportation Quarterly*, 44(4).

- Papalexandris, N., & Kramar, R. (1997). Flexible working patterns: towards reconciliation of family and work. *Employee Relations*, 19(6), 581-595.
- Pierce, J. L., & Newstrom, J. W. (1980). Toward a conceptual clarification of employee responses to flexible working hours: A work adjustment approach. *Journal of Management*, 6(2), 117-134.
- Rau, B. L., & Hyland, M. A. M. (2002). Role conflict and flexible work arrangements: The effects on applicant attraction. *Personnel psychology*, 55(1), 111-136.
- Rijksoverheid (2017). *Nationale markt- en capaciteitsanalyse 2017*. Retrieved on 25<sup>th</sup> of May 2018 from: <https://www.rijksoverheid.nl/ministeries/ministerie-van-infrastructuur-en-waterstaat/documenten/rapporten/2017/05/01/nationale-markt-en-capaciteitsanalyse-2017-nmca>
- Rijksoverheid (2014). *Informatiekrant: beter benutten*. Retrieved on 26<sup>th</sup> of May 2018: <https://www.rijksoverheid.nl/onderwerpen/wegen/documenten/kamerstukken/2014/03/26/krant-beter-benutten>
- RTLnieuws (2017). *Kosten door groeiende files stijgen naar recordbedrag: 12 miljard euro*. Retrieved 25<sup>th</sup> of May 2018 from: <https://www.rtlnieuws.nl/nederland/kosten-door-groeiende-files-stijgen-naar-recordbedrag-12-miljard-euro>
- Safavian, R., & Mclean, K. C. (1975). Variable Work Hours: Who Benefits?. *Traffic engineering*, 45(3).
- Santos, G. (2004). *Road pricing: theory and evidence* (Vol. 9). Elsevier.
- Small, K. A., & Gomez-Ibanez, J. A. (1998). Road pricing for congestion management: The transition from theory to policy, in "Road Pricing, Traffic Congestion and the Environment: Issues of Efficiency and Social Feasibility" KJ Button and ET Verhoef, Eds. Edward J. Elgar, Cheltenham, UK.
- Small, K. A., Verhoef, E. T., & Lindsey, R. (2007). *The economics of urban transportation*. Routledge.
- Sherlock, H. (1991). *Cities are good for us*.
- Stopher, P. R. (2004). Reducing road congestion: a reality check. *Transport Policy*, 11(2), 117-131.
- Taylor, M. A., & Ampt, E. S. (2003). Travelling smarter down under: policies for voluntary travel behaviour change in Australia. *Transport policy*, 10(3), 165-177.
- Telegraaf (2017). *Uitslag stelling: spreiden voorkomt pieken*. Retrieved on 20<sup>th</sup> of June from: <https://www.telegraaf.nl/nieuws/321887/uitslag-stelling-spreiden-voorkomt-pieken>
- Vaughan (2017). *Transportation demand management*. Retrieved on 29<sup>th</sup> of May from: [https://www.vaughan.ca/projects/projects\\_and\\_studies/sustainable\\_transportation/transportation\\_demand\\_management/Pages/default.aspx](https://www.vaughan.ca/projects/projects_and_studies/sustainable_transportation/transportation_demand_management/Pages/default.aspx)
- Vickrey, W. S. (1969). Congestion theory and transport investment. *The American Economic Review*, 59(2), 251-260.
- Volkskrant (2006). *Hou op met wegen bouwen, de files lossen toch niet op*. Retrieved on 20<sup>th</sup> of June from: <https://www.volkskrant.nl/economie/hou-op-met-wegen-bouwen-de-files-lossen-toch-nooit-op~be804e42/>

