The Influence of Urbanization and Socio-Economic Conditions to Vehicle Ownership in Developing City

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Abstract
Malang is a thriving city and destination of migration from rural areas. Vehicle ownership is one indicator of prosperity, but it has a negative effect on city traffic. In 2017 the city of Malang was the third most traffic jam city in Indonesia. This study used the 2016 National Socioeconomic Survey and aimed to see the influence of urbanization and socioeconomic conditions on the preference of owning a vehicle. Income is considered as a budget constraint to the ability to buy a vehicle and is related to the socio-economic conditions of each person. This study used an ordered probit method to measure the level of prosperity with 4 levels of output; those who have no vehicle, who owned at least one motorcycle, who owned at least one car, and who owned at least one car and one motorcycle. The result of the study showed that migration has a negative effect on vehicle ownership. While age has no significant effect, other socioeconomic factors have a significant effect. The highest level of vehicle ownership in Malang Raya was one motorcycle, which means that the community in developing cities like Malang Raya was classified as a middle class. This study might be used by the government of Malang to control the growth of vehicles, by considering population growth and socio-economic conditions, to reduce the congestion problem in Malang Raya.

Keywords: Urban Migration, Socioeconomic, Vehicles Ownership, Malang Raya

I. INTRODUCTION
Transportation is an important activity in human life as a dynamic and social creature. Mobility is done in various ways and modes of transportation (Sani, 2013, p. 2). Related to urbanization, Kingsley Davis defines “Urbanization” to describe not merely the growth in the population of cities but a relative change between the urban and rural (farming) population.

The migration phenomenon is usually inseparable from the comprehensive change of the life of the global economy. Mulyoutami, Wahyuni, & Kolopaking (2014) found that economic factors were the main motivation of migrants to move (Tukiran, 2002, pp. 9–22). Most migration experts state that the main reason for migration is the economics aspect. While the non-economic aspects of migration are social and psychological aspects, such as status and comfort (Mulyoutami et al., 2014).

Malang Raya is a metropolitan area covering three administrative areas, consisting of two cities and one district, Batu City; Malang city; and Malang District, located in East Java Province, Indonesia.

Figure 1 shows that Malang has the highest HDI rank in East Java in 2016. The rapid development in education, economy, and health of Malang City attracts the outsiders to migrate into Malang Raya.

Malang Raya is a dynamic metropolitan area from the aspect of population mobilization, as shown by the high level of migration in and out of Malang Raya.

Congestion in the metropolitan area of Indonesia starts from the urbanization of people who move to improve the quality of life to meet the needs of clothing, food, and boards. Fulfillment of basic needs will attract people to migrate to the centers of economic growth (McGuckin & Srinivasan, 2005).

Figure 2 shows the increasing trend of vehicle ownership growth. The growth of private vehicles has the highest growth. The cause of the high ownership of private vehicles is prestige in owning
cars and motorcycles (Widyawan, 2011). Currently, most of the public transport passengers are the lower middle class, who have no choice but to use public transportation.

The level of congestion in Malang City beat Surabaya City, the capital city of East Java Province. Malang, as the second largest city in East Java, is the third city with the worst level of congestion in Indonesia. Private vehicles cause congestion due to the high growth of vehicle ownership, surpassing the growth of roads (Broaddus, Litman, & Menon, 2010).

Investment on roads often seems to be more cost-effective when compared to investments in public transport, but economically it is not correct because the cost of the road construction is only a fraction of the total cost that will eventually arise (Broaddus et al., 2010). Economic inefficiency due to the use of local budgets for highway investment reduces other investment budgets, such as for health, etc. This cannot be separated from the zero-sum game in the preparation of the budget.

Table 1.
The Trend of Migration in Malang City 2016-2017

<table>
<thead>
<tr>
<th>No</th>
<th>Sub-district</th>
<th>Migration in 2016</th>
<th>Migration in 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>In</td>
<td>Out</td>
</tr>
<tr>
<td>1.</td>
<td>Kedungkandang</td>
<td>434</td>
<td>216</td>
</tr>
<tr>
<td>2.</td>
<td>Sukun</td>
<td>351</td>
<td>215</td>
</tr>
<tr>
<td>3.</td>
<td>Klojen</td>
<td>175</td>
<td>160</td>
</tr>
<tr>
<td>4.</td>
<td>Blimbing</td>
<td>324</td>
<td>308</td>
</tr>
<tr>
<td>5.</td>
<td>Lowokwaru</td>
<td>346</td>
<td>231</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>1,630</td>
<td>1,130</td>
</tr>
</tbody>
</table>

Source: Department of Population and Civil Registration Malang City, 2017
Ownership of the mode of transport is not a random process but is influenced by various determinants of the available mode of transport (service attributes) (Warpani, 2002). Travel behavior which takes into account the above factors is called 'Smart Choice' by Cairns et al. (2004).

