

St.Petersburg State University
Graduate School of Management
Master in Urban Management and Development

**IMPACT OF COVID-19 PANDEMIC ON
CITIZENS' TRANSPORTATION PREFERENCES:
THE CASE OF ST.PETERSBURG**

Master's Thesis by 2nd year student
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АННОТАЦИЯ

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Описание цели, задач и основных результатов	<p>Целью этого исследования стала разработка рекомендаций по корректировке транспортной политики Санкт-Петербурга на основании изменений в транспортных предпочтениях горожан в связи с пандемией Covid-19.</p> <p>Для достижения поставленной цели был проведен анализ результатов опроса жителей Санкт-Петербурга. В исследовании рассматривается, какие изменения произошли в транспортных предпочтениях граждан.</p> <p>Проанализированы причины, способствовавшие изменению транспортных предпочтений горожан. В работе предлагаются политические меры по стимулированию социально-полезных изменений и меры по сдерживанию негативных изменений, произошедших в городской мобильности Санкт-Петербурга в связи с пандемией Covid-19.</p>
Ключевые слова	транспортные предпочтения, городская мобильность, пандемия Covid-19

ABSTRACT

Master Student's Name	Bortnikova Kseniya Romanovna
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Description of the goal, tasks and main results	<p>The goal of this study was to formulate recommendations for St.Petersburg transportation policy modifications based on changes in citizens' transportation preferences due to the Covid-19 pandemic.</p> <p>To accomplish the goal this work provides analysis of St.Petersburg citizens' survey results. The study examines what changes in the transport preferences of citizens have occurred. The reasons that contributed to changes in transportation preferences were analyzed.</p> <p>The paper propose policy measures to encourage socially beneficial changes in transportation behavior and restraining measures for negative changes, occurred in St.Petersburg urban mobility due to the Covid-19 pandemic.</p>
Keywords	transportation preferences, urban mobility, the Covid-19 pandemic

ЗАЯВЛЕНИЕ О САМОСТОЯТЕЛЬНОМ ХАРАКТЕРЕ ВЫПОЛНЕНИЯ ВЫПУСКНОЙ КВАЛИФИКАЦИОННОЙ РАБОТЫ

Я, Бортникова Ксения Романовна, студентка второго курса магистратуры направления «Менеджмент», заявляю, что в моей магистерской диссертации на тему «Влияние пандемии COVID-19 на транспортные предпочтения горожан (на примере Санкт-Петербурга)», представленной в службу обеспечения программ магистратуры для последующей передачи в государственную аттестационную комиссию для публичной защиты, не содержится элементов плагиата.

Все прямые заимствования из печатных и электронных источников, а также из защищенных ранее выпускных квалификационных работ, кандидатских и докторских диссертаций имеют соответствующие ссылки.

Мне известно содержание п. 9.7.1 Правил обучения по основным образовательным программам высшего и среднего профессионального образования в СПбГУ о том, что «ВКР выполняется индивидуально каждым студентом под руководством назначенного ему научного руководителя», и п. 51 Устава федерального государственного бюджетного образовательного учреждения высшего образования «Санкт-Петербургский государственный университет» о том, что «студент подлежит отчислению из Санкт-Петербургского университета за представление курсовой или выпускной квалификационной работы, выполненной другим лицом (лицами)».



(Подпись студента)

02.06.2021 (Дата)

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I, Bornikova Kseniya Romanovna, second year master student, program «Management», state that my master thesis on the topic «Impact of Covid-19 pandemic on citizens' transportation preferences (the Case of St.Petersburg)», which is presented to the Master Office to be submitted to the Official Defense Committee for the public defense, does not contain any elements of plagiarism.

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(Student's signature)

02.06.2021 (Date)

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INTRODUCTION

In December 2019 outbreak of pneumonia was detected in Wuhan (China). Since then the spreading of coronavirus, which was named Covid-19, had happened all around the world. On the 11th of March 2020 World Health Organization has declared Covid-19 to have a status of a pandemic (WHO, 2020).

The coronavirus pandemic led to dramatic changes in everyday activities all around the world. Governments of most countries have introduced different measures to prevent rapid spread of the virus. Most of government's measures were aimed to reduce social contacts, for example, closing shops, city malls, schools, cinemas, restaurants, canceling public events and stimulating distant work and education. There is no doubt, that these measures influence day-to-day activities of citizens. Recent research show impact of Covid-19 pandemic on household activities (Beck and Hensher, 2020), shopping patterns (grocery, bulk and malls) (Li et al., 2020), outdoors activities (de Haas et al., 2020), etc.

Several studies discuss disruption of people's habits due to social distancing mandates. One of them (Sneth, 2020) claims that after crisis consumers can go back to their old habits, but it is more likely that the habits will be modified by new regulations and procedures. Previous behavioristic studies also prove the idea that habits that once were formed influence future choices (Cantillo et al., 2007). The adoption of these ideas makes it necessary to review policy approaches in many areas. First of all, due to the fact that the existing regulatory tools were formed taking into account existing habits, they will not necessarily be effective against new habits that appeared during the Covid-19 pandemic. Moreover, new habits may be desirable or negative for society. Therefore, depending on their assessment, regulators should decide whether to try to "fix" new habits or to get rid of them by returning to the before pandemic behavior.

One of spheres which is needed to be investigated for changes in people's habits is urban mobility and transportation modes. Scientific field faces a rapid growth of articles revealing great concerns about impact of pandemic on mobility issues, including public transport usage (Meena, 2020; Tan et al., 2020). Most of them claim that during the Covid-19 pandemic there has been a significant traffic decrease and a statistically proven significant influence on the transport mode choice (Przybylowski et al., 2021).

Findings of academic researchers can be also proven through data analysis and statistics, collected by several data aggregators. Most of countries face drops in car traffic (there is a statistical evidence of it, based on decrease of congestion and air pollution (Tian et al, 2021), and in public transport ridership (it also can be statistically proved by decrease of average revenue of transportation companies).

Moreover, Moovit Public Transit Index analyzes the repercussions of the Covid-19 pandemic on public transportation ridership, relative to the typical usage before the outbreak began (Figure 1). Updated daily, Moovit’s insights show the percentage of changed demand for public transit around the world. This aggregated index shows a rapid decrease of public transit usage and there is no return of the index to the before-Covid-19 state even a year after pandemic start.

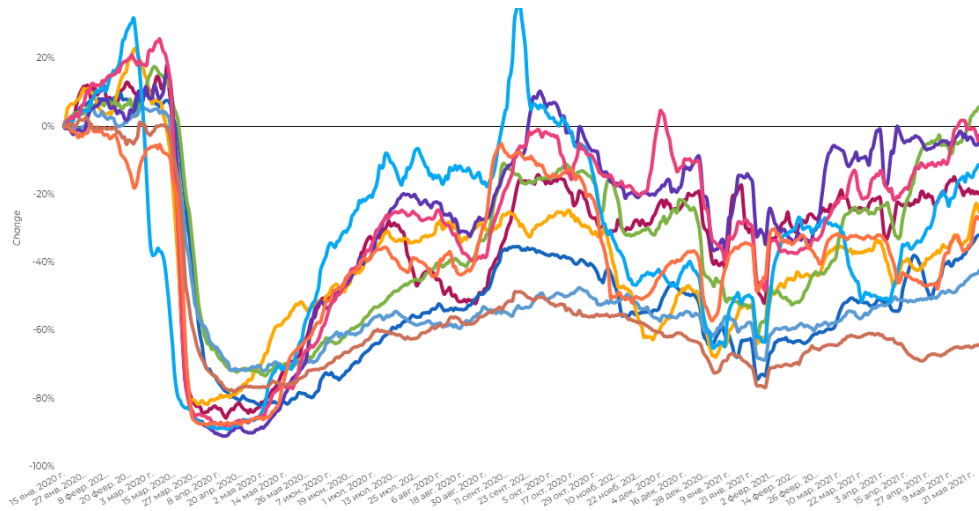


Figure 1 Statistics about worldwide public transport usage citizens compared to previous year

Source: [Moovit Public Transit Index](#) (2021)

Also, Google Mobility Data (Google, 2020) shows a substantial decrease in trips to any locations, except for trips to parks (Franchetti and Noussan, 2020).

The presence of changes in transportation behavior due to the Covid-19 pandemic raises the following points and questions for taking into account by the authorities:

- 1) Identifying whatever changes in transportation preferences have occurred among citizens. Which modes of transportation have become the most preferred and which ones are the least preferred?
- 2) Understanding the characteristics of passengers who have changed their transportation preferences. What groups of citizens often changed their usual transport behavior due to the Covid-19 pandemic?
- 3) Determining the reasons that contributed to changes in transportation preferences. What were the important factors influencing mode choice before and during the Covid-19 pandemic? What kind of switching costs are most receptive by passengers?

4) Determining which changes in transportation preferences are beneficial for the development of the urban transport system, and which of them are negative..

5) Proposing supportive initiatives to boost socially beneficial changes in transportation behavior and restraining measures for changes having negative effect on transportation.

All in all, the goal of transportation policy in case of the Covid-19 pandemic is to understand better how to cultivate and positively support switching tendencies so that can help to achieve welfare gains.

Relevance of research in St.Petersburg

These 5 determined points and questions should be investigated in case of St. Petersburg. Due to the novelty of the topic, there are no academic studies explaining the impact of the Covid-19 pandemic on changes of citizens' transportation behavior in case of St.Petersburg. However, data aggregators' information could show that some changes have occurred.

For example, Citymapper Mobility Index (Citymapper, 2020) compares requests for routings before and during the Covid-19 pandemic in the Citymapper app. According to its data, at the world's biggest cities moving citizens from one point to another have decreased by several times in 2020. St.Petersburg data also shows the same trend, citizens moved less in 2020 compared to the same time period in 2019.

However, the data about changes in the number of requests for routes by Apple (Apple, 2020) (Figure 2) shows that compared to the previous year, at some time of the pandemic duration, the mobility of citizens even increased. However, in general, during the period of the pandemic, there was a decrease in requests for routing both for cars and for walking routes. Perhaps, this can be explained by the assumption that during the pandemic, people may have stopped walking and driving on unfamiliar routes and moved mostly on familiar routine routes, for which there is no need to look for routes in app.

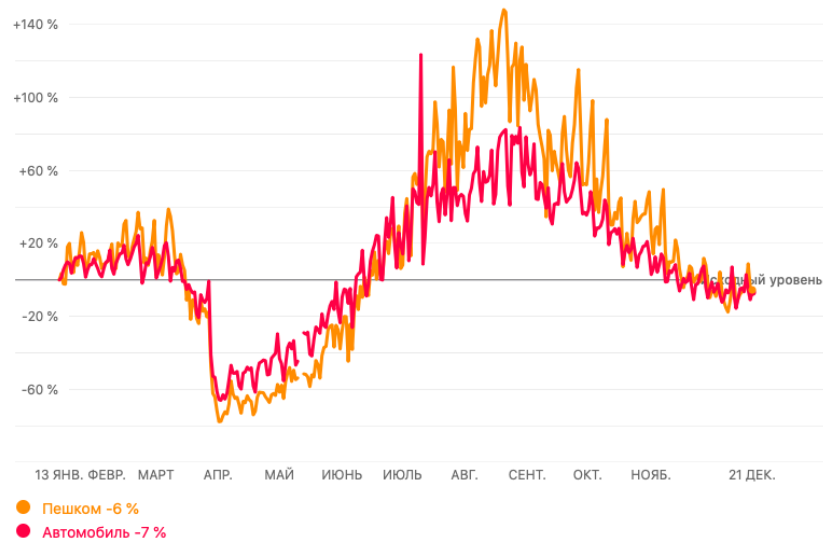


Figure 2 Statistics about requests of routing amount of St. Petersburg citizens compared to previous year

Source: [Apple \(2020\)](#)

Moreover, in case of St.Petersburg analysis of the Covid-19 pandemic impact on citizens' transportation preferences has critical importance because of city transport reform. Transport reform was supposed to start in St. Petersburg in July 2020, but delayed for 2022. It introduces basic principles of the new model of transport services for citizens – reducing duplication of routes, creating a system of uniform travel conditions, increasing carrying capacity. All in all, the reform goal is to increase the public transport demand. That is why it is needed to study how the Covid-19 pandemic affected public transport ridership also.

Here comes the research gap, this study will examine how the Covid-19 pandemic changed citizens' preferences of different transport modes and investigate what measures can support these changes or return back to previous state. This paper aims to answer two research questions: (1) How did the Covid-19 pandemic influence changes in transportation preferences in St.Petersburg? (2) What policy measures may support changes in transportation preferences which are beneficial for the development of the urban transport system and what measures may stop changes negative for urban transport system?

Goal of the study – based on changes in citizens' transportation preferences due to the Covid-19 pandemic formulate recommendations for transportation policy modifications in St. Petersburg.

Objectives:

1. Analyze scientific studies about the changes of people's behavior patterns due to the Covid-19 pandemic in different spheres.

2. Compose a questionnaire for a survey of St.Petersburg citizens for understanding changes in transportation preferences due to the Covid-19 pandemic.

3. Analyze the important factors influencing citizens' transportation preferences in St. Petersburg before and during the Covid-19 pandemic

4. Propose support measures for positive changes in citizens' transportation preferences and measures-barriers for negative changes.

Object of the study: citizens' transportation preferences.

Subject of the study: impact of the Covid-19 pandemic on citizens' transportation preferences.

Research hypothesis of this study: the situation with the Covid-19 pandemic significantly changed the preferences of citizens' transportation preferences.

Findings of this study will be useful for policy makers for improving city transport services. Study will answer policy questions about how to manage transportation needs appeared due to the Covid-19 pandemic. Also, findings about changes in transportation preferences may be highly relevant for transport policy when developing measures for expanding the possibilities for sustainable individual transport and developing concepts that strengthen public transport. These aspects are important for achieving a sustainable transport system in the medium- and long-term period despite the Covid-19 pandemic.

CHAPTER 1. THE ROLE OF THE COVID-19 PANDEMIC IN CHANGES OF CITIZEN'S PREFERENCES

1.1. Factors influencing citizens' transportation preferences

In economics, psychology and philosophy, a preference is a technical term usually used in relation to choice among different alternatives. Based on this, transportation preference is a result of choice (whether real or theoretical) between transport alternatives.

In recent years, there has been an increasing interest in understanding citizens' transportation preferences. Hauser et al. (1981) claim that a lot of attempts have been made in academic field to understand pattern of consumer's transportation behavior since late 1950s. This academic interest of diverse preferences of choosing mobility solutions was driven by desire to propose more citizens-oriented urban transportation planning, public transport services provision, and introducing novelties into current transportation system. The goal of those studies was to identify determinants of transportation alternatives demand based on system characteristics (for ex., costs, travel time, frequency) and commuter's characteristics (for ex. age, income, education).

A considerable amount of literature has been published on transportation preferences. Studies focused on identifying the determinants of mode choice have become extremely relevant last decades due to transportation systems overload, environmental issues, development of new sustainable transportation types.

Overall, recent studies generally conclude that transportation preferences are complex and are influenced by various factors (Chakrabarti, 2017; Jaehyun et al. (2020). Modern researches, for ex., Milioti&Karlaftis (2014) combine different variables for investigating transportation preferences. This study uses for modeling metro, bus, electric bus, urban rail ticket prices and combine them with such variables as unemployment rate, gasoline price, GDP per capita, population of the city, population of the country, number of motorcycle sales, number of car sales. Several studies, for example, Manoj&Verma (2015) and Buehler&Pucher (2012) add to variables list general passenger's characteristics, such as gender, age group, employment, number of cars in household and so on.

Thus, these variables can be divided into several groups:

- transport attributes (transport waiting time, trip price, travel time, transport speed etc);
- socio-demographic characteristics of the users (gender, income, age, vehicle ownership etc.);

- external factors (GDP per capita, unemployment rate, city population, number of car sales etc).

Literature review of these study will focus mostly on the analysis of relevant research output of the last 20 years, investigating impact of these 3 groups of factors on urban mobility. We will discuss key findings and methods used over two recent decades.

Impact of **transport attributes** on transportation preferences has widely investigated in literature (Table 1). As for transport waiting time, Hess et al. (2004) run a natural experiment on college students riding public transport. As a result, 84% of students who faced the choice between paying to reduce waiting time or waiting for free ride choose the free ride. Milioti&Karlaftis (2014) have found that ridership is effected by prices mostly, the biggest impact have metro ticket price and gasoline price.

The significance of trip price was also proved by Paulley et al. (2006). Also, Lane (2010) has found out impact of fuel price increase on modal shift from car to public transport. However, in case of public transport, decrease of trip costs almost has not impact on mobility (Woo et.al., 2020).

The relevance of such factor as a travel time also widely discussed in a literature. For example, Jaehyun et al. (2020) finds that rider's preferences are significantly affected by the travel time, especially when their trips include walking by foot. The same idea of importance of travel time perception for transport choice was discussed by Chowdhury&Ceder (2016), Krygsman et al. (2004). All of these papers consider that improving trip time makes transport mode more attractive to passengers in a short run. However, in case of trip time it needed to take into account access to transport. Several studies find a relationship between long distance to bus stops and user's unwillingness to choose that transport (Keijer&Rietveld, 2004).

The questions of transport reliability impact were discussed by Brakewood et al. (2015), author finds a positive effect of real-time information about public transport provided via mobile devices on public transport usage. According to study, this growing reliance and make this transport mode more preferable among citizens.

Table 1 Impact of transport mode characteristics on transportation preferences

Author	Location	Methods used	Key results
Milioti&Karlaftis (2014)	Greece	time-series modeling approach	Metro ticket price was found to be among the most significant factors affecting ridership

Table 1 (continued)

Author	Location	Methods used	Key results
Paulley et al. (2006)	United Kingdom	meta-analysis	Fares are the most influential factors on ridership
Hess et al. (2004)	USA	natural experiment	Trip price is more important than travel time for modal choice
Lane (2010)	USA	regression analysis	Increase of car costs makes public transport more attractive for citizens
Woo et.al. (2020)	China	regression analysis	Low price responsiveness of car users
Jaehyun et al. (2020)	South Korea	regression analysis	Passenger's perception of travel time has significant impact
Flondel&Vance (2011)	Germany	regression analysis	Fuel prices to have a positive influence on ridership
Chowdhury&Ceder (2016)	Worldwide	literature analysis	Reliability of transport has a positive influence on ridership
Krygsman et al. (2004)	Netherlands	regression analysis	Access time to mode of transport effects the mode choice
Keijer&Rietveld (2004)	Netherlands	descriptive analysis	Distance to a transfer location (bus stop or train station) makes this type of transport unpreferred among residents
Brakewood et al. (2015)	USA	natural experiment	Development of public transport mobile app positively effects ridership

Source: compiled by the author

Thus, much of the studies since the mid-2000s emphasizes the presence impact of transport mode characteristics on transportation preferences. Transport costs determinants are mostly named as influential factors.

As for **socio-demographic characteristics of the transport users**, several studies have proved a significant effect on ridership (Table 2). As for gender, it is contra versional determinant which impact differs in different situations. Findings of Kuhnimhof et al. (2006) show that females have a slightly higher probability of using public transport for trips other than

other transport modes. The statement that women are more dependent on public transport than men is statistically proved by Sanchez&Gonzalez (2016). Another difference between females and males in transportation behavior is number of trips. Olmo&Maeso (2014) prove that women commute more often than men. However, there is exception of work trips, where men usually perform the highest number of commuting. Moreover, Gordon et al. (1989) have found that work trips are shorter for females than for males. The reason of that difference was women necessity to allocate more time to their families. As for transport preferences, there is statistical evidence that young men use more often car sharing than young women (Caulfield&Kehoe, 2021).

There are several studies, discussing income determinants impact on ridership. Manoj&Verma (2015) have proved that the low-income group individuals have longer walk trip lengths and they travel shorter distances on other transport modes. As for high-incomed individuals, they are more likely to choose private vehicles as preferable mods (Valenzuela-Levi, 2021).

Psychological factors of users also must be considered as important determinants of transportation preferences. Some studies figure out a psychological resistance towards public transport modes of transport (Tertoolen et al.,1998). The impact of symbolic perception of car was also discussed by Beirao&Sarsfield-Cabral (2007), pleasure dependence as important determinant of car use was named by Hiscock et al. (2002).

