

**CHARLES UNIVERSITY**  
**FACULTY OF SOCIAL SCIENCES**

Institute of Economic Studies



**Willingness to pay for houseplants  
in the Czech Republic**

Bachelor's Thesis

Author: Eliška Halouzková

Study program: Economics and Finance

Supervisor: Mgr. Petr Polák MSc. Ph.D

Year of defense: 2023

## **Declaration of Authorship**

I hereby declare that I compiled the thesis independently, using only the listed resources and literature, and the thesis has not been used to obtain any other academic title.

I declare that Generative AI tools were used when conducting this thesis to improve the writing style and generate inspiration for further research. The results generated by AI were used with respect to principles of academic integrity.

I grant to Charles University permission to reproduce and to distribute copies of this thesis in whole or in part and agrees with the thesis being used for study and scientific purposes.

Prague, May 2, 2023

Eliška Halouzková

## Abstract

This thesis examines consumers' willingness to pay for houseplants in the Czech Republic. The data for the thesis were collected via self-developed questionnaire. From the data, two regressions were created. First one measured the willingness to pay for houseplants, the second measured factors influencing the exact prices respondents are willing to pay. The study found that several factors, such as gender, previous houseplant purchase, the perception of houseplants as a home decor item, preference for artificial plants, view of houseplants as a hobby and whether houseplants improve their mental health have significant influence on the willingness to pay. The significant factors for the price the respondents pay was university education, preference for low maintenance houseplants, place of purchase, size of the houseplant and recent houseplant purchases.

**Keywords** WTP, willingness to pay, houseplants, price

## Abstrakt

Tato bakalářská práce se zabývá zkoumáním ochoty spotřebitelů platit za pokojové rostliny v České republice. Data byla získána pomocí dotazníkového šetření vyvinutého autorkou práce. Získaná data byla následně zpracována dvěma regresními analýzami. První regresní analýza měří ochotu platit za pokojové rostliny a druhá zkoumá faktory ovlivňující přesnou cenu, kterou jsou respondenti ochotni zaplatit. Výzkum prokázal, že pohlaví, dřívější nákup pokojových rostlin, vnímání pokojových rostlin jako dekorativního prvku, preference umělých rostlin, pohled na pokojové rostliny jako na hobby a to, zda pokojové rostliny zlepšují mentální zdraví, jsou významnými faktory ovlivňujícími pravděpodobnost nákupu pokojových rostlin. Významnými faktory ovlivňujícími cenu jsou vysokoškolské vzdělání, preference pro nízkou náročnost pokojových rostlin, preference pro specializované obchody nebo velké pokojové rostliny a nedávné nákupy pokojových rostlin.

**Klíčová slova** ochota platit, pokojové rostliny, cena

## Acknowledgments

I am grateful especially to Mgr. Petr Polák MSc. Ph.D, for his advice and guidance through this process. Further, I would like to thank my family and friends for their support during my studies.

Typeset in FSV L<sup>A</sup>T<sub>E</sub>X template with great thanks to prof. Zuzana Havrankova and prof. Tomas Havranek of Institute of Economic Studies, Faculty of Social Sciences, Charles University. IES Thesis Template.

### **Bibliographic Record**

Halouzkova, Eliska: *Willingness to pay for houseplants in the Czech Republic*. Bachelor's Thesis. Charles University, Faculty of Social Sciences, Institute of Economic Studies, Prague. 2023, pages 68. Advisor: Mgr. Petr Polák MSc. Ph.D

# Contents

List of Tables	vii
List of Figures	viii
Acronyms	ix
Introduction	x
<b>1 Theoretical Background</b>	<b>1</b>
1.1 History of indoor plants . . . . .	1
1.2 Czech houseplant market . . . . .	2
1.3 Health benefits . . . . .	2
1.3.1 Mental benefits . . . . .	3
<b>2 Literature Review</b>	<b>4</b>
2.1 Willingness to pay . . . . .	4
2.2 Measuring willingness to pay . . . . .	5
2.3 Previous studies about plants . . . . .	7
<b>3 Data and Variables</b>	<b>9</b>
3.1 Data collection . . . . .	9
3.2 Variables . . . . .	10
3.2.1 Dependent variables . . . . .	10
3.2.2 Independent variables . . . . .	10
3.3 Descriptive analysis . . . . .	15
<b>4 Model</b>	<b>19</b>
4.1 Empirical model . . . . .	19
<b>5 Results</b>	<b>25</b>
5.1 Logistic results . . . . .	25

---

5.1.1	Interpreting the results . . . . .	27
5.2	OLS model . . . . .	28
5.2.1	Interpreting the results . . . . .	29
5.3	Additional analysis . . . . .	31
5.4	Limitations . . . . .	32
<b>6</b>	<b>Conclusion</b>	<b>34</b>
	<b>Bibliography</b>	<b>38</b>
<b>A</b>	<b>Online questionnaire</b>	<b>I</b>
<b>B</b>	<b>Results</b>	<b>XVI</b>
B.1	Logit and Probit Comparison . . . . .	XVI
B.2	Tested Logit models . . . . .	XVI
B.3	Tested OLS models . . . . .	XVIII

# List of Tables

3.1	Independet variables table . . . . .	11
3.2	Frequency table . . . . .	16
3.3	Likert scale table . . . . .	17
5.1	Logistic regression results . . . . .	26
5.2	APE . . . . .	27
5.3	OLS Results . . . . .	30
5.4	Price model explained . . . . .	31
B.1	Comparison of logit and probit . . . . .	XVI
B.2	LR Test of the Logit model . . . . .	XVIII
B.3	F Tests . . . . .	XIX

# List of Figures

3.1	Histogram of Age . . . . .	15
4.1	Logistic function . . . . .	21
4.2	Comparison of Logit and Probit Distribution . . . . .	22
5.1	Boxplot Price . . . . .	29
5.2	Bar Graph Price . . . . .	32

# Acronyms

**BDM** Becker, DeGroot, Marschak method

**LTB** Likelihood to Buy

**WTA** Willingness To Accept

**WTP** Willingness To Pay

**LDV** Limited Dependent Variable

**OLS** Ordinary Least Squares

**LPM** Linear Probability Model

**CDF** Cumulative Distribution Function

**WLS** Weighted Least Squares

**MLE** Maximum Likelihood Estimator

**PEA** Partial Effect At The Average

**APE** Average Partial Effect

**AIC** Akaike Information Criterion

**BIC** Bayesian Information Criterion

# Introduction

People used houseplants as popular home decor items for centuries. They can bring a touch of colour to any place and make people feel like they are in nature. During the Covid-19 Pandemic, when nature became a bit scarcer, mental health of many started to decline as people started spending more time at home (O'Connor *et al.*, 2021). One of the ways people coped with the Pandemic were houseplants, as nature and greenery can improve mental health of many (Dzhambov *et al.*, 2021). And since many stores started offering their products online, the sale of houseplants increased Campbell *et al.* (2021). Further, in recent years, new variations of plants came into the Czech Republic and many specialized shops now sell many kinds of exotic houseplants, which were not accessible in the past years.

This thesis examines if and how much people are willing to pay for houseplants and what aspects are behind it. The goal is to identify key factors contributing to plant purchase behaviour and to examine houseplants from an economical perspective. The first section of the thesis focuses on determining the factors influencing whether a person is willing to purchase houseplants, the second section examines how much are people willing to pay for their houseplants.

The data for this thesis were obtained using a self-developed questionnaire distributed among ordinary people, plant collectors and other people interested in houseplants. The respondents were asked about their relationship with houseplants, what they deem important when purchasing houseplants, and lastly whether their relationship with houseplants changed during the Covid-19 pandemic.

Even though willingness to pay is a widely used economical concept to measure consumer preferences, to my knowledge, any similar analysis dealing with willingness to pay for houseplants has not yet been conducted. I hope it sheds light on the purchase decisions of plant owners and people's relationship with houseplants. It might also help plant sellers, large hobby markets,

smaller houseplant shops and even individual sellers to better understand the houseplant market in the Czech Republic. Further, the study might help them better identify the factors influencing their customers' purchase decisions.

The structure of the thesis is the following. In Chapter 1, the thesis provides a theoretical background concerning houseplants and their benefits. Chapter 2 is a literature review of the concept of willingness to pay, methods of measuring it and lastly, summary of previous research. In Chapter 3, the data and its structure are introduced, and both dependent and explanatory variables are described. Chapter 4 describes the model and regressions used in the thesis. Chapter 5 contains the regression results analysis, and lastly, Chapter 6 contains the conclusion of the thesis and its findings.

# Chapter 1

## Theoretical Background

People have been buying houseplants for many years. For most, indoor plants are an interior design accessory. Therefore, there is a large market in the Czech Republic and the world, which has only grown in recent years (Campbell *et al.*, 2021). This chapter introduces the topic of houseplants, their history, benefits, and the houseplant market.

### 1.1 History of indoor plants

For millennia, humans relied on nature for sustenance and shelter. However, it wasn't long before plants became more than just a source of food, and began to be appreciated for their beauty as well. The first proof of potted plants came from paintings and sculptures from the Greek and Roman Empires thousands of years ago. Older civilisations often used terracotta pots and had their plants outside, when the climate allowed it. (Graf & Perrot, 2021).

During medieval times, western cultures started growing houseplants in their homes and further started to cultivate them. In 1653, Sir Hugh Plat wrote a book called *The Garden of Eden*, where he discussed the potential to cultivate exotic indoor plants and grow them in colder climates, like England. During this period, people started to use greenhouses also for exotic houseplants and not just for their produce. The trend continued further in the Victorian era in England. With the colonisation of other countries, the British were able to import new and exotic plants to their homes. During that time, houseplants were seen as a status symbol, as well as many other imported goods (Graf & Perrot, 2021).

In present times, houseplants are seen mostly as a decorative item for our

homes; it can give a place a more natural look. In Europe, one of the biggest exporters is the Netherlands, which has always had a rich horticultural history with flowers and potted plants. And during the Covid-19 pandemic, people started to appreciate indoor nature even more, making the market even better off (Dzhambov *et al.*, 2021).

## 1.2 Czech houseplant market

Since import has become much more efficient and affordable, it is no surprise that in recent years, a majority of the offered houseplants are imported from abroad. Among the biggest importers to the Czech Republic belongs the Netherlands, which annually exports indoor plants worth over \$750M USD. (Pinckaers, 2016)

The houseplant market in EU has its laws, as importing houseplants (which are living things) can be dangerous for local fauna and flora, if the houseplants are infected with foreign pests, or bacteria. There are laws for all EU forbidding import of plants which do not have a plant certificate. A plant certificate can be obtained only by certified nurseries and stores. (European Parliament & Council of the European Union, 2016)

Currently, there are multiple types of stores offering houseplants. They can be divided into four categories; supermarkets, hobby markets, flower shops and specialised houseplant shops. The types of shops were ordered by how much they specialize in selling houseplants. For supermarkets, houseplants are neither a priority nor the main source of their income. In hobby centres, houseplants are a larger part of their sales, but still not the main focus. Further, the majority of flower shops also offers indoor plants. For the last type of shops, houseplants are the majority of their supply. In the Czech Republic such shops are "Dej Mi Pokojovku", "Gardners", "EkoAloe", "Pokojovky" or "KytkaSem". The ones listed are among the most popular ones, but there are many other.

