

Bachelor's Thesis

Financial Management

**THE EFFECT OF THE DEREGULATION OF THE FINNISH TAXI INDUSTRY FROM
A CONSUMER PERSPECTIVE**

12.5.2019

Author: Teppo Valtonen

Supervisor: Roman Teplov

ABSTRACT

Author: Teppo Valtonen

Title: The effect of the deregulation of the Finnish taxi industry from a consumer perspective

School: School of Business and Management

Degree programme: Business Administration / Financial Management

Supervisor: Roman Teplov

Keywords: Taxi industry, Deregulation, Consumer perspective

This Bachelor's Thesis studies the short-term effects of the deregulation of the Finnish taxi industry. Primary data about the customers' experiences is collected from Finnish taxi customers using an online survey. The data collected with the survey is analyzed using quantitative methods. Factor analysis is used to generate indicators of the amount of money customers spend on taxis, availability, and service quality.

Previous studies in other countries which have deregulated the industry indicate that the prices have generally increased where fare controls have been eliminated. The number of taxis has also generally increased, which has improved availability. Quality of service is difficult to measure, but improvements in driver performance and vehicle standards have been reported.

The findings in this thesis show that a change in the amount of money spent on taxis generally hasn't been observed. A majority of respondents have experienced a change in availability, which is mostly an improvement. A majority of respondents feel that quality of service has changed, and most say that the change has been negative. The analysis shows that customers from different socioeconomic backgrounds have different experiences when it comes to their spending on taxis, availability and service quality, when compared to the average respondent. The experiences are also different in different sized cities.

TIIVISTELMÄ

Tekijä: Teppo Valtonen

Tutkielman nimi: Suomen taksialan sääntelyn purkamisen vaikutukset kuluttajan näkökulmasta

Akateeminen yksikkö: School of Business and Management

Koulutusohjelma: Kauppatieteet / Talousjohtaminen

Ohjaaja: Roman Teplov

Hakusanat: Taksiala, Sääntelyn purkaminen, Kuluttajan näkökulma

Tämä kandidaatintutkielma tutkii Suomen taksialan sääntelyn purkamisen lyhyen aikavälin vaikutuksia. Suomalaisilta taksiasiakkailta kerätään primääridataa heidän kokemuksistaan internetkyselyn avulla. Saatua dataa analysoidaan kvantitatiivisilla menetelmillä. Faktorianalyysiä hyödynnetään kuluttajien takseihin käyttämän rahamäärän, saatavuuden ja palvelun laadun mittareiden muodostamiseksi.

Muissa taksialan sääntelyn purkaneissa maissa suoritettut tutkimukset osoittavat, että taksien hinnat ovat yleisesti nousseet, jos hintojen sääntelystä on luovuttu. Taksien määrä on myös yleisesti kasvanut, mikä on parantanut saatavuutta. Palvelun laatua on vaikea mitata, mutta kuljettajien toiminnan ja takseina käytettävien autojen laadun paranemisesta on raportoitu.

Tämän tutkielman löydökset osoittavat, että muutosta takseihin käytettävässä rahamäärässä ei tyypillisesti ole havaittu. Suuri osa vastaajista on kokenut saatavuudessa tapahtuneen muutoksen, joka on tyypillisesti ollut parannus. Suuri osa vastaajista on sitä mieltä, että palvelun laadussa on tapahtunut muutos, ja useimmat sanovat muutoksen olevan negatiivinen. Faktorianalyysi näyttää, että asiakkailla, joilla on erilainen sosioekonominen tausta, on myös erilaiset kokemukset muutoksista takseihin käyttämässään rahamäärässä, taksien saatavuudessa ja palvelun laadussa, verrattuna koko aineiston keskimääräiseen vastaajaan. Kokemukset ovat myös erilaisia erikokoisilla paikkakunnilla.

TABLE OF CONTENTS

ABSTRACT

TIIVISTELMÄ

1. INTRODUCTION	1
1.1 BACKGROUND	2
1.2 RESEARCH OBJECTIVES	3
2. LITERATURE REVIEW	5
2.1 ARGUMENTS FOR DEREGULATION.....	5
2.1.1 Increasing competition	5
2.1.2 Improving availability.....	6
2.1.3 Increasing price flexibility	6
2.2 ARGUMENTS AGAINST DEREGULATION.....	7
2.2.1 Increase in price.....	7
2.2.2 Concern over quality of service	8
2.3 EXPECTATIONS.....	9
2.3.1 Changes in prices	9
2.3.2 Changes in the competitive environment	9
2.3.3 Concerns	10
2.4 RESULTS OF DEREGULATION.....	10
2.4.1 Changes in prices	10
2.4.2 Changes in availability	12
2.4.3 Changes in the quality of service	13
2.5 SUMMARY OF THE RESULTS OF DEREGULATION	14
2.6 PRESENTING A HYPOTHESIS.....	15
3. DATA AND DESCRIPTIVE ANALYSIS	16
3.1 DESCRIPTIVE ANALYSIS	17
3.1.1. Change in taxi costs	18
3.1.2. Change in availability	20
3.1.3. Change in service quality	21
4. DEVELOPING, EVALUATING AND DESCRIBING INDICATORS.....	23
4.1 THEORY OF FACTOR ANALYSIS	23
4.1 GENERATING THE FACTORS	24
4.2 INTERPRETING THE FACTORS	26
4.3 COMPARING THE EXPERIENCES OF CUSTOMERS FROM DIFFERENT SOCIOECONOMIC BACKGROUNDS AGAINST THE AVERAGE	27

4.3.2. Filtering by age	28
4.3.3. Filtering by gender	29
4.3.4. Filtering by marital status	30
4.3.5. Filtering by children	31
4.3.6. Filtering by employment situation.....	31
4.3.7. Filtering by subordinates	33
4.3.8. Filtering by home town population	33
4.3.8. Filtering by method of ordering	35
6. SUMMARY AND CONCLUSIONS	37
REFERENCES	39
APPENDIXES.....	

1. INTRODUCTION

Until 1 July 2018, the Finnish taxi industry was tightly regulated by the Finnish government. Industry regulation dictated, among other aspects, the number of taxis in each geographical area (Taksilaki chapter 4 section 19), the work shifts for each individual taxi (Taksilaki chapter 3 section 13), the fares charged from the customers (Taksilaki chapter 3 section 16), and driver training requirements (Taksilaki chapter 2 section 16) (Laki taksinkuljettajien ammattipätevyydestä sections 2-4). Some of these regulations had been lifted before July 2018, and from 1 July onwards, almost all regulations not related to driver qualification were abolished. (Ministry of Transport and Communications, 2017) The event has gathered a considerable amount of attention, interest, and concern from the media, politicians, the general public, and from the industry itself. Concerns have been raised based on the Swedish experience with taxi industry deregulation, which took place in the early 1990's, where prices rose faster than the Consumer Price Index (Marell and Westin, 2002), and there have also been cases of predatory pricing due to the lack of price controls (Lansky, 2009).

Similar developments have occurred in other countries in the past. Sweden's taxi industry was deregulated in July 1990 in a very similar manner to what has taken place in Finland. Taxi operators could set the fares they charged without government intervention, restrictions on entry into the business were lifted, along with operating area restrictions. Also, the taxis were no longer required to belong to a radio dispatch center. At the same time, the conditions regarding the suitability of drivers were tightened. (Marell & Westin, 2002). In the year 2000, the Irish taxi industry was also deregulated. The restrictions on the number of taxi licenses were removed, but fares remained in the control of the government (Barrett 2010). Along with Sweden, New Zealand also deregulated the taxi industry in the early 1990's (Morrison 1997). Industry deregulation has also been implemented and experimented with in the United States, with varying results (Teal & Berglund, 1987).

Academic research into taxi industry deregulation in other countries has identified positive and negative effects of deregulation. Sometimes the effects have been

predicted, while sometimes they have been unanticipated. The results of deregulation have been quite similar in different countries. This Thesis investigates if these effects can also be observed in Finland.

The subject of this Bachelor's Thesis is a quantitative study on the effects of the deregulation of the Finnish taxi industry. The study will be conducted from a consumer's point of view. The goal of this Thesis is to investigate the short-term effects of the deregulation on the cost of the use of taxis, the availability of taxis, and the quality of the service. This Thesis will also investigate if the effects are different in different locations.

1.1 BACKGROUND

The deregulation of the taxi industry is usually implemented when problems are encountered with factors which are important from a consumer's perspective. These are the cost, availability, and quality of service. The problems may occur in a large geographical area, or in some cases only locally, and deregulation is seen as a way to correct these issues.

As the minimum and maximum rates for taxi pricing are often set by the government, it's often seen that they are too inflexible. They can also be considered to be too high, which is seen as a sign of the taxi industry's monopolistic position. Darbéra (2010, p. 18) studied the opinions of the residents of several European cities on how taxis could better serve their customers. He found out that in all cities the respondents wanted the regulations to be amended so that the cost of taxi rides would be reduced. In Stockholm, where the rates and the number of taxis aren't controlled, the residents don't want to return to regulated rates, but that the government should instead reduce the costs of operating the taxi business so that it would reflect on the prices. However, Darbéra (2010, p. 19) is skeptical about cost cutting as a way to reduce the cost to the customer.

Availability is also considered to be an issue when demand exceeds the supply of taxis, which may lead to increased waiting times. A lack of availability may be caused either because of an increase in the number of customers or a decrease in the number of taxis. Darbéra (2010, p. 19) found out, that in cities which regulate the number of taxis, like Paris, more respondents wished for more taxis than in cities which don't regulate the number of taxis. On the other hand, there have been concerns that the quality of service may also be at risk. According to Darbéra (2010, p. 19), the residents of Amsterdam want stricter quality control measures, and over 50% are unsatisfied with the service. In London, where aspiring taxi drivers are selected based on their performance in a demanding test called "The Knowledge", only 6% of the residents wished for better training and more control (Darbéra 2010, p. 2, 19)

1.2 RESEARCH OBJECTIVES

The objective of this study is to investigate if Finnish consumers have experienced issues with taxi services after the deregulation. Important aspects of a taxi service from a consumer's perspective are the cost, availability, and quality of service. These aspects will be investigated. In addition, the study will investigate if consumers from different socioeconomic backgrounds have differing views about the deregulation, and if the customers' observations are different in different locations.

The following research questions will be presented:

Have the customers experienced a change in taxi costs?

Have the customers experienced a change in the availability of taxi services?

Have the customers experienced a difference in the quality of the service?

Do consumers with different socioeconomic backgrounds have different experiences?

Are the customers' experiences different in different locations?

1.3 BOUNDARIES AND LIMITATIONS

As the study investigates if the customers' experiences are different in different locations, the study is conducted nationwide in Finland. The empirical data utilized in the analysis will be collected from different sized cities in all parts of the country. The study is limited in that it does not include the actual number of taxis in each location or the actual waiting time, instead the customers' experiences and perceptions are used to form a picture of the changes that may have occurred. Service quality is also a highly subjective matter, and it is difficult to measure accurately.

The empirical data which is used will be collected from taxi customers in the form of an anonymous survey, which the respondents can fill online. The respondents will be asked to answer questions related to their use of taxis, their observations about availability, and the quality of the service. In addition, the respondents will be asked to report the population of their home town, which is used to find out if there are differences based on location, and some details which are used to determine their socioeconomic background. The collected data is processed using quantitative methods.

2. LITERATURE REVIEW

This chapter is a presentation and review of previous studies conducted on taxi industry deregulation in several countries. The arguments for and against deregulation and their justifications, expectations on the effects of deregulation, and the studies' findings and explanations of the findings will be reviewed and discussed.

2.1 ARGUMENTS FOR DEREGULATION

There have been several arguments presented for taxi industry deregulation. Many arguments are overlapping, and therefore they may cover other areas as well. Regardless of the location where deregulation took place, the arguments used to justify it appear very similar.

2.1.1 Increasing competition

One of the key arguments used in justifying the deregulation of the taxi industry is that there's a lack of competition both within the industry and with other operators in the transportation sector. This lack of competition is generally argued to have resulted in poor service combined with high cost.

According to the Finnish Ministry of Transport and Communications (2017), the changes related to the deregulation of the Finnish taxi industry will have positive effects through increasing competition. Entering the market and service development will be made easier by making the taxi licenses specific to operators, instead of individual vehicles, and by removing the limit on the number of taxi licenses, which was previously set each year by the Center for Economic Development, Transport and the Environment. These changes will allow taxi operators to expand by increasing the number of vehicles, which is seen as a way to increase competition. This is augmented

by the removal of geographical limitations to the taxi licenses, which will also allow taxis to pick up passengers everywhere.

In Stockholm, Slavnic (2011) observed that tight industry regulation had resulted in a lack of competition, which in turn had led to high prices and low quality of service. These were considered the most important reasons for deregulation, and it was argued that deregulation would enable a market balance to be created by supply and demand.

Frankena and Pautler (1984, p. 6-7) examined taxi industry regulation in the United States. Their findings indicate that taxi regulations which restrict entry into the business haven't necessarily been designed to account for market failures and to ensure efficient allocation of resources, but instead their purpose is to prevent competition against public transportation systems and established taxi firms. This causes resource misallocation, which leads to high fares and increased waiting time for the consumer.

