Bachelor Final Project Civil Engineering

Prices for bicycle storage for E-bike and regular bike users

The difference in price between how much e-bike and regular bicycle users are willing to pay for storages at a walking distance from the destination

Sietse Soethout *4601831*

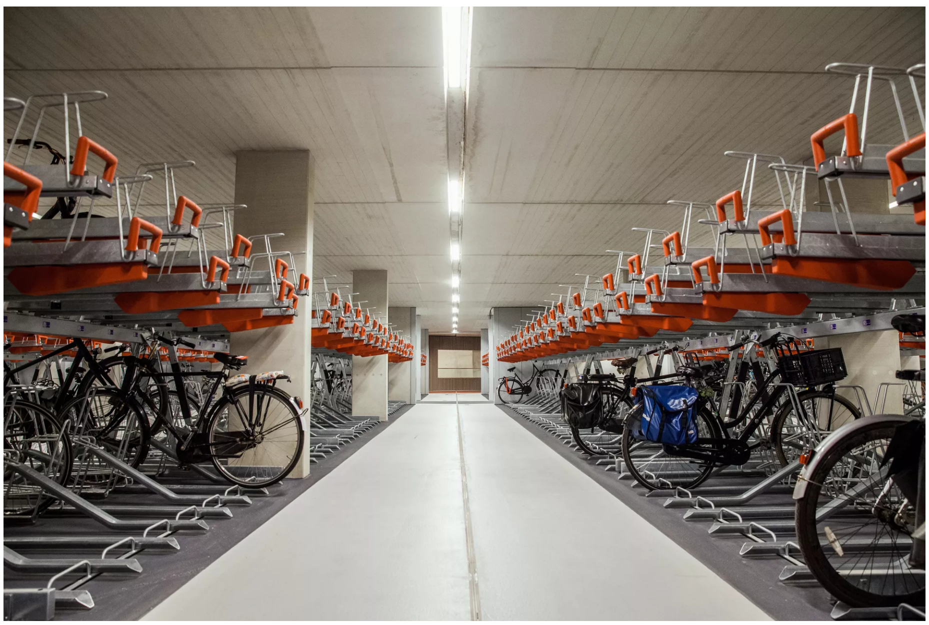

Photo: (van Unen, 2018)

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Coaches:
Dr. Ir Y. Yuan
M.Sc. A. Gavriilidou

Delft University of Technology

Preface

This research is done for the Bachelor Final Project of the Delft University of Technology bachelor Civil Engineering. It will help me to learn how to do a individual research on a university level and how to collect the data needed for the study. The biggest personal challenges are making and sticking to the planning and making a good survey. The planning can be found in appendix A. I have never made a survey before and have to do that well in order to be able to do a research at all. Special thanks to Dr. Ir Y. Yuan and M.Sc. A. Gavriilidou for helping me during this course with this project.

Summary

Because of the increase in bicycle theft, new bicycle storages are needed for e-bike and regular bikes. Due to the lack of free space next to peoples destination, these storages need to be build at a walking distance from these destinations and to cover for the expenses, these storages have to be paid storages. To find out if there is a difference in how much e-bike and regular bike users are willing to pay for a storage at a walking distance, a survey is distributed that contains questions about possible variables that affect this price and questions about a price the participant is willing to pay for multiple distances; 0, 1, 2, 5 and 7 minutes. To answer this main question three sub questions are formulated.

The first question is about what parameters affect the price besides the distance. The second about what distances should be considered and the third about what price range should be offered as an answer option. For the first sub question there are three categories: fixed, left out and used parameters. The fixed parameters are: the chance of having a free place for your bike, the safety and whether the storage is indoors. The left out ones are: the ease of use, habits and the travelers direction of arrival. And the used parameters are: Insurance, bicycle theft, charging options, employment status, age, amount of usage, e-bike or not and most used bicycle. These parameters are determined by hypotheses and other researches.

The answer to the second sub question gives a list of distances, these are determined by literature and assumptions. The distances considered in this report are: 0, 1, 2, 5 and 7 minutes. The distance cycled to the storage is set at 15 minutes, this is in minutes to have a equal travel time for e-bike and regular bike users as e-bike users tend to go faster.

The third sub question results in a price range for daily an monthly prices. These are for prices per day from €0 to €5 with steps of €0.50. And for prices per month from €0 to €20 with steps of €2.

In the survey the participants are divided in to two groups, one for e-bike and one for regular bike users. This is done to give both groups specified questions about their bike. The e-bike users answer all question regarding their e-bike, in case the own a second bike, this second bike is left out of the equation. The questions regarding the price per distance are asked in a random order, but each participant does get the same question order due to technical restrictions. This prevents respondents from choosing one price step higher each time the walking time increases.

For the analysis of the data a multiple linear regression analysis is used. This method assumes a linear correlation and by implementing variables either as dummies or continuous data, a prediction can be made of the price based on these variables. Not all variables can be used, as the most used bike does not have sufficient different answers. Moreover, the prices per month have to be removes too, because of insufficient data. Each answer option from the categorical variables is made into a dummy and for each of them a p-value is given along with a coefficient. This p-value has to be lower than 0.1, as the margin of error is 10% with a confidence level of 90%. This is only the case for the following: the distance, the age group of >60 years old, the group that did not know whether they are willing to pay more for a storage with a charging option, and both the answers "No" and "Don't know / Rather not say" for the insurance. There is no significant difference between e-bike and regular bike users.

Contents

1 Introduction

In The Netherlands the sale of e-bikes and with this the amount of e-bike users is growing strongly (Bremmer, 2019). These e-bikes are expensive bikes that are stored and locked in the same way as 'normal' bikes. This causes a goldmine for bicycle thieves (Bremmer, 2020), because these e-bikes are worth at least €1000 (fietsenwinkel.nl, 2020) and are not any better protected against theft than regular bikes. The main problem is the fact that there are not sufficient guarded bicycle storages to facilitate a safe storage of e-bikes. This problem is not easily solved, because there is not always enough space to build a bicycle storage next to the destination of the user. The new bicycle storages have to be built further away than wanted and this has a walking distance from the storage to the destination as effect. In addition, e-bikes are stored in paid storages more often than non electrical bikes (Gemeente Leiden, 2010), which increases the necessary amount of bicycle storage for e-bikes even more than for regular bikes. Moreover, storages cost money and storages especially for e-bikes are even more expensive as there have to be charging points and preferably lockers to store the e-bikes even more safely. In other words, people will have to walk the last part of their travel to their destination and have to pay for the bicycle storage to make sure these storages can be built, maintained and guarded. When people have to pay to store their bicycle safely, they probably do not want to walk to their destination for the last part. They want to park their bike as close to their destination as possible to reduce the total travel time. To be able to define if a new storage at a given distance from people's destination is profitable the question arises how much people are willing to pay for guarded bicycle storage at a given walking distance from their destination and if e-bike users are indeed willing to pay more than regular bike users. This given distance will be as a function of the total biking time to the storage. Therefore this report will search for a connection between this walking distance and the price. A more detailed overview of the steps taken to answer these questions is given in chapter 2.

The stakeholders that can benefit from this research are municipalities, as in most cities there is a shortage of bicycle storage space, and private bicycle storage owners such as the NS (Nationale Spoorwegen) that have a storage next to almost every big train station. Both these parties can benefit from this research when they intend to build a new bicycle storage, whether it is next to peoples destination or at a walking distance, they can use this research to estimate the profit of the amount of regular and electrical bicycle places and design the optimum amount of storage places for each bicycle type at different distances to peoples destination.

The structure of the report is as follows. In chapter 2 the methodology will be explained, this includes the explanation of the data to be collected and the lay-out of the survey. In chapter 3 the data analysis will be specified and the used variables will be explained. In chapter 4 the results from the analysis will be shown and explained. In the next chapter, chapter 5, the conclusions of the analysis are made and discussed. At the end, in chapter 6, recommendations for future research are done, along with suggestions of thing that could be done in a different way in this research.

2 Methodology

In this chapter the methodology will be explained. First the sub questions are formulated. Next the sub questions will be answered to formulate the questions of the survey. After that the survey is explained. At the end the used analysis method is described.

2.1 Research questions

In order to obtain an answer to the question :

What is the difference in price between e-bike and regular bike users are willing to pay to store their bike safely at different walking distances from their destination?

first a couple of sub question have to be formulated. These sub question should give an idea whether there are parameters that affect the price apart from owning an e-bike or not and to see what distances have to be taken into account during the research. The price has to be looked into as well.

1. What parameters affect the price people are willing to pay besides walking distance?
2. What distance are people willing to walk compared to a biking time of 15 minutes?
3. What prices are e-bike and non electrical bike users willing to pay for these storages at the given distances?

In the rest of this chapter these three sub questions will be answered, these answers will be used to make the questions for the survey. Question one about the parameters is answered in section 2.2, question two about the walking distances in section 2.3 and question three about the prices in section 2.4.

2.2 Parameters

To answer the first sub question, the parameters are determined through two ways; literature and hypotheses.

2.2.1 Parameters from literature

The parameters that contribute the most to why people use a certain storage at a train station are in order from most contributing to least (Gemeente Leiden, 2010):

1. Distance to destination.
2. High change of a free space for their bike.
3. Storage is free.
4. Safety.
5. Travelers direction of arrival.
6. The storage is indoors.
7. Habits.
8. Ease of use, no stairs or storage place above their head.

These factors will be divided in three groups, variables, fixed parameters and left out parameters in table 1. The free storage is left out, because the research is about paid storages. The direction of arrival is left out for the reason that these are not possible without having a location and peoples origination set for the storage. The ease of use and habits are left out as well, this is done because these effect of these factors is about one third of the other ones. This means they are less important to people and to keep the number of variables to a minimum, they are left out. Moreover, habits are not possible to ask about as people develop them, it is not possible to refer to habits in a fictional situation.

In order to tempt people to pay for a storage, safety, a place for your bike and storage indoors are guaranteed. People need advantages compared to parking their bicycle on the street to pay for a storage. This leaves the distance to the destination as variable, this is needed to answer the research question.

Table 1: Storage parameters

Variable	Fixed parameter	Left out parameter
Distance to destination	High chance of a free place	Storage is free
	Safety	Travelers direction of arrival
	Storage is indoors	Habits
		Ease of use

There are more parameters that may contribute to the price participants are willing to pay, to define these parameters some hypotheses have been made in section 2.2.2.

2.2.2 Parameters from hypotheses

In this subsection parameters from hypothesis are determined and explained.