## 1.3 Health benefits

For many years it has been questioned whether houseplants have actual health benefits. One of the main areas of research were potential air purifying qualities. Since people usually spend the majority of their everyday lives inside, whether at home, in the office, or the gym, many want to make sure the air they breathe

is not harmful and are actively looking for ways to improve it. Houseplants have shown abilities to improve the air in homes. According to Pennisi & van Iersel (2012), indoor plants can reduce CO<sub>2</sub> concentration.

Further, it has been found that indoor plants increase thermal comfort. Mangone *et al.* (2014) conducted a quasi-experiment with 67 office workers and two rooms. One with a substantial amount of indoor plants, the other without. They discovered that people in rooms with plants had approximately 12 % more thermal comfort (Liu *et al.*, 2022).

There have been other studies done on the impact of house plants. Houseplants reduce the presence of volatile organic compounds, which are one of the compounds causing air pollution (Liu *et al.*, 2022).

### 1.3.1 Mental benefits

According to a study by Ma (2022) with over 400 respondents, respondents who called themselves "houseplant carers" reported higher mental well-being. The author highlighted that taking care of their plants uplifts their mental health, further the number of houseplants the respondent owned, and the years the individual keeps houseplants were the key factors to a higher mental well-being.

Similar results were also supported by other studies, for example, Hall & Knuth (2019) wrote a review of the recent studies on the mental well-being of plants and nature. Their review was both of outside and inside greenery. They mentioned (among other findings) that vegetation could help significantly reduce stress and increase the ability to concentrate.

Mental health has an impact on economics. According to Layard (2013), mental well-being and economics are connected. Furthermore, he states more economic policies should take mental health into consideration.

# Chapter 2

## Literature Review

### 2.1 Willingness to pay

Willingness To Pay (WTP) is an economic concept used to measure consumer paying preferences. It represents how much they value the product and can serve as a source of information for companies when developing their pricing strategies.

In microeconomics, a consumer's maximum willingness to pay equals their reservation price. Reservation price measures how people value the product and at what price they would be just willing to purchase it. This means the customer does not care if they purchase the product or keep their money; their utility is the same in both cases. It can be vital for companies to understand their consumers WTP to price their products accordingly. (Varian, 2014).

A related economic concept is called Willingness To Accept (WTA). In theory, the main difference is that WTA measures how much a consumer would be willing to sell a given product for. Theoretically, we would expect WTA and WTP to be equal. There are, however, several reasons why it might not be the case. Usually, WTA is higher than WTP as consumers value things they own higher than those who do not. This is called the endowment effect, further studied for example by Morewedge & Giblin (2015).

There have been numerous studies explaining the difference between the two concepts. Earlier studies claim that the substitution effect can cause the discrepancy. According to Hanemann (1991), the smaller the substitution effect, the more significant the difference between WTP and WTA. They mentioned that the difference between the two concepts would be lower if the observed

good had a close substitute. Furthermore, if the good has almost no substitute, the difference between WTP and WTA will be more significant.

Recently, studies have claimed that the two do not have to have such a strong connection. Chapman *et al.* (2017) claim that WTP and WTA are uncorrelated, at best slightly correlated. They did not question the endowment effect that  $WTA > WTP$ ; they focused on measuring the correlation between the two. They created a survey with about three thousand participants on lottery tickets. Their study measured WTP and WTA via an incentivised survey. Their paper also focused on the stability of respondents' decisions and followed up with a second survey six months later.

Chapman *et al.* (2017) had the following results. WTP and WTA had almost no correlation. However, most respondents showed the endowment effect, and their results were stable after six months. The authors acknowledge that their study was done only on one product (lottery tickets), and the correlation could be higher with different products.

## 2.2 Measuring willingness to pay

As mentioned in the above section, WTP is essential for companies to make correct pricing decisions. To this day, there are various methods of measuring it. The following section will provide a summary of the widely used ones.

Breidert *et al.* (2006) wrote a review of existing methods of measurement. Their main divider are revealed and stated preferences. A similar approach to dividing the methods of measuring WTP are from Wertenbroch & Skiera (2002). However, they focused mainly on the Becker, DeGroot, Marschak method (BDM). They use a clear classification of the methods in their paper. This section will follow the same structure.

To begin with, Breidert *et al.* (2006) divided the methods into revealed and stated preferences. Revealed preferences can be observed either by looking at market data or by creating an experiment (laboratory experiments, field experiments or auctions). When measuring WTP with stated preferences, researchers are given answers primarily via survey. The surveys can be either direct (expert judgements and customer surveys) or indirect (conjoint analysis or discrete choice analysis).

Let us look initially at revealed preferences. Market data analysis is the first method of measuring WTP. Sales (or market) data can help estimate WTP as they can provide a clear view of the market and reflects real-life behaviour.

However, market data can be reliable only under the assumption that current demand can be predicted from past demand. This assumption can be challenging to meet as the available data are usually limited. An additional limitation is that market data cannot be used on new or innovative products, as no prior data are available. (Breidert *et al.*, 2006).

Following the structure of Breidert *et al.* (2006), experiments are another way of measuring WTP. They can be split into two types, field and laboratory. In laboratory experiments, respondents are usually given money to spend, and their behaviour is observed and analysed. Naturally, this method can have some drawbacks. The participants are observed in an unnatural setting, which they are aware of, and this can alter their behaviour. Further, the money participants receive is not theirs, nor are the purchased products, therefore a bias can occur. Field experiments, on the other hand, do not suffer from this bias, as the participants are not always even aware that they are in an experiment. During field experiments, the participants are observed in a more natural setting.

Vickrey auctions are another way of estimating WTP. Vickrey auction is a sealed-bid function, meaning that the participants are unaware of what the other participants bid. As is customary, the person with the highest bid wins; however, they pay the price of the second highest bid. This is supposed to ensure the participants reveal their true WTP. (Wertenbroch & Skiera, 2002).

The Vickrey auction has its limitations. The participants can overestimate their true WTP to win the auction. According to Sichtmann & Stingel (2007), the Vickrey auction is not a valid measure of WTP.

The following method of estimating WTP is the BDM method. With this method, participants write the price they would pay for the product on paper, and a random one is selected. The participants who answered higher than the price on the selected paper then bought the product for the price of the selected paper. The BDM method and Vickrey auction have a similarity in that they both give the product to the highest bidders (in BDM case, can be multiple), but for a price lower than they originally intended to pay. (Breidert *et al.*, 2006).

As mentioned at the beginning of this section, consumer preferences can be either revealed or stated. The previous subsection discussed revealed preferences and how to observe them. In this section, stated preferences will be discussed. The most common way of measuring stated preferences is via survey. The surveys can be either direct or indirect.

One of the most frequently used types of indirect surveys is conjoint analysis. Conjoint analysis is a process where a participant is given a number of products with various attributes and is asked to rank them according to their preferences. The conjoint analysis, therefore, measures the participants WTP for certain characteristics and attributes of the given good (Breidert *et al.*, 2006).

With regard to direct surveys, we distinguish between two sections. Expert judgements and customer surveys. A customer survey asks the respondents about their preferences and the prices they would be willing to pay for a product. The main advantage of the method is that it is quite straightforward and not too difficult to implement.

### 2.3 Previous studies about plants

In general, not many studies about consumer behaviour regarding indoor plants have been made. However, a study was written on customers' consistency when purchasing houseplants. The mentioned study was done by Knuth *et al.* (2021), and they focused on Likelihood to Buy (LTB) and studied the consistency of their decisions. Even though likelihood to buy is slightly different from WTP, both concepts are very useful in marketing, and companies can use them to predict the behaviour of their customers.

Knuth *et al.* (2021) collected the data for their study via survey with over two thousand respondents. Pictures of houseplants were shown to them, and questions about their LTB followed. The respondents were asked whether they would purchase the plants for themselves or as a gift for someone else, and then they were asked what they would consider a bargain and what would be too expensive for them. And lastly, they were asked to evaluate whether they would buy the plants at those price points. The data were later analysed based on whether they were consistent with their answers and whether they were likely to switch their decisions. The study found that consumers were more likely to make inconsistent decisions when met with a high price level, further, not many demographic factors affected their decisions.

Now, let us focus on the willingness to pay itself. While there were no studies on WTP for houseplants, a few were done on similar topics. Lorenzo *et al.* (2000) in their study measured the willingness to pay of small-town residents to preserve the urban community forest. They surveyed approximately 650 respondents and asked whether they would be willing to pay to protect the

urban forest in the neighbourhood. The respondents were asked to rank the potential benefits of trees and forests, together with some additional questions. The study showed that respondents' willingness to pay increases with the benefits they ranked higher. Some benefits that positively correlated with WTP were aesthetics, an increased sense of community, the attraction of birds and wildlife and giving shade. The study also found that WTP increased more with quickly noticeable benefits in comparison with benefits that were not so easily visible (for example, stormwater control was an example of not easily visible benefit). The study also mentioned some socioeconomic factors, such as that with income over 80 thousand \$ annually, respondents were willing to pay more than 12\$ in their taxes to protect the urban forest. Another finding was that, surprisingly, renters are willing to pay more than homeowners to protect the urban forest.

As mentioned in Section 2.2, auctions are another way of measuring WTP. One of the older studies was done by Yue *et al.* (2011). They measured whether people are willing to pay more for ornamental plants labelled "native" or "non-invasive". They made their study in response to more invasive plants being imported to the USA, which could have caused severe environmental or economic impacts. They organised a Vickrey auction. That is, a closed auction where the item goes to the highest bidder, but they pay the second highest price. The participants were shown pictures of 5 pairs of plants, The plants had similar appearances, but in each pair, one was invasive. Their study showed that participants were more likely to bid less for invasive plants when they were aware that the plant was invasive, proving that the labelling affects consumers' willingness to pay.

Another study measuring WTP with an experimental auction was done by Rihn *et al.* (2019). Their research measured whether consumers are willing to pay more for fruit plants with an Eco-label, either in text or picture form. The respondents participated in an experimental auction, where their eye movements were tracked. The eye-tracking technology was implemented to determine whether the logo or text was more eye-catching. Their study found that participants respond more to picture logos than text labels and are willing to pay more for such fruit plants.

