Mass Effect and Car Ownership Motivations of Students in Jakarta and Bandung, Indonesia

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Car ownership levels are increasing rapidly in many developing countries. Indonesia, with a total population of 230 million people, is the world's fourth most populous country. In line with population growth, the number of motorized vehicles rapidly increases according to Indonesian Central Agency of Statistics. Increasing car usage has generated various problems such as environmental (CO_2 emission, global warming); social (noise, traffic accident) and economic (external cost of traffic congestion). To cope with these problems and to understand future trends it is necessary to understand persons' desire to buy cars.

Previous research in Bandung, Indonesia found that attitudinal factor is a significant determinant on car ownership motivations among students[1]. This research continues the previous one by including norming effects that often lead persons to adjust once choice to be in line with choices of others and hence can lead to "mass effects" (Schmöcker et al[2]). By studying such mass effects one can hopefully propose policies that influence a significant number of people to change their mobility decisions such as car purchases.

Using 100 samples of university students in Jakarta and 100 samples of university students in Bandung that have been collected on January 2013, analysis is conducted to better understand the influence of "mass effect" factors on student's car ownership decision. From our initial analysis, we found that there is significant correlation between car ownership and three norms factors, i.e: *descriptive norms, injunctive norms and subjective social norms*.

Key Words : car ownership, mass effect, norms factors, students mobility behavior

1. INTRODUCTION

Car ownership levels are increasing rapidly in many developing countries. Increasing income levels allow in particular citizens of the major cities to purchase more and larger vehicles. In Indonesia and other developing countries this trend towards more and larger vehicles appears to keep continuing despite the lower average speeds of cars compared to motorcycles in the already congested cities and despite the well observable other environmental side effects. Indonesia, with a total population of 240 million people, is the world's fourth most populous country[3]. In many islands of the country the number of motorized vehicles rapidly increases according to Indonesian Central Agency of Statistics (2011): In 1987 Indonesians owned around 1 million

cars, and by the end of 2011 there were already 10 million private cars on Indonesian street (Fig.1)
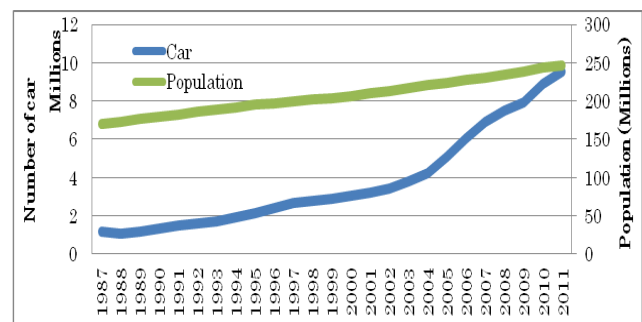

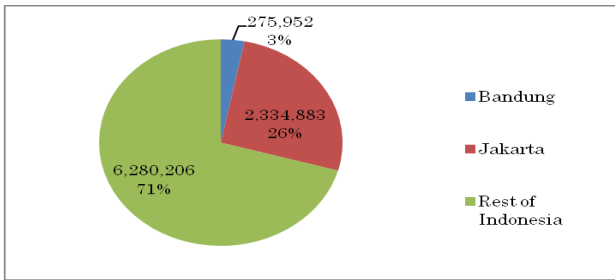**Fig.1** Population and car ownership 1987-2011

Fig.2 Distribution of car ownership in Indonesia 2010

In Bandung and Jakarta, the cities this paper focuses on, the number of car ownership has reached 275,952 and 2,334,883 cars respectively in 2010, around 30% of the total car fleet in Indonesia[4)5)]. Furthermore, the trend towards more cars is difficult to control in Indonesia as almost all cities in Indonesia, except for Jakarta, do not have an advanced mass transportation system such as bus rapid transit (BRT).

In Bandung, according to Joewono and Kubota[6)], 61.2% of public transport (PT) is operated in form of Paratransit (Angkot) while the remainder is bus, taxi and rickshaw. The distribution of car ownership in Indonesia can be seen in Fig.2

Our aim in this paper is to break down persons' motivations to purchase cars in order to understand how one possibly can induce a shift towards more sustainable modes. Our hypothesis is that not just income and attitudes towards cars that are found significant in previous study[1)] but also "mass effect" can explain car purchases and travel behaviour.

