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Sustainable transportation perspective: how our preferences for zero-emission vehicles change through time?

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Abstract
The Slovenian automobile market has gained great momentum in the past decade. However, the demand contractions in the supply chain created a huge crisis in the automobile industry in Slovenia. The automotive industry's new competitive dynamics focus on green logistics, sustainability, and purchase decisions. The study aims to comparatively analyze the factors affecting consumers' automobile purchasing decisions from a sustainable transportation perspective. In the survey, we included 1502 participants to identify the most important parameters of consumer behaviour related to purchasing alternative fuel vehicles. In the regression analysis results in the first analysis, non-financial factors sub-dimensions such as the body shape and fuel type, vehicle size, and style/appearance/colour had a positive effect on purchasing decisions of zero-emission cars. The second analysis was performed 5 years after the first analysis. Moreover, the findings provide insights that non-financial factors sub-dimensions such as entertainment system, vehicle size, and vehicle capacity and financial factors sub-dimensions between the insurance group for the vehicle, finance deals, value for money, annual road tax had a positive effect on purchasing decisions of zero-emission vehicles in the second analysis. Results show that the most relevant factor for purchasing zero-emission vehicles is total vehicle price and that the segment of potential alternative fuel vehicle consumers is much higher than it has been anticipated. This study provides an overview of the current understanding of individuals' vehicle purchasing decisions.

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1. Introduction

Consumer purchasing decisions for zero-emission vehicles are complex processes consisting of internal and external factors. Among the internal factors in purchasing decisions, social demographics, personal experiences, and travel risk perceptions are effective in sustainable transportation (Choo and Mokhtarian, 2004). While alternative fuel-powered vehicles such as biofuel and electricity have become more popular, enhancing sustainable transportation modes and the changing in consumer behaviour (Velazquez et al. 2015).

This study examines the purchasing decisions of zero-emission vehicles from a sustainable transportation perspective. The questionnaire was created specifically for this study and was administered to 1502 respondents.

Within the framework of this scope, the study investigates the following questions:

- To compare whether there is a statistically significant difference between financial factors, non-financial factors, and gender variables in purchasing decisions for zero-emission vehicles.

- To analyze whether there is a statistically significant difference between financial factors, non-financial factors, and education variables in purchasing decisions for zero-emission vehicles.
- To evaluate whether there is a positive relationship between financial and non-financial factors in purchasing decisions and zero-emission vehicles.

The study consists of five parts. The first part includes an introduction, and the second includes a literature review on zero-emission vehicles and purchasing decisions. The third part examines the method, purpose, model, and creation of the scales. Reliability analysis, T-test, ANOVA test, and Regression analysis are performed in the fourth part. Evaluations and results of the study are explained in the fifth part.

2. Literature Review

2.1. Sustainable Transportation

CO_2 emissions are now stated to be the biggest contributor to climate change and are defined as one of the most serious environmental problems (Morrison and Hatfield-Dodds, 2011). The transport sector accounts for approximately 25% of the worldwide carbon dioxide emissions (Zhao et al. 2020). Failure to focus on sustainability in road transport activities may worsen climate change. If freight traffic gains momentum and new sustainable transportation strategies are not implemented, CO_2 emissions are expected to increase by 109% by 2050 (Zanni and Bristow, 2010). CO_2 reduction is closely related to the increasing interest in zero-emission vehicles and allows for improvements in air quality (Banister, 2007).

Sustainable transport is a concept that focuses on environmental problems, comprehensively addresses the effects of the transport sector (Litman and Burwell, 2006), and offers integrated solutions (Zhou, 2012). Eliasson and Proost, (2015) examine sustainable transportation policy and propose policies for reducing greenhouse gas in transportation. Stephenson et al. (2018) review research for sustainable transport based on the findings of a four-stage Delphi study in New Zealand. Crozet and Lopez-Ruiz (2013) develop scenarios for reducing greenhouse gas emissions by 80% in France. Behavioural adaptation and technological change will be the most important structural break for zero-emission vehicles. Janic (2006) investigates the transportation systems of the European Union in the last 15 years within the framework of the sustainability approach and offers suggestions for the future. Ziemba (2021) draws attention that the interest in sustainable transportation in Poland is increasing daily and the tendency to buy zero-emission vehicles is gaining momentum. Zero-emission vehicles have been comparatively analyzed regarding sustainability with the Fuzzy MCFDA Method.