# Chapter 3

## Data and Variables

### 3.1 Data collection

The data for the analysis was collected via a unique self-developed online questionnaire and distributed mostly via social media and email. As the thesis focuses on the market in the Czech Republic, the questionnaire is in Czech. Further, the prices are in Czech crowns (CZK). As the questionnaire gives the respondent different questions based on their answer for the first question, there are two data sets, and two models.

When developing the questionnaire, multiple factors needed to be taken into consideration. As the questions were mostly closed-ended, they needed to be carefully thought out to get as clear a picture as possible. Before creating the final version, a test group of people was asked to give their opinions and whether they felt the questions reflected their preferences. Further, the questionnaire was made to reflect the studies mentioned in Chapter 1 and Chapter 2, such as air purifying abilities or mental benefits. In the preliminary research, the most common answer was visual appeal and price, but the respondents of the preliminary questionnaire had other useful comments about the design and structure of the questionnaire, which were worked into the final version. After the questionnaire was sent to respondents, no adjustments were possible.

As can be observed in Appendix A, the questionnaire was divided into three sections. The task of the first section was to find out consumers' WTP with a direct question. If the respondent answered positively, the second section asked questions about their preferences for houseplants and how much they would pay for them. For those who answered negatively to the first question, the second section asked why they are not willing to pay for houseplants.

The last section was the same for both groups. The section asked general questions, which could affect their WTP. Last subsection were demographic questions. At the very end of the questionnaire, the respondents were shown four pictures of the same houseplant type, however, the plants had different qualities. One was large and blooming, the second was large without blooms, the third was small without blooms, and the last one was small and blooming. The goal of these last four questions was to find out whether the respondents were consistent with their answers from previous sections and also for additional analysis.

## 3.2 Variables

### 3.2.1 Dependent variables

As the main focus of the thesis is the analysis of consumers' WTP, the first dependent variable will be a binary variable, where 1 equals a positive answer, meaning a person is willing to pay for houseplants, and 0 is a negative answer. In the questionnaire, the question: "Imagine you are going to decorate a new apartment, would you purchase houseplants in it?" asks about consumers' WTP directly. A scale of 4 answers ranging from "definitely no" to "definitely yes" was given as options. If the respondent answered "definitely no" or "probably not", the variable was set to 0; if they answered "probably yes" or "definitely", it was set to 1.

The other goal of the thesis is to investigate how much people are willing to pay for houseplants. This will be done with the variable *Price*, monitoring how much people are willing to pay for plants in general. The respondents were asked to write the maximum amount they would be willing to pay for a houseplant. The end variable is, therefore, continuous.

### 3.2.2 Independent variables

The aim of the thesis is to understand which characteristics have influence on respondents' willingness to purchase houseplants. For this reason all respondents were asked these questions. The independent variables are summarized in Table 3.1.

Table 3.1: Independent variables

<b>Variable</b>	<b>Description</b>	<b>Type</b>	<b>Expected Relationship</b>
<i>Mental Health</i>	Plants improve mental health 1 = Yes, 0 = No	binary	+
<i>Design</i>	Plants are a part of interior design 1 = Yes, 0 = No	binary	+
<i>2Years</i>	Plant purchased in the last 2 years 1 = Yes, 0 = No	binary	+
<i>Hobby</i>	Plants are a hobby 1 = Yes, 0 = No	binary	+
<i>Fake</i>	Prefers fake plants 1 = Yes, 0 = No	binary	-
<i>Home</i>	Hours spent at home a day	cont.	+
<i>Pandemic</i>	Liking plants more since Covid 1 = completely disagree 4 = completely agree	Likert scale	+
<i>Flowers</i>	Prefers fake houseplants 1 = Yes, 0 = No	binary	-
<i>Gift</i>	Buys plants more as a gift 1 = Yes, 0 = No	binary	+
<i>Rent</i>	Rents an apartment 1 = Yes, 0 = No	binary	-
<i>Easy</i>	Plant is easy to take care of 1 = completely disagree 4 = completely agree	Likert scale	+
<i>Looks</i>	Looks are important in plants 1 = completely disagree 4 = completely agree	Likert scale	+
<i>Unique</i>	Preference for unique plants 1 = completely disagree 4 = completely agree	Likert scale	+
<i>Count</i>	Number of plants the respondent has	cont.	+
<i>Bloom</i>	Preference for blooming plants 1 = completely disagree 4 = completely agree	Likert scale	+

Variable	Description	Type	Expected Relationship
<i>Air</i>	Preference for air purifying plants 1 = completely disagree 4 = completely agree	Likert scale	+
<i>Colour</i>	Preference for colorful plants 1 = completely disagree 4 = completely agree	Likert scale	+
<i>Shop</i>	Preference for specialized shops 1 = completely disagree 4 = completely agree	Likert scale	+
<i>Size</i>	Preference for bigger plants 1 = completely disagree 4 = completely agree	Liker scale	+
<i>Gender</i>	Gender of the respondent 1 = Woman, 0 = Man	binary	NA
<i>Age</i>	Age of the respondent	cont.	NA
<i>Education</i>	Highest level of education Elementary = 9, High school = 13, University = 18	ordinal	NA
<i>Ec. active</i>	Respondent is economically active	binary	NA
<i>Income</i>	Category of net income 0-15 thousand CZK, 15-20 thousand CZK 20-25 thousand CZK, 25-30 thousand CZK 30-35 thousand CZK, 35-40 thousand CZK 40+ thousand CZK	categorical	NA

The first section of variables are all binary variables, with "yes" having the value of 1 and "no" having the value of 0. As mentioned in Subsection 1.3.1, indoor plants can positively affect people's mental health. Variable ***Mental health*** depicts whether indoor plants positively affect a given respondent. We could assume that if plants make a respondent feel better mentally, they would be more likely to surround themselves with houseplants.

***Design*** depicts whether a person thinks houseplants are a part of interior design. We would expect that respondents with this mindset would have higher WTP, as they would see houseplants as a design item and buy them to make their apartments more visually appealing.

***2 Years*** is a binary variable stating whether the person bought a houseplant in the past two years. The expected relationship is positive, as if the

person purchased a houseplant in the last two years, they would be more likely to replicate this behaviour given the option.

**Hobby**, is a binary variable which equals 1 if the respondent sees houseplants as their hobby and 0 otherwise. We would expect a strong positive relationship with WTP.

**Fake plants**, is expected to have a negative relationship with consumers' WTP. *Fake plants* is equal to 1 if a person prefers artificial plants over a living ones.

**Time at Home** is a continuous variable. The respondents were asked how many hours a day they spend at home. It was specified that sleep does not count. We would expect a positive relationship with WTP, as people who spend more time at home would be more incentivised to decorate their homes with houseplants.

**Pandemic** measures whether respondents' relationship with plants changed during the Covid-19 pandemic. It is a scale from 1 to 4, 1 being "definitely not" and 4 being "definitely yes".

**Flowers** showed, whether the respondent preferred cut flowers over potted houseplants. Here we would expect a negative relationship with WTP.

The variable **Gift** measures, whether the respondents buy houseplants more often as a gift or for themselves. The variable is expected to have a negative relationship on WTP.

Variable **Rent** measures whether the respondent owns the apartment or house they live in, or if the rent. The expected effect of rent is that respondents living in places they own would care for it more and would be more willing to decorate it with houseplants.

Variable **Count** is a continuous variable measuring the number of plants the respondent has.

The following set of variables are demographic variables, each respondent was asked these, and the variables were used in both models.

The first demographic variable is **Gender**; the respondents were given three options, "Male", "Female", and "other", where they were free to specify whom they identified as. Binary variables were created based on respondents gender.

**Age** is a continuous variable depicting the respondent's age.

**Education** of the respondents was also measured, the respondents were given three options. "Elementary education", "High school education", or "University education". The answers were then transformed into binary variables.

The following demographic variable is **Occupation**. The options were the

following: "Student", "Employed", "Unemployed", "Self-employed", and "Retired". As many students and senior citizens work, they are given the option to select more than one answer. These answers were transformed into an economically active dummy variable.

**Income** was the last demographic variable ; the respondents were given options in thousands, 0-15, 15-20, 20-25, 25-30, 30-35, 35-40 or more than 40 thousand CZK. Income brackets were then created.

The following set of variables was used to determine a houseplant's price and the respondent's preferences. The data for these variables were collected in the following way: The respondents were asked, "when purchasing an indoor plant,... is important to me". The respondents then chose their answers on a scale from 1 to 4. The interpretation of the numbers is a scale from "completely disagree" to "completely agree". This section was shown only to respondents who answered "definitely yes", "probably yes", and "probably not" to the initial question.

**Easy** shows whether it is important for the respondent that their plants are easy to take care of. This can mean multiple things, like watering schedule, light requirements, sensitivity to cold etc.

**Looks** is a variable measuring if it's important for the respondents to find the plant pretty when making a purchase.

**Unique** is a variable showing whether it's important for the respondent to have a unique plant; by a unique plant, we mean rare to find or having a unique appearance.

**Air Purifying** shows whether the respondents mind about air purifying abilities when purchasing a houseplant. In Section 1.3 of the thesis, we state the air-purifying abilities of houseplants and mention multiple studies, the goal is to determine whether it actually influences customer purchasing decisions.

**Colour** shows whether people like for their indoor plants to have colourful leaves. An example of a houseplant with colourful leaves is Syngonium Albo Variegata or Philodendron Pink Princess.

**Shop** is this variable which states if the respondent prefers their plant to be from a business oriented solely on houseplants, in contrast to, for example, Billa, or Lidl, which are mostly food stores, who also happen to sell houseplants as a small part of their business.

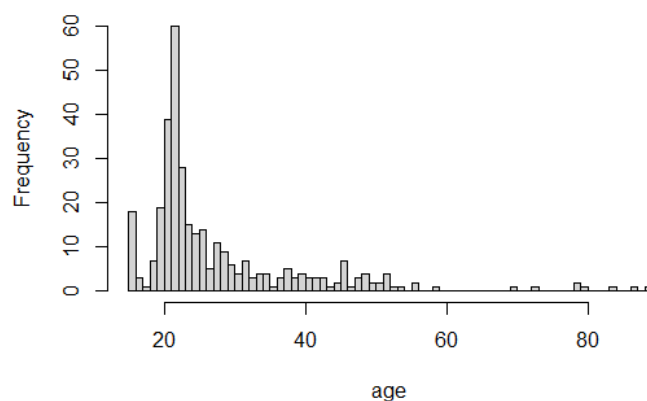
**Size** measures whether people prefer larger plants to smaller ones when purchasing.