Immigrants tend to stay in places with higher densities. In particular, compared to indigenous peoples, immigrants are more likely to use other transportation modes in addition to self-driving, such as transit, carpooling, walking, and cycling (Blumenberg & Shiki, 2008; Chatman & Klein, 2009; Purvis, 2003; M. Smart, 2010; M. J. Smart, 2015; Valenzuela, Schweitzer, & Robles, 2005), especially in the first few years of their migration (Tal & Handy, 2010). Blumenberg & Shiki (2008) observed that Asians tend to assimilate by driving their own cars faster than other immigrants. Asian cultures appreciate hard work and education (Zhou, 2004, p. 147), which can mean more trips for work or school trips but fewer trips for recreation.

Socio-economic conditions refer to work and income of the population. The socio-economic conditions will also differ between non-migrant and migrant population. The non-migrants tend to have higher socioeconomic conditions than migrant populations since the very reason of migration is to get better economic conditions. On average, immigrants and their households have lower income (McGuckin & Srinivasan, 2005).

Age has been one of the variables related to transportation mode preference (Yavuz & Welch, 2010). Travel demand modeling generally assumed age-related travel (Figueroa et al., 2014). The number of trips changes with age, the younger persons would have more travel than the older ones (Gärling & Axhausen, 2003). Johansson-Stenman, Carlsson, & Darwala (2002) found that travel distances peaked around the age of 50 years. However, today the elderly has the same amount of travel as the younger ones. van den Berg, Arentze, & Timmermans (2011) states that there is no difference in travel between young adults and parents in the Netherlands.

Income becomes the limitation of a person in consuming transportation (Yan, 2020). Public transport is usually used by a captive population (the low-income population that has no choice but to use public transport) (Sani, 2011). When the behavior of travel is associated with satisfaction in the choice of service, then consumers will choose those that have a high level of satisfaction (Dabhokar, Shepherd, & Thorpe, 2000). Just like the expression of "time is money," someone with high income tends to want the shortest possible travel time by having a private vehicle that can be used at any time (Sani, 2011).

There are differences in travel behavior between men and women (Curtis & Perkins, 2006; Gärling & Axhausen, 2003). Generally, women are less traveled than men (Root, Schintler, & Button, 2000) and their journeys are shorter (Fanning Madden, 1981). The pattern and timing of a woman's journey will be further complicated as career advancement increases (Root & Schintler, 1999; Wheatley, 2012), Gärling & Axhausen (2003) also state that women traveled less and in close distance to men.

Marital status has a connection with mobility (Luu, Tigh, & Burrow, 2017). Married people decrease their mobility (Haustein & Siren, 2014; J.-K. Kim, Ulfarsson, & Sohn, 2014; Musselwhite & Haddad, 2010; Nordbakke & Schwanen, 2015). The mobility of married people depends on the head of the family (Knight, Dixon, Warrener, & Webster, 2007; Scheiner, 2006) and children under 18 following the pattern of heads of households (J.-K. Kim et al., 2014; S. Kim, 2011).

With this background, the issues that we would like to find out in this study are the effect of population mobility (which includes migration) and socioeconomics (which includes age, sex, occupation, marital status, and income), to the ownership of vehicles in of Malang Raya.

II. METHOD

A. Data Selection

This study used the SUSENAS 2016 data with 2303 household consisting of 8 variables. The dependent variable in this study was vehicle ownership, while the independent variables were Migration Status, Age, Gender, Marital Status, Education, Occupation, and Income. This research used Stata 14.2. software for data analysis.

B. Identification and Definition of Variable Operations

The data used in this study was the 2016 National Socio-Economic Survey (SUSENAS) data, with variables that described the household condition in Malang Raya. Samples obtained were 2303 households from all over Malang Raya.

Table 2. Type of Analysis

<table>
<thead>
<tr>
<th>No</th>
<th>Analysis</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Descriptive Analysis</td>
<td>Cross Tabulation</td>
</tr>
<tr>
<td>2</td>
<td>Inferential Analysis</td>
<td>Chi-Square Test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ordered Probit Analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marginal Effect Analysis</td>
</tr>
</tbody>
</table>
1) **Dependent Variable**
   The dependent variable in this study was the household’s vehicle ownership. The four categories in the dependent variable were: 1 = no vehicle (as a proxy of dependence on public transport), 2 = own a motorcycle, 3 = own a car, and 4 = own cars and motorcycles.

