

## MOTORCYCLE DEPENDENCY IN LOW-INCOME PEOPLE : MODELING SPATIAL AND SOCIO-ECONOMIC FACTORS IN URBANIZED AREA OF YOGYAKARTA

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### **ABSTRACT**

*There are a lot of research on automobile dependency and the factors influencing it that has been done. However, these studies were mostly conducted in developed countries by using a car as the object of research. While the growth in the use of motorcycles in developing countries, especially in Asia has become a phenomenon that is inevitable now, not much is known about the processes and factors that affect motorcycle ownership and dependency in developing countries. Yet according to some studies the majority of motorcyclists are low-income people who should have get more attention from the policy maker. There are allegations that low income people are forced to have a motorcycle because their specific needs cannot be met by existing public transport services. Therefore, by using the urban areas of Yogyakarta as a case study, this study intends to: 1) demonstrate the occurrence of motorcycle dependency in low income people; and 2) model the process of motorcycle dependency in low-income people in terms of spatial and socio-economic factors that influence it. The process of data collection is done through a questionnaire to a sample of 437 low-income households, and interviews with 40 informants. Data from the questionnaire is processed using descriptive and inferential statistics method, while the interview data processed by content analysis method. Based on the analysis it can be concluded that the motorcycle dependency has occurred in low-income people in Yogyakarta urbanized area. The information from the interview was also used for modelling the process of someone becoming a captive users of motorcycle based on their spatial and socioeconomic characteristics. It was found out that there is the different processes that occur for low-income people living in areas with good transport service and the poor one. This assessment of the factors that affect motorcycle dependency on low-income people are expected to give a picture of the areas that should be prioritized in an inclusive policy to increase accessibility of a region, either through improved public transport services or the provision of public facilities that are accessible within a walking distance.*

**Keywords** : *motorcycle dependency, low-income people, urbanized area*

### **A. INTRODUCTION**

Motorization in Asia is happening very rapidly. The rapid growth of vehicle numbers mainly occurs on motorcycles. In Indonesia motorcycle growth has

reached 300% from 2004 to 2014 (Statistical Bureau of Indonesia, 2015). The high rate of motorcycle growth is allegedly caused by the high dependency on private vehicles experienced by the residents. Limited public transport services and urban form factors can lead to high dependency on private vehicles (Newman and Kenworthy, 1989). For low-income people, motorcycle is relatively more affordable than car. Therefore, based on some research, the majority of motorcycle users are low to middle income people (Adriyana 2011; Novitasari 2011; Aritonang, 2007; Erli H. 2006). The large number of low-income people who use motorcycles for their daily trip should receive more attention from policy makers. This is because transportation costs can take a large share of total family expenditures, which can lead to a decrease in their ability to consume non-discretionary spending, as happened in the USA (Agrawal et al., 2011). In this case the factors that influence the dependency of low-income people on private vehicles, especially motorcycles are still unknown. In earlier studies which are not specified on low-income populations, it was revealed that the travel pattern was influenced by spatial factors (Sarkar and Mallikarjuna, 2013, Lin and Yang, 2009;), socioeconomic factors (Banerjee and Hine, 2016; Lin and Yang, 2009 ), and lifestyle factors (Hong, Shen, and Zhang, 2014; Schwanen and Mokhtarian, 2005).

Several studies have been conducted to determine factors affecting motorcycle use and ownership (Yamamoto, 2009; Tuan and Simizu, 2005; Hsu et al., 2007, Senbil et al., 2009). Based on these studies, there were several factors that affect the use and ownership of motorcycles such as income, the number of family members who work, the number of family members who enter the university, residence location, and public transportation services. However, these studies are not devoted to low-income communities. In Indonesia alone, despite the high number of motorcycle ownership, research on factors that cause dependence on private vehicles, especially motorcycles, in low-income communities is still limited. Therefore, the purpose of this study is 1) to demonstrate the occurrence of motorcycle dependency in low income people; and 2) to model the process of motorcycle dependency in low-income people in terms of spatial and socio-economic factors that influence it.

