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Consumer perception of shared mobility services in the light of global climate challenges

This article identifies factors affecting the decision to use shared mobility and presents the attitudes of its users towards the environment and its protection, drawing on the results of quantitative research carried out in August 2021 in Poland using computer-assisted Web interviewing. First and foremost, it allowed to pinpoint the two factors that have by far the greatest influence on the decision to use shared mobility services: distance to vehicle and cost per minute. Thus far, environmental concerns are of secondary importance. Moreover, although Polish drivers at present have no intention of giving up their cars, in the future, given appropriate economic incentives and easy access to shared vehicles, they might be convinced to do so.

Keywords: shared mobility, passenger transport, purchase decisions of transport users

JEL classification: R4, R42, D12, O44

Introduction

Never before has man had such a significant impact on the natural environment – anthropopressure, rising every year, has now become so great that it will leave a visible mark in the fossil record [Stobiecka, 2018, p. 14]. This new epoch of increased human activity, dubbed the Anthropocene, or the "Great Acceleration", is a period of significant geographical changes occurring over an extremely short time, manifested by rapid urbanization and depletion of fossil fuels, which have been accumulating in nature for hundreds of millions of years, environmental contamination, and increased emission of greenhouse gases [IPCC, 2020]. It is estimated that by 2050, due to the high CO_2 emissions, global warming may raise the temperature by 1.5–2°C compared to its level before the Industrial Age [IPCC, 2021]. Such an increase would constitute a threat to the climate, and thus to human health and life. Because of these and other observations, environmental and climate issues have become central elements of internal and international policies in Europe and the world [Cholewińska, 2020, pp. 3–5].

Most CO_2 emissions into the atmosphere are generated by five sectors of the economy: energy (combustion of fossil fuels), industry, deforestation, buildings and construction, and transport, which accounts for 22–24% of total CO_2 emissions, of which the majority (17%) is produced by road transport [Rabiega, Sikora, 2020]. At the same time, transport services and systems play a substantial role in the social and economic growth of the contemporary world [Paradowska, 2013, p. 353], each day enabling unrestricted movement of commodities and people. However, today's reliance of transport on petroleum [Bachorz, 2017, p. 46; EU, 2019, p. 22] has multiple political, economic, and environmental repercussions (e.g. sensitivity to oil price fluctuations and threats of supply suspension, high greenhouse gas emissions). These are the main reasons why efforts to reduce reliance on petroleum and transport-related emissions are being made under European policies (e.g. the European Green Deal of December 2019, or the new Fit for 55 climate package). Fit for 55, adopted on 4 August 2021 by the European Commission, specifies that by 2030 emissions should be reduced by at least 55% compared to the 1990 levels. Such a reduction within the next decade is a fundamental prerequisite for Europe becoming the world's first climate-neutral continent by 2050 and implementing the European Green Deal [EC, 2021].

The desired changes, which are supposed to help counterbalance the adverse effects of human activity on the environment, tend to require a shift to sustainable consumption and production as a response to excess mass production of goods and the associated overconsumption (see e.g. 2030 Agenda for Sustainable Development and Treaty on the Functioning of the European Union, Articles 191–193). This requirement is being increasingly applied not just to the consumption of fast-moving consumer goods, but also to services such as passenger transport, whose sustainability transformation would most considerably contribute to the reduction of negative externalities affecting other areas of life [Moon-Miklaucic et al., 2019, pp. 2–5]. For people living in today's economy, this presents a unique challenge, which entails, i.a., a re-evaluation of the concepts of gain, benefit, or profitability. The economics of sustainable development emphasizes that in order to ensure stable growth for current and future generations, national economic policies, organizational strategies, and business practices must better reflect the environmental limitations [WEF, 2018]. Europe's transformation into an economy based on such principles would reduce environmental costs and its ecological footprint [EC, 2018, p. 2].

Figure 1 presents an approach that could be adopted to implement a sustainable transport system, thereby alleviating the negative impact of passenger transport on human health and the natural environment in urbanized areas. Shared mobility is a solution with countless applications, and as such can promote a shift towards sustainability in many different areas and ways. But it is also based on

a very different mobility pattern. Employing specific shared mobility strategies allows to affect desired changes in consumer attitudes and decisions. As new mobility behaviors are shaped, environmental impacts lessen [Karbaumer, Metz, 2021, p. 19].