2.1.2 Improving availability

The changes outlined by the Finnish Ministry of Transport and Communications (2017) are also seen to improve availability. Since taxi companies can have as many vehicles as they wish, they can expand their fleets, and therefore improve the availability of taxis. Geographical limitations and operating areas will be eliminated, which is seen to lead to more effective use of an operator's vehicles, and as a way to improve services in areas with a low population, where in particular this is seen as a way to improve availability.

2.1.3 Increasing price flexibility

According to the Finnish Ministry of Transport and Communications (2017), the removal of controls on the taxi rates is seen to make the pricing more flexible, as in the past the maximum rates set by the government have in practice been the universal

rates. Increased price flexibility is seen as a way for different service providers to enter the market and serve consumers of different income levels. Consequently, this can also be seen as a way to improve availability.

Frankena and Paulter. (1984) also state, that the effect of higher fares and longer waiting times caused by regulation disproportionately affects low income consumers, who spend more on taxis relative to what they earn, than higher income consumers. The authors also argue that regulations cause the taxi market to be too homogenous, with no differences in rates and quality of service to suit different consumers, and reduced ability to vary the charged rate based on the level of demand at any given moment.

2.2 ARGUMENTS AGAINST DEREGULATION

Several arguments against deregulation have also been presented. Often these have been made by local taxi companies, organizations, or alliances. Economists have also voiced their concerns. However, theories in support of price regulation have attracted criticism.

2.2.1 Increase in price

Shreiber (1975) argues that in a taxi marketplace without regulations on price or the number of vehicles, prices show a tendency to slowly increase. In other words, higher competition in a deregulated marketplace does not lead to lower prices. A taxi operator isn't individually incentivized to lower prices in order to attract more customers, and a passenger isn't likely to let a taxi go by with the hope that a cheaper taxi will arrive. The author also argues that price competition will be rare even in the case of large operators, and it will only work if waiting time is close to zero. If the market price is low enough that a customer's waiting time is relatively long, it increases the probability of a price increase, since the customer is more likely to take the first taxi that arrives. That taxi isn't likely to be turned down by the customer, even if its price is higher than the

going rate. The slow increase in price is therefore caused by the existence of forces pushing prices up and a lack of forces pushing them down. This concept has, however, been criticized as unrealistic, due to taxi fleets being able to advertise their prices, taxi stands where customers can choose their taxi, and telephone orders where a customer can easily compare prices with little additional waiting time (Williams, 1980).

Cairns and Liston-Heyes (1996) argue that the control of taxi prices is necessary if entry into the market is free. They state, that an equilibrium cannot be reached in an environment where free entry is allowed, because only passengers whose valuation for a trip is equal to or greater than the price and search cost of a trip will enter the market. The driver knows this and will quote a higher fare, which breaks the equilibrium. If dispersion of fares exists in the equilibrium, a company which charges slightly more will not lose a customer, given that they have entered the market. This will cause a collapse in the distribution of fares, and an equilibrium doesn't appear. Free entry may, however, result in the market behaving like a common-pool resource, which may cause too much entry to happen. In this case, it may also be justified to regulate the entry and service hours as well. However, the authors note that, in reality, taxi drivers often form cooperatives or companies, which are able to fix their prices. This can result in an oligopolistic equilibrium.

2.2.2 Concern over quality of service

Frankena and Pautler (1984, p. 90) state, that regulations which address driver qualifications, the safety of vehicles, and required insurance, could be utilized in order to improve service quality. Taxis could also be encouraged to compete in quality by setting high rates combined with entry restrictions. The argument in this case is that the profitability of individual taxis would increase without risk of losing profits through the entry of more taxis into the market, and the taxis which are already in the market would be incentivized to compete for customers with quality (Frankena & Pautler, 1984, p. 71). In New Zealand, the local Taxi Federation has voiced concern over lowering of safety standards and unqualified drivers entering the market (Morrison, 1997).

2.3 EXPECTATIONS

The expectations related to deregulation are generally derived from the arguments used to justify deregulation, and therefore appear to follow the trend they set. They mostly focus on the possible advantages of deregulation. Also, the expectations don't appear to vary much depending on location.

2.3.1 Changes in prices

Marell and Westin (2002) reported expectations of a lowering of prices from levels which were considered to be very high. New and more diversified services were also expected. Morrison (1997) also reported similar expectations derived from increasing competition, and that price diversity was also expected to increase as competitors would try to position themselves in the marketplace.

Frankena and Pautler (1984, p. 115-116) expect fares to show even great increase when entry to the market becomes free. However, they argue that this is often caused by fares which have been stagnant for some time, and that the fares would be pressured to increase later in any case. They also don't see exorbitant prices charged by independent operators as becoming a serious issue.

2.3.2 Changes in the competitive environment

Marell and Westin (2002) also reported that large taxi companies were expected to dominate the industry after the change. This was also noted by Slavnic (2011), who also mentioned that this was expected to bring other advantages when large companies are able to take advantage of economies of scale. Marell and Westin (2002) also mention that the supply of taxis was expected to increase with the increase in the number of taxis. This is shared by Frankena and Pautler (1984, p. 116-117), who also

see that the number of taxis is likely to increase, with locations which have had the strictest control over the number of taxis seeing the largest increases. They also state that waiting times are likely to decrease as well.

2.3.3 Concerns

In New Zealand, some concern was placed on the possibility of drivers with poor language skills and local knowledge entering the field, particularly by the Taxi Federation (Morrison 1997). Frankena and Paulter (1984, p. 73) also report on concern about accident rates and costs if deregulation takes place, but also mention that these appear to be unsubstantiated.

2.4 RESULTS OF DEREGULATION

When the deregulation has been implemented, the results have generally followed the expectations set by economists, for example how the number of taxis is expected to increase. Usually, this has also been observed. However, some surprising results have also come up.

2.4.1 Changes in prices

Marell and Westin (2002) observed the rates increasing faster than the general Consumer Price Index, with an approximately 40% increase in the price of private trips, and 20-30% for subsidized trips. A large part of the increase was explained by a 25% Value Added Tax, which was introduced at the time of deregulation, and rising fuel costs, but the price increase was still observed to be higher than their net effect.

In Ireland, the rates which taxis can charge stayed in government control, which limits the amount of variance in prices, but Barrett (2008) states that many drivers are still willing to offer discounts from the official rates.

Morrison (1997) points out that in New Zealand the nominal fares increased, but real fares decreased due to inflation. However, Gaunt (1995) notes that in New Zealand the decrease in prices was smaller in medium-sized cities, and that the smallest cities saw small increases. Therefore, the effect of fare deregulation on prices appears to be related to the size of the city, with smaller cities seeing little to no reduction. Gaunt suggests that this relationship may be explained by Economic Theory of Regulation, where taxi operators in large cities use their lobbying power for cartelization more effectively than in small cities. This leads to the difference between the regulated and competitive number of taxis and fares being greater in large cities than in small cities. Another explanation may be monopoly pricing, which may happen due to lack of demand and competition in small cities. If a community can only support one or two taxi companies, one will set monopoly rates to maximize profits, and try to get the other company to join a cartel agreement.

Teal and Berglund (1987) examined the results of taxi industry deregulation in several cities in the United States, with the focus being on San Diego, Seattle, Sacramento, Phoenix, Tucson, and Kansas City, since they all removed restrictions on entry and prices. Fares increased in all studied cities, with many cities showing increases in real terms. However, just as Frankena and Paulter (1984, p. 115-116) pointed out in their study, Teal and Berglund found out that this was caused by fare increases generally being late relative to the Consumer Price Index, so the fare increases were caused by the prices catching up with inflation. Teal and Berglund state that, in general, fare deregulation hasn't led to price competition, with the exceptions of San Diego and Seattle. In these cities the second-largest operator offers a discounted rate compared to the largest operator. However, even in these cities, the competitors haven't been stimulated to decrease their rates, and the lower-priced companies haven't managed to increase their market share. In many cities, fare deregulation didn't lead to any price competition. The authors conclude that the concepts of industrial organization explain the changes which happen deregulation better than simple models based on economic theory.

2.4.2 Changes in availability

Marell and Westin (2002) observed the results of deregulation in urban and rural areas in Sweden. They noticed an increase in the average density of taxis, from 1.34 taxis per 1000 inhabitants right before the deregulation in 1990, to 1.72 per 1000 inhabitants in 1991. After that, the density decreased, and in the year 2000 it stood at 1.5 taxis per 1000 inhabitants. An increase in the number of taxis was also observed in rural areas, where the growth was mostly concentrated to municipality centers. However, an increase in supply time was not observed. From 1990 to 1994, the average traffic time for each taxi decreased in the majority of the observed municipalities, which caused the supply time to decrease even though the number of taxis increased.

Barrett (2008) found similar development in Ireland, where the taxi industry was partially deregulated in the year 2000. The number of taxis grew rapidly after the deregulation. In the year 2000, there were 4218 taxis in Ireland, in 2002 there were 10757. By 2008 the number had grown to 21177. During that time, the percentage of taxis operating outside Dublin fell from 35% to 32%, but it had increased again to 41% in 2008, indicating improving availability in rural areas as well.

Morrison (1997) also reported that the number of taxis in New Zealand increased after deregulation, with the number of taxis in Wellington increasing from 1.49 to 2.43 per 1000 inhabitants. These observations would indicate that the availability of taxis had improved. Gaunt (1995) points out, that while the number of taxi organizations and vehicles in New Zealand has grown substantially after deregulation, most of the additional activity has taken place in large cities. From October 1989 to December 1993, 49 new taxi organizations were established. 42 of these operate in the four major cities of New Zealand. The percentage of cities which have a taxi service is also shown to have decreased slightly.

Teal and Berglund (1987) examined the results of taxi industry deregulation in several cities in the United States, with the focus being on San Diego, Seattle, Sacramento,

Phoenix, Tucson, and Kansas City, since they all removed restrictions on entry and prices. In all of the focus cities, the number of taxis increased after deregulation, with the number in San Diego increasing by over 120%. Their study was limited in the amount of empirical data on response times, with San Diego being the only city to have data from before and after deregulation. Average response times in San Diego decreased from 10 to 8 minutes. However, after deregulation, trip refusal and no-show rates increased in San Diego and Seattle.

2.4.3 Changes in the quality of service

According to Marell and Westin (2002) in Sweden, interviews of taxi customers indicated that the level of customer service improved, with weight being placed on the performance of drivers. The significance of the improvement may be low, however, since the level of driver performance was already considered to be very high. Marell and Westin point out that in rural areas the driver and the customers often know each other, and that this probably affects the sense of comfort and security that the customers feel.

Barrett (2008) reported that vehicle standards in Ireland improved after deregulation, due to improved quality control, and that the quality of taxis became higher under quality control than what it was when only a certain quantity of licenses existed. However, Barrett points out that quality licensing may cause the required specifications to be higher than what the market needs, and that the benefit gained may be smaller than the cost.

Frankena and Pautler (1984, p. 118-119) state, that deregulation in Oakland and Berkeley reduced average vehicle age. Newcomers to the business were also observed to maintain their vehicles better than existing operators. However, in Seattle, San Diego, Indianapolis, and Fresno, the vehicle quality reportedly declined. The authors state that a decline in vehicle quality may not be inefficient from an economic perspective, since vehicle quality may have been higher than what is efficient.

2.5 SUMMARY OF THE RESULTS OF DEREGULATION

The results of deregulation have been similar in different locations when the same deregulation measures have been implemented. In countries where fare regulations have been removed, prices have generally increased. Often this has been due to the prices lagging behind the Consumer Price Index (Frankena & Paulter, 1984, p. 115-116) (Teal & Berglund, 1987). The number of taxis increased in all observed areas, however, this did not lead to an improvement in availability in Sweden (Marell & Westin, 2002), and some cities in the United States also experienced difficulties (Teal & Berglund, 1987). The previously described results of deregulation have been summarized in table 1.

Table 1. The effects of taxi deregulation in different countries (Marell & Westin 2002) (Barrett 2008) (Morrison 1997) (Teal & Berglund 1987) (Frankena & Paulter 1984)

Country	Sweden	Ireland	New Zealand	United States
Deregulation measures	Fare regulations and entry restrictions lifted, operational areas abolished	Entry restrictions lifted	Fare regulations and entry restrictions lifted	Fare regulations and entry restrictions lifted in San Diego, Seattle, Sacramento, Phoenix, Tucson, and Kansas City
Effect on prices	Prices increased faster than the Consumer Price Index	Fares stayed in government control, many operators offer discounts	Nominal fares increased, real fares decreased due to inflation	Prices increased in all studied cities, many showed real increases
Effect on availability	Average density of taxis increased, the number of taxis increased, supply time decreased	The number of taxis grew rapidly, the percentage of taxis outside Dublin increased from 35% to 41%	The number of taxis increased, most growth in large cities, the percentage of cities with a taxi service decreased slightly	The number of taxis increased in all observed cities, response time decreased in San Diego, trip refusal and no-show rates increased in San Diego and Seattle
Effect on quality of service	Customer service improved, however the level of driver performance was already considered very high	Vehicle standards reportedly improved	Complaints led to reintroduction of testing, compliance officers enforce quality control	Average vehicle age reduced in Oakland and Berkeley, vehicle quality reportedly declined in Seattle, San Diego, Indianapolis and Fresno

2.6 PRESENTING A HYPOTHESIS

Many of the countries which have deregulated their taxi industry are similar to Finland. Finland has a population of approximately 5.5 million. Ireland and New Zealand have similar but lower populations of approximately 4.9 million and 4.4 million, respectively. Sweden has a larger population of approximately 9.8 million. (CIA 2016/2017, p. 258, 362, 538, 715) Finland, New Zealand and Sweden also have similar rates of urbanization at over 80%, while Ireland has a lower rate of approximately 63% (CIA 2016/2017, p. 258, 538, 715, 362). All respective countries have highly-developed market economies, with similar GDPs per capita when corrected for purchasing power (CIA 2016/2017, p. 259-260, 363, 539, 716).

