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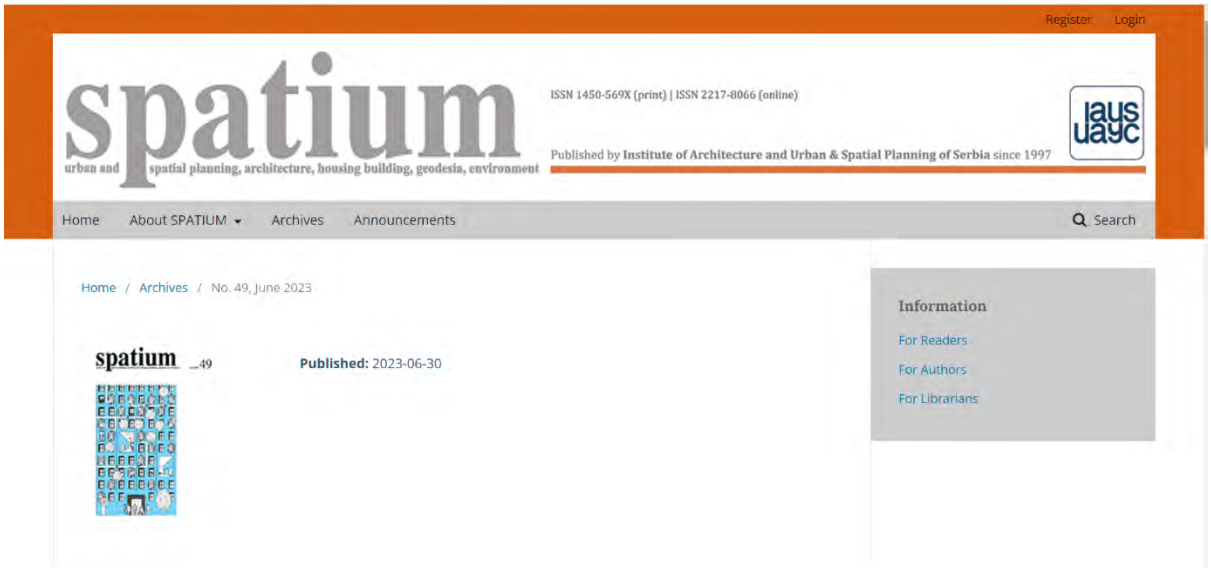

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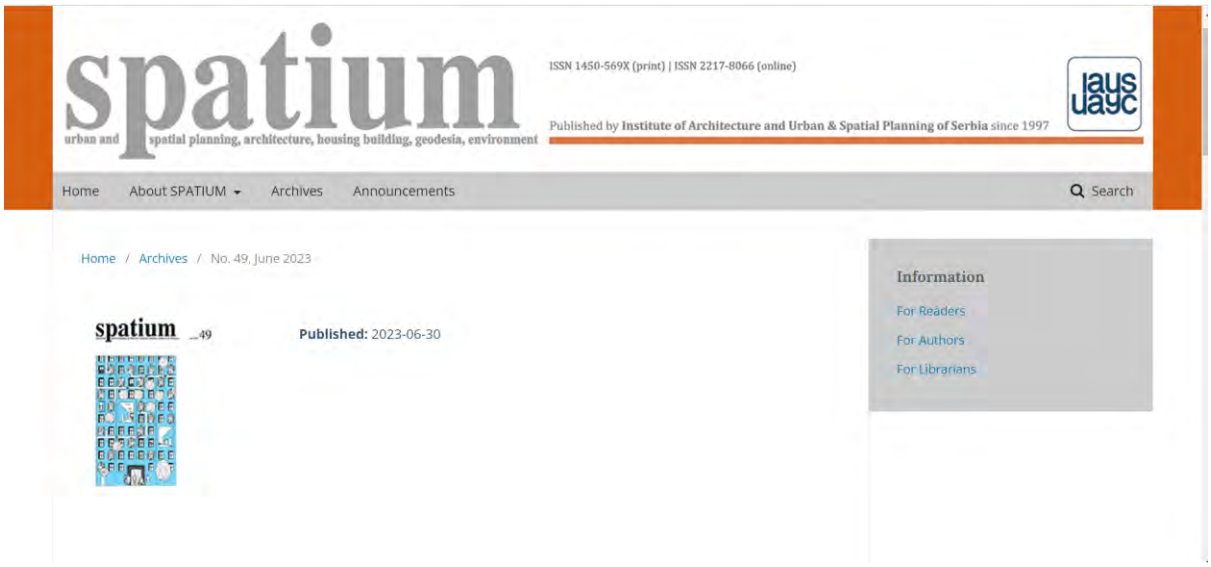

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SCOPE AND AIMS

The review is concerned with a multi-disciplinary approach to spatial, regional and urban planning and architecture, as well as with various aspects of land use, including housing, environment and related themes and topics. It attempts to contribute to better theoretical understanding of a new spatial development processes and to improve the practice in the field.

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EXPLORING THE TRANSPORT MODE CHOICE OF UNIVERSITY STUDENTS IN JAKARTA: A CASE STUDY OF UNIVERSITAS TRISAKTI

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It is difficult to capture the unique and complex travel behaviour of students due to differences in demographics and locations. Students' trips contribute to Jakarta's traffic, yet it is an area that has been rarely explored. Therefore, this study aims to investigate the transport mode choice and factors affecting the travel behaviour of Universitas Trisakti students. The results show that despite living in Jakarta, a motorcycle and car-dominated city, they prefer to use sustainable transport. Public transport is the most common mode, followed by motorcycles, walking, cars, and ride-hailing, but not cycling, unlike their peers in other Indonesian cities. Students with more vehicles in their families and with licenses tend to use motorcycles and cars to go to campus. Moreover, student allowances are found to have a positive and significant influence on walking and ride-hailing choices. In terms of motorcycle use, male students are more likely to use them than female students. Travel distance and travel time also affect the choices of walking, motorcycles, and ride-hailing, whereby the longer the distance and travel time, the less likely students are to choose those transport modes over public transport. In addition, a positive regression is found between transport expenses and the choice of cars or ride-hailing. In conclusion, policies and infrastructure, such as parking fees and bicycle lanes, as well as better public transport and walking facilities, are needed to ease traffic and create a better campus environment.

Key words: **mode choice, university students, Logit Model, Universitas Trisakti, Jakarta.**

INTRODUCTION

Jakarta, as the capital city, is the centre of the economy, politics, and culture in Indonesia. Jakarta is also the densest city in Indonesia, and it serves the surrounding metropolitan area called Jabodetabek. Because of its density, it faces numerous urban problems, including serious transport problems. The high level of motorization and urban sprawl cause congestion, air pollution, greenhouse gas emissions, traffic accidents, and noise pollution. In 2019, Jakarta was ranked as the 7th worst-traffic city in the world (TomTom International BV, 2019), which causes 65 trillion Rupiah in losses annually (Bappenas, 2019).

Based on the commuter statistics in the Jakarta Metropolitan Area (JMA), 72% of commuters use private vehicles, consisting of motorcycles (63%) and cars (9%). Only 20.4% of the JMA population uses public transport, while an insignificant amount (3.9%) uses ride-hailing. Ride-hailing is an app-based taxi service that consists of motorcycles and cars. Gojek and Grab are the most popular ride-hailing services in Indonesia, offering similar services to Uber. It is also rare (1.2%) to find citizens who utilize non-motorized transport (BPS, 2019b). These imbalanced mode shares among the population are responsible for the severe congestion in JMA.

Universities have a crucial role in urban and transport development because of their mixed land uses, with their vibrant built environment, making them one of the major trip generators (Tolley, 1996) for both students and workers. Wibowo *et al*. (2021) emphasize the importance

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of universities as opportunities to measure regional accessibility. According to BPS Jakarta Province (2018), there are 320 universities in Jakarta Province, consisting of 5 state and 315 private universities. The total number of students is 677,335 and 615,236 in state and private universities respectively, representing around 12% of Jakarta's total population.

Limanond *et al.* (2011) stated that it is well known that university students have complex and unique travel behaviour, which differs from that of the general population. It is usually due to their irregular lecture schedules and their free time in the campus area, allowing them to participate in various activities on and off campus most of the day. Joewono *et al*. (2013) explored student activities and trips at several universities in Bandung and analyzed their characteristics, such as the number and length of trips per day, the number of activities, the activity duration, and trip cost. In addition, Khattak *et al*. (2011) stated that unusual travel behaviour of students was not well-understood in the analysis of travel demand.

The activities and flexibility of students' time affect their travel behaviour, including the transport mode choice for their travel to campus. In developed countries, students use more diverse transportation modes than the general population, which tend to be sustainable transport modes (Diana, 2008). A study on students at the University of North Carolina (Rodríguez and Joo, 2004) showed that 21.5%, 28.8%, and 49.6% travelled by public transportation, bicycle/walking, and car, respectively. Similar results were also found at the University of California Los Angeles (Zhou, 2012), where 30.9%, 24.8%, and 41.2% travelled by public transportation, bicycle/walking, and car, respectively. Further, Delmelle (2012) reported that walking is the most widely used mode of transportation at the University of Idaho, followed by cars and bicycles.