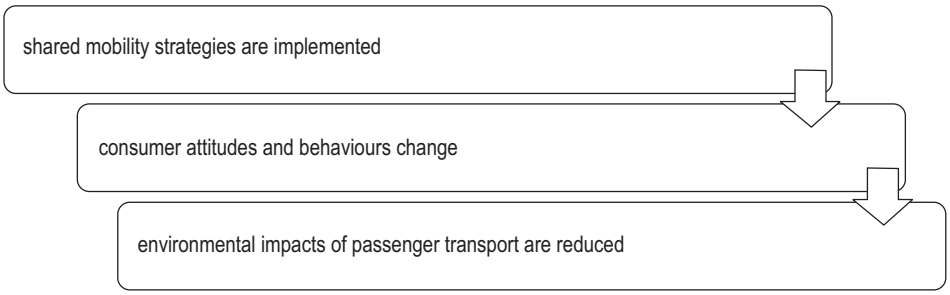

Figure 1. Effect of shared mobility on environmental costs
Source: Own elaboration.

As a model of socio-economic relations, shared mobility constitutes a part of a broader system of the sharing economy [Moon-Miklaucic et al., 2019, p. 5; Shaheen, Cohen, 2020] or, as some researchers call it, collaborative consumption [Botsman, Rogers, 2010]. Solutions based on joint resource utilization have the potential to tap previously unused assets and promote more economically, socially, and environmentally sustainable consumption patterns [Karbaumer, Metz, 2021, p. 19].

It should be emphasized that an assessment of environmental costs gives no grounds for replacing private or – especially – public vehicles with shared ones [Tikoudis et al., 2021]. On the contrary, shared mobility, especially shared micromobility, can be the perfect complement to public transport [Arndt et al., 2019, p. 24; Karbaumer, Metz, 2021, p. 21].

Since some shared mobility strategies have been implemented in Poland, it is worthwhile to examine them and verify their economic and social validity. To this end, the next sections of this article present an analysis of relevant consumer attitudes and behaviors, as well as the factors that affect them.

1. Data description

1.1. Survey overview and questionnaire design

A quantitative research was conducted in August 2021 in Poland into the consumer preferences of shared mobility users, with two main aims: to identify and analyze those components of the shared mobility strategy that have the greatest

impact on consumer decisions, and to present the attitudes of shared mobility users towards the environment and its protection. The survey also examined the respondents' attitudes towards shared mobility and ownership, preferred modes of transport for getting around the city, use of other transport services, as well as positive experiences with shared mobility solutions.

1.2. Sample characteristics

Respondents were recruited for the survey using purposive and accidental sampling. Thanks to the use of computer-assisted Web interviewing, the respondents were easy to reach and could complete the questionnaire from the comfort of their own homes. In total, 348 persons participated in the survey. Given that 11.5 million people in Poland have access to shared mobility services [Mobilne Miasto, 2019, p. 11], for a sample this size the maximum error is 6%, with a confidence level of 95%.

A little over a half of the respondents were female (51%), and just below half were male (49%), comprising three age groups: 18–30 (29%), 31–50 (43%), and over 51 (28%). The sample was designed to over-represent shared mobility users – people who at that time or in the past used shared mobility solutions (83%); in order to verify some of the results, non-users were also recruited (17%). The users included people who shared bicycles (54%), scooters (38%), cars (24%), and mopeds (3%). Due to the small size of the last group, it is only considered in aggregated analyses.

1.3. Analysis method

The respondents were divided into two groups – shared mobility users (N = 270) and non-users (N = 78). Based on that, we ran a multivariate logistic regression model to identify the simultaneous impact of age, gender, education level, city size, salary, and sharing one's own car. The indicators are regarded as statistically significant when $p < 0.05$. This was the only analysis on the whole sample. All further analyses only involved respondents who had used shared mobility more than once. This was to ensure that their views on shared mobility were based on their own experience, as opposed to, e.g., reflecting popular opinion. Users of moped-sharing solutions were also excluded due to their small number (N = 10).

Applying Spearman's coefficient, the degree of correlation between the frequency of sharing a vehicle and the knowledge of the companies operating in the city was evaluated. Motives for using shared mobility solutions for different types of vehicles – cars, bicycles, and scooters – were also examined. Additionally, because the respondents did not put the environment high on their list of reasons to use shared mobility, they were asked about their attitude towards the environment as such and the environmental impact of shared mobility in general.