2.2. Purchasing Decisions of Zero-Emission Vehicles

Recently, zero-emission vehicles have begun gaining traction as a solution to address climate change within the transportation sector. Global concerns over climate change and air pollution are increasing day by day. Therefore, governments encourage the production of zero-emission vehicles to reduce carbon emissions and develop policies for users to purchase zero-emission vehicles as well as the recycling of end-of-life vehicles (Oltra and Jean, 2019).

Low-emission vehicles (ZEV) have come to the forefront with the emergence of the opportunity to travel longer distances with the effect of developments in battery technology. These vehicles are considered promising alternative vehicles in terms of providing new business opportunities for the automobile industry, providing ease of adaptation to information technologies, and reducing greenhouse gas emissions (Onat et al. 2015). Previously, Knez et al. (2014) argued that total vehicle prices are the most influential factor in purchasing low-emission vehicles. In addition, it is surprising that zero-emission vehicles attract the attention of the older population. Obrecht et al. (2019) emphasize that sustainable mobility and low-emission vehicles are closely related to sustainable consumption. They point out that potential buyers of alternative fuel vehicles in Slovenia are much more frequent than expected.

Knez and Obrecht (2017) point out that the share of electric vehicles in Slovenia is less than in England, Germany, and Austria, and a wide network of public charging stations, education, and promotion can be effective, especially for electric vehicle use. Knez et al. (2020) find that vehicle prices and fuel economy are the most important criteria in the zero-emission vehicle purchasing process, conducted on 1500 participants in Slovenia, Poland, and Spain. Women in all 3 countries are more inclined to purchase zero-emission vehicles. They also note that the rate of green consumers in Spain is high, although Poland has the lowest number of green consumers.

According to Othman et al. (2020), effective factors in purchasing zero-emission vehicles are compared in Egypt and Slovenia. Green consumers are more in Slovenia. Respondents are more interested in the total price of the vehicle rather than different taxes. Anderhofstadt and Spinler, (2019) present a series of recommendations for manufacturing and selling low-emission vehicles using the Delphi technique. The first is to increase financial incentives and subsidies for vehicle manufacturers to invest in environmentally friendly technologies. Secondly, it directs customers to purchase alternative fuel vehicles with various promotional activities. The literature reviewed is presented also in Table 1.

Table 1. Literature Reviews for Low and Zero-Emission Vehicles and Purchasing Decisions

