
Willingness to Pay for Ecological Public Transport- Theoretical Approach

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Zuzanna Kłos-Adamkiewicz¹

Abstract:

Purpose: The aim of the paper is to understand if and why people are willing to pay for urban transport, particularly in terms of its sustainability. The author seeks possible ways to assess how WTP can be measured for public goods, specifically in the case of electric vehicles usage in public transport. By understanding the level of WTP among city residents, transport planning can better incorporate social and ecological perspectives. The research also aims to explore the factors influencing WTP, such as demographics, environmental awareness, and knowledge of new energy vehicles.

Design/Methodology/Approach: The article was based on the research through available literature in the field of willing to pay concept relating to public transport services. While the specific method isn't explicitly stated in the paper, the author mentions contingent valuation and hedonic pricing method as potential approaches for understanding WTP in the context of public goods, particularly electric vehicles in public transport. The study also shows the possibility of using surveys and statistical analysis to explore the relationship between WTP and various factors like demographics, environmental awareness, and benefits of using electric vehicles.

Findings: The research allowed to identify the gap in the area of willingness to pay for environmental friendly vehicles in public transport, especially in the case of Poland. Existing research shows many examples of worldwide cities, but is missing important data from Polish cities. The research reveals a complex relationship between various factors and WTP, including demographics, environmental awareness, knowledge about alternative drive vehicles, and perceived tax burdens. Specifically, younger people and those more knowledgeable about new energy vehicles tend to have a higher WTP. However, there's potential resistance to increase of fares, even for more ecological options due to concerns about existing taxes. The study emphasizes the importance of public service obligations in pricing strategies for public transport, balancing affordability, accessibility, and financial sustainability.

Practical Implications: The article provides in-depth research and knowledge about the socio-economic factors related to the concept of willingness to pay in relation to public transport services. The paper shows overview of the public service market in the field of urban transport services including possible ways to introduce electric vehicles.

Originality/Value: The article uses the latest research in the field of willingness to pay concept within the area of electric vehicles usage in public transport and identifies the research gap in this particular subject.

¹PhD., University of Szczecin, Institute of Management, Poland,
ORCID: 0000-0002-5724-7018, e-mail: zuzanna.klos-adamkiewicz@usz.edu.pl;

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1. Introduction

Increasing climate change and the concerns about the issue of negative transport externalities (such as local air emission, noise, congestion, accidents etc.) show the importance of improvements in energy efficiency and necessary shift toward new environmental technologies including, most of all, transport. Public interest in renewable energy systems is growing as the new, efficient technologies are developing (Nomura and Akai, 2004).

This article aims at understanding if people are willing to pay for urban transport, also in terms of its sustainability (Heyman and Ståhle, 2013). By knowing the level and willingness to pay among city residents, it is easier to plan transport in urban areas, taking into consideration social and ecological perspective. The secondary aim of the article is to look for possible ways of how willingness to pay can be assessed in the case of public goods, especially in the case of using electric vehicles in public transport.

Willingness to pay might be a method to understand how people perceive public transport services and its' value, especially when it comes to new vehicles, including electric ones. The basic approach in this article is to show the concept and basic principles of willingness to pay towards the usage of public goods, in this case-public transport.

2. Literature Review

2.1 Willingness to Pay Definitions

The willingness to pay (hereinafter referred to as WTP, also called reservation price) has different definitions according to their authors. From the economic point of view it is a maximum amount of money which a customer is willing to spend on a good or

a service (Homburg *et al.*, 2005; Schmidt and Bijmolt, 2020; Amiran and Hagen, 2003). Many economists refer to WTP as a measure of the value that a person assigns to a consumption or usage experience in monetary units (Wang *et al.*, 2017; Steiner *et al.*, 2016). It is also the “cornerstone of marketing strategy” that drives many marketing decisions (Schmidt and Bijmolt, 2020).

It is important to show, that there are two types of WTP, that also gives an impact on how it might be measured. Firstly, there is a hypothetical measure of WTP (HWTP), that doesn't impose any financial consequences on decisions that consumer make. It also relates to the products and services that are not yet available at the market.

Consumer just state that they would pay for a product or service (Harrison and Rutstrom, 2008; Silva *et al.*, 2007). On the other side, there is Real WTP (RWTP), also called non-hypothetical or incentive based willingness, when consumer may be required to pay their stated WTP in a real context (Botelho and Pinto, 2002; Schmidt and Bijmolt, 2020; Silva *et al.*, 2007).