Table 2 Impact of riders' characteristics on transportation preferences

Author	Location	Methods used	Key results
Kuhnimhof et al. (2006)	Germany	regression analysis	Gender influences the public transport usage; women choose this time pf transport more often
Olmo&Maeso (2014)	Spain	regression analysis	Different gender groups have different habits in transportation
Sanchez&Gonzalez (2016)	Spain	descriptive analysis	Significant differences between males and females commuting for work purposes
Caulfield&Kehoe (2021)	Ireland	regression analysis	Gender influences car sharing usage: men use it more often
Gordon et al (1989)	USA	regression analysis	Gender has impact on trips duration: women does not prefer long time trips

Table 2 (continued)

Author	Location	Methods used	Key results
Manoj&Verma (2015)	India	regression analysis	Low income effects transport mode choice
Valenzuela-Levi (2021)	Worldwide	descriptive analysis	High income influences tendencies for car usage
Tertoolen et al. (1998)	Netherlands	natural experiment	Personal attitude to car usage plays crucial role
Beirao&Sarsfield-Cabral (2007)	Portugal	regression analysis	Personal perception of car usage influences the mode choice
Hiscock et al. (2002)	Scotland	descriptive analysis	Pleasure of transport usage influence car choice as a dominant mode of transport

Source: compiled by the author

To sum up, different rider's characteristics were explained in a literature as significant factors of transportation preferences establishment. Among them there are such determinants as gender status, income, psychological attitude.

All in all, there are a lot of studies about different factors influencing transportation preferences in different countries. Thus, living in a particular country can also be significant in the formation of certain transportation preferences. If we take a deeper look, in general, surrounding environment can be matter for the individual, who makes the transport mode choice. The formation of his preferences can be influenced by any event that happened outside, which he cannot influence. For example, these events may be some kind of accidents and crashes, natural disasters, weather phenomenon, infrastructure failures or new transport modes inventions, etc. Usually, these events may lead to supply reduction of one of urban transportation modes, thus with a high probability led to changes in transportation preferences in favor to another modes.

These events in environment in academic literature are grouped into one, and named as **external factors** influencing transportation preferences. This group may also include some specific area characteristics (for example, GDP, population, unemployment rate etc.) (Milioti&Karlaftis, 2014; Buehler&Pucher, 2012). However, there is still lack of consensus in the academic literature on whether it is necessary to take into account changes in external environment or not. This is true, because in some cases, it is very difficult to trace the direct influence of a such factors on choices.

Despite the skepticism, there is a large volume of published studies describing the role of external factors on transportation preferences changes. Table 3 summarizes research output, which show the significance of such external factors as area population, terrorist attacks, extreme weather, infrastructure closure, informational agenda and new types of transport spread.

Impact of terrorist attack on urban mobility was proved by López-Rousseau (2005). This study identifies Madrid accident of train bombing as the major causes of train usage decrease. Aim of this work were investigate what effect does the terrorist attack has on citizens' transportation patterns. Study compares Madrid accident with airplane attacks of 2001 in USA, when a lot of Americans reduce their air travels for a long time after. As for Madrid attack the decrease of train usage was shorter, train trips reduced for approximately 2 months. Author also investigate highway traffic to approve hypothesis of car trips as a substitution. However, there was no corresponding increase in road traffic, there was a decrease. All in all, bombing influence the train usage for a short time, however, a mode substitute was not revealed.

However, some researchers argue that sometimes changes in external environment may lead to irreversible changes in transportation behavior. For example, Marsden et al. (2016) use as an object of study a situation with Forth road bridge closure in United Kingdom. Due to changes occurred, 8% of travelers reported being never or very unlikely to return to their previous frequency of travel even after bridge reopening. This example shows that changes in external environment may lead to durable changes in transportation behavior.

According to research output, weather conditions must also be considered as influential factors on urban mobility. Due to weather-related hazards city areas transport networks become especially vulnerable, which can cause changes in citizens' transportation preferences (Pregolato et al., 2017). This view is supported by He et al. (2021). This study has mainly been interested in questions concerning flood impact on main factors for mode choice. The findings show that flood disruptions make citizens transport choice depend mostly on travel time, because of citizens' perception of work delay danger. Thus, external events may also change mode choice criteria.

Nowadays agenda also plays an important role of constructing transportation preferences. People concerns about climate change can make environmental modes of transport more preferable. On the city level this external agenda about danger CO² emission may influence an increase in citizens' interest in shared mobility (Fanglei et al., 2020). However, Cohen&Higham (2011) find that knowledge about negative impact of airplanes on the environment does not change the preferences of citizens to use airplanes for travel. According to study, people in developed countries as Norway, UK, Germany, Australia are generally aware of the impact but do not want to change their transport preferences at all, due to the importance of such factors as

speed and ease of travel. Thus, agenda may have controversial impact: in some cases, people may be sensitive to agenda, but in some cases, they are not ready to changes in their habits due to society common claims.

Appearance of new types of transport may also considered as an external event influencing transportation preferences. Thus, May et al. (2020) discusses potential negative consequences of automated cars on urban transport. Study argues that automated cars spread will increase traffic levels and stimulate urban sprawl substantially. Another negative impact concerns public transport and individual mobility. Author predicts that rapid increase of automated cars will cause public transport usage fall by 18%, walking and cycling usage by 13% by 2050. According to this study, these expected changes in transportation preferences need to be responded by current transportation policy.

Table 3 Impact of external factors influencing transport preferences

Article	Location	Methods used	Influencing transport preferences external factors	Key results
Buehler&Pucher, (2012)	USA, Germany	regression analysis	area population per km ²	Population density effects the frequency of public transport riding
López-Rousseau (2005)	Spain	descriptive analysis	accident with train bombing	Accident was significant for mode choices and lead to decrease in the train choice for transportation
He et al. (2021)	United Kingdom	descriptive analysis	flood disruptions	External factors influence importance of travel time determinant
Marsden G. et al. (2016)	United Kingdom	descriptive analysis	road bridge closure	External factor was significant for mode choices and lead to reduce bridge use
Fanglei et al. (2020)	China	regression analysis	environmental agenda	External factor was significant for mode choices and lead to increase of citizens shared mobility usage

Table 3 (continued)

Article	Location	Methods used	Influencing transport preferences external factors	Key results
Cohen&Higham (2011)	Norway, UK, Germany, Australia	qualitative analysis	environmental agenda	External factor was not significant for mode choices
May et al. (2020)	Worldwide	foresight method	spread of automated cars	Spread of automated cars negatively effects choice of public transport and bicycles

Source: compiled by the author

Taken together, these studies support the idea that changes in external environment may lead to corresponding changes in transportation preferences. In this case the question of preferences' persistence may occur due to transportation system stability issues. Some of researchers claim that transportation preferences have proven to be resistant to changes (Tsafarakis, et al., 2019), others sure that they are capable of rapid change and adaptation. Several studies even find a gender difference of external changes coping. For example, Sanchez&Gonzalez (2016) point out that men's transport choice much more resistant to any changes in environment than in the case of women preferences. Study found that women have a greater sensitivity to changes in transport schedule.

In any case, the question of resilience to external changes of any gender opens up an important discussion about the possibility of changes in behavior or the possibility of return to typical behavior from the past. Here comes the research gap – almost no articles explain how to return people to transportation preferences that existed before external environmental changes. And also, it is needed to be explain what transportation policy measures may support changes occurred.

To sum up, all of the studies reviewed at this paragraph support the notion that the topic of the transport preferences has been studied for a long time in the scientific literature. Transportation users have diverse mobility needs and thus different preferences on how to meet those needs. There are differences in determinants of these preferences between different countries, although there are some general patterns. By applying different research methods, modern studies from different countries conclude that both transport attributes (such as transport

waiting time, trip price, travel time etc) and socio-demographic characteristics of the users (gender, income, attitudes etc.) may influence transportation preferences significantly.

The results of a study of the influence of external factors on transport preferences seem to be especially interesting. These studies may be particularly relevant in the context of the impact of the Covid-19 pandemic. The spread of these disease may be considered not only as a serious global problem, but also as one of external changes, which may cause changes in citizens' transportation preferences.

The next paragraph will be devoted to analyzing the impact of the pandemic - first on different areas of life, and then on urban mobility.

1.2. Impact of the Covid-19 pandemic on behavior patterns in different spheres

Governments of the most countries have been introducing different measures to prevent rapid spread of the virus. Several countries (Great Britain, Italy, France, etc.) had implemented national lockdowns, which led to reduction of most of outdoor activities and reasons to leave home. In some countries lockdowns were introduced several times depending on significant increase of sick people and based on medical infrastructure capacity. However, other countries, for example, Sweden have not introduced strict measures, and did not bound people's motions. The effectiveness and correctness of a particular approach is a subject for discussion to this day.

Modern academic output shows that governments' restrictive measures with lockdowns and social distancing mandates have disrupted the people behavior in different spheres. The Covid-19 pandemic is seen as a crisis phenomenon that destroys the context and the usual course of things.

According to Sneth (2020), in case of people's behavior, changes in context matter more than acquired habits. All in all, people's behavior is more contextual rather than habitual. Based on the case of consumption this article investigates context factors which can dramatically change habits. These context factors which can disrupt consumer habits are divided into 4 groups:

- 1) changes in the social context (for ex., migration to another city, life events as marriage, divorce, having children, etc.);
- 2) inventions in technology (any technological breakthrough breaks the old habits. It can be seen on e-commerce emergence example);
- 3) changes in rules and regulations (the simplest example is quitting smoking due to impossibility to smoke in public places due to law)
- 4) appearance of natural diseases (for ex. hurricanes, earthquakes, and the Covid-19 pandemic which we are experiencing today, etc.)

Author said that last type of factors has more significant influence due to less predictability.

In conditions of uncertainty, people tend to improvise and choose solutions to their problems that were not typical for them before. They lean new habits which can last during long period of time. The idea that individual's choices are adaptive comes from behavioristic approach. The question occurs on the durability of this effect. Some of scholars claim that once after a shock or a crisis most habits will return back to normal. However, some switches can occur, for example, if person once tries services as Uber which is more friendly than calling a taxi service, they likely will never come back to their previous habits (Sabouri et al., 2020).

However, it is necessary to admit, that the situation of new habit acceptance is possible then costs of switching to it are not so high for a person.

The Covid-19 pandemic is suggested as one of external factors which can causes major societal shifts. Most of articles conclude about temporal effects of pandemic on people’s patterns (Reeves et al., 2020). Studies infer that the main question is not only about the duration of the pandemic effects, but also about the potential range of changes. Historically, we know some cases when crises fundamentally reshaped people’s behaviors and beliefs. The great example can be the Black Death, which causes 25-30 million deaths in 14th century. Some of scholars associated the end of Black Death as a new era of European history. They claim that it causes the end of serfdom and feudalism and the begging of Enlightenment (Scheidel, 2017). Thus, the time of crisis phenomena can be considered as a period when the most important changes occur, leading to the acceleration of the development of society. This thought is mentioned and by Graham&Thrift (2007), who claim that periods of disruption are times when greatest innovations occur.

However, due to the fact that a little time have passed, today it is too early to say that the Covid-19 pandemic will lead us to a new era and our life will never be the same. Nevertheless, it is difficult to deny the presence of changes that can tend to become entrenched in people’s behavior. A lot of research and statistics indicate that changes are taking place. Table 4 summarizes research findings about unusual patterns of behavior due to the Covid-19 pandemic.

Table 4 Research findings on changes in behavior patterns due to the Covid-19 pandemic

Authors	Sphere of changes	Changes in behavior patterns
Rogers (2020)	Consumption	People make their future purchase decisions strongly influenced by how brands respond to the pandemic.
Olson (2020)	Medicine	People started to more often consultate with doctors online, more individuals and firms buy subscription to medical apps.
He&Harris, (2020)	Ethics	Ethical aspect of decision-making process has become more important during the pandemic. This change has shifted consumers towards more responsible and prosocial consumption. Firms and organizations mirrored the changes and adjusted their CSR activities accordingly.

Table 4 (continued)

Authors	Sphere of changes	Changes in behavior patterns
Huang et al. (2020)	Housing market	People temporarily suspended real estate transactions due to a drop in permanent income and the inability to be sure of income sources.
Gloster et al. (2020)	Mental health	People are more likely to feel anxiety, especially about their health. Mental health of people with loss of income or inability to get basic supplies was affected more often.
Sheth J. (2020)	Shopping	People have become more critical for shopping, just online shopping is not enough, the choice was often given in favor of customized and convenient online stores.

Source: compiled by the author

Thus, the changes cover a wide variety of areas. However, the question arises how long people will adapt and accept these changes. Kirk et al. (2020) presented 3 phases acceptance of changes made by Covid-19:

1) reacting. This phase links to first reaction to change, for example, hoarding behavior of people exacerbated by crisis supply chain disruptions. At this stage, person makes decisions quickly and emotionally.

2) coping. On this phase people try to find product or service which can help to cope with uncertain reality. A good example can be Zoom as a service to maintain social connectedness in a time social distance.

3) adapting. This phase comes as people cope with pandemic, then innovations and changes were adopted. In the Covid-19 pandemic case this adaptation lasted for less time than in other situations. For example, social media, television, and other transformational technologies often took years to overcome substantial consumer resistance and to achieve widespread adoption. In case of the Covid-19 pandemic, it has compressed an adoption curve and has catalyzed innovation acceptance. According to author, as peoples adapt to the new normal, it can lead to long-lasting positive outcomes. So, this phase demonstrates potentially transformative changes in behavior and individual and social identity.

In case of our country, we can say that people are at the stage of adapting on the Covid-19 pandemic. It cannot be denied that changes in behavior have occurred (Accounts Chamber of the Russian Federation, 2021). Some of them are positive for society, others – negative. But it is necessary to understand how to make people to maintain positive and socially-beneficial changes

in post-Covid-19 conditions. For example, there are several studies proving transformation of user behavior patterns of bike sharing trials during the Covid-19 pandemic (Shang et al., 2021). In this case, the main question is how to stimulate people to «fix» their new transportation preferences and make them continue to use bicycles even after the Covid-19 pandemic.

All in all, understanding of changes in patterns is needed from both a research and policy point of view. We need to assess how people respond to such externality as pandemic and how to preserve positive for society changes and restrain negative changes.

Next, we will discuss the changes that have taken place in the field of urban mobility. In case of that field this understanding is important for adjusting current transport planning and for planning interventions during any similar future disruption. Analysis of changes in transportation preferences is also important for forecasting future demands of different transport modes and for strategical planning of largest urban agglomerations transportation systems. Quantifying these changes is needed to understand potential longer term shifts, since changes in preferences arising from external factors, can persist for a long time and transform to a new attitude to different forms of transport.

Importance of studying impact of Covid-19 on urban mobility

Nowadays it is quite clear that the transport system plays an important role in the development of cities. Well-developed transportation system influences the growth of economic growth, tourism, business and logistics, trade, and of course it increases mobility of citizens. Different researches have proven the impact of investments in the transport infrastructure on economic growth on areas (Aghion and Howitt (1998), Barro and Sala-i-Martin (1995)). Recent research have broaded this concept and included not only physical transport infrastructure to the factors which influence different areas economic growth, but also included efficiency of the whole transportation system (use of modern rolling stock, high quality human capital working at transport sphere, intelligent transport systems, ICT applications etc) (Kozlak, 2017). That is why understanding ways of improving transportation system is one of the main stages for stimulating the socio-economic development.

In the context of impact of the Covid-19 pandemic on urban mobility, it is important to assess what changes have occurred in order to intervene to change negative trends (for example, a decrease in the use of public transport, increase of car usage) and support positive changes (for example, increase of bicycles or scooters usage).

According to Griffiths et al., 2021 the Covid-19 pandemic should be considered as a driver for authorities to support and encourage sustainable transportation shift. Governments all

over the world facing challenges which they can use as a chance to develop more smart and environmental urban mobility.

Several studies have already found out the preliminary impact of Covid-19 on transportation preferences, which should be taking into account by authorities. Table 5 summarizes research finding about changes in behavior due to the Covid-19 pandemic.

Table Impact of the Covid-19 pandemic on transportation preferences

Authors	Country	Sphere of changes	Findings about COVID-19 impact
Eisenmann et al. (2021)	Germany	Transportation	Public transport lost ground during pandemic while individual modes of transport, especially the private car, became more important.
Bhaduri et al. (2020)	India	Transportation	Changes in transport behavior was explained by commitment to slow down the spread of virus
De Vos (2020)	Belgium	Transportation	Empirical proved that social distance measures led to reducing usage of public transport
Shang et al. (2021)	China	Transportation	Rapid increase of bike sharing behavior
Dong et al. (2021)	China	Transportation	Decrease of public transport usage due to psychological feelings of unsafety.
Circella (2021)	USA	Transportation	People who have well-paid jobs were more likely to reduced their public transport travel during pandemic, while lower income workers were more likely to continue to travel as they used before.
Molloy et al. (2020)	Switzerland	Transportation	Outflow from public transport to private cars and to some extent bikes
Beck et al. (2020)	Australia	Transportation	Tendency of shifting to private cars for job trips
Jenelius& Cabecauer, (2020)	Sweden	Transportation	Month ticket sales on public transport decrease rapidly, however 1-day tickets sales grow

Source: compiled by the author

Thus, there are various studies investigating changes in behavior patterns in different spheres, especially in transport behavior due to the Covid-19 pandemic. Literature review (Griffiths et al., 2021; show that changes in external environment may influence transportation habits and enforce establishing new ones. Most of them prove modal shifts, current increase in car use and decrease in the use of alternatives, raise of shared modes of transportation usage.

However, first of all, it is needed to assess which modal shifts due to the Covid-19 pandemic are beneficial for urban transportation development and which may lead to negative effects, based on environmental issues, health issues, social issues etc. The next paragraph will be devoted to the analysis of the determinants of the modal shift and determining the benefits of different modal shifts for the transport system development.

1.3. Changes in mode choice determinants

There is an opinion in scientific field that transportation preferences tend to become more habitual than it used before (Thogersen, 2009). Usually, habits are formed when persons' behavior is frequently repeated in a stable context and leads to rewarding outcomes (Ouellette&Wood, 1998), which is true for most everyday travel mode choices (Thogersen, 2006). Travel mode choices driven by habits may deviate from the person's expressed intentions and economical profits. As a consequence, when performing repetitive behaviors, people tend to ignore new information even though it could be highly relevant for their choices (Aarts et al., 1997). Such deviation is usually in the direction of a higher use of private cars and a lower use of public transport, walking, bicycling (Verplanken et al., 1998).

Ronis et al. (1989) sure that for changing habitual behavior and stimulate modal shift there is need to create conditions that make the automatic execution of the habit impossible or unattractive. These conditions that can contribute to the modal shift are one of the main questions in the context of urban mobility research. In academic literature, there is a large volume of published studies describing the determinants of modal shift, but before review it, let us qlrify what do we mean by this term.

Modal shift – is a switch from a given transport mode to another, as a result of a modified choice. The mechanism underlying modal shift is considering whether a transport mode becomes more advantageous than another (for different sets of reasons) over the same route or in the same market (Pastori et al., 2018). All in all, it is driven by changes in transportation preferences. Also modal shift largely depends on available transport alternatives in a given local context (Kroesen, 2017). To sum up, modal choice is a complex process of decision-making, determined by a wide range of factors coming from different fields, such as geography, sociology, psychology and economy.

The issue of modal shift from private cars has become of increasing concern to local governments all over the world due to congestion and air pollution (Kii et. al., 2005), traffic jams, noise (Nikitas, 2018; Morton, 2018) and other problems caused by rapid cars increase. Also the need of car-users modal shift connects to health issues, because lack of physical activity is mentioned as perhaps the most important public health problem of the 21st century (Blair, 2009). Also several studies prove governmental cost saving for health care system due to citizens' shift to walking and bicycles (Bassett et., 2020).