On the other hand, private vehicles are the most common mode used by students in developing countries, such as Indonesia. At Gadjah Mada University, Yogyakarta (Fauzi and Basuki, 2016), 68.64%, 7.63%, 5.51%, 11.02%, and 7.2% of students used motorcycles, cars, public transportation, walking, and bicycles as modes of travel, respectively. Primasari *et al*. (2013) stated that at Brawijaya University, Malang, mode use is dominated by motorcycles at 53.1%, followed by public transportation, walking, cars, and bicycles at 22.9%, 17.7%, 5.7%, and 0.5%, respectively. A study at the Indonesian Muslim University Makassar (Alkam and Said, 2018) showed that private vehicles are the most widely used mode, reaching 70.34%, followed by public transportation, online taxis, and walking at 13.81%, 11%, and 4.86%, respectively. All of those three studies reveal that in many Indonesian cities, motorcycles dominate students' choice of transport mode for commuting.

There is limited research on students' commuting behaviour in Jakarta and its influencing factors. Previous studies by Maulana and Yudhistira (2020) and Irjayanti *et al.* (2021) only analyzed the city's commuter behaviour for the general population. Therefore, this study aims to explore the mode choice of university students and understand the associated influential factors. Data were gathered from Universitas Trisakti as a case study. Universitas Trisakti is one of the largest private universities in Jakarta, located in a dense area of 23,980 people/km^2 (BPS Jakarta Barat, 2020).

Exploring students' transport modes of choice provides an idea of how their mobility influences the surrounding traffic. Moreover, understanding the basis of their mode choice is important for making transport strategies, policies, and plans in Jakarta. This study is expected to provide recommendations for universities with regard to improving the quality of the campus environment and for policy-makers in terms of reducing the impact of students' mobility in the city.

BACKGROUND

Mode choice and its determinants among students have been explored in previous studies in both developed and developing countries (Khattak *et al*., 2011; Limanond *et al*., 2011; Delmelle and Delmelle, 2012; Zhou, 2012; Olawole and Olapoju, 2016; Moniruzzaman and Farber, 2018; Nguyen-Phuoc *et al*., 2018; Krishnapriya and George, 2020).

A study by Limanond *et al*. (2011) on mode choice behaviour in a university in Thailand found that car ownership plays a significant role in students' transport mode choice, though it does not affect travel distance and trip number. Those who own a car are more likely to use it, while others select ridesharing or taking a bus. Furthermore, the authors found no distinct behaviour differences between genders in this study.

Another study by Delmelle and Delmelle (2012) found different factors affecting the choice of a car as a transport mode at Idaho University, United States. By analyzing spatial and temporal patterns, the authors discovered that parking permits are an essential factor for car commutes, specifically in the winter. Moreover, gender significantly influenced driving behaviour, with females being more likely to drive while males shift modes throughout the year.

A study of travel behaviour and student mode choice in the United States was also conducted by Zhou (2012) using data from the University of California (UCLA), located in Los Angeles, a car-dominated city. The intriguing results show that students did not have any tendency to drive alone more than their peers in other cities. The results showed that being multimodal and having a discounted transit pass increases the probability of using alternative modes, whereas holding parking permits raises the possibility of driving alone. Travel distance is positively associated with carpooling and telecommuting, while gender and status significantly affect cycling, walking, and public transport. Students living alone tend to drive alone, while those with peers living nearby tend to take public transport.

Moreover, a study in Toronto, Canada, by Moniruzzaman and Farber (2018) aimed to ascertain the determinants of sustainable mode choice among university students. The results showed that transit passes and bicycle ownership are essential in determining sustainable mode choices among students in Toronto. Furthermore, in terms of public transport use, a study by Tsioulianos *et al*. (2020) also found that university students in Greece are willing to walk further to/from bus stops than the standard 400 m maximum in the

general public if supported by a higher frequency of bus services.

Studies on the ability of a residential location to affect mode choice (Khattak *et al*., 2011; Olawole and Olapoju, 2016) revealed different behaviour between students living on- and off-campus. Olawole and Olapoju (2016) found that in Nigeria, walking dominated the choice of on-campus students and buses were the main choice for those living away from the university building. Furthermore, gender, age, monthly stipend, travel distance, time, trip frequency, and cost significantly influenced the mode choice. Similar results on walking were also found in the study by Khattak *et al*. (2011). Students living on-campus tend to walk more and drive less due to their distinct demographic, since the majority of them are younger, unmarried, undergraduate, and full-time.

A study on mode choice behaviour in Kochi, India, by Krishnapriya and George (2020) revealed that students at all levels, including those in college, prefer public buses and two-wheelers. Gender also plays a significant role in mode choice, specifically for two-wheeler users. When travel cost is considered, buses are the most preferred mode. Residential characteristics also influence college students' mode choice, particularly with regard to the frequency of buses.

Nguyen-Phuoc *et al*. (2018) in Vietnam found that motorcycles dominate Vietnamese cities. Analyzing six universities, Nguyen-Phuoc found that age, gender, and income significantly affect student transport mode decisions. Moreover, travel time tends to decrease their desire to walk to campus. They found that motorcycle users are willing to switch to public transport when an efficient and reliable transport system is provided.

The above studies show that it is challenging to capture student behaviour with regard to transport mode choice in campus settings with various demographics and locations.

METHODOLOGY

Study area

Universitas Trisakti was selected to represent the universities in Jakarta. It is located in West Jakarta, Jakarta Province, with an area of 664.01 km^2 and a population of 10,556,810 (BPS Provinsi Jakarta, 2020). The campus is in a dense sub-district with a density of 23,980 people/km^2 (BPS Jakarta Barat, 2020).

According to the Ministry of Education and Culture (2021), Universitas Trisakti is one of the largest private universities in Jakarta, with a total of 20,913 students. Every year, 3,745 students enroll at the university, dominated by undergraduates (72.5%), masters students (11.4%), associates (8%), those studying for professional certification (3.4%), doctoral students (3.2%), and bachelor of applied science students (1.5%). However, it is important to note that the institution has experienced a downward trend in the number of students since 2020 due to the COVID-19 pandemic.

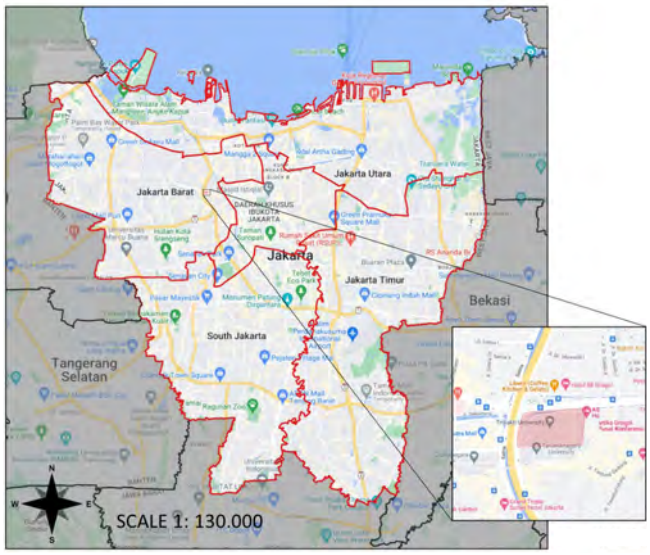
The entrance and exit gates of Universitas Trisakti are on Jalan Letjen S. Parman and Jalan Kyai Tapa, both arterial roads, as shown in Figure 1. These two roads are known as congestion-prone spots in Jakarta according to the 2014 and 2017 Jakarta Open Data. The campus generates activities that play vital roles in regional traffic within the campus and its surroundings. Various types of public transportation, such as BRT TransJakarta, commuter line rail transport, conventional buses, and minibuses, are connected to the institution. The campus area also provides good pedestrian paths, but without surrounding bike lanes.

Data collection

This quantitative study was conducted with data collected from students through online questionnaires in February 2022. The questionnaire consisted of two sections: the socio-demographics of travellers and travel characteristics of Universitas Trisakti undergraduate students. The first section collected information on gender, monthly allowance, car and motorcycle ownership in the family, and ownership of a driving license. The second section collected information about the transport mode, distance to and from the university, travel time, travel cost, and the main reason for using a particular transport system.

The questionnaire included several question types, both nominal and scale forms. Due to the pandemic, the respondents were selected based on particular criteria. The population of this study is active undergraduate students at Universitas Trisakti who attended offline lectures before the pandemic, i.e., the classes of 2017-2019 only. Based on data from the Ministry of Research, Technology and Higher Education, the average number of annual students at Universitas Trisakti is 3,000; hence, the total population over three years is around 9,000. The number of samples was determined using the Slovin formula, which also adopts the random sampling method. For a ± 6% error margin and 94% confidence level, the minimum sample required is 270. After the survey process, data from 316 respondents were gathered, with only 275 students used for analysis after the checking and cleaning process.

Figure 1. Jakarta province and the location of Universitas Trisakti (Source: Google Maps)



Data analysis

Data were analyzed using statistical methods; prior to this process, descriptive statistics were conducted with frequency and crosstab. Frequency was employed to determine the mode choice, socio-economic, and travel characteristic proportions. Subsequently, data were analyzed with a crosstab to understand the distribution of socio-economic and travel characteristics among the five modes, i.e., walking, motorcycle, car, public transport, and ride-hailing.