Papers	Participants	Variables	Results
Gulzari, et al. (2022)	1581 consumers in Switzerland	• Consumer behavior • Zero-emission vehicles	They emphasize that financial incentives such as subsidies or fines for the adoption of green vehicles can be more persuasive.
Logan, et al. (2022)	UK	• Low-emissionvehicles • Vehicle integration	The study shows that consumers in the UK are demanding that low-emission vehicles use public transport.
Ga, et al. (2022)	ASEAN countries	• Zero-emission vehicles	Consumers argue that low-emission vehicles have some disadvantages such as low onboard energy density storage, short cruising range, high initial cost, and a great investment for charging/fueling infrastructures.
Suhud and Willson (2019)	Jakarta	• Low-cost green vehicles • Purchase intention • Perceived price • Perceived quality	Low-cost green vehicles' brand image remarkably influences perceived price perceived quality and perceived quality purchase intention.
Costa, et al. (2019)	278 consumers in Italy	• Consumers 'willingness • Pay for zero-emission vehicles	Italian car users will be willing to pay a price premium of around €2100 for a 20% CO_2 reduction per kilometer for zero-emission vehicles.
Beak et al. (2019)	10082 consumers in South Korea	• Electric vehicle • Greenhouse gas reduction	The most important factors underlying the low rate of use of electric vehicles in South Korea are high prices, lack of batteries, and the long time taken while charging.
Chen et al. (2019)	406 consumers in China	• Purchase intention. • New energy vehicle • Customer perceived value	LEV-supportive policies affect the vehicle price and directly influence the purchase intention. On the other hand, functional quality indirectly positively affects customer purchase intention.
Boroumand et al. (2019)	France	• Purchase of zero-emission vehicle	Encouraging the purchase of vehicles with CO_2-emitting engines is a challenge in the battle against global warming. Therefore, it is important to try to persuade the consumer with tax incentives to create an effective environmental policy and to use cleaner and more efficient vehicles.
Gomez Vilchez, et al. (2019)	1248 consumers in France, Italy, Spain, UK, Poland, Germany	• Electric vehicles • Purchase incentives	Government incentives are an effective factor in purchasing electric vehicles. Government incentives vary across Europe due to differences in the socioeconomic characteristics of consumers.
Chng et al. (2019)	Consumers in UK	• Car purchase reflections • Pro-environmental behaviors	While women and the elderly had higher environmental sensitivity in the car purchasing process, wealthy and educated participants did not pay much attention to environmental factors. In addition, recommendations are made for policymakers to take encouraging steps in low-emission vehicle purchases.
Eneizan et al. (2016)	332 Jordanian car dealers	• Green marketing strategies • Zero-emissionvehicles	Adopting working green marketing strategies will significantly increase the sales volume of zero-emission vehicles. However, it is stated that the adoption of marketing strategies can reduce the sales volume of non-low-emission vehicles.
Rudolph (2016)	875 consumers in Germany	• Zero-emission vehicle • Purchase decision	Different incentives such as direct subsidies, free parking, a separate CO_2 tax, an increase of fuel costs by tax elevation, and an increase of available charging infrastructure have been developed to increase zero-emission vehicle sales. On the other hand, it has been found that even when incentives are given, car users are reluctant to switch to low-emission vehicles.

Oshiro and Masui (2015)	Japan	• Climate change mitigation • Low-emission vehicles	To achieve the long-term greenhouse gas emission reduction target in Japan and to reduce greenhouse gas emissions by 80% compared to the previous year by 2050, it has been announced that the use of low-emission vehicles should be emphasized.
Mannberg, et al. (2014)	Stockholm	• Alternative fuel vehicles • Adoption of low-emission vehicles	They prove that education level is an important factor in purchasing alternative fuel vehicles, especially postgraduate graduates are more likely to purchase low-emission vehicles. They also suggest that women show more interest in low-emission vehicles than men.

3. Methodology

The study presented in this manuscript is a research study. Collected data consist of primary and secondary data. For the primary data collection, a pre-structured questionnaire from Borthwick and Carreno (2012) was modified and distributed in Slovenia by Zupan et al. (2013). The population of this survey are individuals that currently own a vehicle or have access to it as well as Individuals that currently don't own a car or do not have daily access to a car when required. The focus group of our study was adults. Secondary data were included in the literature review only.

The sample was represented by a total of 1502 participants in two series within a five-year gap. 687 participants in the first invested period analysis and 815 participants in the second investigated period analysis whose current opinions about relevant vehicle performance aspects and financial factors for vehicle purchasing decisions were studied. First, a pilot survey was conducted to test whether the questionnaire applied in the study was valid and suitable for the research. Considering the information obtained from the preliminary study, the questionnaire was given its final form.

The various steps involved in the development and validation are shown utilizing the flow chart in Fig. 1.