2) **Independent Variables**
   The independent variables used in this study were:
   a) **Migration Status**
      The non-migrant resident = 0, and the resident status = 1.
   b) **Age**
      There were 2 categories in this variable: non-productive if they are over 64 years old, and productive if they are between 17-64 years old. In processing the data using the ordered probit method, the age variable is entered into the numerical variable by the ratio scale.
   c) **Gender**
      Female = 0, and Male = 1.
   d) **Marital status**
      Not married and divorce = 0 and Married = 1.
   e) **Education**
      Elementary and junior high school education = 0, and High school and above = 1.
   f) **Occupation**
      Occupational from the head of the household with two categories, no activities = 0, and work, schools and other activities = 1.
   g) **Income**
      The study used 3 categories of income, low (below IDR 1,000,000 per month), medium (between IDR 1,000,000 to IDR 1,500,000 per month), and high (above IDR 1,500,000 per month). In data processing using ordered probit method, the income variable is entered into a numerical variable with ratio scale.

C. **Probit Ordered Analysis Hypothesis**

Table 3.

<table>
<thead>
<tr>
<th>No</th>
<th>H</th>
<th>DESCRIPTION</th>
<th>REFERENCE</th>
</tr>
</thead>
</table>
| 1  | H1 | It is assumed that the migration status has a positive effect on vehicle ownership | • Hu, 2017  
• Tal & Handy, 2010  
• Blumenberg, 2009  
• Chatman & Klein, 2009  
• Valenzuela et al., 2005 |
| 2  | H2 | It is assumed that age has a positive effect on vehicle ownership | • Figueroa et al., 2014  
• van den Berg et al., 2011  
• Buehler, 2011  
• Yavuz & Welch, 2010  
• Gärling & Axhausen, 2003 |
| 3  | H3 | It is assumed that male gender has a positive effect on vehicle ownership | • Beirão & Sarsfield Cabral, 2007  
• Curtis & Perkins, 2006  
• Gustafson, 2006  
• Gärling & Axhausen, 2003  
• Root et al., 2000 |
| 4  | H4 | It is assumed that male gender has a positive effect on vehicle ownership | • Renne & Bennett, 2014  
• Westman, Olsson, Gärling, & Friman, 2017  
• McMillan, 2005 |
| 5  | H5 | It is assumed that employment has a positive effect on vehicle ownership | • Wang, Monzon, & Commo, 2015  
• Bunel & Tovar, 2014  
• Wang, 2012 |
| 6  | H6 | It is assumed that income has a positive effect on vehicle ownership | • Yan, 2002  
• Dabholkar et al., 2000  
• Bruton, 1975  
• Moses et al, 1963 |
| 7  | H7 | It is assumed that marital status negatively affects vehicle ownership | • Luiu et al., 2017  
• J-K. Kim et al., 2014  
• Haustein & Siren, 2014  
• Knight et al., 2007  
• Scheiner, 2006 |
III. RESULTS AND DISCUSSION

A. Graph Analysis

1) 5 Year Migration Status
   Figure 4 shows in Malang Raya the sample is mostly non-migrant population based on 5-year migration data.

   ![Figure 4. Migration Status of 5 Year Population](image1)

2) Population Age
   Age is divided into 2 categories non-productive (over 64 years old), and productive (17-64 years old). Figure 5 shows non-productive age is 16.93%, and productive age is 83.07%.

   ![Figure 5. Population Age](image2)

3) Gender
   Figure 6 shows that the sample consists of 82.89%, male and 17.11% female.

   ![Figure 6. Population Gender](image3)

4) Marital status
   Figure 7 shows that the sample consists of 6.21% unmarried, 76.34% married, 3.78% divorce and widowed 13.68%.

   ![Figure 7. Marital Status](image4)

5) Education
   Figure 8 shows that Elementary School and Junior High School education dominate the sample.

   ![Figure 8. Education](image5)
6) **Occupation**

Figure 9 shows that the sample shows 9.38% respondent with no activities, 21.32% works, 40.12% going to school, 28.96% doing household care, and 0.22% with other activities.

![Figure 9. Occupation](image)

7) **Income**

Figure 10 shows that the sample consist of 33.35% of low-income household (below IDR1,000,000 per month), 33.26% of middle-income household (between IDR1,000,000 to IDR1,500,000 per month), and 33.39% of high-income household (above IDR1,500,000 per month).