# Appendix I

Table 1: Chi-square – flexibility among industries

<b>Chi-square</b>	<b>49,31</b>
Degrees of freedom	24
P-value	0,00

Table 2: Chi-square – flexibility among education levels

<b>Chi-square</b>	<b>24,06</b>
Degrees of freedom	9
P-value	0,00

Table 3: Chi-square – extent flexibility among education levels

<b>Chi-square</b>	<b>19,66</b>
Degrees of freedom	6
P-value	0,00

Table 4: Chi-square – compensation offer by education level

<b>Chi-square</b>	<b>19,05</b>
Degrees of freedom	6
P-value	0,00

Table 5: Chi-square – compensation offer by age

<b>Chi-square</b>	<b>21,57</b>
Degrees of freedom	10
P-value	0,02

Table 6: Chi-square – motivation demand flexibility by household

<b>Chi-square</b>	<b>47,86</b>
Degrees of freedom	6
P-value	0,00

Table 7: Chi-square – motivation demand flexibility by age

<b>Chi-square</b>	<b>45,29</b>
Degrees of freedom	15
P-value	0,00

Table 8: Chi-square – motivation to reject flexibility by education

<b>Chi-square</b>	<b>18,44</b>
Degrees of freedom	9
P-value	0,03

Table 9: Chi-square – motivation against PT use by educational level

<b>Chi-square</b>	<b>39,24</b>
Degrees of freedom	21
P-value	0,01

Table 10: Chi-square – motivation against PT use by age

<b>Chi-square</b>	<b>61,97</b>
Degrees of freedom	35
P-value	0,00

Table 11: Chi square – motivation against PT use by household

<b>Chi-square</b>	<b>37,62</b>
Degrees of freedom	14
P-value	0,00



# Appendix II

<b>Answer</b>	<b>Percentage</b>	<b>Count</b>
<i>Younger than 25 years</i>	8.47%	16
<i>25-34 years</i>	26.98%	51
<i>35-44 years</i>	20.11%	38
<i>45-54 years</i>	23.81%	45
<i>55-64 years</i>	18.52%	35
<i>65 years or older</i>	2.12%	4
<b>Total</b>	<b>100%</b>	<b>189</b>

Table 1: Descriptive statistics - Age

<b>Answer</b>	<b>%</b>	<b>Count</b>
<i>ICT</i>	4.28%	8
<i>Healthcare and social assistance</i>	12.83%	24
<i>Transport &amp; logistics</i>	5.35%	10
<i>Consultancy</i>	9.63%	18
<i>Financial services</i>	5.35%	10
<i>Education, culture &amp; science</i>	5.88%	11
<i>Public administration &amp; safety</i>	8.02%	15
<i>Media &amp; telecommunication</i>	1.60%	3
<i>Different:</i>	47.06%	88
<b>Total</b>	<b>100%</b>	<b>187</b>

Table 2: Descriptive statistics - Industries

<b>Answer</b>	<b>Percentage</b>	<b>Count</b>
<i>One-person household</i>	15.87%	30
<i>Multiple-person household</i>	57.67%	109
<i>Multiple-person household with one of more children below the age of 12</i>	26.46%	50
<b>Total</b>	<b>100%</b>	<b>189</b>

Table 3: Descriptive statistics - household

<b>Answer</b>	<b>%</b>	<b>Count</b>
<i>High school</i>	4.23%	8
<i>Intermediate vocational education (MBO)</i>	20.11%	38
<i>Higher vocational education (HBO)</i>	50.26%	95
<i>University (WO)</i>	25.40%	48
<b>Total</b>	<b>100%</b>	<b>189</b>

Table 4: Descriptive statistics – educational level

<b>Answer</b>	<b>Percentage</b>	<b>Count</b>
<i>Man</i>	52.38%	99
<i>Woman</i>	47.62%	90
<b>Total</b>	<b>100%</b>	<b>189</b>