Insurance
Another parameter that may effect the price and willingness to pay is whether the bike user has a bike insurance. If peoples bicycle is insured, they probably will not worry about their bicycle being stolen as they will get a new one for free. However, they will still have to walk home and contact insurance when they find out their bike is stolen. Because of this, it is possible insured people are willing to pay less. Another possible explanation is the fact that these people already pay for insurance and therefore the extra costs for storage on top of that become too expensive.

Bicycle theft
Another parameter is whether a bicycle has ever been stolen from the participant. If they have, it is hypothesized that they are more concerned about bicycle theft and therefore are willing to pay more to keep their bicycle safe.

Charging availability
The third parameter is the option for e-bike users to charge their bikes battery in the storage. If they can charge their bike, they will have a full battery upon returning to the storage. This can influence the price to be higher than when this option is not available. This parameters only affects e-bike users, as non electrical bike users do not have a battery.

Employment status and age
The fourth parameter is the employment status of the participant, when they are employed they will most likely be willing to pay more than unemployed people. Students are willing to pay less, as they do not have the financial resources to pay for a storage. Retired people are concerned about their bike as for 55% of them cycling is their biggest hobby (Fietsen123.nl, 2011). This last argument is connected to the age of the participant, as retired people are not always over the age of 65. Therefore the age of the participants has to be taken into account as well.

Most used bicycle
The last parameter is the most used bike for non e-bike users. This can be relevant as people with in general more expensive bikes, such as racing bikes, may be willing to pay more than people with in general less expensive bikes, such as city bikes. To include this last parameter, plenty of data is needed. Because of that this is an optional parameter that can only be included when there is plenty of data.

2.3 Walking distances

To conduct a survey, some parameters have to be fixed. Three of them have been discussed in section 2.2.2, however there is one more important parameter. This is the distance people bike to the storage.The travel time to this storage by bicycle will be given as 15 minutes as the average biking distance is 3.6 kilometres for normal bikes and 5.5 for e-bikes (Central Bureau for Statistics, 2018). With the knowledge that e-bikes can go faster than regular bikes, the distance will be given in minutes to create a survey with equal parameters. After all parameters are set, the walking distance can be determined. The minimum is set at 0 minutes, this represents a storage directly next to the destination. The maximum is set at 7 minutes, this is rounded off half of the 15 minutes biking time, as it is assumed people do not want to walk longer than half their biking time. The maximum distance people are willing to walk to a destination is not determined by one value. Multiple researches come with multiple results. For example, the maximum walking distance to a train station is estimated between 760 m and 2.2 km and for shopping between 300 m and 1000m (Molster and de Haan, 2016). This indicated that there is no data to determine the maximum distance people are willing to walk. Therefore the estimation of 7 minutes is made and used. The values in between are set at 1, 2 and 5 minutes. The step size increases after the 2 minutes value to make the times better distinguishable. As the times increases, the percentage of the minute step decreases, for example: from 1 to 2 minutes the step is 1 minute, but the time difference is 100%. From 5 to 6 minutes the step size is still 1 minute but the time difference is only 20%. Therefore the step size has to increase. Instead of using step sizes of 1,2 and after that 3 minutes, which would result in walking times of 1,2,4 and 7 minutes, step sized have been altered to 1,3 and 3 to give the walking time of 5 minutes. This is done because 5 minutes is a common used time and therefore people have a better understanding of it.

2.4 Prices

Now the walking distances are set, the prices for each distance have to be determined. As a reference the price of the NS and the municipality of Amsterdam are taken. There are two options, to pay per day and to pay per year. The price per day for the NS is €1,25 and €75 per year (ns.nl, 2020), these are the same for the storages of the municipality of Amsterdam (amsterdam.nl, 2020). Because there are two payment options, the participants have to be divided into two groups. One that pays per day, and one that pays for a subscription. This subscription will be priced per month, instead of per year, to make the it easier to compare the two values and because prices per month are easier to estimate than prices per year. The groups will be formed based on the amount of usage of guarded bicycle storages. When a participant uses a storage more than 5 times a month, the reference price of a monthly subscription will be cheaper. Therefore people that use a storage more than 5 times a month will be put in the monthly payment group and the ones that use a guarded storage 5 times or less a month are put in the daily payment group. The participants will be given a range of prices to choose from, the ranges for daily and monthly prices both start at €0,00, this will indicate that the suggested storage is too far away from the destination to pay anything at all, this is explicitly mentioned in the survey. The daily prices will go up with €0,50 per step up to €5,00. The step size is €0,50, because with a smaller step size the difference between price options is too small to make a well founded choice between options. The maximum is chosen to make around 10 answer options around the reference price of €1,25 a day, this way people do not become overwhelmed when seeing the question. The option to pay more than €5,00 is added as well.

For the prices per month the step size is set at €2,00, with this step size the maximum price is €20,00 with 10 answer options. The option to pay more than €20,00 is added in this question as well. The maximum is again chosen to make around 10 answer options around the reference price of €6,25 a month (€75 a year divided by 12 is €6,25 a month). An overview of the pricing options is given in table 2.

Table 2: Pricing overview

	Price per day	**Price per month**
Minimum	€0.00	€0.00
Maximum	€5.00	€20.00
Reference price	€1.25	€6.25
Step size	€0.50	€2.00

An overview of all parameters and variables including the ones from the hypotheses is given in table 3.

Table 3: Complete parameter overview

Variable	**Fixed parameter**	**Left out parameter**
Distance to destination (0,1,2,5,7 minutes)	High change of a free place	Storage is free
Insurance	Safety	Travelers direction of arrival
Experienced bicycle theft	Storage is indoors	Habits
Charging availability		Ease of use
Employment status		
Age		
Price per month / Price per day		
Amount of storage use		
E-bike / no e-bike		
(Most used bicycle)		

2.5 Survey

The survey design will be explained in this chapter and an overview of the survey is given in figure 1. Each variable from table 3 is made into a question and each fixed parameter is explicitly described in the question introductions. There are three stages of questions in the survey:

1. Questions about personal data
2. Questions about other variables
3. Price selection questions

All survey question will be put in one of these groups and an explanation will be given on how the answer to that question can be used.

Personal data

The personal data includes the questions about age and employment status. Both these questions are used to see if there is a difference in willingness to pay between people who give different answers to these questions. The question about age is an open question, the answer will be used to form groups based on the age. The question about employment status has multiple given options. It is used to compare different groups based on employment status, this question has fixed answer options instead of open questions to be able to easily make groups.

Other variables

All other variables except for distance are made into separate questions. The first one after the personal data is about owning an e-bike, it only has the answer options yes and no and is used to divide the participants into two groups. This is done after the personal questions to be able to give both groups different formulated questions for the other variables. The e-bike group answers all questions specifically about their e-bike. Their other bikes have to be left out of the equation for all following questions, this is stated in the survey. After splitting the participants in two, the questions about the other variables are asked. The question about insurance is simply if the participant has a bicycle insurance for their chosen bike (e-bike or regular bike are separated). For the question about bicycle theft the question is asked if the participant has ever had a bike stolen from him/her. These should give a direct comparison between the group that answered yes and no. The one about charge option availability is asked in a different way, the question is asked if the participant is willing to pay more for a storage with charging options than one without. This should give an idea whether people are willing to pay more for this option, and a comparison can be made to see if this is indeed the case. The question about charging options availability is only asked to participants with an e-bike. These three questions all have three answer options; Yes / No / Do not want to answer. The last answer option is implemented to respect the privacy of people that do not want to give an answer, although the survey is anonymous.

The other two variables are the amount of storage use and the most used bicycle. The most used bicycle is only asked to the group without an e-bike and gives multiple answer options including the option to choose "Other" and write your own answer. This makes it easy to make groups based on the most used bike and make a comparison in price between these groups. The amount of storage use is the the last question asked before the questions about the prices. It is used to divide both groups, the e-bike and non e-bike group, in two again. The question is asked how many times a month the participant uses a guarded bicycle storage. There are two answer options: 5 times a month or less, which leads to prices per day and more than 5 time a month, which leads to prices per month as described in section 2.4.

Price selection

The price and walking distance are combined into 5 question that give a price range to choose from for each walking distance. These ranges can be found in table 2. Each participant is given the same questions and the same answer options. The distances are asked in the following order: 0, 5, 1, 7, 2 minutes. This way the participant starts with the 0 minutes to make it easier to have an understanding of what is too much and what is a good price for a bicycle storage. The other distances are set in a random order, but each participant is given the same order, due to technical restrictions. This order is done to prevent respondents from choosing one price step lower each time the walking time increases. That is harder to do in this scenario as people do not know what distances will be asked asked in later questions. The option to see their previous answers is enabled to prevent people from choosing inconsistent answers, for example paying more when the walking distance in higher. This way the given answer still depends on the previous given ones, but are not just one price step lower when the distance is one step higher.

