



# Ridesharing platform entry effects on ownership-based consumption in Indonesia

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## ABSTRACT

Ridesharing platforms are often discussed in connection with their positive environmental impact — an assumption rooted in the idea that access-based consumption reduces traditional vehicle ownership. However, evidence in support of this claim is inconsistent. The present paper maintains that the environmental impact of ridesharing platforms must be understood in terms of an interplay of access-based and ownership-based consumption mechanisms. The results of a multimethod investigation in the context of Indonesia show that the presence of informal motorcycle taxis at the time of initial platform entry led to an ‘access-replaces-ownership’ effect. At later entries, the limited availability of informal car taxis, coupled with the changing competitive ridesharing landscape, created an ‘access-induced ownership’ effect. Ridesharing platform entries thus at first had a positive environmental impact, but in later stages produced a negative overall environmental impact. The societal and practical implications of the findings for policy-makers oriented towards environmental sustainability are addressed.

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## 1. Introduction

A growing literature discusses the positive impact of sharing economy platforms on a wide range of societal, economic and environmental issues. Positive effects are primarily documented for societal aspects of sharing economy platforms (Pavlou and Gefen, 2004; Albinsson and Perera, 2012; Fraiberger and Sundararajan, 2017; Greenwood and Wattal, 2017; Li et al., 2017). Matters are less straightforward, however, for the impact of such platforms on economic and environmental issues (Martin et al., 2017; Ma et al., 2018; Retamal, 2017; Ciulli and Kolk, 2019; Geissinger et al., 2019). Sharing economy platforms are grounded in the economic principle of underused assets — i.e., forms of consumer behavior, in which people exchange — and get access to — goods and services they use infrequently (cf., Belk, 2014). Scholars typically argue that this access-based aspect of sharing economy platforms accounts for the positive contribution to the environment. That is, the platform

replaces the need to purchase under-utilized durable products, which reduces the amount of resources required to produce them (Botsman and Rogers, 2010; Hamari et al., 2016).

In the specific case of ridesharing platforms, the evidence in support of this claim is largely inconsistent. In North America, the arrival of sharing transportation services indeed reduced the need to own private vehicles, and caused a decrease in car sales (Rayle et al., 2014). However, this access-based consumption pattern is at odds with what happened in China. In China, the introduction of ridesharing platforms increased new vehicle purchases (Gong et al., 2017; Guo et al., 2018). This contradictory evidence seems to suggest that the positive relationship between access-based consumption and environmental impact does not universally apply. It begs into question, which ridesharing platform entry effects account for the emergence of an access-based or ownership-based consumption pattern, and under what conditions either mechanism is set in motion. It is important to find answers to these questions, because they offer important insights into the circumstances under which ridesharing platforms may produce an environmentally beneficial (access-based) rather than a detrimental (ownership-based) effect.

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The incompatible findings for the consequences of ridesharing platforms on society and environment may be due to the difference between developed and developing countries. Ridesharing platform entries are differently perceived and presented in the news media of different countries (Yuana et al., 2019). They trigger different attitudes and responses from the public at large, traditional transportation service providers, and local authorities. Retamal (2017) suggested that sharing economy platforms in the developed countries are perceived as an enabler for access-based consumption away from traditional ownership, yet considered first access for new consumers with the promise of future ownership in developing countries. Platforms in developing countries enable consumers to “leverage [their] lifestyles beyond individual possibilities” (Belk, 2014, p.134) by providing access to products they previously could not afford. In view of these differences, it is surprising that extant studies of sharing economy platforms thus far mainly focused on developed countries (e.g., Hamari et al., 2016), and incidentally looked into developing countries (e.g., Ma et al., 2018).

The aim of the present study is, therefore, to explore the role of local conditions on the impact of ridesharing entries on ownership-based consumption in Indonesia. Indonesia, a developing country, is the fourth most populous country in the world, the world's 10th largest economy based on purchasing power parity, and a member of the G-20 (World Bank, 2019). In Indonesia, three major ridesharing platforms entered the national market within a relatively close timespan, with two different services in different geographic areas, leading to an oligopolistic market structure. This case allows for exploration of the complex set of local conditions that potentially play a role in the entries of ridesharing platforms, in accordance with the suggestion of Xiao et al. (2013). For research into ICT-related innovation phenomena in developing countries, they categorize local conditions into technological, societal, and environmental categories. The Indonesia case further enables deeper understanding of the complexity of ridesharing platform entries' impact to incumbent business models of product ownership. By means of a multimethod approach — i.e., a combination of qualitative and quantitative methodologies — the case of ridesharing platform entries in Indonesia will be reconstructed qualitatively, and analyzed quantitatively using the difference-in-difference approach employed in the platforms-oriented marketing domain (cf., Chevalier and Mayzlin, 2006).