![Figure 10. Income](image)

<table>
<thead>
<tr>
<th>Migration</th>
<th>Vehicle Ownership</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No Vehicle</td>
<td>Own a Motorcycle</td>
</tr>
<tr>
<td>Non-Migrants</td>
<td>386</td>
<td>1,427</td>
</tr>
<tr>
<td>%</td>
<td>17.86</td>
<td>66.03</td>
</tr>
<tr>
<td>Migrants</td>
<td>41</td>
<td>90</td>
</tr>
<tr>
<td>%</td>
<td>28.87</td>
<td>63.38</td>
</tr>
<tr>
<td>Total</td>
<td>427</td>
<td>1,517</td>
</tr>
<tr>
<td>%</td>
<td>18.54</td>
<td>65.87</td>
</tr>
</tbody>
</table>

**Table 4.** Cross Tabulation of Migration Status and Vehicle Ownership

8) **Vehicle Ownership**

Figure 11 shows that 18.54% have no vehicle, 65.87% own a motorcycle, 1.22% own a car, and 14.37% own car and motorcycle.

![Figure 11. Vehicle Ownership](image)

**B. Cross Tabulation Analysis and Chi Square Testing**

1) **Cross Tabulation of Migration Status and Vehicle Ownership**

The cross-tabulation of migration status (Table 4) shows 2,161 non-migrants, of which 17.86% own no vehicle, 66.03% own a motorcycle, 1.25% own a car. There are 142 migrants, of which 28.87% own no vehicle, 63.38% own a motorcycle, 0.70% own a car and 7.04% own car and motorcycle. Chi-Square test results indicated that there was a difference in the proportion of vehicle ownership in terms of migration.

2) **Cross Tabulation of Age and Vehicle Ownership**

The result (Table 5) shows 390 samples were non-productive age, consisted of 42.05% who own no vehicle, 46.15% own a motorcycle, 2.05% own a car, and 9.74% own motorcycle and car. 1913...
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sample are of productive age, consists of 13.75% own no vehicle, 69.89% own a motorcycle, 1.05% own a car and 15.32% own car and motorcycle. Chi Square test results indicated that there was a difference in the proportion of vehicle ownership in terms of travel frequency.

3) Cross Tabulation of Gender and Vehicle Ownership

The cross-tabulation result (Table 6) shows 394 samples are women, 42.13% do not own a vehicle, 51.78% own a motorcycle, 0.51% own a car, and 5.58% own motorcycle and car. While 1909 are males, 13.67% do not own a vehicle, 68.78% own a motorcycle, 1.36% own a car and 16.19% own car and motorcycle. Chi Square test results indicated that there was a difference in the proportion of vehicle ownership in terms of gender.

4) Cross Tabulation of Marital Status and Vehicle Ownership

The cross-tabulation result (Table 7) shows 545 samples are unmarried/divorced, 38.35% of which do not own a vehicle, 55.96% own a motorcycle, 1.10% own a car, and 4.59% own motorcycles and cars. 1758 samples are married, where 12.40% has no vehicle, 68.94% own a motorcycle, 1.25% own a car and 17.41% own car and motorcycle. Chi-Square test results indicated that there was a difference in the proportion of vehicle ownership in terms of marital status.

5) Cross Tabulation of Education and Vehicle Ownership

The cross-tabulation result (Table 8) shows that from the 1582 samples with elementary and junior high school education, 22,63% have no motor vehicle, 67,51% own a motor, 1.07% own a car, and 15.32% own a car and motorcycle.

---

Table 5.
Cross Tabulation of Age and Vehicle Ownership

<table>
<thead>
<tr>
<th>Age</th>
<th>No Vehicle</th>
<th>Own a Motorcycle</th>
<th>Own a Car</th>
<th>Own Motorcycle and Car</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Productive</td>
<td>164</td>
<td>180</td>
<td>8</td>
<td>38</td>
<td>390</td>
</tr>
<tr>
<td>%</td>
<td>42.05</td>
<td>46.15</td>
<td>2.05</td>
<td>9.74</td>
<td>100</td>
</tr>
<tr>
<td>Productive</td>
<td>263</td>
<td>1,337</td>
<td>20</td>
<td>239</td>
<td>1,913</td>
</tr>
<tr>
<td>%</td>
<td>13.75</td>
<td>69.89</td>
<td>1.05</td>
<td>15.32</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>427</td>
<td>1,517</td>
<td>28</td>
<td>331</td>
<td>2,303</td>
</tr>
<tr>
<td>%</td>
<td>18.54</td>
<td>65.87</td>
<td>1.22</td>
<td>14.37</td>
<td>100</td>
</tr>
</tbody>
</table>

