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# Access or Ownership? The effect of car attributes and collective psychological ownership on the preference for car subscription services

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## Abstract

Alternative transportation services for urban commuters expand with car subscription services. Car subscription services give drivers access to cars without ownership for a relatively longer time period (e.g., months) than other sharing economy transportation services. Based on a mix of between- and within-subject design online experiment involving 274 participants, this study investigates traditional and upcoming subscribed car features namely, mileage limit, price, self-driving capability, advanced safety systems, and the moderating influence of collective psychological ownership of these features on people's preference for car subscription services. The results suggest that these features significantly impact people's preference toward this service. Collective psychological ownership was found to moderate the influence of self-driving capability and advanced safety systems on people's preference for car subscription services. Individuals with high collective psychological ownership preferred subscription cars with self-driving capability and were more concerned with the lack of advanced safety systems in a subscription car. Car subscription companies need to consider traditional (price and mileage limit), and upcoming features (self-driving capability and advanced safety systems) when offering their services. More importantly, the moderating influence of collective psychological ownership on these features means that car subscription companies should account for people's psychological disposition when considering additional car features.

## Keywords

Car subscription, sharing economy, price, safety system, self-driving vehicle, collective psychological ownership

**T**he reliance on private vehicles for commuting can be observed in many cities worldwide, leading to worsened traffic congestion during peak-hour periods (Schuitema, Steg, & Rothengatter, 2010). For cities, this translates into a reduction in the quality of life due to loss of time and increased pollution. For instance, it has been estimated that in large cities such as Los Angeles, Jakarta, and Moscow, commuters spent 102, 63, and 91

hours, respectively, in traffic each year (INRIX, 2018). Transportation is also a major contributor of pollution. For example, the transportation sector contributes roughly 28% of the total pollution in the U.S. (EPA, 2016). Urban areas are, therefore, need to understand what influences commuters' transportation decisions and whether these decisions can be influenced for collective benefits.

The recent phenomenon of access-based consumption (Bardhi & Eckhardt, 2012; Lawson, Gleim, Perren, & Hwang, 2016), fueled by the proliferation of the internet, has enabled the creation of new business models (Belk, 2014). In transportation, this access-based scheme challenges the need to own vehicles. Examples

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include, among others, carsharing, ridesharing, and bikesharing. Martin, Shaheen, and Lidicker (2010) found that the presence of access-based transportation services have led to a decrease in vehicle purchases. Such on-demand services improve commuters' mobility and vehicle utilization. They have also been argued to contribute to pollution reduction (Efthymiou, Antoniou, & Waddell, 2013). The positive impact of access-based transportation services has gained the attention of policy makers, commuters, and suppliers of such services. Yet, very little is known about how urban commuters choose their modes of transportation given the presence of these novel services. Whether the presence of these access-based transportation services and their benefits contribute toward improving urban areas depend on commuters' preference for such services in favor of their own vehicles.

The introduction of car subscription services (month-to-month car services) spurs further interest in the sharing economy model of access, which differs from other access-based services, such as carsharing and ridesharing, in terms of the length of time of access (monthly vs. minutes). Car subscription services more closely resemble leasing, albeit with the ability to quickly return or change vehicles during the term of contract. The service thus enables users to enjoy the benefits of owning a car but without the need to consider the cost of owning a car. In comparison to car sharing and ridesharing, car subscription services enable one to partially personalize the car, as it is only used by one subscriber during the time of subscription. This means that subscriptions cars present an opportunity for subscribers to develop sense of ownership over the cars even in the absent of legal ownership.

In the present study, we investigate this sense of ownership in terms of collective feeling, i.e., collective psychological ownership (CPO; Pierce & Jussila, 2009). CPO typically develops over owned object, such as car. Meanwhile, in transportation research, it has been known that people are emotionally attached to their own car (Steg, 2005). People would judge their car more favorably when comparing their own cars with alternative like subscription car. We posit that if users have higher tendency to feel collective ownership to their own car, they will be less

favorable to subscribed cars attributes (e.g., low price, availability of safety system) and will more likely be impacted by the unfavorable attributes (e.g., limited monthly mileage, high price). We investigate these assumptions by looking at traditional and upcoming attributes of car subscription services, namely price, mileage limit, the availability of safety systems, and self-driving capability. The price of the trip has also been known as a significant determinant of transportation choices involving sharing economy-based transportation services (Bardhi & Eckhardt, 2012; Paundra, Rook, van Dalen, & Ketter, 2017), while mileage limit has been proposed as the factor preventing the use of a lease vehicle (Merrick, 1998). Furthermore, in recent years cars have been equipped with advanced safety systems and in the near future will be equipped with self-driving capability. These two features can arguably improve safety and alleviate congestion (Schoettle & Sivak, 2014). Overall, the main objective of this study is to contribute to the discussion on the relevance of psychological ownership on people's transportation mode choices (cf., Paundra et al., 2017). Meanwhile, we also aim to further our understanding of people's transportation preference given various traditional and upcoming car features.