## **B. DESIGN OF THE RESEARCH**

Motorcycle dependency in this study is defined as the condition in which a person or a household has no other alternative in order to travel other than owning a private vehicle, resulting from the certain spatial, socio-economic, and public transportation conditions. The first objective of this paper is to identify whether the condition of 'dependency' occurs in low-income people. Motorcycle dependency leads to forced motorcycle ownership, so that transportation costs of using motorcycle, the choice of residential location, and perceptions and experiences of respondents were used to prove the existence of 'compulsion'. In this case to indicate whether the ownership of the motorcycle is a compulsion or not, the following references were used:

1. Transportation costs of using motorcycle  
The transportation cost reference used in this study is 20% of total expenditure (Litman, 2014, Venter and Behrens, 2005). A household is said to be experiencing motorcycle dependency which causes them into forced motorcycle ownership condition is when transportation costs of using motorcycle is more than 20% of total expenditure
2. Lack of choice or alternative in terms of:
  - a. Other modes of transportation other than motorcycles to meet the needs of travel. Thus, the absence of a motorcycle lead a person to become unable to perform normal activities that can cause him to become excluded
  - b. Other residential options which are better in terms of accessibility to public transport and public facilities.
3. The desire to get out of the conditions that cause the necessity to have a motorcycle

The method of analysis utilised in this study is a combination of quantitative and qualitative analysis. This is considering the research on the factors that affect motorcycle dependency on low-income people in Indonesia is a relatively new research so that still needed exploration of the variables that allegedly influential. In addition, this study is also intended to complement previous research on the factors that affect the use of motorcycles of low-income people in Yogyakarta Urbanized Area, with statistical modelling method. (See Herwangi, 2015). Data on transportation expenditure and housing preference were obtained from 437 respondents obtained through questionnaires. While the perception about the conditions that cause the necessity to have a motorcycle obtained from interviews to 31 respondents. The difficulty of using this method is the need for intensive primary data collection through interviews which is resolved by selecting respondents who also the respondents of the questionnaire so that they were relatively familiar with the topic being asked.

The population in this study are low-income households living in the Yogyakarta Urbanized Area who own motorcycles. As the case studies four districts were selected, where two districts represent areas that have good access to public transport and public facilities (non transport disadvantaged area or NTDA), and two districts represent areas with poor access to public transport and public facilities (transport disadvantaged area or TDA).

The research location of Yogyakarta Urbanized Area (YUA) is an area of 186.87 square km, consisting of 14 districts in the City of Yogyakarta as the core area and 3 districts in Bantul Regency and 6 districts in Sleman Regency surrounding the city of Yogyakarta. Based on previous research (Herwangi, 2014) the area around the city centre and the East and North areas of YUA has relatively good accessibility to public transport compared to the Western and Southern part.

## **C. RESULT**

### **1. Analysis of Motorcycle Dependency of Low-income People in YUA**

- a. Motorcycle dependency and Spatial, socio-economic, and public transport service factors

As described in the references, private vehicle dependency of socio-economic, spatial (location), and transport services. From the interviews, it was revealed that these factors influenced the compulsion of having a motorcycle, so that low-income people unable to perform its activities without motorcycle, as said by Sunaryono (42 years).

*Question: Why do you choose a motorcycle?*

*Answer: Because there is no other choice. What choice do I have?*

1. Socioeconomic factors:

- Having a small child who can be sick at an unexpected time, while the nearest health facility is quite far from their residential location.

*Question (Q): Ma'am, what if you do not have a motorcycle, is it hard to do things?*

*Answer (A): Yes it is. I mean if I need to go suddenly in any time.....*

*Q: anytime?*

*A: I mean if my daughter get a fever...I should bring her to hospital...public transport is impossible.. So I have to have motorcycle (Reni Setyowati, 28 years old).*

- The need to transport goods using motorcycles for livelihood purposes, for example: food traders, caterers, petty trader, clothes sellers, groceries seller that have to shop in large quantities, as well as to find a job.
- Personal conditions that can not afford to use public transport, such as: old age, disabilities and health condition.
- Having jobs that require high mobility, such as salesmen, field technical officers, construction worker, workers who work with the shift system that requires trips at unusual hours, for example: security guard, shopkeeper

*Q: If for example you do not have a motorcycle, is it difficult for your husband to go to work?*

*A: Yes, sometimes it is difficult, he must find a friend who has a motorcycle (to get a lift to work). If there is nobody could give a lift, he can not go to work because there is no public transport to his work place. As a construction worker, the house where he works does not always in an accessible location. It means that taking public transport is impossible. That's the only constraint. So the constraints is on the transportation.. (Yeni Lestari, 46 years).*

2. Spatial factors and public transport services:

- Housing location that is far from the public transport network, so that the respondents have to walk quite far to reach the public transport stops. Based on the ArcGIS analysis on the data, it was found that most respondents reside at a distance of more than 1 km from public transport stops. The distance from the residence to the stop location can be seen in Figure 1.