According to Fujii and Gärling[7)], the increase in frequency of using a travel mode causes the development of a habit of using this travel mode and weakens the choice tendency towards alternative modes; this is found for public transport as well as for automobile choice. Gärling et al[8)], mention that frequent drivers who are forced to change to public transport for a short period continue to choose public transport more frequently than before the forced behavioural change. One might hence conclude that it is possible to induce a shift to more sustainable modes by encouraging or enforcing sustainable habits at one life stage.

In particular influencing younger people´s habits appears to be important. According to e.g. Lanzendorf [9)] and Simma and Axhausen[10)], the way one grows up influences the way one travels, including habits and one's perspectives on the car, for the rest of one's life course. Other research from the public health domain shows that habits developed during the adolescence period will have a significant impact on the lifelong lifestyle of individuals[11)]. Furthermore, in particular commuting behavior is mostly habitual and habits are usually formed immediately after getting a job. These habits are expected to be influenced though by behavioural intentions developed before getting a job[7)].

Thus the main foci of this research are university students where it is expected that their current habits could influence their commuting behaviour not only presently but also after they graduate and obtain a job. We aim to distinguish factors that lead to actual car purchases among students and factors that lead to a desire to buy cars in the future and hence survey car owners as well as (current) non-car owners.

The structure of this paper is as follows: After this introduction, the second part of this paper will discuss previous research on car ownership forecasting and the motivation of individuals to buy cars. Next section we will discuss some theory and definition related to "mass effects". The following part discusses first characteristics of our study area, Bandung and Jakarta, Indonesia, before explaining the survey among students regarding their motivation to buy cars. After that we discuss about the initial result of our survey. Finally, in Section 6 some initial conclusions and possible future research is discussed.

2. PREVIOUS STUDY

In our previous study, we conducted a research about the influence of attitudinal variables toward the decision to own a car[12)]. Our focus was on car-ownership motivations in Indonesia where cars have become the main contributor to traffic congestion. We suggest that attitudes towards cars are important to explain car ownership trends. Using data from 500 undergraduate students from Bandung, Indonesia, we constructed five factors regarding car perception through principle component analysis: *symbolic/affective*, *arrogant prestige*, *independence, comfort,* and *social orderliness*. These five factors plus some socio-demographic variables, such as *monthly income*, are used as explanatory variables for modelling *car ownership* using structural equation modelling as shown in Fig.3. We find only the attitudinal factors *independence* and *arrogant prestige* to be significant. Independence describes the perception that the car gives freedom to travel anytime and anywhere. Arrogant prestige describes the perception of cars being a sign for "showing off".
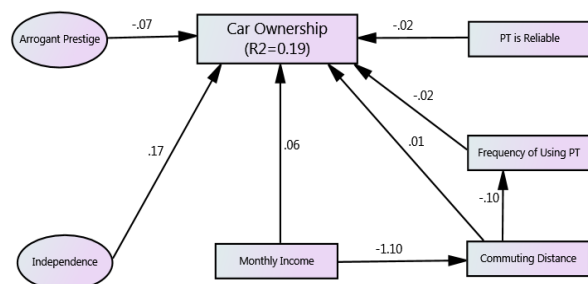

Fig.3 Car Ownership Structural Equation Model

Further we included attitudes towards public transport (PT) and socio-demographics. We found significant paths to car ownership from the attitudinal factor *PT are reliable* as well as *frequency of using PT*, *commuting distance* and *monthly income*. *Frequency of using PT* is treated as observed, endogenous variable since we assume it might be influenced by *commuting distance*. *Commuting distance* in turn might be influenced by *monthly income* as accommodation nearer the campus is in general more expensive. *Monthly income* and the *PT is reliable* are treated as observed, exogenous variables.

Table 1 shows the estimated path coefficients and their reliability. Our results suggest that *independence, arrogant prestige* and some socio-demographic variables significantly influence car purchase decision.

As expected we find that "Monthly Income" directly effects *car ownership* with regression weight of 0.06, i.e. if the respondent is in the next higher income category, on average he is 6% more likely to own a car. We also find that income indirectly influences *car ownership* through *commuting distance* and *frequency of using PT* with different sign. Though we find this effect to be significant, it is a weak effect as the combined indirect effect of monthly income is only -0.01. The path confirms our observation that high income students, probably especially those with parents out of town, choose to stay near the campus, while the lower income students choose to stay far from campus.