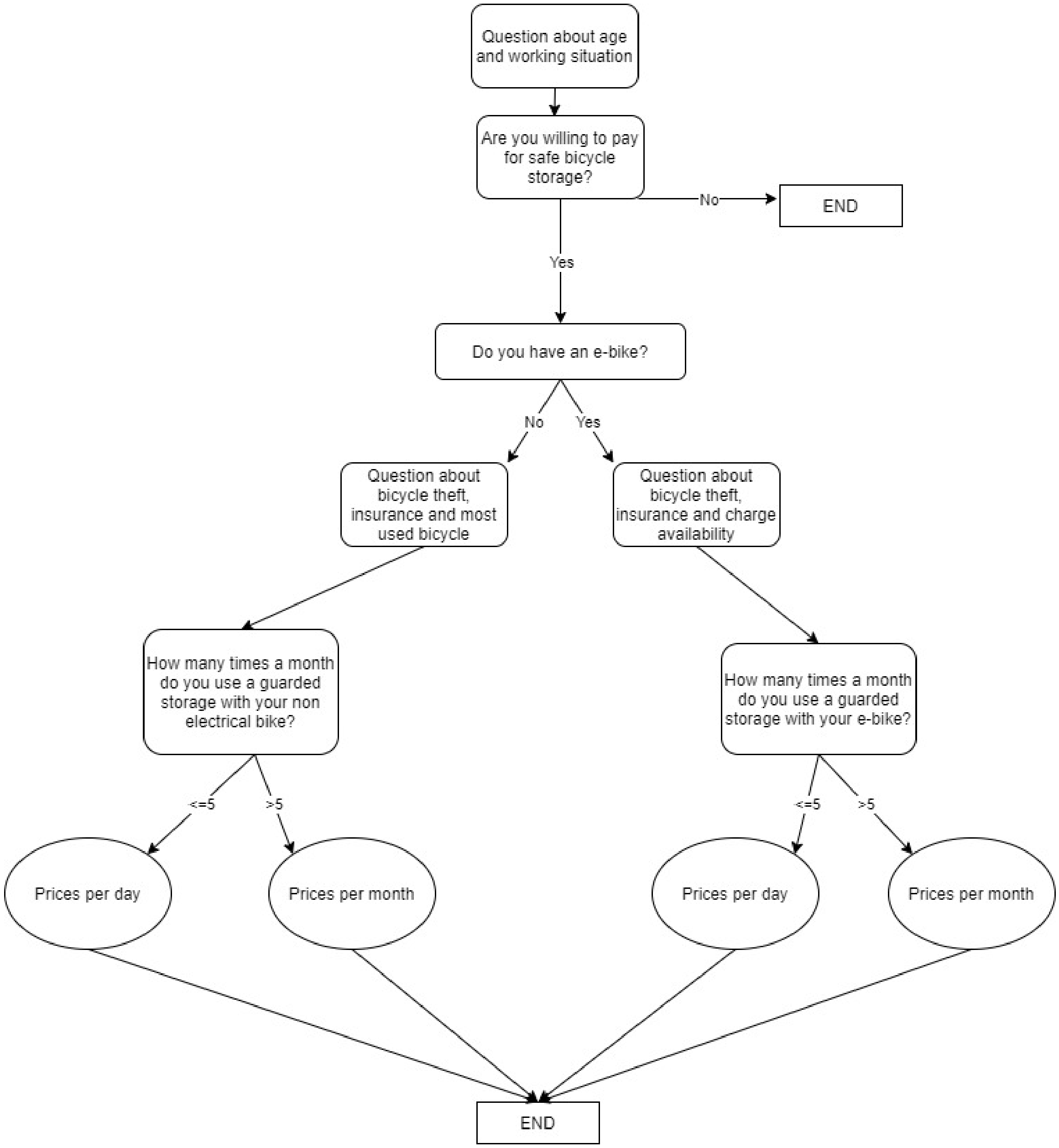

Figure 1: Survey overview

The question about willing to pay for a safe storage at the start is implemented to exclude people who do not want to pay ever. These people would answer the minimum of €0,00 at every question and therefore that data would not be useful. All the other questions have been explained before. The complete survey (in Dutch) can be found in appendix B.

2.6 Data analysis method

The main goal of this report is to find a price for a new bicycle storage based on various parameters. This can be done by plotting each parameter against the price, but this can only show one parameter at the same time. Therefore a multiple linear regression analysis (MLR) is performed. This method takes all data collected and, with set variables, it searches for a linear correlation between all variables and the price people filled in. For each variable in table 1 the data is examined to see if there is sufficient data to use this variable. If there is not sufficient data, the variable is dropped. There are two kind of variables, categorical, this are answers in words and continuous, this are answers that are numbers. The continuous data can be used directly. In order to use the categorical data, the variables have to be made into dummy variables. This gives for each variable either a 1 or a 0. When it is a 1 it contributes to the price, when it is a 0 it does not contribute. For categorical variables with multiple answer options, instead of only yes and no, a simple 0, 1 conversion cannot be done. These variables have to be split into multiple dummies, one for each answer options. The splitting of these variables into multiple dummies has a down side, with the factor 0 or 1 known for all but one of the options, the last 0 or 1 can be predicted. For example, if there is a variable split into 3 dummies and the first two are zeros, the third has to be a 1. This has as consequence that the model cannot distinguish one variable from the other, and the model will not work properly. To prevent this from happening one option in each group of created dummies is dropped. This will be the base option, if all other dummies in that group are zero, the base option will still be used. The result of this model is a list of all answer options and the corresponding coefficient and p-value along with a constant. These coefficients are used in a formula to predict the price and from this coefficient it can be concluded how big the impact of that answer options is compared to the left out base option. The p-value gives an indication of the significance of the variable, it can be compared to a level of significance, usually 5% . If the p-value is lower than 0.05, it is significant, if it is higher than 0.05 it is not. When a variable is insignificant it does not mean it is useless to use it in the MLR, it does mean the answer option does not differ enough from the other answer options. In other words, the answer option does not contribute to a difference in price willing to pay. When an answer option is found to be insignificant, the corresponding coefficient is always zero and the answer option will be added to the base option. This means that that base option will contain multiple answer options and therefore the constant will represent both base answer options. The constant always represents the effect of all dummies that are set at zero, including the base options. The following formula is used to predict the price based on the survey data:

$$Price = constant + var1 * c1 + var2 * c2 + ...$$

In this formula var1, var2 etc. are the dummy value 0 or 1 or the walking distance in minutes, as the distance is the only continuous variable. The c terms are the coefficient of the corresponding answer option and the constant is the constant given by the analysis as described before.

3 Data analysis

At the start of this chapter general data from the survey is given and the personal data is analysed. After that all variables are discussed to see if there is enough data to use that variable in the MLR. In the end the MLR is explained.

3.1 General data

The total number of respondents is 122. As discussed before, the people that do not want to pay have to be excluded. The percentage of people that are not willing to pay for a guarded storage comes down to 35%, this leaves 76 respondents after excluding these people and deleting non usable answers. With a confidence level of 90%, there is a margin of error of 10% (Pollfish, 2020). This means that the percentage of people willing to pay in the Netherlands is between the 25% and 45%, with a certainty of 90%. To see if there is a connection between the willingness to pay and the personal data, the age and employment status, a comparison is made in figure 2 and figure 3. The age is not taken as a continuous variable, like it was asked in the survey. Instead, the participants are divided into three groups, <30, 30-60 and >60 years old. This should give an idea of the price willing to pay per age category instead of per age. These age boundaries are based on the hypothesis in section 2.2.2 and the fact that there is limited data, therefore the amount of groups has to be kept to a minimum to get a good result.

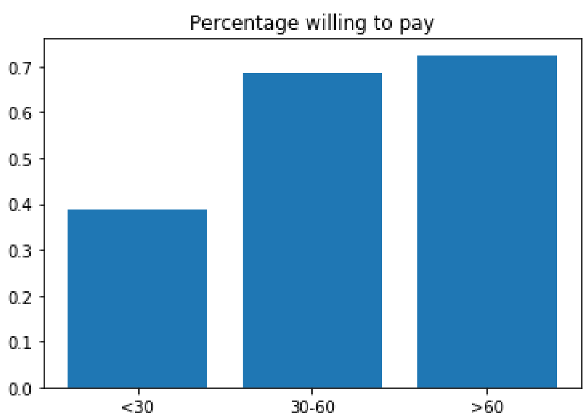

Figure 2: Percentage of participant that is willing to pay for a guarded storage per age group

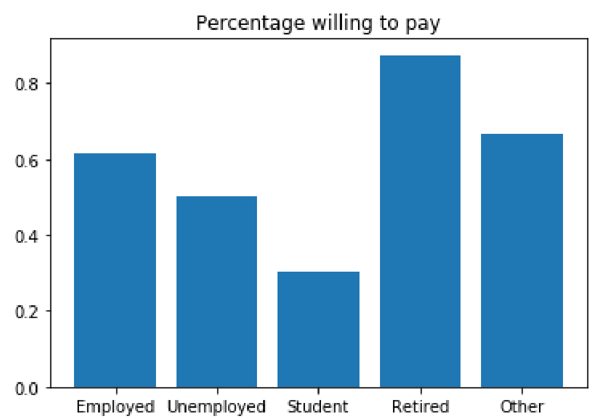

Figure 3: Percentage of participant that is willing to pay for a guarded storage per employment status

It can be seen that older people are most likely to pay for a guarded storage. The same goes for retired people. As the amount of participants is not very high, these numbers are only an indication.

3.2 Variables

In this subsection all variables from table 3 are looked into to give some statistical information about each variable regarding the difference between e-bike and regular bike users. This statistical information will briefly explained without testing if the found conclusion is statistical significant. This is done because the correlation of these variables with the fact that the participant may or may not have an e-bike is not a goal of this report. The statistical information is only given to give some insight in the data set. The variables are also studied to determine if there is sufficient data to use this variable in the MLR as well. All percentages in the figures in this section are based on the number of participant after excluding the people that do not want to pay for a storage, the total amount is 76 participants. To amount of data is declared sufficient if the most chosen answer does not cover more than 75% of the answers, this ensures there are at least 25% of the people chose another option and therefore it is assumed there is sufficient data to use the variable. If there is not sufficient data, the variable will be excluded fro the multiple linear regression analysis. All respondents will still be used in the analysis, only the question about the variable that does not satisfy the requirement will be removed from the data set.

3.2.1 Insurance

As can be seen in figure 4, 71.1% of the participants does not have a bike insurance. This is the most chosen answer and the percentage is below 75%, therefore the variable insurance will be used in the MLR. It can be concluded that most people do not have a bike insurance. However, there is a difference between e-bike and non e-bike owners. Of the people that own an e-bike, 65% has a their bike insured compared to only 12.5% of the regular bike owners. This is most likely for the reason that e-bikes are more expensive.

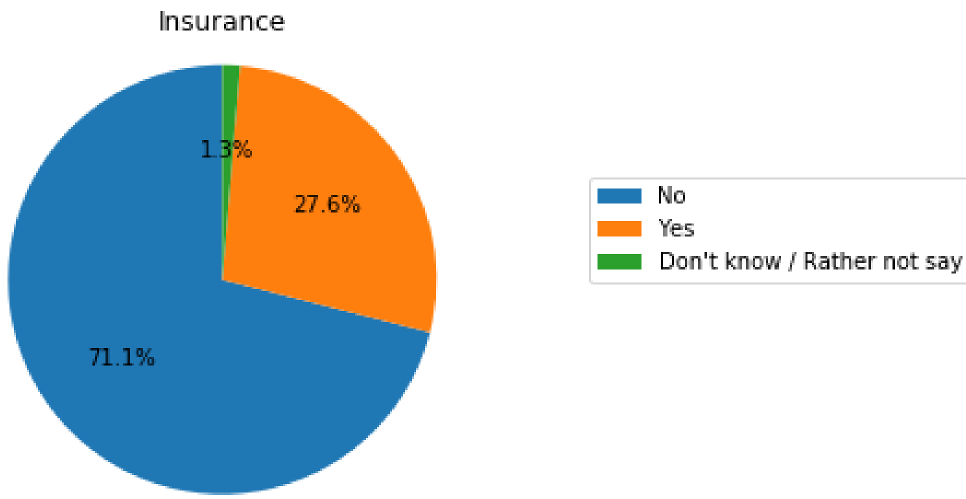

Figure 4: Does the participant have their bike insured?