In the following sections, car subscription services, a recent trend in the sharing economy, will be further elaborated. The influence of traditional and upcoming features of car subscription services, as well as the moderating influence of CPO will then be discussed.

## Theory

### *Car subscription services as part of the sharing economy*

The sharing economy, defined as an economic arrangement that allows people to unlock the value of underused assets through market-mediated mechanism (Bardhi & Eckhardt, 2012; Sundararajan, 2016), has grown tremendously in recent years. In the sharing economy, people can limit the costs of owning products and instead only incur the costs of using that product (Hamari, Sjöklint, & Ukkonen, 2015). This attracts companies and consumers to an access-based business model, challenging the

**Table 1. Car subscription service provider's overview**

Car subscription platform	Covered markets	Car switching	Mileage limit	Sharing option
Canvas	San Francisco, Los Angeles	Limited	Yes*	Yes
Book by Cadillac	New York, Dallas, Los Angeles	Limited	Yes	Yes
Porsche Passport	Atlanta	Unlimited	No	Yes
Care by Volvo	Nationwide	Limited	Yes	Yes
Audi on demand	San Francisco	Limited	Yes	No
Clutch	Atlanta	Unlimited	No	Yes
Flexdrive	Atlanta, Austin, Philadelphia	Unlimited	Yes	No

dominance of traditional ownership (Belk, 2007; Lambertson & Rose, 2012). This business model can be seen in various industries, but has more widely been adopted in the accommodation and transportation sectors (e.g., Airbnb and Uber, respectively) (Zervas, Proserpio, & Byers, 2017). Sharing economy companies attracted more than USD 23 billion in funding in 2016 (BCG, 2017). Consumers are also attracted to the sharing economy given that it is more sustainable than traditional consumption through ownership (Haws, Winterich, & Naylor, 2014; Hellwig, Morhart, Girardin, & Hauser, 2015).

In transportation, numerous sharing economy-based transportation services have been developed to cater to commuters' diverse needs. Some popular services like ridesharing (e.g., Uber and Didi) and carsharing (e.g., Car2go), are available in various cities worldwide and disrupt the transportation services in the urban area. They improve access to mobility services and compete with existing transportation service providers, motivating traditional providers to improve their services. More recently, companies have started to offer car subscription services. Car subscription services follow the subscription-based service whereby consumers pay recurring fees for access to products or services. Interest in this model has significantly increased in recent years (McCarthy, Fader, & Hardie, 2015). The major drivers of this change include the development of new technologies and proliferation of the internet (Fruchter & Sigué, 2013; Libai & Muller, 2009). Subscription-based business model is especially apparent in the software industry, where more and more producers go away from the perpetual licensing and decide for the

subscription model (Zhang & Seidmann, 2010). Car subscription services fall under the category of *Mobility-as-a-Service* (Callegati, Giallorenzo, Melis, & Prandini, 2018). The fact that companies, such as Ford, Cadillac, Porsche, and Volvo have recently introduced car subscriptions shows that it has been recognized as an important consumer trend in the automotive industry as well (Bonnington, 2017).

At first glance, car subscriptions might resemble leasing or rental services; however, there are several differences between these models. Compared to leasing, consumers do not engage in long-term commitments and in most cases are able to return their vehicles within a week or a month (Canvas, 2017). Car subscription providers cover all costs of insurance and maintenance, often including a door-to-door service. Further, car subscription services allow users to switch cars, something that leasing and rental services do not typically allow during the course of lease or rent. Subscription cars can also be used with friends and family. Such flexibility makes the service an interesting alternative for sharing economy enthusiasts (Bonnington, 2017; Ferris, 2017).

Several companies offer subscription car services. The majority of these companies are auto manufacturers, such as Volvo, Cadillac, and Audi. These companies are mainly based in the U.S, and there are very limited subscription car services outside the U.S. These subscription car services typically offer mileage limitations, the possibility of switching cars, and sharing options. Table 1 summarizes the services offered by these companies.