Table 5: Descriptive statistics - Gender

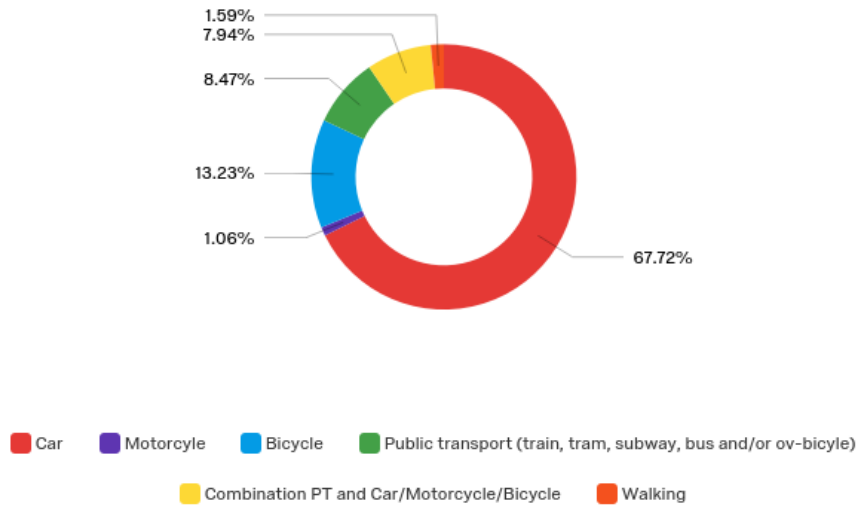


Figure 1: Usual mode of transport among sample

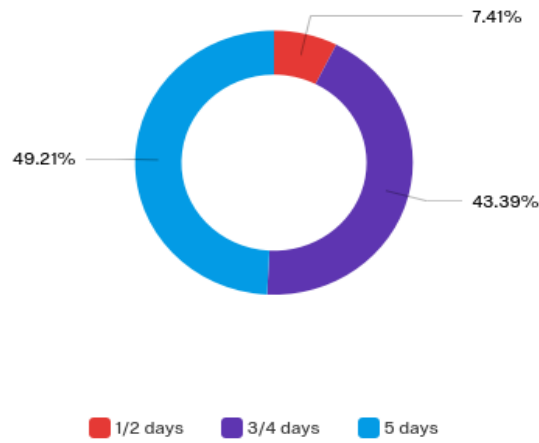
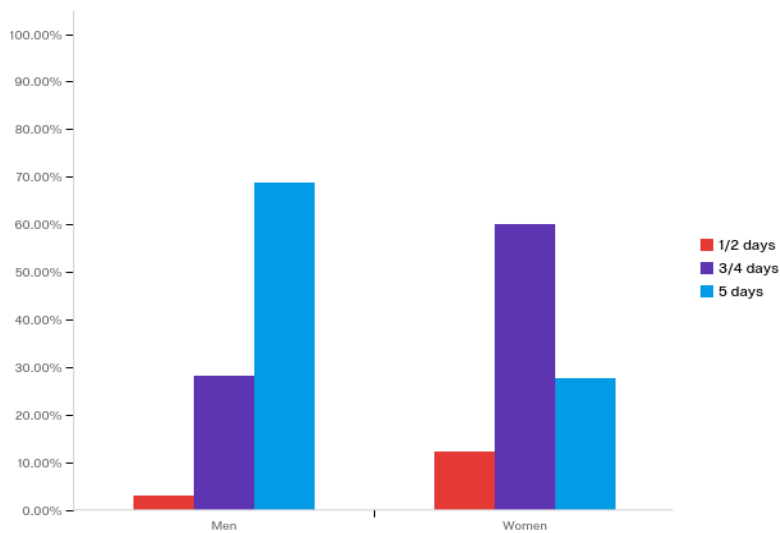