The modal shift from private vehicles is of high importance problem in most of EU countries, which face annual growth of passenger cars per thousand inhabitants. Countries with highest number of cars per thousand citizens are Luxembourg – 676, Italy – 646, Cyprus and

Finland – 629. Counties with the lowest number are Latvia with 369 cars and Romania with 332 (Eurostat, 2018). And this numbers will have a tendency to grow because private car is a normal good according to economic theory (its demand increases when the income of population rises). Contrariwise, usage of public transport modes as a good has a negative income elasticity of demand (demand increases with income growth) (Mankiv et al.,2006).

Changes in routine mode choices are often the results of a complex process that can take place consciously or unconsciously and which includes both objective and subjective determinants. Objective determinants can typically be identified quantitatively, while subjective ones are qualitative (De Witte et al., 2013). Previous theoretical output shows that there are several factors which can influence a citizen’s modal shift from private cars towards public transport. Several factors which are important for citizens for decision about changes of transport modes can be divided into 2 groups (Figure 3).

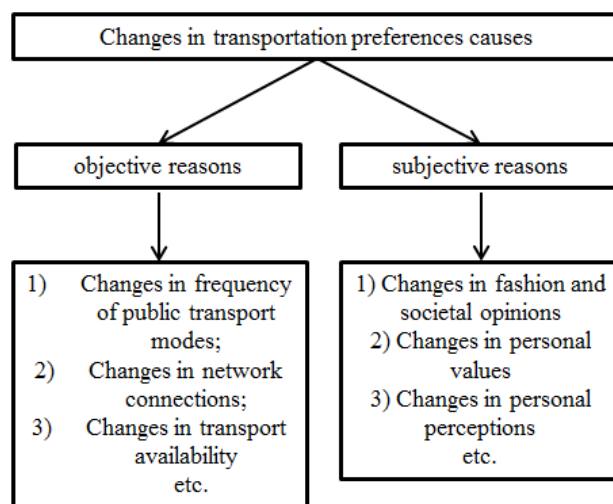


Figure 3 Causes of changes in transportation preferences

Source: compiled by the author

- *objective reasons of changes in transportation preferences*

First group of them are objective reasons which are taken into account for making changes in transportation preferences. This group of factors cannot be influenced by citizens. According to Redman et al. (2013) these factors are: changes in availability of public transport stops; changes in network of connections; changes in frequency of public transport modes etc. This list can be expanded by deterioration or improvement of traffic conditions in a particular area; increase or decrease of distance between home and destination point. Moreover, personal characteristics of users can be added to this group of objective reasons (for example, such changes as switching to remote work, changing income, losing a job, retiring, etc.). Each of these factors can make a person to reconsider their transportation preferences

- *subjective reasons of changes in transportation preferences*

Second group of mode choice factors consists of psychological ones. Several studies prove that perception of a specific transport mode is more important than economic factors. These factors can be grouped into the following:

1) fashion and societal factors

Changes in people's opinions about the status of a person using a particular type of transport also can be significant to modal shift choice. Several studies show the importance of symbolic component of car ownership. Choice of car as a mode of transport based on willing to show social status and having a high level of income (Steg, 2007).

However, recent studies show that changes in collective consciousness occur. Metz (2013) and Newman&Kenworthy (2015) claim that symbolism of the car is slowly changing and it is no longer perceived as a status symbol. Moreover, there are some studies showing that drive a car is longer seen as a source of pleasure (McDonald, 2015). Perhaps, these changes in social opinion may make cars less preferable in the future.

2) personal values

For example, rapid dissemination of ecological thinking and increase of sensitivity to environmental damage can force modal shift from private cars (Mikki et al., 2012; Anable, 2005). Another example could be the increasing importance the values of individualism for a person, which can make modal shift difficult. (Ashmore, 2020).

3) personal perceptions of different transport modes

This factor includes the endowment of a particular transport with characteristics in different dimensions. One of them could be feeling of security – Currie&Delbosc (2013) show that passengers feel themselves unsafely when they travel with unknown people in public transport. According to Redman (2013), this list of transport mode perceptions also includes such factors as sense of comfort and convenience. Thus, changing the users' perceptions of these factors can lead to corresponding changes in preferences.

In the scientific literature there are a lot of studies about factors affecting the changes in transportation preferences. The summary of the articles studied is presented in Table 6. Various research methods are used to understand citizens' preferences in field of transportation, such as in-depth interviews (De Witte et al., 2006), mass surveys (Dell'Olio et al., 2011), processing of travel data (Strömngren et al., 2020), field experiments (Trogersen&Moller, 2008; Fujii S. et al., 2001).

Some of them investigate how to make public transport more preferable (Mohammad et al., 2013), others explore how to increase modal shift to individual mobility (Cherry C. et al., 2016). Most of researches focus on marginal level of car costs for making a switch to other modes (Kingham et al., 2001), studying the impact of public transport fares reduction (Baum,

1973). Main results of studies demonstrate that people would switch from private cars then benefits of other transportation modes become clearer. Expected benefits include possibility to plan routes and travel time, comfort, safety, decrease of transport waiting time etc.

As for trip price impact on changes in transportation preferences studies show contradictive results. De Witte et al. (2006) have proved that making public transport free was not considered as important factor for modal shift. This view is supported by Mohammad et al. (2013) findings, which show that reducing travel time and cost of public transport are factors which motivate private vehicle users to change their preferences.

Conversely, Baum (1973) reported significant importance of trip price factor. According to his data, 47% of car-users would use public transport if they were paid 30 cents for each journey. Quite similar experiment was conducted by Trogersen&Moller (2009), who give free one-month card for public transport to car-users. Results shows that fare elimination had insignificant impact on car users' use of public transport. However, when the free period had stopped, the use of public transport fell back to the previous level.

As for travel time impact Fujii et al. (2001) experiment with free cards for public transport results show that travel time is more important for car-users than the cost of the trip. In the same vein, Tarabay&Abou-Zeid (2020) have found that the important factor for car users in favor of switching to taxi is increase of parking search time. Moreover, trip price was also significant to them; car drivers were ready to switch to taxi if increase of parking fees from actual prices occurs.

Some authors have mainly been interested in transport waiting time determinant impact assessment. Dell'Olio et al. (2011) argue that potential users define waiting time, journey time and level of occupancy as the most important points of improvement in public transport. They will be ready to modal shift if these issues were solved. Similarly, Strömgren et al. (2020) prove this idea in context of individual mobility modes. Their survey points out that modal shift to bicycles depends on reduction of average commuting distance and duration of traveling.

As for comfort determinant, Kingham et al. (2001) find that convenient seats in public transport and convenient stops are the main factors that would encourage citizens to change their transportation preferences in favor of public transport.

Table 6 Factors influencing changes in transportation preferences

Author	Location (country/city)	Sample size (number of respondents)	Key findings about factors influencing changes in transportation preferences
Kingham et al. (2001)	England, Hertfordshire	320	Trip price factor was not significant; comfort and travel time were significant
Mohammad et al. (2013)	Malaysia, Bandar Baru Bangi	151	Trip price and travel time were significant
Dell'Olio et al. (2011)	Spain, Santander	864	Transport waiting time and travel time were significant
De Witte et al. (2006)	Belgium, Brussels	1276	Trip price factor was not significant
Baum (1973)	USA, Chicago	400	Trip price factor was significant
Strömngren et al. (2020)	Sweden, Stockholm	1240	Transport waiting time and travel time were significant
Trogersen&Moller (2009)	Denmark, Copenhagen	597	Trip price factor was not significant
Fujii et al. (2001)	Japan, Kyoto	335	Trip price factor was not significant
Tarabay&Abou-Zeid (2020)	Lebanon, Beirut	400	Trip price and travel time were significant

Source: compiled by the author

All in all, a lot of possible determinants influencing changes in transportation preferences are discussed in the literature. In an academic field, stimulating modal shift from private vehicles

to other alternatives is considered the most important challenge in terms of ecology, health, and traffic and transport system overload. The most beneficial shifts are considered to be public transport and individual personal mobility shifts.

And investigating the factors that influence the choice of the preferred travel mode is important for understanding how change in the citizens' mode choice behavior can best be achieved. And with that understanding policy makers can provide appropriate interventions to stimulate their behaviors.

1.4. Transport passengers' switching costs

Citizens' preferences of choosing certain services or products, to the detriment of its analogs and similar goods, reflects the consumer's behavior on the variety of options available. The problem of consumer choice based on available alternatives is associated in economic theory with the concept of switching costs. This term means psychological and economic costs that the consumer may deal with when switch supplier or service company (Klemperer, 1987). The switching costs are assumed by the user before or at the same time when the substitute can provide its benefits (Dikolli et al., 2007).

Klember (1995) claim that usually people avoid switching alternatives not due to their habits, but because their previous investments in one of alternative. These investments can be physical (for ex. purchase special equipment), informational (for ex. time for searching information about preferred alternative), psychological (addiction to service or self-association with the service). All these investments lead to several groups of switching costs which are needed to overcome for making decision of switching to new one alternative:

1) Need for compatibility with existing equipment

In this instance switching costs result from a consumer's desire for compatibility between his current purchase and previous investments. Different parts of one system should be compatible, like cameras should be compatible with their lenses. In the case of transport, this type of switching costs may be associated with purchase of travel cards for a certain type of transport, which makes it difficult for the user to switch to another one. In addition, as an example, the need to use a bank card, then the user will choose the types of transport on which such payment will be possible.

2) Transaction costs of switching alternatives

People evaluate not only the benefits of alternatives, but also pay attention on transaction costs. For example, two mobile operators can provide similar tariffs, but one of them requires high transaction cost to open or close account. Transportation market also has similar examples. For instance, using public transport means that person is able to spend time to go to the ticket office to buy a ticket, which is often over-crowded, while taxi aggregators offer a one-click service.

3) Cost of learning how to deal with new alternatives

Consumer who invested his time to learn how to use alternative would prefer to continue use the same well-known service. In the case of transport, there is a need of time for adoption when new modes of transport appear, for example, car sharing or shared-ride taxi (Sfeir et al., 2020).

4) Uncertainty about quality of new alternatives

Consumers prefer to re-use services if they are quite sure about their quality. They would rather to pay more to be guaranteed in quality of experienced service.

5) Discount coupons

This method of keeping the client from switching is often used in transportation sphere. For example, taxi aggregators enroll passengers in frequent-user programs that reward them for repeating travels. It is also used in public transport through the system of travel tickets, where an increase in the number of trips low one trip cost.

6) Psychological cost of switching, or non-economic brand loyalty

These are costs based not on identifiable economic reasons but on adherence to product of service. There is evidence in psychological science that people make choices in favor of products and services that they have previously chosen to reduce cognitive dissonance (Brehm, 1956). An example of such costs in the field of transportation can be car-drivers who are pensioned to their cars and will not change them for other modes of transport in any circumstances (Gardner&Abraham, 2007).

This switching costs theory may be used by authorizes to propose appropriate police measures, which will stimulate modal shift or fix existing transportation preferences. Thus, policy measures may be connected to:

- making switching costs lower

The aim of this measure – to reduce switching costs of beneficial alternative and to provide additional benefits of modal shift to it. For example, to encourage people give up the car usage, policymakers need to reduce their costs of switching to public transport, for example, by providing high travel comfort or ensuring low waiting time for public transport.

- making switching costs higher

The aim of such measures – is to introduce additional costs for modal shift. These measures can be used to prevent changes in transport preferences that have already been formed. These measures are used to maintain positive behavior. For example, to prevent individual modes of transport users (such as scooters and bicycles users) from switching to a car usage. To do this, policymakers can make the costs of switching higher by developing special bike paths, improving the road surface, increasing amount of parking slots for bicycles and scooters.

Understanding both possible stimulating and restrictive measures is needed to propose supportive initiatives to boost socially beneficial changes in transportation behavior and restraining measures for changes, which have negative effect on transportation. In the next paragraph, we will discuss transportation policy measures which can affect transportation preferences.

Methods of transport policy in favor or against modal shift

Scientists are sure that transportation preferences are changeable by appropriate police measures (Heinen and Chatterjee, 2015). Decision-makers need to understand better how to cultivate and positively support switching tendencies from private cars so that they can occur whilst simultaneously achieving welfare gains.

Thogersen (2006) claim that for changing and influencing passengers' preferences 3 areas should be taken into account by policy makers:

- 1) volitional features (such as the traveler's motives, evaluations, perceptions, individual abilities);
- 2) contextual opportunities (for ex., availability of transportation mode alternatives);
- 3) individual or habitual features (these factors are partly determined by individual (for ex., transport habits, car ownership).

Contextual changes are said to be one of ways stimulating changes in transportations preferences (Mardsen et al., 2020). As we have discussed above, the Covid-19 pandemic may also be considered as a such event which may have an appropriate influence to transportation preferences.

However, Covid-19 pandemic should not be considered as changeable event which will take us on a more sustainable transition pathway per se. Mardsen et al. (2020) sure that learning from adaptation during disruption could be the basis for designing new interventions that reconfigure the mobility system in more sustainable and welfare enhancing ways. These opinions also support Griffiths et al. (2021), who study impact of Covid-19 crisis to transportation sector. As conclusion scientists come up with the idea that the time of pandemic is the best for policy responses aimed to stimulate a sustainable mobility transition that mitigates the potential for long-term environmental damage.

In this case the goal of transport policy is to support preferences formation when this preference is socially beneficial and approved. On the other hand, there is also the goal of breaking pandemic preferences established during the Covid-19 pandemic that are not beneficial for society. In this case, it is necessary to determine what measures can be applied to change habits.

Several studies investigate outcomes of restrictive policy measures in field of modal shift. Measures may be connected to transport pricing policies: for ex. increasing fuel prices (Bernard et al., 2013; Donovan et al., 2008), parking pricing (Schlag, 1997), carbon tax tariff (AIE, 2014); public transport ticket prices (Baum, 1973). There are also restrictive measures connected to slower car journeys (Wiel, 2002), toll for city centre access; measures are those which influence the individual choice between modes (e.g. improving station access time (CEREMA, 2015),

improving bus and rail schemes, encouraging walking and bicycling (Gaffon, 2003) etc. All in all, the list of possible policy options is quite big. And the idea of our study approach is to use switching cost theory to propose such measures which will be most perceptible by passengers. In the following paragraphs, we will describe in details what changes in transport preferences in St.Petersburg have occurred and offer policy measures which low or high switching costs for users.

To sum up the output of first chapter, we found out that Covid-19 pandemic can act as a driver for changing citizens' behavior in different spheres and especially in transportation. In this context, it is necessary to consider Covid-19 pandemic not just as a crisis phenomenon, which by itself will change the transport behavior to a more beneficial one for society. Decision makers need to support or slow down the pace of change by introducing appropriate measures. It is necessary to assess what shifts have already occurred, and identify measures to maintain and stimulate beneficial for society shifts in transport behavior. In case that there have been shifts that are unfavorable for the development of the cities' transport system, the authorities need to determine measures that stimulate a return to before-Covid-19 behavior. The next paragraph will be devoted to the study of shifts in transport behavior that have occurred in St. Petersburg due to the Covid-19 pandemic.

CHAPTER 2. EMPIRICAL STUDY OF THE COVID-19 PANDEMIC IMPACT ON CHANGES IN CITIZENS' TRANSPORTATION PREFERENCES

2.1. Description of research methods, collected data and sample

As was mentioned above, the main goal of the study – is to formulate recommendations for transportation policy modifications based on changes in citizens' transportation preferences due to the Covid-19 pandemic. In order to achieve this goal several steps of research need to be applied (Figure 4).

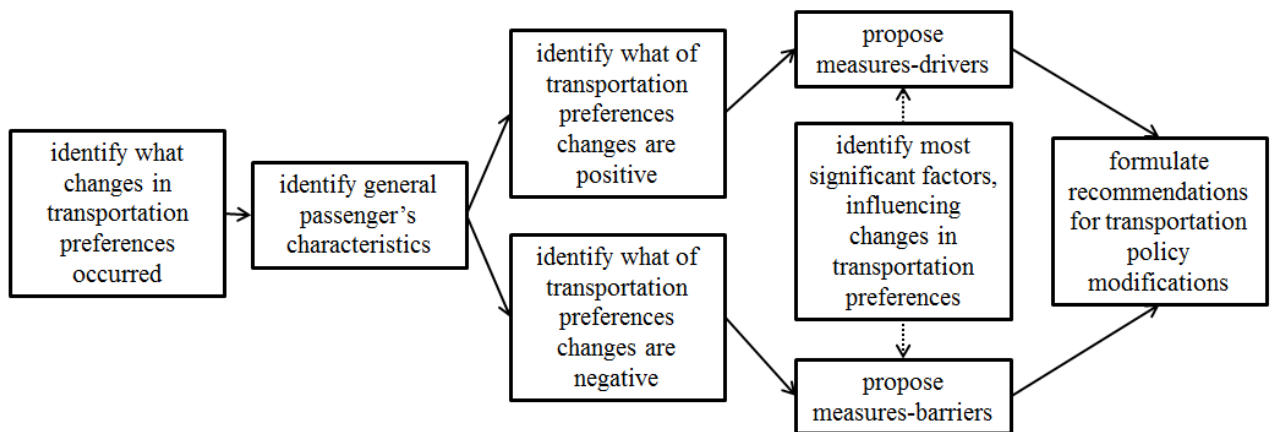


Figure 4 Research design

Source: compiled by the author

Firstly, study investigates what changes have occurred in transportation preferences. Secondly, it identifies socio-demographic characteristics of the users, who have exactly changed their transportation preferences. Next step it compares which changes are beneficial for urban transportation system and which are not, based on criteria of environmental friendliness, public health issues, and transportation system load. After that, we consider what factors were the most significant for transport choice of different groups. Next step, using findings about influential factors, we look for stimulating switching costs in order to support beneficial changes and restrictive to avoid spread of negative ones. Finally, based on switching costs we come up with recommendations for transportation policy modifications.

The research logic was considered as a basis of our empirical study. We run an online-survey in order to compare transport preferences before the Covid-19 pandemic and during the pandemic spread in St. Petersburg.

Our survey was conducted among the individuals-owners of private cars and individuals without private cars in their households. The survey was conducted from 8 November 2020 to 30 March 2021 via GoogleForms. The poll was spread on the VKontakte social network in groups of St. Petersburg districts. The choice in favor of the Internet survey was made due to the pandemic limitations, ease of data collection and research costs limitations.

As a result, we engaged 340 respondents; however, due to formal errors (incomplete answers or inappropriate cities), the number of received surveys was 255. So, these survey questionnaires were ultimately subject to analysis.

Our questionnaire began with a general introduction in the aims of the study, usage of results, estimated time of completion and guaranteed anonymity of answers. The survey consisted of 32 questions. It took a maximum of approximately 7-10 min to complete the survey questionnaire. Please see Appendix for more information on question types.

The survey was structured in five parts:

1) Socio-economic questions about the respondent (gender, age, marriage status, amount of household members, occupation, amount of under age children, education, income, car ownership);

Next questions were repeated for two blocks. The first block is related to transport preferences before the start of the Covid-19 pandemic and the first restrictions in St. Petersburg (until March 2020). The second block is related to transport preferences during the Covid-19 pandemic (since March 2020 until now).

Next parts of questionnaire were different for car-owners and citizens without car in households.

For car-owners:

2) Questions about preferred transportation modes (before March 2020 and since March 2020 until now);

3) Questions about important factors regarding the transport mode choices (before March 2020 and since March 2020 until now);

4) Questions about frequency of travels by private car (before March 2020 and since March 2020 until now);

5) Questions about frequency of travels by individual transport modes (bicycle, scooter, skateboard) (before March 2020 and since March 2020 until now);

6) Other questions about trip destinations, changes occurred in life due to the Covid-19 pandemic etc.

For citizens without private cars in a household:

2) Questions about preferred transportation modes (before March 2020 and since March 2020 until now);

3) Questions about important factors regarding the transport mode choices (before March 2020 and since March 2020 until now);

4) Questions about frequency of travels by public transport (before March 2020 and since March 2020 until now);

5) Questions about frequency of travels by individual transport modes (bicycle, scooter, skateboard (before March 2020 and since March 2020 until now);

6) Other questions about trip destinations, changes occurred in life due to the Covid-19 pandemic etc.

Sample representativeness

The representativeness of the sample relative to the population can be analyzed in terms of demographic features like gender and age. Table 7 summarizes sample and population features.