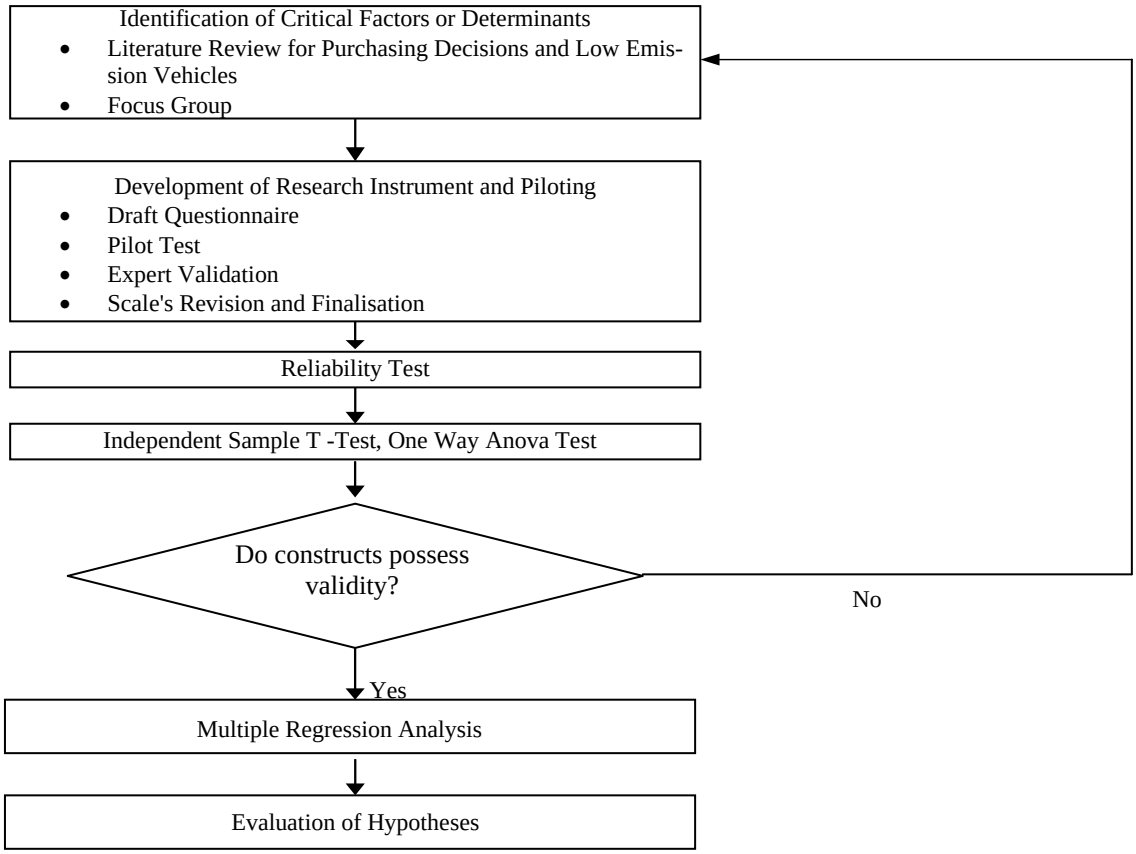

Fig.1. Development and validation of research flow chart

The collected data were processed and analyzed with the statistical software program SPSS for statistical analysis. ANOVA (Sum of squares), mean values, T-test, Cronbach's Alpha (reliability test), and Leven's test for equality of variances as well as Standardized and unstandardized Beta coefficients were used for SPSS analysis. The correlation of financial and non-financial factors was also investigated.

4. Results and Discussion

This paper used a questionnaire survey to comprehend the purchasing decisions of zero-emission vehicles. Samples were collected in the case of Slovenia, which paid attention to zero-emission vehicles selected for the survey. The survey was executed to I. analysis and II. analysis. The questionnaires were distributed in Slovenia. The questionnaire was designed on a "seven-point Likert scale, in addition to using the email survey method to implement the administration of the questionnaire. Data collected was statistically analyzed with SPSS 25 software. According to Table 3, the reliability values used in the research indicate the criteria for the participants to reach the same result in coherent and repeated evaluations. The reliability analysis test, established to test the propositions in the foundations of the research, was performed for all of the scale expressions found in the survey study. The alpha values were found between 0.811 and 0.917 in the reliability test performed on all propositions. Since it is a value between 0,80 <a <1.00, it suggests that the research propositions are highly reliable.

Non-financial factors such as body shape, fuel type, vehicle size, style/appearance/colour scale were above 5 in I. analysis. On the other hand, the average of all non-financial factors sub-factors except acceleration was above 5 in the second analysis. This highlights that non-financial factors are so important for purchasing decisions for zero-emission vehicles. The standard deviation value was found to be over 1. Based on this data, body shape is the most important non-financial factor, while acceleration is the least preferred (See Table 4).