Figure 2: Work-related travel frequency among sample



<b>Chi-square</b>	<b>32,34</b>
Degrees of freedom	2
P-value	0,00

Figure 3: Work-related travel frequency by gender

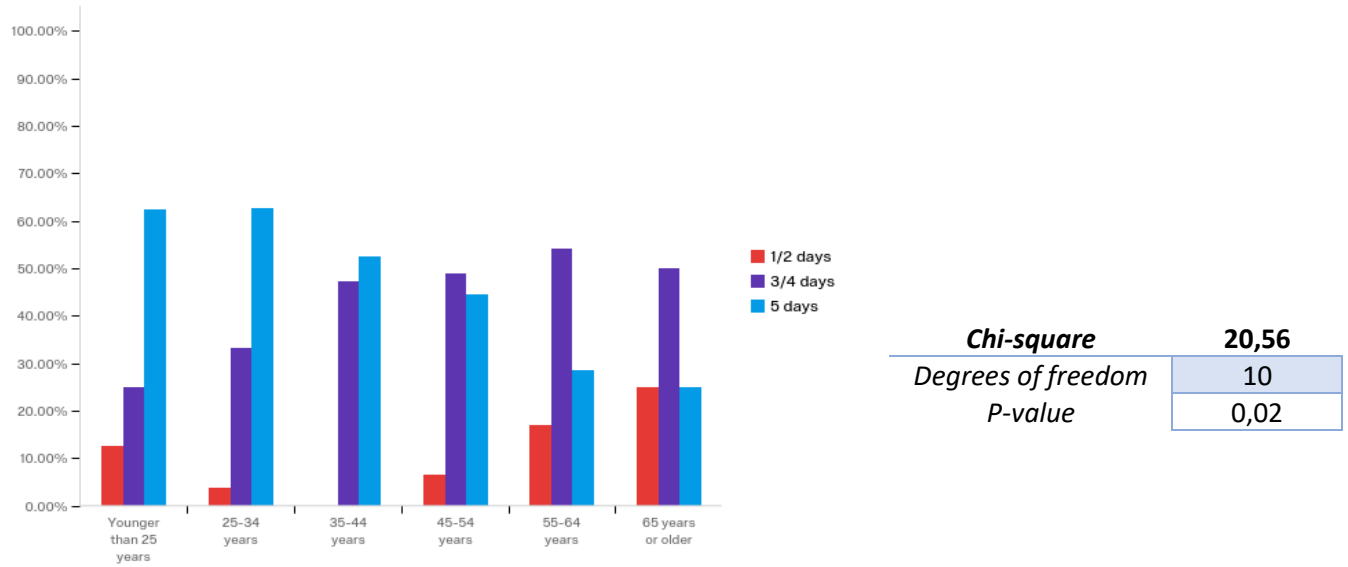


Figure 4: Work-related travel frequency by age

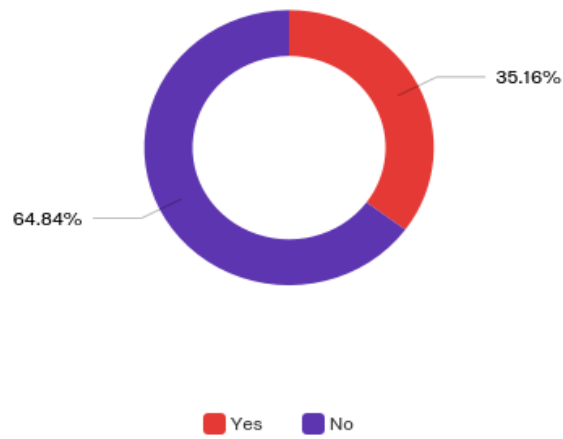


Figure 5: Demand for flexibility expansion among sample

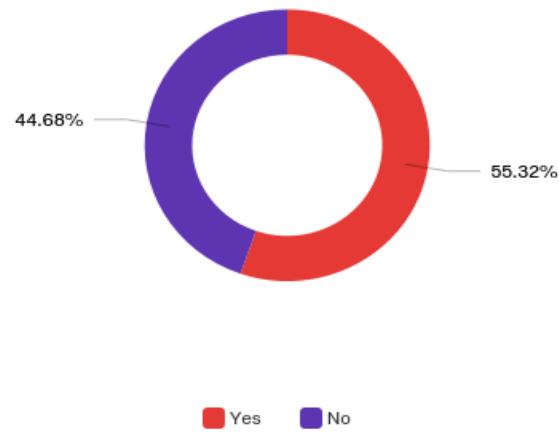


Figure 6: Demand for flexibility among employees who currently do not enjoy flexibility