### *Impact of car features on intentions to use car subscription services*

Previous research has been conducted on two traditional car features that influence intentions to use car services: price and mileage limitations. Price is known to be the most important aspect in the consumer decision-making process (Monroe, 2003). Scholars agree that financial benefits are among top factors influencing consumers' intentions to participate in the access-based economy (Bardhi & Eckhardt, 2012; Böcker & Meelen, 2017) as well as the most important attribute when choosing between a shared and a private car (Carteni, Cascetta, & de Luca, 2016; Paundra et al., 2017). Accessing can be cheaper than owning a car (Shaheen & Cohen, 2008), if we consider the overall cost of car ownership. When considering how prices impact intention to use alternative car services, one must consider that high car service prices (e.g., car subscription service) lead to low intention and vice versa (De luca & Di Pace, 2015). We argue that for car subscription services, the influence of price remains significantly high with regards to intention to select this service.

The second car feature considered is mileage limitations. Mileage limitations, in principle, work as a cap for use of the car, which is a strong demotivating factor for many (Merrick, 1998). This notion closely resembles range anxiety consumers can experience when using electric vehicles. Car drivers have irregular driving patterns and mileage limitations (like the use of electric vehicles) restrict them from using the car for long-distance drive or unexpected car use (cf. Karlsson & Kullingsjö, 2013). This is undoubtedly a cause of concern for car subscription users as they will be more likely to be anxious of exceeding the mileage limit. We argue that mileage limitations potentially reduce people's intention to use this service.

Other than the abovementioned traditional features, in this study we also considered two upcoming car features: self-driving capability and advanced safety systems. Self-driving capability is expected to be made available within the next few years (Gartner, 2017). Self-driving shared cars are also expected to challenge the need for public transportation and private cars in urban areas (Fagnant & Kockleman, 2014). Self-driving cars are expected to be received positively, given the expected

increase in safety and decrease in traffic congestion (Schoettle & Sivak, 2014). Self-driving capability is also favorable for daily commutes (Zmud, Sener, & Wagner, 2016) as well as long-distance travel (Haboucha, Ishaq, & Shiftan, 2017). Another positive attribute of self-driving capability is that it can cater those who are not capable of driving themselves (Lutin, Kornhauser, & Lerner-Lam, 2013). For cities, self-driving cars are expected to reduce pollution (Igliński & Babiak, 2017). Overall, the self-driving feature in subscribed car is expected to positively increase people's intention to use car subscription services.

Safety systems are an important feature of a car. Recently, cars have been equipped with advanced driver assistance systems to promote safety (Kaul, Singh, Rajagopalan, & Coury, 2010). The systems continuously monitor car surrounding and inform the driver when potential dangerous behaviour is detected (Merat & Lee, 2012). It is well known that consumers will pay premium prices for advanced safety systems (Kaul et al., 2010; Accenture, 2016). As safety is highly valued, it is expected that safety systems will positively impact people's intention to use car subscription services.

### *CPO as a moderator*

People attach strong emotional feelings to both material and immaterial possessions. The possessed things can become an object of cultivation and extended self (Belk, 1988). Over the years, this concept has been a topic of interest for multiple scholars (Heider, 1958; Belk, 1988; Furby, 1991). Building upon the literature on the psychological feeling of possession, Pierce and Jussila (2010) developed the CPO concept, which is defined as a "*collectively held sense (feeling) that a target of ownership (or a piece of that target) is collectively 'ours'*" (p.812). One should note that this concept is different from individual psychological ownership (IPO), which deals with individual feeling of ownership (Pierce, Kostova, & Dirks, 2003). It is worth mentioning the difference between the psychological and legal ownership, with the former existing in "mind" and the latter being stated and protected by the law. In fact, people could develop the feeling of possession toward

objects that they may not be legal owners of (Pierce Kostova, & Dirks, 2001). For instance, professional drivers often feel ownership over racing cars even if they are only allowed to access them under specific circumstances (Avey, Avolio, Crossley, & Luthans, 2009).

CPO has been mostly investigated in the work and organizational settings. It has been observed that a common feeling among team members can contribute to an increased effectiveness of group projects (Druskat & Pescosolido, 2002). Interestingly, although the notion of CPO is perceived at a group level, it influences actions at both the collective and personal level (Pierce & Jussila, 2010). The relevance of the CPO has been demonstrated in studies on preferences for domestic products and family businesses (Rantanen & Jussila, 2011; Gineikiene, Schlegelmilch, & Auruskeviciene, 2017). Emotional attachment and willingness to contribute to the family business in the long term are found to be correlated (Rantanen & Jussila, 2011). It has also been shown that a strong notion of domestic ownership increases intention to select local products (Gineikiene et al., 2017).