The mode choice probability was determined using discrete choice modelling. Discrete choice models are usually used in transportation research to parameterize utility functions for the alternatives, based on revealed preferences and explanatory factors (Ben-Akiva and Lerman, 1985). Furthermore, multinomial logit regression was utilized to investigate the factors influencing the five transport mode choices among students. The multinomial logit model has been widely used for choice modelling because it gives the choice probabilities of each alternative as a function of the systematic portion of the utility of all the alternatives (Koppelman and Bhat, 2006). The analysis employed SPSS (Statistical Package for Social Science) software. The basic form of the multinomial logit model is given in Equation (1)

$$p = \frac{exp^{(a+b_1x_1+b_2x_2+b_3x_3\dots)}}{1+exp^{(a+b_1x_1+b_2x_2+b_3x_3\dots)}} \quad (1)$$

where p is the probability of the decision maker selecting a particular alternative, a is the constant value of the formula, and b is the coefficient value of the predictor variable.

RESULTS AND DISCUSSION

Descriptive statistics

Of the total 275 respondents in this study, 34.5% were male and 65.5% female students. Approximately 65.5% of the students had a monthly allowance of IDR <1,500,000, followed by 23.3% at IDR 1,500,001 – IDR 3,000,000, while the rest received > IDR 3,000,000. Moreover, the majority of students (82.9%) come from a family with 1 - 2 cars, and 89.1% have a motorcycle, while the remaining 10.9% have neither. Further, 54.2% and 52.7% of students have car and motorcycle driving licenses, respectively.

The results show that 40.4% of the students use public transport as their travel mode, which consists of the Commuter Line (KRL), TransJakarta, conventional buses, and minibuses. The second biggest share is private motorcycles (20.7%), followed by walking (17.5%), cars (12.7%), and ride-hailing (8.7%). Meanwhile, no student was found to cycle to campus (see Figure 2).

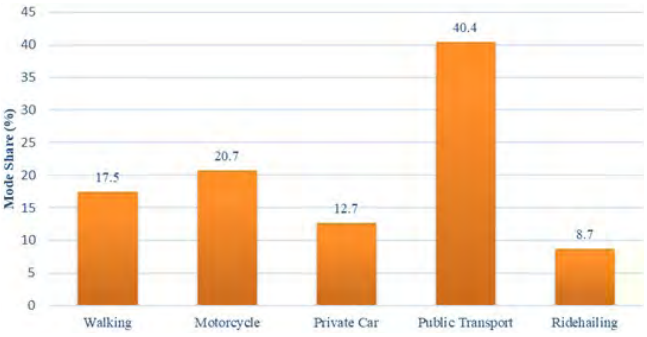
The results show that more than half of the students use public transport or walk (57.9%). It indicates that students, although in Jakarta, prefer to select sustainable transport modes, which differs from the general population. These findings align with a previous study stating that students have different travel behaviour and socio-demographics compared to the general population (Khattak *et al*., 2011), since they tend to use public transport and non-motorized modes (Ripplinger and Brandt-Sargent, 2009). It occurs because they usually comprise a younger and busier population group with relatively low income but who have more daily trips than the general population.

Table 1. Characteristics of Respondents

Variables	N	Percentage (%)
Gender		
Male	95	34.5
Female	180	65.5
Monthly Allowance (Indonesian Rupiah – IDR)*		
≤ IDR 500,000.00	67	24.4
IDR 500,001 – IDR 1,000,000	68	24.7
IDR 1,000,001 – IDR 1,500,000	45	16.4
IDR 1,500,001 – IDR 2,000,000	27	9.8
IDR 2,000,001 – IDR 2,500,000	19	6.9
IDR 2,500,001 – IDR 3,000,000	18	6.5
> IDR 3,000,000	31	11.2
Car Ownership in Family		
0	47	17.1
1 - 2	187	68
3 - 4	26	9.5
> 4	15	5.5
Motorcycle Ownership in Family		
0	30	10.9
1 - 2	182	66.2
3 - 4	40	14.5
> 4	23	8.4
Car Driving License		
Yes	149	54.2
No	126	45.8
Motorcycle Driving License		
Yes	145	52.7
No	130	47.3

**Average exchange rate in 2019: 1 USD = 14,136.4 IDR*

Figure 2. Mode choice of Universitas Trisakti students

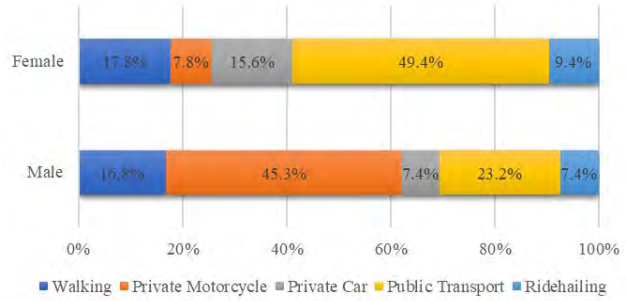


However, these results are contrary to the student mode choice in other Indonesian cities, where most prefer motorcycles to public transport (Primasari, *et al*., 2013; Fauzi and Basuki, 2016; Alkam and Said, 2018). This occurs because Jakarta is the leader in public transport provision compared to other cities (Soehodho, 2017). The existence of effective public transportation gives students in Jakarta more alternatives for commuting to campus.

Gender influence on campus trip mode choice

The results show that public transport, walking, and private cars are popular among female students. Around 49.4% of female students use public transport as their main transport, while only 23.2% of male students choose it (see Figure 3). The different patterns show that male students tend to use motorcycles to get to campus (45.3%), while only a few female students use them (7.8%). This is contrary to previous studies, which found that male students in Asian countries prefer public transport over females for safety reasons (Zhang *et al*., 2017; Dias *et al*., 2022).

Figure 3. Mode share according to gender



Travel distance and trip mode choice

Figure 4 shows that students who walk are associated with short-distance travel, with 69.2% walking less than 1 km and 28.6% walking between 1-5 km. Meanwhile, public transport is mostly used for long-distance travel between 10–40 km (87.4%). Ride-hailing is common for shorter distances from 1-10 km, with around 70.8% of total ride-hailing users. Furthermore, motorcycle use is evenly distributed in all ranges of distances.

Monthly allowance and trip mode choice

The mode choice among students varies according to their monthly allowance, which reflects their socio-economic status. The use of public transport decreases as the allowance increases. Only a few students with a stipend between IDR 4,500,000 – IDR 5,000,000 use public transport (see Figure 5). On the other hand, the bigger the allowance, the higher the use of cars. Students who walk are evenly distributed in all ranges, with the biggest portion having an IDR 3,500,001 – IDR 4,000,000 stipend. Similar results were also shown by motorcycle users, where the majority is in all allowance ranges, except IDR 3,500,001 – IDR 4,500,000. Furthermore, ride-hailing was selected by those with an allowance of IDR 500,000 – IDR 3,500,000 and > 5 billion rupiahs.

Figure 4. Mode share by travel distance

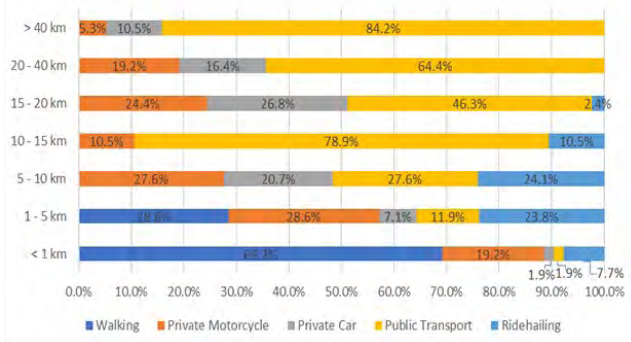
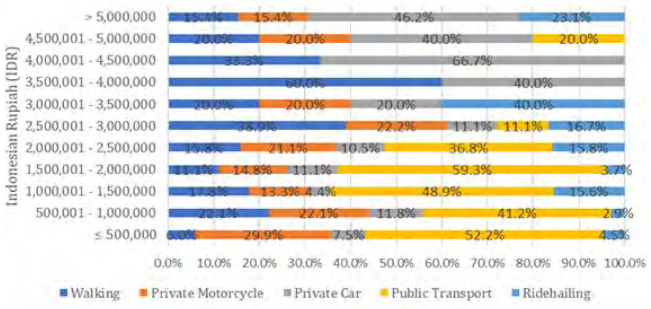


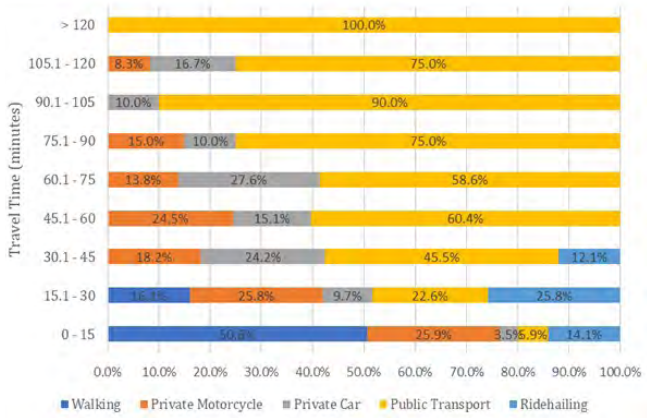
Figure 5. Travel time and monthly allowance



Travel time and trip mode choice

Figure 6 shows that public transport has the biggest share of long travel time. Meanwhile, walking is associated with shorter travel time, particularly between 0 to 15 minutes (50.6%). Motorcycle users seem to be evenly distributed in all ranges. However, it has a decreasing trend as the travel time increases. Car users also vary in all levels, with the most common time within 60.1 – 75 minutes (27.6%). Students who use ride-hailing only have a short travel time, from 1 to 45 minutes maximum.