The remainder of this paper is structured as follows: Section 2 discusses existing research on ridesharing platforms. In Section 3, the multimethod approach of the present study is introduced. The case of ridesharing platform entries in Indonesia is reconstructed, and in great detail examined in quantitative analysis in Section 4. Finally, the findings are discussed in Section 5.

## 2. Theoretical background

### 2.1. Sharing economy platforms and durable goods purchases

The emergence of sharing economy platforms has spurred research interest in recent years (e.g., Sundararajan, 2016; Kenney and Zysman, 2016; Zervas et al., 2017; Clemons et al., 2017; Paundra et al., 2017; Ciulli and Kolk, 2019). Sharing economy platforms change the way products and services are consumed in various industries (Gawer, 2009; Ma et al., 2018) by offering consumption mechanisms based on access rather than ownership (Belk, 2014; Clemons et al., 2017; Bardhi and Eckhardt, 2017). Sharing economy platforms are thought to empower social inclusion (Mäkinen, 2006), enable people to improve their lifestyle (Belk, 2007), and facilitate economic transactions by increasing trust between buyers and suppliers (Albinsson and Perera, 2012;

Einav et al., 2016). They do so by serving as intermediaries that reduce search costs (Bakos, 1997), facilitate access-based consumption (Horton and Zeckhauser, 2016), and enable efficient use of durable goods (Schor, 2016).

By enabling a more efficient use of underutilized assets and durable goods, sharing platforms reduce the need to produce these goods (Ciulli and Kolk, 2019; Geissinger et al., 2019). Various studies therefore assume that sharing economy platforms positively contribute to the environment (Botsman and Rogers, 2010; Heinrichs, 2013; Hamari et al., 2016; Li et al., 2019). However, the claimed favorable environmental contribution is sometimes at angle with empirical reality (Frenken and Schor, 2017; Retamal, 2017). In transportation, for instance, the option to access rather than possess vehicles may lead to increased mobility, which potentially nullifies the environmental benefits theoretically associated with the use of sharing economy services — a phenomenon that has been denoted as the *boomerang effect* (Murillo et al., 2017). As such, the environmental contribution of sharing economy platforms may not be as easily determined as previously suggested.

Retamal (2017) proposed six criteria to assess the environmental impact of sharing economy activity: (i) the use of durable, quality goods, (ii) the intensified use of goods, (iii) the enabling of repair, take back and recycling, (iv) the insurance that rental replaces product purchase, (v) the minimization of commodity transport, and (vi) the reduction of private vehicle kilometers travelled. According to Retamal (2017), the effectiveness of access-based consumption as a replacement for product purchase (the fourth criterion) is the least understood. If access-based consumption can replace ownership-based consumption — and as such prevent hyperconsumption — it will indeed have a positive environmental contribution. If it instead induces ownership-based consumption, it will have a negative environmental impact.

Previous studies have advanced at least four potential changes in the attitudes towards the procurement and consumption of durable assets in response to sharing economy platform entry: cannibalization, value enhancement, equalization and participation. Fig. 1 describes these effects dependent on the contingencies between platform presence and ownership of durables.

First, the cannibalization effect refers to the detraction of consumers away from purchase towards rental as result of platform entry (Jiang and Tian, 2018). This implies that ownership-based consumption is replaced by access-based consumption (Retamal, 2017). Second, the value enhancement effect means that durable product purchases increase due to the entry of sharing platforms (Razeghian and Weber, 2018; Matzler et al., 2015; Benjaafar et al., 2018). This increase may be explained by the enhanced opportunities for owners of durable assets to offset their ownership cost by revenues from renting out their assets. Would-be suppliers then have an incentive to invest in durable goods — i.e., engagement with the platform should generate income. The value-enhancement effect thus implies that platform entry induces ownership-based consumption. Third, the participation effect pertains to the access to services of durable goods by non-owners as a consequence of platform entry (Abhishek et al., 2018). The participation effect does not directly influence durable products purchases, as it relates to non-owners joining as consumers of platform-based services. But indirectly, it incentivizes prospective suppliers to engage in durable goods purchases through an enhanced value proposition associated with platform entry. Finally, an equalizing effect occurs if platform entry reduces the difference in willingness to pay for durables between heavy users and mild consumers of associated services (Abhishek et al., 2018). Specifically, the impact of platform entry on durable product purchases will be small if some heavy users choose not to procure the durable product as they can use the sharing service. Yet, an equal