According to Petrostat (2020), total population of St.Petersburg in 2020 amounted to 5.4 million inhabitants. Out of these citizens, 4.449 million inhabitants are older than 18 years old. Residents of this age group were on focus of our study, because they are able to make independent decisions on the choice of transport for their movements.

Table 7 Sample representativeness

	Saint Petersburg population		Sample	
	Million	%	Responses	%
Total population (age:18-65+)	4.449	100	255	0.00006%
Age group				
18–24 years	0.326	16.2%	59	23.1%
25–34 year	0.898	16.6%	93	36.4%
35–44 years	0.877	16.2%	59	23.1%
45–54 years	0.695	12.8%	28	10.9%
55–64 years	0.729	13.5%	14	5.4%
65+ years	0.924	17.1%	2	0.8%

Table 7 (continued)

	Saint Petersburg population		Sample	
	Million	%	Responses	%
Gender				
Female	2.446	55%	117	45%
Male	2.002	45%	138	54%

Source: author's survey

The survey questionnaire was spread among Vkontakte with millions of members; however, the response rate was not that high. By the way, this sample allowed us to get several insights about transportation preferences in our city, which will be discussed in the next paragraphs.

Due to the online survey, the sample is skewed towards young respondents under 34, who make up more than half of the respondents. Average age of respondents is 34,17 years. A particular problem arose with respondents over 65 years old; they failed to be involved in the study. However, this limitation can be justified: elderly people usually are not on the focus of transportation policy, because of low rate of day trips, discounted cost for public transport, low rate of sharing mobility usage. Moreover, for citizens at the age of 65+ the question of establishing new transportation preferences is not as acute as for younger generations due to long process duration.

General socio-economic information about respondents

Despite not so big sample size, the survey attracts respondents of different family status, employment and incomes. Table 8 provides a summary of participant social and economics characteristics. The survey proportionally has engaged married (50.6%) and single persons (49.4%). As for education, most of respondents (85,2%) have high or incomplete high education. This may be justified by St. Petersburg citizens' high education level in comparison to other Russian cities (Zoom market research, 2017). The employment and occupation statuses of the respondents are diversified, however most of participants have full-time occupation and work as employees.

Household size questions show that most of respondents have 2 or 3 household's members. As for under age children in a household, the sample is skewed towards respondents without kids (69%). This is quite understandable, because this group consists not only of young persons without kids, but also of adults and old people, whose children have already grown up.

Also, it could be considered that declared net income per family member distributed proportionally among respondents. Usage of a relative indicator to number of family members allowed us to look at the unbiased level families' incomes.

As for car ownership determinant almost 44,3% of respondents have declared an availability of cars in their households. This fact allows us to distinguish differences between car-owners' transportation preferences and non-owners car.

Table 8 Sample description

	Responses	%
Amount of married people	114	50.6%
Education		
Junior secondary education	4	1.5%
Secondary education	7	2.7%
Basic vocational	27	10.6%
Incomplete higher education	34	13.3%
Higher education	183	71.9%
Employment		
Full-time	169	66.3%
Part-time	29	11.4%
Temporary part-time	14	5.5%
No employment	43	16.9%
Occupation		
Student	47	18.4%
Employee	148	58%
Pensioner	9	3.5%
Public servant	15	5.9%
Entrepreneur	25	9.8%
Unemployed	11	4.3%
Household size (number of persons)		
1	37	14.5%
2	89	34.9%
3	67	26.3%
4	42	16.5%
5	12	4.7%
6 or more	8	3.1%

Table 8 (continued)

	Responses	%
Number of children under age		
0	176	69%
1	49	19.2%
2	28	11%
3 or more	2	0.8%
Declared net income per family member		
Less than 10 000 rub	8	3.1%
More than 10 000 rub, but less than 15 000 rub	14	5.5%
More than 15 000 rub, but less than 23 000 rub	36	14.1%
More than 23 000 rub, but less than 30 000 rub	40	15.7%
More than 30 000 rub, but less than 42 000 rub	44	17.3%
More than 42 000 rub, but less than 63 000 rub	59	23.1%
More than 63 000 rub	54	21.2%
Amount of private car owners	113	50.2%

Source: author's survey

Overall, we can conclude that general socio-economic information makes the sample seem to be represented different respondents' groups. This fact allows us to draw conclusions from the analysis of transport preferences for different social and economic groups of the population.

2.2. Changes in citizens' transportation preferences due to the Covid-19 pandemic

In most cases car-ownership can be the most influential factor on mode perception and choices (He&Thogersen). Based on that fact and sample analysis, we have divided all respondents into several groups (Figure 5). As for criteria for division, we put car ownership to understand difference in transportation behavior changes for car owners and non-car-owners. Thus, we get two separate groups – car-owners (people, who have one or more cars in their ownership) (50,2%) and non-car owners (49.8%) (people, who have no cars in their ownership).

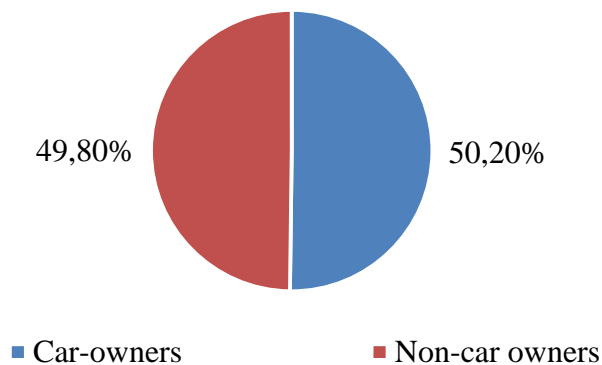


Figure 5 Respondents distribution by car ownership criteria

Source: author's survey

The next step was to analyze the group's data on their transportation behavior before the Covid-19 pandemic. It turned out that the respondents of each group can be grouped into sub-groups depending on their preferences (Figure 6).

For example, **car owners can be divided into two sub-groups:**

- 1) those people who combined the use of a personal car and public transport (metro, buses, trolleybuses, tram, mini-bus etc.). It is important to note that the frequency of their use of public transport before the Covid-19 pandemic was high - several times a week and more often;
- 2) those people who mostly used a private car before the Covid-19 pandemic and practically did not use public transport, but nevertheless sometimes preferred other types of mobility (for example, taxi, car sharing, bicycle, etc.)

As for the respondents of **non car-owners group**, their behavior before the Covid-19 pandemic was also diverse. The following group **can be also divided into two sub-groups:**

- 1) those people who used mainly only public transport (metro, buses, trolleybuses, tram, mini-bus etc.) for urban mobility;
- 2) those people who used mostly other types of transport (for example, taxi, car sharing, bicycle, etc.)

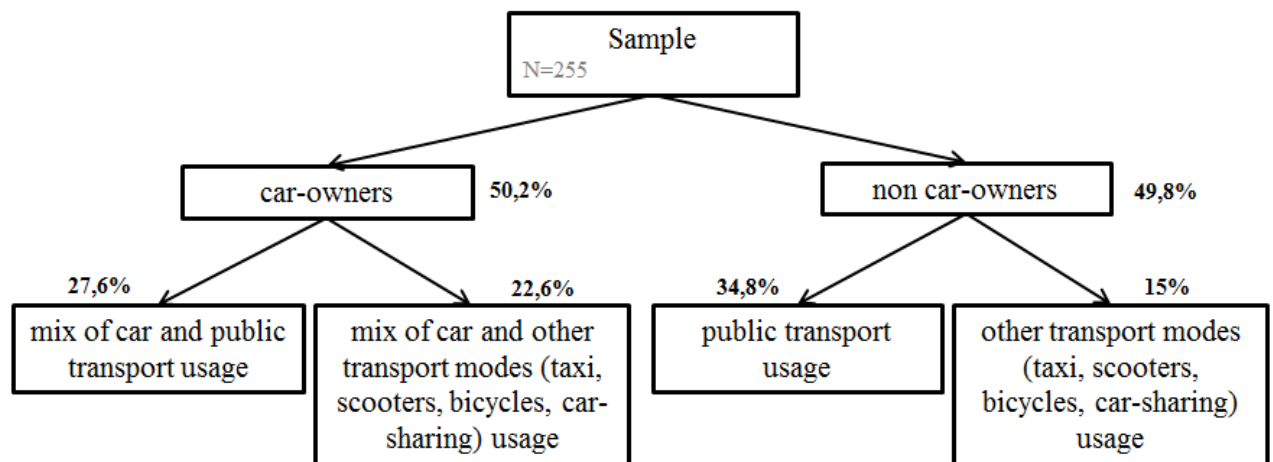
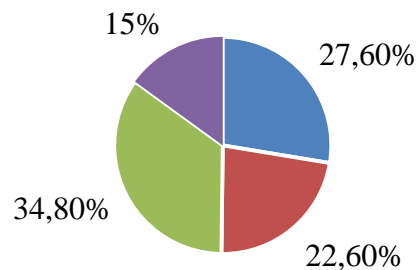


Figure 6 Respondents groups by transportation behavior before the Covid-19 pandemic

Source: author's survey

Thus, we were able to divide all respondents into 4 almost equal groups based on the patterns of their transport behavior before the Covid-19 pandemic (Figure 7). For the convenience of further analysis, we have numbered the groups from 1 to 4.



- Group 1. Car-owners, who mostly combine car usage and public transport usage
- Group 2. Car-owners, who mostly combine car usage and other transport modes (taxi, scooters, bicycles, car-sharing etc.) usage
- Group 3. Non car-owners, who mostly prefer public transport
- Group 4. Non car-owners, who mostly prefer other transport modes (taxi, scooters, bicycles, car-sharing etc.)

Figure 7 Respondents distribution by transportation behavior before the Covid-19 pandemic

Source: author's survey

Speaking about the established groups of respondents, it is very interesting to discuss what changes in their behavior can potentially occur. (Figure 8).

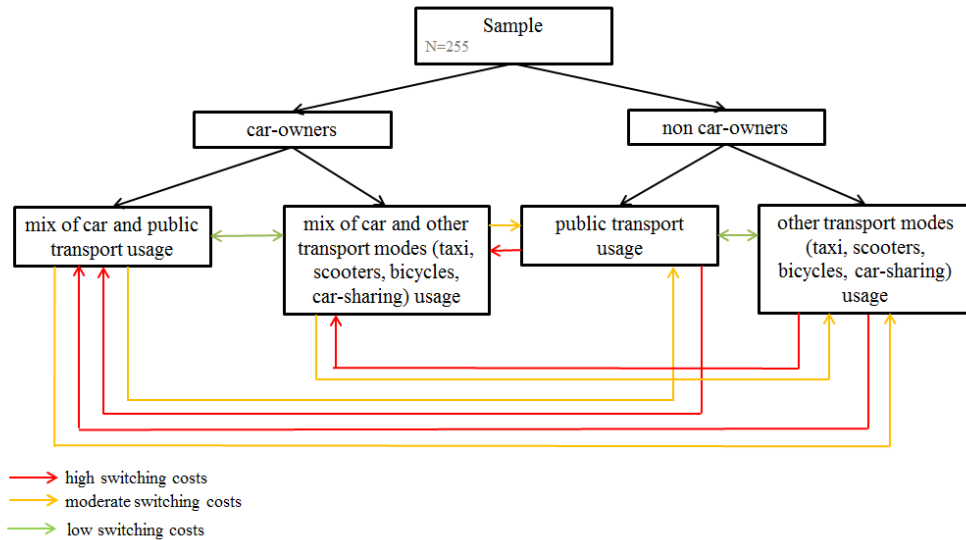


Figure 8 Costs of switching to each type of transportation behavior
Source: compiled by the author

It is obvious that for different groups of car owners, there are minimal costs of switching within a group. For them, it is not particularly important to combine trips by car with public transport or to combine trips by car with other types of transport. Thus switching costs are low. The same situation is for non-car owners. Switching between public transport and other types of transport (such as taxis, car sharing or scooters) is low due to the simplicity, low level of psychological and monetary costs.

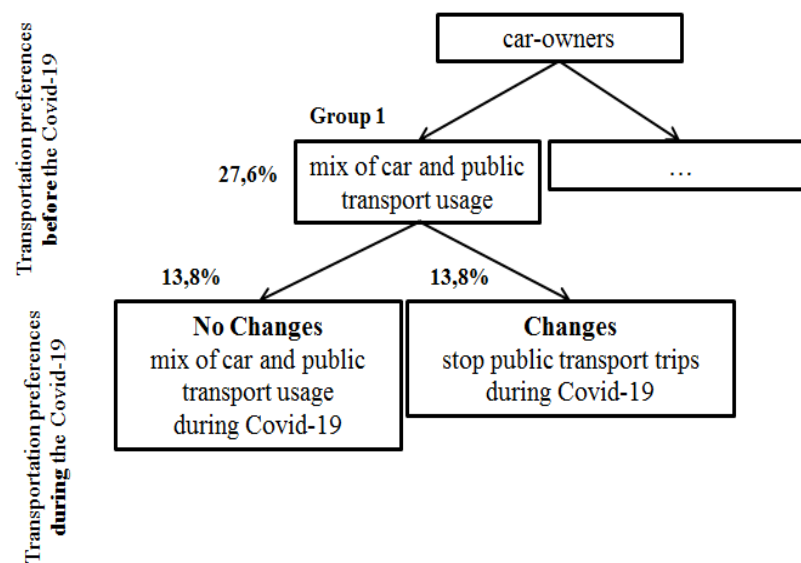
For those, who do not have a car, the switch to use a car is much higher, since this requires certain costs for the purchase of the vehicle and its maintenance. Therefore, their costs of switching to a car are estimated as high.

As for car owners, they can drive both by car and by public transport and other modes. But their switching to complete car abandonment requires an moderate level of cost from them. For car owners, full switching to public transport or other types of transport depends more on the subjective factors or external costs of switching. However, for them, this switch is not associated with the need to bear additional monetary costs, which simplifies the transition in comparison with those who do not have a car.

However, these were only our assumptions about what changes might have occurred. Next, we will focus on analyzing real data to understand how each group has changed its behavior due to the Covid-19 pandemic. We will look at each user group separately to understand what changes in transport preferences have occurred.

Group 1. Car-owners, who have mostly combined car usage with public transport usage before the Covid-19.

This group consists of those people who have combined usage of private car and public transport before Covid-19 for everyday trips. According to their answers they have used public transport several times a week or more often. However, they also use their own cars quite often. The response to the Covid-19 pandemic within the group was different (Figure 9): some of car users (13.8% out of sample) did not change their behavior and continued to combine trips by private car and public transport; others of this group (13.8% out of sample) stop their trips in public transport at all.



*Figure 9 Changes in transportation preferences of the Group 1 due to the Covid-19 pandemic
Source: compiled by the author*

Let's look at each subgroup in more details:

- *car-users who continue combining private car and public transport for their mobility during the Covid-19 pandemic*

These respondents make up 13.8% of the sample. Before the Covid-19 pandemic most of these people have used public transport regularly. The purpose of their trips in 80 percent of cases was a trip to work or school. They used their own car for trips for guest visits, as well as for shopping (including grocery stores).

This group was the most resistant to the pandemic. The majority of respondents noted that the Covid-19 pandemic has very little impact on their lives. During the pandemic, the respondents used public transport with the same regularity as they used before. The purpose of the trips remained unchanged – to get to work or to education places. Their use of the car has

increased slightly – regular trips outside the city (to exploring the nature or to the dachas) have been added to the shopping trips.

It should be considered that each of the respondents from this group noted that a trip on public transport did not cause him any concerns about his health and the possibility of contracting an infection.

- *car-users who stop public transport trips during the Covid-19 pandemic*

These respondents also make up 13.8% of the sample. Before the Covid-19 pandemic most of these people used public transport regularly (several times a week or more often). They perform their public transport trips to cinemas, museums, guest visiting. However, due to the Covid-19 pandemic they stop commuting by public transport at all.

The reasons that underlie this behavior are fears of being infected in public transport. 74% of these subgroup respondents out of this subgroup claim that it is not safe to use public transport during the Covid-19 pandemic. Also, all of this people notice that they concerns about their health and always wear masks in public places.

Nevertheless, fear to be infected is not the only reason for stop public transport trips. They mostly state as a one of reasons – decrease of occasions to leave homes. Out of these subgroup 62% of respondents started remote work, so they lost the need to travel for work, although before the pandemic, this was one of the main reasons to choose a public transport. Furthermore, 58% of them have decreased their meets with relatives and friends and 62% more often made purchases online. All in all, their daily tasks to leave home and use public transport as it used before have reduced.

As for substitutes of public transport they have not oriented to individual mobility. Most of them have never used bicycle or scooter as a mode for transportation. This is also partly true for taxi and car sharing. Based on this, we can conclude that most of trips during the pandemic, this group made mainly on their personal cars.

Such a move away from at least combining public transport with car in favor of only a car usage can be dangerous for the city's transport system. The necessary measures to curb this trend will be discussed in the next paragraph.

Group 2. Car-owners, who have mostly combined car usage with other transport modes usage before the Covid-19.

Second group consists of car users who have not used public transport at all, or use it rarely (several times a year or rare) before the Covid-19 pandemic. Before the pandemic in addition to their car, they often took taxi rides, used car sharing less often, and rarely used individual mobility modes.

It also needed to be discussing what respondents' characteristics from this group are. This group consists mainly of people who have used their private cars quite often – every day or several times a week. This habit was fixed before the pandemic and has intensified during it. They have put a comfort as the most important factor for mode choice during the pandemic and before it. However, their response to the Covid-19 pandemic was different. On one hand it was an almost complete rejection of the use of other means of transport in favor of the car usage, but on the other hand, it was increase of other transportation modes usage (Figure 10).

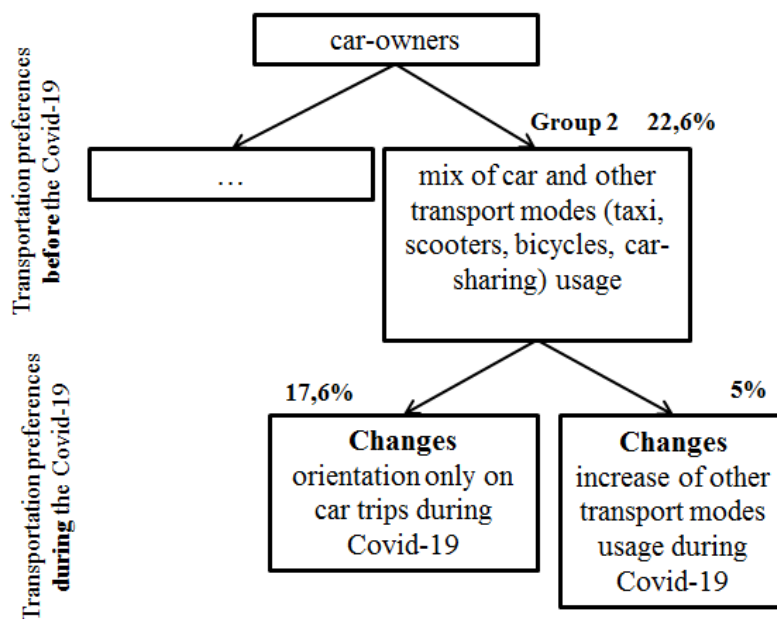


Figure 10 Changes in transportation preferences of the Group 2 due to the Covid-19 pandemic

Source: compiled by the author

As for riders characteristic this group differs from others. It mostly consists of employees and entrepreneurs, who named their financial situation as quite moderate and good. Average income per family member is more than 40 000 rubles. During the pandemic, these people noted that they continued to work on a fixed schedule in the organization's building. They chose a private car for their daily commute to work.

Nevertheless, positive trends have emerged among this category during the pandemic. For example, people who had never used bicycles or scooters before the Covid-19 pandemic began to do so. Also, 20% of respondents noted that during the pandemic, they began to use car sharing and individual mobility modes more often for travel. However, the special transport policy is needed to fixing these positive changes. These will be discussed in the next paragraph.

Group 3. Non car-owners, who mostly prefer public transport usage before the Covid-19.