Pearson value chi2 = 177.3709  Pr = 0.000

Table 6.
Cross Tabulation of Gender and Vehicle Ownership

<table>
<thead>
<tr>
<th>Gender</th>
<th>No Vehicle</th>
<th>Own a Motorcycle</th>
<th>Own a Car</th>
<th>Own Motorcycle and Car</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>166</td>
<td>204</td>
<td>2</td>
<td>22</td>
<td>394</td>
</tr>
<tr>
<td>%</td>
<td>42.13</td>
<td>51.78</td>
<td>0.51</td>
<td>5.58</td>
<td>100</td>
</tr>
<tr>
<td>Male</td>
<td>261</td>
<td>1,313</td>
<td>26</td>
<td>309</td>
<td>1,909</td>
</tr>
<tr>
<td>%</td>
<td>13.67</td>
<td>68.78</td>
<td>1.36</td>
<td>16.19</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>427</td>
<td>1,517</td>
<td>28</td>
<td>331</td>
<td>2,303</td>
</tr>
<tr>
<td>%</td>
<td>18.54</td>
<td>65.87</td>
<td>1.22</td>
<td>14.37</td>
<td>100</td>
</tr>
</tbody>
</table>

Pearson value chi2 = 184.5124  Pr = 0.000

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8.79% own motorcycles and cars. There are 721 samples with high school, S1, S2, and S3 education, which 9.57% do not have vehicles, 62.27% own a motorcycle, 1.07% own a car and 8.79% own car and motorcycle. Chi Square test indicated that there was a difference in the proportion of vehicle ownership in terms of education.

6) Cross Tabulation of Occupation and Vehicle Ownership
The cross tabulation (Table 9) shows that from the 216 samples that have no activities, 32.87% own no vehicle, 59.26% owned a motorcycle, 0.93% owned a car, and 6.94% owned motorcycle and car. While the 2,087 that has activities (work, school, etc.) 17.06% have no vehicle, 66.55% own a motorcycle, 1.25% own a car and 15.14% own car and motorcycle. Chi-Square test results indicated that there was a difference in the proportion of vehicle ownership in terms of occupation aspect.

7) Cross Tabulation of Income and Vehicle Ownership
The cross-tabulation result (Table 10) shows 768 of the sample were low-income household, with 25.26% own no vehicle, 17.66% own a motorcycle, 0.00% own a car, and 2.08% own motorcycle and car. While 1535 samples have middle and high income, with 15.18% has no vehicle, 62.48% own a motorcycle, 1.82% own a car and 20.52% own car and motorcycle. Chi Square test results indicated that there was a difference in the proportion of vehicle ownership in terms of income.

Table 7.
Cross Tabulation of Marital Status and Vehicle Ownership

<table>
<thead>
<tr>
<th>Marital Status</th>
<th>Vehicle Ownership</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No Vehicle</td>
<td>Own a Motorcycle</td>
</tr>
<tr>
<td>Unmarried/ Divorced</td>
<td>209</td>
<td>305</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>38.35</td>
</tr>
<tr>
<td>Married</td>
<td>218</td>
<td>1,212</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>12.40</td>
</tr>
<tr>
<td>Total</td>
<td>427</td>
<td>1,517</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>18.54</td>
</tr>
</tbody>
</table>

Pearson value chi2 = 209.3600  Pr = 0.000

Table 8.
Cross Tabulation of Education and Vehicle Ownership

<table>
<thead>
<tr>
<th>Education</th>
<th>Vehicle Ownership</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No Vehicle</td>
<td>Own a Motorcycle</td>
</tr>
<tr>
<td>Elementary and Junior High School</td>
<td>358</td>
<td>1,068</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>22.63</td>
</tr>
<tr>
<td>High School, S1, S2, and S3</td>
<td>69</td>
<td>449</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>9.57</td>
</tr>
<tr>
<td>Total</td>
<td>427</td>
<td>1,517</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>18.54</td>
</tr>
</tbody>
</table>

Pearson value chi2 = 158.1628  Pr = 0.000
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Table 9. Cross Tabulation of Occupation and Vehicle Ownership