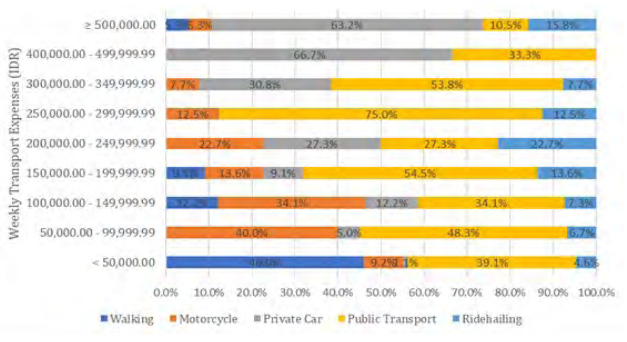
Figure 6. Mode share and travel time



Weekly transport expenses and trip mode choice

Students of Universitas Trisakti also reported their weekly transport costs in this study. Those who walk pay mostly <IDR 50,000 (46%), IDR 100,000 – IDR 200,000, and even ≥ IDR 500,000. The possible explanation for these findings is that the reported transport expenses are not only a home-campus trip but also other trips conducted in a week. Moreover, many car users tend to have higher transport expenses. Additionally, most public transport users spend up to IDR 349,999. This may be caused by the type of

Figure 7. Mode share and weekly transport expenses (IDR)

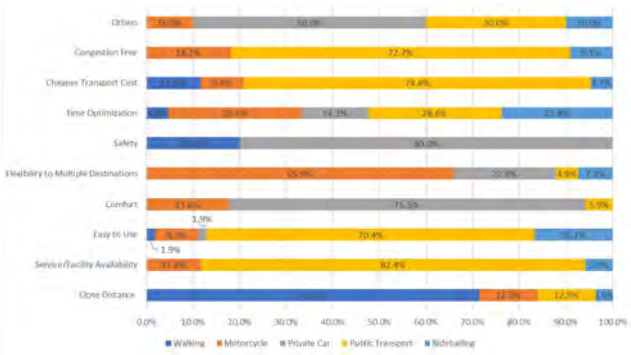


mode, travel distance, and the number of transfers. The distribution results also showed that the use of motorcycles costs less than public transport.

Reasons for choice of campus travel mode

Figure 8 summarizes the main reasons for selecting a transport mode. Public transport is chosen for various reasons, such as availability, ease of use, cost efficiency, and because it is congestion-free. Meanwhile, most car users are concerned about safety and comfort. Furthermore, some students prefer motorcycles due to the flexibility of travel to multiple destinations and time optimization because of their ability to avoid congestion.

Figure 8. Mode share and main reason to use transport mode



Mode choice modelling

This study used five main modes of transport as dependent variables: walking, motorcycle, car, public transport, and ride-hailing. The multinomial logit modelling uses public transport as the reference category. The independent variables consist of gender, monthly allowance, vehicle ownership, driving license ownership, travel time, travel distance, and transport expenses. Before the modelling process, correlations between these independent variables were computed to avoid multicollinearity.

The variables in this study are statistically significant for improving the model compared to a null model, where AIC = 441.292 and -2 Log Likelihood = 361.292. Approximately 84.8% (Nagelkerke Pseudo R2) of the variability is explained by the variables used in the model, which means that the MNL model fits the sample data properly. Moreover, the Pearson chi-square is insignificant at 1.000, indicating that the model is well-fitted with the data.

Significant factors that influence the walking choice are student allowance, travel distance, travel time, and having a motorcycle driving license. Students with a higher allowance prefer walking to public transport at a 95% significance level. Travel distance is significant at a 99% level, whereby the further the distance, the less likely students are to choose to walk, preferring to use public transport. It is predictable because walking is only favourable for short-distance trips. Moreover, travel time also significantly affects walking choices (at a 90% significance level), which may be correlated with travel distance. Further, students who have motorcycle driving licenses prefer walking to public transport.

Some factors that significantly affect motorcycle use are gender, vehicle ownership, owning a driving license, travel distance, and travel time. The models show a notable difference in gender preference (99% significant) between motorcycles and public transport. Male students prefer to use motorcycles 12.229 times more than their female counterparts, who are more likely to select public transport. This result is in line with previous studies that stated motorcycles were the least preferred option for female students (Nguyen-Phuoc *et al*., 2018; Krishnapriya and Soosan George, 2020). Further, most females in Jakarta, Kuala Lumpur, and Manila are less likely to select motorcycles (Ng and Acker, 2018).

Students with more motorcycles and licenses are more likely to ride to campus. These results align with previous studies showing that students owning motorcycles tend to use them (Nguyen-Phuoc *et al*., 2018). It is common because some countries have motorcycle dependency due to socio-economic and habitual factors (Chang and Wu, 2008; Guillen *et al*., 2013). The total number of cars owned are also correlated with motorcycle use, but only at a 90% significance level. Negative impact occurs with travel distance and travel time. The further the distance and the longer the travel time, the less likely students will commute by motorcycle.

Car users show different results when compared to public transport users. Students with more cars within their families and with licenses have a greater tendency to drive (OR = 7.627 and OR = 14.215, respectively). This finding aligns with the previous study by Limanond *et al.* (2011), showing that car ownership greatly influences students' tendency to drive. Also, positive regression was found between transport expenses and car usage.

Ride-hailing users show that allowance, transport expense, travel distance, and travel time impact their choice. The bigger their stipend, the greater the tendency to use ride-hailing over public transport. Ride-hailing users are also associated with higher transport expenses. Therefore, the longer the distance and travel time, the less likely students are to choose ride-hailing over public transport.

Travel distance is negatively associated with walking, motorcycle use, and ride-hailing at 99%, 95%, and 95% significant levels, respectively. Students typically walk short distances because they find it uncomfortable to walk long distances, especially in humid cities. Studies have found that the walking distance preference in Jakarta is only between 500 to 700 meters (Afkara and Kusuma, 2020). Moreover, most Jakarta highways have high traffic volumes and high-speed limits. Motorcycle users are less likely to ride as the distance increases for reasons of safety. In fact, of the 109,215 traffic accidents in Indonesia, more than 70% are caused by motorcycles (BPS, 2019a). Furthermore, ride-hailing is related to progressive fares, which become more expensive as the distance increases (Irawan *et al*., 2021a).

Travel time is a primary factor with regard to mode choice (Frank *et al*., 2008). In this study, travel time is negatively associated with walking, motorcycle, and ride-hailing, indicating students are less likely to select those modes when faced with a longer travelling time. The possible

Table 2. Multinominal logistic regression with public transport as reference

Variable	Walk		Motorcycle		Car		Ride-hailing	
	B	Exp[B]	B	Exp[B]	B	Exp[B]	B	Exp[B]
Intercept	7.888		-2.004		-6.039		2.169	
Gender [Male][1]	0.162	0.038	2.504***	12.229	-0.913	0.401	0.226	1.254
Monthly Allowance	0.352**	1.422	-0.017	0.983	0.070	1.072	0.275**	1.317
Number of Cars	-0.735	0.479	0.736*	2.087	2.032***	7.627	0.051	1.053
Number of Motorcycles	-0.306	0.736	0.597*	1.818	-0.045	0.956	-0.381	0.683
Car Driving License[have][1]	-0.211	0.810	0.628	1.874	2.654***	14.215	0.106	1.112
Motorcycle Driving License [Have][1]	2.039**	7.680	1.542**	4.673	-1.215*	0.297	0.622	1.862
Travel Distance	-2.609***	0.074	-0.476**	0.621	-0.353	0.703	-0.646**	0.524
Travel Time	-1.243*	0.289	-0.582***	0.559	-0.282	0.755	-1.194***	0.303
Transport Expenses	0.019	1.020	0.090	1.095	0.467***	1.595	0.478***	1.613
Goodness of Fit Parameters								
N				275				
Cox and Snell R^2; Nagelkerke R^2; McFadden R^2				0.803; 0.848; 0.552				
-2LL (0); -2LL (ß); [X2; df; p-value]				808.358; 361.292 [447.066; 36; 0.000]				
AIC				441.292				
Pearson [X2; df; p-value]				[621.520; 1040; 1.000]				

Significant at a level of 90%; ** Significant at a level of 95%; * Significant at a level of 99%*

explanation for this is that travel time could be related to travel distance.