Nonparametric statistics were used to check the research questions, because data were nominal or not normally distributed. Following Hui et al. [2019], SPSS was used to fit the regression. All statistical analyses were performed using SPSS Statistics 26.0.

2. Main observations and findings

The main observations are divided into three parts. The first one concerns the respondents' motives for using shared mobility services, the second one their willingness to give up their cars in favor of shared transport, and the third one their awareness of the impact of transport behaviors on the environment. The analysis of motives focused on two vital questions that seem to be the most relevant factors behind changing consumer behaviors.

2.1. Motives for using shared mobility services

Noteworthy, most interviewed shared mobility users owned at least one vehicle – 46% both a bicycle and a car, 16% only a car, 9% only a bicycle, and 9% a car, a bicycle, and a scooter. Only 8% did not own any vehicles.

Table 1. Results of logistic regression

	B	SE	p	Exp(B)	95% CI
age	–0.05	0.01	0.001	0.960	0.93–0.98
sex	–0.55	0.34	0.104	0.580	0.30–1.12
education 1	–	–	0.691	–	–
education 2	–0.56	0.68	0.410	0.570	0.15–2.17
education 3	–0.40	0.67	0.555	0.670	0.18–2.50
salary	0.00	0.00	0.537	1.000	1.00–1.00
city size 1	–	–	0.113	–	–
city size 2	1.28	0.67	0.057	3.600	0.96–13.46
city size 3	0.98	0.54	0.072	2.650	0.92–7.69
city size 4	0.18	0.38	0.629	1.200	0.57–2.53
car	–0.24	0.38	0.531	0.790	0.37–1.66
constant	3.97	0.90	0.000	53.093	–

Notes: education 1 – secondary education, education 2 – undergraduate, education 3 – higher education, city size 1 – 25,001–100,000 residents, city size 2 – 100,001–250,000 residents, city size 3 – 250,001–500,000, city size 4 – more than 500,000.

Source: Own elaboration.

As noted by Andreotti et al. [2017, pp. 8–9] in reference to previous research [Eurobarometer, 2016; Smith, 2016], "people with a higher level of education are more likely to engage in the sharing economy, either as providers or as consumers. […] Analogous to education as a key indicator of social status, the aforementioned literature also indicates that the sharing economy is used primarily by employed and wealthy people". This, however, seems not to be the case in Poland. A statistical analysis of the simultaneous effect of age, gender, education level, city size, salary, and sharing one's own car showed that only age is significant predictor of the willingness to use shared mobility. The chi-square test showed that the tested model was statistically significant ($\chi_2(9) = 27.34$; $p = 0.001$). Data was checked for multicollinearity, revealing no impact on our results.

Applying Spearman's coefficient showed a positive correlation between the frequency of sharing a vehicle and the knowledge of companies operating in the city (cars: $r = 0.758$, $p < 0.001$; bicycles: $r = 0.504$, $p < 0.001$; scooters: $r = 0.468$, $p < 0.001$).

The main motives for using shared mobility were identified by calculating the mean for each statement. Tables 2–5 list the motives in the order of their significance.

Table 2. Shared mobility

Motives	Mean	Med.	SD	Min.	Max.
distance to vehicle	6.18	6.0	1.04	1	7
cost per minute	6.04	6.5	1.26	1	7
convenience of use	5.99	6.0	1.17	1	7
sense of security	5.95	6.0	1.15	1	7
quality of vehicle	5.88	6.0	1.14	1	7
cost per kilometer	5.84	6.0	1.38	1	7
environmental impact	4.95	5.0	1.81	1	7
number of vehicles to choose from	4.84	5.0	1.59	1	7

Source: Own elaboration.

Table 3. Car sharing

Motives	Mean	Med.	SD	Min.	Max.
cost per minute	6.23	7	0.999	3	7
cost per kilometer	6.20	7	0.992	4	7
distance to vehicle	6.10	6	1.008	4	7
sense of security	5.92	6	1.118	3	7
comfort of use	5.78	6	1.227	1	7
number of vehicles to choose from	5.32	5	1.515	1	7
environmental impact	5.22	6	1.744	1	7

Source: Own elaboration.