Table 3. Reliability Analysis

Measures	Year	N	Cronbach's Alpha
Non-financial factors for purchasing decisions of zero-emission vehicles	I. analysis	687	0.811
	II. analysis	815	0.857
Financial factors for purchasing decisions of zero-emission vehicles	I. analysis	687	0.820
	II. analysis	815	0.846
Factors influencing the purchasing decisions of zero-emission vehicles	I. analysis	687	0.875
	II. analysis	815	0.917

Table 4. Analysis of T-test by Gender Variable in Non- Financial Factor for Purchasing Decisions of Zero-emission Vehicles

		Levene's Test for Equality of Variances		t-test for Equality of Means	t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Entrainment system	I. analysis	4.267	0.039	2.356	687	0.019	0.26881
	II. analysis	6.040	0.014	0.215	815	0.830	0.02380
Engine power	I. analysis	3.481	0.062	1.328	687	0.185	0.12729
	II. analysis	1.825	0.177	1.907	815	0.057	0.19536
Body shape	I. analysis	0.918	0.338	1.631	687	0.103	0.18339
	II. analysis	5.523	0.019	0.357	815	0.721	0.03518
Acceleration	I. analysis	0.873	0.350	1.917	687	0.056	0.21375
	II. analysis	5.851	0.016	3.409	815	0.001	0.41320
Fuel type	I. analysis	5.562	0.019	1.407	687	0.160	0.16574
	II. analysis	0.028	0.866	0.446	815	0.656	0.04860

Vehicle brand	I. analysis	6.388	0.012	0.557	687	0.577	0.07228
	II. analysis	0.023	0.880	1.490	815	0.137	0.17044
Model of vehicle	I. analysis	0.002	0.961	1.394	687	0.164	0.17924
	II. analysis	4.261	0.039	1.693	815	0.091	0.19524
Vehicle size	I. analysis	0.632	0.427	0.923	687	0.356	0.09164
	II. analysis	2.780	0.096	0.978	815	0.328	0.09336
Vehicle capacity	I. analysis	2.833	0.093	1.697	687	0.090	0.18896
	II. analysis	2.588	0.108	1.835	815	0.067	0.18451
Style/appearance/colour	I. analysis	0.103	0.748	0.351	687	0.726	0.04113
	II. analysis	4.685	0.031	2.292	815	0.022	0.25035

The study was designed to reveal the underlying factors that affect the purchasing habits of people. The results have revealed a new perspective of purchasers and which factors are the most important for purchasing an LEV. The results indicate some differences between the male and female populations, especially when examining the style/appearance/colour criteria in I. analysis. On the other hand, it was determined that there are differences between female and male populations according to the entertainment system, and body shape criteria in II. analysis. Style/appearance/colour is more significant for women however body shape is more important for men than in I. analysis. The body shape of a vehicle is more important for women while style/appearance/colour is more significant for men in II. analysis.

The standard deviation was above 1 in all financial factors except total vehicle prices in I. analysis. Financial factors such as maintenance/repair costs, fuel economy, and total vehicle prices scale were found to be above 6 in II. rather high analysis. Total vehicle prices are the most important factor of financial factors while an annual road tax is the least preferred (See Table 5).

Table 5. Analysis of T-test by Gender Variable in Financial Factor for Purchasing Decisions of Zero-Emission Vehicles

		Levene's Test for Equality ofVariances		t-test for Equality of Means	t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Maintenance/repair costs	I. analysis	40.941	0.000	4.894	687	0	0.44542
	II. analysis	6.250	0.013	3.236	815	0.001	0.26948
Insurance group for vehicle	I. analysis	14.175	0.000	3.009	687	0.003	0.29640
	II. analysis	0.007	0.932	1.886	815	0.060	0.18129
Finance deals	I. analysis	16.535	0.000	5.011	687	0	0.65393
	II. analysis	0.723	0.395	1.093	815	0.275	0.13102
Value for money	I. analysis	18.836	0.000	4.351	687	0	0.41024
	II. analysis	7.933	0.005	2.423	815	0.016	0.19721
Annual road tax	I. analysis	19.666	0.000	3.049	687	0.002	0.37251
	II. analysis	0.087	0.768	0.376	815	0.707	0.04652
Fuel economy	I. analysis	3.321	0.069	2.528	687	0.012	0.20325
	II. analysis	14.22	0.000	3.760	815	0	0.31092
Trade-in value	I. analysis	7.542	0.006	0.248	687	0.804	0.02903
	II. analysis	0.985	0.321	0.857	815	0.392	0.09096