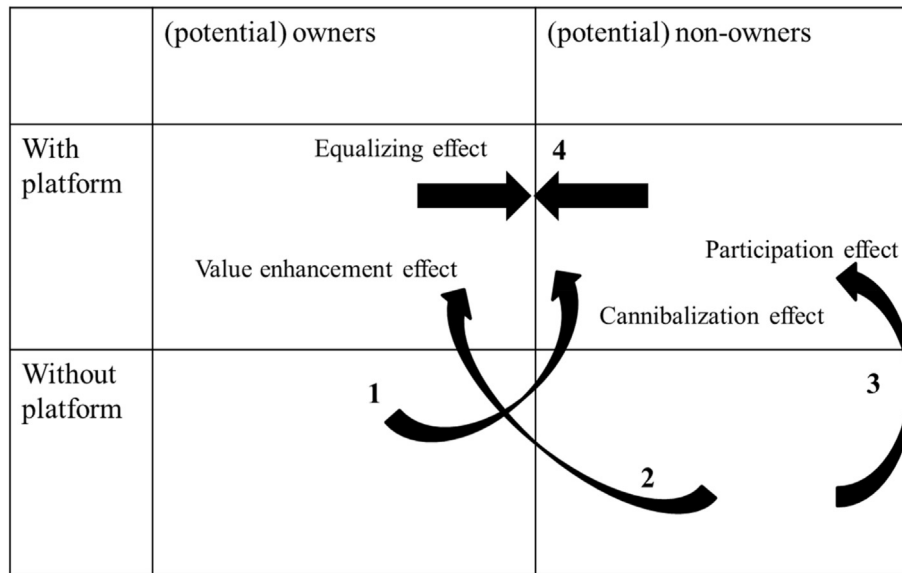


Fig. 1. Portrayal of four potential effects of sharing economy platform entry on durable products purchase.

proportion of mild consumers will buy the products and offer their asset on the sharing platform. Overall, the existence of varying responses to platform entry implies that different effects on durable goods purchases may result depending on the heterogeneous reactions and perceptions of the stakeholders involved, especially consumers and suppliers.

## 2.2. Ridesharing platforms entries

Sharing-economy platforms impact the transportation sector by offering new mobility services (Cohen and Kietzmann, 2014; Kahlen et al., 2018) and enabling access to mobility without ownership (Martin et al., 2010; Schaefer et al., 2016). Ridesharing platforms are present all over the world with a potential market size of USD 285 billion by 2030 (Goldman Sachs, 2017). Examples include Uber in the U.S. and in various European countries, Didi in China, Ola in India, and Grab in various South-East-Asian countries. In some cases, these platforms have positive societal externalities, such as the improvement of the labor market (Li et al., 2018), and the reduction of accidents due to drunk-driving (Greenwood and Wattal, 2017).

The impact of ridesharing platforms on society and incumbent businesses is arguably dependent on the contextual characteristics (cf., Yuana et al., 2019; Retamal, 2017). Extant research has considered a variety of characteristics, such as user heterogeneity (Abhishek et al., 2018), cost of ownership (Benjaafar et al., 2018), social characteristics (Fraiberger and Sundararajan, 2017), and product features (Weber, 2016). As such, these characteristics should be systematically considered in order to gain a realistic view of ridesharing platform entry effects. The present study combines the identified platform effects in Fig. 1 with the conditioning factors identified by Xiao et al. (2013) as technological, environmental, and social-related. Technological factors relate to the information and communication technology (ICT) infrastructure and capabilities of organizations. Environmental factors pertain to policy, regulation, and market conditions that impact people's responses to platform introductions. Social factors refer to user behavior (as individual consumers of offline and online products and services), managerial behavior as well as corporate behavior within the broader organizational setting. Fig. 2 visualizes the moderating influence of these

factors on the effect of platform entry on durable good purchase decisions.