Based on the experiences observed in these countries, summarized in table 1, and their similarity to Finland in population and economic development with the exception of the United States, *it can be hypothesized that customers in Finland may experience an increase in the amount of money spent on taxis, and an improvement in availability and quality of service.* Barrett (2008) reported that in Ireland the number of taxis increased in the countryside as well, indicating a possible expected improvement in availability in rural areas. The same was also observed in Sweden (Marell & Westin, 2002). However, it should be noted that an increase in the quality of the service may only be small (Marell and Westin, 2002).

3. DATA AND DESCRIPTIVE ANALYSIS

The data used in this study is primary cross-sectional data, which was collected from Finnish taxi customers with an anonymous online survey in April of 2019. The survey collected data about taxi customers' personal use of taxis and their experiences as a customer compared to the situation before the deregulation of the industry. The survey contains 23 questions, which were a series of multiple-choice questions apart from age, which the respondents filled in themselves. Information about the respondents, such as gender and if they have children, was collected for classification purposes. The survey was conducted nationwide in Finland to classify the respondents based on the population of their home town. This was done to investigate if residents of different areas had observed different changes in the customer experience. The survey questions are available in Appendix 14, and in Finnish in Appendix 15.

One data sample in the database is equal to one respondent. In all, the database contains 180 data samples. The average age of the respondents is 41, with the maximum being 76 and minimum 16. 60% of the respondents were men and 40% women. 34% were unmarried, 23% in cohabitation, 37% were married, 5% were divorced and 1% were widowers. 48% have a child or children. 72% of the respondents are employed, 3% are unemployed, 21% are students, 3% are retirees, and approximately 2% selected "Other". 26% of the respondents have subordinates at work. 64% live in a city with more than 200 000 residents, 9% in a city of 100 000 to 200 000 residents, 16% in a city of 50 000 to 100 000, 8% in a city of 10 000 to 50 000, and 3% in a city of less than 10 000 residents. 40% order their taxis primarily by calling a local taxi center, 5% call the taxi operator directly, 40% use a smartphone app, 2% order with a text message, and 13% hail a taxi on the street or go to a taxi stand. The distributions of aforementioned variables are presented in Appendix 16. The respondents were required to answer all questions, so there are no missing values, and therefore no gaps in the data. The survey was hosted by Webropol, a service which allows users to create and distribute surveys. A hyperlink to the survey was generated on Webropol. This link was then distributed on the internet using social media and email. The respondents could share the link to other people if they wished.

The statistical analysis software used in analyzing the collected data is the StataSE 15 (64-bit) by StataCorp. The raw data used in the analysis was exported from the Webropol servers into a Microsoft Excel sheet. This data was imported directly to StataSE 15 for analysis. The answers for the multiple-choice questions were coded as numerical values by Webropol based on how many alternatives each question has. For example, a question with 6 alternatives would have alternative 1 coded as the numerical value 1, and alternative 6 as the numerical value 6.

In many cases, the values which were assigned automatically by Webropol to the alternative answers, were reversed in the final data which was analyzed. For example, the data for question 9 “How has the number of taxi trips you’ve taken in your area changed after the deregulation?”, which has 6 alternatives, was changed. The alternative “Increased a lot” was given the numerical value 6, and the alternative “Decreased a lot” was given the numerical value 1. Originally, the values were 1 for “Increased a lot” and 6 for “Decreased a lot”, respectively. This was done to denote an observed improvement with a larger number. The same process was applied to questions 8, 10, 11, 12, 13, 14, 18, 19, 20, 21, and 22. Questions 15 and 16, “How has taxi waiting time in your area changed after the deregulation?” and “How has fare refusal by taxis in your area changed after the deregulation?”, were processed in the same way, however in these cases a decrease in waiting time and fare refusal is an improvement from a customer’s point of view. In these questions, the alternatives “Decreased a lot” and “Fare refusal decreased a lot” were given the value 6, and “Increased a lot” and “Fare refusal increased a lot” were given the value 1.

3.1 DESCRIPTIVE ANALYSIS

This section seeks to answer the first three research questions: “*Have the customers experienced a change in taxi costs?*”, “*Have the customers experienced a change in the availability of taxi services?*”, and “*Have the customers experienced a difference in the quality of the service?*”.

The section investigates if the respondents have experienced a change in the amount of money they spend on taxis, general availability, or general service quality. This information is received from the variables “taxispending”, “availability” and “servicequality”, which are based on survey questions 8, 13, and 18, respectively. A summary of the variables is presented in table 2, which includes the means, standard deviations, numbers of observations, quartiles, and minimum and maximum values of the three variables. The raw data used in the summary is presented in Appendix 1.

Table 2. Summary of the variables which measure taxi costs, availability, and service quality.

Summary of the variables important to customers								
Variable	Mean	Std. Dev.	Minimum	Maximum	N	Lower Quartile	Median	Upper Quartile
taxispending	3,705556	1,175624	1	6	180	3	4	4
availability	3,661111	1,191984	1	6	180	3	4	5
servicequality	2,988889	1,186464	1	6	180	2	3	4

3.1.1. Change in taxi costs

The respondents were asked to report whether they have noticed any difference in the amount of money they spend on taxis after the deregulation. This is indicated by the variable “taxispending”, which is based on question 8 “How has the amount of money you’ve spent on taxis in your area changed after the deregulation?”. The findings are summarized in Figure 1. The raw data used in the bar graphs in this section is presented in Appendix 2.

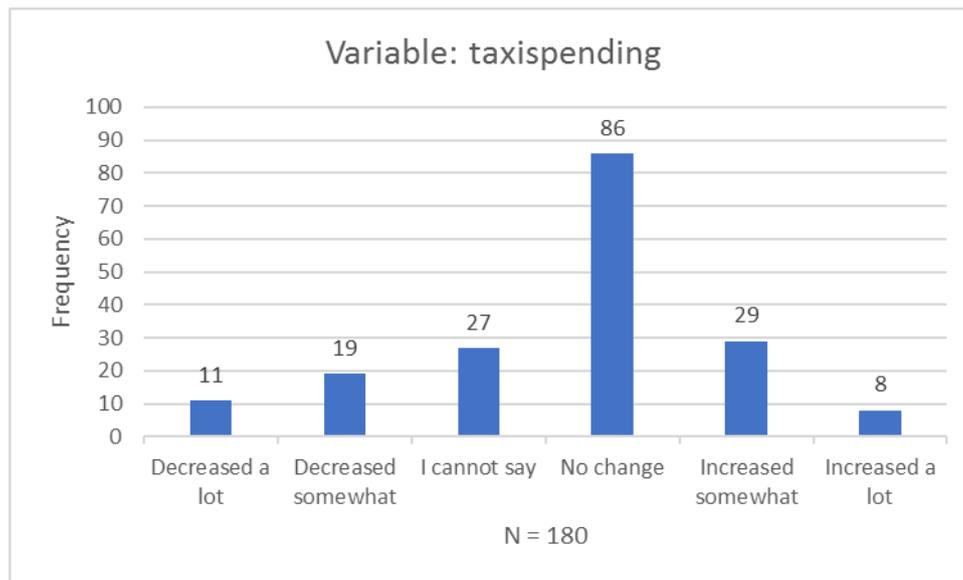


Figure 1. Bar graph of the distribution of the variable “taxispending”.

“Increased a lot” indicates that the respondent has experienced a significant increase in the amount of money they spend on taxis, while “Decreased a lot” indicates that they have experienced a significant decrease. “No change” indicates that the respondent hasn’t noticed any change in the amount of money they spend on taxis after the deregulation. “No change” has the highest frequency, and approximately 48% of all respondents chose this alternative, indicating that almost half of the respondents don’t see an increase in their taxi costs. The second largest group is formed by respondents who feel that their spending on taxis has somewhat increased after the deregulation, making up approximately 16% of all respondents.

When the percentages of the respondents who feel their spending on taxis has increased or decreased are added, the sum stands at approximately 37%. The number is smaller than the percentage of respondents who feel their spending has not changed, which is approximately 48%. It can be concluded that for the most part the customers have not experienced a change in the amount of money they spend on taxis.

3.1.2. Change in availability

The respondents were asked to report if they had experienced a change in the general availability of taxis after the deregulation. This is indicated by the variable “availability”, which is based on question 13, “How has the availability of taxis in your area changed after the deregulation?”. These findings are presented in Figure 2.

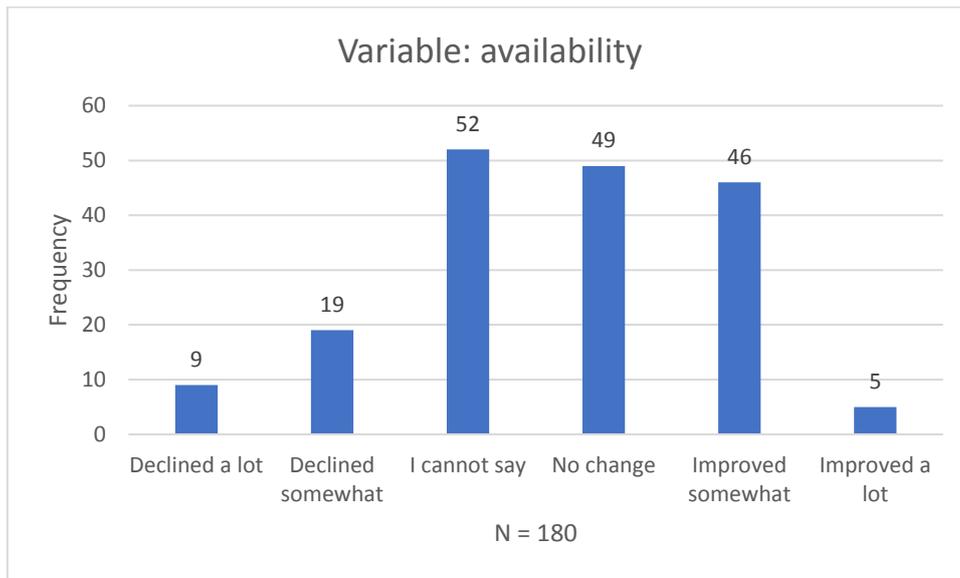


Figure 2. Bar graph of the distribution of the variable “availability”.

As with taxi costs, “No change” indicates that the respondent hasn’t experienced any change in general availability. In this case, “I cannot say” has the highest frequency and percentage, however, the difference between “I cannot say” and “No change” is not very large. “I cannot say” indicates that the respondent cannot say if availability has changed. Approximately 26% of the respondents feel that availability has somewhat improved, making it the largest group of respondents which has noticed change.

The respondents who have felt a change in general availability make up approximately 44% of the entire group. The number is greater than of those who haven’t felt a change, 27%, or who cannot say, 29%. Approximately 28% of the respondents, 51 individuals, feel that availability has somewhat improved or improved a lot. This means that out of those respondents who have experienced a change in availability, approximately 65% feel that availability has somewhat improved or improved a lot. It can be concluded that

the largest group of respondents is the one which has experienced a change in general availability, and for the most part the change has been an improvement in availability.

3.1.3. Change in service quality

The respondents reported their view on the change in general service quality, indicated by the variable “servicequality”. The variable is based on question 18, “How has the quality of the taxi service in your area changed after the deregulation?”. The findings are presented in Figure 3.

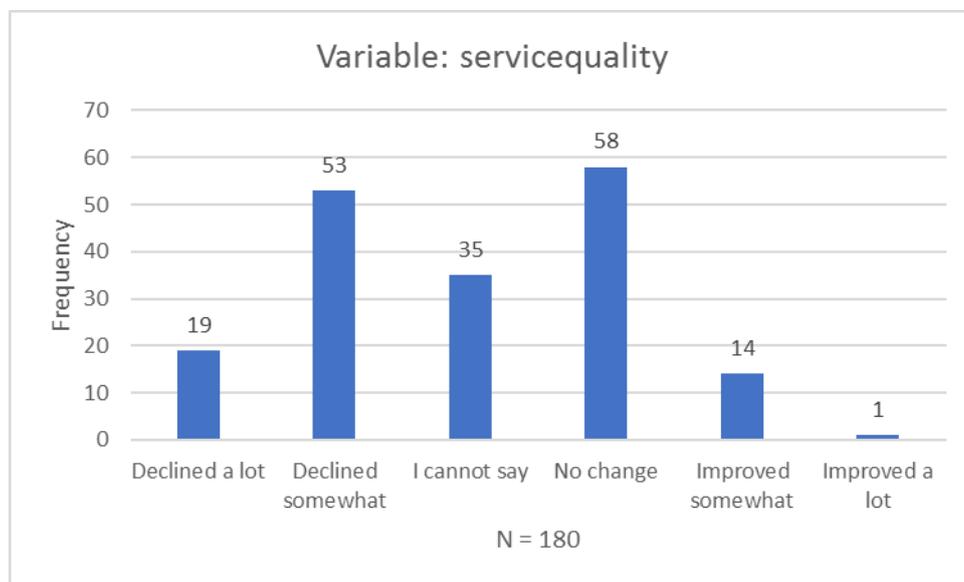


Figure 3. Bar graph of the distribution of the variable “servicequality”.