These respondents constitute 34,8% of the sample. The most important factors for this category, both before and during the pandemic, were the ability to accurately plan routes and travel time. However, the impact of such factors as the trip price during the pandemic has significantly decreased, and at the same time the importance of the safety factor has increased. Based on this, we can conclude that users of public transport were ready to pay more for the trip for not to get infected. This may explain the increased use of car-sharing and taxi services by this group during the pandemic.

As for their reaction on the pandemic (Figure 11), 68 % of this group stressed that due to the pandemic they were less likely use public transport. The main reason was the risk of infection. Out of this, 25% of respondents have begun to give preference not in favor of public transport, but in favor of individual mobility.

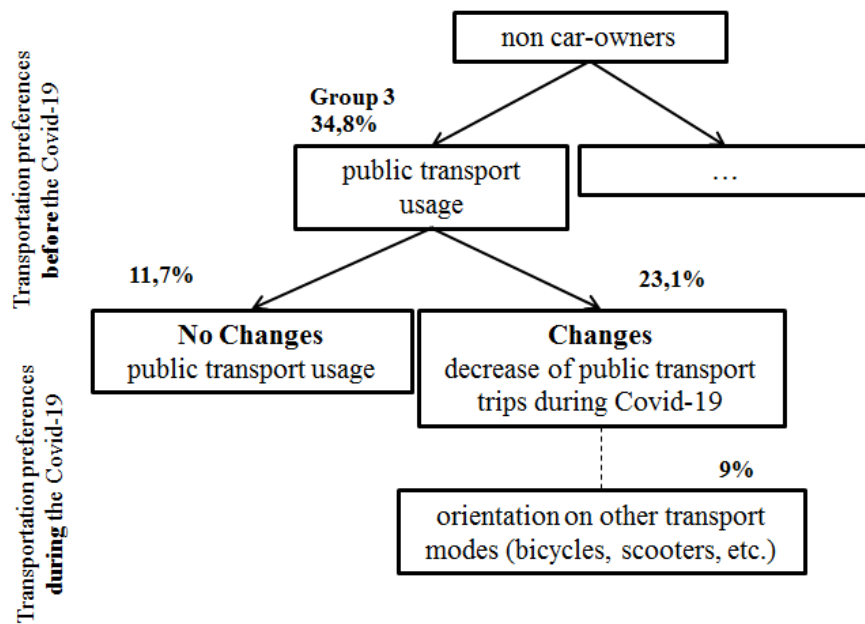


Figure 11 Changes in transportation preferences of the Group 3 due to the Covid-19 pandemic

Source: compiled by the author

Particularly noteworthy is the fact that 30% of this group said that the pandemic made them think about buying a personal car. These intentions can be realized, since the majority in this group considers their financial situation to be moderate or even good. It can be noted that this group was less affected by the Covid-19 pandemic from a financial point of view; only 3% of respondents point out a decrease in income or loss of work.

Group 4. Non car-owners, who mostly prefer other transportation modes usage before the Covid-19.

This group includes respondents who do not own a private car, and do not use public transport on most trips.

75% of this group uses a bicycle or scooter for frequent trips several times a week or more often. This trend was established before the Covid-19 pandemic and intensified during it (Figure 12). The remaining 15% prefer car sharing and taxi services for daily trips.

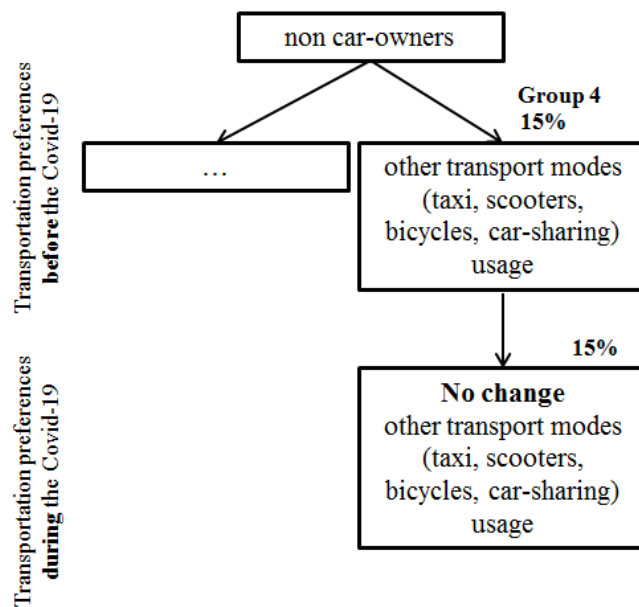


Figure 12 Changes in transportation preferences of the Group 4 due to the Covid-19 pandemic

Source: compiled by the author

As for the characteristics of the respondents also there are interesting factors. This group mainly includes people of middle income, as well as low income. What is good for the development of the transport system, most of this group, about 80% stress that they would not like to buy a car in the near future.

All in all, this descriptive analysis of the gathered data helps us to identify what shifts in the choices of transport have occurred among citizens. The summary is presented in Figure 13

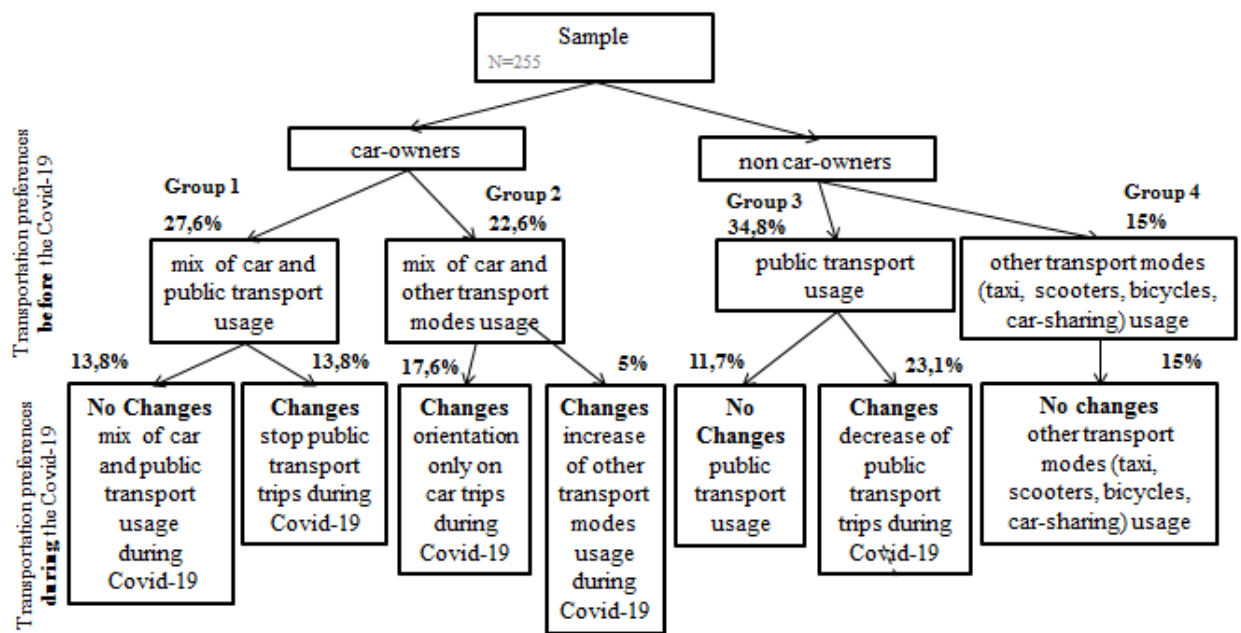


Figure 13 Changes in transportation preferences due to the Covid-19 pandemic

Source: compiled by the author

The comparison of before and during pandemic questions gives us insights about car-owners and non-car-owners preferences. Nevertheless, the analysis of the respondents' responses almost did not reveal the objective reasons for the changes that have occurred. Only in one case with the second subgroup of Group 1, it was possible to find objective reasons for the decline in the use of public transport. It was the transition to remote work, the increase of online shopping and the reduction in reasons to leave their houses.

This means that the changes that occurred were influenced to a greater extent by hidden reasons. Further analysis can give us information about factors influencing mode choice before and during the Covid-19 pandemic. This information is extremely important for understanding what switching costs are most receptive by passengers. Based on switching cost theory we will propose supportive initiatives to boost socially beneficial changes in transportation behavior and restraining measures for changes having negative effect on transportation. However, before recommendation settings it is needed to determine which shifts are beneficial for the development of the urban transportation system, and which ones are more likely to lead to negative consequences.

Evaluation of changes in transportation preferences

Our study shows that several types of changes were identified due to the pandemic. These trends may be summarized to a list:

- **orientation on more frequent personal car use;**
- **refusal to travel on public transport;**
- **orientation on more frequent other modes use** (growth in the number of car sharing uses; growth in the number of individual mobility uses; growth in the number of taxis uses).

Each of these trends can have both positive and negative consequences. We will evaluate these changes from the point of view of environmental friendliness, public health, and transportation system load.

1. Orientation on more frequent personal car use

Type of change: negative.

Nowadays there is no doubt that private cars increase leads to environmental consequences due to CO² emission. Traffic jams and transportation system overload are such consequences which most of cities face nowadays due to rapid car number growth. Of course smog and air pollution lead to health issues of citizens.

2. Refusal to travel on public transport

Type of change: negative.

Public transport is a network of vehicles sharing with fixed routes and schedules. In most of modern cities urban public transport systems is the base of global cities everyday operations (Horcher&Tirachini, 2021).

In big cities public transport development is a tool for economic development and job creation, it's decline may lead to negative consequences in case of transportation system.

In case of environmental friendliness, public transport usage also leads to congestions and emission, however in a less volume than private vehicles. It also help to fewer traffic jams. In context of health – less greenhouse gas emission is better for air quality. Also, public transport encourages citizens to activities, at least by walking time to transport stops.

- 3. Orientation on more frequent other modes use (growth in the number of car sharing uses; growth in the number of individual mobility uses; growth in the number of taxis uses).*

Type of change: positive.

This change includes several components at once, so you need to consider each of them separately.

- Growth in the number of car sharing

Type of change: positive.

Car sharing is identified as the use of a single vehicle by several people through special services (Shaheen et al., 2015).

Car sharing has more favorable impact on the environment, as it reduces the number of vehicles used simultaneously. Loose (2010) prove that operator companies strive to reduce their gasoline costs and use cars with the lowest fuel consumption, which make that vehicles more environmentally friendly. Car sharing also reduces gas emissions, as the main ones occur when the car is driving slowly in search of a suitable parking spot. Since the rules of carsharing allow leaving the car anywhere, the user does not look for parking as carefully as on his own car.

As for the loading of the transport system, carsharing is also much better than private cars, since it replaces several of them at once.

- Growth in the number of individual mobility uses

Type of change: positive.

Individual mobilities are urban transport solution aimed at providing travel options for short time trips.

Urban studies have a consistent view on this type of mobility benefits. First of all, it provides cost-effective, sustainable, flexible, and on-demand transport alternative (Shaheen et al., 2020) and reduces reliance on using private vehicles for short-distance travel (Clewlow, 2018).

Also this trend leads to reduction in emissions, crashes and congestion (De Hartog et al., 2010). As for health impact, there are benefits due to reductions in CO² emissions when citizens disrupt private vehicle for short trips. Moreover, if we talk about health, it should be mentioned that non-electric individual modes such as scooters or bicycles help to stimulate physical activities and mental health.

As for transportation system load it is quite obviously that individual mobility has the smallest impact in comparison to other transportation modes.

- growth in the number of taxis uses.

Type of change: positive.

Taxi is a vehicle with a driver available to hire for general public. Taxis act as one of the sharing options. Being in different places helps many residents to make quick and long urban trips. In case of the cities taxi market performs as intensive labor industry, generates the only source of income for a huge number of citizens.

Also, while for example public transport operates on government subsidies, taxis are fully sponsored by their users.

As for health issues, most often the taxi is on the move, then they make a trip usually and less pollute the air, because no need to find acceptable parking as for private cars.

All in all, we have assumed that such changes as orientation on more frequent personal car use and refusal to travel on public transport are negative and measures-barriers should be implemented. However, orientation on more frequents other modes usage is positive change that occurs due to the Covid-19 pandemic. That is why this change needs to be supported by transportation policy. However, as was mentioned above, before proposing measures, we need to understand the underlying causes of these changes. The next section will be devoted to the search for subjective factors that affect transport behavior.

2.3 Factors influencing transportation preferences before and during the Covid-19 pandemic

To search for subjective reasons of transport changes, we used the questionnaire questions about factors which affect respondent's mode choices. In our questionnaire we asked respondents about their most important determinants of mode choices before Covid-19 spread and during it. They could choose from 1 to 3 most important for their mode choice factors from this list:

- trip price (passenger's perception of money needed for traveling);
- possibility to plan routes and travel time (passenger's perception of transport mode reliability and time accuracy);
- comfort (passenger's self -perception of comfortable trip);
- transport waiting time (passenger's perception of time needed to a trip start);
- safety (passenger's self -perception of being safe during the trip, this includes likelihood of accidents, likelihood of being infected).

Our empirical study was focused on investigating, which of these factors were considered as the most important before and during the Covid-19 pandemic. The research question was: the impact of which factors changed due to the Covid-19 pandemic and for which factors the difference turned out to be the most significant. The answers to these questions will allow us to find out what factors are important for consolidating positive changes in preferences and vice versa. We also will use this analysis to understand what switching costs are most receptive by passengers.

2.3.1. Factors influencing transportation preferences before the start of the Covid-19 pandemic spread and the first restrictions in St.Petersburg (until March 2020).

Table 9 summarizes findings about the most important factors for car users, public transport users and other modes users before the Covid-19 pandemic. All respondent's groups claimed that possibility to plan routes and travel time were decisive factors for defying their transportation preferences. Transport waiting time was also named as considerable factor for choosing mode of transport by each of respondent's group. Both these criteria are highly connected to time planning, which is significantly important for big cities citizens. Also, it can be shown that such factor as safety was considered as the least important factor for mode choice in each transport users' group.

Table 9 Importance of factors for different transport users' groups before the Covid-19 pandemic

Group name / Most important factors of mode choice	Car-owners (50,2% of sample)	Non car-owners, who mostly prefer public transport usage before the Covid-19 (34,8% of sample)	Non car-owners, who mostly prefer other transportation modes usage before the Covid-19 (15% of sample)
Trip price	34%	58%	40%
Possibility to plan routes and travel time	65%	70%	72%
Comfort	48%	10%	37%
Transport waiting time	36%	60%	40%
Safety	12%	1%	1%

Source: author's survey

However, despite the similarities different users' groups have their own distinctive features. It can be shown that the determinant of trip price was not mentioned by car users in most cases, only 34% respondents of what group named this factor. At the same time, percentage of car-users who have chosen comfort determinant (48%) is definitely high than among public transport and other transportation users. This means that car-users are generally ready to pay more for their trips to travel in a comfortable environment. Another insight about car users is connected to their safety sensitivity. The percentage of car-users who pay attention on safety determinant was 12% which is higher than other groups. This difference can be explained by the assumption that in most cases respondents feel safe in their own modes of transport.

For public transport users the most influential determinants of transport choice are possibility to plan routes and travel time, transport waiting time and trip price. The percentage of group's choice of transport waiting time determinant is higher than in another groups. It is quite understandable because usually public transport ridership supposes some amount of waiting time for mode arrival. However, other modes usually considered more available, because a small time to access (for ex., own car or bicycle).

Other transport modes users have named possibility to plan routes and travel time the most important factors affecting their ridership; this group has the highest percentage of naming that factor (72%) in comparison with respondents from other groups. Trip price had also mostly taken into account by that group. However, the determinants of comfort and safety were named by less amount of this group members. This is also explainable, because usage of individual transport modes, such as bicycles and scooters, may be considered uncomfortable due to for ex., weather conditions, that leads to less importance of comfort to this group.

Overall, there findings seem to be some evidence to indicate that transport reliability and waiting time were considered by respondents as the most influential factors of mode choice for before the Covid-19 pandemic spread. The difference between groups show that car owners also have named comfort factors, public transport and other mode users also have put attention on trip prices. For the next step of analysis it is necessary to compare these obtained results with important factors of mode choice during the Covid-19 pandemic.

2.3.2. Factors influencing transportation preferences during the Covid-19 pandemic spread in St. Petersburg (since March 2020 until now).

According to survey results, the Covid-19 pandemic radically has changed daily activities of respondents and their lifestyle in St.Petersburg. More than a half of respondents mentioned that they have started more often shop online; also survey participants were less likely to meet with relatives and friends. Moreover, the pandemic left an imprint on citizens activity, 45% said that they began to less often leave their houses.

About 6% of those surveyed even noted that they had moved out of town during the pandemic. This finding can be proven by deurbanization trend of most Russian cities. According to Pokrovsky (2020), the pandemic has led to an increase in atypical migration processes, primarily to a massive outflow of citizens to out-of-city areas. Study showed that so-called «second homes» (or dachas) of city residents began to combine recreational, “quarantine-sanitary” and work functions, which makes it possible to use them for long-term residence and after the end of the crisis.

According to our study, the pandemic also affected the financial situation of St. Petersburg residents. Every 4th respondent noted a decrease in income due to the pandemic; moreover, 5% of respondents noted that they have lost their jobs due to the pandemic.

Lifestyle changes could not get around the dramatic changes in mobility. We bogged down the groups highlighted at the last stage and analyzed how the factors for their choice of transport have changed. Similar survey was conducted by McKinsey (2020) on a globe scope of urban transport. Their finding shows that before the pandemic citizens pay attention on travel

time, trip price and comfort for mode choice. However, the pandemic has changed decision factors to one criterion mostly - safety (risk of infection). Analysts proved that this trend has provoked a significant increase in demand for bicycles, scooters and other micro transport. McKinsey analysts are sure that it will continue after the pandemic: according to their data, 70% of public transport passengers are ready to ride a bike or walk at least once a week.

We have applied quite similar methods to our sample. To each group of respondents we have find out determinative factors of mode choice during the pandemic. Table 10 shows that determinants have changed for each group.

Table 10 Findings about the most important factors for different groups of transport users during the Covid-19 pandemic

Group name	Car owners (50,2% out of sample)			Non car-owners, who mostly prefer public transport usage before the Covid-19 (34,8% out of sample)			Non car-owners, who mostly prefer other transportation modes usage before the Covid-19 (15% out of sample)		
	Before Covid-19	During Covid-19	Changes*	Before Covid-19	During Covid-19	Changes*	Before Covid-19	During Covid-19	Changes*
Most important factors of mode choice									
Trip price	34%	28%	-6%	58%	44%	-14%	40%	37%	-3%
Possibility to plan routes and travel time	65%	55%	-10%	70%	67%	-3%	72%	70%	-2%
Comfort	48%	40%	-8%	10%	26%	+16%	37%	27%	-10%
Transport waiting time	36%	33%	-3%	60%	48%	-12%	40%	30%	-10%
Safety	12%	36%	+24%	1%	45%	+44%	1%	34%	+32%

Source: author's survey

General conclusion is that the most of respondents noted that such a factor as safety began to be one of the decisive. However, this analysis also gives us another important insight. The survey data showed that the subjective perception of factors has changed mostly by groups which were identified as having changes in behavior in the previous paragraph (car-owners and non car-owners, who used public transport). As for users of other modes of transport (taxis, bicycles, car sharing), their behavior has not changed and as we see their perception of the

factors has not changed significantly. The only exception is the importance of the safety factor, but such increase is typical for other groups also and can be explain by general concerns of citizens' about transport's epidemiological safety.

Therefore, we can conclude that the change in perceptions was one of the main reasons for the changes in behavior due to the Covid-19 pandemic. The next step we will analyze in details the changes in these factors perception for each individual subgroups of respondents, who have changed their behavior. After that we will propose policy measures connected to factors which respondents are receptive to.

2.4. Recommendations for St. Petersburg authorities

All in all we have discussed which of the changes is positive for the city's transport system, and now we can consider how to use the switching cost theory to maintain positive changes in transport preferences and reduce negative ones.

First of all, let's summarize the results of behavior changes occurred due to the Covid-19 pandemic for each group, obtained from the analysis in the previous paragraphs (Table 11).