### 3.3 Descriptive analysis

During Spring 2023 , 351 respondents filled out the questionnaire. For the questionnaire, the Google Forms platform was used, as it is easy to use and reliable. Out of the 351 responses, some were eliminated, as they were illogical or otherwise suspicious. Out of all the questions, only one was non-compulsory due to its sensitive nature; it was the question about income. Therefore the variable was used only for a part of the analysis.

In total, the questionnaire collected 334 reliable answers from the respondents. Of the 334 respondents, around 36 % of them were men, and 64 % were women. No respondent used the "other" option. The average age of the respondent was 28, the median was 23, and the most common answer was 22. The youngest respondent was 15 years old, and the oldest was 89 years old. As both the median and mode are lower than the mean, we can observe a skewness in the data; this could be mainly caused by the questionnaire distribution mainly among peers. See the histogram of age on Figure 3.1.

Figure 3.1: Histogram of Age



Source: Authors computations

The most frequent education level among the respondents was High School education, with 179 respondents or 54 %. The second most frequent education is a university. Only 17 respondents have elementary education as their highest. Corresponding with our findings, 58 % or 198 of the respondents are students. Further, 189 respondents are either employed or self-employed or both (this includes working students), and the remaining 145 respondents are either not working students (130), unemployed (7) or seniors (8). For the purpose of the analysis, a binary variable, "economically active", was created. Overall,

189 respondents are economically active, and 145 are economically inactive. Table 3.2 provides an overview of the variables and their frequency.

Table 3.2: Frequency table

<i>Variable</i>	Frequency	Percentage
<i>Gender</i>		
Man	122	36.53
Woman	212	63.47
<i>Age</i>		
15-23	147	44.01
23-30	95	28.44
30-50	71	21.26
50+	21	6.28
<i>Education</i>		
Elementary	17	5.03
High School	182	53.85
University	139	41.12
<i>Income</i>		
0-15	115	40.78
15-25	51	18.09
25-40	57	20.21
40+	58	20.92
<i>Occupation</i>		
Student	198	59.28
Employed	159	47.6
Self employed	41	12.27
Unemployed	7	2.10
Senior	8	2.40
<i>Economically active</i>	189	56.59

The second part of the questionnaire aimed to understand which factors influence WTP, each respondent answered these. Out of all 334 respondents, the average number of houseplants was 20.5, the median was 6.5, and the mode was 3. As the minimum was 0, which was answered 31 times, and the maximum was 300, which was answered once, there is a visible skewness in the data. An interesting analysis is to combine the variable count with the hobby variable. 135 respondents said that houseplants are their hobby. The respondents who have houseplants as a hobby have, on average, 42.7 plants. The median is 25, and the mode is 10. Whereas the respondents for whom houseplants are not a hobby have, on average, 5.4 houseplants, mean is three and mode is 0. A majority (73 %) of the respondents had purchased a houseplant in the last

two years. Only 37 respondents prefer artificial houseplants over live ones, and for a majority of respondents, their relationship with houseplants has not changed much over the Pandemic. For 112 respondents, their relationship did not change at all. For 81, it has mostly stayed the same. 62 respondents said that their relationship with houseplants had changed a bit over the pandemic, and for 79, their relationship has definitely changed.

Further, for a vast majority (311), houseplants improve their mental health, and 217 of the respondents prefer live plants over cut flowers. 45 % purchase houseplants more often as gifts and not for themselves. Furthermore, the majority (93 %) see houseplants as interior design items.

The next group of questions was given only to those who are at least partially willing to pay for houseplants. These questions examined their preferences, and the variables were mostly on the Likert scale from one to four, one being "completely disagree" and four being "completely agree". An overview of the answers is in Table 3.3.

Table 3.3: Likert scale table

<i>Variable</i>	1	2	3	4
<i>Easy</i>				
Frequency	25	66	133	95
Percentage	7.49	19.76	39.82	28.44
<i>Appearance</i>				
Frequency	3	8	57	251
Percentage	0.9	2.4	17.07	75.15
<i>Unique</i>				
Frequency	91	126	81	21
Percentage	27.25	37.72	24.25	6.28
<i>Bloom</i>				
Frequency	156	103	51	9
Percentage	46.71	30.84	15.27	2.69
<i>Air</i>				
Frequency	82	110	94	33
Percentage	24.55	32.93	28.14	9.88
<i>Colour</i>				
Frequency	134	117	56	12
Percentage	40.11	35.03	16.77	3.58
<i>Size</i>				
Frequency	166	113	32	8
Percentage	49.7	33.83	9.58	2.39

According to expectations, for many respondents (68 %), the purchased plant must be easy to take care of. Also, according to our expectations, the vast majority care about the plants' appearance when purchasing. Only three respondents said they completely disagree, and eight said they partially disagree. 64 % do not mind if their plant is not unique and original, and only 21 respondents answered they care a lot.

Further, most respondents (78 %) do not mind their houseplants not blooming. Regarding air purifying abilities, 110 respondents answered partially disagree, and the mean was 2.2. 134 respondents said that they are indifferent about whether the plant has a unique colouring, the mean was 1.8; therefore, most respondents are indifferent about it. Last but not least, the majority of respondents (83 %) answered completely or partially disagree in regards to whether they prefer large plants when making a purchase. The respondents who said they would not purchased any houseplants reasoned most often that they do not think they would be able to take care of them. Further, most respondents said they do not have a relationship with houseplants at all. Only 5 respondents mentioned they do not purchase houseplants because of children or pets. And one person said they would not purchase any houseplants because of frequent work travel.

# Chapter 4

## Model

### 4.1 Empirical model

This chapter is going to discuss the model which will be used in the thesis and will follow Wooldridge (2015), as in their book they provide a clear and view picture on the topic. As mentioned in Chapter 3, the observed variable WTP is a variable dividing the sample into two categories. Those willing to pay for a given product and those not. Therefore the variable has limited range of values (0 and 1). In econometrics, such dependent variable is called Limited Dependent Variable (LDV). In general, LDV does not have to be a binary variable (as in our case) but can also take other limited values. As shown in the next part of this chapter, such variables should be estimated a bit differently than continuous dependent variables.

For a binary dependent variable, the probability of  $y$  being equal to 1 is the same as expected value of  $y$ :

$$P(y = 1|x) = E(y|x) \quad (4.1)$$

Thus, for binary dependent variables the following equation holds.

$$P(y = 1|x) = \beta_0 + \beta_1 x_1 + \dots + \beta_k x_k \quad (4.2)$$

The equation 4.2 is an example of a Linear Probability Model (LPM). In the equation 4.2, it is shown that  $P(y=1|x)$  (also called response probability) is a linear function of  $x$ . Therefore LPM uses Ordinary Least Squares (OLS) and is the simplest method of estimating LDV which can be used to estimate a binary dependent variable. However, it has certain drawbacks.

The main limitation is that using LPM the value of the dependent variable can be predicted as less than 0 or greater than 1. From its definition, this is not possible for a binary variable. As Wooldridge (2015) mentioned, it can be a little embarrassing.

Fortunately for the purpose of the thesis, this can be addressed through binary response models. As the name suggests, the models are interested in the response probability.

$$P(y = 1|\mathbf{x}) = P(y = 1|x_1, x_2, x_3, \dots, x_k) \quad (4.3)$$

In order to overcome the limitation of the values being greater than one or lower than 0, we will construct a binary response model with nonlinear function  $G$ ,  $0 < G(z) < 1$ , for all  $z$ .

$$P(y = 1|\mathbf{x}) = G(\beta_0 + \beta_1 x_1 + \dots + \beta_k x_k) = G(\beta_0 + \mathbf{x}\boldsymbol{\beta}) \quad (4.4)$$

Two of the most used functions  $G$  are the logistic function and the Standard normal Cumulative Distribution Function (CDF).

$$G(z) = \frac{e^z}{1 + e^z} = \Lambda(z) \quad (4.5)$$

The equation 4.5 is the logistic function. Further, the function has values ranging from 0 to 1 for all  $z$ . Also, the logistic function is increasing rapidly at  $z = 0$ . If  $z=0$ ,  $G(z) \rightarrow 0$ , as  $z \rightarrow -\infty$ , and  $G(z) \rightarrow 1$ , as  $z \rightarrow \infty$ . This can be observed in Figure 4.1 on the page below.

As mentioned, the second function is the Standard normal cumulative distribution function, which is used for the probit model.

$$G(z) = \Phi(z) = \int_{-\infty}^z \Phi(v)dv \quad (4.6)$$

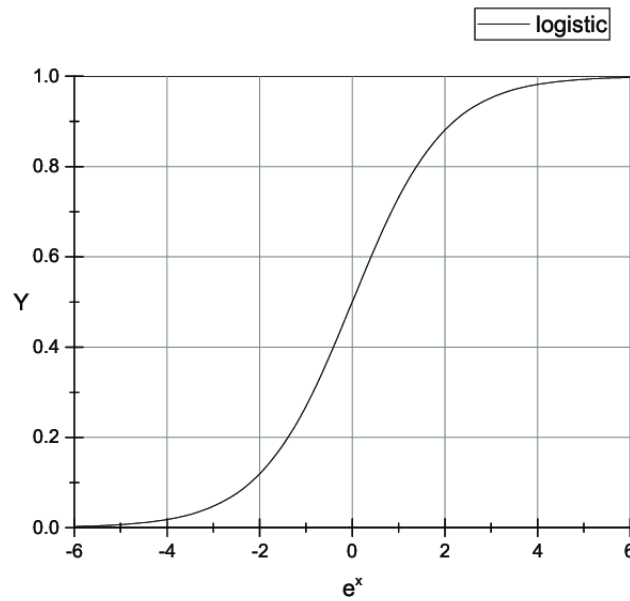
where  $\Phi(z)$  is the standard normal density function.

$$\Phi(z) = \frac{1}{\sqrt{2\pi}} e^{-\frac{z^2}{2}} \quad (4.7)$$

Again, the CDF for probit increases most rapidly at 0, if  $z=0$ ,  $G(z) \rightarrow 0$ , as  $z \rightarrow -\infty$ , and  $G(z) \rightarrow 1$ , as  $z \rightarrow \infty$  and is thus also a good tool for estimating a binary dependent variable. Figure 4.2 compares both functions in the same graph.