From the suppliers' perspective, ridesharing platforms can be attractive as they may reduce search costs (Bakos, 1997), and enable efficient exploitation of durable goods (Schor, 2016). If suppliers already invested in vehicles, they would have an incentive to join the platform. The presence of multiple platforms (a technology-related factor) may further entice suppliers to offer their assets for access-based consumption. Prospective suppliers may postpone investments, and join the platform until operating and demand conditions of platforms are sufficiently attractive (an environment-related factor). For current and potential consumers, the presence of ridesharing platforms facilitates access-based consumption (a social factor), see also (Horton and Zeckhauser, 2016). For some consumers, the presence of ridesharing platforms will allow them to either delay or even completely cancel their initially contemplated vehicle purchase. Obviously, such decisions will depend on the attractiveness of ridesharing platforms, as well as on the availability of other transportation services (environment-related factors). If ridesharing services are widely available and cheap, consumers may opt for delaying purchases or not investing in new vehicles. Otherwise, they may choose to continue investing in new vehicles. Note that these behavioral responses also illustrate how individual users may deal with ridesharing platforms. This focus on the individual user of ICT innovation (as a social factor) in developing countries is sparse in the literature, but highly recommended (Xiao et al., 2013).

Previous studies of ridesharing platform entry in different countries provided evidence of the existence of both cannibalization effects (access replaces ownership) and value enhancement effects (access induces ownership). For instance, Gong et al. (2017), studying the influence of Uber's entry in China between 2010 and 2015, found an average of eight percent increase in new car sales, while Guo et al. (2018) who investigated Didi's entry in 51 cities in China in 2015, observed that platform entry was associated with around four percent increase in new vehicle sales. These findings are consistent with a value enhancement effect. However, work by Rayle et al. (2014) in North America suggests that sharing economy transportation services led users to reduce private vehicle ownership, consistent with a cannibalization effect. These conflicting

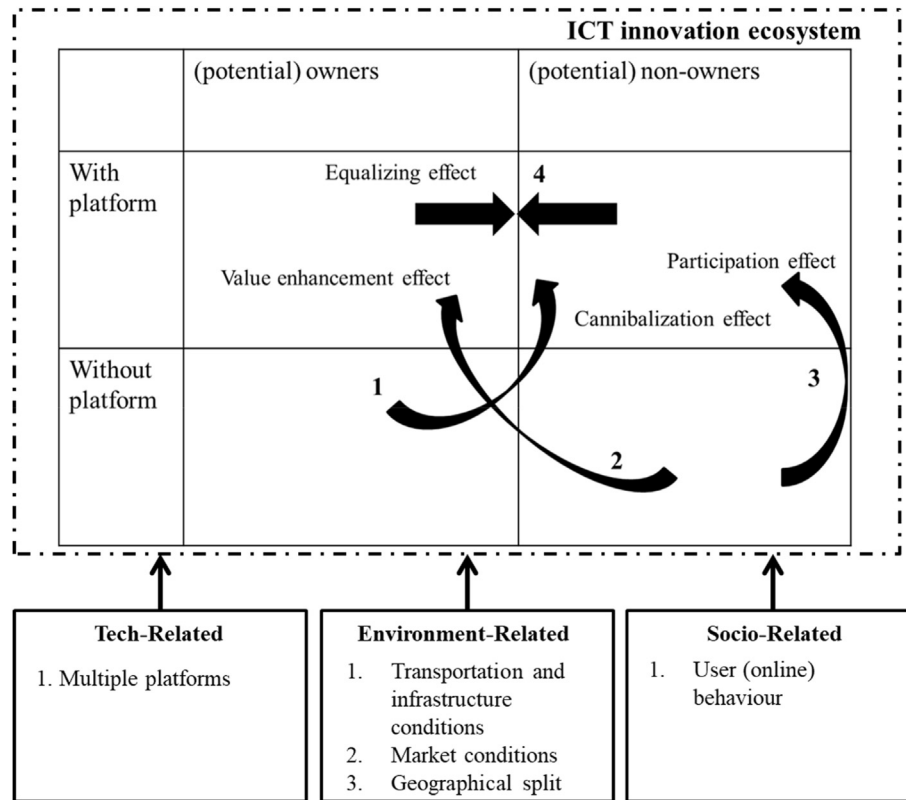


Fig. 2. Potential effects of ridesharing platform entry on new vehicle registrations considering three categories of local factors.

findings exemplify the case that users and suppliers in different locations respond differently to ridesharing platform entries (cf., Yuana et al., 2019). This present study investigates the *access-replaces-ownership* (cannibalization) versus *access-induces-ownership* (value enhancement) argument in the case of Indonesia, while considering the moderating effect of local characteristics on the impact of ridesharing entries on new vehicle ownership.