3.2.2 Experienced bicycle theft

Of all the participants, 64% has had a bike stolen from him or her, as can be seen in figure 5. This percentage gives no reason to exclude the variable, and thus it will be used. If the theft variable of e-bike and non e-bike owners is compared, it can be concluded that there is a small difference. From the e-bike owners, 47.8% has had a bike stolen compared to 69.1% of the regular bike users. This difference does not mean e-bikes get stolen more, as the question was not specifically asked about e-bikes for the e-bike owners. Both groups had the same question about a bike being stolen in general.

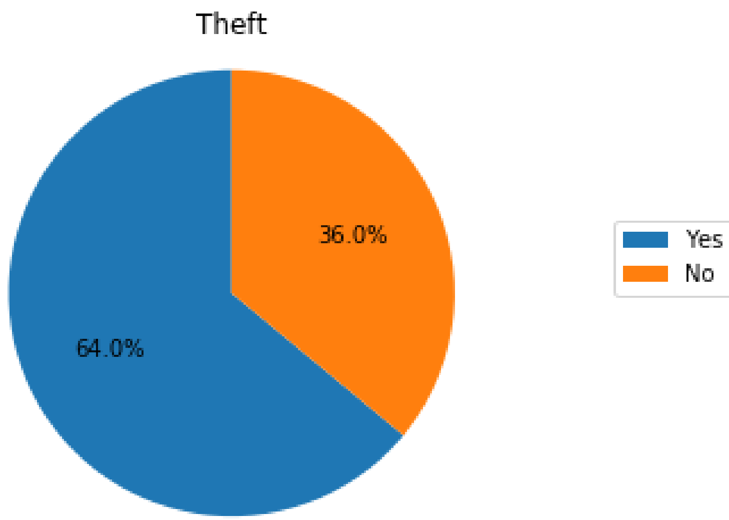

Figure 5: Does the participant ever had a bike stolen from them?

3.2.3 Charging availability

From figure 6 it can be seen that the most chosen answer is that the participant is willing to pay more in the case a charging option is available in the storage. This, again, gives no reason to exclude the variable. Because this question was only asked to e-bike owners, there is no comparison to be made.

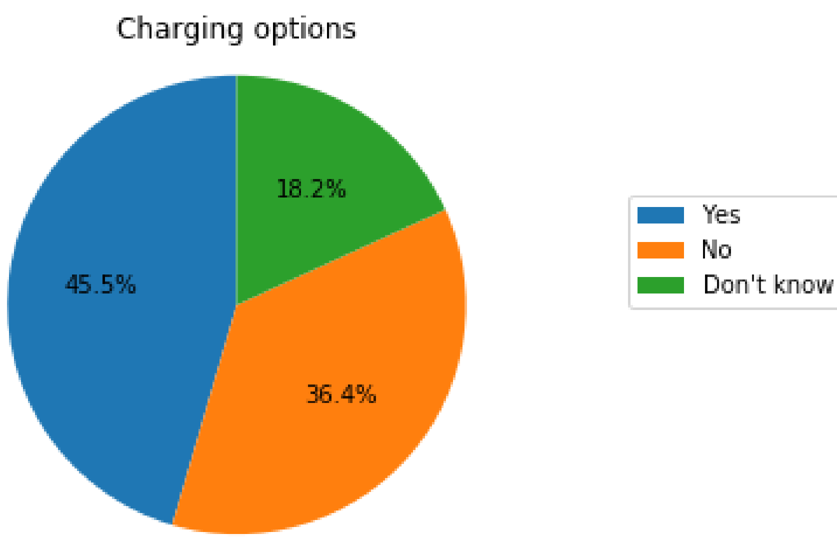

Figure 6: Is the participant willing to pay more for a storage with a charging option?

3.2.4 Employment status

In figure 7 it is clear that almost half of the participants is employed, 48.7% to be exact. Therefore the variable of employment will be used in the analysis. The small group of students is explainable by looking back at figure 3. From the asked students, only 30% of the asked students is willing to pay, compared to at least 50% in the other employment categories. If a comparison is made between e-bike and regular bike owners it stands out that there is no real difference in the percentage of students in the e-bike and regular bike group, 9.1% and 9.3% respectively. The percentage of retired people in both groups differs much more, 50.0% in the e-bike group and 31.5% in the regular bike group. Regarding the employed participants, the percentage of them in the e-bike group is 31.8%, compared to 55.6% in the regular bike group. In other words, the share of students does not change between e-bike and regular bikes, but the share of retired people is much higher for e-bikes and the percentage of employed people is much higher in the regular bike group. The remaining percentages in the groups are from the answer category "other", this includes unemployed, people who did not want to answer this questions and people that did not have their current employment status listed in the answer options. The answer option "Unemployed" is added to the "other" option to make the graph readable, the answer option "Unemployed" is a separate answer and will be used as such in the analysis.

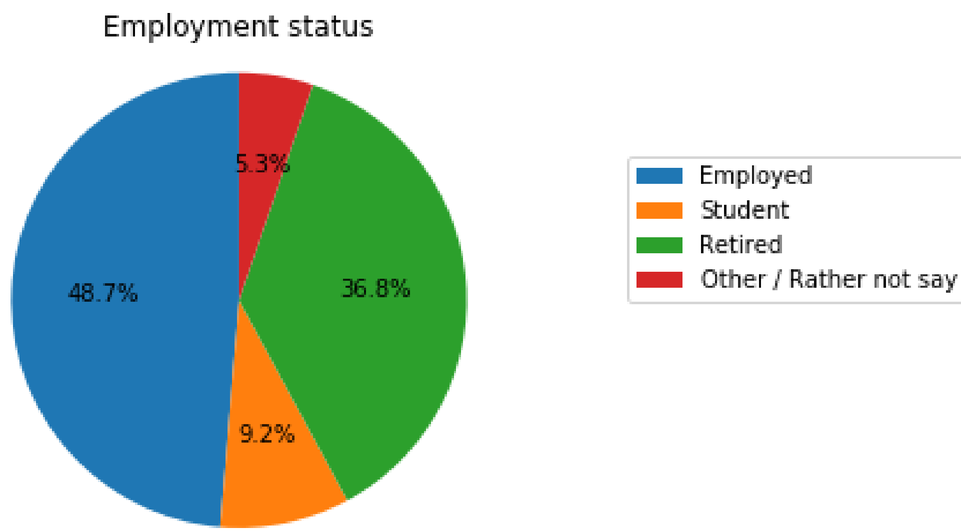

Figure 7: What is the employment status of the participant

3.2.5 Age

In figure 8 it can be seen that there is a majority of people over the age of 60. The amount of people that filled in the survey is between the 30 and 40 in each age category. The huge difference in the amount of people per age group is only because people over the age of 30 are more often willing to pay for a guarded bicycle storage. Even with this shift in percentages per age group, there is no reason to exclude the age variable. Regarding the comparison between the e-bike and regular bike group, in the e-bike group the percentage of people over the age of 60 is 52.6%, while for the regular bike group it is 39.6%. The percentage of people between the age of 30 and 60 stays roughly the same, 36.8% for e-bikes and 39.6% for regular bikes. The share of people under the age of 30 is 10.5% in the e-bike group, compared to 20.8% in the regular bike group.

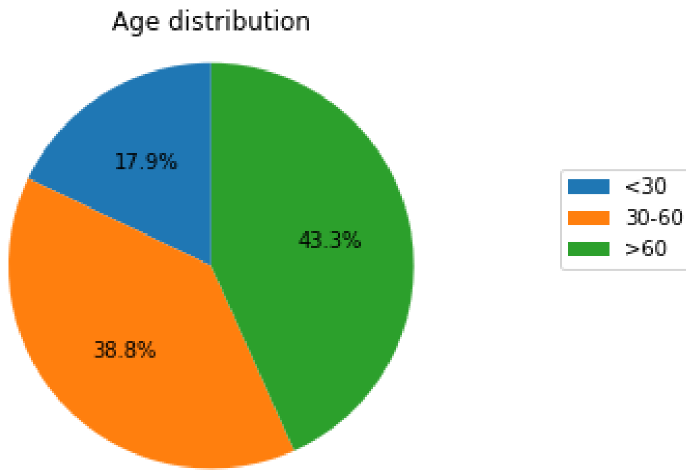

Figure 8: The participants age per age category

3.2.6 E-bike/ no e-bike

As can be seen in figure 9, 71.1% of the respondents own an e-bike. This is fortunately just in the range of keeping the variable for the analysis, as without this variable the main research question could not be answered.

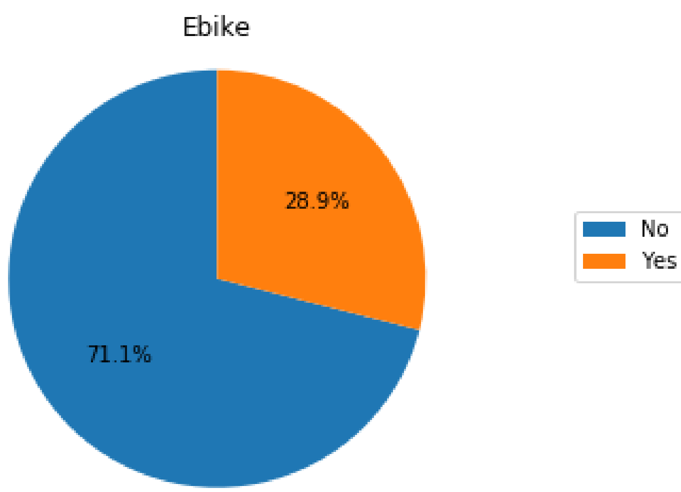

Figure 9: Does the participant own an e-bike?

3.2.7 Most used bicycle

As can be seen in figure 10, 91% of the participants has a city bike as most used bicycle. This means that from the 56 people that filled in the survey for regular bikes, only 5 do not have a city bike as most used bicycle. Therefore the question about most used bicycle is not used in the MLR and this variable is excluded. As stated before, all answers of participant with not "City bike" as answer will not be deleted from the data set, only the column containing the answers to this variable are removed.