Compared to *monthly income*, *commuting distance* has less effect on *car ownership*. We further find that commuting distance negatively influences PT usage. This might be again explained by the relatively low quality of the PT network. Those living far away from campus would often need to transfer or possibly there is no available PT at all. The indirect effect of commuting distance on car ownership via *frequency of using PT* is again very small (0.002).

Frequency of using PT and the perception that *PT is reliable* both negatively influence *car ownership* with similar regression weights. This suggests that if PT is perceived more positively, the chances to use PT more and possibly not to own a car is also higher.

Table 1 SEM Model Estimation, in brackets standardized effects

		Path	Estimate	t-stat	
Commuting dist.	←	Monthly income	-1.10 (-0.20)	-4.32	***
Freq. of using PT	←	Commuting dist.	-0.10 (-0.11)	-2.30	**
Car ownership	←	Arrogant prestige	-0.07 (-0.16)	-3.08	***
Car ownership	←	Independence	0.17 (0.32)	5.24	***
Car ownership	←	Monthly income	0.06 (0.12)	2.71	***
Car ownership	←	Commuting dist.	0.01 (0.10)	2.25	**
Car ownership	←	Freq. of using PT	-0.02 (-0.19)	-4.25	***
Car ownership	←	PT is reliable	-0.02 (-0.08)	-1.92	*

*. Significant at the 0.1 level . ** at the 0.05 level, *** at the 0.01 level.

We find that *arrogant prestige* significantly influences *car ownership* with a negative regression value -0.07. One might argue that in particular for this variable the causality is not clear. The interpretation in line with the model structure is that those who project a negative image on cars and car ownership tend to therefore also not purchase one.

Another possibility could be that non car owners might still desire a car but project a negative image on an item they do not currently own as a way to reduce cognitive dissonance[13]. In other words, since they cannot afford a car they project it to convey an arrogant impression. We can not fully solve which of these two explanations is more likely with the data available to us.

Independence has a significant positive influence on *car ownership*. We remind that the construct refers to time and space travel flexibility which hence suggests that "classic utility factors" play a more important role for purchase decisions compared to the other attitudinal factors. We find that the regression weight (0.17) to be the highest parameter value among all the significant paths. This result might because given the current PT conditions in Bandung one cannot guarantee punctual arrival when using minibuses. When travelling by car, one might also get stuck in congestion, however, at least one does not have the uncertainty of having to wait until a vehicle has collected enough passengers for the driver to decide to depart. Furthermore the route network is fairly limited.

Though these explanatory variables mentioned above significantly influence *car ownership*, the predictive power of our model is still fairly low ($R^2=0.19$). This means there appear to be still other not accounted for parameters. We consider that possibly other factors such as "mass effects" might also be important in influencing student decisions to own a car.

3. MASS EFFECTS AND CAR OWNERSHIP

(1) Literature review

"Mass effects" has several meanings such as herd behaviour, peer effects, conformity, or fashion[14]. The term "mass effects" used in this paper is in line with what Schmöcker et al[2),14)] refer to as "informational mass effects". They define informational mass effect as positive influence to adjust one's choice to be in line with observed choices of others. This ''observation'' might be either information obtained directly about others' behaviour or indirectly obtained by perceiving an expectation on one's choice. The pressure to confirm to this information is also commonly referred to as norming effects. In our paper, we aim to distinguish different type of norming effects.
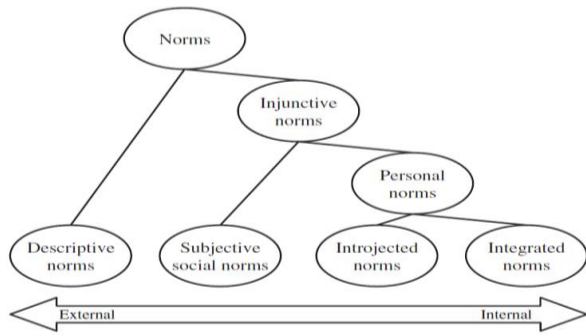
Fig.4 The proposed norm taxonomy. Taken from Thogersen[16]

Cialdini et al[15] distinguish two types of norms: descriptive and injunctive norms. Descriptive norms refer to the common behaviour of others (e.g. the majority choices); whereas injunctive norms refer to one's perceptions of the expectations of others regarding the behavior in question. To simplify, according to Cialdini et al[15], descriptive norms specify what is done and injunctive norms specify what ought to be done.