### 3. Data and methods

A longitudinal case study of Indonesian ridesharing platform entries is conducted through qualitative and quantitative analysis to gain insight into the effects of platform entry on durable products purchase subject to local conditions. The qualitative analysis is performed to identify the technological, environmental, and social factors that moderate platform entry effects in the context of Indonesia. The subsequent quantitative analysis is performed to substantiate the precise nature and extent of the qualitative findings.

#### 3.1. Qualitative data collection

The qualitative analysis involves a review of various sources to reconstruct relevant local conditions in Indonesia in the periods prior, during and after the entries of three major ridesharing platforms. First, all news articles on the CNN Indonesia website ([www.cnnindonesia.com](http://www.cnnindonesia.com)) from January 1, 2015 (the time of first entry of ridesharing platforms in Indonesia) to December 31, 2017 related to ridesharing platforms were browsed, using the search terms “Gojek”, “Grab”, and “Uber”. These terms refer to the three largest ridesharing platforms in Indonesia at the time of the study — with 56%, 33%, and 8% market shares (EcommerceIQ, 2018). Second, academic and

applied research publications about the state of transportation infrastructure, ridesharing platforms, and commuting habits in Indonesia were collected to explore local conditions. Together, these qualitative sources gave a rich understanding of how the three ridesharing platforms were received in Indonesia.

#### 3.2. New vehicle registration data

For the quantitative analysis, monthly new vehicle registrations data were collected for seven provinces in Indonesia — Greater Jakarta, East Java, Central Java, West Java, North Sumatera, South Sumatera, and Riau — between January 2013 and December 2017. They were obtained from the Korps Lalu Lintas Polisi Republik Indonesia (Indonesian Traffic Police; <http://www.rckorlantaspolri.id/>). The data include new motorcycle and new car registrations, but exclude other types of registrations, such as change of ownership, validation and extension of vehicle registration certificate, change of address, change of plate number, modifications, duplication of vehicle title, or incoming and outgoing registration of vehicle from other provinces.

#### 3.3. Description of variables

##### 3.3.1. Dependent variable

The dependent variable of this study is the natural logarithm of the monthly number of new vehicle registrations (cf., Guo et al., 2018; Gong et al., 2017) in a particular province  $i$  at the month  $t$ ,  $\ln Reg_{it}$ .

##### 3.3.2. Independent variables

Two types of independent variables were considered. The first pertains to the entry of motorcycle and car ridesharing platforms in



**Table 1**  
Entry of different ridesharing services in six major provinces in Indonesia.

Provinces	Gojek	Grab	Uber
<i>Entry date of motorcycle ridesharing service</i>			
Greater Jakarta	07-Jan-15	20-May-15	13-Apr-16
West Java	13-Apr-15	01-Feb-17	01-Nov-16
Central Java	16-Nov-15	26-May-17	
East Java	08-Jun-15	13-Mar-17	01-Nov-16
North Sumatera	15-Nov-15	14-Aug-17	
South Sumatera	15-Nov-15	22-Jun-17	
Riau	17-Apr-17		
<i>Entry date of car ridesharing service</i>			
Greater Jakarta	19-Apr-16	09-Aug-15	30-Jan-15
West Java	29-Jun-16	22-Jun-16	31-May-15
Central Java	30-Jun-16	21-Feb-17	18-Apr-17
East Java	17-May-16	11-May-16	18-Jan-16
North Sumatera	20-Jun-16	20-Sep-16	12-Apr-17
South Sumatera	14-Oct-16	22-Jun-17	26-Apr-17
Riau	09-Jun-17	17-Jul-17	12-May-17

Indonesia. The entry dates of these services were gathered from various sources, including company social media accounts (e.g., Twitter and Instagram) and news reports. The entries of the three ridesharing platforms for motorcycles and cars occur at different times; see Table 1. Indicator variables  $First_{it}$ ,  $Second_{it}$ ,  $Third_{it}$ ,  $Fourth_{it}$ ,  $Fifth_{it}$  and  $Sixth_{it}$  represent if a ridesharing platform entry of a particular order occurred in province  $i$  in month  $t$ .