Table 11 Findings about changes in transportation behavior occurred due to the Covid-19 pandemic

Group number	Percentage of the sample	Subgroup	Changes in transportation behavior due to the Covid-19 pandemic	Type of changes
Group 1 (partially)	13.8%	Car-owners, who have mostly combined car usage with public transport usage before the Covid-19.	stop public transport trips during Covid-19	negative
Group 2	17.6%	Car-owners, who have mostly combined car usage with other transport modes usage before the Covid-19.	orientation only on car trips during Covid-19	negative
	5%	Car-owners, who have mostly combined car usage with other transport modes usage before the Covid-19.	increase of other transport modes usage during Covid-19	positive
Group 3 (partially)	23,1%	Non car-owners, who mostly prefer public transport usage before the Covid-19.	decrease of public transport trips during Covid-19	negative

Source: author's survey

To make a recommendations for transportation policy modifications we will procedure in such way: 1) name group of respondents; 2) name changes in their transportation preferences

which were identified previously; 3) name factors which were important for mode choice; 4) propose high switching costs to positive changes and low costs to negative ones; 5) propose other recommendations to authorities how to deal with new obtained habits.

So, for each group of respondents we have different recommendations for authorities about possible measures. Also, because of the fact that some modes of transport are govern by private sector, in some cases we also come up with recommendations to businesses.

The proposed recommendations may be a reaction of the authorities to changing preferences in terms of consolidating new positive habits or returning to before Covid-19 transport preferences. However, it should be stated that these possible measures are not exhaustive and are expected further additional studies with possible regulatory impact assessment.

1. Recommendations for car-owners, who have mostly combined car usage with public transport usage before the pandemic and stop using it during Covid-19 the pandemic

Survey data shows that this group used public transport regularly for commuting trips to cinemas, museums, guest visiting before March 2020. However, due to the pandemic in most cases they stop using public transport at all. So, this decrease of public transport usage should be considered as a negative change. That is why it is need to be influenced by authorities' measures (Table 12).

Table 12 Factors influencing transportation preferences of Group 1 (part) respondents during the Covid-19 in comparison with before Covid-19 situation

Most important factors of mode choice during Covid-19	Group respondents, %	Difference with before Covid-19 responses
Trip price	35%	-8%
Possibility to plan routes and travel time	47%	-2%
Comfort	45%	+2%
Transport waiting time	23%	-3%
Safety	39%	+27%

Source: author's survey

- measures connected to user's safety perception

Taking into account the fact that security is one of the most important factors for this group, low switching costs to other modes should be implemented.

One of possible measure can aimed at forming a positive image of public transport towards citizens. Social advertising of safe public transport, as well as tighter controls on the wearing of masks of riders, could have a positive impact on the citizens' perception.

To make these people feel safe it is also needed to continue remind passengers of keeping social distancing regulations on vehicles and stations or stops. In St. Petersburg were developed a variety of audio, video and text notifications, as well as stickers on the seats in carriages and markings on the edge of the platform where passengers wait for the subway train.

It is also possible to improve the quality of disinfection of public transport modes, increase the cleaning frequency in order to reduce the respondent's perception of public transport as a place where they can get infected.

In addition, the presence in the society of such a group of people who refused public transport for fear of getting sick makes it possible for the kick sharing business to attract this audience. Owners of kick sharing companies in the city, such as Whosh, RentGo, can use their marketing strategy to position scooters as an opportunity to avoid contact with other people and crowding in transport. This positioning can have a positive impact on the frequency of scooters use.

- measures connected to user's comfort perception

Also measures can be aimed at increasing the comfortability of public transport. It is necessary to make the environment in public transport comfortable, for example, to improve the comfort of the seats, make places of entrance to transport more convenient, increase distances between seats. Also it is possible to increase the frequency of public transport modes on order to make transport less overcrowded. A stable wi-fi connection in public transport would also be an additional benefit for that people for returns their preferences. This is true, because it will help this group use their time in public transport as a benefit and as a possibility to prepare for work or for study

.According to survey, this group have not oriented to individual mobility as a substitute of public transport. Most of respondents have never used bicycle or scooter as a mode for transportation neither before the Covid-19 pandemic. For their possible shift to bicycles or scooters authorities should lower costs of switching. Several measures can be proposed to achieve this group shift to individual mobility. As far as we know that they mostly search for comfort in their trips, improving the quality of cycling infrastructure is needed.

- measures connected to user's possibility to plan routes and travel time

Despite the decrease in the importance of the possibility to plan routes and travel time, it still remains one of the most significant for this group. By the way, the decrease in its importance was not radical (2%). Since this factor is important for them, it is possible to introduce measures that will make it difficult to plan time on their cars. For example, to limit access to the city by car, significantly reduce free parking spaces in the city in order to increase the search time for them.

As for measures to support their return to public transport the one transport app can be proposed. This app can provide more accurate information about routes, expected travel time and waiting time.

2. Recommendations for car-owners, who have mostly combined car usage with other transport modes usage before the Covid-19 but orientated only on car trips during Covid-19

This group consists of car users who have not used public transport at all, or use it rarely (several times a year or rare) before the Covid-19 pandemic. However, before the pandemic they sometimes took taxi rides, used car sharing less often, and rarely used individual mobility modes. Because of the pandemic, they have significantly reduced the use of other modes of transport other than the car. The absence of shift to other modes of transport should be changed as a negative transportation behavior. Several measures to return them to before-pandemic behavior should be implemented. Measures should be connected to factors, which this group claims to be most influential: possibility to plan routes and travel time, comfort, transport waiting time. Also price determinant can be considered because of increase of its importance (Table 13).

Table 13 Factors influencing transportation preferences of Group 2 (part) respondents during the Covid-19 in comparison with before Covid-19 situation

Most important factors of mode choice during Covid-19	Group respondents, %	Difference with before Covid-19 responses
Trip price	10%	+2%
Possibility to plan routes and travel time	44%	-2%
Comfort	45%	-2%

Table 13 (continued)

Most important factors of mode choice during Covid-19	Group respondents, %	Difference with before Covid-19 responses
Transport waiting time	31%	-7%
Safety	26%	+11%

Source: author's survey

- measures connected to user's possibility to plan routes and travel time

Returning these respondents to the use of such modes of transport as car-sharing, scooters and bicycles can contribute to improving time reliability of these transports. For this purpose, as one of the measures in the context of individual mobility, special lanes can be extended throughout the city. This will help riders make trips faster, without wasting time on avoiding cars and other obstacles. The accessibility of this type of transport can also be significantly improved. Authorities can help arrange parking for scooters and bicycles near densely populated areas to reduce the time to find a vehicle.

Policy measures may also be aimed at reducing the reliability in the time when these respondents travel by car. Again, one of the measures may be to reduce free parking in the city center, which will increase the user's time to their search.

- measures connected to user's perception of comfort

To increase the comfort of traveling on individual transport, again, there is need of special lanes with a good asphalt surface, so that the user can feel more comfortable.

- measures connected to user's transport waiting time

These measures should make the car alternatives more accessible to the users in terms of waiting time, which will reduce the switching costs for users. So the authorities can organize special parking spaces for car sharing, as well as for rented bicycles and scooters near densely populated areas, as well as near the metro. This will reduce the time spent on finding access to these transport and make it as accessible as using own car.

3. Recommendations for car-owners, who have mostly combined car usage with other transport modes usage before the pandemic and started to use other types of transport more often during the pandemic

Positive orientations in favor of individual mobility should continue even after the pandemic, thus high switching costs should be implemented based on important for user's factors (Table 14).

Table 14 Factors influencing transportation preferences of Group 2 (part) respondents during the Covid-19 in comparison with before Covid-19 situation

Most important factors of mode choice during Covid-19	Group respondents, %	Difference with before Covid-19 responses
Trip price	30%	-2%
Possibility to plan routes and travel time	56%	-8%
Comfort	50%	-12%
Transport waiting time	32%	=
Safety	43%	+23%

Source: author's survey

- measures connected to user's possibility to plan routes and travel time

Since this group consists mainly of people with high incomes, it is very difficult to keep their motivation using price factors. However, it is possible to use the importance of time for them as one of the deciding factors.

The authorities need to make other modes of transport the most attractive through high switching costs. For example, in the context of individual mobility and the importance of time planning determinant, the development of special dedicated lanes for bicycles and scooters may evolve. This will allow these respondents to get from point A to point B faster, and thus be sure of the time reliability.

Also, to make costs of switching higher, the city authorities can arrange several free parking lots in the city center for car sharing users. This may encourage them to avoid driving their own car and spend with a long time searching for parking slot in favor of car sharing. Since a car left in such parking lot in most cases will almost immediately be picked up by another user, this will not load the city space with cars, but at the same time reduce the time costs of users searching for a parking space.

As for individual mobility modes, also it important to safe and increase the availability of such transport to reduce time cost for searching. For that purpose, the policy of supporting such businesses as kick or bike sharing by the authorities should be carried out. It can be done through subsidies or special tax incentives for these businesses. It is also possible to provide urban infrastructure for the establishing parking lots for scooters or bicycles.

- measures connected to comfort perception

Policy measures should be dedicated to comfort of traveling supporting. For example, in order to increase the comfort of traveling on individual transport, again, there is need of special lanes with a good asphalt surface, so that the user can feel more comfortable.

- measures connected to safety perception

Dedicated lines for the movement of an individual highway can also be a factor that positively affects the user's perception of their safety from getting into an accident.

4. Recommendations for non car-owners, who mostly prefer public transport usage before the Covid-19, decrease to use it during Covid-19

As for the users of public transport, who continued to use it during the Covid-19 pandemic, again, measures are required to strengthen their behavior. As for the users of public transport, who have not continued to use it during the Covid-19 pandemic, again, measures are required to return their past behavior. As we have discussed above, the probability of their switching to a personal car is very high. And their intentions can be realized, since the majority in this group considers their financial situation to be moderate or even good. That is why, several measures should be implemented against their switch to car usage. For that purpose, switching cost for that group should be high. Putting into account factors, which this group sensitive to time determinants and safety (Table 15), several measures can be proposed.

Table 15 Factors influencing transportation preferences of Group 3 (part) respondents during the Covid-19 in comparison with before Covid-19 situation

Most important factors of mode choice during Covid-19	Group respondents, %	Difference with before Covid-19 responses
Trip price	20%	-7%
Possibility to plan routes and travel time	27%	-1%
Comfort	15%	+8%
Transport waiting time	24%	-6%
Safety	21%	+22%

Source: author's survey

- measures connected to user's possibility to plan routes and travel time and transport waiting time

First of all, authorities should make the public transport more attractive in terms of time reliability to high switching costs for public transport users.

To return this category on public transport, the authorities must constantly improve predictive travel systems. Such initiative has already well used in the city's new buses, where a special scoreboard shows how much time is left on the road. This is also true for digital displays at bus stops that not to show the required waiting time. Real time arrival information can be additional benefit which can avoid this group of switching. In general, it is necessary to make the journey by public transport predictable in terms of time, for this transport managers need to monitor compliance with the schedule and time intervals of movement.

- measures connected to user's safety perception

To make public transport more safety and to avoid user's switch to another modes of transport several measures can be proposed. For example, limit average public transport speed to avoid accidents. Moreover, these measures can be aimed to constructing epidemiological safety perception via strict controlling mask wearing in public transport. Also increase of hand sanitizer dispensers on vehicles, transport and stops disinfection increase can be proposed

- measures connected to user's comfort perception

Although this factor is the most significant, its change was significantly differs in comparison to the responses before the pandemic.

Based on the fact, that these people choose between the potential purchase of a car and continuing to travel on public transport and comfort determinant has become especially important for them during the pandemic, the authorities need to ensure a high level of public transport comfort. This can be achieved by modern modes of public transport with comfortable seats, technologically equipped. The implementation of these measures is mentioned in the planned transport reform.

All in all, developed in this paragraph recommendations will allow city authorities and businesses to make a significant shift for sustainable and environmental transportation system, decrease the car usage tendencies and encourage public transport and other mobility usage.

2.5. Research limitations

It is necessary to pay attention on research limitations and discuss open questions for future research.

First limitations are connected to high degree of uncertainty of Covid-19 period. During the collection of data, the second wave of Covid-19 was discussed and restrictions from the authorities increased again. This could leave an imprint on respondents' perception of transport, especially in the context of epidemiological safety.

Also, conducting this research when the pandemic is not over yet, we were not able to objectively assess the real impact of it. This led to limitation about durability of changes in transportation preferences, due to current unpredictable situation we cannot statistically forecast whether identified changes will safe after the end of crisis. However, no matter what, policy makers must be aware of the situation with transport preferences, and this study made it possible to find such socially significant changes that need to be supported now, otherwise they may decrease by the end of the crisis, for example, an increase in individual mobility. The situation is exactly the same with the increase in the use of private cars, it is important that the authorities react with restrictions now, before these preferences become fix in a habit that has already difficult to overcome.

By the way it is necessary to take the results of this survey with a caution. Of cause for further research must include a broader sample or better residential representativeness among St.Petersburg citizens. Due to the pandemic restriction, this study was conducted on the Internet, which leads to difficulties on attracting older people. For future research, it is necessary to combine both online and offline research for a better result. Nevertheless, working with a not so big sample allowed us testing the research methodology and made it possible to carry it out on a larger sample next time.

As a recommendation for future work, we suggest further studies on this survey can be repeated later to assess whether identified changes have a long-term character.

CONCLUSION

During the analysis of scientific research output we have summarized factors influencing citizens' transportation preferences before the Covid-19 pandemic. Observed modern studies have indicated that transport attributes (such as transport waiting time, trip price, travel time etc) and socio-demographic characteristics of the users (gender, income, personal attitudes etc.) are usually affect transportation preferences. Impact of changes in external environment (such as diseases, accidents, weather hazards etc) on transportation preferences was considered more influential and having longer effect. That is why, the Covid-19 pandemic was discussed as an external factor that causes significant changes in behavior patterns.

We have reviewed academic articles that suggested the Covid-19 pandemic as one of external factors which can cause major societal shifts. Several studies have showed the impact of the Covid-19 pandemic on the change in normal people's behavior in the field of shopping, real estate, medicine, and others.

However, the emphasis of our literature review was placed on the analysis of changes in transport preferences. Great amount of studies show that transport preferences have changed in many countries. The reviewed articles show a significant reduction in the use of public transport, an increase in the use of private cars for travel, an increase in the orientation of people to use personal mobility equipment (bicycles, scooters, etc.). All in all, the Covid-19 pandemic was considered as driver for authorities to modify current transportation policy, especially support and encourage sustainable transportation shifts and prevent formation of negative transportation shifts.

Based on this, the research goal was formulated. The goal of the work was to formulate recommendations for St. Petersburg transportation policy modifications based on changes in citizens' transportation preferences due to the Covid-19 pandemic. To accomplish this goal we run a survey among St.Petersburg citizen's to understand what changes in their transportation preferences have occurred due to the Covid-19 pandemic.

The survey results show that in St.Petersburg there are several citizens' groups whose behavior has not changed due to the Covid-19 pandemic. For example, citizens, who have preferred other modes of transport modes (such as taxi, bicycles, scooters, car sharing etc.) before the pandemic were resistant to changes. They continue to use these modes mostly as they used to.

However, survey analysis has identified several changes in transportation preferences of 4 transportation user groups:

- 1) some of car-owners, who have mostly combined car usage with *public transport usage* before the Covid-19 *stop public transport trips during the Covid-19 at all*;
- 2) some of car-owners, who have mostly combined car usage with *other transport modes usage* before the Covid-19 *have orientated only on car trips during Covid-19*;
- 3) some of car-owners, who have mostly combined car usage with *other transport modes usage* before the Covid-19 *have increased other transport modes usage during Covid-19*;
- 4) non car-owners, who mostly prefer public transport usage before the Covid-19 *have decreased public transport usage during Covid-19*.

Reasons of these changes were also investigated. We put our attention both on objectives and subjective reasons to understand the underlying causes of these changes. One of the results has shown that the refusal of car-owners to continue using public transport was because of, on the one hand, objective reasons (such as switching to remote work, reducing the reasons to go somewhere) and on the other hand, subjective reasons (fear of getting infected on the trip). However, other changes were influenced mostly by subjective reasons, such as personal perceptions of transportation modes' safety, comfort, time reliability and so on. The perception of safety was found to be one of the main factors affecting the change in transport preferences to each group.

All in all, we have assumed that such changes as orientation on more frequent personal car use and refusal to travel on public transport are negative for transportation system due to congestions, emissions and other issues. Thus several possible measures-barriers of such behavior changes were proposed to policymakers (for example, decrease of free parking slots in a city center, paid entry of cars to the city center etc). As for other transport (taxi, scooters, bicycles etc) usage increase, we have identified these shifts beneficial for society and thus propose to support these shift by measures-drivers (such as development of special bike paths, increasing parking slots for bicycles and scooters in the city, etc.).

As a result the proposed recommendations may be a timely reaction of the city authorities to changing preferences due to the Covid-19 pandemic. However, it should be stated that these possible measures are not exhaustive and are expected further additional studies with better citizens' engagement.

REFERENCES

1. Almlöf E., Cebecauer M., Jenelius E., Rubensson I. 2020. Who is still travelling by public transport during COVID-19? Socioeconomic factors explaining travel behaviour in Stockholm based on smart-card data.
URL: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3689091 (accessed 15.12.20).
2. Aghion P., Howitt P. 1998. Endogenous Growth Theory. *The MIT Press, Cambridge*.
3. Apple mobility index. [Electronic source] Access mode: <https://covid19.apple.com/mobility> (accessed 21.12.20).
4. Ashmore D., Thoreau R., Kwami C., Christie N., Tyler N. 2018. Using thematic analysis to explore symbolism in transport choice across national cultures. *Transportation* 47. pp. 607-620.
5. Barro R., Sala-i-Martin, X. 1995. Economic growth. *The MIT Press, Cambridge*.
6. Basset D., Hosking J., Ameratunga S., Woodward A. Variations in the health benefit valuations of active transport modes by age and ethnicity: A case study from New Zealand. *Journal of Transport & Health* 19. pp. 2-15.
7. Beck M., Hensher D. 2020. Insights into the impact of COVID-19 on household travel and activities in Australia – The early days under restrictions. *Transport policy* 96. pp. 76-93.
8. Beirao G., Sarsfield-Cabral J. 2007. Understanding attitudes towards public transport and private car: a qualitative study. *Transportation Policy* 14 (6). pp. 478-489.
9. Bernard J., Cléaud G., Jess N., Roucher D. 2013. Comment prévoir le prix du pétrole? *INSEE Note de conjoncture*. pp. 41-58.
10. Blair S. 2009. Physical inactivity: the biggest public health problem of the 21st century. *British Journal of Sports Medicine* 43 (1). pp. 1-2.
11. Brakewood C., Macfarlane G., Watkins K. 2015. The impact of real-time information on bus ridership in New York City. *Transportation Research* 53. pp. 59-75.
12. Budd L., Ison S. 2020. Responsible Transport: A post-COVID agenda for transport policy and practice. *Transportation Research. Interdisciplinary Perspectives* 6.
13. Buehler R., Pucher J. 2012. Demand for Public Transport in Germany and the USA: An Analysis of Rider Characteristics. *Transport Reviews* 31 (5). pp. 541– 567.
14. Carrington D. 2020. UK road travel falls to 1955 levels as Covid-19 lockdown takes hold.
URL: <https://www.theguardian.com/uk-news/2020/apr/03/uk-road-travel-falls-to-1955-levels-as-covid-19-lockdown-takes-hold-coronavirus-traffic> (accessed 14.12.20).