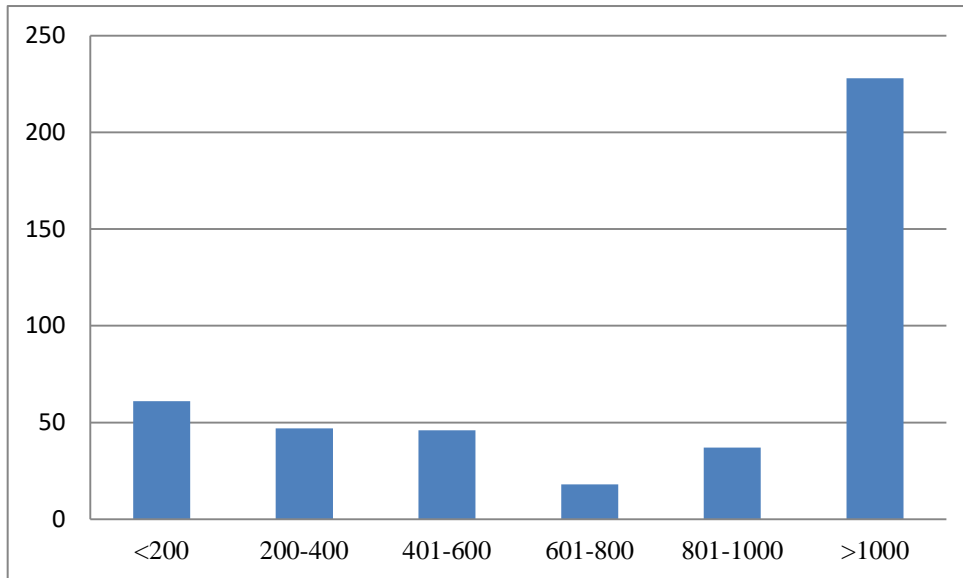


Figure 1. Distance from house to the nearest bus stop

- Unavailability of public transport routes to work places and school. Data shows that only 51 respondents (11.7%) of the total respondents who are at least 90% of the length of daily journey for the work trips can be served by public transport routes that already exist. As for the school trips only as many as 12 respondents (2.7%) who has been served public transport.
- The service hours of public transport is not suitable with the need of low income people .

## 2. Motorcycle Dependency and Limited Choice of Housing Location

Residential location that has good access to transportation and public facilities will reduce dependence on motorcycles. But most low-income people is unable to locate homes that have these conveniences due to financial constraints. From the data obtained, it is known that from 437 respondents, 84.4% of the total respondents (369 households) chose the location of their house now because it is inherited from their parents and because financially only be able to buy in that location (Herwangi, 2014)

When compared between MBR living in TDA and NTDA, there was no significant difference. Low-income people, both living in the TDA and NTDA, are mostly getting their house as a legacy of their parents and also because they can not afford to buy elsewhere. When viewed from the consideration of the access to public transportation when choosing a house, it was found that only about 14.6% of the MBR living in the TDA and 8.7% of the MBR living in NTDA considered it. In this case it can be said that the limitation in choosing a residence also affects the low-income people who live both in TDA and NTDA to own a motorcycle.

From the interviews, it was also revealed that the desire to move to a better location with better accessibility is only a wishful thinking for them.

*Q: Sir., as we know..the location of this house is not accessible from public transport network. Have you ever thought of moving to an area that is closer to public transport network?*

*A: Wow .. With current condition I already thanking God, Alhamdulillah. But if could have a dream, yes, we all know that there may be a wishful thinking that somehow our son will succeed, he will buy the land on the side of the road (which is passed by public transport), let me make a business, it is indeed there is a goal. But we don't know how. Hehe. Only God's Will (Paidi, 49 years old).*

### **3. Motorcycle Dependency and the Cost of Transportation**

In low-income people it is allegedly that motorcycle dependency leads to forced motorcycle ownership. To determine whether a household is motorcycle dependent that leads them into transport poverty condition, transport expenditures of having motorcycle is used. Based on the analysis of low-income people both living in TDA and NTDA have to pay high transportation cost, which account for 8.35% of total expenditure for low-income people living in NTDA and 20.90% of total expenditure for low-income people living in TDA. When compared to the standard of transportation expenditure, 70.7% of respondents use more than 10% of their expenditure for motorcycle costs. As much as 35% of respondents even use more than 20% of their total expenditure for transportation costs by motorcycle. By using the standard cost of transportation alone, then at least 35% of respondents have forced motorcycle ownership or transport poverty.