<table>
<thead>
<tr>
<th>Occupation</th>
<th>No Vehicle</th>
<th>Own a Motorcycle</th>
<th>Own a Car</th>
<th>Own Motorcycle and Car</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has No Activities</td>
<td>71</td>
<td>128</td>
<td>2</td>
<td>15</td>
<td>216</td>
</tr>
<tr>
<td>%</td>
<td>32.87</td>
<td>59.26</td>
<td>0.93</td>
<td>6.94</td>
<td>100</td>
</tr>
<tr>
<td>Has Activities (work, school, etc.)</td>
<td>356</td>
<td>1,389</td>
<td>26</td>
<td>316</td>
<td>2,087</td>
</tr>
<tr>
<td>%</td>
<td>17.06</td>
<td>66.55</td>
<td>1.25</td>
<td>15.14</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>427</td>
<td>1,517</td>
<td>28</td>
<td>331</td>
<td>2,303</td>
</tr>
<tr>
<td>%</td>
<td>18.54</td>
<td>65.87</td>
<td>1.22</td>
<td>14.37</td>
<td>100</td>
</tr>
</tbody>
</table>

Pearson value \( \chi^2 = 37.2933 \) \( Pr = 0.000 \)

Table 10. Cross Tabulation of Income and Vehicle Ownership

<table>
<thead>
<tr>
<th>Income</th>
<th>No Vehicle</th>
<th>Own a Motorcycle</th>
<th>Own a Car</th>
<th>Own Motorcycle and Car</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-Income</td>
<td>194</td>
<td>558</td>
<td>0</td>
<td>16</td>
<td>768</td>
</tr>
<tr>
<td>%</td>
<td>25.26</td>
<td>72.66</td>
<td>0.00</td>
<td>2.08</td>
<td>100</td>
</tr>
<tr>
<td>Middle and High Income</td>
<td>233</td>
<td>959</td>
<td>28</td>
<td>315</td>
<td>1,535</td>
</tr>
<tr>
<td>%</td>
<td>15.18</td>
<td>62.48</td>
<td>1.82</td>
<td>20.52</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>427</td>
<td>1,517</td>
<td>28</td>
<td>331</td>
<td>2,303</td>
</tr>
<tr>
<td>%</td>
<td>18.54</td>
<td>65.87</td>
<td>1.22</td>
<td>14.37</td>
<td>100</td>
</tr>
</tbody>
</table>

Pearson value \( \chi^2 = 171.1996 \) \( Pr = 0.000 \)

C. Ordered Probit Analysis

Figure 12 is the basic theory where transportation is seen as a derivative requirement of one’s socio-economic conditions. The uniqueness of this study is to reveal the application of the theory of the emergence of travel based on population status (migration of a person).

"Figure 12: Theory of Travel Emergence"

Source: Khisty & Lall, 1998
The Ordered Probit regression equation:

\[ P(y) = F(-0.596 \text{ mig} + 0.311 \text{ sex} + 0.727 \text{ mar} + 0.40 \text{ edu} + 0.318 \text{ occ} + 3.17 \text{ inc} - 1823.2794) \]

Log likelihood = -1823.2794  
Number of obs = 2,303  
LR chi2(9) = 590.34  
Prob > chi2 = 0.0000  
Pseudo R2 = 0.1393

It can be interpreted as follows:

1. Coefficient \( \beta \) of \(-823.2794\) means there are not covered factors outside the independent variables that also affect vehicle ownership in Malang Raya.  
2. Migrant status is negative and significant. This means that if the population has a migrant status it will have no vehicle. This study differs from previous studies, such as the one conducted by Blumenberg & Shiki (2008), where they found that Asians assimilate to the culture of driving their own cars faster than other immigrants. Likewise with research conducted by Lovejoy & Handy (2007), which explains that migrant residents prefer to drive their own cars rather than using public transport facilities. Even migrants who do not have a car expect to buy it, while those who cannot afford it will try to buy a used car.  
3. Age is negative and insignificant. Age does not affect vehicle ownership in Malang Raya. The tendency of Malang residents to own a vehicle is not affected by age. The findings of this study are different from previous studies.  
4. Male is positive and significant. This means that there is more tendency of men to have a vehicle than women. Similar to previous studies such as Gärling & Axhausen (2003) and Curtis & Perkins (2006) that found that there are differences in transportation preferences between men and women. Gärling & Axhausen (2003) found that women traveled less and closer than men. Empirical research on gender differences in travel behavior by Root et al. (2000) and Gärling & Axhausen (2003) showed significant differences in travel behavior, needs, and opportunities between men and women. Generally, women travel less than men and their work trips are shorter. Research conducted by Johansson-Grénman
et al. (2002) in Sweden also shows that there are differences in behavior between men and women in traveling. The results showed that men traveled more often by driving their own cars, while women more often used public transport services.