WTP for a specific good or a service should stand in correlation with its value (Ajzen *et al.*, 2000; Steiner *et al.*, 2016; Simonson and Drolet, 2004) and the judged desirability (Shin *et al.*, 2012). The greater the judged desirability or utility of the change of good or service, the more money consumers should be willing to pay (Voelckner, 2006).

Consumer should determine what combination of item characteristics and price offers the best solution in correlation to its value. This could be a challenge as preferences and values are often ill-defined and unstable (Simonson and Drolet, 2004; Bettman *et al.*, 1998). Research in this field (Ajzen *et al.*, 1996) provide that people indicate higher WTP to private or public goods if the information they are given about them makes a persuasive case for their value.

Many factors have an influence on WTP. Most common are economic, social, psychological and those related to cultural dimensions. Economic factors refer to household income, market values and value uncertainty. Social factors may include social desirability bias, perceived social norms etc. And also they include demographic features, such as gender, age or education.

Psychological factors include perceived fairness of a price, or fear of price increase. As for cultural factors, that influence WTP, which highly depend on research area, they include cultural differences, value of ones' leisure, and also monetary value which is derived from retail atmosphere (Lupa-Wójcik, 2024).

2.2 WTP in Case of Private and Public Goods

It has been noted that there is a significant difference between WTP for private and public goods (Brown and Duffield, 1995a; Carson, 1997). Unlike a private good, a

public good or service (which is also a public transport) benefits a broad segment of community or society. WTP often depends on whether the good or service is valued separately or as a part of a more inclusive good or service.

In theory, WTP provides a measure of a good's or service's benefit that might be compared to the cost of providing it. Also, the information about possible substitutes is relevant in that matter (Ajzen *et al.*, 2000; Liebe *et al.*, 2011). WTP for public goods, according to research undertaken by Ajzen *et al.* (1996b), was found to increase with the quality of arguments used to describe the good, especially under conditions of high personal relevance. If the personal relevance was low, the WTP for public goods was higher when an altruistic, as opposed to an individualistic, orientation was activated.

Some economists doubt the validity of stated WTP, as they argue- that individuals may strategically overstate their WTP for public goods, and also many doubt that preferences are sufficiently stable for individuals to give meaningful answers. The possibility exists that in the case of WTP for small, local, concrete or familiar problems will be equal, or even greater than for larger, more abstract, or less familiar ones (Guagnano *et al.*, 1994).

In case of private goods, they have specific features related to excludability and rivalry and producing individual private utility. But, as in the example of public goods, the influence of altruism is expected as well, as private utility component is, very often, added to the public one (Meyer and Liebe, 2010).

One of the tools to measure WTP is Contingent Valuation (CV), which is the primary tool for measuring non-use value, as well as for public and private goods (Brown and Duffield, 1995b). This method is commonly used, when respondents are being asked to provide an estimate of how much money they would be willing to pay for a certain good, but only on a hypothetical or contingent market. This method become a common technique for evaluating goods that are not physically traded (Nomura and Akai, 2004). But usage of this method is not the case in this particular article, but might be a follow-up for in-depth research in this field.

2.3 WTP and Environmental Attitude

Research in the field of WTP in relation to environmental issues in transport (including renewable energy and energy efficiency) shows that variance can be explained by demographic factors, such as age, salary, gender and education (Achtnicht, 2012; Zarnikau, 2003; Hensher, 2010; Gracia *et al.*, 2012; Gökşen *et al.*, 2002).

Higher WTP for environmental costs in transport are more likely for younger people, with higher education (Hersch and Viscusi, 2006a; Daziano and Bolduc, 2013a; O'Garra *et al.*, 2007) and among woman, who have stronger preferences

towards the environment (Torgler *et al.*, 2008; Hsu *et al.*, 2008), whereas older people have a significantly lower willingness to pay higher gasoline prices in order to protect the environment (Hersch and Viscusi, 2006b). But on the other hand, according to Daziano and Bolduc, (2013b) women, older adults and more educated people are more concerned about environmental issues, as for income- it has no significant effect in the car choice context.

Obtaining more information about energy resources options play important role in WTP, especially among people, who are interested in paying extra to support investment in both renewable energy resources and energy efficiency (Zarnikau, 2003; Zografakis *et al.*, 2010).