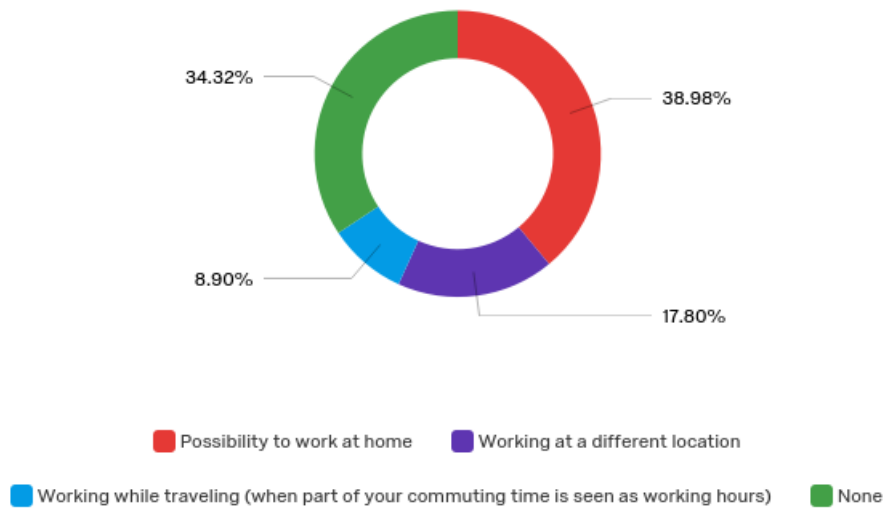


Figure 7: Demand for other forms of flexibility among sample

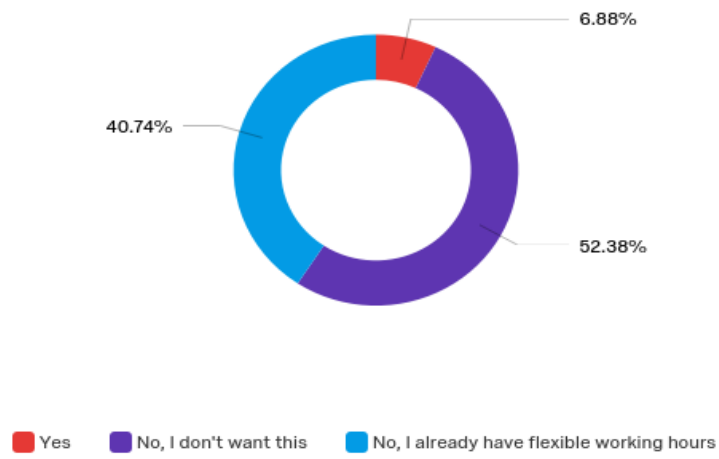


Figure 8: Willingness to make a modal switch when having full flexibility in one's job

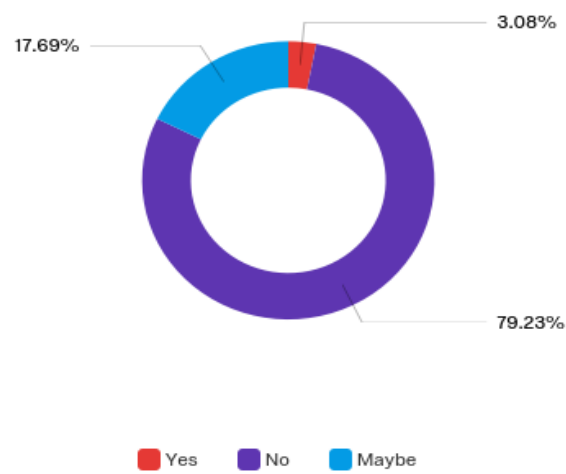
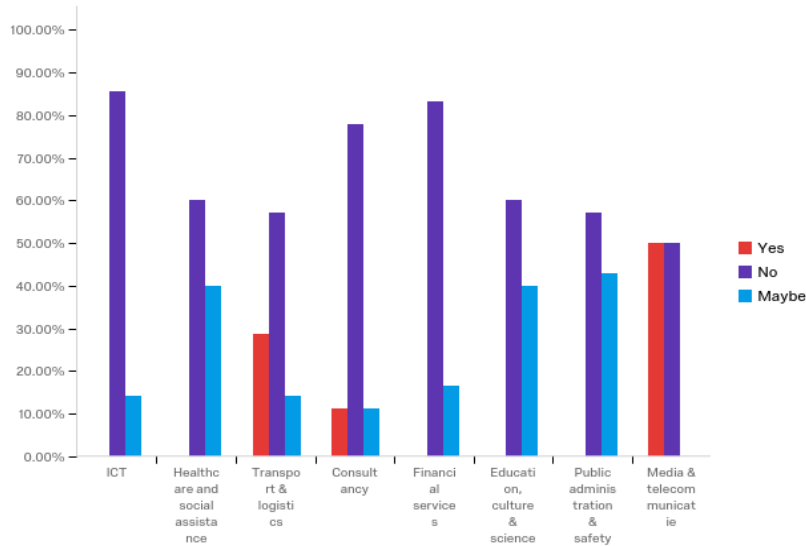