As with taxi costs, “No change” has the largest frequency and percentage, indicating that the largest group of respondents is the one which hasn’t experienced any change in general service quality. “Declined somewhat” forms the second largest group, indicating that approximately 29% of the respondents feel that general service quality has declined somewhat. Approximately 11% feel that general service quality has declined a lot.

The respondents who have experienced a change in general service quality make up approximately 48% of all respondents, while those who haven’t felt a change make up

approximately 32%. Out of all respondents, 40%, 72 individuals, feel that general service quality has somewhat declined or declined a lot. This means that of those respondents who have experienced a change in general service quality, approximately 83% feel that the quality has somewhat declined or declined a lot. It can be concluded that the largest group of customers has experienced a change in general availability, and for the most part the change has been negative.

4. DEVELOPING, EVALUATING AND DESCRIBING INDICATORS

In this section, factors will be generated from the variables used in the survey. Factors will be used as indicators of various aspects of a taxi service which are important to the customer. Exploratory factor analysis will be conducted to investigate the effects of the deregulation from the viewpoints of various customer groups. In addition, the effect of location on the changes experienced by the respondents will be studied.

4.1 THEORY OF FACTOR ANALYSIS

Principal component analysis or factor analysis can be used to condense information from several variables. The condensed information can then be turned into a small number of principal components or factors. The generated factors can then be named so that they correspond to the variables which have loaded to the factor. (Metsämuuronen 2006, p. 581)

Factor analysis attempts to identify “hidden variables” at the background of observed variables. In order to name the factor, the strongest correlations between the factor and the observed variables should be identified. (KvantiMOTV 2004)

Communality tells the amount of variance in a single variable which is explained by the factors. When the communality of a variable is close to one, the factors can explain its variance almost entirely. Correspondingly, when the communality gets lower, the ability of the factors to explain the variance in the variable decreases. (KvantiMOTV 2004)

Eigenvalues indicate how well a factor can explain the variance in an observed variable. When the eigenvalue grows, the ability of a factor to explain a variable's variance also grows, and vice versa. Eigenvalues can be divided with the number of variables in a factor to get the total variance explained by the factor. This number varies between one and zero. A factor's explanatory power improves the greater the total

variance explained is. The explanatory power of the whole analysis is received by adding the total variance explained by every factor. (KvantiMOTV 2004)

Cronbach's alpha is used to measure the consistency of an indicator, and therefore it is also used to measure the reliability of an indicator (Metsämuuronen 2006. p. 442). Cronbach's alpha is calculated from the correlations between the variables and the number of propositions. The number does not have specific reference values. However, it can be used to compare different models. (KvantiMOTV 2008)

4.1 GENERATING THE FACTORS

The factors used in the analysis were based on questions 9, 10, 11, 12, 14, 15, 16, 19, 20, 21 and 22. These questions are in the form of "How has [the subject of the question] in your area changed after the deregulation?". The alternatives for each question range from 1 to 6, with 6 indicating the greatest positive change or improvement and 1 indicating the greatest negative change or decline. The factors are therefore positively and unidirectionally loaded. Principal-Component Factor Analysis and Varimax rotation with Kaiser normalisation is used to generate the factors. Only factors with an Eigenvalue higher than 1 were included in the analysis.

Using the StataSE 15 software, three factors were generated using Principal-Component Factor Analysis. The factors explain approximately 58 % of the variance observed in the variables. The generated factors are presented in Table 3. The generation process in StataSE 15 is presented in Appendix 3.

Table 3: Factors generated using Principal-Component Factor Analysis

	Factor 1	Factor 2	Factor 3	Rotated with Kaiser normalisation		
Variable	Service	Taxi costs	Availability	Uniqueness	Communality	KMO MSA
carquality	0,8322			0,2988	0,7012	0,7802
cleanliness	0,8276			0,3003	0,6997	0,7704
knowledge	0,7842			0,3263	0,6737	0,8452
behaviour	0,7577			0,3808	0,6192	0,8498
publictransport		0,7424		0,4304	0,5696	0,6145
taxiprices		0,6618		0,4471	0,5529	0,8179
cartrips		0,6191		0,5597	0,4403	0,7839
<i>taxitrips</i>		-0,5855	0,3964	0,4915	0,5085	0,7727
numeroftaxis			0,8081	0,3375	0,6625	0,5353
waitingtime			0,7510	0,4072	0,5928	0,6826
farerefusal			0,5165	0,6842	0,3158	0,7685
Eigenvalues	3,40697	1,52231	1,40691			
Cumulative %	0,3097	0,4481	0,5760			
Cronbach alpha	0,8346	0,5828	0,5397	<- 0,6130 if farerefusal is dropped		

StataSE 15 doesn't automatically produce communalities or MSA values for the variables. When conducting Principal Component Factor Analysis, Stata returns values under the name "Uniqueness", which is the amount of variance in a variable which the factors do not explain. These values are equal to 1 – Communality. Communality can therefore be derived with the formula 1 – Uniqueness. (StataCorp, 2017, p. 7) Stata also has an option for conducting Principal Component Analysis. In this case the program returns values called "Unexplained" in the place of the "Uniqueness" values. The "Uniqueness" and "Unexplained" values are identical in both methods of conducting the analysis. Because of this, the communalities are also identical. Factor loadings in Principal Component Analysis are lower than in Principal-Component Factor Analysis. In addition, the variable "taxitrips" loads onto factors 2 and 3 with a difference of 0.1533. With Principal-Component Factor Analysis, the difference is 0.1891. The analysis performed with Principle Component Analysis is presented in Appendix 4.

4.2 INTERPRETING THE FACTORS

The factors generated from the database are “Service”, “Taxi costs”, and “Availability”. The variable “taxitrips” in the factor “Taxi costs” also loaded onto the factor “Availability”. The difference in loading between the two factors is less than 0.2 points. Otherwise the variables have mainly loaded onto only one factor.

The Cronbach alpha of the factor “Availability” can be raised from 0.5397 to 0.6130 by dropping the variable “farerefusal”. Including the variable “taxitrips” to “Availability”, improves the alpha very little, from 0.5397 to 0.5590. Substituting “farerefusal” with “taxitrips” reduces the alpha from 0.5397 to 0.5287. The variable “farerefusal” has a communality of less than 0.4, so its variance is not explained very well by the factors. It is also the only variable with a communality of less than 0.4. These aspects should be remembered when interpreting the factors. However, since the factor analysis conducted here is of exploratory nature, and Cronbach alpha doesn’t have specific reference values, the values which the factors get are acceptable for the purposes of this study.

The Kaiser-Meyer-Olkin measure of sampling adequacy or KMO MSA values measure the relationship between the correlation and correlation + partial correlation of a variable. If partial correlation is small, the value is close to 1. The values should be higher than 0.6 to be applicable for the analysis. (Metsämuuronen 2006, p. 588) The variable “numeroftaxis” is the only variable that has a value of less than 0.6.

Factor 1 is called “Service”. All variables which have loaded onto it have a positive loading. If the factor gets high values, the respondents have observed an improvement in the quality of the vehicles being used as taxis, vehicle cleanliness, driver skill and knowledge and driver behaviour. Factor 2 is called “Taxi costs”. Three out of four variables have a positive loading. This means that where the factor gets high values, the respondents have observed an increase in taxi prices, have increased their use of public transportation or private cars. The fourth variable is “taxitrips”, and it has a

negative loading. In this case where the factor gets high values, the respondents have observed a decrease in taxi trips they have taken. Factor 3 is named “Availability”. All variables are positively loaded. If the factor gets high values, the respondents have noticed an increase in the number of taxis, a decrease in waiting times, and a decrease in fare refusal as well. The last two variables get high values when a decrease has been observed.

4.3 COMPARING THE EXPERIENCES OF CUSTOMERS FROM DIFFERENT SOCIOECONOMIC BACKGROUNDS AGAINST THE AVERAGE

This section seeks to answer the research questions *Do consumers with different socioeconomic backgrounds have different experiences?* and *Are the customers’ experiences different in different locations?* by comparing the factors generated from the entire database to factors which have been sorted by the appropriate variables. For example, the factors will be sorted by the size of the city in which the respondents live. The distributions of the variables used for sorting are presented in Appendix 16. The factors generated with the entire database are standardized, which leads to their means being close to zero, and standard deviations being equal to one. The factors are summarized in Table 4. The raw data used in the summary is presented in Appendix 5.

Table 4: Summary of factors generated from the entire database

Summary of the factors generated using the entire database								
Factor	Mean	Std. Dev.	Minimum	Maximum	N	Lower Quartile	Median	Upper Quartile
Service	-8.49e-10	1	-2.464593	2.874402	180	-.7300569	.0527329	.7962914
Taxi costs	2.08e-09	1	-3.099482	3.280552	180	-.6441251	-.1428218	.5484223
Availability	1.26e-09	1	-3.000558	2.684576	180	-.7554508	-.0194701	.7876099

4.3.1 Difference in socioeconomical background

In this section, the values of the factors which have been filtered by each category are compared to the average values of the factors, which are based on the entire database.

For the factor “Service”, a larger mean value indicates an improvement in service compared to the average based on the entire database. A smaller mean indicates a decline in service. For the factor “Taxi costs”, a larger value indicates an increase in taxi costs, and a smaller value indicates a decline. The factor “Availability” is interpreted in the same way as the factor “Service”.

4.3.2. Filtering by age

The mean values for the factors filtered by the respondents’ age show a difference in experiences. The results of the analysis are shown in Table 5. The results indicate that respondents who are 30 or younger have experienced a very positive change in all factors when compared to the entire database. The raw data is presented in Appendix 6.

Table 5: Comparing the experiences of respondents who are 30 years old or younger, and who are over 30 years old.

Comparison between taxi users who are up to 30 years old and those who are older			
	Age	30 or younger	Over 30
Variable	Factor	Experience	Experience
carquality	Service	Improved	Declined
cleanliness			
knowledge			
behaviour			
publictransport	Taxi costs	Declined	Increased
taxiprices			
cartrips			
taxitrips			
numeroftaxis	Availability	Improved	Declined
waitingtime			
farerefusal			
The result is the same with age 41, which is the average age of the survey			

Respondents who are over 30 years old have opposite results. The mean values for the factors are lower for “Service”, higher for “Taxi costs” and lower again for “Availability” when compared to the entire database average. This indicates that the change which the respondents over 30 years old have experienced is very negative compared to the entire database. These results are repeated when the filtering the results by the age of 41, which is the average age of all respondents.

4.3.3. Filtering by gender

The respondents were asked to report their gender. The category “Other” is excluded because no respondents selected it. The results of the analysis based on gender are presented in Table 6. Based on the results, men appear to have had a more positive experience with the deregulation. They reported a decline in service and taxi costs, and an improvement in availability. Women reported an improvement in service, an increase in taxi costs, and a decline in availability. The raw data is presented in Appendix 7.

Table 6: Comparing the experiences of respondents based on their gender

Comparison between male and female customers			
	Gender	Male	Female
Variable	Factor	Experience	Experience
carquality	Service	Declined	Improved
cleanliness			
knowledge			
behaviour			
publictransport	Taxi costs	Declined	Increased
taxiprices			
cartrips			
taxitrips			
numeroftaxis	Availability	Improved	Declined
waitingtime			
farerefusal			

4.3.4. Filtering by marital status

The same logic is followed when investigating the effect of marital status. The results are presented in Table 7. Compared to the factors generated from the entire database, respondents who are unmarried had experienced an improvement in service quality, a decline in taxi costs and a decline in availability. Respondents who live in cohabitation had experienced a decline in service quality, a decline in taxi costs and an improvement in availability. Married respondents had experienced a decline in service, an increase in taxi costs and an improvement in availability. The raw data is presented in Appendix 8.

Table 7: Comparing the experiences of respondents of different marital status.

Comparison between taxi users of different marital status						
	Marital status	Unmarried	Cohabitation	Married	Divorced	Widow
Variable	Factor	Experience	Experience	Experience	Experience	Experience
carquality	Service	Improved	Declined	Declined	Improved	Declined
cleanliness						
knowledge						
behaviour						
publictransport	Taxi costs	Declined	Declined	Increased	Increased	Increased
taxiprices						
cartrips						
taxitrips						
numeroftaxis	Availability	Declined	Improved	Improved	Declined	Declined
waitingtime						
farerefusal						

Divorced respondents had experienced an improvement in availability, an increase in taxi costs and a decline in service. Widows had a very negative experience, reporting a decline in service, an increase in taxi costs, and a decrease in availability. It should be noted that the number of divorced respondents and widows is very low, which may affect the reliability of the indicator.