According to further research, person's likelihood to buy an electric vehicle increases with youth, education, green lifestyle, being aware that fuel prices may grow, but it reflects the WTP for individual transport though (Hidrué *et al.*, 2011; Guerra, 2019; Jensen *et al.*, 2013). According to Hansla *et al.* (2008) WTP for green electricity increases with a positive attitude towards green electricity and decreases with higher electricity costs (Daziano and Bolduc, 2013a).

According to research undertaken by Nyga *et al.* (2020):

- (1) individuals are willing to pay more for the electric bus service than the other modes of public transport, with the median of 3.00€,
- (2) the initial choice of prices is very important when introducing a new means of transport and it is necessary to look at the WTP, for whom the means of transport is intended (young, eco-aware people, mostly women), and to correspondingly choose the price,
- (3) eco-friendly image impact WTP for public transport services positively.

Since the value of non-market goods cannot be reflected with the usage of market price, it is necessary to measure it from another side. One of the possible ways to do so is WTP. WTP has been used to measure, as mentioned before, the values of non-market goods, in particular air, wind energy, green electricity etc (Tan and Lin, 2019).

The European Union encourages transport companies to use environmentally friendly and sustainable vehicles. There is a critical role in this system assigned to transport management- especially transport operators and authorities that need to meet the goals of sustainable, innovative and competitive services.

Also they are responsible for creation the level of prices which are affordable, meet the needs of all groups of users. Public transport operator, on the basis of public funding, is also responsible for creating the optimal amount of ticket subsidies (Blaž *et al.*, 2019).

2.4 WTP for Environmentally Friendly Public Transport

The question of how to encourage people to choose sustainable mode of transport has caught the attention of transport and mobility researchers. With regard to mobility, the choice of environmentally friendly mode of transport can be regarded as an alternative that maximizes collective interests (e.g., mitigating global climate change, persuing environmental sustainability) (Doran *et al.*, 2015; Dawes and Messick, 2000).

Commuting-mode decisions have been a subject of multiple studies (Lai and Chen, 2011; Wall *et al.*, 2007; Steg, 2005; Urbanek, 2021), as well as WTP in public transport in terms of crowding reduction (Li *et al.*, 2010; Li and Hensher, 2011), road safety (Rizzi and Ortúzar, 2006), infrastructure investment (Ito *et al.*, 2013), and even post COVID-19 travel behaviour patterns (Awad-Núñez *et al.*, 2021).

Public transport systems, due to their specificity, perform a functions that are basic and also necessary for business, economic and social development of urban centres. Public transport, as a public good, have specific terms of usage, when it comes to prices, which work under the rules of subsidisation. Both in developed and developing countries, subsidies are implemented under two major premises: (1) to increase public transport use and to reduce externalities, including GHG emissions and congestion, and (2) to make transport more affordable, particularly for the poorest.

Study shows that consumers with increased environmental concerns (Guerra, 2019; Sang and Bekhet, 2015; Liao *et al.*, 2017), and those living in rural areas are more likely to choose electric vehicles (Kopplin *et al.*, 2021; Sun *et al.*, 2020). But on the other hand research on the relation of environmental concern and ecological behaviour has shown positive correlation, but it's strength varies (Diekmann and Preisendörfer, 2003; Borchers *et al.*, 2007; Scarpa and Willis, 2010).

Research in the field of WTP in public transport have been done also for hydrogen buses (O'Garra *et al.*, 2007; Bigerna and Polinori, 2015; Haraldsson *et al.*, 2006; Viktorsson *et al.*, 2017; Heo and Yoo, 2013). The research (O'Garra *et al.*, 2007) included public WTP for the air pollution reductions associated with a scenario of large-scale introduction of hydrogen buses. Results indicate that bus users have a positive WTP for H₂ buses (but it relates only to hypothetical WTP).

The research took place in four cities, Berlin, London, Luxembourg and Perth and in two of them, London and Perth, respondents were divided into bus users and non-bus users. The results show WTP (in taxes) to support the large scale introduction of this type of buses (an extra €0.29 to €0.35 per single bus fare). Overall, results of the surveys through the years show positive attitude towards WTP for usage of hydrogen buses.

Much of existing literature that analyse public preference for new environmental transport technologies and fuels focuses mostly on electric private vehicles (O'Garra *et al.*, 2007; Schmidt *et al.*, 2004).

2.5 Willingness of Residents to Pay to Improve the Environmental Performance of Public Transport

Although, majority of the literature relate to WTP in the field of private transport (i.e., ability to pay more for hybrid or electric vehicles), some of the research, but not many, include the subject of WTP in public transport in relation to improvement of service quality and/or environment.