Group-level attachment is rooted in group identification (Ledgerwood, Liviatan, & Carnevale, 2007), and this feeling is stronger among people with closer ties with each other (Pierce & Jussila 2010). Since private cars are often treated as a reflection of household social standing (Lansley, 2016), CPO is expected to be highly relevant in investigating access-based car services versus owned cars. People will develop feelings of attachment to their cars (Steg, 2005; Bardhi & Eckhardt, 2012). As a group, people who share a car will have common experiences (e.g., trips made together) that are linked to the car. Thus, the private car becomes an “*extended us*” within a group (Pierce & Jussila, 2010). Having this emotional attachment to their cars influences consumers’ evaluation of their vehicles. For example, it has been shown that at individual level, the feeling of psychological ownership can moderate the effect of price on preferences for carsharing services (Paundra et al. 2017).

Theoretically, a subscription car could also lead to psychological attachment. However, due to several reasons, it can be expected that a much stronger feeling of ownership is

developed toward a privately owned car. First of all, owning a private car usually involves a much longer commitment and iteratively leads to the development of psychological ownership (Pierce et al. 2003). Second, a car owner has a much higher control over the vehicle and, for example, can freely modify its appearance or performance. Investing in an object leads to a stronger attachment since it develops a higher perception of control (Pierce et al. 2003). Finally, since car subscription providers usually offer a limited selection of cars, it might be difficult for users to find a car that best fits their preferences. All things considered, it is expected that people have a stronger emotional attachment toward a private car, leading to a more positive evaluation of its attributes compared to the attributes of a subscription car. That is, consumers’ sense of CPO moderates the influence of car features on their intention to select subscribed car.

## Method

### Participants and design

The experiment was a mixed 2 (Price: low, high) x 2 (Mileage: unlimited, 800km per month) x 2 (self-driving capability: autonomous, not autonomous) between subject and x 2 (safety: with advanced safety systems; without advanced safety systems) within design on the intention to select a subscription car. CPO was added to this design as a covariate. 399 participants were approached online via various social media outlets and Amazon Mechanical Turk (269 men, 129 women, and 1 unspecified;  $M_{age}=29$  years). Among these 399 participants, 67.9% were car owners, and a further 15.3% have access to car. Based on the length of the questionnaire, the minimum time to complete the study was 4 minutes. Hence, questionnaires that were completed in less than 4 minutes were excluded. Our final sample included 274 participants (174 men, 100 women;  $M_{age}=29$  years,  $SD = 7.9$ ) comprising various nationalities, with majority coming from the U.S. (32.5%), the Netherlands (22.3%), and Poland (20.8%). Table 2 provides an overview of the descriptive statistics of our participants.

### Procedure

**Table 2. Sample descriptions**

Sample description	Summary	N (Total= 274)	%
Gender	Male	174	63.5%
	Female	100	36.5%
Age	<21	4	1.5%
	21–25	110	40.1%
	26–30	86	31.4%
	31–40	57	20.8%
	41–60	14	5.1%
	>61	3	1.1%
Annual income	< €10,000	66	24.1%
	€10,000–€19,999	55	20.1%
	€20,000–€29,999	39	14.2%
	€30,000–€39,999	32	11.7%
	€40,000–€49,999	26	9.5%
	€50,000–€59,999	20	7.3%
	>€60,000	21	7.7%
	N/A	15	5.4%

Our experiment was conducted online using the Qualtrics survey tool. The experiment started with a description of car subscription services and their pros and cons compared to those related to having one's own vehicle. The procedure in Paundra et al. (2017) was followed and was adapted according to the context of car subscription services. The description of the car subscription services was as follows:

*If you wanted to travel by car in the past, you could buy one, or use rental, or carsharing services. Today, you have an additional option: **car subscription**. Its main features are outlined below:*

*Once you register to this service, you get an exclusive access to a car as long as you need. It is usually offered for a monthly fee and you can switch your subscribed car model every month. Insurance and maintenance costs are included and there is a concierge who picks up your car if a repair is needed. Of course, car subscription has its pros and cons compared to having your own vehicle. On the next page you can find the most important differences.*