5. Marital status is positive and significant. This means that a married person has a greater tendency to own a vehicle than a person with unmarried status. This is in line with research conducted by Haustein & Siren (2014), J.-K. Kim et al. (2014), Musselwhite & Haddad (2010) and Nordbakke & Schwanen (2015) who explained that life with a partner reduces the likelihood of mobility, especially for recreational and social reasons. According to Knight et al. (2007), Scheiner (2006) and S. Kim (2011) mobility of people living with a spouse or other person can also lead to dependence, if they are not the head of the family or when living with children under 18 years, these children will follow the travel pattern of the head of the family. Research conducted in South Korea by J.-K. Kim et al. (2014) explained that parents also experience problems where their travel needs are not met. This is due to the responsibility of parents to take care of children, so that a lot of time that previously used for recreation, is spent taking care of their children/families after marriage.

6. Top education (Senior High School, S1, S2, S3) is positive and significant. This means that the higher the education of a person, the greater the ownership of the vehicle. It is in line with work and income, the higher the education of a person the greater the probability to get a good job with a large salary so that more able to have a vehicle. This finding is the same as the study conducted by Renne & Bennett (2014) where car ownership and travel are positively related to income and education. Likewise, Westman et al. (2017) in Sweden found that travel satisfaction was related to education.

7. The occupation has positive and significant activity. This means the more people have activities, the greater the tendency to own a vehicle. This reinforces previous research. Gao, Mokhtarian, & Johnston (2008), Horner (2004), Grengs (2012) explained that accessibility to the workplace, the balance between work and housing and social inequality is the concern in urban areas. Bunel & Tovar (2014), Geurs, De Montis, & Reggiani (2015) showed that the accessibility of transportation modes to reach work site is a consideration for accepting work. van Wee, Hagoort, & Annema (2001), Wang et al. (2015) concludes that job accessibility is generally not only determined by the number of jobs but also influenced by spatial competition.

8. Income is positive and significant. This finding is similar to previous research that shows the higher one’s income, the higher the value of time. The high value of time leads people to own their own vehicles because the length of time for personal vehicle travel is shorter than public transportation. This is the same as the research conducted by Yan (2002) which found that income is the limit of someone in consuming transportation, individuals with higher income will value their time higher. The higher a person’s income, the higher the value of time. As the expression of time is money, someone with high income tends to want the shortest possible travel time by having a private vehicle that can be used at any time (Sani, 2011). This means that individuals with high income will choose a fast mode of transportation even though it is costly.

The Minister of Home Affairs Regulation Number 9 of 2009 has confirmed that the responsibility for managing social and public facilities has been transferred to the regional government. Article 22 paragraph (1) states that the management of infrastructure, facilities, and utilities that have been handed over to the regional government is entirely the responsibility of the relevant regional government. The lack of budget often becomes a scapegoat for the failure of the government in managing public facilities and social facilities, for example, the bus stop facility for public transport. The unavailability of public transport infrastructure is the cause of the high ownership of private vehicles.

Ministry of Home Affairs Regulation Number 9 of 2009 basically requires that the public facilities and social facilities handed over by the developer in a good condition. However, the facts in the field are that the developer only handed over some piece of land. Another problem is the failure of the developer to fulfill the promise to build several facilities in the residential areas, including transportation modes (transportation that connects the housing environment with public transport). In the migrant population group, this condition worsens. The results of this study show that the more a person is a migrant, the less likely to have a vehicle. With poor public facilities and social services in the transportation sector, it will further complicate the activities of migrant populations.

In Law Number 22 of 2009 concerning Article 93 of road transport from Ministry of Transportation, it is stated that the government should carry out...
the priority setting of mass transportation and the integration of various modes of transportation. If the Act is implemented, the tendency of private vehicle ownership will decrease. The implementation of the law will improve the comfort of migrant residents in Malang who tend to not own a vehicle.

In Law Number 25 of 2009 concerning Public Service Article 5 from Ministry of State Apparatus Empowerment, it is stated that public service includes, are among others, the transportation sector and its procurement or distribution comes from the regional government budget. The intended public goods are facilities and infrastructure in the transportation sector. But in its implementation, the provision of facilities and infrastructure was not implemented by the government. This causes people to have no choice but to own private transportation. This condition worse since the results of the study found that vehicle ownership was no longer affected by age, although to have a driver license it was required to be over 17 years of age. Urgent needs in the field of transportation urge people of any age to own private vehicles.