To gain a better understanding of both models, we will now focus on a

Figure 4.1: Logistic function



Source: Fan *et al.* (2019).

latent variable model, which they both are derived from. In a latent variable model, the dependent variable is a function of a latent (or unobserved) variable. Assume  $y^*$  is the unobserved variable:

$$y^* = \beta_0 + \mathbf{x}\boldsymbol{\beta} + e, y = 1[y^* > 0] \quad (4.8)$$

By  $[\cdot]$  we understand a binary outcome. Meaning that in the notation  $y=1[y^*>0]$  if  $y^*$  is  $>0$ , then  $y=1$  and  $y=0$  when  $y^* \leq 0$ . Further, in the equation 4.8,  $e$  is independent of  $\mathbf{x}$  and is symmetrically distributed around 0. Therefore the following equation holds

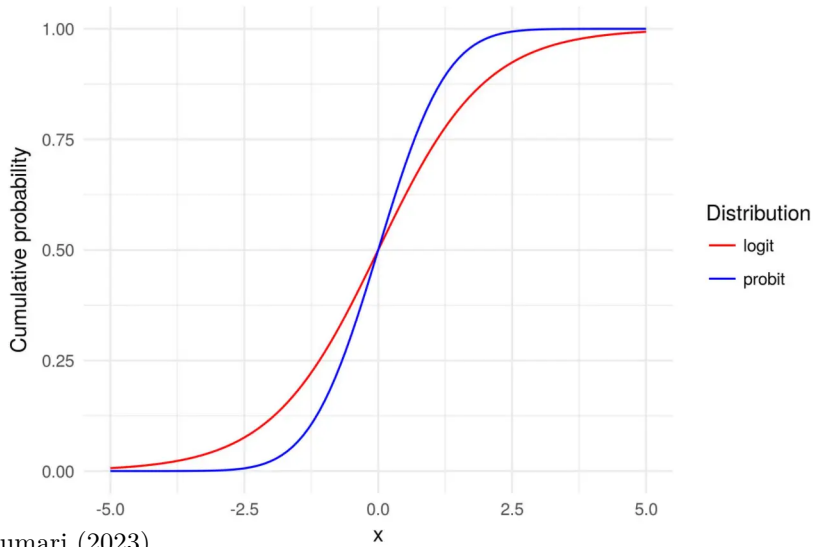
$$1 = G(-z) = G(z), z \in \mathbb{R} \quad (4.9)$$

Now, we are able to derive the equation for logit and probit models using equation 4.8 and equation 4.9

$$\begin{aligned} P(y = 1|x) &= P(y^* > 0|x) = P(e > -(\beta_0 + \mathbf{x}\boldsymbol{\beta})|x) \\ &= 1 - G[-(\beta_0 + \mathbf{x}\boldsymbol{\beta})] = G(\beta_0 + \mathbf{x}\boldsymbol{\beta}) \end{aligned} \quad (4.10)$$

As we can observe, equation 4.4 and 4.10 are equal. When working with these two models, we are interested in the effect of  $x_j$  on  $P(y=1|x)$ , the response probability. For both logit and probit, the partial effect

Figure 4.2: Comparison of Logit and Probit Distribution



Source: Kumari (2023).

of  $E(y^*|x)$  and  $E(y|x)$  has the same direction, however since  $y^*$  is an unobserved variable, it can be quite challenging to work with it. Further, since  $G(\cdot)$  is a nonlinear function, it can also be challenging to estimate the effect of  $x_j$  on the response probability  $p(x) = P(y=1|x)$ .

Therefore, to find the partial effect, we will use calculus. Under the assumption that  $x_j$  is roughly continuous, the partial effect of  $x_j$  on the response probability can be estimated as

$$\frac{\partial p(\mathbf{x})}{\partial x_j} = g(\beta_0 + \mathbf{x}\boldsymbol{\beta})\beta_j, g(z) = \frac{dG(z)}{dz}(z) \quad (4.11)$$

Since  $G(\cdot)$  is strictly increasing for both logit and probit models (as visible in Figure 4.2), the direction of the partial effect relies on the sign of  $\beta_0$ . In a case when  $x_1$  is a binary variable (which in this thesis is often the case), then the partial effect can be written as

$$G(\beta_0 + \beta_1 + \beta_2x_2 + \dots + \beta_kx_k) - G(\beta_0 + \beta_2x_2 + \dots + \beta_kx_k) \quad (4.12)$$

Now let us focus on estimating the models. As previously mentioned in this chapter, we are interested in nonlinear binary response model. This makes the use of Ordinary Least Squares (OLS) or Weighted Least Squares (WLS) not possible. Therefore, we will use the Maximum Likelihood Estimator (MLE). For a random sample with  $n$  observations, it is necessary to obtain the density of

$y_i$  given  $x_i$ , this can be written as

$$f(y|x_i; \boldsymbol{\beta}) = [G(x_i\boldsymbol{\beta})]^y [1 - G(x_i\boldsymbol{\beta})]^{(1-y)}, y = 0, 1 \quad (4.13)$$

From the above equation we can see that, when  $y=1$ ,  $f(y|x_i; \boldsymbol{\beta}) = G(x_i\boldsymbol{\beta})$ , and when  $y=0$ ,  $f(y|x_i; \boldsymbol{\beta}) = 1 - G(x_i\boldsymbol{\beta})$ . Therefore, if we take a log of the equation 4.13, we obtain the log-likelihood function for observation  $i$ , which is defined as

$$\ell_i(\boldsymbol{\beta}) = y_i \log[G(x_i\boldsymbol{\beta})] + (1 - y_i) \log[1 - G(x_i\boldsymbol{\beta})]. \quad (4.14)$$

Now, we obtain the log-likelihood function for the whole sample by a simple summation.

$$\mathcal{L}(\boldsymbol{\beta}) = \sum_{i=1}^n \ell_i(\boldsymbol{\beta}) \quad (4.15)$$

For a model where  $G(\cdot)$  is a logistic CDF, the MLE of  $\boldsymbol{\beta}$  is called the logit estimator  $\hat{\boldsymbol{\beta}}$  and if  $G(\cdot)$  is a standard normal CDF, then the estimator  $\hat{\boldsymbol{\beta}}$  is called the probit estimator. Under general assumptions, the MLE is consistent, asymptotically normal and asymptotically efficient, which is sufficient for the purpose of the thesis.

For hypotheses testing with binary response models, one can use the likelihood statistic test.

$$LR = 2(\mathcal{L}_{ur} - \mathcal{L}_r) \quad (4.16)$$

where  $\mathcal{L}_{ur}$  is the unrestricted log-likelihood value and  $\mathcal{L}_0$  is the value of log-likelihood of the restricted model. For the goodness-of-fit measure of binary response models, we can use the Pseudo R-squared.

$$R^2 = \frac{\mathcal{L}_{ur}}{\mathcal{L}_0} \quad (4.17)$$

When evaluating the results of a binary response model, two main methods can be used. First, the Partial Effect At The Average (PEA), which replaces each independent variable with its sample average.

$$g(\hat{\boldsymbol{\beta}}_0 + \bar{\mathbf{x}}\hat{\boldsymbol{\beta}}) = g(\hat{\beta}_0 + \hat{\beta}_1\bar{x}_1 + \hat{\beta}_2\bar{x}_2 + \dots + \hat{\beta}_k\bar{x}_k), \quad (4.18)$$

Where  $g(\cdot)$  is for logit the standard normal density and for probit the  $\exp(z) = \frac{\exp(z)}{[1-\exp(z)]^2}$ . However, PEA has a few limitations, for example, if the

independent variables are discrete, it may not always be desired to find the "average" person in the sample. Further, if the continuous variables are in nonlinear functions (such as logarithms).

A second, and in some cases more suitable approach is called Average Partial Effect (APE). In a situation with binary independent variables, APE is preferred, as it takes into account the marginal effects of the whole sample.

$$n^{-1} \sum_{i=1}^n g(\hat{\beta}_0 + \bar{\mathbf{x}}_i \hat{\boldsymbol{\beta}}) \quad (4.19)$$

# Chapter 5

## Results

### 5.1 Logistic results

In this section, the results of the logit model will be discussed. The observed variable WTP is a binary dependent variable; in Chapter 4, the methods of estimation were discussed. In this analysis, we will examine the effect of independent variables on the probability that a person is willing to purchase a houseplant. The comparison between the observed models can be found in Appendix B.

As previously mentioned, both logit and probit models can be used as an estimation tools for a binary dependent variable. Based on the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC), the logistic regression turned out to be more suitable for our data. Even though the logit model is a better fit for our data, both models yield similar estimates, as can be observed in Table B.1.

For the purpose of the analysis, a base group logit model was estimated.

$$P(\text{WTP} = 1|x) = G(\beta_0 + \beta_1 \text{Woman} + \beta_2 \text{Age} + \beta_3 \text{Education} + \beta_4 \text{Eactive}) \quad (5.1)$$

Apart from the binary variables, the base group for the variable Education was elementary. Overview of all independent variables can be found in Table 3.1. The function  $G(\cdot)$  is the logistic function defined in Chapter 4. Twelve new models were then created, separately adding one new independent variable, and then they were compared against each other using the LR test. The individual models, as well as the LR tests, can be found in Section B.2. The most suitable model is the following:

$$P(\text{WTP} = 1|x) = G(\beta_0 + \beta_1 \text{Woman} + \beta_2 \text{Age} + \beta_3 \text{Education} + \beta_4 \text{Eactive} + \beta_5 \text{Twoyears} + \beta_7 \text{Design} + \beta_9 \text{Fake} + \beta_{10} \text{Count} + \beta_{11} \text{Hobby} + \beta_{12} \text{Mental}) \quad (5.2)$$

The Mc Fadden R-squared of the model is 0.3367, and the model is statistically significant with  $\chi^2$  is 76.91 and p-value 0.000. A comparison of several models can be found in Table 5.1 on the page below. The final model is number three.

Table 5.1: Logistic regression,  $\beta$  coefficients

	(1) WTP	(2) WTP	(3) <b>WTP</b>	(4) WTP
Woman	1.396***	0.783 <sup>+</sup>	0.851 <sup>+</sup>	0.920 <sup>+</sup>
Age	0.002	0.015	0.033	0.035 <sup>+</sup>
Education				
High School	0.461	0.567	0.500	0.557
University	− 0.224	− 0.081	− 0.065	0.008
Occupation				
Ec. active	− 0.029	− 0.260	− 0.297	− 0.237
Two Years		1.886***	1.213*	1.112*
Home				0.004
Design		1.697**	2.167**	2.101**
Pandemic		0.245		0.230
Fake			− 1.649**	− 1.753**
Count			0.007	0.006
Hobby			1.567 <sup>+</sup>	1.657 <sup>+</sup>
Mental Health			1.782**	1.784**
Gift				0.302
Flowers				− 0.137
Rent				− 0.164
Constant	1.255	− 1.771	− 3.578*	− 4.131*
N	334	334	334	334
Df	5	8	11	16
Chi-square	18.479**	50.98***	77.508***	76.806***
Pseudo R	0.081	0.223	0.336	0.341

+p < 0.10, \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001

### 5.1.1 Interpreting the results

As mentioned in Chapter 3, the standard interpreting tool for a logit model is APE and PEA. Whenever the observed model has multiple binary variables, it is usually better to use the APE, Wooldridge (2015). Table 5.2 summarizes the results for model 5.2.