*A **private car** is always available for you until you decide to sell it. You can modify its appearance or performance, but you cannot easily*

*switch to another car. You can share it with anybody you want. However, you need to pay for maintenance and insurance. You also need to consider the decrease in resale value of your private car over time. Finally, you need to spend your time on buying and selling a private car.*

*A **Subscribed car** is always available for you until you stop your subscription. You cannot modify its appearance or performance, but you can easily switch to another car. You can share it only with preregistered users. However, you do not need to pay for maintenance and insurance. You also do not need to consider a decrease in resale value of a subscribed car over time. Finally, you do not need to spend your time on buying and selling a subscribed car.*

Following these descriptions, a pre-manipulated intention to select a subscription car was examined. The following scenario was presented: "Imagine you are now considering between a private car and a subscribed car. Please indicate how likely are you to choose a subscribed car". After indicating their preference, participants were asked to rate their CPO. The features of subscription cars were introduced to ensure that our participants understood these features:

*Imagine you are now considering between a*

**Table 3. Example of a scenario displayed in the experiment**

	Private car	Subscribed car
Car is self-driving	NO	NO
Monthly mileage limit	Unlimited	800 km
Estimated monthly cost	480 Euro	520 Euro

private car and a subscribed car of certain characteristics. There are three key distinctive features between these cars:

1. **Self-driving capability:** it is a high degree of automation, meaning that under specific circumstances (e.g. difficult weather conditions) a driver might still be required to control the car
2. **Monthly mileage limit:** a number of kilometres per month you can drive without additional charges.
3. **Estimated monthly cost:** it includes gasoline, insurance, maintenance, and decrease in car resale value if a car is private. It includes subscription fee, and gasoline if a car is subscribed.

Participants were then presented a table showing the features of private and subscription cars according to one of the eight scenarios (these scenarios refer to each combination of between-subject manipulation) that were randomly assigned to participants and asked to rate their preference. In all scenarios, the features of private cars remained the same (i.e., not a self-driving car, with unlimited mileage limit, and cost 480 Euro per month) and the features of subscribed cars were manipulated accordingly. Table 3 shows an example of one such scenario.

In the next phase, the safety systems feature was considered. We provided a description regarding the advanced safety systems: "Imagine the subscribed car has been additionally equipped with advance safety systems, including Lane Departure Warning, Adaptive Cruise Control, Collision Avoidance,

and Steering Takeover Assistance if a car is self-driving". Again, the scenario description was presented to participants, as shown in Table 3, but with an additional row for the advanced safety system.. An example of the scenario displayed in this phase can be seen in Table 4. The final rating for preference was then presented to the participants. In the final part, participants completed a questionnaire assessing their demographics, traveling habit, and their knowledge on car subscription services.

### Manipulations

**Price.** We approximated the cost of car travel based on the price in the area of our study in Europe. By considering the cost of insurance, depreciation, maintenance, and fuel, the cost of owning a private vehicle amounted to 480 Euros per month. Meanwhile, the cost of a car subscription service was obtained from a German provider (i.e., Cluno) and approximated to 440 Euros for a low price and 520 Euros for a high price. Participants would be shown the same cost of owning a private car and either the low or high price of the subscription car.

**Mileage.** It is a common practice among car subscription providers to impose mileage limitations. Taken from car subscription services in the U.S. (e.g., Canvas), the limitations were set to 800 kilometers or unlimited. Therefore, participants received information about mileage limits in which a private car has unlimited mileage limits while a subscription car has either 800 kilometers or unlimited mileage limitations.

**Self-driving capability.** Gartner (2017)

**Table 4. Example of a scenario displayed in the experiment including safety system**

	Private car	Subscribed car
Car is self-driving	NO	NO
Advanced safety systems	NO	YES
Monthly mileage limit	Unlimited	800 km
Estimated monthly cost	480 Euro	520 Euro



**Table 5. Correlations coefficient (N = 274)**

	1	2	3	4	5	6
1 Self-driving capability	-					
2 Mileage	.036	-				
3 Price	.014	.014	-			
4 Collective psychological ownership	-.004	-.037	-.049	-		
5 Intention to select a subscription car without safety system	.157***	.102	.197***	.036	-	
6 Intention to select a subscription car with safety system	.100	.188***	.136**	-.016	.733***	-

\*\* $p < .05$ . \*\*\* $p < .01$

expects level 4 self-driving cars will be available to consumers in a few years. A level 4 self-driving capability means that a driver might still be required to take control over the car, but that for the most part it drives itself. We made use of this description and manipulated the availability of self-driving capability. Participants were informed whether the car was equipped with self-driving capability or not. Participants were also informed that their private car was not equipped with self-driving capability while the subscription car was either equipped with a self-driving capability or not.