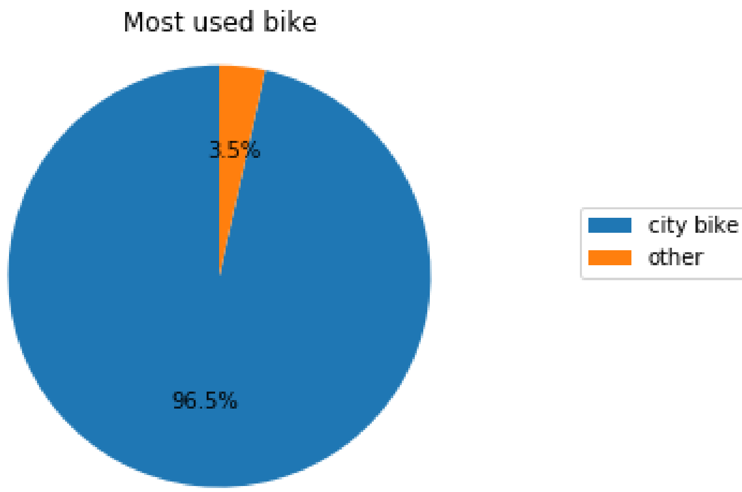

Figure 10: What kind of non electrical bike does the participant use most?

3.2.8 Price per month/day

Whether participants are shown prices per day or per month, depends on the question how many times a month they use a guarded bicycle storage. The percentage of people that chose each answer is displayed in figure 11. Only 10.5% answered they use a guarded bicycle storage more than 5 times a month. This mean this variable has to be excluded due to insufficient data. In this case the participants that gave answers per month can not be used in the analysis, because they gave prices in a completely different range. Simply removing the price per month/day parameter will not work. Therefore all answers with prices per month have to be deleted from the data set. This means the total amount of responses reduces to 68.

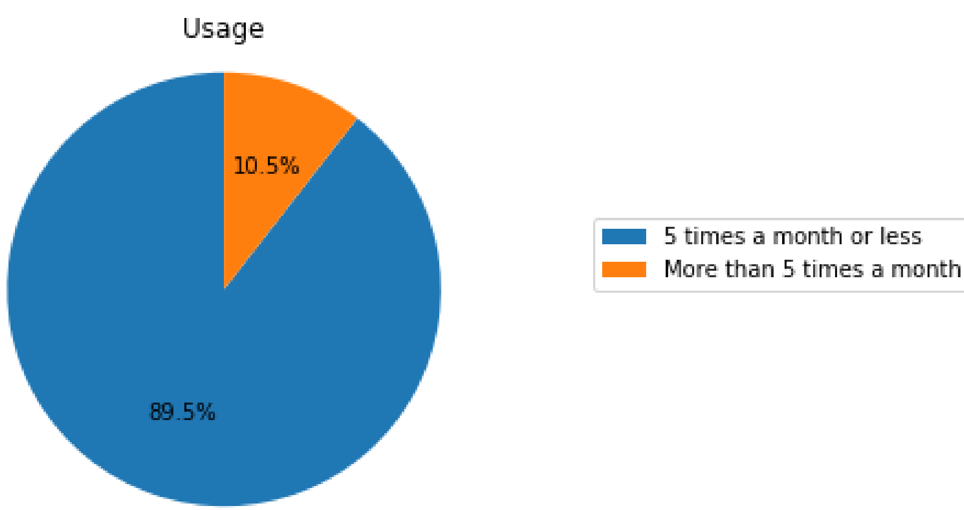

Figure 11: How many times a month does the participant use a guarded bicycle storage?

3.2.9 Distance

The distance parameter is a different kind of parameter than the others. It is the only continuous parameter, and is not tied to a single question. This means the distance parameter can always be used in the MLR and no distances have to be excluded from the data set.

3.3 Multiple regression analysis

In order to use the MLR, a linear correlation between the distance and price has to be assumed. An indication that this correlation is indeed linear is given in figure 12 where the mean price for each distance is given and this mean value is lower each time the walking distance increases, there seems to be a linear relation between the walking distance and the price.

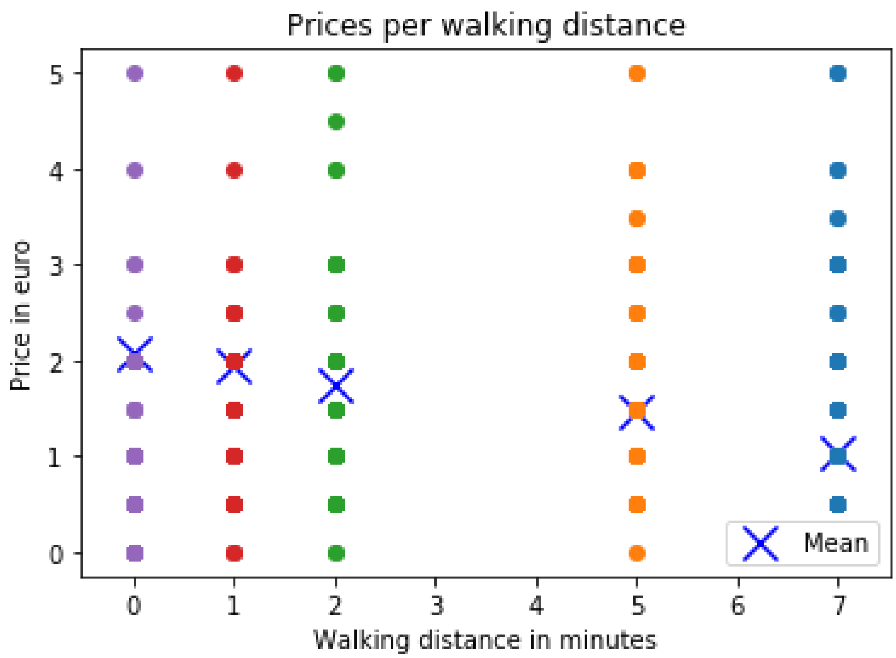

Figure 12: Prices given as answers for each walking distance

An overview of which variables are used in and left out of the multiple linear regression analysis is given in table 4.

Table 4: Parameters for the MLR

Used categorical variable	**Used continuous variable**	**Unused variable**
Insurance	Distance to destination	Most used bicycle
Experienced bicycle theft		Amount of storage use
Charging availability		
Employment status		
Age		
E-bike / no e-bike		

Fixed parameter	**Left out parameter**
High change of a free place	Storage is free
Safety	Travelers direction of arrival
Storage is indoors	Habits
	Ease of use

4 Results

All used categorical variables are made into dummies, one dummy for each answer option for each variable. In table 5 an overview is given of all dummies in the MLR. Answer option 2 for the "Experienced bicycle theft" variable is not used as a dummy, although it was an answer option in the survey. This is the case because no respondent chose this answer, so it will not contribute to the analysis in any way. The base answer option for each variable is displayed in the table as well. In the end a prediction can be made for the price based on all variables. This prediction will be compared to the actual data.

Table 5: Dummies in the MLR

	Base option	**Option 1**	**Option 2**	**Option 3**	**Option 4**
Insurance	Yes	No	Don't know / Rather not say		
Experienced bicycle theft	Yes	No	*Don't know / Rather not say*		
Pays more for charging availability	Yes	No	Don't know		
Employment status	Other / Rather not say	Unemployed	Student	Retired	Employed
Age	30-60	<30	>60		
E-bike	Yes	No			

4.1 Coefficients

In this subsection the coefficients for each answer options for each variable are explained and compared to the base answer option. After all the categorical variables, the result of the continuous variable distance is explained. For each variable all non base values will be listed along with their corresponding coefficient and p-value. This p-value has to be smaller than 0.1, as the margin of error is 10% with a confidence level of 90%, to reject the null hypothesis, which states that the coefficient is zero and there is no significant difference. An overview of all coefficients and p-values is given in table 6.

4.1.1 Bike insurance

Base value: Yes
No: C = -0.6447 & *P-value = 0.000*
Don't know / Rather not say : C = 1.3234 & *P-value = 0.08*

The p-value of participants that do not have a bike insurance is lower than 0.1, which means the null hypotheses is rejected and that there is a significant difference. This is the case for people who answered "Don't / Rather not say" too. These people are willing to pay €1.32 more than people that have a bike insurance. This result a a bit strange, as not knowing whether you have a bike insurance should not make a difference. The people that do not have a insurance are willing to pay €0.64 less than the people with an insurance. This result is the opposite of the hypothesis in section 2.2. A possible explanation can be that participants with insurance care more about their bike and are therefore willing to pay more.

4.1.2 Experienced theft

Base value: Yes
No: C = -0.0171 & P-value = 0.896

Respondent that have experienced bicycle theft are willing to pay €0.02 less than people who have not. However, this difference is insignificant as the p-value of 0.896 is much bigger than 0.1 and the conclusion is that there is no difference between the two groups.

4.1.3 Charging option

Base value: Yes
No: C = 0.0313 & P-value = 0.899
Don't know / Rather not say: C = -0.6308 & P-value = 0.054

The p-value for participants that are not willing to pay more for a storage with a charging option is 0.899, this is much higher than 0.1 and the difference is therefore insignificant. The dummy value of the answer "No" is always zero and the base value now has two answers: "Yes" and "No". The answer "Don't know / Rather not say" has a p-value of 0.054 and the null hypothesis can be rejected. The people that gave this answer are willing to pay €0.63 less than the people that answered "Yes" or "No".

4.1.4 Employment status

Base value: Other / Rather not say
Unemployed: C = -0.0391 & P-value = 0.937
Student: C = 0.3998 & P-value = 0.422
Retired: C = -0.0366 & P-value = 0.924
Employed: C = 0.0579 & P-value = 0.876

All p-values for the answers to the questions about employment status are more than 0.1, therefore the null hypothesis is rejected for all of them and there is no significant difference between them.

4.1.5 Age

Base value: 30-60 years old
<30 : C = 0.2901 & P-value = 0.314
>60 : C = 0.2833 & P-value = 0.069

The age group of <30 has a p-value of 0.314, this is higher than 0.1 and the null hypothesis can not be rejected. The age group of >60 has a p-value lower than 0.1, it is 0.069. This group is willing to pay €0.28 more than the other two age groups and that difference in significant.

4.1.6 E-bike or regular bike

Base value: Yes
No: C = 0.0488 & P-value = 0.799
The answer option no e-bike has a p-value of 0.799, which makes it insignificant. There is no difference between e-bike and regular bike owners.

4.1.7 Distance

C = -0.1404 & *P-value = 0.000*
The p-value for distance is 0.000. This is probably due to the fact that people will always pay less when they have to walk further. Because distance is a continuous variable, the coefficient says something about the price per minute walking. This price is €0.14 lower for each minute the participant has to walk to their destination.