Table 4. Bicycle sharing

Motives	Mean	Med.	SD	Min.	Max.
distance to vehicle	6.05	6	1.134	2	7
comfort of use	5.91	6	1.282	1	7
cost per minute	5.87	6	1.112	2	7
sense of security	5.68	6	1.314	1	7
cost per kilometer	5.63	6	1.400	1	7
environmental impact	5.55	6	1.560	1	7
number of vehicles to choose from	5.10	5	1.533	1	7

Source: Own elaboration.

Table 5. Scooter sharing

Motives	Mean	Med.	SD	Min.	Max.
distance to vehicle	5.96	6	1.23	1	7
cost per minute	5.93	6	1.38	1	7
cost per kilometer	5.78	6	1.42	1	7
convenience of use	5.77	6	1.35	1	7
sense of security	5.64	6	1.40	1	7
environmental impact	5.30	6	1.77	1	7
number of vehicles to choose from	4.97	5	1.77	1	7

Source: Own elaboration.

The decision to use shared mobility services is primarily motivated by:
- distance to vehicle,
- cost per minute,
- convenience of use,
- sense of security.

These results show that Polish shared mobility users attach much importance to "instrumental motives (economic/monetary, sometimes in combination with functional motives, such as convenience)", while being less than users from other European countries motivated by "normative motives (primarily geared towards sustainability, but also altruism)" [Andreotti et al., 2017, p. 12].

2.2. Willingness to give up owning a car

Most of the respondents (53%) would not give up their car in favor of shared transport, 25% do not have an opinion, only 22% would consider it, and only 10% are already convinced and willing to do it ($p < 0.001$). Table 6 lists possible motives for owning a car in the order of their significance.

Table 6. Giving up a car

Possible motives	Mean	Med.	SD	Min.	Max.
free parking in the city	5.98	7	1.47	1	7
location close to place of residence or work	5.68	6	1.55	1	7
ready availability	5.66	6	1.55	1	7
possibility to reserve a vehicle for a specific time	5.55	6	1.62	1	7
vehicles of various sizes (also more spacious models)	5.26	6	1.62	1	7
regularly modernized fleet (no old vehicles)	5.19	5	1.62	1	7
electric vehicles	4.96	5	1.84	1	7

Source: Own elaboration.

Here, too, considerations of money and convenience are at the top of the list, leaving the environment far behind.

Most (66%) car sharing users agree that car sharing has a positive impact on the environment, 22% do not have an opinion, and 16% are not convinced. The chi-square test shows that the result is statistically significant ($p < 0.001$).

Most (79%) bicycle-sharing users agree that bicycle sharing has a positive impact on the environment, 15% do not have an opinion, and 6% are not convinced. The chi-square test shows that the result is statistically significant ($p < 0.001$).

2.3. Awareness of the impact of transport behavior on the environment

A little over a half (56%) of the respondents acknowledge that choosing to commute daily in one's personal car would have a negative impact on the environment, 62% believe that using public transport is more environmentally friendly, 44% like the idea of minimizing the number of one-person trips in cars powered by an internal combustion engine (petrol, diesel), 46% think those should be replaced with alternative fuel vehicles, 66% agree that electric cars are more environmentally friendly, and 63% believe that their choice of a mode of transport can affect the environment.

A positive, weak, and statistically significant Spearman correlation was observed between agreeing that using shared mobility services reduces the negative impact of transport on the environment, and the frequency of using bike sharing services ($r = 0.26$, $p < 0.001$).

No correlation between age and environmental awareness was found.

Conclusions

The results of the survey allowed to identify three key takeaways.

Firstly, distance to vehicle and cost per minute are significantly more important for consumers than other factors (e.g. number of different vehicles on offer or vehicle use convenience). In consequence, if shared mobility vehicles are really to become part of a larger transport ecosystem, city authorities – working together with the business sector – should ensure that accessibility zones are expanded and vehicles are more densely distributed.

Secondly, Polish drivers have no intention of giving up their cars. What could convince them to do so in the future is, above all, ready availability of vehicles close to their place of residence or work, free parking in the city, and lower rates for economical or accident-free driving. This confirms the first conclusion.

Thirdly, thus far environmental concerns are of secondary importance in the decision-making process. There is a strong correlation between a deep sense of responsibility for the environment and using bicycle sharing solutions, but it has no bearing on the decision to share a car. Nevertheless, it seems that the bike, also shared, remains a symbol of ecological responsibility.

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