**Safety systems.** We checked the importance of safety systems by providing textual information to our participants. In the first stage of the experiment, safety systems were not mentioned. After they indicated their initial preference, we introduced them with advance safety systems, such as Lane Departure Warning, Adaptive Cruise Control, Collision Avoidance, and Steering Takeover Assistance if a car was self-driving. These features were known to be desirable features of a car's safety systems (Kaul et al., 2010; Hergeth, 2016). Following the statement, participants were asked to rate their preference once more by comparing private cars without safety systems with subscription cars with safety systems.

## Measures

**Intention to select a subscription car.** Intention to select a subscribed car was measured based on the 7-point Likert type scale (1 = *very unlikely*, 7 = *very likely*). It was measured three times for each respondent: (1) pre-manipulation, (2) post-manipulation without safety systems, and (3)

post-manipulation with safety systems. The item was "Please indicate how likely are you to choose the subscribed car". Based on these scores, two dependent variables (intention to select a subscribed with and without safety systems) were computed. This was achieved through subtracting the pre-manipulation scores from the post-manipulation scores, consistently with the similar study conducted by Paundra et al. (2017).

**CPO.** CPO measure was derived from the study by Pierce, Jussila, and Li (2017). It was originally used in the organizational context, for example, to examine implications of the notion of possession for an organization and then extended to other areas, like family business (Rantanen & Jussila, 2011), domestic products (Gineikiene et al., 2017), and cars (Paundra et al., 2017). The CPO construct consisted of 4 items, measured with the reversed 7-point Likert type scale (1 = *strongly disagree*, 7 = *strongly agree*, Cronbach's  $\alpha = 0.90$ ). All of these items were adjusted to represent a notion of possession over a private car. The four items were: 1) "We (my family and I) collectively feel that this car belongs to US together," 2) "We (my family and I) collectively agree that this is OUR car," 3) "All of the family members feel as though we own this car collectively," and 4) "We (my family and I) feel a high degree of collective (family) ownership for this car."

## Results

Repeated measures analyses were conducted to test our hypotheses. In our analysis, CPO was mean-centered to support the interpretation.

**Table 6. Multivariate MANOVA**

Variable	Intention to select subscribed car	
	F-test	p
Safety systems	6.828	.010
Safety systems * Self-driving	5.174	.024
Safety systems * Mileage	.325	.569
Safety systems * Price	5.076	.025
Safety systems * CPO	4.516	.035
Safety systems * Self-driving * Mileage	.025	.875
Safety systems * Self-driving * Price	.001	.976
Safety systems * Self-driving * CPO	2.557	.111
Safety systems * Mileage * Price	.293	.589
Safety systems * Mileage * CPO	.830	.363
Safety systems * Price * CPO	.503	.479

### Correlation analysis

Our manipulations had significant correlation coefficients with intention to select a subscription car without safety systems, except for mileage limitation. Meanwhile, for intention to select a subscription car with safety systems, our manipulations were also significant except for self-driving capability. CPO was not correlated with intention to select a subscription car. Table 5 presents the results of the correlation analysis.

### Hypotheses testing

We conducted a repeated-measure MANOVA to analyze the significance of these abovementioned features and the moderating influence of CPO on the intention to select a subscription car.

**Multivariate testing.** Table 6 shows the multivariate effect of safety systems, our within-subject factor, on the combined characteristics of a subscription car. The result was significant ( $F(1, 246) = 6.828, p = 0.010$ ). There were also significant interactions between safety and self-driving feature ( $F(1, 246) = 5.174, p = .024$ ), safety and price feature ( $F(1, 246) = 5.076, p = .025$ ), as well as safety and CPO ( $F(1, 246) =$

$4.516, p = .035$ ).