Table 6: MLR results

Variable	**Coefficient**	**p-value**
Constant	2.3081	0.000
Distance	-0.1404	0.000
Age		
<30	0.2901	0.314
>60	0.2833	0.069
Employment		
Retired	-0.0336	0.924
Student	0.3998	0.422
Employed	0.0579	0.876
Unemployed	-0.0391	0.937
E-bike		
No	0.0488	0.799
Charging		
No	0.0313	0.899
Don't know	-0.6308	0.054
Experienced bicycle theft		
No	-0.0171	0.896
Insurance		
No	-0.6447	0.000
Don't know / Rather not say	1.3234	0.008

4.2 Predictions

If the model predictions are plotted for walking a distance of 0 minutes, it is visible that the model from the MLR is far from perfect. Sometimes the prediction is spot on, and other times it is far from right. These predictions are plotted in figure 13. In this case all insignificant variables are still used, this is done because there are not enough significant variables to make an estimation for each respondent. The graph is therefore not a true prediction based on the data, but is given to provide an example of how the predictions compare to the true data. For the other graphs the prediction has the same form, it is just 0.14 lower per minute walking for all respondents as the only changed variable is the distance. The predictions for the other distances can be found in appendix C.

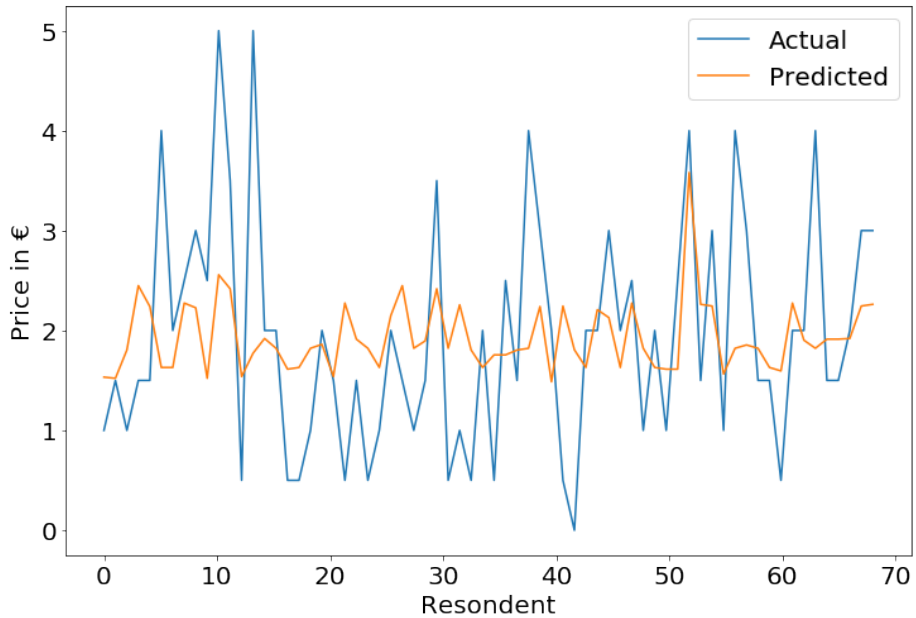

Figure 13: Predicted versus actual data for 0 minutes walking distance

5 Conclusion & discussion

The main question, what the difference in price is between how much e-bike and regular bike users are willing to pay to store their bike safely at different walking distances from their destination, is answered by first answering three sub questions. The first question, what parameters affect the price besides the distance, has multiple answers. There are some parameters fixed, these are the chance of having a free place for your bike, the safety and whether the storage is indoors. Some others have been left out of this research, such as the ease of use, habits and the travelers direction of arrival. All these parameters are based on prior surveys and hypotheses. The variables that are used besides the distance are: Insurance, bicycle theft, charging options, employment status, age, amount of usage, e-bike or not and most used bicycle.

The answer to the second sub question about the walking distances is a list of distances in minutes: 0, 1, 2, 5 and 7. The price for these distances, as the third sub question describes, is given in two ranges. The first for prices per day, from €0 to €5 with steps of €0.50. The second for prices per month, from €0 to €20 with steps of €2. From all parameters, the one about amount of storage use and most used bicycle contained insufficient data to use in the analysis and where dropped.

The results from the multiple linear regression analysis gives a coefficient for each dummy variable. Most dummies are insignificant, as the p-value is lower than the margin of error of 0.1 with a confidence level of 90%. These dummies always have a coefficient of zero. A possible explanation for this is the fact that the number of respondent is not very high and therefore there is not a lot of data to use in the model.

There are a few significant answer options, the first being the distance. From the MLR is it concluded that for each minute the participants have to walk, the price they are willing to pay is €0.14 less. This seems logical as it was predicted people would pay less if they have to walk further. Another answer option is the age >60, this group is willing to pay €0.28 more than the other age groups. It seems that the hypothesis about this age group is true, as older people are willing to pay more. If this is indeed because they care more about their bike, as the hypothesis stated, can not be concluded from this data.

The most noticeable significant answer option is for the variable charging options, participants that answered "Don't know / Rather not say" are willing to pay €0.63 less than the people that answered with "Yes" or " No". There is no real explanation for this and it is most likely this outcome is a result of randomness. The fact that a participant does not know whether he/she is willing to pay more for a bicycle storage with a charging option should not affect the price he/she is willing to pay.

The last significant answer option is the group that answered "Don't know / Rather not say" to the insurance question. This seems to be a result from randomness once again, as these answer option is chosen by a small group. Because the group that gave the significant answer is small, there is a high chance that everyone that gave this answer gives a answer that differs from the rest.

The main question, about the difference in price between e-bike and regular bike users, has as a result that there is no difference. The p-value of the e-bike variable was much higher than 0.1 and therefore the coefficient is zero. The Hypothesis that e-bike users are willing to pay more for a bicycle storage, because their bikes are more expensive is, based on this research, not true.

6 Recommendations

There are some thing that could have been done better or approached in another way in this research. First of all, at the start of the research the analysis method was not chosen yet. Because of this the survey was made and distributed before there was a good idea of what answer options should be considered. This led to the answer options "Don't know" and "Don't know / Rather not say" to be in the survey, while there were not usable answers in the MLR. They even led to some questionable results as some of these answer options turned out to make a significant difference. The other thing hat had an impact on the research was the amount of data. The distribution of the survey started later than planned and therefore the amount of responses was limited. This limited amount of responses was also due to the fact that most big organizations that can reach a lot of people that care about bicycle storages, such as the ANWB and CROW, did not want to distribute the survey. If a good distribution plan was set up before the actual distribution, more respondents could have been reached. With these problems solved, a better model can be made to predict the price people are willing to pay.

In future studies a approximation can be made if these new storages at walking distance are profitable by comparing the price and amount of bicycles with the costs of building, maintaining and guarding the bicycle storage.

A nonlinear correlation between the distance and price can be looked into as well. From the data in this research it is not certain that the correlation is linear.

Another possible point of improvement is adding more variables. Because most variables turned out to be insignificant, it is possible that there are a lot of other variables that are not mentioned in this research that affect the price. If more significant variables are found, a better prediction model can be made.

Appendix

A Planning

Week	To do	Deadline
1	Workplan	4-9
2	Methodology Draft of survey Getting used to latex Setting up report in latex	11-9
3	Mid-term presentation Making and distributing survey Fixing latex errors	22-9
4	Mid-term report Making a data analysis aproach Collecting first data from survey	29-9
5	Collecting data from survey Analyzing first results, setting up graphics and first tekst	
6	Draft report Analyzing all results, making a conclusion	9-10
7	Preparing presentation Finishing report	
8	Final report Final presentation	19-10 29-10

B Survey

Fietsenstallingen op loopafstand

Door de grote toename in het aantal fietsen in Nederland wordt het veilig stallen van uw fiets steeds moeilijker. Om mogelijkheden voor toekomstige fietsenstallingen te onderzoeken wordt er met deze enquête onderzoek gedaan naar fietsenstallingen op loopafstand van de bestemming. Bij deze bestemming moet u bijvoorbeeld denken aan een treinstation, een bioscoop of een toeristische attractie waar u op de fiets naartoe gaat. Deze enquête duurt ongeveer 5 minuten, alvast bedankt.

Een aantal vragen is verplicht, deze kunt u herkennen aan de rode * achter de vraag.

Voor vragen over deze enquête kunt u contact opnemen via: s.s.soethout@student.tudelft.nl

Deze enquête is volledig anoniem, bovendien is er bij persoonlijke vragen altijd de mogelijkheid deze over te slaan.
*Vereist

1. Wat is uw leeftijd? (Indien u hier geen antwoord op wilt geven kunt u de vraag overslaan.)

2. Wat is uw huidige werksituatie?

Markeer slechts één ovaal.

- Werkloos
- Werkend
- Student/scholier
- Gepensioneerd
- Anders/zeg ik liever niet

3. Bent u bereid te betalen voor het gebruik van een fietsenstalling waar u altijd een plek heeft en uw fiets gegarandeerd veilig en droog staat? *

Markeer slechts één ovaal.

- Ja *Ga naar vraag 4*
- Nee *Ga naar vraag 33*
- Weet ik niet / Zeg ik liever niet *Ga naar vraag 4*

4. Heeft u een elektrische fiets? *

Markeer slechts één ovaal.

- Ja *Ga naar vraag 5*
- Nee *Ga naar vraag 19*

Elektrische fiets

U heeft aangegeven een elektrische fiets te hebben. De volgende vragen zullen allemaal betrekking hebben op uw elektrische fiets. Als u ook een normale fiets heeft wordt u gevraagd die in de volgende vragen buiten beschouwing te laten.

5. Zou u meer betalen voor een fietsenstalling als u uw fiets er kon opladen dan voor een stalling zonder oplaadmogelijkheid? *

Markeer slechts één ovaal.

- Ja
- Nee
- Weet ik niet

6. Is er wel eens een fiets van u gestolen?

Markeer slechts één ovaal.

- Ja
- Nee
- Weet ik niet / Zeg ik liever niet

7. Is uw elektrische fiets verzekerd tegen diefstal?

Markeer slechts één ovaal.

- Ja
- Nee
- Weet ik niet / Zeg ik liever niet

Ga naar vraag 8

Fietsenstallingen

8. Hoe vaak per maand maakt u gebruik van een bewaakte fietsenstalling met uw elektrische fiets? (Zowel gratis als betaald) *

Markeer slechts één ovaal.