4.3.5. Filtering by children

The respondents were asked to report if they have children. This information was used to create two categories, one for respondents with children and one for no children. These categories were then compared to the average based on the entire database. This comparison is presented in Table 8. Compared to the average generated from the entire database, respondents with no children reported an improvement in service, a decline in taxi costs and an improvement in availability. Respondents with children reported a decline in service, an increase in taxi costs, and an improvement in availability. The raw data is presented in Appendix 9.

Table 8: Comparing the experiences of respondents who have and don't have children.

Comparison between taxi users with and without children			
	Children	No	Yes
Variable	Factor	Experience	Experience
carquality	Service	Improved	Declined
cleanliness			
knowledge			
behaviour			
publictransport	Taxi costs	Declined	Increased
taxiprices			
cartrips			
taxitrips			
numberoftaxis	Availability	Declined	Improved
waitingtime			
farerefusal			

4.3.6. Filtering by employment situation

The respondents are also compared based on their employment situation. The results of this comparison are presented in Table 9. Respondents who were employed at the

time of the survey had experienced a decline in service, an increase in taxi costs and an improvement in availability. Unemployed respondents had experienced an improvement in service, increased taxi costs and a decline in availability. The raw data is presented in Appendix 10.

Students and retirees had more positive experiences. Students reported an improvement in service and a decline in taxi costs, while retirees reported an improvement in service and availability. Students experienced a decline in availability, and retirees an increase in taxi costs. No respondents reported their employment situation as being “On parental leave”, so no data could be produced. Respondents who selected “Other” reported an improvement in service, an increase in taxi costs and a decline in availability. Only a small number of respondents reported their employment situation belonging in this category, which may affect the reliability of the indicators.

Table 9: Comparing the experiences of respondents with different employment situations

Comparison between taxi users with different employment situations						
	Employment situation	Employed	Unemployed	Student	Retired	Other
Variable	Factor	Experience	Experience	Experience	Experience	Experience
car quality	Service	Declined	Improved	Improved	Improved	Improved
cleanliness						
knowledge						
behaviour						
public transport	Taxi costs	Increased	Increased	Declined	Increased	Increased
taxi prices						
car trips						
taxi trips						
number of taxis	Availability	Improved	Declined	Declined	Improved	Declined
waiting time						
fare refusal						

4.3.7. Filtering by subordinates

The effect of having subordinates is also studied. The respondents who reported having no subordinates had a more negative experience. They reported a decline in service and availability, and also in taxi costs. Those with subordinates experienced an improvement in service, an increase in taxi costs and an improvement in availability. The results of the comparison are presented in Table 10. The raw data is presented in Appendix 11.

Table 10: Comparing the experiences of respondents who have or don't have subordinates at work

Comparison between taxi users who have or don't have subordinates at work			
	Subordinates	No	Yes
Variable	Factor	Experience	Experience
carquality	Service	Declined	Improved
cleanliness			
knowledge			
behaviour			
publictransport	Taxi costs	Declined	Increased
taxiprices			
cartrips			
taxitrips			
numberoftaxis	Availability	Declined	Improved
waitingtime			
farerefusal			

4.3.8. Filtering by home town population

The respondents were asked to report the population of their home town. This information was used to classify the respondents in 5 categories. A difference in taxi

customer experiences compared to the average can be seen from the results. This indicates that the effects of the taxi deregulation have been different in different locations compared to the average, with some locations experiencing improvement and others a decline. The results of the comparison are presented in Table 11. The raw data is presented in Appendix 12.

Table 11: Comparing the experiences of respondents living in cities of different sizes.

Comparison between taxi users' experiences in different sized cities						
	Population	<10000	10000-50000	50000-100000	100000-200000	>200000
Variable	Factor	Experience	Experience	Experience	Experience	Experience
carquality cleanliness knowledge behaviour	Service	Declined	Declined	Improved	Improved	Declined
publictransport taxiprices cartrips taxitrips	Taxi costs	Declined	Declined	Declined	Increased	Increased
numeroftaxis waitingtime farerefusal	Availability	Declined	Declined	Declined	Declined	Improved

Respondents living in cities with less than 10 000 residents had experienced a decline in service, taxi costs, and availability, when compared to the average based on the entire database. Respondents living in cities with 10 000 to 50 000 residents showed similar results. The respondents living in cities with 50 000 to 100 000 residents had had the most positive experience, showing improvement in service and decline in taxi costs. However, they indicated a decline in availability. Respondents living in cities with 100 000 to 200 000 residents experienced an improvement in service, an increase in taxi costs, and a decline in availability. Respondents living in cities with more than 200 000 residents were the only ones to indicate an improvement in availability. These respondents also showed a decline in service and an increase in taxi costs.

4.3.8. Filtering by method of ordering

The respondents were asked their primary method of ordering a taxi. A difference in customer experience can be seen between the different methods. These differences are shown in Table 12. The raw data is presented in Appendix 13.

Table 12: Comparing the experiences of respondents based on their primary method of ordering a taxi.

Comparison between the users of different ordering methods						
	Method	Call taxi center	Call the taxi operator	Smartphone app	Text message	Stand or street hail
Variable	Factor	Experience	Experience	Experience	Experience	Experience
carquality cleanliness knowledge behaviour	Service	Declined	Improved	Improved	Declined	Declined
publictransport taxiprices cartrips taxitrips	Taxi costs	Declined	Declined	Increased	Declined	Increased
numeroftaxis waitingtime farerefusal	Availability	Declined	Declined	Improved	Declined	Declined

The respondents who primarily order a taxi by calling the local taxi center experienced a decline in service, taxi costs, and availability. Those who call the taxi operator directly reported improved service, and a decline in taxi costs and availability. Respondents who use a smartphone application to order reported an improvement in service, an increase in taxi costs and an improvement in availability. A small number of respondents order their taxis with a text message. They experienced a decline in service, taxi costs and availability. Those who mainly walk to a taxi stand or hail a taxi on the street had the most negative experience, with a reported decline in service and availability, and an increase in taxi costs.

The findings described in this section indicate that people in different socioeconomic positions have had different experiences with the deregulation of the taxi industry. Young people who are 30 years old or younger have had a decisively more positive experience than people over 30, who have had a quite negative experience. Men appear to have had a more positive experience than women. Unmarried people and those in cohabitation have had a more positive experience than people who are married or divorced. Widows have had a very negative experience. However, in this case the small number of widows and divorced respondents should be noted. People who don't have children have had a more positive experience than those with children. People who are employed, unemployed or in some other form of employment have had more negative experiences than students or retirees. No respondents reported being on parental leave, so no data exists of that group. People who have subordinates at work have had a more positive experience than those without subordinates. The people who called a local taxi operator directly or order with a smartphone app had the most positive experiences compared to the average. Street hailers and taxi stand customers had the most negative experience.

The findings also indicate that there is a difference based on the size of the city where the respondents live. Service has declined in small cities of less than 10 000 and 10 000 to 50 000 residents, and also in large cities of more than 200 000 residents. Taxi costs have reportedly declined in cities with a population of 100 000 or less, while an increase is shown in larger cities. The decline in taxi costs may not only be caused by a reduction in prices, but also by people taking public transportation or driving to their destination more often. People living in cities of more than 200 000 residents are the only ones who reported an increase in availability.

6. SUMMARY AND CONCLUSIONS

The data collected from Finnish taxi customers with an anonymous online survey was analyzed using frequency tables, means, standard deviations, and factor analysis. The aspects which were investigated relate to the changes brought on by the deregulation of the Finnish taxi industry in 2018. The aspects were change in the amount of money the respondents spend on taxis, change in quality of service, and change in taxi availability. Respondents to the survey came from different cities and different socioeconomic positions across Finland. The software used in the analysis was StataSE 15 (64-bit) statistical analysis software by StataCorp.

The frequency tables generated by Stata were analyzed and converted into bar graphs to ease interpretation. These were then used to answer the first three research questions. Analyzing the variables on changes in spending on taxis, general quality of service, and general change in availability revealed some changes. The largest group of respondents generally hasn't experienced a change in the amount of money they spent on taxis, with 48% of respondents reporting no change in their spending, and 15% not being able to say. There were more respondents who had experienced a change in availability than those who felt there had been no change. 65% of those who had experienced change felt that availability had somewhat improved or improved a lot. 48% of all respondents felt that they had experienced a change in service quality. 40% of all respondents, 83% of those who felt a change, reported feeling that service quality had somewhat declined or declined a lot.

Indicators were generated with Principal-Component Factor Analysis to investigate hidden variables, and to find patterns in the variance of the variables. Once the factors were generated, the database was filtered to answer the last two research questions. The experiences of customers in different socioeconomic positions vary were found to vary. Young people had a more favorable view of the deregulation, along with men. Unmarried people had a better experience than married or divorced people. People without children were also found to have better experiences, as did people who have

subordinates at work. Those who call a local taxi operator directly or order with a smartphone application had good experiences. Location has an effect on the effects which have been felt by the respondents. Service was found to have declined in small communities, and taxi costs had increased in cities with a population of over 100 000. Only people living in large cities of over 200 000 residents reported improvement in availability, but they also reported increase in their taxi costs and a decline in service.

However, the hypothesis which was formed in the beginning is only partially confirmed by the findings. When it comes to changes in taxi spending, the largest group is the one which hasn't experienced any increase in taxi spending. In availability, the largest group has experienced a change, with the majority of that group experiencing an improvement in availability, confirming part of the hypothesis. However, the factor analysis shows that only respondents living cities with more than 200 000 residents have reported an improvement in availability. The largest group in service quality is the one which has experienced a change, and in that group the perceived change has overwhelmingly been negative. Service quality has been perceived as declining in cities smaller than 50 000 and larger than 200 000 residents.

Further studies should focus on identifying the most important variables in each aspect of the customer service experience. When some time has passed from the deregulation, time series data can also be used to gain new insight into how the situation changes over time. New studies can also be conducted to possibly identify new factors which affect the customer experience. This study compared the experiences of customers from different socioeconomic backgrounds against the average of the entire database. Future studies could investigate if people from one group have different experiences compared to some other group, instead of the average, and what are the reasons behind the difference, if a difference is observed.

REFERENCES

Barrett, S. D. (2003) REGULATORY CAPTURE, PROPERTY RIGHTS AND TAXI DEREGULATION: A CASE STUDY. *Economic Affairs* 23, 4, 34-40.

Cairns, R. D., Liston-Heyes, C. (1996) Competition and regulation in the taxi industry. *Journal of Public Economics* 59, 1, 1-15.

Central Intelligence Agency. (2016/2017) *The World Factbook* 53, 258-260, 362-363, 538-539, 715-716.

Darbéra, R. (2010) *Taxicab regulation and urban residents' use and perception of taxi services: A survey in eight cities*. 12th World Conference on Transport Research, July 11 – July 15, Lisbon, Portugal.

Frankena, M., Pautler, P. A. (1984) An Economic Analysis of Taxicab Regulation. Bureau of Economics of the Federal Trade Commission Staff Report.

Gaunt, C. (1995) The impact of taxi deregulation on small urban areas: Some New Zealand evidence. *Transport Policy* 2,4, 257-262.

KvantiMOTV. (2004) Faktorianalyysi. [www document]. [Accessed 14 April 2019]. Available: <https://www.fsd.uta.fi/menetelmaopetus/faktori/faktori.html>

KvantiMOTV. (2008) Mittaaminen: Mittarin luotettavuus. [www document]. [Accessed 14 April 2019]. Available: <https://www.fsd.uta.fi/menetelmaopetus/mittaaminen/luotettavuus.html>

Laki taksinkuljettajien ammattipätevyydestä. Act 695/2009. [Taxi Driver Professional Qualification Act]. [www document]. [Accessed 12 May 2019]. Available: <https://www.finlex.fi/fi/laki/ajantasa/kumotut/2009/20090695>

Lansky, D. (2009) The great Swedish taxi rip-off. *The Local*. [Internet document]. [Accessed 12 May 2019]. Available: <https://www.thelocal.se/20090112/16868>

Marell, A. Westin, K. (2002) The effects of taxicab deregulation in rural areas of Sweden. *Journal of Transport Geography*, 10, 2, 135-144.

Metsämuuronen, J. (2006) Tutkimuksen tekemisen perusteet ihmistieteissä. 4th edition. Helsinki, International Methelp

Ministry of Transport and Communications, (2017) Factsheet 60/2017. Taxi and vehicle-for-hire services in the Act on Transport Services. [Internet document]. [Accessed 10 March 2019]. Available: <https://www.lvm.fi/documents/20181/937315/Factsheet+60-2017+Taxi+and+vehicle-for-hire+services+in+the+Act+on+Transport+Services.pdf/bbb5ca8a-d24d-4b41-a5be-004f4036aeb2>

Morrison, P. S. (1997) Restructuring effects of deregulation: the case of the New Zealand taxi industry. *Environment and Planning A*, 29, 5, 913 – 928

Slavnic, Z. (2011) Struggle for Survival in the Deregulated Market: Re-commodification and Informalisation of the Taxi Sector in Stockholm. *Forum for Social Economics*, 40, 2, 233-251.