Monthly allowance, which reflects socioeconomic status, is associated with ride-hailing and walking decisions. It is aligned with a previous study (Irawan *et al*., 2021a) that found a tendency for higher-income students to use ride-hailing more. Students who walk seem not to be influenced by their economic condition, as shown in Figure 5. Conversely, students' monthly allowance does not significantly affect the use of private vehicles.

Irrespective of the most common use of public transport by students, cars and motorcycles also have a large share at 33.4%. Before 2021, parking in the campus area was free for students. Perhaps increasing the parking tariff will reduce private vehicle usage. Further studies need to be conducted to determine the optimal parking tariff. Improvements in public transport and walking facilities are required to enable students to shift to public transport and walk for long- and short-distance trips.

The bicycle facilities near the university should also be highlighted. This study found no students cycling to campus, which is possibly caused by the unsafe environment around the campus area. As stated, Universitas Trisakti is located on arterial roads with high volumes and high-speed vehicles without bicycle lanes. Building a safe and continuous bike lane in the surrounding campus area may increase bicycle use and help replace cars and motorcycles for short-distance trips.

During the 2020 COVID-19 pandemic, the government implemented a public activity restrictions (PPKM) policy to prevent the spread of the virus. This policy limited community-wide activities, which had a significant impact on mobility and travel behaviour. In Indonesia, a substantial reduction in travel was reported during the pandemic for all modes (Irawan *et al*., 2021b; Maimunah *et al*., 2022). Moreover, people's mode preferences also changed during the pandemic, significantly impacting public transport. A study in Jakarta reveals that transport modes shifted from previously public to private vehicles during the pandemic (Maimunah *et al*., 2022). Moreover, those who still used public transport tended to choose ride-hailing, a more private form of public transport, compared to conventional public transport during the pandemic (Sjamsoeddin, 2021), since health protocol criteria became their main priority.

The Public Activity Restriction Policy (PPKM) for COVID-19 was officially lifted in December 2022, resulting in the return of all activities to their pre-pandemic patterns. However, the traffic is now dominated by private vehicles, while the passenger density on public transport is still below pre-pandemic levels. As of March 2023, the congestion index in the capital city has now exceeded 50%; later, it could approach or even exceed the 53% index from 2019 (Indraswari, 2023). Meanwhile, public transport passenger numbers have started recovering but have not reached pre-pandemic levels. MRT passenger numbers in early 2023 were still below the average of over 2.6 million people per month in 2019 (Annur, 2023). As for the commuter line, the average number of daily passengers in February 2023 was 743,242, which is still below the 1 million per day in 2019 (Yolandha, 2022).

University students who have returned to campus to continue their studies are also subject to the revocation of PPKM. Although there has still been a lack of new studies since the revocation, the increasing number of private vehicles and the decline of public transport use during the post-pandemic period may also reflect students' movements and mode preference changes in Jakarta. Although most

students may use the same modes as before, there is still a chance that they will shift from public transport to other modes. Further study could be done to investigate students' post-pandemic transport mode choice and the probability of private vehicle use shifting toward more sustainable transport.

CONCLUSIONS

Understanding students' transport preferences and their influencing factors can help develop and enhance policies, programs, and infrastructure to create a better environment in the university areas and throughout Jakarta. Students should be encouraged to use more sustainable modes of commuting, such as public transport, walking, and cycling. This is because a decrease in private vehicle use would ease traffic congestion around university areas in Jakarta, thereby creating a better environment for students and the overall population. Data were gathered from Universitas Trisakti as a case study. This study found that living in Jakarta, a motorcycle and car-dominated city, students do not tend to use private vehicles like the majority of Jakarta's population and even their peers in other Indonesian cities. The transport modes used by students in this situation are dominated by public transport, followed by motorcycles, walking, cars, and ride-hailing. Many factors were found to influence students' decisions, such as gender, monthly allowance, the number of vehicles owned, having a driving license, travel distance, time, and weekly transport expenses. To promote more sustainable transport among students, policies and infrastructures need to be implemented, such as optimum parking fees within the campus area, improvement of public transport and walking facilities, and bicycle lanes. Hopefully, students will be able to contribute more to improving the campus environment and reducing Jakarta's traffic congestion.

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Exploring the Mode Choice of University Students in Jakarta: A Case Study in Universitas Trisakti

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Abstract

University students' unique and complex travel behavior makes it challenging to capture due to various demographic and location, which is responsible for Jakarta's traffic. Therefore, this study explored the mode choice and contributing factors affecting the travel behavior of Universitas Trisakti students. The result showed that despite living in Jakarta, a motorcycle and car-dominated city, students don't use private vehicles like Jakarta population and their peers in other Indonesian cities. Students in Jakarta prefer public transport and then followed by motorcycle, walking, car, ridehailing, and yet no biking. Some factors that significantly affected their decision mode were gender, monthly allowance, number of cars and motorcycles, driving license, travel distance, travel time, and weekly transport cost. In conclusion, policies and infrastructure, such as parking fees, bike lanes, as well as better public transport and walking facilities, are needed to ease traffic and create a better campus environment.

Keywords: Mode Choice, University Students, Logit Model, Universitas Trisakti, Jakarta

1. Introduction

Jakarta, the capital city of Indonesia, is the centre of economy, politics, and culture, hence, it serves the surrounding metropolitan area called Jabodetabek. As the densest city in Indonesia, it faces numerous urban problems, such as air and noise pollution, greenhouse gas emission, traffic accidents, as well as noise pollution. In 2019, this city was ranked as the 7th worst traffic city in the world (Tomtom, 2019), which causes losses worth 65 trillion Rupiah yearly (Bappenas, 2019).

Generally, congestion occurs due to the high number of vehicles on the road and based on the commuter statistic in Jakarta Metropolitan Area (JMA), private vehicles dominate the mode by 72%, while motorcycles and car users are 63% and 9%. Only 20.4% of the JMA population uses public transport, while an insignificant amount of 3.9% uses ride-hailing. It is also rare to find citizens who utilize non-motorized transport (1.2%) (BPS, 2019). These imbalance mode shares among the population are responsible for the severe congestion in JMA.

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University is a major sector that generates various road trips (Tolley, 1996), both for students and workers. According to BPS Jakarta Province (2018), there are 320 universities in DKI, consisting of 5 state and 315 private universities. The total number of students is 677.335 and 615.236 in state and private universities, respectively, about 12% of the population.

Limanond, Butsingkorn and Chermkhunthod (2011) stated that university students are well known to have complex and unique travel behavior, which differ from the general population. This is usually due to the irregular lecture schedules and the need to be in the campus area to participate in various on-campus and off-campus activities. Joewono *et al*. (2013) explored student activities and trips at several universities in Bandung and found different characteristics, such as the number and length of trips per day, the number of activities, duration, and cost. However, Khattak *et al*. (2011) stated that unusual behavior by students was not well understood in the analysis of travel demand.

The activities and flexibility of students' time affect their travel behavior, including the choice of mode to campus. In developed countries, students use more diverse transportation modes than the general population (Diana, 2008). Study on students at the University of North Carolina (Rodríguez and Joo, 2004) showed that 21.5%, 28.8%, and 49.6% used public transportation, bicycle/walking, and car, respectively. Similar results were also found at the University of California Los Angeles (Zhou, 2012), where 30.9%, 24.8%, and 41.2% used public transportation, bicycle/walking, and car, respectively. Delmelle (2012) reported that walking is the most widely used mode of transportation at the University of Idaho, followed by cars and bicycles.

On the contrary, private vehicles are the most common mode that students use in developing countries, such as Indonesia. At Gadjah Mada University, Yogyakarta (Fauzi and Basuki, 2016), 68.64%, 7.63%, 5.51%, 11.02%, and 7.2% of students used motorcycles, cars, public transportation, walking, and bicycles as a mode of movement, respectively. Primasari, Ernawati, and W (2013) stated that at Brawijaya University, Malang, mode use is dominated by motorcycles at 53.1%, followed by public transportation, walking, cars, and bicycles at 22.9%, 17.7%, 5.7%, and 0.5%, respectively. Literature at the Indonesian Muslim University Makassar (Alkam and Said, 2018) showed that private vehicles are the most widely used mode, reaching 70.34%, followed by public transportation, online taxis, and walking at 13.81%, 11%, and 4.86%, respectively. Based on this study, it can be seen that in many Indonesian cities, motorcycle dominates the choice of students' mode of commuting.

Overall, there is limited study on students' commute behavior in Jakarta and its influencing factors. Preliminary studies by Maulana and Yudhistira (2020) and Irjayanti, Puri and Rosida (2021) only analyzed the city's commuter behavior as a whole. Therefore, this study aims to explore the mode choice of students and understand the associated influential factors. Data were collected from Universitas Trisakti, one of the largest private universities in West Jakarta which is located in a dense area of 23,980 people/km^2 (BPS Jakarta Barat, 2020).

Exploring students' mode of choice provides an idea of how their mobility influences surrounding traffic. Moreover, understanding the basis of mode choice is important for making transport strategies, policies, and plans in Jakarta. This study is expected to be a recommendation for universities to improve the quality of the campus environment and provide recommendations for policy-makers to reduce the impact of students' mobility in the city.