Table 5.2: APE

<i>Variable</i>	APE
Woman	0.061***
Age	0.002
Education	
High School	0.033
University	−0.004
Occupation	
Ec. active	−0.020
Two Years	0.080**
Design	0.143**
Fake	−0.109**
Count	<0.001
Hobby	0.103*
Mental Health	0.117**

+p < 0.10, \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001

From the APE results table, the variable *woman* is significant at 1 % significance level; the coefficient is equal to 0.061, meaning that women are 6 % more likely to purchase a houseplant. The demographic variables *Age*, *Education* and *Occupation* are not statistically significant even at 10 % significance level.

According to our expectations, variable *Two years* showed significance at 1 % significance level, and the respondents who purchased a houseplant in the past two years are 8 % more likely to purchase another one.

Respondents who view houseplants as interior design items are 14.3 % more likely to purchase a houseplant at 1 % significance level. This could support our initial hypothesis that even though the respondents do not view houseplants as a hobby, they would purchase them solely as a design item.

A significant negative relationship showed the variable *Fake*. Respondents who prefer artificial plants over living ones are 10.9 % less likely to purchase a houseplant. This finding is not surprising, as if they were in a situation of

designing a new accommodation, they would more likely purchase an artificial one.

Contrary to our expectations, the variable *Count* is not supported even at 10 % significance level. It could be the case that the number of houseplants one has is not indicative of whether one would purchase another one.

Respondents who see houseplants as a hobby are 10.3 % more likely to purchase a houseplant at 5 % significance level. Respondents who feel that houseplants improve their mental health are 11.7 % more likely to purchase a houseplant. This finding is according to our expectations, as Dzhambov *et al.* (2021) mentioned, houseplants can improve mental health, especially since the Covid-19 Pandemic.

The findings of the regression were mostly in line with our expectations, however the variable *Pandemic*, which measures whether the respondent's relationship with houseplants changed during the pandemic, did not improve the model significantly. As mentioned by Campbell *et al.* (2021), during the Pandemic many started purchasing houseplants, therefore a significant positive relationship with WTP was expected.

## 5.2 OLS model

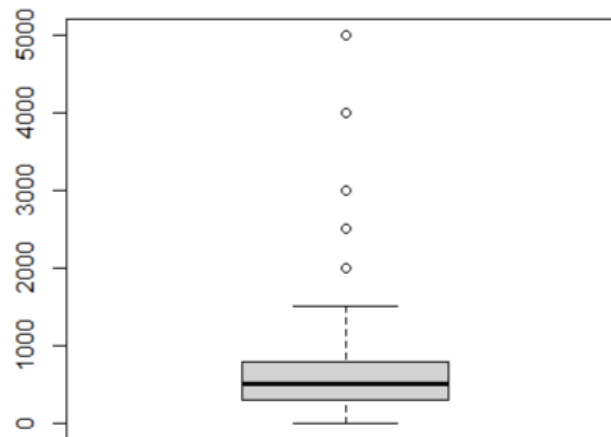
As mentioned in Chapter 3, the second observed variable is the price respondents are willing to pay for houseplants. As the purpose of the model is to determine which factors influence price, the data on the variable price were first analysed. On Figure 5.1, we can observe outliers in *Price*. For the purpose of the analysis, the outliers were omitted as they could have a negative impact on the analysis.

In the case of our analysis, *Price* is a continuous variable, therefore, an OLS model is appropriate. The observed models and tests can be found in Section B.3. The most suitable model is expressed by the following equation:

$$\begin{aligned} \ln(\text{Price}) = & \beta_0 + \beta_1 \text{University} + \beta_2 \text{Easy} + \beta_3 \text{Shop} \\ & + \beta_4 \text{Big} + \beta_5 \text{Twoyears} + \beta_6 \text{Income} \end{aligned} \quad (5.3)$$

A comparison between different tested models can be found in Table 5.3. The demographic variables *Woman*, *Age*, *High School*, and *Economically active* and other independent variables *Easy*, *Unique*, *Colour*, *Bloom*, *Air*, *Home*,

Figure 5.1: Boxplot Price



Source: Authors computations

*Design, Pandemic, Fake, Count, Hobby, Mental, Appearance, Gift, Flower and Rent* were excluded as they do not significantly improve the model. On the Table 5.3, the chosen model is the log Price number 2. The final model has the variable *Price* in logarithms. To determine the best model for our data, a combination of AIC tests and F-tests were run.

### 5.2.1 Interpreting the results

On the Table 5.4, we can observe that two demographic variables, proved to significantly improve the model. The first variable is university education, which has a negative effect of 15.7 %. This would suggest that respondents with university education pay 15 % less for houseplants. The only other demographic variable in our model is income, specifically income between 25 and 40 thousand CZK. However, in general, the effect of the income bracket is quite small, 0.17 %. Unlike our expectations, the increase in income is not associated with a significant increase in *Price*.

However, according to our expectations, variable *Easy* had a significant negative impact on the variable *Price*. *Easy* proved to be significant at 5 % significance level, and the respondents who answered positively were willing to pay approximately 8.16 % less than those who answered negatively. This goes according to our expectations as, in general, houseplants which are easy to take care of and do not require special treatment are often less expensive.

Further, also according to our expectations, the variable *Shop* proved to be significant on 5 % significant level. The respondents who prefer their house-

Table 5.3: OLS Results

	(1) Price	(2) <b>log(Price)</b>	(3) log(Price)
University	– 93.434*	– 0.171*	– 0.160 <sup>+</sup>
Easy	– 44.614 <sup>+</sup>	– 0.085*	– 0.081 <sup>+</sup>
Shop	121.003*	0.198*	0.205*
Big	39.274	0.097*	0.095*
Twoyears	128.085*	0.294**	0.310**
Home			– 0.013
Fake			– 0.194
Income			
15-25	14.363	0.002	0.006
25-40	206.550***	0.316**	0.325**
40+	142.141*	0.202 <sup>+</sup>	0.229*
Constant	460.75***	5.948***	6.030***
N	225	225	225
Df	216	216	214
Pseudo R	0.147	0.164	0.171

+p < 0.10, \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001

plants to be from a specialised shop are willing to pay 22 %. This is also quite consistent with the current houseplant market, as the plants from specialised shops tend to be more expensive. For instance, *Epipremnum aureum* in a 12 cm pot from "IKEA" costs 99 CZK, whereas in "Gardners.cz" (a specialised shop), the same plant in the same size costs 250 CZK.

The variable *Big* also proved to be significant on the 5 % significance level. The respondents who prefer their houseplants to be large pay approximately 10 % more than those for whom it is not an important factor. Large plants are, in general, more expensive, as it can be significantly more work to put a large plant on the market, therefore increasing their value. The respondents seem to be aware of this, therefore, those who prefer their plants to be big are prepared to pay more.

The last significant variable of the model is *Two Years*, at 1 % significance level. The respondents who purchased a plant in the last two years are willing to pay 34 % more for their plants. This could be either because they are aware of the market prices. Another possibility could be that they are more interested in buying pricier and rarer plants, as they already have common plants.

Table 5.4: Price model explained

	Coefficient	Exponentiated Coefficient
Education		
University	− 0.17*	0.84*
Easy	− 0.09*	0.92*
Shop	0.20*	1.22*
Big	0.10*	1.10*
Two years	0.29**	1.34**
Income		
15-25	0.00	1.00
25-40	0.32**	1.37**
40+	0.20 <sup>+</sup>	1.22 <sup>+</sup>
Constant	5.95***	390.41***

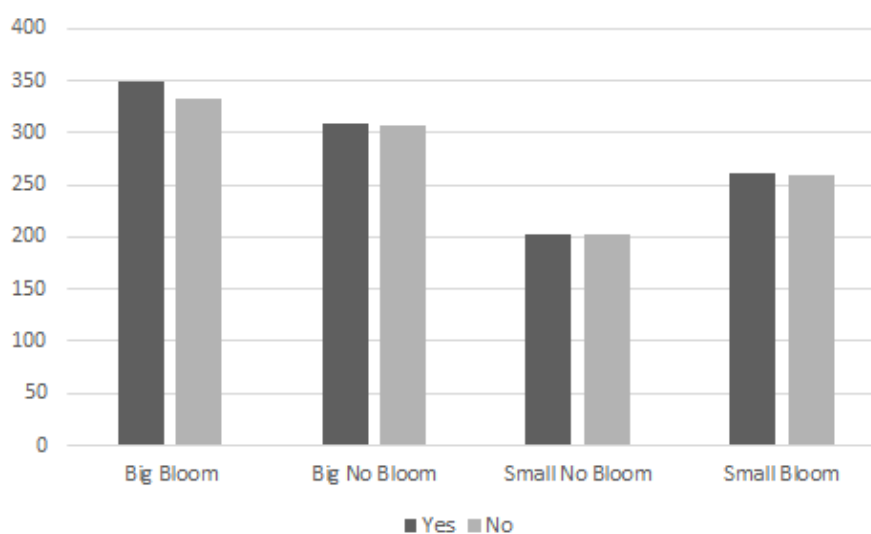
+p < 0.10, \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001

### 5.3 Additional analysis

The last section of the analysis was to determine whether the respondents were consistent with their answers based on four pictures of the same houseplant, however different properties. The plant selected for the pictures was *Spathiphyllum*, a common houseplant, which can grow quite large and also blooms quite often. All pictures of the plants can be seen in Appendix A. In the first one, the *Spathiphyllum* was large and with a clearly visible blooms. In the second one, the plant was large but had no blooms. In the third one, the plant was small and had no blooms, and in the last one, the *Spathiphyllum*, was small, however, had a significant bloom. The goal of the analysis was to determine whether respondents who answered "yes" to both *Size* and *Bloom* variables would pay more for the large plant with blooms. The results can be seen in Figure 5.2.

In the graph, the first two columns are the average prices for the big plant with a visible bloom. The first column is the average price of the respondents who answered "yes" to both the questions about size and bloom. The average prices do not differ significantly. For the respondent who prefers large blooming plants, it was 349 CZK, and for the remaining, it was 333 CZK. For the second picture, the difference between the two groups is only 3 CZK. Further, there was no difference between the prices for the third plant, which was a small one without blooms. No significant difference was also for the last plant, a small *Spathiphyllum* with a bloom. These findings are not in line with our

Figure 5.2: Bar Graph Price



Source: Authors computations

expectations, as we would expect the respondents who prefer their houseplants to have certain attributes to be willing to pay more for them. One of the possibilities is that the respondents were inconsistent with their answers; there are, however, other options. In the survey, only one picture of the plant with each attribute was shown. Further the pictures were in different settings, and the respondents could focus on other features of the plant.