Types of injunctive norms can also be distinguished according to how internalized which leads to the definition of *Personal norms* and *Social norms*[16]. Personal norms (also known as internalized norms) is defined as self-expectation of specific action in a particular situation, experienced as a feeling of moral obligation while social norms (also known as subjective social norms) is defined as norms based on group expectations. Rewards and punishment backing the norm are defined and imposed. In summary, personal norms are about the moral obligation (internal) while social norms is about external social pressure (external).

Thorgesten[16] proposed a new norm taxonomy which extends the personal norm in to two subtypes of norms: *introjected norms* and *integrated norms*. Introjected norms are described as personal norms which are only superficially internalized which are enforced by anticipated guilt or pride. Integrated norms are described as personal norms which are based on conscious reflection on and evaluation of behaviour outcome and, hence, on relatively deep and elaborating processing. In summary, introjected norms are solely emotionally internalized while integrated is rationally internalized.

The proposed norm taxonomy is summarized in Fig. 4. According to Thorgesten[16] the injunctive norm construct in the taxonomy – subjective social norms, introjected norms, and integrated norms – are assumed to form a continuum of increasing levels of internalization and integration into the self. The correlations between the close constructs in Fig.4 are said to be positively correlated compared to the more distal constructs, for example subjective social norms are assumed to be more is strongly correlated with introjected norms than with integrated norm, and integrated norms more strongly correlated with introjected norms than with subjective social norms.

(2) Proposed car ownership model

Based on norm taxonomy discussed earlier, we would like to propose a car ownership model that incorporates norm as determinant variables for car ownership decisions. It is depicted in Fig.5.

The norms that are used in the car ownership models are descriptive norms and injunctive norms which assumed directly influence car ownership. Personal norms and subjective norms are assumed to indirectly influence car ownership through injunctive norms. Subjective social norms according to *theory of planned behaviour*[18] is believed to have direct influence to behavioural intention thus we also made a direct line to car ownership. We do not incorporate introjected and integrated norms in our model but we add a new variable *motivation to comply* which we hypothesize to have a direct influence on subjective social norms and also have an indirect influence to car ownership as shown by the dashed line (in Fig.5). We also assume that beside via injunctive norms, personal norms also have indirect influence to car ownership decision, also shown by dashed line.

(3) Questionnaire design and implementation

First the respondents are asked whether they have a car or not. After that they are asked questions related to constructing the different norm types.

1. Descriptive norms

Descriptive norms as a latent variable will be constructed by seven variables regarding to "how many cars there are around them". We ask whether they grow up with a car or not, whether their partner (girlfriend/boyfriend/spouse) has a car for his/her personal use and whether family members except parents; close friends; peers at university; people in neighbourhood; people in province/state have cars. The latter five questions are asked as a choice between four different categorical answers: less than 25%, 25-50%, 50-75%, and more than 75%.
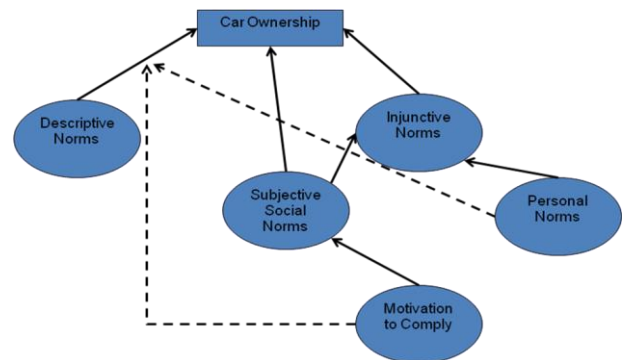

Fig.5 The proposed car ownership model

2. Injunctive norms

In this section, the respondents are asked to answer the question "To what extent, does each of the following groups expect you to buy a car within the next 10 years?" with 7 point Likert scale answer from "they strongly expect me not to buy a car" to "they have no expectation" as middle point and "they strongly expect me to buy a car" as the end point. The categories are the same as the latter five categories in descriptive norms section (see Table 2).

3. Personal norms

In this section, the respondents are asked to answer this question "Please rate on a scale per 1 – 7, how important the following groups are to your decision regarding buying a car in the future" with 7 being the most important and 1 being the least important. The categories are the same as seven categories in injunctive norms section.

4. Subjective social norms

In this section, the respondents are asked to rate their level of agreement regarding six statements mentioned using 7 points Likert scale from "strongly disagree to strongly agree". And those statements are as follows: "it is a no brainer to have a car", "I feel that there is social pressure to have a car here", "transport modes other than car (walking, bike and public transport) are looked down upon", "the majority of people think that having a car is the right thing to do", "I think people should use cars less" and "I feel guilty having a car".