**Table 1.** Percentage of Transportation Cost from Total Households Expenditure per Month

	Sample		Inference for Population	
	TDA	NTDA	TDA	NTDA
Low-income households with transportation cost more than 10% from total expenditure per month	74,0%	67,0%	68,07% – 79,93%	60,26% – 73,74%
Low-income households with transportation cost more than 20% from total expenditure per month	41,6%	27,5%	34,94% – 48,26%	21,45% – 33,55%

When compared between the low-income households living in TDA and NTDA, it can be seen that more households experienced transport poverty in TDA than in NTDA. This is because low-income people living in TDA use motorcycles more than those who live in NTDA, whereas households' income in both areas is similar.

#### 4. Willingness to Get Out from Motorcycle Dependency Condition

Meanwhile, the absence of other options for low-income people in choosing the housing location caused a high dependence on the motorcycle due to the gap between the housing location and the location of the activities, especially the work activity. This is especially true for low-income people living in the TDA. It is revealed that respondents who live in areas that are difficult to reach public transportation and away from the location of public facilities so dependent on motorcycles, they also want to move to a more affordable location by public transport when there is an opportunity and cost. This may indicate that the limited housing options for low-income people make them compelled to rely on motorcycles to meet their travel needs.

*Q: Just a moment Sir... If there is a chance to move to a more accessible location, are you willing to move?*

*A: Uh yes, obviously yes.*

*Q: If this is the case, if there is a chance, then there is a cost, what kind of area will you looking for?*

*A: Yes, he'em (respondent answered quickly) as much as possible I will look for a house that is close with public transportation service, close to public facilities such as gas stations, or supermarkets, hospital, so I look for it. (Ira, 36 years old)*

Some respondents also expressed the desire to move to public transport when a number of factors are met, namely:

- a. The availability of routes that reach the work place and in suitable operating hours
- b. The cost of public transportation is more affordable
- c. Faster waiting time and in vehicle travel time
- d. The distance to the public transportation stop is not too far from the house
- e. Convenience in public transport is improved.

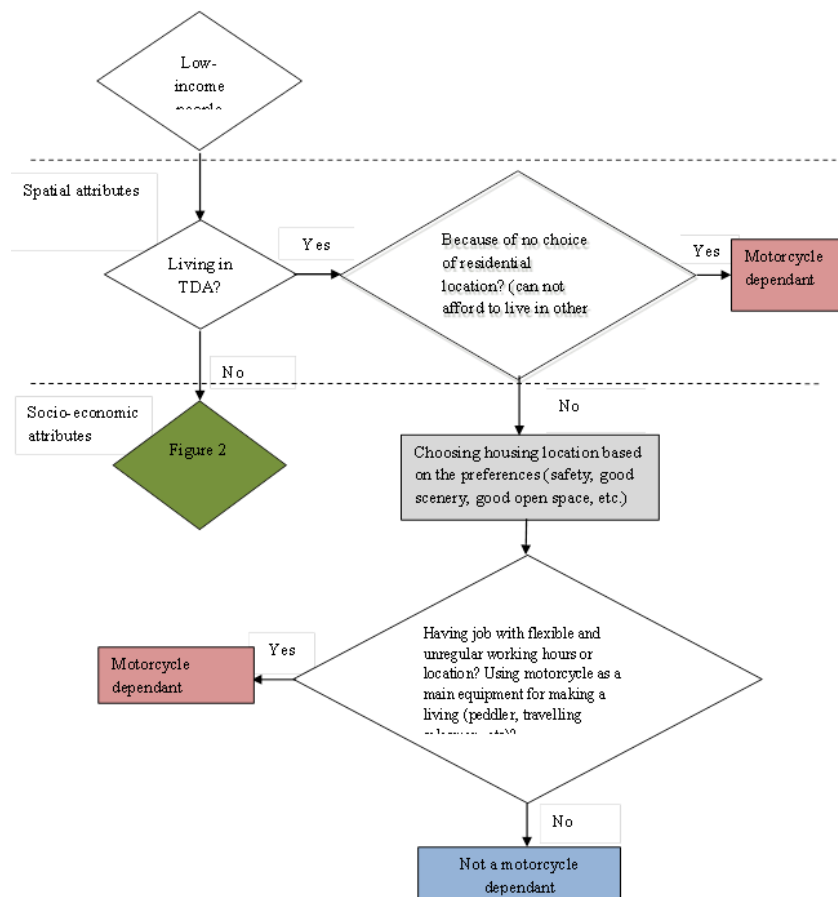
#### 5. The proses of Low-income People being a Motorcycle Dependant