## 5.4 Limitations

As mentioned in Chapter 2, measuring WTP with a survey is a commonly used technique, however, certain biases can occur. First, the survey can suffer from self-selection bias. Even though the questionnaire reached many people, however, the respondents choose to answer it at their free will. This can mean that people who are generally interested in the topic may be more inclined to answer it. Further, even though the questionnaire was fully anonymous, the respondents may still feel some pressure to answer in a certain way. Since the questionnaire was sent out via social media and email, only people with internet connection were able to answer it. Additionally, a variable *pre-pandemic* could have been added, this variable would measure whether the respondent owned houseplants before the Covid-19 Pandemic. This would allow for a better analysis of how the Covid-19 pandemic influenced the purchase behaviour in

consumers. Additionally, a variable *Online*, which would measure whether respondents prefer to shop online or in person for houseplants.

# Chapter 6

## Conclusion

This thesis examined consumers' willingness to pay for houseplants in the Czech Republic. It aimed to understand consumer preferences for houseplants in a small yet prospective market. The topic of houseplants and their influence on people is relatively unexplored and offers many more possibilities for future research.

For the thesis, a unique questionnaire was developed, which collected data about respondent's preferences for houseplants. From the data, two models were created. The first one was a logit model, which aimed to measure the WTP for houseplants. The purpose was to understand the underlying factors influencing consumers when purchasing houseplants. As significant factors proved to be gender, the research has shown that women are approximately 6 % more likely to purchase a houseplant. Other demographic variables did not prove to be significant. Additionally, the respondents who purchased a houseplant in the last two years are 8 % more likely to purchase another one. The respondents who view houseplants as home decor items are 14 % more likely than those who do not. Those, who prefer artificial plants over live ones are 10 % less likely to purchase a houseplant. Furthermore, those who view houseplants as their hobby are 10 % more likely to purchase them and lastly, those who feel houseplants improve their mental health are approximately 11 % more likely to purchase a houseplant.

The second part of the thesis was to understand the factors influencing the price the respondents are willing to pay for their houseplants. Only replies from respondents with a positive willingness to pay were used in this section of the thesis. The data were examined using a linear regression model. A significant relationship with *Price* has one demographic variable: education. Respondents

with a university degree proved to pay 15 % less for their houseplants.

Additionally, respondents who care that their plant is simple to maintain pay, on average, 8 % less. Respondents who prefer their houseplants to be from specialized shops pay, on average 22 % more than those who do not. The size of the plant also plays a role. The respondents, for whom it is important that the plant is large, pay approximately 10 % more than others. The last significant factor is if the respondent have purchased a houseplant in the last two years. If they did, they are willing to pay approximately 34 % more for them.

In the last section of the thesis, an additional analysis was performed. The results of the additional analysis were, however, inconclusive and did not support the other findings of the thesis. As the thesis deals with a very promising and unexplored topic, the idea of further analysis is worth pursuing. In particular, conjoint analysis could be a suitable form of future analysis, as it is quite similar to the additional analysis performed in the thesis and could build upon the analysis performed.

# Bibliography

- BREIDERT, C., M. HAHLER, & T. REUTTERER (2006): “A review of methods for measuring willingness-to-pay.” *Innovative marketing* **2(4)**.
- CAMPBELL, B. L., A. L. RIHN, & J. H. CAMPBELL (2021): “Impact of the coronavirus pandemic on plant purchasing in southeastern united states.” *Agribusiness* **37(1)**: pp. 160–170.
- CHAPMAN, J., M. DEAN, P. ORTOLEVA, E. SNOWBERG, & C. CAMERER (2017): “Willingness to pay and willingness to accept are probably less correlated than you think.” *Technical report*, National Bureau of Economic Research.
- DZHAMBOV, A. M., P. LERCHER, M. H. BROWNING, D. STOYANOV, N. PETROVA, S. NOVAKOV, & D. D. DIMITROVA (2021): “Does greenery experienced indoors and outdoors provide an escape and support mental health during the covid-19 quarantine?” *Environmental Research* **196**.
- EUROPEAN PARLIAMENT & COUNCIL OF THE EUROPEAN UNION (2016): “Regulation (eu) 2016/679 of the european parliament and of the council of 27 april 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing directive 95/46/ec (general data protection regulation).” Accessed: April 24, 2023.
- FAN, C., Z. XIE, Y. LIU, C. LI, & H. LIU (2019): “Adaptive controller based on spatial disturbance observer in a microgravity environment.” *Sensors* **19**: pp. 47–59.
- GRAF, A. B. & R. PERROT (2021): “houseplant.” *Encyclopedia Britannica* .
- HALL, C. & M. KNUTH (2019): “An update of the literature supporting the

- well-being benefits of plants: A review of the emotional and mental health benefits of plants.” *Journal of Environmental Horticulture* **37(1)**: pp. 30–35.
- HANEMANN, W. M. (1991): “Willingness to pay and willingness to accept: how much can they differ?” *The American Economic Review* **81(3)**: pp. 635–647.
- KNUTH, M. J., H. KHACHATRYAN, & C. R. HALL (2021): “How consistent are consumers in their decisions? investigation of houseplant purchasing.” *Behavioral Sciences* **11(5)**: pp. 1–73.
- KUMARI, A. (2023): “Logit vs probit models: Differences, examples.” *Data Analytics* .
- LAYARD, R. (2013): “Mental health: the new frontier for labour economics.” *IZA Journal of Labor Policy* **2(1)**: pp. 1–16.
- LIU, F., L. YAN, X. MENG, & C. ZHANG (2022): “A review on indoor green plants employed to improve indoor environment.” *Journal of Building Engineering* **53**.
- LORENZO, A. B., C. A. BLANCHE, Y. QI, M. M. GUIDRY *et al.* (2000): “Assessing residents’ willingness to pay to preserve the community urban forest: A small-city case study.” *Journal of Arboriculture* **26(6)**: pp. 319–325.
- MA, J. (2022): “Interaction with nature indoor: Psychological impacts of houseplants care behaviour on mental well-being and mindfulness in chinese adults.” *International Journal of Environmental Research and Public Health* **19(23)**.
- MANGONE, G., S. KURVERS, & P. LUSCUERE (2014): “Constructing thermal comfort: Investigating the effect of vegetation on indoor thermal comfort through a four season thermal comfort quasi-experiment.” *Building and Environment* **81**: pp. 410–426.
- MOREWEDGE, C. K. & C. E. GIBLIN (2015): “Explanations of the endowment effect: an integrative review.” *Trends in cognitive sciences* **19(6)**: pp. 339–348.
- O’CONNOR, R. C., K. WETHERALL, S. CLEARE, H. MCCLELLAND, A. J. MELSON, C. L. NIEDZWIEDZ, R. E. O’CARROLL, D. B. O’CONNOR,

- S. PLATT, E. SCOWCROFT *et al.* (2021): “Mental health and well-being during the covid-19 pandemic: longitudinal analyses of adults in the uk covid-19 mental health & wellbeing study.” *The British journal of psychiatry* **218(6)**: pp. 326–333.
- PENNISI, S. V. & M. W. VAN IERSEL (2012): “Quantification of carbon assimilation of plants in simulated and in situ interiorscapes.” *HortScience* **47(4)**: pp. 468–476.
- PINCKAERS, M. H. (2016): “The netherlands horticulture market.” *Technical report*, USDA Foreign Agricultural Service, The Hague, Netherlands.
- RIHN, A., X. WEI, & H. KHACHATRYAN (2019): “Text vs. logo: Does eco-label format influence consumers’ visual attention and willingness-to-pay for fruit plants? an experimental auction approach.” *Journal of Behavioral and Experimental Economics* **82**.
- SICHTMANN, C. & S. STINGEL (2007): “Limit conjoint analysis and vickrey auction as methods to elicit consumers’ willingness-to-pay: An empirical comparison.” *European Journal of Marketing* **41(11/12)**: pp. 1359–1374.
- VARIAN, H. R. (2014): *Intermediate microeconomics: a modern approach: ninth international student edition*. WW Norton & Company.
- WERTENBROCH, K. & B. SKIERA (2002): “Measuring consumers’ willingness to pay at the point of purchase.” *Journal of marketing research* **39(2)**: pp. 228–241.
- WOOLDRIDGE, J. M. (2015): “Introductory econometrics: A modern approach.” *Cengage learning* pp. 583–622.
- YUE, C., T. M. HURLEY, & N. ANDERSON (2011): “Do native and invasive labels affect consumer willingness to pay for plants? evidence from experimental auctions.” *Agricultural Economics* **42(2)**: pp. 195–205.

# **Appendix A**

## **Online questionnaire**

# Pokojové rostliny

Milí respondenti,

jsem studentka Fakulty sociálních věd na UK a ve svoji bakalářské práci se věnuji pokojovým rostlinám a ekonomii.

V dotazníku se jedná převážně o uzavřené otázky, takže by Vám měl zabrat kolem 5 minut.

Děkuji moc za váš čas.

**Pokud si dotazník otevíráte na mobilu v Messengeru nebo Facebooku, možná nepůjde spustit, stačí si otevřít v prohlížeči (Safari, Google...).**

**\*Povinné pole**

1. Představte si, že si zařizujete nový byt. Koupili byste si do něj pokojové rostliny? \*

*Označte jen jednu elipsu.*

- Určitě ne *Přeskočte na otázku 11*
- Spíše ne
- Spíše ano
- Určitě ano

## Preferenční otázky

V této sekci budou následovat otázky zkoumající, na čem Vám u pokojových rostlin záleží.

U každé otázky máte škálu odpovědí od "naprosto nesouhlasím" do "naprosto souhlasím". Vyberte vždy nejlépe vystihující možnost.

2. Při výběru pokojové rostliny je pro mě důležité, aby byla rostlina nenáročná na péči. \*  
Například aby se nemusela často zalévat, nepotřebovala hodně světla atd.

Označte jen jednu elipsu.

Naprosto nesouhlasím

1

2

3

4

Naprosto souhlasím

3. Při výběru pokojové rostliny je pro mě důležité, aby se mi vzhledově líbila. \*

Označte jen jednu elipsu.

Naprosto nesouhlasím

1

2

3

4

Naprosto souhlasím

4. Při výběru pokojové rostliny je pro mě důležité, aby byla rostlina originální. \*
- Originální rostlina může být vzácná, nebo například mít zvláštní tvar listů.

Označte jen jednu elipsu.

Naprosto nesouhlasím

1

2

3

4

Naprosto souhlasím

5. Při výběru pokojové rostliny je pro mě důležité, aby rostlina kvetla. \*

Označte jen jednu elipsu.

Naprosto nesouhlasím

1

2

3

4

Naprosto souhlasím

6. Při výběru pokojové rostliny je pro mě důležité, aby rostlina čistila vzduch. \*

Označte jen jednu elipsu.