Warranty	I. analysis	0.895	0.345	2.034	687	0.042	0.21560
	II. analysis	1.894	0.169	1.037	815	0.300	0.11477
Total vehicle prices	I. analysis	2.683	0.102	2.341	687	0.020	0.15575
	II. analysis	1.799	0.180	3.459	815	0.001	0.27449

T-test explains whether there was a difference between the gender of the consumers participating and financial factors for purchasing decisions of zero-emission vehicles. Table 5 points out that there is only one difference between the male and female populations when evaluating financial factors criteria according to trade-in value. I. analysis. However, results explained no differences between female and male populations when evaluating financial factors criteria in II. analysis. In addition, it was explained that the most important financial factor for car purchasing decisions was total vehicle price among male and female participants in I. analysis and II. analysis.

Table 6. Analysis of Anova test by Education Variable in Non-Financial Factor for Purchasing Decisions of Zero-Emission Vehicles

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Non-financial factors	Between groups	10.628	4	2.657	3.232	0.012
	Within groups	560.612	683	0.822		
	Total	571.239	687			
Financial factors	Between groups	8.154	4	2.039	2.743	0.028
	Within groups	506.775	683	0.743		
	Total	514.929	687			

ANOVA test allows for determining whether there is a relationship between more than two groups (McHugh, 2011). Non-financial factors (Table 6) for zero-emission purchase decisions differ according to the education variable. in I. analysis. It has been concluded that there is a difference regarding education levels in non-financial factors for zero-emission car purchase decisions the variables such as 'entertainment system (p: 0.002), engine power (p: 0.04), model of the vehicle (0.000), vehicle capacity (0.003), style/appearance/colour (0.001) in Anova Test in I. analysis. Non-financial factors for buying zero-emission vehicles according to the level of education vary between primary school and undergraduate-graduate degrees in Post-Hoc Tests. It is seen that the entertainment system (x: 2.57) and engine power (x: 3.00) are the least important criteria for zero-emission car purchase decisions by elementary school graduates. They suggest that the fuel type (x: 4.42) is the most important criterion for non-financial factors for zero-emission purchase decisions. Especially in 2023, when gas prices are high and are expected to increase in the long term, fuel consumption information is crucial. People also emphasize repair costs and on value/money ratio. Two less important features are "trade-in value" (how much money you get when you sell your vehicle) and "annual road tax". It makes sense because annual road tax is a relatively smaller expense than e.g. vehicle price.

Table 7. Analysis of Anova test by Education Variable in Financial Factor for Purchasing Decisions of Zero-Emission Vehicles

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Non-financial	Between groups	21.062	5	4.212	4.745	0.000
	Within groups	719.972	810	0.888		
	Total	741.034	815			
Financial	Between groups	10.284	5	2.057	2.617	0.023
	Within groups	637.351	810	0.786		
	Total	647.635	815			

Financial factors (Table 7) vary according to the education level such as the maintenance /repair costs variable for purchasing decisions of zero-emission vehicles in II. analysis. The maintenance /repair costs are more important for elementary and high school graduates according to the university and master graduates. While annual road tax is not considered an important criterion for university and master/Ph.D. graduates, it is very important for elementary and high school graduates in I. analysis. According to II. analysis data, non-financial factors "body shape (p:0.30), acceleration (p:0.47), vehicle brand (p:0.10), model of the vehicle (p:0.30), vehicle capacity (p:0.08), style/appearance/colour (p:0.00)" vary according to education level in the Welch Brown-Forsythe Test.