- 5 keer of minder per maand *Ga naar sectie 11 (Prijzen per dag)*
- meer dan 5 keer per maand *Ga naar sectie 5 (Prijzen per maand)*

Ga naar vraag 8

Prijzen per maand

Het gaat in de volgende vragen enkel over betaalde stallingen, er wordt telkens aangenomen dat er geen alternatieve gratis stalling is. In de volgende vragen wordt telkens een nieuwe stalling voorgesteld die op een loopafstand ligt van uw bestemming. Deze afstand is aangegeven in minuten die u erover doet om van de uitgang van de stalling naar de ingang uw bestemming te lopen. In elk geval wordt er van uit gegaan dat u 15 minuten heeft gefietst naar de stalling en het laatste gedeelte van uw reis moet lopen naar uw bestemming. U wordt gevraagd het maximale bedrag in te vullen dat u bereid bent te betalen voor het stallen van uw fiets in de stalling. De prijzen zijn weergegeven als een maand abonnement aangezien u heeft aangegeven veelvoudig gebruik te maken van fietsenstallingen. Bij elke vraag is er een oplaadmogelijk voor uw elektrische fiets in de stalling aanwezig. Indien u de geven loopafstand te groot vind om geld voor te betalen kunt u een bedrag van €0 aangeven, hiermee geeft u aan de voorkeur te geven aan het stallen van uw fiets op een onbewaakte plek dichtbij uw bestemming. Bij de betaalde stalling heeft u altijd een plek, en staat uw fiets gegarandeerd veilig en droog.

0 minuten

9. Hoeveel euro bent u bereid te betalen per maand voor het stallen van uw fiets op een loopafstand van 0 minuten van uw bestemming? (Direct naast uw bestemming). *

Markeer slechts één ovaal.

- €0,00
- €2,00
- €4,00
- €6,00
- €8,00
- €10,00
- €12,00
- €14,00
- €16,00
- €18,00
- €20,00
- >€20,00

5 minuten lopen

10. Hoeveel euro bent u bereid te betalen per maand voor het stallen van uw fiets op een loopafstand van 5 minuten van uw bestemming? *

Markeer slechts één ovaal.

- €0,00
- €2,00
- €4,00
- €6,00
- €8,00
- €10,00
- €12,00
- €14,00
- €16,00
- €18,00
- €20,00
- >€20,00

1 minuut lopen

11. Hoeveel euro bent u bereid te betalen per maand voor het stallen van uw fiets op een loopafstand van 1 minuut van uw bestemming? *

Markeer slechts één ovaal.

- €0,00
- €2,00
- €4,00
- €6,00
- €8,00
- €10,00
- €12,00
- €14,00
- €16,00
- €18,00
- €20,00
- >€20,00

7 minuten lopen

12. Hoeveel euro bent u bereid te betalen per maand voor het stallen van uw fiets op een loopafstand van 7 minuten van uw bestemming? *

Markeer slechts één ovaal.

- €0,00
- €2,00
- €4,00
- €6,00
- €8,00
- €10,00
- €12,00
- €14,00
- €16,00
- €18,00
- €20,00
- >€20,00

2 minuten lopen

13. Hoeveel euro bent u bereid te betalen per maand voor het stallen van uw fiets op een loopafstand van 2 minuten van uw bestemming? *

Markeer slechts één ovaal.

- €0,00
- €2,00
- €4,00
- €6,00
- €8,00
- €10,00
- €12,00
- €14,00
- €16,00
- €18,00
- €20,00
- >€20,00

Ga naar vraag 33

Prijzen per dag

Het gaat in de volgende vragen enkel over betaalde stallingen, er wordt telkens aangenomen dat er geen alternatieve gratis stalling is. In de volgende vragen wordt telkens een nieuwe stalling voorgesteld die op een loopafstand ligt van uw bestemming. Deze afstand is aangegeven in minuten die u erover doet om van de uitgang van de stalling naar de ingang van uw bestemming te lopen. In elk geval wordt er van uit gegaan dat u 15 minuten heeft gefietst naar de stalling en het laatste gedeelte van uw reis moet lopen naar uw bestemming. U wordt gevraagd het maximale bedrag in te vullen dat u bereid bent te betalen voor het stallen van uw fiets in de stalling gedurende 1 dag. Bij elke vraag is er een oplaadmogelijk voor uw elektrische fiets in de stalling aanwezig. Indien u de geven loopafstand te groot vind om geld voor te betalen kunt u een bedrag van €0 aangeven, hiermee geeft u aan de voorkeur te geven aan het stallen van uw fiets op een onbewaakte plek dichtbij uw bestemming. Bij de betaalde stalling heeft u altijd een plek, en staat uw fiets gegarandeerd veilig en droog.

Dagprijs

0 minuten

14. Hoeveel euro bent u bereid te betalen per dag voor het stallen van uw fiets op een loopafstand van 0 minuten van uw bestemming? (Direct naast uw bestemming). *

Markeer slechts één ovaal.

- €0,00
- €0,50
- €1,00
- €1,50
- €2,00
- €2,50
- €3,00
- €3,50
- €4,00
- €4,50
- €5,00
- >€5,00

5 minuten lopen

15. Hoeveel euro bent u bereid te betalen per dag voor het stallen van uw fiets op een loopafstand van 5 minuten van uw bestemming? *

Markeer slechts één ovaal.

- €0,00
- €0,50
- €1,00
- €1,50
- €2,00
- €2,50
- €3,00
- €3,50
- €4,00
- €4,50
- €5,00
- >€5,00

1 minuut lopen

16. Hoeveel euro bent u bereid te betalen per dag voor het stallen van uw fiets op een loopafstand van 1 minuut van uw bestemming? *

Markeer slechts één ovaal.

- €0,00
- €0,50
- €1,00
- €1,50
- €2,00
- €2,50
- €3,00
- €3,50
- €4,00
- €4,50
- €5,00
- >€5,00

7 minuten lopen

17. Hoeveel euro bent u bereid te betalen per dag voor het stallen van uw fiets op een loopafstand van 7 minuten van uw bestemming? *

Markeer slechts één ovaal.

- €0,00
- €0,50
- €1,00
- €1,50
- €2,00
- €2,50
- €3,00
- €3,50
- €4,00
- €4,50
- €5,00
- >€5,00

2 minuten lopen

18. Hoeveel euro bent u bereid te betalen per dag voor het stallen van uw fiets op een loopafstand van 2 minuten van uw bestemming? *

Markeer slechts één ovaal.

- €0,00
- €0,50
- €1,00
- €1,50
- €2,00
- €2,50
- €3,00
- €3,50
- €4,00
- €4,50
- €5,00
- >€5,00

Ga naar vraag 33

Geen elektrische fiets

U heeft aangegeven geen elektrische fiets te hebben, de volgende vragen gaan dan ook over uw niet elektrische fiets.

19. Wat voor soort fiets gebruikt u het vaakst? *

Markeer slechts één ovaal.

- Racefiets
- Stadsfiets
- Bakfiets
- Ligfiets
- Vouwfiets
- Mountainbike
- Anders: ____________________

20. Is er wel een fiets van u gestolen?

Markeer slechts één ovaal.

- Ja
- Nee
- Weet ik niet / Zeg ik liever niet

21. Is uw fiets verzekerd tegen diefstal?

Markeer slechts één ovaal.

- Ja
- Nee
- Weet ik niet / Zeg ik liever niet

Fietsenstallingen

22. Hoe vaak per maand maakt u gebruik van een bewaakte fietsenstalling? (Zowel gratis als betaald) *

Markeer slechts één ovaal.

- 5 keer of minder per maand *Ga naar sectie 25 (Prijzen per dag)*
- meer dan 5 keer per maand *Ga naar sectie 19 (Prijzen per maand)*

Prijzen per maand

Het gaat in de volgende vragen enkel over betaalde stallingen, er wordt telkens aangenomen dat er geen alternatieve gratis stalling is. In de volgende vragen wordt telkens een nieuwe stalling voorgesteld die op een loopafstand ligt van uw bestemming. Deze afstand is aangegeven in minuten die u erover doet om van de uitgang van de stalling naar de ingang van uw bestemming te lopen. In elk geval wordt er van uit gegaan dat u 15 minuten heeft gefietst naar de stalling en het laatste gedeelte van uw reis moet lopen naar uw bestemming. U wordt gevraagd het maximale bedrag in te vullen dat u bereid bent te betalen voor het stallen van uw fiets in de stalling. De prijzen zijn weergegeven als een maand abonnement aangezien u heeft aangegeven veelvoudig gebruik te maken van fietsenstallingen. Indien u de geven loopafstand te groot vind om geld voor te betalen kunt u een bedrag van €0 aangeven, hiermee geeft u aan de voorkeur te geven aan het stallen van uw fiets op een onbewaakte plek dichtbij uw bestemming. Bij de betaalde stalling heeft u altijd een plek, en staat uw fiets gegarandeerd veilig en droog.

0 minuten

23. Hoeveel euro bent u bereid te betalen per maand voor het stallen van uw fiets op een loopafstand van 0 minuten van uw bestemming? (Direct naast uw bestemming). *

Markeer slechts één ovaal.

- €0,00
- €2,00
- €4,00
- €6,00
- €8,00
- €10,00
- €12,00
- €14,00
- €16,00
- €18,00
- €20,00
- >€20,00

5 minuten lopen

24. Hoeveel euro bent u bereid te betalen per maand voor het stallen van uw fiets op een loopafstand van 5 minuten van uw bestemming? *

Markeer slechts één ovaal.

- €0,00
- €2,00
- €4,00
- €6,00
- €8,00
- €10,00
- €12,00
- €14,00
- €16,00
- €18,00
- €20,00
- >€20,00

1 minuut lopen

25. Hoeveel euro bent u bereid te betalen per maand voor het stallen van uw fiets op een loopafstand van 1 minuut van uw bestemming? *

Markeer slechts één ovaal.

- €0,00
- €2,00
- €4,00
- €6,00
- €8,00
- €10,00
- €12,00
- €14,00
- €16,00
- €18,00
- €20,00
- >€20,00

7 minuten lopen

26. Hoeveel euro bent u bereid te betalen per maand voor het stallen van uw fiets op een loopafstand van 7 minuten van uw bestemming? *

Markeer slechts één ovaal.

- €0,00
- €2,00
- €4,00
- €6,00
- €8,00
- €10,00
- €12,00
- €14,00
- €16,00
- €18,00
- €20,00
- >€20,00

2 minuten lopen

27. Hoeveel euro bent u bereid te betalen per maand voor het stallen van uw fiets op een loopafstand van 2 minuten van uw bestemming? *

Markeer slechts één ovaal.