D. Marginal Effect Analysis

Interpretation of an Ordered Probit model also done based on marginal effect.

Table 12.
Marginal Effect Analysis Results Have No Vehicles in Malang Raya

| Have No Vehicle Ownership | dy / dx  | Standard Error | P > |z| |
|---------------------------|---------|----------------|------|
| *Migrant Population       | 0.1719361 | 0.06624        | 0.009 |
| Age                       | 0.0006646 | 0.00046        | 0.152 |
| *Male                     | -0.0785698 | 0.02677       | 0.003 |
| *Married                  | -0.1979766 | 0.02776        | 0.000 |
| *Top Education (Senior High School, S1, S2, S3) | -0.0977395 | 0.0123        | 0.000 |
| *Have a Activities        | -0.0823953 | 0.04224        | 0.051 |
| Income                    | -7.22e-08  | 0.00000        | 0.000 |

Marginal effects after oprobit

\[ Y = \Pr(kep=1) \text{ (predict)} \]

\[ = 0.1444457 \iff 14.44\% \]

It indicated that the change in the value of each independent variable in 1 person will affect the probability of ownership of vehicles with the category of not owning a vehicle of 14.44%.

Table 13.
Marginal Effect Analysis Results Have a Motorcycle in Malang Raya

| Have a Motorcycle | dy / dx  | Standard Error | P > |z| |
|-------------------|---------|----------------|------|
| *Migrant Population | -0.088537 | 0.04894        | 0.069 |
| Age               | -0.0000972 | 0.00008       | 0.201 |
| *Male             | 0.0252001  | 0.01282        | 0.049 |
| *Married          | 0.0855761  | 0.01876        | 0.000 |
| *Top Education (Senior High School, S1, S2, S3) | -0.0040838 | 0.00642       | 0.525 |
| *Have Activities  | 0.0297013  | 0.02236        | 0.184 |
| Income            | 1.05e-08   | 0.00000        | 0.007 |

Marginal effects after oprobit

\[ Y = \Pr(kep=2) \text{ (predict, outcome(2))} \]

\[ = 0.74055703 \iff 74.05\% \]

It indicated that the change in the value of each independent variable in 1 person will affect the probability of ownership of vehicles with motorcycle category of 74.05%.

Table 14.
Marginal Effect Analysis Results Have a Car in Malang Raya

| Vehicle Ownership | dy / dx  | Standard Error | P > |z| |
|-------------------|---------|----------------|------|
| *Migrant Population | -0.0756292 | 0.01625        | 0.000 |
| Age               | -0.0005238 | 0.00037       | 0.153 |
| *Male             | 0.0489814  | 0.01333        | 0.000 |
| *Married          | 0.1028973  | 0.01065        | 0.000 |
| *Top Education (Senior High School, S1, S2, S3) | 0.0946769 | 0.01447       | 0.000 |
| *Have Activities  | 0.0482792  | 0.01844        | 0.009 |

Marginal effects after oprobit

\[ Y = \Pr(kep=3) \text{ (predict, outcome(3))} \]

\[ = 0.74055703 \iff 74.05\% \]

It indicated that the change in the value of each independent variable in 1 person will affect the probability of ownership of vehicles with car category of 74.05%.
The Influence of Urbanization and Socio-Economic Conditions to Vehicle Ownership in Developing City
Candra Aji Kusuma, Multifiah, Wildan Syafitri

IV. Conclusion
Migrants tend to have no vehicles, age does not affect vehicle ownership, and the most significant factors in vehicle ownership are marital status, education, and employment.

Based on research on vehicle ownership in Malang Raya, our suggestions are as follows:

1. For Policy Maker
The government should provide a public transport service network, especially in areas of migrant populations. To make public transport attractive to them, the government should create a network of public transport services that reach educational areas, office areas, and household areas.

2. For Public Transport Operator
If public transport wants to compete with the private vehicle then it is necessary to pay attention to the timeliness and speed of travel time in the service.

Income and education also affect perceptions of facilities and convenience of public transport. Public transport operators should improve their facilities and comfort during their trip.

Marriage also has a significant effect; public transport operators should provide family-friendly transportation.

3. For Academics in Preparing Further Research
For further research is expected to increase the location of research. Further research is expected to cover aspects of online transportation as a hot topic from 2017 to 2018.

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V. References


The Influence of Urbanization and Socio-Economic Conditions to Vehicle Ownership in Developing City
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