On the basis of assumption, that consumer choices reflect their preferences, it is possible to deduce choice behaviour (or direct question about preferences), whether transportation improvements are socially desirable. A quantitative measure of the social desirability of improvements can be obtained by the WTP valuation (Eboli and Mazzulla, 2008).

One of the methods was already mentioned - the Contingent Valuation (CV), which reflects the hypothetical attitude towards a good or a service, whereas the other is Hedonic Proce Method (HPM)- which relies on actual behaviour observed in the market. Many studies that valuate WTP for reducing traffic air pollution and noise was analysed by (Eboli and Mazzulla, 2008) also including the issue of WTP for better services and a discrete choice model between the private and public transport mode in order to estimate WTP for better bus services.

A number of studies have been implemented in the field of public acceptance and WTP for energy efficiency and modal choice. But only few of them analysed the WTP for public transport services, including electric vehicles, as a mode of ecological transport (Tan and Lin, 2019; Zhang and Bai, 2017).

As existing research shows, if a person knows more about new energy vehicles, he is willing to pay more for the new public transport fares, but it also stands in line with total agreement towards the role of new energy vehicles in improvement of air quality. Also, when it comes to public service, in which public transport is included- the issue of paid taxes also arise- as people don't want to pay more, as they pay enough taxes. The second conclusion is that younger people are willing to pay more and also those, who know something more about new energy vehicles and are aware of environmental issues (Tan and Lin, 2019).

3. Discussion

While considering the level of WTP, it is important to include the rules of public service obligation. There are different attitudes toward WTP in case of private and public sector, as well as it comes to transport services in the urban area. WTP varies

nationwide, and most of the factors that were analysed encompass economic, social, psychological and cultural dimensions.

There is a little research in the field of WTP concerning public transport services in polish cities. That is why it is important to show the results of similar research in this field and look for possibilities to undertake this activity in Poland. The best solution would be usage of CV or HPM method, or both if possible and engage the respondents within appropriate research group and sample selection significance. The lack of direct research in this field highlights a potential gap which, after reviewing the literature should be fulfilled and be a part of follow-up research.

This study examines residents' willingness to pay for ecological public transport, focusing on the role of electric vehicles. The findings reveal a different and complex types of factors that have an influence on WTP, including demographics, environmental awareness, knowledge of new energy vehicles, and perceptions of existing tax burdens.

Based on paper findings it would be recommended to create targeted public awareness campaigns helping city dwellers to get more familiar with potential benefits of investments in public transport. But still, there might be a resistance to increase of the fares, even for environmentally friendly options.

The study also highlights the importance of considering public service obligations when designing pricing strategies for ecological public transport. Balancing affordability and accessibility with the financial sustainability of the system is crucial for successful policy implementation. Further research could explore the long-term impacts of policy interventions and investigate the role of other factors, such as service quality and convenience, in shaping public preferences for sustainable transportation.

4. Conclusions

This paper focused on the issue of WTP in relation to public transport services. The findings revealed that there is a gap in in-depth research for WTP for public transport services, including electric and more environmental friendly vehicles regarding polish cities.

The existing research show the factors, methods and results of WTP assessment in different countries. For sure, it is much easier to conduct such research for particular, market oriented products or services, rather than public transport services, which need to meet public procurement rules. Nevertheless there is a good background for further exploitation of this subject in relation to polish cities.

Several factors influence WTP, including knowledge of new energy vehicles, general environmental awareness, age, and perceptions of current tax burdens.

Younger individuals, women and those, who are more informed about environmental issues and new energy technologies tend to exhibit higher WTP. This is also a field for further discussion based on needed research in polish conditions.

Though, the paper also shows that there is a demonstrable WTP for public transport improvements that enhance environmental performance, particularly through the adoption of electric vehicles. This suggests public support for greener transportation options.

Public resistance to increased taxes for public services, including transport, presents a challenge for funding improvements and transitioning to more ecological options. This highlights the need for innovative funding mechanisms and clear communication about the long-term benefits of such investments.

Summarizing the considerations included in the article- the article highlights the need for additional research to explore the complexities of willingness to pay for public transport improvements in diverse contexts, particularly at the national level. It also suggests examining the role of public service obligations and investigating the long-term implications of policy interventions aimed at promoting environmentally-friendly public transportation options.

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