**Univariate testing.** We then followed the multivariate results with testing the car features and CPO at the average value of dependent variable—hence, by taking the average of before and after the manipulation of safety systems. Table 7 presents the ANOVA for the between-subject factors and CPO. We found that all of our manipulation factors—self-driving ( $F(1, 246) = 4.396, p = .037$ ), mileage ( $F(1, 246) = 5.737, p = .017$ ), and price ( $F(1, 246) = 9.053, p = .003$ )—had significant influence on intention to select a subscription car. The results also suggested that CPO did not have a significant main effect on intention to select a subscription car ( $F(1, 246) = .519, p = .472$ ). Instead, CPO moderated the influence of self-driving feature on intention to select a subscription car ( $F(1, 246) = 4.131, p = .043$ ). Meanwhile, the moderating influence of CPO was not significant for price and mileage features.

We also tested each stage of the experiment separately (before and after the added safety systems feature), as shown in Table 8. We found that traditional car features such as price (without safety systems:  $F(1,246) = 12.605, p = .000$  and with safety systems:  $F(1,246) = 4.040, p = .045$ ) and mileage limit (without safety systems:  $F(1,246) = 4.164, p = .042$  and with safety systems:  $F(1,246) = 6.643, p = .010$ )

**Table 7. Univariate ANOVA**

Variable	Intention to select a subscription car based on the average of with and without safety systems	
	F-test	P
Intercept	.002	.996
Self-driving	4.396	.037**
Mileage	5.737	.017**
Price	9.053	.003***
CPO	.519	.472
Self-driving * Mileage	.783	.377
Self-driving * Price	1.998	.159
Self-driving * CPO	4.131	.043**
Mileage * Price	2.069	.152
Mileage * CPO	.617	.433
Price * CPO	1.447	.230

Note: \*  $p < .10$ , \*\*  $p < .05$ , \*\*\*  $p < .01$ .

consistently had significant influence on intention to select subscription cars. Meanwhile, the upcoming feature of self-driving capability had significant influence only on intention to select subscription cars without safety systems ( $F(1,246) = 8.509$ ,  $p = .004$ ), but not with safety systems ( $F(1,246) = 1.545$ ,  $p = .215$ ). We observed the significant moderating influence of CPO on self-driving capability on intention to select subscription cars without safety systems ( $F(1,246) = 5.851$ ,  $p = .016$ ). Overall, we again found that CPO only had significant moderating influence on upcoming features, but not on traditional features.

## Discussion

In this study, our goals were threefold. First, we wanted to investigate the moderating role of collective psychological disposition on ownership. We found evidence for the significant moderating influence of CPO, albeit not for all car features. Second, our study furthered the investigation of sharing economy-based transportation services. Car subscription services are still relatively new access-based approach to transportation that is only available in few locations, especially in comparison to more popular services such as ridesharing or carsharing. Having understanding of people's

interest on this car subscription service will enable future investigation and implementation of this service. Third, we provided support for previously investigated car features (price and mileage limitations) as well as upcoming car features (self-driving capability and safety systems).

## Scientific relevance

Our findings support the investigation of the role of ownership in transportation choices, especially when considering the sharing economy-based transportation services. To our knowledge, this is the first study to investigate CPO in the sharing economy transportation context. It extended previous finding that suggest the moderating influence of IPO on car features on intention to select a shared vehicle (Paundra et al., 2017). Beyond individual sense of ownership, collective sense of ownership also played a determining role in people's perception of car attributes. Interestingly, the influence was different. While in Paundra et al. (2017) IPO influenced traditional car features (i.e., price), in this study we found that the influence of CPO was more prominent for upcoming car features (i.e., safety systems and self-driving capability). That is, people with high CPO have a higher intention to select a subscription car when it is

**Table 8. Univariate ANOVA**

Variable	Intention to select subscription car without safety systems		Intention to select subscription car with safety systems	
	F-test	p	F-test	p
Intercept	8.059	.005***	5.839	.016**
Self-driving	8.509	.004***	1.545	.215
Mileage	4.164	.042**	6.643	.010***
Price	12.605	.000***	4.040	.045**
CPO	2.500	.115	.000	.989
Self-driving * Mileage	.572	.450	.523	.470
Self-driving * Price	1.858	.174	1.505	.221
Self-driving * CPO	5.851	.016**	1.988	.160
Mileage * Price	.539	.464	1.479	.225
Mileage * CPO	.838	.361	.127	.722
Price * CPO	1.902	.169	1.117	.292
R-Squared	.088		.045	

Note: \*  $p < .10$ , \*\*  $p < .05$ , \*\*\*  $p < .01$ .

equipped with advance safety systems and when it has self-driving capability. These two features suggested a certain collectivistic aspect inasmuch as safety systems give users the sense of protection for them and their group, while self-driving capability enhances users' ability to interact with their group in the vehicle.