Second, user online behavior is measured by means of Google Trends search volume indices for each ridesharing platform and province. The general public's interest in a particular topic is assumed to be reflected by online search volumes, where a higher search volume suggests a greater interest (Choi and Varian, 2012; Wallsten, 2015; Li et al., 2018). The search volume indices are collected through R's *gtrendsR* package (Massicotte and Eddebuettel, 2018). As search keys, the platform names, 'Gojek', 'Grab', and 'Uber', are used for each of the seven Indonesian provinces, between January 2013 and December 2017. The resulting indices are denoted as  $Google (Gojek)_{it}$  ( $M = 15.0$ ,  $SD = 22.6$ ),  $Google (Grab)_{it}$  ( $M = 7.5$ ,  $SD = 14.1$ ), and  $Google (Uber)_{it}$  ( $M = 5.4$ ,  $SD = 8.0$ ); index values below 1 were given a numerical value of 0.5.

### 3.3.3. Control variables

At the province level, the annual unemployment rate, the natural logarithm of the gross domestic product (GDP) per capita, and the natural logarithm of the annual population size (in millions) are considered as control variables. This information was obtained from Badan Pusat Statistik (BPS; the Indonesian Statistics Bureau). At the country level, the relative fuel price difference with respect to the fuel price in January 2013 is used. This was taken from public announcements in the national newspapers. The fuel price in Indonesia is administered by the government and communicated via the national newspapers. Fuel prices varied from IDR 4500 (approximately 0.31 U.S. Dollar<sup>1</sup>) per liter before June 2013 to IDR 8500 (approximately 0.59 U.S. Dollar) per liter in November 2014. The latest fuel price administered by the government is at IDR 6500 (approximately 0.45 U.S. Dollar) per liter, which has taken effect since April 2016. Table 2 summarizes the descriptive statistics of the mentioned control variables and the dependent variable.

<sup>1</sup> One USD is equal to 14,350 IDR based on the mid-market value of IDR against USD at July 11, 2018.

**Table 2**  
Mean, standard deviation, and correlation coefficients of the available variables.

Variables	Mean	SD	1	2	3	4
1 LnReg	10.53	0.83	—			
2 LnPopulation	2.85	0.76	.52***	—		
3 LnIncome	3.92	0.66	.12***	-.64***	—	
4 Unemployment rate	5.97	1.81	.58***	.12***	.19***	—
5 Fuel price changed	43.20	17.3	-.00	.01	.07	.00

Note: \* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .

## 4. Case study: ridesharing platform entries in Indonesia

### 4.1. Qualitative analysis

#### 4.1.1. Environmental factor: Indonesian transportation sector and informal transit

The urban transportation network in Indonesia lacks an adequate transportation infrastructure due to low investment levels (Asian Development Bank, 2016). The Indonesian road infrastructure ranks 14 in length worldwide with 496,607 km road in total, but contains around 42% of unpaved road surfaces (CIA World Factbook, 2018). In 2012, the road density in Indonesia was 21 km per 100 sq. km, which is lower than in neighboring countries, such as Malaysia, Thailand, and the Philippines. Meanwhile, only 4816 km of railways were operational in 2014 (CIA World Factbook, 2018). Public transportation in Indonesia mainly consists of bus rapid transit, bus, minibus, van, and other forms of informal transit.<sup>2</sup> Althoff et al. (2017) report that people in Indonesia walk on average 3513 steps per day, the least among the 46 countries they studied.

The combination of inadequate public transportation services, road infrastructure, and low walking habits means that commuters in Indonesia heavily rely on private transportation, especially motorcycles. In 2016, more than 105 million motorcycles and 14 million cars were registered in Indonesia (Badan Pusat Statistik, 2018). Indonesians without access to private vehicles rely on taxi services, informal car service, or the 'ojek' (informal motorcycle taxi) — the most popular transportation service in the country. Ojek has been available in Indonesia since 1969. The service was at first offered using a bicycle, but was in later years replaced by the motorcycle (Fauziah, 2017). Since 1979, ojek flourished as an alternative transportation mode in Jakarta and other provinces, even though the service was never officially regulated.