2. Background

Mode choice and its determinants among students have been explored in preliminary studies in both developed and developing countries (Khattak *et al*., 2011; Limanond, Butsingkorn, and Chermkhunthod, 2011; Delmelle and Delmelle, 2012; Zhou, 2012; Olawole and Olapoju, 2016; Moniruzzaman and Farber, 2018; Nguyen-Phuoc *et al*., 2018; Krishnapriya and Soosan George, 2020).

The study by Limanond, Butsingkorn, and Chermkhunthod (2011) on mode choice behavior using a university in Thailand found that car ownership plays a significant role though it does not affect travel distance and trip number. Those, who own a car, are more likely to use it, while others select ridesharing or taking a bus. Furthermore, there is no distinct behavior between genders found in this study.

Another study by Delmelle and Delmelle (2012) found different factors affecting the car choice mode at Idaho University, United States. By analyzing spatial and temporal patterns, they found that parking permit is a key factor for commuting by cars, specifically in the winter. Moreover, genders significantly influence driving behavior, with females more likely to drive while males shift modes in the year.

A study of travel behavior and mode choice of students in the United States was also conducted by Zhou (2012). Data were collected from the University of California, located in Los Angeles (UCLA), one of the car-dominated cities. Interestingly, students drive alone more than their peers in other cities. Being multimodal and having discounted transit pass increases the probability of other modes, whereas holding parking permits raises the possibility of driving alone. Travel distance is positively associated with carpooling and telecommuting, while gender and status significantly affect biking, walking, and public transport. Students living alone tend to drive alone, while those with peers living nearby take public transport.

Moreover, the study in Toronto, Canada, by Moniruzzaman and Farber (2018) aimed to answer the determinants of sustainable mode choice among students. The results showed that transit pass and bike ownership are essential in determining sustainable mode choices among students in the region.

Studies on the ability of a residential location to affect mode choice (Khattak *et al*., 2011; Olawole and Olapoju, 2016) revealed different behavior between students living on- and off-campus. Olawole and Olapoju (2016) found that in Nigeria, walking dominated the choice of on-campus students and buses for those leaving outside the university premises. Furthermore, gender, age, monthly stipend, travel distance, time, trip frequency, and cost significantly influence the mode choice. Similar results on walking were also found in the study by Khattak *et al*. (2011). Students living on-campus tend to walk more and drive less due to their distinct demographic, where the majority are younger, un-married, undergraduate, and full-time.

The study on mode choice behavior in Kochi, India, by Krishnapriya and Soosan George (2020) revealed that all levels of students, including those in college, prefer public buses and two-wheeler. Gender also plays a significant role in mode choice, specifically for two-wheeler users, with the bus as the most preferred mode when travel cost is considered. Residential characteristics also influence college students' mode choice, particularly on the frequency of buses.

Nguyen-Phuoc *et al*. (2018) in Vietnam found that motorcycles dominate the city. Analyzing six universities, Nguyen-Phuoc found that age, gender, and income significantly affect student mode decisions. Moreover, travel time tends to decline their

choice to walk to campus. Motorcycle users are willing to switch to public transport when an efficient and reliable system is provided.

The previous literatures lead to the assertion that in campus settings, with various demographics and locations, it is challenging to capture students' mode choice behaviors.

3. Methodology

3.1 Study Area

The study area is Universitas Trisakti, located in West Jakarta City, Jakarta Province, with an area of 664.01 Km^2 and a population of 10.556.810 (BPS Provinsi Jakarta, 2020). The campus is in a dense sub-district area with a density of 23.980 people/km^2 (BPS Jakarta Barat, 2020).

According to the Ministry of Education and Culture (2021), Universitas Trisakti is one of the largest private universities in Jakarta, with a total of 20,913 students. Every year, 3,745 people enrol into the university, which are dominated by undergraduate students (72.5%), masters (11.4%), D3 (8%), Profession (3.4%), S3 (3.2%), and D4 (1.5%). However, it is important to note that the institution has experienced a downward trend in the number of students since 2020 due to the Covid-19 pandemic.

The entrance and exit gates of Universitas Trisakti are on Jalan Letjen S. Parman and Jalan Kyai Tapa, both arterial roads, as shown in Figure 1. These two roads are listed as congestion-prone points in Jakarta according to the 2014 and 2017 Open Data. The campus generates activities that play vital roles in regional traffic within the campus and its surroundings. Various types of public transportation, such as BRT TransJakarta, commuter line rail transport, conventional, and minibuses pass through the institution. The campus area also provides good pedestrian paths but without surrounding bike lanes.

3.2 Data Collection

This quantitative study was conducted with data collected from students through questionnaire in February 2022. The questionnaire consisted of two sections to determine the socio-demographic of travellers and travel characteristics by Universitas Trisakti undergraduate students. The first section collected information on gender, monthly allowance, car and motorcycle ownership in the family, and driving license. The second section contains information about the mode of travel, distance to and from the university, travel time, cost, and the main reason for using a particular transport system.

The questionnaire consists of several question types, both in the form of nominal choices and a scale. Due to the pandemic, the respondents were selected based on particular criteria. The population of this study is active undergraduate students at Universitas Trisakti who have attended offline lectures before the pandemic class of 2017 to 2019 only. Based on data from the Ministry of Research, Technology and Higher Education, the average annual students at Universitas Trisakti are 3000, hence, the total population in three years is around 9000. The number of samples was determined using the Slovin formula, which also adopts the random sampling method. For a ± 6% error margin and 94% confidence level, the minimum sample required is

270. After the survey process, 316 respondents' data were gathered, with only 275 students used for analysis after the checking and cleaning process.

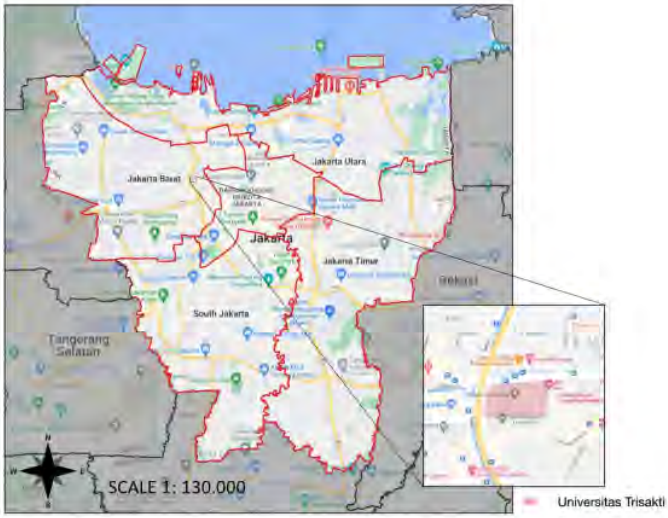

Figure 1: Jakarta Province and Location of Universitas Trisakti
Source: Google Maps

3.3 Data Analysis

Data were analyzed using statistical methods, and prior to this process, the descriptive statistics were used to evaluate the frequency and crosstab. Frequency was employed to determine the mode choice, socio-economic, and travel characteristic proportions. Subsequently, the analysis was continued with a crosstab to understand the distribution of socio-economic and travel characteristics to the five-mode choices, namely walking, motorcycle, car, public transport, and ride-hailing.

Determination of mode choice probability was conducted with discrete choice modeling, usually used in transportation study to parameterize utility functions for the alternatives based on revealed preferences and explanatory factors (Ben-Akiva and Lerman, 1985). Furthermore, multinominal logit regression investigates the factors influencing the five student's mode choices. The multinominal logit model has been widely used for choice modeling because it gives the choice probabilities of each alternative as a function of the systematic portion of the utility of all the alternatives (Koppelman and Bhat, 2006). The analysis employed SPSS (Statistical Package for Social Science) software, while the basic form of the multinominal logit model is given in Equation (1).

$$p = \frac{exp^{(a+b_1x_1+b_2x_2+b_3x_3\ldots)}}{1+exp^{(a+b_1x_1+b_2x_2+b_3x_3\ldots)}} \quad (1)$$

Where p is the probability of the decision maker selecting a particular alternative, a is the constant value of the formula, and b is the coefficient value of the predictor variable.

4. Results and Discussion

4.1 Descriptive Statistics

Of the total 275 respondents in this study, 34.5% and 65.5% are male and female students, respectively. Approximately 65.5% of students have monthly allowance between ≤ IDR 500,000 - IDR 1,500,000 followed by 23.3% at IDR 1.500.001 – IDR 3.000.000, while the rest is > IDR 3.000.000. The allowance reflects students' economic status, where 82.9% come from a family with 1 to 2 cars, 89.1% have a motorcycle, and the remaining 10.9% own none. Moreover, 54.2% and 52.7% of students have car and motorcycle driving licenses, respectively.