15. Cantillo et al. 2007. Modeling discrete choices in the presence of inertia and serial correlation. *Transportation science*. 41(2). pp.195-205.
16. Caulfield B., Kehoe J. 2021. Usage patterns and preference for car sharing: A case study of Dublin. *Case Studies on Transport Policy* 9 (1). pp.253-259.
17. Chakrabarti S. 2017. How can public transit get people out of their cars? An analysis of transit mode choice for commute trips in Los Angeles. *Transportation Policy* 54. pp. 80-89.
18. Chowdhury S., Ceder A. 2016. Users' willingness to ride an integrated public transport service: a literature review. *Transport policy* 48. pp.183-195.
19. Clewlow R. 2018. The Micro-Mobility Revolution.URL: <https://medium.com/populus-ai/the-micro-mobility-revolution-95e396db3754> (accessed 15.05.21).
20. Cherry C., Yang H., Jones L., He M. 2016. Dynamics of electric bike ownership and use in Kunming, China. *Transportation Policy* 45. pp. 127-135.
21. Citymapper Mobility Index. [Electronic source] Access mode: <https://citymapper.com/cmi/stpetersburg> (accessed 21.12.20).
22. Circella C. 2020. The COVID-19 Pandemic: what does it means for Mobility? What are the temporary vs. longer-term impacts? *UC Davis Institute of Transport Studies, 3 Revolutions Programm.* URL: https://scag.ca.gov/sites/main/files/file-attachments/mtf092320_circella.pdf?1602910605 (accessed 24.03.21).
23. Cohen, S. A.; Higham, J. E. 2011. Eyes wide shut? UK consumer perceptions on aviation climate impacts and travel decisions to New Zealand. *Current Issues in Tourism* 14 (4). pp. 323– 335.
24. Conti B. 2018. Modal shift and interurban mobility: Environmentally positive, socially regressive. *Journal of Transport Geography* 69. pp. 234-241.
25. Currie G., Delbosc A. 2013. Factors influencing young peoples' perceptions of personal safety on public transport. *Journal of Public Transportation* 16(1). pp.1–19.
26. Dell'Olio L., Ibeas A., Cecin P. 2011. The quality of service desired by public transport users. *Transport Policy* 18(1). pp. 217–227.
27. De Witte A., Hollevoet J. Dobruszkes F., Hubert M., Macharis C. 2013. Linking modal choice to motility: A comprehensive review. *Transportation Research: Part A* 49. p. 329–341.
28. De Witte A., Macharis C., Mairesse O. 2006. How persuasive is 'free' public transport?: A survey among commuters in the Brussels capital region. *Transport Policy* 15(4). p. 216–224.

29. Dikolli S., Kinney J., Sedatole K. 2007. Measuring Customer Relationship value: The role of switching cost. *Contemporary Accounting Research* 24 (1). p. 93 -132.
30. Donovan, J. Genter, Petrenas B., Mumby N., Hazledine T., Litman T., Hewison G., Guidera T., O'Reilly L., Green A., Leyland G. 2008. Managing transport challenges when oil prices rise. New Zealand Transport Agency. URL: <https://www.nzta.govt.nz/assets/resources/research/reports/357/docs/357.pdf> (accessed 20.03.21).
31. Eeshan B., Manoj B., Zia W., Arkopal K., Charisma F. 2020. Modelling the effects of COVID-19 on travel mode choice behavior in India. *Transportation Research Interdisciplinary Perspectives*.
32. Eisenmann C., Nobis C., Kolarova V., Lenz B., Winkler C. 2021. Transport mode use during the COVID-19 lockdown period in Germany: The car became more important, public transport lost ground. *Transport policy* 103. pp. 60-67.
33. Eurostat. 2018. [Electronic source] Access mode: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Passenger_cars_in_the_EU (accessed 20.03.21).
34. Fanglei J. , Kun A., Enjan Y. 2020. Mode choice analysis in urban transport with shared battery electric vehicles: A stated-preference case study in Beijing, China. *Transportation Research Part A: Policy & Practice* 133. pp. 95-108.
35. Flondel M., Vance C. 2011. Rarely enjoyed? A count data analysis of ridership in Germany's public transport. *Transport policy* 18 (2), pp. 425-433.
36. Fujii, S, Garling T., Kitamura R. 2001. Changes in drivers' perceptions and use of public transport during a freeway closure: Effects of temporary structural change on cooperation in a real-life social dilemma. *Environment and Behavior* 33. pp. 796–808.
37. Gaffron P.2003. The implementation of walking and cycling policies in British local authorities. *Transport Policy* 10. pp. 235-244.
38. Gardner B., Abraham C. 2007. What drives car use? A grounded theory analysis of commuters' reasons for driving. *Transportation Research Part F: Traffic Psychology and Behaviour* 10 (3). pp. 187-200.
39. Gloster A., Larmininos D., Lubenko J., Pretsi G., Squatrito V. et al. 2020. Impact of COVID-19 pandemic on mental health: An international study. URL: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0244809> (accessed 21.02.21).
40. Goldbaum C. 2020. Subway service is cut by a quarter because of coronavirus. URL: <https://www.nytimes.com/2020/03/24/nyregion/coronavirus-nyc-mta-cuts-.html?searchResultPosition=6> (accessed 14.12.20).

41. Google, 2020. COVID-19 Community Mobility Reports. [Electronic source] Access mode: <https://www.google.com/covid19/mobility/> (accessed 14.12.20).
42. Gordon P., Kumar A., Richardson H. 1989. Gender differences in metropolitan travel behavior. *Regional Studies* 23(6). pp. 499-510.
43. Graham S., Thrift N. 2007. Out of Order: Understanding Repair and Maintenance. *Theory Culture & Society* 24(3). pp.1-25.
44. Griffiths S., Furszyfer Del Rio D., Sovacool B. 2021. Policy mixes to achieve sustainable mobility after the COVID-19 crisis. *Renewable and Sustainable Energy Reviews* 143.
45. Hauser J., Tybout A., Koppelman F. 1981. Consumer-Oriented Transportation Service Planning: Consumer Analysis and Strategies. *Applications of Management Science*. pp. 91–138.
46. He H., Harris L. 2020. The impact of Covid-19 pandemic on corporate social responsibility and marketing philosophy. *Journal of business research* 116. pp.176–182.
47. He Y., Thies S., Avner P., Rentschler J. 2021. Flood impacts on urban transit and accessibility. A case study of Kinshasa. *Transportation Research Part D: Transport and Environment* 96.
48. Heinen E., Chatterjee K. 2015. The same mode again? An exploration of mode choice variability in Great Britain using the National Travel Survey. *Transportation Research*, 78. pp. 266-282.
49. Hess D., Brown J., Shoup D. 2004. Waiting for the bus. *Journal of Public Transport* 7 (4) pp. 67-84.
50. Heran F. 2001. La réduction de la dépendance automobile. *Cahiers Lillois d'Economie et de Sociologie* 37. pp. 61-86.
51. Hiscock R., Macintyre A., Kearns A., Ellaway A. 2002. Means of transport and ontological security: Do cars provide psycho-social benefits to their users? *Transportation Research Part D: Transport and Environment* 7(2). pp. 119-135.
52. Hörcher D., Tirachini A. 2021. A review of public transport economics. *Economics of transportation* 25.
53. Huang N., Pang J., Yang Y. 2020. The Impact of the COVID-19 Epidemic on the Housing Market in China. URL: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3642444 (accessed 21.02.21).
54. Impact of Coronavirus (COVID-19) on Public Transit usage. [Electronic source] Access mode: https://moovitapp.com/insights/en/Moovit_Insights_Public_Transit_Index-countries (accessed 21.12.20).

55. Jamal T., Budke C. Tourism in a world with pandemics: local-global responsibility and action. *Journal of tourism futures* 6(2). pp. 181-188.
56. Jaehyun H., Sugie L., Joonho K. 2020. Unraveling the impact of travel time, cost, and transit burdens on commute mode choice for different income and age groups. *Transportation Research* 141. pp. 147-166.
57. Keijer M., Rietveld P. 2004. How do people get to the railway station; a spatial analysis of the first and the last part of multimodal trips. *Journal of Transport Planning and Technology* 23 (3).
58. Kii M., Hirota K., Minato K. 2005. A study on modal shift potential considering public transport operation. URL: <http://128.40.111.250/cupum/searchpapers/papers/paper161.pdf> (accessed 11.04.21).
59. Klemperer P. 1987. The competitiveness of markets with switching costs. *Rand Journal of Economics* 18 (1). pp. 138-150.
60. Klemperer P. 1995. Competition when Consumers have Switching Costs: An Overview with Applications to Industrial Organization, Macroeconomics, and International Trade. *The Review of Economic Studies* 62 (4). pp. 515-539.
61. Kirk C.P, Rifkin L.S. 2020. I'll trade you diamonds for toilet paper: Consumer reacting, coping and adapting behaviors in the COVID-19 pandemic, *Journal of Business Research* 117, pp. 124-131.
62. Kozlak A. 2017. The role of the transport system in stimulating economic and social development. *Transport economics and logistic* 72. pp.19-32.
63. Kroesen M. To what extent do e-bikes substitute travel by other modes? Evidence from the Netherlands. 2007. *Transportation Research. Part D: Transport and Environment* 53. pp. 377-387.
64. Krygsman S., Dijst M., Arentze T. 2004. Multimodal public transport: an analysis of travel time elements and the interconnectivity ratio. *Transport Policy* 11. pp. 265–275.
65. Kuhnimhof T., Chlond B., Ruhren S. 2006. Users of transport modes and multimodal travel behavior. *Transportation Research*. pp. 40-48.
66. Lane B. 2010. The relationship between recent gasoline price fluctuations and transit ridership in major US cities. *Journal of transport geography* 18 (2). pp. 214-225.
67. Li J., Hallsworth J.A., Coca-Stefaniak A. 2020. The changing grocery shopping behavior of Chinese consumers at the outset of the COVID-19 outbreak. *Tijdschrift voor Economische en Sociale Geografie*. pp.574-583.
68. López-Rousseau, A., 2005. Avoiding the death risk of avoiding a dread risk: the aftermath of march 11 in Spain. *Psychological Science* 16. pp. 426–428.

69. Louviere J., Hensher D., Swait J. 2000. Stated choice methods: analysis and application. *Cambridge University Press*.
70. Manoj M., Verma, A., 2015. Activity-travel behaviour of non-workers belonging to different income group households in Bangalore. *Journal of transport geography* 49. pp. 99–109.
71. Mardsen G., Anable J., Chatterton T., Docherty L., Faulconbridge J., Murray L., Shires J. 2020. Studying disruptive events: Innovations in behavior, opportunities for lower carbon transport policy? *Transport policy* 94. pp.89-101.
72. Mankiw N., Taylor M. 2006. Microeconomics. London: Thomson Learning.
73. Marsden, G., Anable, J., Shires, J., Docherty, I., 2016. Travel Behaviour Response to Major Transport System Disruptions Implications for Smarter Resilience Planning. Organisation for Economic Co-operation and Development (OECD). <https://www.econstor.eu/bitstream/10419/173916/1/859334333.pdf> (accessed 21.12.20).
74. May D., Shepherda S., Pfaffenbichlerb P., Embergerc G. 2020. The potential impacts of automated cars on urban transport: An exploratory analysis. *Transport Policy* 98. pp.127-138.
75. Meena S. 2020. Impact of novel Coronavirus (COVID-19) pandemic on travel pattern: A case study of India. *Indian Journal of Science and Technoogy* 13. pp. 2491–2501.
76. Metz D. 2013. Peak Car and Beyond: The Fourth Era of Travel. *Transport Review* 33, pp. 255-270.
77. Milioti C., Karlaftis M. 2014. Multimodal public transport demand: a cointegration time-series approach. *Internatonal journal of transport economics* 41 (3). pp.361-382.
78. Molloy J., Tchervenkov C., Axhausen K., 2020. Tracing the Sars-CoV-2 impact. The first month in Switzerland-March to April 2020. URL: <https://findingspress.org/article/12903-tracing-the-sars-cov-2-impact-the-first-month-in-switzerland> (accessed 15.12.20).
79. Mohammad G. Eftekhar H., Shokri F., Bin Ismail A. 2013. The Comparison of Mode Choice Sensitivity to the Reduction of Travel Time and Cost in Multimodal Trip. *Research Journal of Applied Sciences, Engineering and Technology* 6 (9). pp. 1680-1684.
80. Morton C. 2018. Appraising the market for bicycle sharing schemes: perceived service quality, satisfaction, and behavioural intention in London. *Case Studies on Transport Policy* 6(1), pp. 102-111.
81. Newman P., Kenworthy J. 2015. The end of automobile dependence. How cities are moving beyond car-based planning. Washington DC: Island Press.
82. Olmo M., Maeso E. 2014. Travel patterns, regarding different activities: work, studies, household responsibilities. *Transportation Research Procedia* 3. pp.119-128.

83. Olson P. 2020. Telemedicine, once a hard sell, can't keep up with demand. *The Wall Street Journal*. URL: <https://www.wsj.com/articles/telemedicine-once-a-hard-sell-cant-keep-up-with-demand-11585734425> (accessed 11.02.21).
84. Ortuzar J., Willumsen L. 1994. *Modeling Transport*. New York, USA.
85. Ouellette .A., Wood W. 1998. Habit and intention in everyday life: the multiple processes by which past behavior predicts future behavior. *Psychological Bulletin* 124. pp. 54-74.
86. Pastori E., Brambilla M., Maffii S., Vergnani R., Gualandi E., Skinner I. 2018. Modal shift in European transport: a way forward URL: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Passenger_cars_in_the_EU#Overview (accessed 11.02.21).
87. Paulley N., Balcombe R., Mackett R. et al. 2006. The demand for public transport: The effects of fares, quality of service, income and car ownership. *Transport Policy* 13 (4). pp. 295-306.
88. Redman L., Friman M., Garling, T., Hartig, T. 2013. Quality attributes of public transport that attract car users: A research review. *Transport Policy* 25, pp. 119–127.
89. Reeves M., Carlsson-Szlezak P., Whitaker K., Abraham M. 2020. Sensing and shaping the post-covid era. URL: <https://www.bcg.com/en-us/publications/2020/8-ways-companies-can-shape-reality-post-covid-19.aspx> (accessed 21.02.21).
90. Rogers D. 2020. Consumers are putting brands on notice over coronavirus behaviour, study finds. URL: <https://www.campaignlive.co.uk/article/consumers-putting-brands-notice-coronavirus-behaviour-study-finds/1678821> (accessed 01.02.21).
91. Pregnolato M., Ford A., Wilkinson S., Dawson R. 2017. The impact of flooding on road transport: A depth-disruption function. *Transportation Research Part D: Transportation Environment* 55. pp. 67-81.
92. Sabouri S., Park K., Smith A., Tian G., Ewing R. 2020. Exploring the influence of built environment on Uber demand, *Transportation Research Part D: Transport and Environment* 81.
93. Sanchez I., Gonzalez E. 2016. Gender differences in commuting behavior: Women's greater sensitivity. *Transportation Research Procedia* 18. pp. 66 – 72.
94. Scheidel W. 2017. *The Great Leveler*. Princeton University Press.
95. Shaheen P., Cohen A., Chan N., Bansal A. 2020. Sharing strategies: carsharing, shared micromobility (bikesharing and scooter sharing), transportation network companies, microtransit, and other innovative mobility modes. URL: <https://escholarship.org/uc/item/0z9711dw> (accessed 15.05.21).

96. Shang W.L., Chen J., Bi H., Sui Y., Chen Y, Yu H. 2021. Impacts of COVID-19 pandemic on user behaviors and environmental benefits of bike sharing: a big-data analysis. *Applied Energy* 285.
97. Schlag B. 1997. Public acceptability of transport pricing. *IATSS Research* 21(2). pp. 134-142.
98. Sfeir G., Abou-Zeid M. 2020. Multivariate count data models for adoption of new transport modes in an organization-based context. *Transport Policy* 91. pp. 59-75.
99. Sheth J. 2020. Impact of Covid-19 on consumer behavior: Will the old habits return or die? *Journal of Business Research*, 1, pp. 280-283.
100. Steg L. 2003. Can public transport compete with the private car? *IATSS Research* 27 (2), pp. 27–35.
101. Steg L. 2005. Car use: Lust and must. Instrumental, symbolic and affective motives for car use. *Transportation Research Part A: Policy and Practice* 39(2–3), pp. 147–162.
102. Strömngren M., Schantz P., Sommarc J.N., Raza W., Markst A., Forsberg B. 2020. Modeling commuter modal shift from car trips to cycling: Scenario construction and outcomes for Stockholm, Sweden. *Journal of Transport Geography* 86. pp. 1-20.
103. Tafarakis S., Gkorezis P., Nalmpantis D., Genitsaris E., Andronikidis E., Altsitsiadis E. 2019. Investigating the preferences of individuals on public transport innovations using the Maximum Difference Scaling method. *European transport research review* 11 (3)
104. Tan L., Ma C. 2020. Choice behavior of commuters' rail transit mode during the COVID-19 pandemic based on logistic model. *Journal of Traffic Transportation*. URL: https://www.researchgate.net/publication/346731436_Choice_behavior_of_commuters'_rail_transit_mode_during_the_COVID-19_pandemic_based_on_logistic_model (accessed 10.04.21).
105. Tarabay R., Abou-Zeid M. 2020. Modeling the choice to switch from traditional modes to ridesourcing services for social/recreational trips in Lebanon. *Transportation* 4. pp. 1733-1763.
106. Tertoolen G., Kreveld D., Verstraten B. 1998. Psychological resistance against attempts to reduce private car use. *Transportation Research Part A: Policy Practice* 32 (3). pp. 171-181.
107. Thogersen J. 2006. Understanding repetitive travel mode choices in a stable context: A panel study approach. *Transportation Research Part A: Policy and Practice* 40 (8). pp.621-638.
108. Thogersen J. 2009. Promoting public transport as a subscription service: Effects of a free month travel card. *Transport Policy* 16(6), pp. 335–343.

109. Valenzuela-Levi N. 2021. The rich and mobility: A new look into the impacts of income inequality on household transport expenditures. *Transport Policy* 100. pp. 161-171.
110. Van Raaij W., Verhallen T. 1983. A behavioural model of residential energy use. *Journal of Economic Psychology* 3. pp. 39-63.
111. WHO timeline - COVID-19. 2021. [Electronic source] Access mode: <https://www.who.int/news-room/detail/08-04-2020-who-timeline---covid-19> (accessed 14.02.21).
112. Waygooda B., Avinerib E. Communicating transportation carbon dioxide emissions information: Does gender impact behavioral response? *Transportation Research Part D: Transport and Environment* 48. pp.187-202.
113. Woo C., Liu Y., Cao K., Zarnikau J. 2020. Can Hong Kong price-manage its public transportation's ridership? *Case Studies on Transport Policy* 8 (4). pp. 1191-1200.
114. Xuelin T., Chunjiang A., Zhikun C., Zhiqiang T. 2021. Assessing the impact of COVID-19 pandemic on urban transportation and air quality in Canada. *Science of The Total Environment* 765.
115. Zhen J., Chan C., Schoonees A., Apatu S., Thabane L., Young T. 2020. Transmission of respiratory viruses when using public ground transport: A rapid review to inform public health recommendations during the COVID-19 pandemic. *South African Medical Journal* 110 (6). pp. 478-483.
116. Zoom market ranking of the most educated cities in Russia 2017. [Electronic source] Access mode: <https://www.mazm.ru/article/a-2048.php> (accessed 10.04.21).

Appendix. Questionnaire for St. Petersburg citizens

Уважаемый респондент, Высшая школа менеджмента Санкт-Петербургского государственного университета проводит исследование об изменении транспортного поведения горожан вследствие пандемии коронавируса. Полученная информация будет использована для повышения качества оказания транспортных услуг жителям городов. Опрос займет не более 7-10 минут. Все данные будут использованы только в обобщенном виде для научных целей. Вы можете быть уверены в полной конфиденциальности ответов. Благодарим за участие!

Блок вопросов №1

1. Укажите, пожалуйста, из какого Вы города.

Мой ответ

2. Укажите, пожалуйста, Ваш пол

- a. Женский
- b. Мужской

3. Укажите, пожалуйста, сколько Вам полных лет?

Мой ответ

4. Укажите, пожалуйста, состоите ли Вы в браке?

- a. Да
- b. Нет

5. Укажите, пожалуйста, сколько человек постоянно проживает вместе с Вами?

- a. 1
- b. 2
- c. 3
- d. 4
- e. 5
- f. 6
- g. 7 и больше

6. Укажите, пожалуйста, сколько человек в Вашей семье работает?

- a. Никто не работает
- b. Один
- c. Два
- d. Три
- e. Больше трёх

7. Укажите, пожалуйста, сколько несовершеннолетних детей в Вашей семье?