Table 8. Regression Analyses Between Non-Financial Factors and Purchasing Decisions of Zero-Emission Vehicles

Coefficients[a]							
Model			Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		Years	B	Std. Error	Beta		
(Constant)	I. analysis		4.249	0.289		14.715	0.000
	II. analysis		2.840	0.250		11.376	0.000
Entertainment system	I. analysis		0.061	0.036	0.087	1.714	0.087
	II. analysis		0.162	0.034	0.193	4.799	0.000
Engine power	I. analysis		0.001	0.051	0.977	0.029	0.977
	II. analysis		0.066	0.041	0.073	1.635	0.102
Body shape	I. analysis		0.104	0.041	0.012	2.522	0.012
	II. analysis		0.019	0.038	0.021	0.505	0.613
Acceleration	I. analysis		0.037	0.045	0.408	0.828	0.408
	II. analysis		0.018	0.033	0.024	0.556	0.578
Fuel type	I. analysis		0.070	0.034	0.040	2.054	0.040
	II. analysis		0.026	0.032	0.031	0.807	0.420
Vehicle brand	I. analysis		0.008	0.041	0.854	0.184	0.854
	II. analysis		0.043	0.042	0.052	1.029	0.304
Model of vehicle	I. analysis		0.051	0.042	0.234	1.192	0.234
	II. analysis		0.051	0.042	0.063	1.213	0.226
Vehicle size	I. analysis		0.124	0.047	0.008	2.670	0.008
	II. analysis		0.098	0.041	0.100	2.362	0.018
Vehicle capacity	I. analysis		0.035	0.037	0.341	0.952	0.341
	II. analysis		0.103	0.036	0.111	2.882	0.004
Style/appearance/colour	I. analysis		0.087	0.039	0.026	2.238	0.026
	II. analysis		0.047	0.032	0.056	1.460	0.145

Regression Analysis is a statistical method that examines the mathematical relationship between the dependent variable and independent variables (Engström et al. 2010). When the results of multiple linear regression analysis are examined in Table 8, the entertainment system, vehicle size, and vehicle capacity were statistically significant in purchasing decisions of zero-emission vehicles in the II. analysis. According to the results of the regression analysis, the body shape and fuel type, vehicle size, and style/appearance/colour have a statistically significant effect on purchasing decisions of zero-emission vehicles at a 0.05 significance level in I. analysis.

Table 9. Regression Analysis Between Financial Factors and Purchasing Decisions of Zero-Emission Vehicles

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	Years	B	Std. Error	Beta		
(Constant)	I. analysis	3.000	0.400		7.505	0.000
	II. analysis	2.031	0.291		6.985	0.000
Maintenance/repair costs	I. analysis	0.064	0.056	0.060	1.144	0.253
	II. analysis	0.033	0.047	0.030	0.698	0.485
Insurance group for vehicle	I. analysis	0.048	0.055	0.048	0.872	0.383
	II. analysis	0.114	0.041	0.118	2.768	0.006
Finance deals	I. analysis	0.006	0.032	0.008	0.180	0.857
	II. analysis	0.140	0.032	0.180	4.297	0.000
Value for money	I. analysis	0.091	0.048	0.089	1.888	0.059
	II. analysis	0.100	0.043	0.087	2.324	0.020
Annual road tax	I. analysis	0.051	0.037	0.064	1.375	0.169
	II. analysis	0.111	0.031	0.148	3.528	0.000
Fuel economy	I. analysis	0.056	0.054	0.046	1.052	0.293
	II. analysis	0.055	0.047	0.049	1.164	0.245
Trade-in value	I. analysis	0.003	0.036	0.003	0.079	0.937
	II. analysis	0.032	0.036	0.036	0.874	0.382
Warranty	I. analysis	0.081	0.042	0.088	1.923	0.055
	II. analysis	0.060	0.035	0.072	1.715	0.087
Total vehicle prices	I. analysis	0.010	0.063	0.000	0.016	0.873
	II. analysis	0.008	0.043	0.007	0.185	0.853

The regression results concluded (see Table 9) that financial factors were ineffective in increasing purchasing decisions of zero-emission vehicles in I. analysis. There was a positive relationship between the insurance group for the vehicle, finance deals, value for money, annual road tax, and purchasing decisions of zero-emission vehicles in II. analysis.