Based on the analysis of various factors that can be a reference in determining motorcycle dependency, the process of low income people became motorcycle dependant could be described. Based on the interview, it can be inferred that the process of low-income people become a captive user of motorcycle is related to a combination of spatial, socio-economic, and transportation services factors.

For low-income people living in the TDA, the process of a person becomes a captive user of motorcycle starting from the reason for choosing a residence. For low-income people who does not have a choice of housing location because of the financial limitation, they are more likely to become captive users of motorcycle. This is because in the TDA area, public facilities are not available around the housing, and are not bypassed by public transport route. Thus to be able to travel, it takes a private vehicle like a motorcycle. In the case that the low-income people have alternative options for the location of the residence, and chooses the housing location based on non-spatial factors, if one of his family members is working with flexible time and place, then they are also likely to become a motorcycle captive users. This is because the unavailability of public transport routes and

services that fit their needs in terms of the working hour. But if the accessibility factor is not a consideration because it already has a motorcycle before, then the low-income people can not be said as a motorcycle captive users because in this case they are already aware of the risk of choosing housing location in TDA

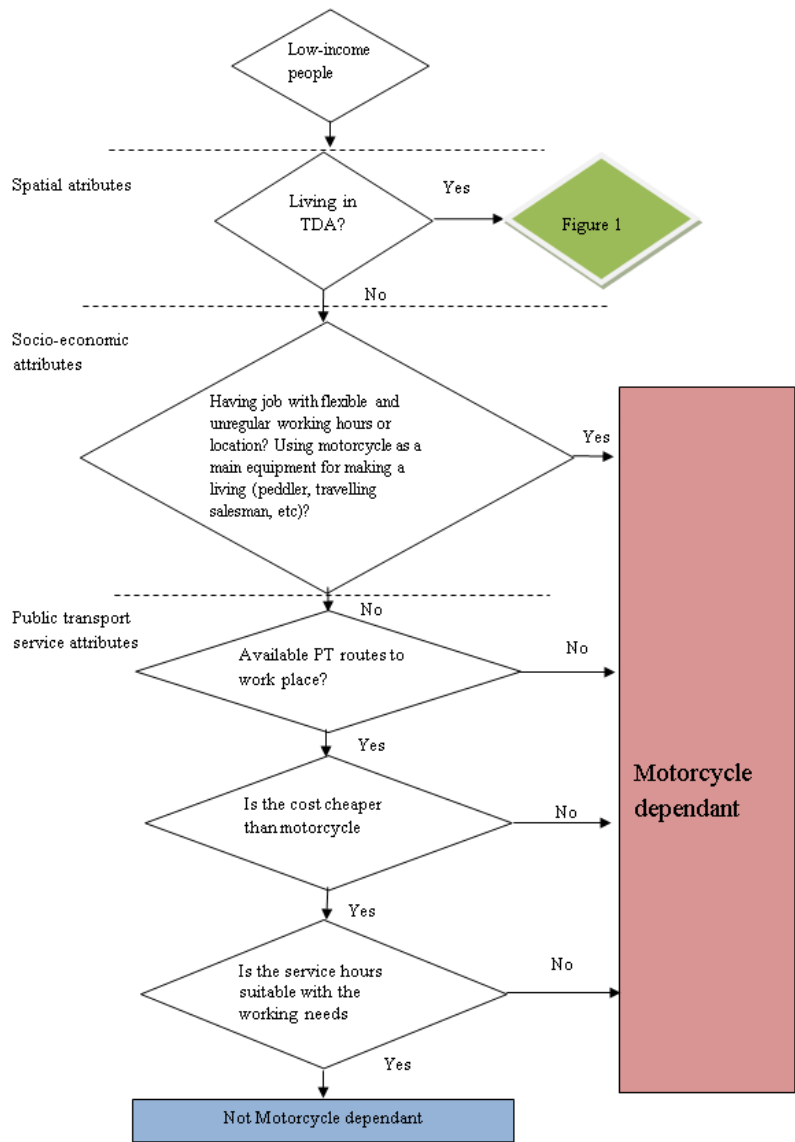
For low-income people living in NTDA areas, the compulsion of having a motorcycle is likely to occur due to a mismatch between the needs of the low-income people who works in jobs with flexible and irregular working hours, such as peddler, security, construction worker, with the availability of existing public transport services. In addition, unsuitable routes, service times and costs are also the reason most low-income people have been forced to own motorcycles to meet their travel needs. In this case, both low-income people living in TDA and NTDA use their motorcycles mostly for work purposes, so these factors are related to the work that determines the likelihood of the low-income people being a motorcycle dependant or not. Conceptual model of the proses of low-income people living in TDA and NTDA being a motorcycle dependant can be seen in Figure 2 and Figure 3.