Naprosto nesouhlasím

1

2

3

4

Naprosto souhlasím

7. Při výběru pokojové rostliny je pro mě důležité, aby byla rostlina barevná. \*

Barevnou rostlinou se rozumí taková, jejíž listy jsou i jiné než zelené. Příkladem jsou panašované rostliny nebo rostliny s růžovými listy.

Označte jen jednu elipsu.

Naprosto nesouhlasím

1

2

3

4

Naprosto souhlasím

8. Při výběru pokojové rostliny je pro mě důležité, aby byla ze specializovaného obchodu na pokojové rostliny. \*

Pokojové rostliny se dají koupit v supermarketech (Billa, Lidl), hobby marketech (Hornbach, Bauhaus) nebo ve specializovaných obchodech (Dej mi pokojovku, Pokojovky, EkoAloe). Rostliny pochází od různých dodavatelů a mohou se lišit v kvalitě.

Označte jen jednu elipsu.

Naprosto nesouhlasím

1

2

3

4

Naprosto souhlasím

9. Při výběru pokojové rostliny je pro mě důležité, aby byla rostlina velká. \*

Označte jen jednu elipsu.

Naprosto nesouhlasím

1

2

3

4

Naprosto souhlasím

10. Jakou částku jste ochotni za novou pokojovou rostlinu zaplatit? \*
- Uved'te vaši odpověď prosím v korunách. Cenu květináče neberte v potaz.

---

Přeskočte na otázku 12

#### Doplňující otázka

11. Proč byste si pokojové rostliny nekoupili? \*

Můžete zaškrtnout více políček.

Zaškrtněte všechny platné možnosti.

- O pokojové rostliny se nezajímám.
- Mám pocit, že bych se o ně neuměl postarat.
- Kvůli mazlíčkům nebo dětem rostliny nekupuji.
- Jiné: \_\_\_\_\_

Přeskočte na otázku 12

#### Obecné a demografické otázky

V této části následují obecné otázky o Vás a Vašem vztahu k pokojovým rostlinám.

12. Myslíte, že mají pokojové rostliny pozitivní vliv na Vaše psychické zdraví? \*

Označte jen jednu elipsu.

- Ano
- Ne

13. Berete pokojové rostliny jako bytový doplněk? \*

Označte jen jednu elipsu.

- Ano
- Ne

14. Koupili jste si v posledních 2 letech pokojovou rostlinu? \*

*Označte jen jednu elipsu.*

Ano

Ne

15. Berete pokojové rostliny jako Vaše hobby? \*

*Označte jen jednu elipsu.*

Ano

Ne

16. Preferujete umělé rostliny před živými? \*

*Označte jen jednu elipsu.*

Ano

Ne

17. Kolik hodin denně průměrně trávíte doma? \*

Uvádějte prosím bez spánku.

---

18. Změnil se v průběhu pandemie Váš vztah k přírodě a rostlinám? \*

*Označte jen jednu elipsu.*

Určitě ne

\_\_\_\_\_

1

\_\_\_\_\_

2

=====

3

=====

4

\_\_\_\_\_

Určitě ano

\_\_\_\_\_

19. Kupujete častěji pokojové rostliny nebo řezané? \*

*Označte jen jednu elipsu.*

Pokojové

Řezané

20. Kupujete rostliny spíše pro sebe nebo jako dárek? \*

*Označte jen jednu elipsu.*

Pro sebe

Dárek

21. Bydlíte ve vlastním nebo v nájmu? \*

*Označte jen jednu elipsu.*

Ve vlastním

V nájmu

22. Jaké je Vaše pohlaví? \*

*Označte jen jednu elipsu.*

Žena

Muž

Jiné: \_\_\_\_\_

23. Kolik je Vám let? \*

Prosím uveďte pouze číslo.

\_\_\_\_\_

24. Jaké je Vaše nejvyšší dosažené vzdělání? \*

*Označte jen jednu elipsu.*

Základní

Středoškolské

Vysokoškolské

25. Jste... \*

Je možné zvolit více políček.

*Zaškrtněte všechny platné možnosti.*

Student

Zaměstnaný

Nezaměstnaný

OSVČ

Senior

26. Váš čistý měsíční příjem je  
Jedná se o nepovinnou otázku.

*Označte jen jednu elipsu.*

- 0-15 tisíc korun
- 15-20 tisíc korun
- 20-25 tisíc korun
- 25-30 tisíc korun
- 30-35 tisíc korun
- 35-40 tisíc korun
- Více než 40 tisíc korun

27. Kolik vlastníte pokojových rostlin? \*

---

28. Kolik korun byste zaplatili za tuto pokojovou rostlinu? \*



---

29. Kolik korun byste zaplatili za tuto pokojovou rostlinu? \*



---

30. Kolik korun byste zaplatili za tuto pokojovou rostlinu? \*



---

31. Kolik korun byste zaplatili za tuto pokojovou rostlinu? \*



---

Obsah není vytvořen ani schválen Googlem.

Google Formuláře

# Appendix B

## Results

### B.1 Logit and Probit Comparison

Comparison of Probit and Logit models

Table B.1: Logit and Probit

	Logit WTP	Probit WTP
Woman	1.396***	0.719
Age	0.002	0.001
Education		
High School	0.461	0.175
University	– 0.223	– 0.176
Eactive	– 0.029	0.005
Constant	1.255	0.818
AIC	221.8823	222.1785
BIC	244.7492	245.0453
Mc Fadden R2	0.0809	0.0796

+p < 0.10, \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001

### B.2 Tested Logit models

- m1 = WTP  $\sim$  woman + age + highschool + university + eactive
- m2 = WTP  $\sim$  woman + age + highschool + university + eactive + twoyears

- 
- $m3 = WTP \sim \text{woman} + \text{age} + \text{highschool} + \text{university} + \text{eactive} + \text{twoyears} + \text{home}$
  - $m4 = WTP \sim \text{woman} + \text{age} + \text{highschool} + \text{university} + \text{eactive} + \text{twoyears} + \text{design}$
  - $m5 = WTP \sim \text{woman} + \text{age} + \text{highschool} + \text{university} + \text{eactive} + \text{twoyears} + \text{design} + \text{pandemic}$
  - $m6 = WTP \sim \text{woman} + \text{age} + \text{highschool} + \text{university} + \text{eactive} + \text{twoyears} + \text{design} + \text{fake}$
  - $m7 = WTP \sim \text{woman} + \text{age} + \text{highschool} + \text{university} + \text{eactive} + \text{twoyears} + \text{design} + \text{fake} + \text{count}$
  - $m8 = WTP \sim \text{woman} + \text{age} + \text{highschool} + \text{university} + \text{eactive} + \text{twoyears} + \text{design} + \text{fake} + \text{count} + \text{hobby}$
  - $m9 = WTP \sim \text{woman} + \text{age} + \text{highschool} + \text{university} + \text{eactive} + \text{twoyears} + \text{design} + \text{fake} + \text{count} + \text{hobby} + \text{mental}$
  - $m10 = WTP \sim \text{woman} + \text{age} + \text{highschool} + \text{university} + \text{eactive} + \text{twoyears} + \text{design} + \text{fake} + \text{count} + \text{hobby} + \text{mental} + \text{gift}$
  - $m11 = WTP \sim \text{woman} + \text{age} + \text{highschool} + \text{university} + \text{eactive} + \text{twoyears} + \text{design} + \text{fake} + \text{count} + \text{hobby} + \text{mental} + \text{flowers}$
  - $m12 = WTP \sim \text{woman} + \text{age} + \text{highschool} + \text{university} + \text{eactive} + \text{twoyears} + \text{design} + \text{fake} + \text{count} + \text{hobby} + \text{mental} + \text{rent}$

Table B.2: LR Tests

	LR Chisq	Pr(>Chisq)
lrtest(m1, m2)	23.667	<0.0000***
lrtest(m2, m3)	0.0405	0.8405
lrtest(m2, m4)	7.4752	0.0063**
lrtest(m4, m5)	1.3584	0.2438
lrtest(m4, m6)	9.6063	0.0019**
lrtest(m6, m7)	4.6978	0.0302*
lrtest(m7, m8)	4.3004	0.0381*
lrtest(m8, m9)	8.5806	0.0034**
lrtest(m9, m10)	0.1624	0.6870
lrtest(m9, m11)	0.0003	0.9869
lrtest(m9, m12)	0.0977	0.7547

+p < 0.10, \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001

### B.3 Tested OLS models

- model = price ~ woman + age + highschool + university + eactive + easy + colour + unique + bloom + air + shopbin + big + twoyears + home + design + pandemic + fake + count + hobby + mental + appearance + gift + flower + rent + income
- aic\_log = log(price + offset) ~ university + easy+ shopbin + big + twoyears + home + fake + income
- aic\_log1 = log(price + offset) ~ easy+ shopbin + twoyears + home + fake + income
- aic\_log2 = log(price + offset) ~ university + easy+ shopbin + twoyears + home + fake + income
- aic\_log3 = log(price + offset) ~ university + shopbin + twoyears + home + fake + income
- aic\_log4 = log(price + offset) ~ university + easy + twoyears + home + fake + income
- aic\_log5 = log(price + offset) ~ university + easy + shopbin + big + home + fake + income
- aic\_log6 = log(price + offset) ~ university + easy + shopbin + big + twoyears + fake + income

Table B.3: F tests

	F	Pr(>F)
<code>anova(aic_log, aic_log1)</code>	3.896	0.0218*
<code>anova(aic_log, aic_log2)</code>	4.1971	0.0417*
<code>anova(aic_log, aic_log3)</code>	4.1235	0.0175*
<code>anova(aic_log, aic_log4)</code>	5.5308	0.0046**
<code>anova(aic_log, aic_log5)</code>	12.113	0.0006***
<code>anova(aic_log, aic_log6)</code>	1.6604	0.1989
<code>anova(aic_log7, aic_log8)</code>	2.1971	0.1397
<code>anova(aic_log9, aic_log10)</code>	3.5587	0.0151*

+p < 0.10, \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001

- `aic_log7` =  $\log(\text{price} + \text{offset}) \sim \text{university} + \text{easy} + \text{shopbin} + \text{big} + \text{twoyears} + \text{fake} + \text{income}$
- `aic_log8` =  $\log(\text{price} + \text{offset}) \sim \text{university} + \text{easy} + \text{shopbin} + \text{big} + \text{twoyears} + \text{income}$
- `aic_log9` =  $\log(\text{price} + \text{offset}) \sim \text{university} + \text{easy} + \text{shopbin} + \text{big} + \text{twoyears} + \text{income}$
- `aic_log10` =  $\log(\text{price} + \text{offset}) \sim \text{university} + \text{easy} + \text{shopbin} + \text{big} + \text{twoyears}$