5. Motivation to comply

In this section, the respondents are asked to rate their level of agreement regarding three statements mentioned using 7 points Likert scale from "strongly disagree to strongly agree" as follows: "It is important for me to be similar to others in my community", "I tend to rely on others when I have to make an important decision quickly", "I prefer to find a group I can follow rather than make my own way in life"

4. DATA COLLECTION

(1) Descriptive Statistics

The targets of our survey were students of Bandung Institute of Technology (ITB) and students of Indonesian University (UI) in Jakarta. These are state universities which have long been credited as two of the most prestigious universities in Indonesia and hence attract

students from all over Indonesia.

Our survey focuses on undergraduate students aged between 17 and 23, as students, with the support of their parents, often purchase cars within their four years at university. The descriptive statistics of "norms" variables are shown in Table 2.

Table 2 Mean and Std. Deviation of Variables Constructing Norm Factors

Variable	Mean	Std. Dev.
Descriptive Norms - Cronbach's alpha = 0.71 **(Answers on a scale from 1 to 4)**		
Your parents (grow up with car)	3.66	.757
Your partner (has car)	3.14	.995
Your family members and relatives	2.70	.920
Your close friends	2.42	.890
Your classmates, friends & peers at university	2.49	.796
People in your neighborhood	2.66	.889
People in your province/state	2.96	.725
Injunctive Norms - Cronbach's alpha = 0.90 **(Answers on a scale from 1 to 7)**		
Your parents	5.37	1.117
Your partner	4.92	1.118
Your family members and relatives	5.04	1.109
Your close friends	4.85	1.097
Your classmates, friends & peers at university	4.67	.996
People in your neighborhood	4.33	.936
People in your province/state	4.12	.956
Personal Norms - Cronbach's Alpha = 0.79 **(Answers on a scale from 1 to 7)**		
Your parents	7.20	1.113
Your partner	6.47	1.653
Your family members and relatives	5.73	1.443
Your close friends	4.54	1.768
Your classmates, friends & peers at university	4.06	1.611
People in your neighborhood	3.30	1.358
People in your province/state	2.91	1.391
Subjective Social Norms - Cronbach's Alpha = 0.63 **(Answers on a scale from 1 to 7)**		
it is a no brainer to have a car	2.07	1.184
I feel that there is social pressure to have a car here	3.19	1.611
transport modes other than car (walking, bike and public transport) are looked down upon	3.46	1.750
the majority of people think that having a car is the right thing to do	4.59	1.229
I think people should use cars less	5.49	1.307
I feel guilty having a car	3.38	1.221
Motivation to Comply **(Answers on a scale from 1 to 7)**		
It is important for me to be similar to others in my community	3.88	1.556

In Indonesia, 17 is the minimum age to obtain a driving licence as well as for buying a car. The majority of the samples were obtained through internet surveys. In total 200 complete surveys, 100 from each city could be obtained. In this paper we do not distinguish between students from Bandung and Jakarta but instead treat them as one group. From 200 respondents, 113 respondents (around 56.5%) are car owners. We find that 76.5% of students grew up with a car, and that the percentage of student whose partner has car is around 31.5%. Further, most students are surrounded by families, peers, neighbours and friends that have cars.

Regarding injunctive norm, the mean values and standard deviation for seven variables show that the majority of the students' parents and family members have some positive expectation of students buying a car in the future. It can also be interpreted as some pressure to buy a car is felt by students. While the other groups, with means more than 4 can also be considered as some positive expectation to buy a car in the future.

For personal norms data, the mean values and standard deviation for seven variables show that for many students, parents and the partner are very important regarding their decision to buy a car in the future, family members are also more important while other groups can be considered less important.

For subjective social norms data, the mean value and standard deviation for the seven variables might indicate that the social pressure to not use a car is not strong enough to influence students to not use a car.

For motivation to comply data, we found that the cronbach alpha for this construct is not reliable hence we only use one variable as this construct, "it is important for me to be similar to others in my community" which we consider to most closely represent the general motivation to comply.

(2) Correlation coefficient

In order to find the influence of these types of norms with car ownership, as an initial analysis, we perform a correlation analysis as shown in Table 3.