Figure 9: Willingness to travel by PT when being provided free traveling options in off-peak hours



<b>Chi-square</b>	<b>46,87</b>
Degrees of freedom	16
P-value	0,00

Figure 10: Willingness to accept free public transport offer by industry

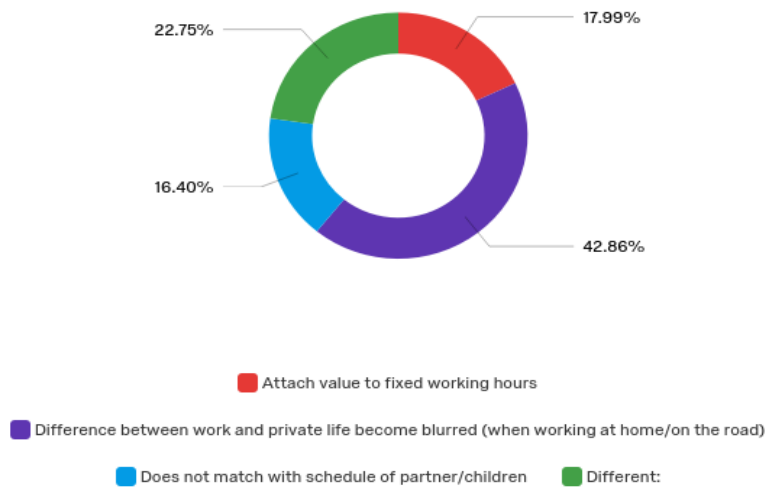


Figure 11: Motivation to reject flexibility among sample

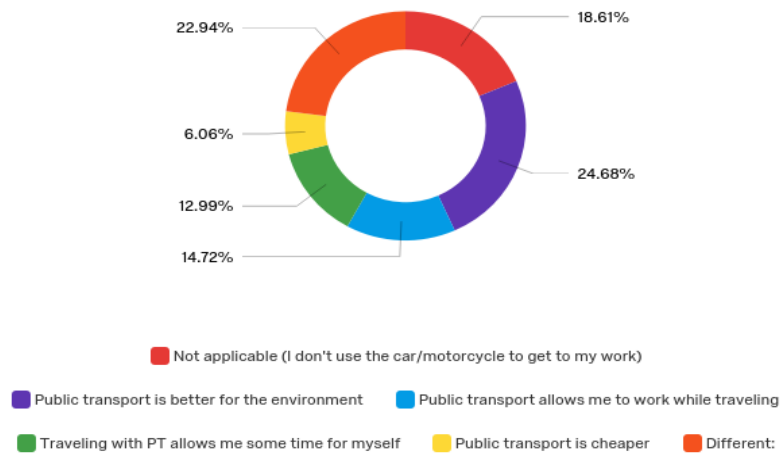


Figure 12: Motivation to use public transport among sample

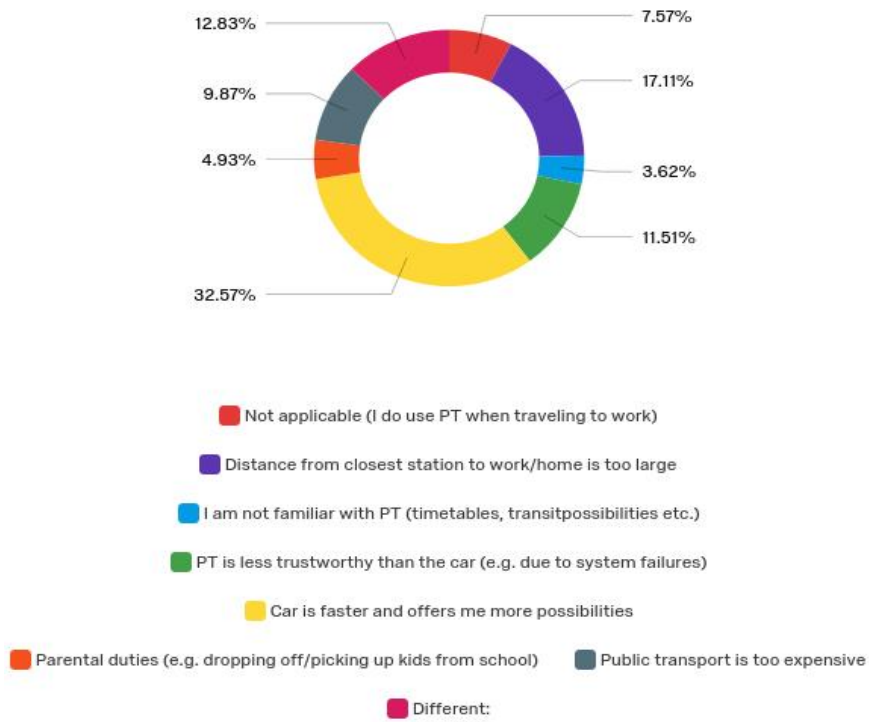


Figure 13: Motivation to not use public transport among sample

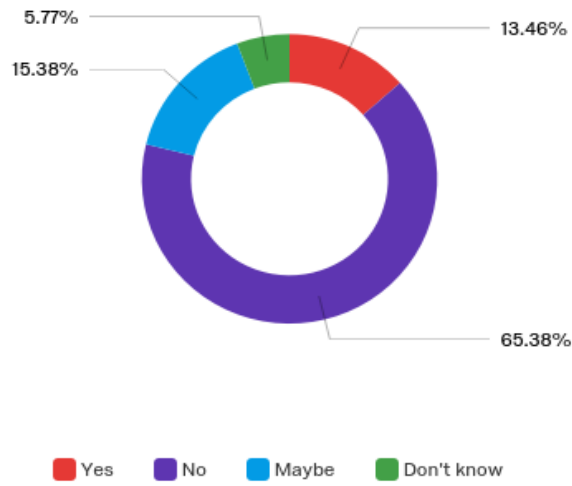


Figure 14: Willingness to use public transport should free rental bike be offered to bridge last mile

# Appendix III

## Survey flow

The x shown in front certain questions indicate that the question is mandatory for all respondents

**X Q1** How many days per week do you travel to you work?

- 1/2 days
- 3/4 days
- 5 days

**X Q2** What is the average distance you have to travel from home to work?

X km

**X Q3** Does your employer offer you the possibility to work with flexible working hours? (the possibility to deviate from regular start/ending times)

- Yes -> Q5
- No -> Q4
- Don't know-> Q4
- Sometimes -> Q5

**Q4** Would you be interested in working with flexible working hours? (the possibility to deviate from regular start/ending times)

- Yes -> Q7
- No -> Q7

**Q5** To what extent is working with flexible working hours possible in your situation?

- Less than 50% of my employment
- More than 50% of my employment
- There is no restriction on flexibility in my job ->Q7

**Q6** Would you wish to expand the flexibility in your current working situation?

- Yes
- No

**X Q7** Are there other forms of flexibility you would like to incorporate in your current situation?

*(Multiple answers are possible)*

- Possibility to work at home
- Working at a different location
- Working while traveling (when part of your commuting time is seen as working hours)
- None

**X Q8** What would be the most important reason for you to demand flexible working hours?

- A larger degree of freedom/ more influence on own schedule
- The possibility to avoid traveling in peak hours
- Improved work/private life balance (e.g. time to drop off kids at school)
- Different:

**X Q9** What would be the most important reason for you to reject flexible working hours?

- Attach value to fixed working hours
- Difference between work and private life become blurred (when working at home/on the road)
- Does not match with schedule of partner/children
- Different:

**X Q10** What is your usual mode of transport is when traveling to work?

- Car -> Q11
- Motorcycle -> Q11
- Bicycle -> Q12
- Public transport (train, tram, subway, bus and/or ov-bicycle)-> Q12
- Combination PT and Car/Motorcycle/Bicycle -> Q12
- Walking -> Q12

**Q11** Imagine that your employer offers you to travel by public transport for free in off-peak hours, when you work with flexible working hours. Would you accept the offer made by your employer and change your mode of transport to public transport?

\*Off-peak hours are from 9.00 to 16.00 and from 18.30 to 6.30\*

- Yes
- No
- Maybe



**X Q12** Would you be willing to change you transport mode if you had complete control over your working flexibility?

- Yes ->Q13
- No, I don't want this ->Q14
- No, I already have full flexibility ->Q14

**Q13** Which mode of transport would you change to get to you work in the instance of having total control over your working flexibility?

- Car
- Motorcycle
- Bicycle
- Public transport (train, tram, subway, bus and/or ov-bicycle)
- Combination PT and Car/Motorcycle/Bicycle

**X Q14** What could be a reason for you to make use of public transport instead of the car when working with flexible working hours?

*(Multiple answers are possible)*

- Not applicable (I don't use the car/motorcycle to get to my work)
- Public transport is better for the environment
- Public transport allows me to work while traveling
- Traveling with PT allows me some time for myself
- Public transport is cheaper
- Different:

**X Q15** What could be a reason for you **not** to make use of public transport instead of the car when working with flexible working hours?

*(Multiple answers are possible)*

- Not applicable (I do use PT when traveling to work) ->Q16
- Distance from closest station to work/home is too large ->QA1
- I am not familiar with PT (timetables, transit possibilities etc.) ->Q16
- PT is less trustworthy than the car (e.g. due to system failures) ->Q16
- Car is faster and offers me more possibilities ->Q16
- Parental duties (e.g. dropping off/picking up kids from school) ->Q16
- Public transport is too expensive ->Q16
- Different: ->Q16

QA1 – What is the average distance from the closest station to your work?

- 0-250 metre
- 250 to 500 metres
- 500 to 750 metres
- More than 750 metres
- Don't know

QA2 – In case you would be able to use a rental bike free of charge (OV-bicycle) to bridge the distance from station to work, would this motivate you to make use of public transport

- Yes
- No
- Maybe
- Don't know

**X Q16** Would you be willing to change from car/motorcycle use to free public transport use in off-peak hours, when being given a monetary compensation for the presumed extra traveling time?

- Yes -> Q17
- No -> Q18
- Maybe, depends on the compensation -> Q17

**Q17** What is the minimum amount of compensation you would like to receive per kilometre travelled in order to use public transport?

(to illustrate, the monthly compensation is shown based on a traveling distance of 20 km and a work week of 5 days)

- € 0,10 per km € 72,- per month
- € 0,15 per km € 107,- per month
- € 0,19 per km € 136,- per month (usual compensation when traveling with car)
- € 0,25 per km € 178,- per month
- More than € 0,25 per km More than € 178,- per month

**X Q18** Which industry are you currently working in?

- ICT
- Healthcare and social assistance
- Transport & logistics
- Consultancy
- Financial services
- Education, culture & science
- Public administration & safety
- Media & telecommunication
- Different

**X Q19** Wat is uw hoogst genoten opleiding?

What is your highest level of education?

- High school
- Intermediate vocational education (MBO)
- Higher vocational education (HBO)
- University (WO)

**X Q20** What is your gender?

- Man
- Woman

**X Q21** What is your age?

- Younger than 25 years
- 25-34 years
- 35-44 years
- 45-54 years
- 55-65 years
- 65 years or older

**Q22** What is the composition of your household?

- One-person household
- Multiple-person household
- Multiple-person household with one of more children below the age of 12

**End of survey**