#### 4.1.2. Technological and social factors: ridesharing platforms in Indonesia

The presence of ridesharing platforms in Indonesia started with the introduction of motorcycle ridesharing services by Gojek, a local ridesharing company in January 2015. Two other major ridesharing platforms, the Singapore-based Grab, and Uber, followed suit. Each of these platforms introduced motorcycle and car ridesharing services in the months following their entry. The introduction of ridesharing services started in Jakarta, and was later established in other provinces. In the three years after initial entry, ridesharing services were present in seven of the ten largest provinces in Indonesia. The initial platform entry mainly corresponds to Gojek's motorcycle ridesharing services; the second entry mainly concurs with Uber's and Gojek's car

<sup>2</sup> Indonesia has no rail-based mass rapid transit, unlike neighboring countries. Examples include Singapore mass rapid transit (MRT) that started in 1987, Kuala Lumpur Rapid Rail in 1996, and Bangkok MRT in 2004. Jakarta MRT only became operational in 2019.

ridesharing services. Grab typically entered later than the other platforms.

Right after the introduction of Gojek's motorcycle ridesharing services, many joined the platform as suppliers. The majority of Gojek's drivers, 33%, were former ojek drivers (Primaldhi and Rakhmani, 2017), others were housewives, university students, and employees in private sectors (<http://metrotvnews.com/>; [Metrotvnews.com](http://metrotvnews.com), 2015). These drivers were attracted by the flexibility of the work schedule and the incentives, that could reach up to IDR 200 thousand a day (around 2.5 times the minimum wage in Indonesia).<sup>3</sup> A huge influx of motorcycle drivers was observed during the early period of platform entry (Yuana et al., 2019). By contrast, only few informal car transport services were offered when car ridesharing platforms entered. Many of these drivers did not own vehicles prior to their platform engagement, as 72% of them took a loan for car purchases following platform entry (Primaldhi and Rakhmani, 2017). This may be interpreted as a value enhancement effect.

The presence of three ridesharing platforms in Indonesia (a technological factor) meant that these platforms entered into a competitive market that required them to give attractive offers to suppliers and consumers. Between January 2015 and December 2017, each of the platforms offered incentives and promotions to suppliers and consumers, which created fierce price competition especially in the early period of (their) entry. For instance, in August 2015, Grab temporarily provided a promotional motorcycle ride-sharing service tariff of IDR 5000 per trip versus IDR 15000 per trip by Gojek, attracting consumers to use the service. For suppliers, these platforms provided a competitive incentive together with other perks, such as full insurance coverage. Traditional ojek drivers thus had ample opportunity to benefit from the new market situation — given that they did not need to invest in vehicles to join these platforms.

The change in consumer behavior in favor of these ridesharing services (a social factor) caused clashes between ridesharing platforms and traditional (informal) transportation service providers. For example, taxi drivers, traditional ojek drivers, and other transportation service providers faced the impact of platform entry on their businesses, causing them to engage in protests and illegal sweepings throughout the 2015–2017 period. The situation forced the government to regulate ridesharing platforms. A summary of the events related to platform entry in Indonesia is in Table 3.<sup>4</sup>

#### 4.1.3. Summary of findings

Table 4 summarizes the main characteristics of Indonesian transportation conditions and ridesharing platform development. The qualitative findings highlight factors related to ridesharing platforms entries in Indonesia. The lack of adequate transportation infrastructure in Indonesia (an environmental factor) set the scene during the pre-ridesharing platform entry period, whereby informal transportation suppliers became an integral part of the transportation system (cf., Kruse, 2016; Yuana et al., 2019). From the suppliers' side, traditional ojek drivers, who did not need to invest in new vehicles, joined these platforms and constituted a large portion of the initial suppliers of motorcycle ridesharing services. From the consumers' side, competition among multiple ridesharing platforms (a technological factor) led to promotional offerings from platforms at the start of their entries (cf., Li et al., 2019). This reduced the cost of ridesharing services for

consumers, which spurred the interest of consumers (a social factor), enabling them to delay new vehicle purchases. The combined impact of the presence of vehicle-owner suppliers and low service costs for consumers led to a potential delay in the purchase of new vehicles, causing a short-term reduction in new vehicle demand — i.e., a cannibalization effect.

Contrary to the large pool of ojek drivers, however, informal car drivers were few in Indonesia. Thus, people who wished to offer car ridesharing services via these platforms (the potential suppliers) were not informal car drivers who owned vehicles, but non-vehicle owners who invested in vehicles prior to joining the platform. Indeed, in the Indonesian case, the majority of these drivers invested in their own vehicles. Hence, following the platform entries, a higher demand for vehicles materialized among prospective drivers. From the consumers' side, the entry of car ridesharing platforms had a relatively small impact on the delay of new vehicle purchases. This was due to the fact that car ownership in Indonesia is relatively limited, and that informal car services are less widely used than the ojek. The combined impact indicates a potential increase in new vehicle demand associated with car ridesharing service entries, which corresponds with the value enhancement effect.