Table 3 Correlation coefficient between car ownership and types of norms

Variables	Des. Norms	Inj. Norms	Personal Norms	Sub. Soc. Norms	Mot. to Comp.
Car Ownership	.296**	.300**	.118	-.216**	-.071
Des. Norms		.281**	.050	-.251**	.041
Inj. Norms			.527**	-.061	-.032
Personal Norms				-.040	-.213*
Sub.Soc.Norms					.227**

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

It appears that car ownership has a positive significant correlation with descriptive norms and injunctive norms. Car ownership also has negative significant correlation with subjective social norms. However, it does not have significant correlation with subjective social norms and motivation to comply.
Descriptive norms have a positive significant correlations with injunctive norms. It also has negative significant correlation with subjective social norms. Injunctive norms have a positive significant correlation with personal norms. Personal norms have negative significant correlation with motivation to comply. And lastly subjective social norms have a positive significant correlation with motivation to comply.

5. DISCUSSION

From the initial result of the correlation coefficient it seems there is some evidence that descriptive norms, injunctive norms and subjective social norms influence students motivation to own a car. This is in accordance with the proposed car ownership model depicted in Fig. 5 where we hypothesize that descriptive norms, injunctive norms and subjective social norms directly influence car ownership.

Personal norms and motivation to comply do not have significant correlation with car ownership. Whether there is a weak indirect influence or not still needs to be tested.

Personal norms might influence injunctive norms, this notion is supported by the result of the correlation coefficient where there is significant correlation between both latent constructs. Motivation to comply also has significant correlation with subjective social norms indicating that it might have direct influence to subjective social norms as we hypothesised in Fig. 5. It is interesting to note that there is a negative significant correlation between personal norms and motivation to comply, which we will analyse further.

Car ownership has positive significant correlation with descriptive norms which might indicate that since others who relate to students own a car; students will follow them to also own a car, i.e.: follow what others do. While the positive significant correlation between car ownership and injunctive norms might indicate that people around students expect them to buy a car, they internalized that expectation and therefore they own a car.

Car ownership has negative significant correlation with subjective social norms, at this point, in line with our previous results; we might say that regarding car, the norms in society project car as a negative image hence students might want to go "against the trend".

Interesting to note that although injunctive norms has significant correlation with personal norms, it has no

significant correlation with subjective social norms, whereas according to Thogersten[16], injunctive norms is distinguished according to how internalized they are i.e: *Personal norms* and *Social norms.*

6. CONCLUSION

The previous research objective was to understand factors determining car purchase decisions among younger people in developing countries. Through a survey among Indonesian students asking for attitudes as well as socio-demographic characteristics we obtained several conclusions which we believe have some policy implications and give possibly some hope that, at least to some degree, adequate transport policy could reduce the trend towards a rapid increase in car traffic.

We found that independence related aspects are the most important factor for students to purchase a car. The result emphasizes that in situations where there are insufficient convenient PT options, such PT services need to be improved first before one in fact has a choice. The result might also imply that possibly the status symbol factor of cars is decreasing, at least for some parts of the population.

This interpretation is supported by our findings regarding our construct *arrogant prestige*, which describes negative attitudes one has towards cars. We find arrogant prestige to be negatively significant, implying that those who think cars are arrogant also tend to not own one. We discuss some reservations regarding causality of this factor that should be explored with further research, but believe that, regardless of this discussion, this result indicates that students start to realise the negative societal effects of the car more.

Our findings further suggested that attitudinal variables towards the car and public transport as well as some socio-demographic variables only explain car ownership to a limited degree which is shown by the R^2 results. This might mean that increasing income in the coming years not necessarily means that all students will purchase a car. Possibly some "deeper factors" as well as societal trends might influence purchase decisions.

The current research tries to answer the shortcoming of the previous research by incorporating norms as the determinants of car ownership. What we can conclude so far is that car ownership decisions among Bandung and Jakarta students, might be influenced directly by descriptive norms, injunctive norms, subjective social norms. The negative correlation between subjective social norms and car ownership needs to be futher analysed.

The proposed analysis model might be used for further study to predict car ownership decisons The reliability of all constructed norm factors appear accept-able. The considered types of norms are partly in accordance with the taxonomy proposed by Thorgesten[16], although we do not incorporate introjected and integrated norms.

The present research does not distinguish between students from Bandung and Jakarta. In current research we consider distinguishing Bandung and Jakarta students and will use attitudes towards cars, socio demographic factor together with norms to explain car ownership.

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