**Figure 2.** Conceptual model of the proses of low-income people living in TDA being a motorcycle dependant



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**Figure 3.** Conceptual model of the proses of low-income people living in NTDA being a motorcycle dependant

These findings also prove that transport disadvantage research in Indonesia can not be done only in the area level, by measuring areas that are not served by public transport or blank spots, as is the case in many transport planning approaches in Indonesia. Research that combines data at the level of individual and areas is needed to really locate the problems in mobility and accessibility of the population so as to produce a truly effective solution. Including how to make people want to use public transportation. In this case, this research also contributes to the variables that need attention when researching or planning the transportation especially for low-income people in Indonesia, such as spatial variables related to the form of settlements, public transport services, operating time, the types of work, as well as the cost of public transport which must be able to compete with the cost of motorcycle.

This finding also simultaneously answers and complements the indications put forward by Currie and Senbergs, 2007; Currie and Delbosch, 2009, Currie and Delbosch, 2013 in a Melbourne study that low-income people living in transport-disadvantage areas consciously chose to live in these locations due to non-transport factors, i.e., the number of green open spaces. This is possible in the context of developed countries because of self-selection in the selection process of residential location, i.e. the individual chooses the location of the residence in accordance with the preferences of the mode of transportation (Hong et al., 2014). For example, residents who choose to live in the suburbs with limited access to public transport because of their preference for private vehicle mode. In this study, it was found out that the selection of residential sites in the periphery areas in which the case was included in the TDA was largely due to the limited choice (either because of inheritance or inability to buy elsewhere). So having a motorbike for them becomes a necessity because there is no other choice. Furthermore, although they choose residential locations due to non-transport factors, for those who have jobs with temporary working hours, owning a motorcycle remains a must.

#### **D. DISCUSSION**

Even though the cost is quite significant, the absence of motorcycles for low-income people can cause them to experience transport disadvantage. This is due to the socio-economic, spatial, and transportation services as mentioned earlier. This disadvantage transport condition causes low-income people in YUA to become motorcycle dependant. This can be seen from: 1.) the amount of costs that must be spent for motorcycles; 2.) inconvenience felt when riding a motorbike (mainly related to safety); 3.) improper use of motorcycles (riding more than 2 people in 1 motor, transporting goods); And 4.) the desire to exit from a condition of dependence on a motorbike by moving to a better location of access to public facilities and public transport. These findings also prove that transport disadvantage research in Indonesia can not be done only in the area level, by measuring areas that are not served by public transport or blank spots, as is the case in many transport planning approaches in Indonesia. Research that combines data at the level of individual and areas is needed to really locate the problems in mobility and accessibility of the population so as to produce a truly effective solution. Including how to make people want to use public transportation. In this case, this research also contributes to the variables that need attention when researching or planning the transportation especially for low-income people in Indonesia, such as spatial variables related to the form of settlements, public transport services, operating time, the types of work, as well as the cost of public transport which must be able to compete with the cost of motorcycle.

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