Table 1: Characteristics of Respondents

Variables	*N*	Percentage (%)
Gender		
Male	95	34.5
Female	180	65.5
Monthly Allowance		
≤ IDR 500.000,00	67	24.4
IDR 500.001 – IDR 1.000.000	68	24.7
IDR 1.000.001 – IDR 1.500.000	45	16.4
Rp1.500.001 - Rp2.000.000	27	9.8
Rp2.000.001 - Rp2.500.000	19	6.9
Rp2.500.001 - Rp3.000.000	18	6.5
Rp3.000.001 - Rp3.500.000	5	1.8
Rp3.500.001 - Rp4.000.000	5	1.8
Rp4.000.001 - Rp4.500.000	3	1.1
Rp4.500.001 - Rp5.000.000	3	1.8
> Rp5.000.000,00	13	4.7
Car Ownership in Family		
0	47	17.1
1 - 2	187	68
3 - 4	26	9.5
> 4	15	5.5
Motorcycle Ownership in Family		
0	30	10.9
1 - 2	182	66.2
3 - 4	40	14.5
> 4	23	8.4
Car Driving License		
Yes	149	54.2
No	126	45.8
Motorcycle Driving License		
Yes	145	52.7
No	130	47.3

Studies have shown that 40.4% of the students use public transport as their main travel mode, which consists of Commuter Line (KRL), TransJakarta conventional bus, and minibus. Others include walking, using cars, and ride-hailing in percentages of

20.7%, 17.5%, 12.7, and 8.7%. Meanwhile, no student is found to bike campus (see Figure

The results showed that more than half of the students use public transport and walking (57.9%). This indicates that students, even those in Jakarta, tend to select sustainable transport, which differs from the mode choice of the general population. Khattak *et al.* (2011), stating that students have different travel behavior and socio-demographics compared to the general population, who use public transport and non-motorized modes (Ripplinger and Brandt-s gent, 2009). Khattak *et al.* (2011) stated that the reason is that they usually comprise a younger and busier population group with relatively low incomes, but have more daily trips.

Figure 2: Mode Choice of Universitas Trisakti's Student

However, these results are contrary to students' mode choice in other Indonesian cities, where most prefer motorcycles to public transport (Primasari, Ernawati, and W, 2013; Fauzi and Basuki, 2016; Alkam and Said, 2018). This occurs because Jakarta is the leader in public transport provision compared to other cities (Soehodho, 2017). The existence of effective public transportation gives alternatives for students in Jakarta to commute to campus.

4.2 Gender Influence on Campus Trip Mode Choice

Around 49.4% of female students use public transport as their main means of transport, which is less than male who contain only 23.2% (see Figure 3). The different patterns found that 45.3% and 7.8% of male and female students use a motorcycle to campus. This is contrary to previous studies, which found that male students in Asian Countries prefer public transport over female due to safety reasons (Zhang, Yao, and Liu, 2017; Dias *et al.*, 2022).

4.3 Travel Distance and Trip Mode Choice

According to Figure 4, the walking distance between <1 km and 1 – 5 km is 69.2% and 28.6% respectively. Meanwhile, public transport is most common in the further distance from 10 – 40 Km (87.4%). Ride-hailing is common for shorter distances from 1 – 10 Km, with around 70.8% of total ride-hailing users. Furthermore, motorcycle use is almost evenly distributed in all ranges of distance.

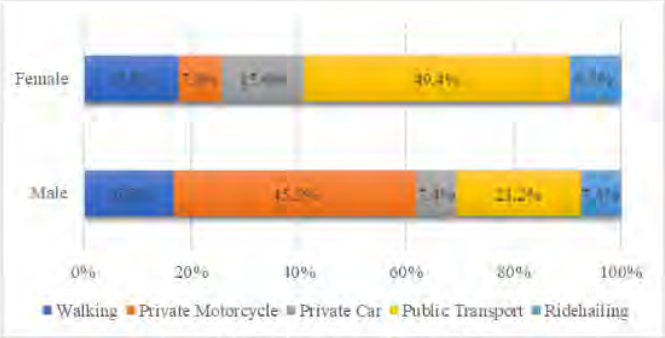

Figure 3: Mode Share by Gender

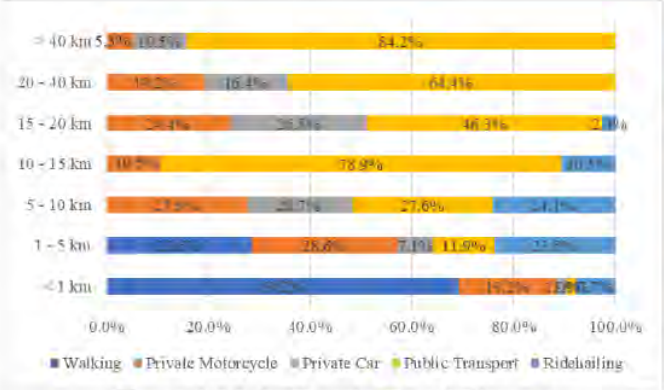

Figure 4: Mode Share by Travel Distance

4.4 Monthly Allowance and Trip Mode Choice

The mode choice among students varies according to their monthly allowance, which reflects their socio-economic status. The use of public transport decreases as allowance increases, because only a few students possess IDR 4.500.000 – 5.000.00. On the other hand, the bigger the allowance, the higher the use of cars. Students who walk are evenly distributed in all ranges, with the biggest portion having IDR 3.500.001 – IDR 4.000.000 stipend. Similar results were also shown by motorcycle users, where the majority is in all allowance ranges, except IDR 3.500.001 – IDR 4.500.000. Furthermore, ride-hailing was selected by those with allowance betwen IDR 500.000 – IDR 3.500.000 and > 5 billion rupiahs.

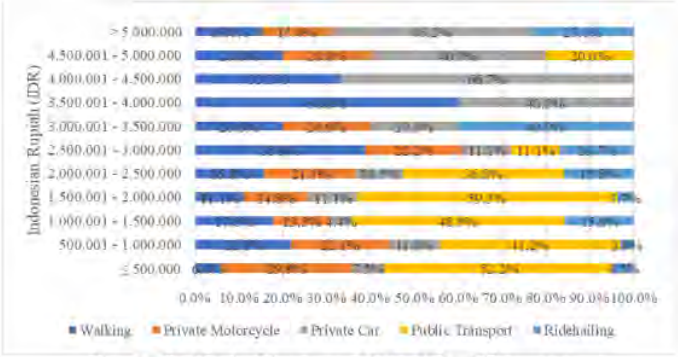

Figure 5: Mode Share and Monthly Allowance

4.5 Travel Time and Trip Mode Choice

Figure 5 shows that public transport has the biggest share for long travel time. Meanwhile, walking is associated with shorter travel time, particularly between 0 to 15 minutes (50.6%). Motorcycle users seem to be evenly distributed in all ranges, with a decrease in the trend of shares as the travel time inclines. Car users also vary in all levels, with the most common time within 60.1 – 75 minutes (27.6%). Students who use ride-hailing only spend short travel time, between 0.1 to 45 minutes maximum.

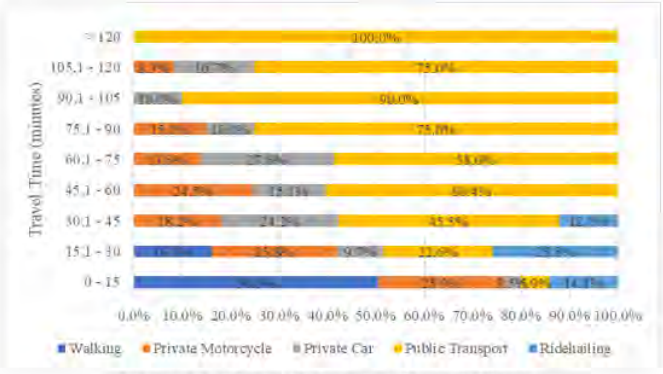

Figure 6: Mode Share and Travel Time

4.6 Weekly Transport Expenses and Trip Mode Choice

Students of Universitas Trisakti also reported their weekly transport costs in this study. Those who walk pay mostly < IDR 50.000 (46%), 100.000 – IDR 200.000, and even ≥ 500.000. The possible explanation for these findings is that the reported transport expenses are not only a home-campus trip but also other trips conducted in a week. Moreover, many car users tend to have higher transport expenses. Public transport users spend more vary from < IDR 50.000 to 349.999 due to their mode type, travel distance, and the number of transfers. The distribution results also showed that motorcycle users cost less than public transport users.

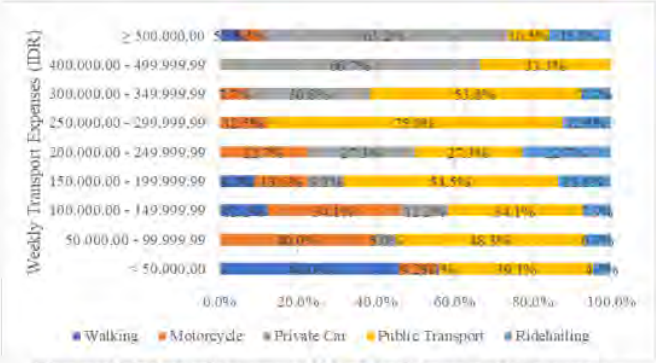

Figure 7: Mode Share and Weekly Transport Expenses

4.7 Main Reason to Select Campus Travel Mode

Figure 8 summarises the main reasons to select a commute mode. Public transport is selected for various reasons, such as availability, ease to use, efficient cost, congestion-free. Meanwhile, most car users are concerned about safety and comfort. Furthermore, students prefer motorcycles due to the flexibility to multiple destinations and time optimization by its ability to avoid congestion.