StataCorp. (2017) Manual - Factor Analysis. [www document]. [Accessed 14 April 2019]. Available <https://www.stata.com/manuals/mvfactor.pdf>

Taksiliikennelaki. Act 217/2007. [Taxi Transport Act]. [www document]. [Accessed 12 May 2019]. Available: <https://www.finlex.fi/fi/laki/ajantasa/kumotut/2007/20070217>

Teal, R. F., & Berglund, M. (1987). The impacts of taxicab deregulation in the USA. *Journal of transport economics and policy*, 37-56.

APPENDIXES

Appendix 1. The raw data used in table 2.

```
. tabstat taxispending availability servicequality, stat(mean sd min max N p25 median p75)
```

stats	taxisp~g	availa~y	servic~y
mean	3.705556	3.661111	2.988889
sd	1.175624	1.191984	1.186464
min	1	1	1
max	6	6	6
N	180	180	180
p25	3	3	2
p50	4	4	3
p75	4	5	4

Appendix 2. The raw data used in the frequency tables in section 3.1.

```
. tabulate taxispending
```

taxispendin g	Freq.	Percent	Cum.
1	11	6.11	6.11
2	19	10.56	16.67
3	27	15.00	31.67
4	86	47.78	79.44
5	29	16.11	95.56
6	8	4.44	100.00
Total	180	100.00	

```
. tabulate availability
```

availabilit y	Freq.	Percent	Cum.
1	9	5.00	5.00
2	19	10.56	15.56
3	52	28.89	44.44
4	49	27.22	71.67
5	46	25.56	97.22
6	5	2.78	100.00
Total	180	100.00	

```
. tabulate servicequality
```

servicequal ity	Freq.	Percent	Cum.
1	19	10.56	10.56
2	53	29.44	40.00
3	35	19.44	59.44
4	58	32.22	91.67
5	14	7.78	99.44
6	1	0.56	100.00
Total	180	100.00	

Appendix 3. The factor generation process (Principal-Component Factor Analysis).

```
. correlate taxitrips taxiprices publictransport cartrips numberoftaxis waitingtime farerefusal knowledge behaviour carquality cleanliness
(obs=180)
```

	taxitr-s	taxipr-s	public-t	cartrips	number-s	waitin-e	farere-l	knowle-e	behavi-r	carqua-y	cleanl-s
taxitrips	1.0000										
taxiprices	-0.3075	1.0000									
publictran-t	-0.2369	0.2876	1.0000								
cartrips	-0.2482	0.3448	0.2352	1.0000							
numberofta-s	0.1892	0.0402	0.0316	-0.0634	1.0000						
waitingtime	0.1743	-0.1163	-0.0212	-0.1056	0.4475	1.0000					
farerefusal	0.2888	-0.0894	0.0171	-0.1647	0.1577	0.2161	1.0000				
knowledge	0.2213	-0.3652	-0.0608	-0.3172	0.0141	0.2060	0.2097	1.0000			
behaviour	0.2043	-0.2445	-0.0071	-0.2279	0.0811	0.2205	0.2194	0.5895	1.0000		
carquality	0.1510	-0.3018	-0.0309	-0.2348	-0.0131	0.1543	0.1122	0.5540	0.4797	1.0000	
cleanliness	0.1862	-0.3049	-0.0878	-0.1513	0.0448	0.1971	0.1542	0.5459	0.5387	0.6836	1.0000

```
. factortest taxitrips taxiprices publictransport cartrips numberoftaxis waitingtime farerefusal knowledge behaviour carquality cleanliness
```

```
Determinant of the correlation matrix
Det = 0.061
```

```
Bartlett test of sphericity
```

```
Chi-square = 487.042
Degrees of freedom = 55
p-value = 0.000
H0: variables are not intercorrelated
```

```
Kaiser-Meyer-Olkin Measure of Sampling Adequacy
KMO = 0.776
```

```
. factor taxitrips taxiprices publictransport cartrips numberoftaxis waitingtime farerefusal knowledge behaviour carquality cleanliness, pcf
(obs=180)
```

```
Factor analysis/correlation          Number of obs = 180
Method: principal-component factors   Retained factors = 3
Rotation: (unrotated)                Number of params = 30
```

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	3.40697	1.88466	0.3097	0.3097
Factor2	1.52231	0.11541	0.1384	0.4481
Factor3	1.40691	0.48283	0.1279	0.5760
Factor4	0.92408	0.15774	0.0840	0.6600
Factor5	0.76634	0.12067	0.0697	0.7297
Factor6	0.64567	0.02469	0.0587	0.7884
Factor7	0.62098	0.07121	0.0565	0.8448
Factor8	0.54977	0.06947	0.0500	0.8948
Factor9	0.48029	0.09379	0.0437	0.9385
Factor10	0.38651	0.09634	0.0351	0.9736
Factor11	0.29017	.	0.0264	1.0000

```
LR test: independent vs. saturated: chi2(55) = 489.83 Prob>chi2 = 0.0000
```

```
Factor loadings (pattern matrix) and unique variances
```

Variable	Factor1	Factor2	Factor3	Uniqueness
taxitrips	0.4697	0.3617	-0.3962	0.4915
taxiprices	-0.5668	0.1227	0.4653	0.4471
publictran-t	-0.2193	-0.0008	0.7222	0.4304
cartrips	-0.4897	-0.0553	0.4444	0.5597
numberofta-s	0.1742	0.7702	0.1972	0.3375
waitingtime	0.3934	0.6222	0.2258	0.4072
farerefusal	0.3733	0.4171	0.0496	0.6842
knowledge	0.7846	-0.1968	0.1389	0.3263
behaviour	0.7277	-0.1120	0.2779	0.3808
carquality	0.7329	-0.3250	0.2417	0.2988
cleanliness	0.7553	-0.2492	0.2593	0.3003

. alpha taxitrips taxiprices publictransport cartrips numberoftaxis waitingtime farerefusal knowledge behaviour carquality cleanliness

Test scale = mean(unstandardized items)
Reversed items: taxiprices publictransport cartrips

Average interitem covariance: .2195384
Number of items in the scale: 11
Scale reliability coefficient: 0.7474

. alpha carquality cleanliness knowledge behaviour

Test scale = mean(unstandardized items)

Average interitem covariance: .6646441
Number of items in the scale: 4
Scale reliability coefficient: 0.8346

. alpha publictransport taxiprices cartrips taxitrips

Test scale = mean(unstandardized items)
Reversed item: taxitrips

Average interitem covariance: .2248345
Number of items in the scale: 4
Scale reliability coefficient: 0.5828

. alpha numberoftaxis waitingtime farerefusal

Test scale = mean(unstandardized items)

Average interitem covariance: .2950652
Number of items in the scale: 3
Scale reliability coefficient: 0.5397

. alpha numberoftaxis waitingtime

Test scale = mean(unstandardized items)

Average interitem covariance: .5863128
Number of items in the scale: 2
Scale reliability coefficient: 0.6130

Appendix 4. Principal Component Analysis factor generating process

```
. correlate taxitrips taxiprices publictransport cartrips numberoftaxis waitingtime farerefusal knowledge behaviour carquality cleanliness
(obs=180)
```

	taxitr-s	taxipr-s	public-t	cartrips	number-s	waitin-e	farere-l	knowle-e	behavi-r	carqua-y	cleanl-s
taxitrips	1.0000										
taxiprices	-0.3075	1.0000									
publictran-t	-0.2369	0.2876	1.0000								
cartrips	-0.2482	0.3448	0.2352	1.0000							
numberofta-s	0.1892	0.0402	0.0316	-0.0634	1.0000						
waitingtime	0.1743	-0.1163	-0.0212	-0.1056	0.4475	1.0000					
farerefusal	0.2888	-0.0894	0.0171	-0.1647	0.1577	0.2161	1.0000				
knowledge	0.2213	-0.3652	-0.0608	-0.3172	0.0141	0.2060	0.2097	1.0000			
behaviour	0.2043	-0.2445	-0.0071	-0.2279	0.0811	0.2205	0.2194	0.5895	1.0000		
carquality	0.1510	-0.3018	-0.0309	-0.2348	-0.0131	0.1543	0.1122	0.5540	0.4797	1.0000	
cleanliness	0.1862	-0.3049	-0.0878	-0.1513	0.0448	0.1971	0.1542	0.5459	0.5387	0.6836	1.0000

```
. factortest taxitrips taxiprices publictransport cartrips numberoftaxis waitingtime farerefusal knowledge behaviour carquality cleanliness
```

```
Determinant of the correlation matrix
Det = 0.061
```

```
Bartlett test of sphericity
```

```
Chi-square = 487.042
Degrees of freedom = 55
p-value = 0.000
H0: variables are not intercorrelated
```

```
Kaiser-Meyer-Olkin Measure of Sampling Adequacy
KMO = 0.776
```

```
. poa taxitrips taxiprices publictransport cartrips numberoftaxis waitingtime farerefusal knowledge behaviour carquality cleanliness, mineigen(1)
```

```
Principal components/correlation      Number of obs = 180
                                      Number of comp. = 3
                                      Trace = 11
Rotation: (unrotated = principal)    Rho = 0.5760
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.40697	1.88466	0.3097	0.3097
Comp2	1.52231	.115409	0.1384	0.4481
Comp3	1.40691	.482829	0.1279	0.5760
Comp4	.924077	.157739	0.0840	0.6600
Comp5	.766338	.120668	0.0697	0.7297
Comp6	.64567	.0246879	0.0587	0.7884
Comp7	.620982	.0712145	0.0565	0.8448
Comp8	.549768	.069475	0.0500	0.8948
Comp9	.480293	.0937864	0.0437	0.9385
Comp10	.386506	.096336	0.0351	0.9736
Comp11	.29017	.	0.0264	1.0000

```
Principal components (eigenvectors)
```

Variable	Comp1	Comp2	Comp3	Unexplained
taxitrips	0.2545	0.2932	-0.3340	.4915
taxiprices	-0.3071	0.0995	0.3923	.4471
publictran-t	-0.1188	-0.0007	0.6088	.4304
cartrips	-0.2653	-0.0449	0.3746	.5597
numberofta-s	0.0944	0.6243	0.1662	.3375
waitingtime	0.2131	0.5043	0.1903	.4072
farerefusal	0.2022	0.3381	0.0418	.6842
knowledge	0.4251	-0.1595	0.1171	.3263
behaviour	0.3942	-0.0907	0.2343	.3808
carquality	0.3971	-0.2634	0.2038	.2988
cleanliness	0.4092	-0.2020	0.2186	.3003

```
. rotate, kaiser
Principal components/correlation      Number of obs = 180
                                      Number of comp. = 3
                                      Trace = 11
Rotation: orthogonal varimax (Kaiser on)  Rho = 0.5760
```

Component	Variance	Difference	Proportion	Cumulative
Comp1	2.78542	.945302	0.2532	0.2532
Comp2	1.84012	.129459	0.1673	0.4205
Comp3	1.71066	.	0.1555	0.5760

Rotated components

Variable	Comp1	Comp2	Comp3	Unexplained
taxitrips	-0.0411	-0.4294	0.2761	.4915
taxiprices	-0.1309	0.4841	0.0813	.4471
publictran-t	0.1523	0.5932	0.0984	.4304
cartrips	-0.0476	0.4569	-0.0420	.5597
numerofta-s	-0.0963	0.0692	0.6420	.3375
waitingtime	0.0581	0.0418	0.5752	.4072
farerefusal	0.0527	-0.0754	0.3853	.6842
knowledge	0.4607	-0.0857	0.0161	.3263
behaviour	0.4566	0.0285	0.0958	.3808
carquality	0.5136	0.0096	-0.0690	.2988
cleanliness	0.5057	0.0137	-0.0052	.3003

Component rotation matrix

	Comp1	Comp2	Comp3
Comp1	0.8249	-0.4652	0.3210
Comp2	-0.3884	-0.0540	0.9199
Comp3	0.4106	0.8835	0.2253

```
. sort1
```

Rotated components sorted

Variable	Comp1	Comp2	Comp3	Unexplained
carquality	0.5136	0.0096	-0.0690	0.2988
cleanliness	0.5057	0.0137	-0.0052	0.3003
knowledge	0.4607	-0.0857	0.0161	0.3263
behaviour	0.4566	0.0285	0.0958	0.3808
publictran-t	0.1523	0.5932	0.0984	0.4304
taxiprices	-0.1309	0.4841	0.0813	0.4471
cartrips	-0.0476	0.4569	-0.0420	0.5597
taxitrips	-0.0411	-0.4294	0.2761	0.4915
numerofta-s	-0.0963	0.0692	0.6420	0.3375
waitingtime	0.0581	0.0418	0.5752	0.4072
farerefusal	0.0527	-0.0754	0.3853	0.6842

```
. estat kmo
```

Kaiser-Meyer-Olkin measure of sampling adequacy

Variable	kmo
taxitrips	0.7727
taxiprices	0.8179
publictran-t	0.6145
cartrips	0.7839
numerofta-s	0.5353
waitingtime	0.6826
farerefusal	0.7685
knowledge	0.8452
behaviour	0.8498
carquality	0.7802
cleanliness	0.7704
Overall	0.7758