In addition, our study builds upon extant research that investigates traditional features, price (e.g., Lamberton & Rose, 2012; De Luca & Di Pace, 2015) and mileage limitations, and their influence on intention to select sharing economy transportation services. Mileage limitations are a relatively under-investigate feature in the sharing economy context as popular services are mainly serving single trip, instead of monthly. Nevertheless, such limitations resemble driving range limitation in electric vehicle context (Franke & Krems, 2013). People's inability to specifically predict their range of needs might detract individuals from using car subscription services with low mileage limitations. We observed similar findings in our analysis whereby unlimited mileage led to a higher intention to use car subscription services. Our study also explores the upcoming car features and how these features influence intention to use subscription car services. To this end, our study opens up interesting topics that will be of

interest for urban areas and cities alike. Therefore, there is a need to consider both the technical feature as well as the psychological component of such features.

### Practical relevance

From a societal perspective, our study shows the potential introduction of novel car subscription services into society. Hence, auto manufacturers and car rental companies might benefit from considering this business model. Moreover, this arrangement is more sustainable as people can flexibly change their vehicle to cater to their needs, instead of relying only on a single vehicle. Insofar as people have diverse needs at different times, this flexibility will increase utilization of vehicles over their lifetime. We nevertheless observed that this preference will depend on price, mileage limitations, self-driving capability, and safety systems. Car subscription service providers need to ensure that their pricing strategy as well as their mileage limit offering attractive for potential consumers. In the future, they will also need to consider added features. For urban areas, subscription car services can be a dual-edge sword; one that enables people to quickly change their vehicles enabling them to have the

most recent technology and more efficient cars, but another that potentially increase the number of vehicles on the road as cars become more accessible to many. Policy needs to be built to cater to this new service.

More importantly, from a societal perspective, the influence of psychological disposition should be considered when developing policies and business models. CPO toward a car influences consumers' evaluation of car features which impacted their intention to select subscription cars. Policy makers and companies should consider this psychological disposition. Consumers are impacted by their perception of collective ownership and policy makers in urban area can develop such collectivistic ownership to improve the overall transportation systems in the city. Companies can tailor their marketing approach and promotion to account for collective ownership.

### Limitation and future research

Based on this study, there are several potential outlets for future research. First, our study only considered four car features, which might be a limited set of features when one considers purchasing or using a car. Future research can complement this study by using conjoint experiment to find out whether particular car features are of interest and complement the conjoint experiment with CPO. It is not our goal to exhaustively investigate car features and their link to consumers' intention to use car subscription services, but instead we were interested in confirming previously research features, as well as exploring new features. It will also be interesting to conduct this experiment in a longitudinal manner, in which we investigate the change in consumers' CPO toward their car over time as well as their willingness to use alternative services. The collective aspect of the construct also highlights the need to investigate whether people within a group (e.g., in one family) have similar levels of collective ownership. This highlighted some interesting theoretical and practical issues, as differences in psychological attachment in one family might partially explain why family members prefer or use different type of transportation modes. Car subscription services as a transportation mode option can also be one

interesting future study. Because this service is relatively new, it might be interesting to follow the introduction and growth of such companies in a particular locality. Nevertheless, our current study presented some insights that are of importance for urban society. Further, as we investigate upcoming car features, it would be of interest to re-test this study at later time when self-driving capabilities and car subscription services have been introduced. In that way, we could test consumers' perception of these features before and after they experienced them. This study could not incorporate such a temporal dimension, although we made use of within-subject design to mirror such situation for the advance safety systems. Future study should consider using longitudinal study to verify our within-subject manipulation approach.

### Conclusion

Access-based consumption enables transportation companies to introduce various transportation services that cater to commuters' diverse needs. Car subscription services, for example, allow consumers full-service access to cars on a monthly basis with the flexibility of changing car types. Our study shows that when considering this access-based type of consumption as alternative to owning a vehicle, one should account for the collective psychological sense of ownership. That is, CPO plays a key role in determining how consumers evaluate car subscription services. We posit that CPO is an important factor, especially for upcoming car features of advanced safety systems and self-driving capability that influences intention to use car subscription services. Coupled with the fact that significant influence of traditional features such as price and mileage limitations, we argue that to successfully introduce car subscription services, one must account for people's collective sense of ownership. Overall, our study points to the importance of investigating psychological disposition when considering transportation choices and how they will impact urban transportation.

### Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the authorship and/or publication of this article.

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