- €0,00
- €2,00
- €4,00
- €6,00
- €8,00
- €10,00
- €12,00
- €14,00
- €16,00
- €18,00
- €20,00
- >€20,00

Ga naar vraag 33

Prijzen per dag

Het gaat in de volgende vragen enkel over betaalde stallingen, er wordt telkens aangenomen dat er geen alternatieve gratis stalling is. In de volgende vragen wordt telkens een nieuwe stalling voorgesteld die op een loopafstand ligt van uw bestemming. Deze afstand is aangegeven in minuten die u erover doet om van de uitgang van de stalling naar de ingang van uw bestemming te lopen. In elk geval wordt er van uit gegaan dat u 15 minuten heeft gefietst naar de stalling en het laatste gedeelte van uw reis moet lopen naar uw bestemming. U wordt gevraagd het maximale bedrag in te vullen dat u bereid bent te betalen voor het stallen van uw fiets in de stalling gedurende 1 dag. Indien u de geven loopafstand te groot vind om geld voor te betalen kunt u een bedrag van €0 aangeven, hiermee geeft u aan de voorkeur te geven aan het stallen van uw fiets op een onbewaakte plek dichtbij uw bestemming. Bij de betaalde stalling heeft u altijd een plek, en staat uw fiets gegarandeerd veilig en droog.

Dagprijs

0 minuten lopen

28. Hoeveel euro bent u bereid te betalen per dag voor het stallen van uw fiets op een loopafstand van 0 minuten van uw bestemming? (Direct naast uw bestemming). *

Markeer slechts één ovaal.

- €0,00
- €0,50
- €1,00
- €1,50
- €2,00
- €2,50
- €3,00
- €3,50
- €4,00
- €4,50
- €5,00
- >€5,00

5 minuten lopen

29. Hoeveel euro bent u bereid te betalen per dag voor het stallen van uw fiets op een loopafstand van 5 minuten van uw bestemming? *

Markeer slechts één ovaal.

- €0,00
- €0,50
- €1,00
- €1,50
- €2,00
- €2,50
- €3,00
- €3,50
- €4,00
- €4,50
- €5,00
- >€5,00

1 minuut lopen

30. Hoeveel euro bent u bereid te betalen per dag voor het stallen van uw fiets op een loopafstand van 1 minuut van uw bestemming? *

Markeer slechts één ovaal.

- €0,00
- €0,50
- €1,00
- €1,50
- €2,00
- €2,50
- €3,00
- €3,50
- €4,00
- €4,50
- €5,00
- >€5,00

7 minuten lopen

31. Hoeveel euro bent u bereid te betalen per dag voor het stallen van uw fiets op een loopafstand van 7 minuten van uw bestemming? *

Markeer slechts één ovaal.

- €0,00
- €0,50
- €1,00
- €1,50
- €2,00
- €2,50
- €3,00
- €3,50
- €4,00
- €4,50
- €5,00
- >€5,00

2 minuten lopen

32. Hoeveel euro bent u bereid te betalen per dag voor het stallen van uw fiets op een loopafstand van 2 minuten van uw bestemming? *

Markeer slechts één ovaal.

- €0,00
- €0,50
- €1,00
- €1,50
- €2,00
- €2,50
- €3,00
- €3,50
- €4,00
- €4,50
- €5,00
- >€5,00

Ga naar vraag 33

Dank U

Dank u wel voor het invullen van deze enquête. Nadat u op verzenden heeft geklikt kunt u dit venster sluiten.

C Predictions

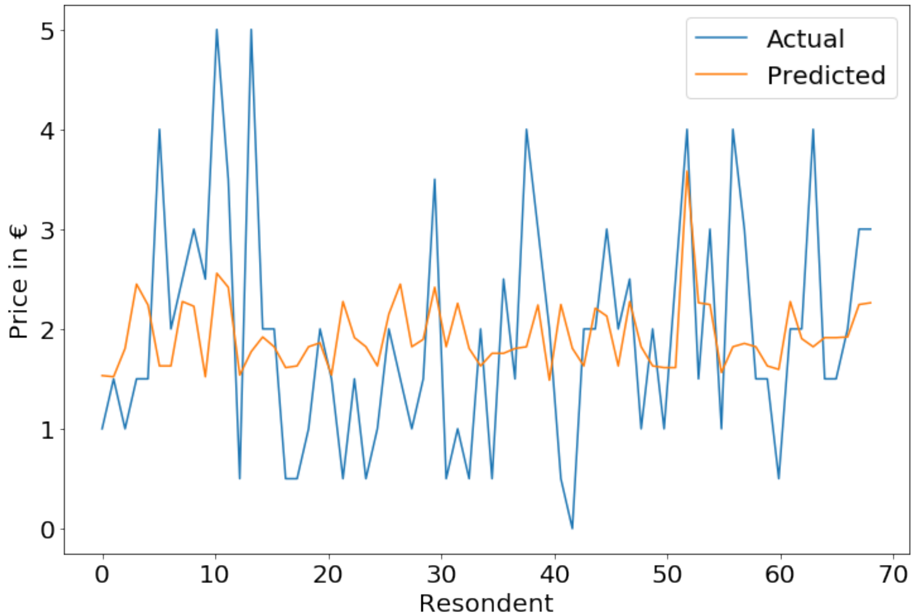

Figure 14: Predicted versus actual data for 1 minute walking distance

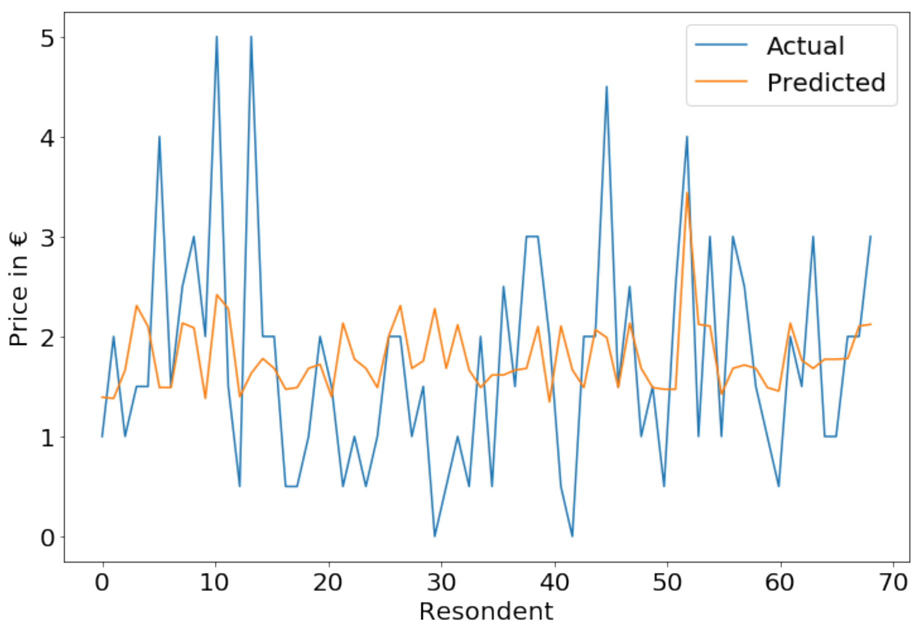

Figure 15: Predicted versus actual data for 2 minutes walking distance

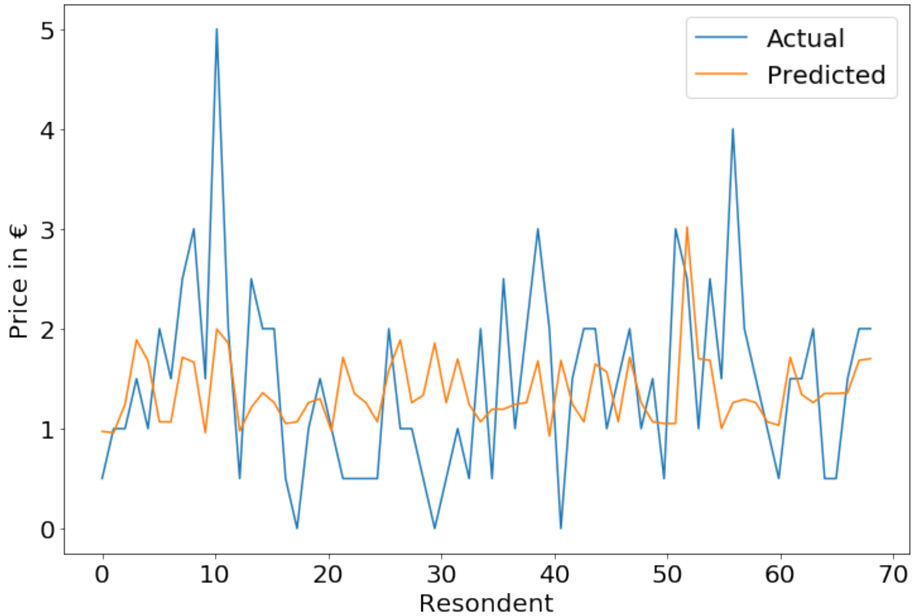

Figure 16: Predicted versus actual data for 5 minutes walking distance

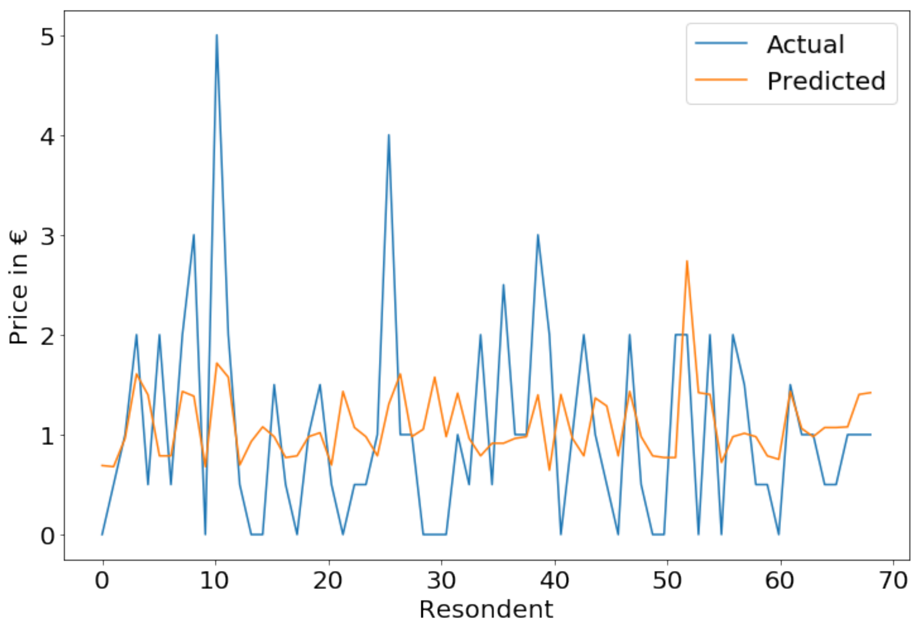

Figure 17: Predicted versus actual data for 7 minutes walking distance

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