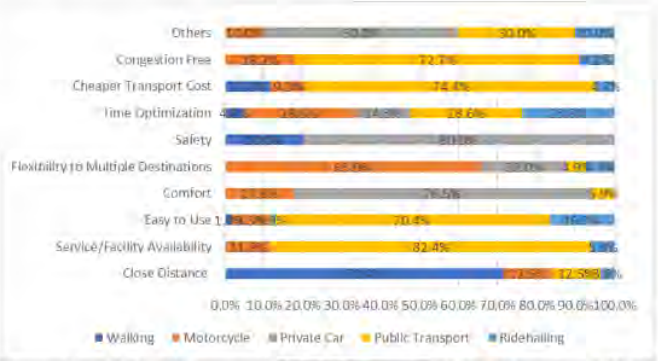

Figure 8: Mode Share and Main Reason to Use Transport Mode

4.8 Mode Choice Modelling

This study used five main modes as dependent variables, namely walking, motorcycle, car, public transport, and ride-hailing. The multinominal logit modeling was conducted using public transport as the reference category. The independent variables include gender, monthly allowance, vehicle ownership, driving license, travel time, distance, and transport expenses. Prior to the modeling process, correlations between those independent variables were computed to avoid multicollinearity.

The variables in this study are statistically significant in improving the model compared to a null model, where AIC = 441.292 and -2 Log Likelihood = 361.292. Approximately 84.8% (Nagelkerke Pseudo R^2) of the variability is explained by the variables used in the model, hence, it can e concluded that the MNL model fits the

sample data properly. Moreover, the Pearson chi-square is insignificant at 1.000, indicating that the model is well-fitted with the data.

Statistical significant regression has been found between student allowance, travel distance, travel time, and motorcycle driving license ownership with walking choice. Students with a higher allowance prefer walking to public transport at a 95% significant level. Travel distance is significant at 99%, where the longer the distance, the less likely their ability to walk than using public transport. This is predictable because walking is only favorable for short-distance trips. Moreover, travel time is also significantly affected with 90% of walking choices, which is correlated with travel distance. Students who have motorcycle driving licenses prefer walking to using public transport.

Some factors that significantly affect motorcycle use are gender, vehicle ownership, driving license, travel distance, and travel time. The models show a significant difference in gender preference at 99% significant between the motorcycle and public transport. Male students tend to use motorcycles 12.229 times more their female counterpart, who are more likely to select public transport as their reference category. Preliminary studies by Nguyen-Phuoc *et al*. (2018) and Krishnapriya and Soosan George (2020) stated that the least prefered means of transportation by female students' is motorcycles. Furhter, most females in Jakarta, Kuala Lumpur, and Manilla are less likely to select motorcycles (Ng and Acker, 2018). Students with more motorcycles and licenses in their families are more likely to ride to campus. Nguyen-Phuoc *et al*. (2018) stated that it is not surprising for students owning a motorcycle to use it in universities. This is common because some countries have motorcycle dependency due to socio-economic and habitual factors (Chang and Wu, 2008; Guillen, Ishida, and Okamoto, 2013). Total cars owned also correlate with motorcycle use but only at a 90% significant level. Negative impact occurs with travel distance and travel time. The further the distance and the longer the time, the less likely students will commute by motorcycle.

The car users show quite distinct results when compared to public transport users. Students with more cars within their families and who have licenses are highly significant influencing students to drive (OR = 7.627 and OR = 14.215, respectively). This is in line with the previous study by Limanond, Butsingkorn, and Chermkhunthod (2011) that car ownership influences usage among students. Also, positive regression is found between transport expenses and car usage.

Ride-hailing users show that students' allowance, transport expense, travel distance, and travel time impact their choice. The bigger their allowance, the greater the tendency to use ride-hailing over public transport. Ride-hailing users are also associated with higher transport expenses. Therefore, the longer the distance and travel time, the less likely students are to choose ride-hailing over public transport.

Table 1: Multinominal Logistic Regression with Public Transport as Reference

Variable	*Walk*		Motorcycle		*Car*		*Ride-hailing*	
	B	*Exp[B]*	*B*	*Exp[B]*	*B*	*Exp[B]*	*B*	*Exp[B]*
Intercept	7.888		-2.004		-6.039		2.169	
Gender[Male][1]	0.162	0.038	2.504***	12.229	-0.913	0.401	0.226	1.254
Monthly Allowance	0.352**	1.422	-0.017	0.983	0.070	1.072	0.275**	1.317
Number of Cars	-0.735	0.479	0.736*	2.087	2.032***	7.627	0.051	1.053
Number of Motorcycles	-0.306	0.736	0.597*	1.818	-0.045	0.956	-0.381	0.683
Car Driving License[have][1]	-0.211	0.810	0.628	1.874	2.654***	14.215	0.106	1.112
Motorcycle Driving License[Have][1]	2.039**	7.680	1.542**	4.673	-1.215*	0.297	0.622	1.862
Travel Distance	-2.609***	0.074	-0.476**	0.621	-0.353	0.703	-0.646**	0.524
Travel Time	-1.243*	0.289	-0.582***	0.559	-0.282	0.755	-1.194***	0.303
Transport Expenses	0.019	1.020	0.090	1.095	0.467***	1.595	0.478***	1.613

Goodness of Fit Parameters

N	275
Cox and Snell R^2; Nagelkerke R^2; McFadden R^2	0.803; 0.848; 0.552
-2LL (0); -2LL (ß); [X2; df; p-value]	808.358; 361.292 [447.066; 36; 0.000]
AIC	441.292
Pearson [X2; df; p-value]	[621.520; 1040; 1.000]

*Significant at a level of 90%; ** Significant at a level of 95%; *** Significant at a level of 99%

Travel distance is negatively associated with walking, motorcycle, and ride-hailing at 99%, 95%, and 95% significant levels, respectively. The reason for walking is usually for the short-distance trip because long distance makes people uncomfortable due to the city's humid nature. Studies found that walking distance preference in Jakarta is only between 500 to 700 meters (Afkara and Kusuma, 2020). Moreover, most Jakarta highway contains increased traffic volumes and high-speed limits. Motorcycle users are less likely to ride as the distance increase due to safety reasons. In fact, of the 109.215 traffic accidents in Indonesia, more than 70% are caused by motorcycles (Ministry of Transportation of Republic Indonesia, 2019). Furthermore, ride-hailing is related to progressive fare, which becomes more expensive as the distance increases (Zudhy *et al*., 2021).

Travel time is mainly a major factor in mode choice (Frank *et al*., 2008). In this study, travel time is negatively associated with walking, motorcycle, and ride-hailing, indicating students are less likely to select those modes due to longer traveling time. The possible explanation for this that travel time could be related to the travel distance.

Monthly allowance, which reflects their socioeconomic status, is associated with ride-hailing and walking. Zudhy *et al*. (2021) stated that there is a tendency for students with higher income to use ride-hailing more. Students who walk seem not to be influenced by their economic condition, as shown in Figure 5. Conversely, students monthly allowance does not significantly affect the use of private vehicles.

Irrespective of the common use of public transport by students, cars and motorcycles also have quite a big share at 33.4%. Before 2021, parking in the campus area was free for students. Hopefully, by increasing the parking tariff will probably reduce the private vehicles use among students. Further studies need to be conducted to determine the optimum tariff. Improvements in public transport and walking facilities are needed to enable students to shift to public transport and walk for long and short-distance trips.

The highlight should also be given to the bike facilities around the university area. This study found no students biking to campus which could possibly cause by the unsafe environment around Universitas Trisakti area. As stated, Universitas Trisatkti is located on arterial roads with high volumes and high-speed vehicles without any bicycle lanes. Building a safe and continuous bike lane in the surrounding campus area may increase bike use and replace car and motorcycle use for short-distance trips. Further study could be done to investigate the shifting probability of private vehicle users toward more sustainable transport.

5. Conclusion

Understanding students' mode choice and its factors can help Universities and the government to develop and improve policies, programs, and infrastructure to create a better environment in university areas and Jakarta in general. Students should be promoted to use more sustainable modes of commuting, such as public transport, walking, and cycling. This is because the decrease in private vehicle use will ease traffic congestion around university areas in Jakarta, thereby creating a better environment for students and the overall population. Data were collected from Universitas Trisakti's students living in Jakarta, a motorcycle and car-dominated city. This study found that living in Jakarta, students don't use private vehicles like Jakarta population and even their peers in other Indonesian cities. The transport modes used by students in this situation are dominated by public transport, followed by motorcycle, walking, car, and ride-hailing. Many factors are found to be the influencer of students' decisions, such as gender, monthly allowance, number of cars and motorcycles, driving license, travel distance, time, and weekly transport expenses. To promote more sustainable transport among students, policies and infrastructures need to be implemented, such as parking fees within the campus area, improvement of public transport and walking facilities, and bike lanes. It is expected that students can create a better campus environment and ease traffic congestion in Jakarta.

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