- a. Нет несовершеннолетних детей
- b. Один
- c. Два
- d. Три
- e. Больше трех

8. К какой категории граждан Вы относитесь?

- a. Учащийся / студент
- b. Пенсионер
- c. Госслужащий

- d. Наёмный работник
- e. Предприниматель
- f. Безработный
- g. Другое:

9. Укажите, пожалуйста, уровень Вашего образования.

- a. Высшее образование
- b. Незаконченное высшее образование
- c. Среднее профессиональное образование
- d. Полное среднее
- e. Неполное среднее

10. Укажите, пожалуйста, какой у Вас тип занятости в данный момент.

- a. Полная занятость
- b. Временная неполная занятость
- c. Неполная занятость
- d. Ни один из пунктов не характеризует мою занятость в данный момент

11. Укажите, пожалуйста, по какому графику Вы работаете/учитесь в данный момент.

- a. Я работаю/учусь по фиксированному графику (определено постоянное время начала и окончания рабочего/учебного дня) в здании организации
- b. Я работаю/учусь по свободному графику (не определено постоянное время начала и окончания рабочего/учебного дня) в здании организации
- c. Я работаю/учусь по гибридной системе (часть рабочей недели работаю/учусь в здании организации, часть работаю удаленно)
- d. Я работаю/учусь удаленно
- e. Я не работаю, и не учусь в данный момент

12. Укажите, пожалуйста, среднемесячный уровень доходов на одного члена Вашей семьи.

- a. Менее 10000 рублей
- b. Больше 10000 рублей, но меньше 15000 рублей
- c. Больше 15000 рублей, но меньше 23000 рублей
- d. Больше 23000 рублей, но меньше 30000 рублей
- e. Больше 30000 рублей, но меньше 42000 рублей
- f. Больше 42000 рублей, но меньше 63000 рублей
- g. Больше 63000 рублей

13. Охарактеризуйте, пожалуйста, Ваше материальное положение.

- a. Очень тяжелое, так как хватает только на еду
- b. Тяжелое, так как хватает только на еду и одежду
- c. Умеренное, так как хватает на еду, одежду и отпуск раз в году
- d. Хорошее, так как хватает на еду, одежду, покупку автомобиля и отпуск раз в году
- e. Очень хорошее, так как хватает на всё, вплоть до покупки одежды и автомобилей, дорогостоящего отдыха на престижных курортах несколько раз в году

14. Совершая поездки на транспорте в текущий момент времени используете ли Вы средства индивидуальной защиты (маски)?

- a. Да
- b. Нет

15. Укажите, какие изменения произошли в Вашей жизни в связи с пандемией коронавирусной инфекции?

- a. Я стал стараться реже выходить из дома
- b. Я стал реже встречаться с друзьями и родственниками
- c. Я переехал жить за город
- d. Мой доход значительно снизился
- e. Я потерял работу
- f. Я стал чаще делать покупки онлайн
- g. Не могу сказать, что пандемия внесла изменения в мой образ жизни
- h. Ваш вариант ответа:

16. Есть ли у Вас личный автомобиль, принадлежащий Вам или Вашей семье

- a. Да
- b. Нет

Если на предыдущий вопрос (№16) Вы ответили «Да», просим Вас перейти к блокам вопросов №3 и №4, если Вы ответили «Нет», то просим Вас перейти к блокам вопросов №1 и №2.

БЛОК 1. (вопросы для респондентов, не имеющих автомобиль)

Вопросы блока №1 относятся к временному периоду ДО марта 2020 года (ДО начала первых ограничений, связанных с распространением коронавирусной инфекции)

17. Какими видами транспорта Вы пользовались чаще всего в черте города до начала пандемии коронавирусной инфекции (до марта 2020 года)? Пожалуйста, укажите от 1 до 3 вариантов.

- a. Автобус
- b. Пригородные электрички в пределах Санкт-Петербурга
- c. Маршрутное такси
- d. Метро
- e. Трамвай
- f. Троллейбус
- g. Такси
- h. Арендванный наземный транспорт (велосипед, самокат, каршеринг)
- i. Собственный наземный транспорт (велосипед, самокат и др.)
- j. Практически не пользовался транспортом (ходил только пешком)

18. Укажите, пожалуйста, те факторы, которые были основными при выборе вида транспорта до начала пандемии коронавирусной инфекции (до марта 2020 года)?

- a. Цена поездки
- b. Комфорт в поездке
- c. Время ожидания транспорта
- d. Возможность точного планирования маршрута и времени в пути
- e. Безопасность (вероятность происшествия на виде транспорта, в т.ч. аварий)
- f. Ваш вариант ответа: _____

19. Как часто Вы пользовались общественным транспортом (метро, автобус, троллейбус, пригородная электричка, маршрутное такси) в черте города до марта 2020?

- a. Очень часто (практически каждый день)
- b. Часто (несколько раз в неделю)
- c. Редко (несколько раз в месяц)

- d. Очень редко (несколько раз в год)
- e. Никогда (ни разу не пользовался за год)
- f. Ваш вариант ответа: _____

20. Если Вы использовали общественный транспорт до марта 2020 (метро, автобус, троллейбус, пригородная электричка, маршрутное такси), то куда чаще всего совершали поездки?

- a. Не пользовался общественным транспортом за указанный период
- b. На работу/ на учебу
- c. В магазины (в том числе продуктовые магазины)
- d. В кинотеатры, театры, музеи и др.
- e. В рестораны и кафе
- f. В школу/секции/детский сад
- g. В медицинские учреждения
- h. В гости, к родственникам
- i. За город на прогулки/на дачу
- j. Ваш вариант ответа:

Если в предыдущем вопросе Вы выбрали вариант а «Не пользовался общественным транспортом за указанный период», то вопрос No21 следует пропустить.

21. Вызывала ли поездка на городском транспорте опасения, связанные со здоровьем?

- a. Не пользовался общественным транспортом за указанный период
- b. Да, опасался за свое здоровье
- c. Нет, не опасался за свое здоровье

22. Как часто до марта 2020 Вы пользовались арендованным или собственным наземным транспортом личного пользования (велосипед, самокат, скейтборд и др.) для передвижения по городу, но не в качестве развлечения/прогулки.

- a. Очень часто (практически каждый день)
- b. Часто (несколько раз в неделю)
- c. Редко (несколько раз в месяц)
- d. Очень редко (несколько раз в год)
- e. Никогда (ни разу не пользовался за год)

БЛОК №2. (вопросы для респондентов, не имеющих автомобиль)

Вопросы блока №2 относятся к временному периоду с марта 2020 года по настоящее время (В ПЕРИОД РАСПРОСТРАНЕНИЯ КОРОНАВИРУСНОЙ ИНФЕКЦИИ).

23. Какими видами транспорта Вы пользуетесь в период пандемии (в период с марта 2020 года по настоящее время) наиболее часто в черте города? Пожалуйста, укажите от 1 до 3 наиболее подходящих вариантов.

- a. Автобус
- b. Пригородные электрички в пределах Санкт-Петербурга
- c. Маршрутное такси
- d. Метро
- e. Трамвай
- f. Троллейбус
- g. Такси
- h. Арендванный наземный транспорт (велосипед, самокат, каршеринг)
- i. Собственный наземный транспорт (велосипед, самокат)
- j. Практически не пользовался транспортом (ходил только пешком)

24. Выбирая между разными видами транспорта для совершения поездок, на что Вы в первую очередь обращали внимание в указанный период времени (с марта 2020 года по настоящее время)? Пожалуйста, укажите от 1 до 3 наиболее подходящих вариантов.

- a. Цена поездки
- b. Комфорт в поездке
- c. Время ожидания транспорта
- d. Возможность точного планирования маршрута и времени в пути
- e. Безопасность (вероятность происшествия на виде транспорта, в т.ч. аварий)
- f. Ваш вариант ответа: _____

25. Как часто Вы пользовались общественным транспортом (метро, автобус, троллейбус, пригородная электричка, маршрутное такси), с марта 2020 года по настоящее время?

- a. Очень часто (практически каждый день)
- b. Часто (несколько раз в неделю)
- c. Редко (несколько раз в месяц)
- d. Очень редко (несколько раз за период)
- e. Никогда (ни разу не пользовался за период)

26. Если Вы использовали общественный транспорт (метро, автобус, троллейбус, пригородная электричка, маршрутное такси) в период с марта 2020 года по настоящее время, то куда чаще всего ездили? Пожалуйста, укажите 1-3 наиболее подходящих варианта.

- a. Не пользовался общественным транспортом в указанный период
- b. На работу/ на учебу
- c. В магазины (в том числе продуктовые магазины)
- d. В кинотеатры, театры, музеи и др.
- e. В рестораны и кафе
- f. В школу /детские секции/детский сад
- g. В больницы для визита к врачам
- h. В гости, к родственникам
- i. За город на прогулки/на дачу
- j. Ваш вариант ответа: _____

27. Опасались ли Вы за свое здоровье, совершая поездки на общественном транспорте в период с марта 2020?

- a. Не пользовался общественным транспортом за указанный период
- b. Да, опасался за свое здоровье
- c. Нет, не опасался за свое здоровье

28. Как часто Вы пользовались арендованным или собственным наземным транспортом личного пользования (велосипед, самокат, скейтборд, ролики) как средством передвижения (не в качестве развлечения или прогулки), начиная с марта 2020 года?

- a. Очень часто (практически каждый день)
- b. Часто (несколько раз в неделю)
- c. Редко (несколько раз в месяц)
- d. Очень редко (несколько раз за период)
- e. Никогда (ни разу не пользовался за период)

29. Начали ли Вы задумываться в период пандемии над покупкой автомобиля?

- a. Да, я задумывался (-лась) над покупкой
- b. Нет, я не задумывался (-лась) над этим

30. Укажите, пожалуйста, изменилась ли частота Вашего пользования общественным транспортом в период распространения коронавирусной инфекции?

- a. Я стал чаще пользоваться общественным транспортом, чем раньше
- b. Я стал реже пользоваться общественным транспортом
- c. Нет, я пользуюсь общественным транспортом точно в таком же объеме, как и раньше

31. Если в период пандемии (с марта 2020 по настоящее время) Вы стали реже пользоваться общественным транспортом, то по какой причине?

- a. Из-за высокой опасности заражения инфекцией
- b. Из-за сокращения необходимости ездить куда-либо
- c. Из-за сокращения количества общественного транспорта/отмена маршрута общественного транспорта
- d. Из-за отключения льготных тарифов для оплаты общественного транспорта
- e. Другая причина:
- f. Я пользуюсь общественным транспортом точно в таком же объеме, как и раньше

32. Отметили ли Вы у себя новые предпочтения при выборе вида транспорта для передвижения по городу возникшие у Вас в период пандемии?

- a. Я стал чаще отдавать предпочтение арендованному автомобилю для передвижения по городу
- b. Я стал чаще отдавать предпочтение такси для передвижения по городу
- c. Я стал чаще отдавать предпочтение наземному транспорту личного пользования (велосипед, самокат, скейтборд и др.) для передвижения по городу
- d. Не могу сказать, что у меня появились новые предпочтения

БЛОК №3 (вопросы для респондентов, имеющих автомобиль)

Вопросы блока №3 относятся к временному периоду ДО марта 2020 года (ДО начала первых ограничений, связанных с распространением коронавирусной инфекции)

33. Какими видами транспорта Вы пользовались чаще всего в черте города до начала пандемии коронавирусной инфекции (до марта 2020 года)? Пожалуйста, укажите от 1 до 3 вариантов.

- a. Личный автомобиль, принадлежащий Вам или Вашей семье
- b. Арендванный наземный транспорт (велосипед, самокат, каршеринг)
- c. Собственный наземный транспорт (велосипед, самокат)
- d. Автобус
- e. Пригородные электрички в пределах Санкт-Петербурга
- f. Маршрутное такси
- g. Метро
- h. Трамвай
- i. Троллейбус
- j. Такси
- k. Практически не пользовался транспортом (ходил только пешком)

34. Укажите, пожалуйста, те факторы, которые были основными при выборе вида

транспорта до начала пандемии коронавирусной инфекции (до марта 2020 года)?

- a. Цена поездки
- b. Комфорт в поездке
- c. Время ожидания транспорта
- d. Возможность точного планирования маршрута и времени в пути
- e. Безопасность (вероятность происшествия на виде транспорта, в т.ч. аварий)
- f. Ваш вариант ответа: _____

35. Как часто Вы пользовались общественным транспортом (метро, автобус, троллейбус, пригородная электричка, маршрутное такси) в черте города до марта 2020?

- a. Очень часто (практически каждый день)
- b. Часто (несколько раз в неделю) Редко (несколько раз в месяц)
- c. Очень редко (несколько раз в год)
- d. Никогда (ни разу не пользовался за год)
- e. Ваш вариант ответа

36. Если Вы использовали общественный транспорт до марта 2020 (метро, автобус, троллейбус, пригородная электричка, маршрутное такси), то куда чаще всего совершали поездки ?

- a. Не пользовался общественным транспортом за указанный период
- b. На работу/ на учебу
- c. В магазины (в том числе продуктовые магазины)
- d. В кинотеатры, театры, музеи и др.
- e. В рестораны и кафе
- f. В школу/секции/детский сад
- g. В медицинские учреждения
- h. В гости, к родственникам
- i. За город на прогулки/на дачу
- j. Ваш вариант ответа:

Если в предыдущем вопросе Вы выбрали вариант 1. «Не пользовался общественным транспортом за указанный период», то вопрос 37 следует пропустить

37. Вызывала ли поездка на городском транспорте опасения в связи со сложившейся эпидемиологической обстановкой?

- a. Не пользовался общественным транспортом в указанный период
- b. Да, опасался за свое здоровье
- c. Нет, не опасался за свое здоровье

38. Как часто Вы пользовались личным автомобилем до марта 2020?

- a. Очень часто (практически каждый день)
- b. Часто (несколько раз в неделю)
- c. Редко (несколько раз в месяц)
- d. Очень редко (несколько раз в год)
- e. Никогда (ни разу не пользовался за год)

39. Если в период до марта 2020 года Вы использовали личный автомобиль, то куда чаще всего на нем ездили? Пожалуйста, укажите 1-3 наиболее подходящих варианта.

- a. На работу/ на учебу
- b. В магазины (в том числе продуктовые магазины)

- c. В кинотеатры, театры, музеи и др.
- d. В школу/секции/детский сад
- e. В больницы для визита к врачам
- f. В гости, к родственникам
- g. За город на прогулки/на дачу
- h. Другое: _____

40. Как часто до марта 2020 Вы пользовались арендованным или собственным наземным транспортом личного пользования (велосипед, самокат, скейтборд и др.) для передвижения по городу (не в качестве развлечения/прогулки)

- a. Очень часто (практически каждый день)
- b. Часто (несколько раз в неделю)
- c. Редко (несколько раз в месяц)
- d. Очень редко (несколько раз в год)
- e. Никогда (ни разу не пользовался за год)

БЛОК №4 (вопросы для респондентов, имеющих автомобиль)

Вопросы блока №4 относятся к временному периоду с марта 2020 года по настоящее время (В ПЕРИОД РАСПРОСТРАНЕНИЯ КОРОНАВИРУСНОЙ ИНФЕКЦИИ).

41. Какими видами транспорта Вы пользуетесь в период пандемии (в период с марта 2020 года по настоящее время) наиболее часто в черте города? Пожалуйста, укажите от 1 до 3 наиболее подходящих вариантов.

- a. Личный автомобиль, принадлежащий Вам или Вашей семье
- b. Арендванный наземный транспорт (велосипед, самокат, каршеринг)
- c. Собственный наземный транспорт (велосипед, самокат)
- d. Автобус
- e. Пригородные электрички в пределах Санкт-Петербурга
- f. Маршрутное такси
- g. Метро
- h. Трамвай
- i. Троллейбус
- j. Такси
- k. Практически не пользовался транспортом (ходил только пешком)

42. Выбирая между разными видами транспорта для совершения поездок, на что Вы в первую очередь обращали внимание в указанный период времени (с марта 2020 года по настоящее время)? Пожалуйста, укажите от 1 до 3 наиболее подходящих вариантов.

- a. Цена поездки
- b. Комфорт в поездке
- c. Время ожидания транспорта
- d. Возможность точного планирования маршрута и времени в пути
- e. Безопасность (вероятность происшествия на виде транспорта, в т.ч. аварий)
- f. Другое _____

43. Как часто Вы пользовались общественным транспортом (метро, автобус, троллейбус, пригородная электричка, маршрутное такси), начиная с марта 2020 года по настоящее время

- a. Очень часто (практически каждый день)
- b. Часто (несколько раз в неделю)
- c. Редко (несколько раз в месяц)
- d. Очень редко (несколько раз за период)

е. Никогда (ни разу не пользовался за период)

44. Если Вы использовали общественный транспорт (метро, автобус, троллейбус, пригородная электричка, маршрутное такси) в период с марта 2020 года по настоящее время, то куда чаще всего ездили? Пожалуйста, укажите 1-3 наиболее подходящих варианта.

- a. Не пользовался общественным транспортом в указанный период
- b. На работу/ на учебу
- c. В магазины (в том числе продуктовые магазины)
- d. В кинотеатры, театры, музеи и др.
- e. В рестораны и кафе
- f. В школу /детские секции/детский сад
- g. В больницы для визита к врачам
- h. В гости, к родственникам
- i. За город на прогулки/на дачу
- j. Ваш вариант ответа: _____

45. Опасались ли Вы за свое здоровье, совершая поездки на общественном транспорте с марта 2020?

- a. Не пользовался общественным транспортом за указанный период
- b. Да, опасался за свое здоровье
- c. Нет, не опасался за свое здоровье

46. Как часто Вы пользовались личным автомобилем начиная с марта 2020 года по текущий момент?

- a. Очень часто (практически каждый день)
- b. Часто (несколько раз в неделю)
- c. Редко (несколько раз в месяц)
- d. Очень редко (несколько раз за период)
- e. Никогда (ни разу не пользовался за период)

47. Если Вы использовали личный автомобиль в период с марта 2020 года по настоящее время то куда чаще всего Вы ездили на нем? Пожалуйста, укажите 1-3 наиболее подходящих варианта.

- a. На работу/ на учебу
- b. В магазины (в том числе продуктовые магазины)
- c. В кинотеатры, театры, музеи и др.
- d. В рестораны и кафе
- e. В школу/детские секции/детский сад
- f. В больницы для визита к врачам
- g. В гости, к родственникам
- h. За город на прогулки/на дачу
- i. Ваш вариант ответа: _____

48. Как часто Вы пользовались арендованным или собственным наземным транспортом личного пользования (велосипед, самокат, скейтборд, ролики) как средством передвижения (не в качестве развлечения или прогулки), начиная с марта 2020 года?

- a. Очень часто (практически каждый день)
- b. Часто (несколько раз в неделю)
- c. Редко (несколько раз в месяц)
- d. Очень редко (несколько раз за период)

е. Никогда (ни разу не пользовался за период)

49. Укажите, пожалуйста, изменилась ли частота Вашего пользования общественным транспортом в период распространения коронавирусной инфекции?

- а. Я стал чаще пользоваться общественным транспортом, чем раньше
- б. Я стал реже пользоваться общественным транспортом
- с. Нет, я пользуюсь общественным транспортом точно в таком же объеме, как и раньше

50. Если в период пандемии (с марта 2020 по настоящее время) Вы стали реже пользоваться общественным транспортом, то по какой причине?

- а. Из-за высокой опасности заражения инфекцией
- б. Из-за сокращения необходимости ездить куда-либо
- с. Из-за сокращения количества общественного транспорта/отмена маршрута общественного транспорта
- д. Из-за отключения льготных тарифов для оплаты общественного транспорта
- е. Другая причина:
- ф. Я пользуюсь общественным транспортом точно в таком же объеме, как и раньше

51. Отметили ли Вы у себя новые предпочтения при выборе вида транспорта для передвижения по городу возникшие у Вас в период пандемии?

- а. Я стал чаще отдавать предпочтение арендованному автомобилю для передвижения по городу
- б. Я стал чаще отдавать предпочтение такси для передвижения по городу
- с. Я стал чаще отдавать предпочтение наземному транспорту личного пользования (велосипед, самокат, скейтборд и др.) для передвижения по городу