5. Summary and Conclusion

Adopting the concept of sustainable development is vital for the transport sector because it has extensive environmental, social, and economic impacts on society. Considering the Covid-19 pandemic, the transition from gasoline vehicles to zero-emission vehicles has accelerated to reduce the carbon footprint. In this study, purchasing decisions of zero-emission vehicles were evaluated in a quantitative study where data was collected at two different moments: I. analysis and II. analysis. The second analysis was performed almost 5 years after the first analysis.

Regarding the significance of the research, the results are highly substantial. This research is an additive to the existing literature on purchasing decisions for zero-emission vehicles. In addition, it strengthens available evidence on factors that influence purchasing decisions for zero-emission vehicles by providing evidence of state research, which exists in prior studies. The empirical results explore that the non-financial and financial factors have statistically considerable positive influences on purchasing decisions of zero-emission vehicles. Differences emerged in the analysis results between the first and second analyses. An interesting insight from the research is the finding that the body shape of non-financial factors and total vehicle prices of financial factors are the most important issues for LEV.

This study explains that non-financial factors "body shape, vehicle size, style/appearance/colour and fuel type" were found to significantly impact purchasing decisions of zero-emission vehicles in I. analysis. Moreover, it suggests that non-financial factors sub-dimensions such as entertainment system, vehicle size, vehicle capacity, and financial factors sub-dimensions of the insurance group for a vehicle, value for money, finance deals, and annual road tax have statistically significant positive influences on purchasing decisions of zero-emission vehicles in II. analysis.

The COVID-19 epidemic, which emerged in Wuhan, China's Hubei province in 2019, led to serious illness and death. It has affected not only health but also daily lives, economies, and social systems worldwide (Addo et al. 2020). The COVID-19 pandemic has caused major changes in consumers' purchasing decisions. While perceived vulnerability is one of the main motivations for purchasing a vehicle during the pandemic, the loss of consumers' income due to the COVID-19 outbreak might cause them in between to abandon their car purchase decisions (Yan et al. 2020).

Amid this transformation, the Covid-19 pandemic has placed intense stress and pressure on the automotive industry. The emergence of labour shortages due to quarantine decisions and disruptions in the global supply chain have deeply affected the automotive industry. For instance, Tesla, Toyota, Hyundai, and Volkswagen had to cease facility operations (Araz et al. 2020). These multinational companies in the automotive industry have started to pay more attention to sustainable practices (Nylund et al. 2021). During the COVID-19 pandemic, enterprises' demand for competitive advantage has turned to sustainable transportation applications and have developed strategies in this direction.

Therefore, loosening vehicle purchase restrictions for a short time will affect consumers' automobile purchasing decisions and allow sales to increase (Li and Jones, 2015). Due to the risk of contamination and curfews during the COVID-19 pandemic process, consumers need to use fewer vehicles, and the perception that zero-emission vehicles are too expensive has become widespread within the framework of the attitude toward reducing expenditures (Arribas-Ibar et al. 2021). Within the framework of sustainable transport, several strategies should be implemented, such as reducing private car use, increasing car sharing, and introducing parking restriction programs. Thus, it is envisaged to reduce CO_2 emissions. In the future, the prevalence of ZEV is predicted to be determined by 2 factors such as ZEV performance (vehicle price and range of use) and the evolution of ZEV regulations (Oltra and Jean, 2009). Moreover, it is foreseen that some regulations, such as a CO_2 emissions VAT system and annual road tax based on CO_2 emissions, be made to encourage drivers to purchase ZEVs within the scope of sustainable transportation (Carreno et al. 2014). The main limitation of this study is that is limited to Slovenia only due to time and cost constraints as well as project limitations. Moreover, due to the risk of contamination during the pandemic process, some of the surveys are conducted online, and some of them are face-to-face. The next study will discuss how income levels, urban versus rural living conditions, and educational backgrounds in the ZEV purchase decision in different EU or non-EU countries.

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