```
. alpha taxitrips taxiprices publictransport cartrips numeroftaxis waitingtime farerefusal knowledge behaviour carquality cleanliness
```

Test scale = mean(unstandardized items)

Reversed items: taxiprices publictransport cartrips

Average interitem covariance: .2195384
 Number of items in the scale: 11
 Scale reliability coefficient: 0.7474

```
. alpha carquality cleanliness knowledge behaviour
```

Test scale = mean(unstandardized items)

Average interitem covariance: .6646441
 Number of items in the scale: 4
 Scale reliability coefficient: 0.8346

```
. alpha publictransport taxiprices cartrips taxitrips
```

Test scale = mean(unstandardized items)

Reversed item: taxitrips

Average interitem covariance: .2248345
 Number of items in the scale: 4
 Scale reliability coefficient: 0.5828

```
. alpha numeroftaxis waitingtime farerefusal
```

Test scale = mean(unstandardized items)

Average interitem covariance: .2950652
 Number of items in the scale: 3
 Scale reliability coefficient: 0.5397

```
. alpha numeroftaxis waitingtime
```

Test scale = mean(unstandardized items)

Average interitem covariance: .5863128
 Number of items in the scale: 2
 Scale reliability coefficient: 0.6130

Appendix 5. The raw factor value data using the entire database

```
. tabstat servicefactor taxicostsfactor availabilityfactor, stat(mean sd min max N p25 median p75)
```

stats	servic~r	taxico~r	avalla~r
mean	-8.49e-10	2.08e-09	1.26e-09
sd	1	1	1
min	-2.464593	-3.099482	-3.000558
max	2.874402	3.280552	2.684576
N	180	180	180
p25	-.7300569	-.6441251	-.7554508
p50	.0527329	-.1428218	-.0194701
p75	.7962914	.5484223	.7876099

Appendix 6. The factors sorted by age

```
. generate youngperson = 1 if ikä <= 30
(114 missing values generated)

. replace youngperson = 0 if ikä > 30
(114 real changes made)

. bysort youngperson: tabstat servicefactor taxicostsfactor availabilityfactor, stat(mean sd min max N p25 median p75)
```

```
-> youngperson = 0
```

stats	servic~r	taxico~r	avalla~r
mean	-.0705587	.1841242	-.0343421
sd	1.005277	1.023791	1.044888
min	-2.464593	-2.782458	-3.000558
max	1.996353	3.280552	2.582405
N	114	114	114
p25	-.8847852	-.5291119	-.7554508
p50	.0527329	.0316157	-.0406241
p75	.7652629	.7411837	.8036568

```
-> youngperson = 1
```

stats	servic~r	taxico~r	avalla~r
mean	.121874	-.3180327	.0593182
sd	.986497	.8772247	.9220457
min	-2.193547	-3.099482	-1.712117
max	2.874402	1.697493	2.684576
N	66	66	66
p25	-.6098033	-.7070353	-.7554508
p50	.0944226	-.4462764	-.0194701
p75	.9311543	.0297008	.6865349

```
. generate averageoryounger = 1 if ikä <= 41
(98 missing values generated)

. replace averageoryounger = 0 if ikä > 41
(98 real changes made)

. bysort averageoryounger : tabstat servicefactor taxicostsfactor availa
> ilityfactor, stat(mean sd min max N p25 median p75)
```

```
-> averageoryounger = 0
```

stats	servic~r	taxico~r	avalla~r
mean	-.1145668	.2303872	-.0072169
sd	.9830745	1.053618	1.061666
min	-2.464593	-2.782458	-3.000558
max	1.600019	3.280552	2.582405
N	98	98	98
p25	-.8928607	-.3543118	-.7554508
p50	.0107696	.0622135	.007574
p75	.7157019	.7648745	.8377778

```
-> averageoryounger = 1
```

stats	servic~r	taxico~r	avalla~r
mean	.1369213	-.2753407	.0086251
sd	1.008802	.8599529	.9273407
min	-2.303626	-3.099482	-1.976673
max	2.874402	1.697493	2.684576
N	82	82	82
p25	-.6645076	-.7070353	-.7554508
p50	.1361122	-.4462764	-.0308782
p75	.9311543	.235502	.6843653

Appendix 7. The factors sorted by gender

```
. bysort gender: tabstat servicefactor taxicostsfactor availabilityfactor, stat(mean sd min max N p25 median p75)
```

```
-> gender = 0
```

stats	servic~r	taxico~r	avails~r
mean	-.1376389	-.1596501	.122213
sd	1.018114	.9575144	1.067745
min	-2.303626	-3.099482	-3.000558
max	2.874402	2.601835	2.684576
N	108	108	108
p25	-.9913271	-.6812826	-.7426082
p50	.015819	-.2347411	.0788621
p75	.7243889	.2360165	.90924

```
-> gender = 1
```

stats	servic~r	taxico~r	avails~r
mean	.2064583	.2394751	-.1833195
sd	.9417807	1.021025	.8638163
min	-2.464593	-2.782458	-2.533248
max	1.996353	3.280552	1.47717
N	72	72	72
p25	-.4920813	-.4512758	-.8525276
p50	.3774342	.0826541	-.1050547
p75	.9524578	.770888	.5665438

Appendix 8. Factors sorted by marital status

```
. bysort maritalstatus : tabstat servicefactor taxicostsfactor availabilityfactor, stat(mean sd min max N p25 median p75)
```

```
-> maritalstatus = 1
```

stats	servic~r	taxico~r	avails~r
mean	.1954698	-.1978807	-.1306016
sd	1.010799	1.057357	.9597639
min	-2.193547	-3.099482	-1.976673
max	2.874402	2.32876	2.684576
N	62	62	62
p25	-.3600759	-.6992711	-.8548604
p50	.222135	-.4043344	-.1733876
p75	.9828444	.3415867	.5848939

```
-> maritalstatus = 2
```

stats	servic~r	taxico~r	avails~r
mean	-.0569702	-.0190284	.1409286
sd	.953501	1.030516	1.090373
min	-1.706662	-2.782458	-2.783709
max	1.756256	3.280552	2.582405
N	41	41	41
p25	-.8928607	-.5913648	-.5241854
p50	.0182807	-.2524227	.2279628
p75	.7248796	.5036132	.8705976

```
-> maritalstatus = 3
```

stats	servic~r	taxico~r	avails~r
mean	-.1792109	.1255986	.1027494
sd	.9584326	.9364759	.9576421
min	-2.464593	-1.430591	-3.000558
max	1.376824	2.601835	1.640368
N	66	66	66
p25	-.8918123	-.3641876	-.6345641
p50	-.0920699	-.0346306	.126978
p75	.6224222	.4625651	.8377778

```
-> maritalstatus = 4
```

stats	servic~r	taxico~r	avails~r
mean	.2935747	.5172337	-.4875226
sd	1.310886	.6594677	1.094597
min	-2.260402	-.5291119	-1.882347
max	1.996353	1.379818	1.044602
N	9	9	9
p25	.1521614	.1881043	-1.057967
p50	.6860824	.6757795	-.7318123
p75	.8101165	.8400403	.4824834

```
-> maritalstatus = 5
```

stats	servic~r	taxico~r	avails~r
mean	-.2987994	.0520802	-.0372644
sd	1.130021	1.393907	1.160931
min	-1.097845	-.9335612	-.8581665
max	.5002459	1.037722	.7836377
N	2	2	2
p25	-1.097845	-.9335612	-.8581665
p50	-.2987994	.0520802	-.0372644
p75	.5002459	1.037722	.7836377

Appendix 9. Factors sorted by children

```
. bysort children : tabstat servicefactor taxicostsfactor availabilityfactor, stat(mean sd min max N p25 median p75)
```

```
-> children = 1
```

stats	servic~r	taxico~r	availa~r
mean	.1733067	-.1533206	-.0485607
sd	.9918417	1.001274	.947176
min	-2.193547	-3.099482	-2.783709
max	2.874402	2.499417	2.684576
N	94	94	94
p25	-.6082129	-.6716525	-.7892352
p50	.222135	-.3492674	-.0831963
p75	.9570353	.4025759	.6472256

```
-> children = 2
```

stats	servic~r	taxico~r	availa~r
mean	-.1894283	.167583	.0530779
sd	.9798079	.9770182	1.057755
min	-2.464593	-2.782458	-3.000558
max	1.376824	3.280552	2.582405
N	86	86	86
p25	-.9805958	-.4421426	-.7390093
p50	-.0332495	.0001074	.126978
p75	.6587307	.7149625	.8893198

Appendix 10. Factors sorted by employment situation.

```
. bysort employment : tabstat servicefactor taxicostsfactor availabilityfactor, stat(mean sd min max N p25 median p75)
```

```
-> employment = 1
```

stats	servic~r	taxico~r	avala~r
mean	-.1637691	.0633715	.0059809
sd	1.014232	.9675592	1.015177
min	-2.464593	-2.782458	-3.000558
max	1.996353	2.601835	2.331095
N	129	129	129
p25	-1.001106	-.5679789	-.7318123
p50	-.1460714	-.0598402	.0026829
p75	.7157019	.6689532	.8036568

```
-> employment = 2
```

stats	servic~r	taxico~r	avala~r
mean	.392213	.9058669	-.0431672
sd	.4026132	1.501913	1.01244
min	-.0384557	-.6401491	-1.174735
max	1.025856	3.280552	.9464512
N	5	5	5
p25	.1528537	.235502	-1.101395
p50	.3688406	.3110791	.5447581
p75	.45197	1.342351	.5690839

```
-> employment = 3
```

stats	servic~r	taxico~r	avala~r
mean	.4274011	-.4636653	-.1172472
sd	.8080604	.8335129	.9329911
min	-1.261663	-3.099482	-1.712117
max	2.874402	1.553919	2.684576
N	38	38	38
p25	-.090626	-.8059916	-.8468887
p50	.3672507	-.5346056	-.2559986
p75	.9828444	-.1414373	.5690839

```
-> employment = 5
```

stats	servic~r	taxico~r	avala~r
mean	.1978951	.6594844	.9602795
sd	1.075315	1.345825	1.005188
min	-1.706662	-.9335612	-.1510156
max	.9147386	2.559811	2.582405
N	5	5	5
p25	.5002459	-.1669736	.5830622
p50	.6224222	.5461521	.7836377
p75	.6587307	1.291993	1.003308

```
-> employment = 6
```

stats	servic~r	taxico~r	avala~r
mean	.644809	.5391997	-.3005689
sd	1.625415	.8244343	.8117627
min	-1.231958	-.2083881	-1.196485
max	1.600019	1.423411	.38605
N	3	3	3
p25	-1.231958	-.2083881	-1.196485
p50	1.566366	.4025759	-.0912712
p75	1.600019	1.423411	.38605

Appendix 11. Factors sorted by subordinates

```
. bysort subordinates : tabstat servicefactor taxicostsfactor availabilityfactor, stat(mean sd min max N p25 median p75)
```

```
-> subordinates = 1
```

stats	servic~r	taxico~r	avala~r
mean	-.0052426	-.06157	-.0837315
sd	1.018767	1.003298	1.020641
min	-2.464593	-3.099482	-3.000558
max	2.874402	2.601835	2.684576
N	134	134	134
p25	-.7344967	-.668712	-.8395298
p50	.0537368	-.1904854	-.1175695
p75	.7936931	.494111	.6743634

```
-> subordinates = 2
```

stats	servic~r	taxico~r	avala~r
mean	.0152719	.1793562	.2439135
sd	.9538998	.979042	.9040229
min	-2.303626	-1.976612	-2.783709
max	1.996353	3.280552	1.640368
N	46	46	46
p25	-.7204107	-.4480716	-.5638942
p50	.0513514	.08946	.4536248
p75	.8101165	.6249474	.8795707

Appendix 12. Factors sorted by home town population

```
. bysort population: tabstat servicefactor taxicostsfactor availabilityfactor, stat(mean sd min max N p25 median p75)
```

```
-> population = 1
```

stats	servic~r	taxico~r	avai~r
mean	-.0949331	-.31548	-.7268132
sd	.7114621	1.985709	1.39236
min	-.9805958	-2.782458	-3.000558
max	.6200985	2.601835	.6167375
N	5	5	5
p25	-.576433	-1.324559	-.8830618
p50	-.1460714	-.0598402	-.4708448
p75	.6083362	-.0123778	.1036614

```
-> population = 2
```

stats	servic~r	taxico~r	avai~r
mean	-.1555734	-.483808	-.1961406
sd	1.103623	.541257	1.015905
min	-1.660743	-1.430591	-2.728255
max	1.097524	.341849	1.21282
N	15	15	15
p25	-1.233926	-.9656128	-.8992311
p50	-.3144971	-.4444813	-.0143901
p75	1.060309	-.0245554	.5640038

```
-> population = 3
```

stats	servic~r	taxico~r	avai~r
mean	.4707886	-.057835	-.348149
sd	.8091743	.9091812	.8663053
min	-1.827184	-1.976612	-2.783709
max	1.566366	2.32876	.9702076
N	28	28	28
p25	.0046315	-.668712	-.8979429
p50	.5217408	-.1772181	-.5130743
p75	1.118383	.5357646	.2848136

```
-> population = 4
```

stats	servic~r	taxico~r	avai~r
mean	.1827988	.147177	-.1169387
sd	.7892277	.81221	1.014514
min	-1.120041	-.9623979	-1.976673
max	1.403589	2.559811	1.640368
N	16	16	16
p25	-.4398235	-.3101109	-.701374
p50	.15769	-.0786136	-.2969164
p75	.7853781	.4038925	.4237243

```
-> population = 5
```

stats	servic~r	taxico~r	avai~r
mean	-.1146431	.0698196	.1568566
sd	1.039349	1.029556	.9842665
min	-2.464593	-3.099482	-2.533248
max	2.874402	3.280552	2.684576
N	116	116	116
p25	-.9854179	-.6441251	-.7426082
p50	.015819	-.0852596	.27862
p75	.7202907	.7163934	.8844453

Appendix 13. Factors sorted by method of ordering

```
. bysort hailingmethod : tabstat servicefactor taxicostsfactor availabilityfactor, stat(mean sd min max N p25 median p75)
```

```
-> hailingmethod = 1
```

stats	servic~r	taxico~r	availa~r
mean	-.047788	-.0105706	-.0946824
sd	1.018917	.8482009	1.004587
min	-2.464593	-1.976612	-2.783709
max	1.996353	1.869985	2.582405
N	72	72	72
p25	-.8066357	-.6053516	-.8845341
p50	.0527329	-.0575593	-.1004409
p75	.7543527	.5201315	.7071049

```
-> hailingmethod = 2
```

stats	servic~r	taxico~r	availa~r
mean	.1548101	-.6880102	-.3854931
sd	.7906103	1.510806	.5973503
min	-1.261663	-2.782458	-1.053774
max	1.030871	2.559811	.5830622
N	9	9	9
p25	-.3144971	-1.527904	-.9410254
p50	.1361122	-1.022535	-.4708448
p75	.7936931	-.3381342	.0540627

```
-> hailingmethod = 3
```

stats	servic~r	taxico~r	availa~r
mean	.0669023	.0783976	.2700973
sd	.9847368	1.091278	.9874255
min	-2.303626	-3.099482	-3.000558
max	2.874402	3.280552	2.684576
N	73	73	73
p25	-.5588911	-.6401491	-.5019633
p50	.1964499	-.1851368	.5447581
p75	.7988897	.7149625	.9464512

```
-> hailingmethod = 4
```

stats	servic~r	taxico~r	availa~r
mean	-.8754467	-.2927092	-.0431835
sd	.1703453	.6629974	.8362195
min	-1.040931	-.7786797	-.750846
max	-.7006243	.4625651	.8795707
N	3	3	3
p25	-1.040931	-.7786797	-.750846
p50	-.8847852	-.562013	-.2582752
p75	-.7006243	.4625651	.8795707

```
-> hailingmethod = 5
```

stats	servic~r	taxico~r	availa~r
mean	-.0091341	.0916644	-.4043906
sd	1.116061	.9012321	.9958577
min	-1.827184	-1.430591	-2.728255
max	1.600019	2.32876	1.224954
N	23	23	23
p25	-.9697297	-.5716442	-.8468887
p50	.0182807	-.0598402	-.5638942
p75	1.068475	.4025759	.38605

Appendix 14. The questions from the survey conducted to collect the data.

1. What is your age? *

2. What is your gender? *

- Male
- Female
- Other

3. What is your marital status? *

- Unmarried
- Cohabitation
- Married
- Divorced
- Widow

4. Do you have a child or children? *

- Yes
- No

5. What is your employment situation? *

- Employed
- Unemployed
- Student
- On parental leave
- Retired

6. Do you have subordinates at work? *

Yes

No

7. What is the population of your home town? Select the population of your home town in Finland. *

Over 200 000

100 000 - 200 000

50 000 - 100 000

10 000 - 50 000

Under 10 000

8. How has the amount of money you've spent on taxis in your area changed after the deregulation? *

Increased a lot

Increased somewhat

No change

I cannot say

Decreased somewhat

Decreased a lot

9. How has the number of taxi trips you've taken in your area changed after the deregulation? *

- Increased a lot
- Increased somewhat
- No change
- I cannot say
- Decreased somewhat
- Decreased a lot

10. How have the prices of your taxi trips in your area changed after the deregulation? *

- Increased a lot
- Increased somewhat
- No change
- I cannot say
- Decreased somewhat
- Decreased a lot

11. How has the number of trips you've taken on other forms of public transport in your area changed after the deregulation? *

- Increased a lot
- Increased somewhat
- No change
- I cannot say
- Decreased somewhat
- Decreased a lot

12. How has your number of private car trips in your area changed after the deregulation? *

- Increased a lot
- Increased somewhat
- No change
- I cannot say
- Decreased somewhat
- Decreased a lot

13. How has the availability of taxis in your area changed after the deregulation? *

- Improved a lot
- Improved somewhat
- No change
- I cannot say
- Declined somewhat
- Declined a lot

14. How has the number of taxis changed in your area after the deregulation? *

- Increased a lot
- Increased somewhat
- No change
- I cannot say
- Decreased somewhat
- Decreased a lot

15. How has taxi waiting time in your area changed after the deregulation? *

- Decreased a lot
- Decreased somewhat
- No change
- I cannot say
- Increased somewhat
- Increased a lot

16. How has fare refusal by taxis in your area changed after the deregulation? *

- Fare refusal decreased a lot
- Fare refusal decreased somewhat
- No change
- I cannot say
- Fare refusal increased somewhat
- Fare refusal increased a lot

17. How do you usually order a taxi in your area? *

- By calling the taxi center
- By calling the taxi operator directly
- With a smartphone application
- With a text message
- I usually hail a taxi on the street or go to a taxi stand

18. How has the quality of taxi service in your area changed after the deregulation? *

- Improved a lot
- Improved somewhat
- No change
- I cannot say
- Declined somewhat
- Declined a lot

19. How has driver knowledge and skill in your area changed after the deregulation? *

- Improved a lot
- Improved somewhat
- No change
- I cannot say
- Declined somewhat
- Declined a lot

20. How has driver behaviour in your area changed after the deregulation? *

- Improved a lot
- Improved somewhat
- No change
- I cannot say
- Declined somewhat
- Declined a lot

21. How has the quality of vehicles used as taxis in your area changed after the deregulation? *

- Improved a lot
- Improved somewhat
- No change
- I cannot say
- Declined somewhat
- Declined a lot

22. How has the cleanliness of taxis in your area changed after the deregulation? *

- Improved a lot
- Improved somewhat
- No change
- I cannot say
- Declined somewhat
- Declined a lot

23. How has the acceptance of different payment methods (card, cash, mobile payment) in your area changed after the deregulation? *

- All advertised methods can be used
- I cannot say
- All advertised methods can't always be used

Note: Question 23. was omitted from the analysis by the author.

Appendix 15. The survey questions in Finnish.

1. Mikä on ikäsi? *

2. Mikä on sukupuolesi? *

- Mies
- Nainen
- Muu

3. Mikä on siviilisäätyysi? *

- Naimaton
- Avoliitossa
- Avioliitossa
- Eronnut
- Leski

4. Onko sinulla lapsi tai lapsia? *

- On
- Ei ole

5. Mikä on työllisyystilanteesi? *

- Töissä
- Työtön
- Opiskelija
- Vanhempainvapaalla
- Eläkkeellä
- Muu

6. Onko sinulla alaisia työssäsi? *

- On
- Ei ole

7. Mikä on kotikaupunkisi asukasluku? Valitse Suomessa sijaitsevan kotikaupunkisi asukasluku. *

- Yli 200 000
- 100 000 - 200 000
- 50 000 - 100 000
- 10 000 - 50 000
- Alle 10 000

8. Miten kotiseudullasi takseihin käyttämäsi rahamäärä on mielestäsi muuttunut sääntelyn purkamisen jälkeen? *

- Kasvanut paljon
- Kasvanut jonkin verran
- Ei muutosta
- En osaa sanoa
- Laskenut jonkin verran
- Laskenut paljon

9. Miten kotiseudullasi ajamiesi taksimatkojen määrä on mielestäsi muuttunut sääntelyn purkamisen jälkeen? *

- Kasvanut paljon
- Kasvanut jonkin verran
- Ei muutosta
- En osaa sanoa
- Laskenut jonkin verran
- Laskenut paljon

10. Miten kotiseudullasi ajamiesi taksimatkojen hinnat ovat mielestäsi muuttuneet sääntelyn purkamisen jälkeen? *

- Nousseet paljon
- Nousseet jonkin verran
- Ei muutosta
- En osaa sanoa
- Laskeneet jonkin verran
- Laskeneet paljon

11. Miten muilla julkisilla kulkuvälineillä kotiseudullasi ajamiesi matkojen määrä on mielestäsi muuttunut sääntelyn purkamisen jälkeen? *

- Noussut paljon
- Noussut jonkin verran
- Ei muutosta
- En osaa sanoa
- Laskenut jonkin verran
- Laskenut paljon

12. Miten yksityisautolla kotiseudullasi kulkemiesi matkojen määrä on mielestäsi muuttunut sääntelyn purkamisen jälkeen? *

- Noussut paljon
- Noussut jonkin verran
- Ei muutosta
- En osaa sanoa
- Laskenut jonkin verran
- Laskenut paljon

13. Miten taksien saatavuus kotiseudullasi on mielestäsi muuttunut sääntelyn purkamisen jälkeen? *

- Parantunut paljon
- Parantunut jonkin verran
- Ei muutosta
- En osaa sanoa
- Heikentynyt jonkin verran
- Heikentynyt paljon

14. Miten taksien määrä kotiseudullasi on mielestäsi muuttunut sääntelyn purkamisen jälkeen? *

- Kasvanut paljon
- Kasvanut jonkin verran
- Ei muutosta
- En osaa sanoa
- Laskenut jonkin verran
- Laskenut paljon

15. Miten taksien odotusaika kotiseudullasi on mielestäsi muuttunut sääntelyn purkamisen jälkeen? *

- Lyhentynyt paljon
- Lyhentynyt jonkin verran
- Ei muutosta
- En osaa sanoa
- Pidentynyt jonkin verran
- Pidentynyt paljon

16. Miten taksien kuljetuksesta kieltäytyminen kotiseudullasi on mielestäsi muuttunut sääntelyn purkamisen jälkeen? *

- Kuljetuksesta kieltäytyminen vähentynyt paljon
- Kuljetuksesta kieltäytyminen vähentynyt jonkin verran
- Ei muutosta
- En osaa sanoa
- Kuljetuksesta kieltäytyminen lisääntynyt jonkin verran
- Kuljetuksesta kieltäytyminen lisääntynyt paljon

17. Miten pääsääntöisesti tilaat taksin kotiseudullasi? *

- Soittamalla taksikeskukseen
- Soittamalla suoraan autoilijalle
- Alypuhelinsovelluksella
- Tekstiviestillä
- Otan taksin pääsääntöisesti lennosta tai taksiasemalta

18. Miten taksipalvelun laatu kotiseudullasi on mielestäsi muuttunut sääntelyn purkamisen jälkeen? *

- Parantunut paljon
- Parantunut jonkin verran
- Ei muutosta
- En osaa sanoa
- Heikentynyt jonkin verran
- Heikentynyt paljon

19. Miten kuljettajien tiedot ja taidot kotiseudullasi ovat mielestäsi muuttuneet sääntelyn purkamisen jälkeen? *

- Parantuneet paljon
- Parantuneet jonkin verran
- Ei muutosta
- En osaa sanoa
- Heikentyneet jonkin verran
- Heikentyneet paljon

20. Miten kuljettajien käytös kotiseudullasi on mielestäsi muuttunut sääntelyn purkamisen jälkeen? *

- Parantunut paljon
- Parantunut jonkin verran
- Ei muutosta
- En osaa sanoa
- Heikentynyt jonkin verran
- Heikentynyt paljon

21. Miten kotiseudullasi takseina käytettävien ajoneuvojen laatu on mielestäsi muuttunut sääntelyn purkamisen jälkeen? *

- Parantunut paljon
- Parantunut jonkin verran
- Ei muutosta
- En osaa sanoa
- Heikentynyt jonkin verran
- Heikentynyt paljon

22. Miten taksien siisteys kotiseudullasi on mielestäsi muuttunut sääntelyn purkamisen jälkeen? *

- Parantunut paljon
- Parantunut jonkin verran
- Ei muutosta
- En osaa sanoa
- Heikentynyt jonkin verran
- Heikentynyt paljon

23. Miten eri maksutapojen (kortti, käteinen, mobiilisovellus) hyväksyminen on muuttunut kotiseudullasi sääntelyn purkamisen jälkeen? *

- Kaikki ilmoitetut maksutavat kelpaavat
- En osaa sanoa
- Kaikki ilmoitetut maksutavat eivät aina kelpaa

Note: Question 23 was omitted from the analysis by the author.

Appendix 16. The distributions of the variables used for sorting in section 4.3.