Overall, findings of the qualitative study suggest that both cannibalization and value enhancement effects moderate the effects of platform entry on durable goods purchases. The next subsection quantitatively validates these findings.

## 4.2. Quantitative analysis

Following the preliminary qualitative findings, this section presents the results of a difference-in-difference analysis aimed at quantifying the effects of platform entry, with a specific focus on cannibalization and value enhancement effects.

### 4.2.1. Difference-in-difference approach

The difference-in-difference approach mimics an experimental research design with observational data, by investigating the treatments in different locations at different times (Greenwood and Wattal, 2017). In this study, the change in the number of new vehicle registrations is compared before and after the entry of ridesharing platforms. The approach helps in making inferences about causal relationships between social phenomena (Bertrand et al., 2004), and has been commonly used in prior research of platform entries (e.g., Zervas et al., 2017; Greenwood and Wattal, 2017; Gong et al., 2017; Guo et al., 2018). The following specification is employed to examine the influence of platform entries on new vehicle registrations:

$$\begin{aligned} \ln \text{Reg}_{it} = & \text{Province}_i + \text{Month}_t + \sum_{n=1}^6 \beta_n d_{it}^n + \beta_7 \text{Google}(\text{Gojek})_{it} + \\ & \beta_8 \text{Google}(\text{Grab})_{it} + \beta_9 \text{Google}(\text{Uber})_{it} + \beta_{10} \ln \text{Population}_{it} \\ & + \beta_{11} \ln \text{Income}_{it} + \\ & \beta_{12} \text{unemployment}_{it} + \beta_{13} \text{fuelPriceChanged}_{it} + \theta_i t + \varepsilon_{it} \quad (1) \end{aligned}$$

Where  $\text{Province}_i$  and  $\text{Month}_t$  refer to fixed province and month of the year effects;  $d_{it}^n$  indicates the  $n$ th entry for province  $i$  at month  $t$ ,  $n = 1, \dots, 6$ ; the economic indicators,  $\ln \text{Population}_{it}$ ,  $\ln \text{Income}_{it}$ ,  $\text{unemployment}_{it}$ , and  $\text{fuelPriceChanged}_{it}$  represent control variables;  $\theta_i t$  refers to the effect of the linear time trend  $t$  of province  $i$ ; and  $\varepsilon_{it}$  is the independently-distributed error term with zero mean. The model is estimated by least squares; heteroskedasticity-consistent

<sup>3</sup> Indonesia minimum wage in 2015 is IDR 1,790,342 per month (roughly equal to IDR 89,500 per day) based on formal guideline of minimum wage by Indonesian Ministry of Manpower.

<sup>4</sup> A detailed timeline of events is available from the authors upon request.

**Table 3**  
Ridesharing platforms competition in Indonesia.

Category	Explanations
Customers	<i>Activities.</i> At the start of entries, platforms offered discounts, free rides, and low price promotion. In 2015, price started from IDR 5000 ( $\approx$ USD 0.33) per trip for motorcycle ridesharing service, but over time increased to between IDR 10,000 ( $\approx$ USD 0.67) and IDR 15,000 ( $\approx$ USD 1.00). Other promotion includes luxury car rides, and 100% availability of rides. Platform provided built-in chat service to ensure consumers' safety and privacy. <i>Results.</i> In the first six months after entry, Gojek managed to serve 1 million motorcycle rides. The number also continued to grow over time with Grab following in terms of the number of rides.
Suppliers	<i>Activities.</i> Recruitment of drivers occurred very rapidly at the start of the entry. Incentives were relatively high at the start but continue to decrease. For example, Gojek reduced drivers' incentives by 25% ten months after its very first entry. Platforms provided support to drivers. For instance, platform provided guidance for drivers during odd-even numbered restriction in Jakarta. Insurance was also given to drivers. <i>Results.</i> Drivers' recruitment was at one point stopped due to overwhelming response. Drivers' protest due to reduce incentives occur quite frequently during the course of the three-year period.
Regulators	<i>Activities.</i> Central government and local governments were involved in regulating car ridesharing services, which required platforms to comply with requirements pertaining to car condition, license, platform legal status, and insurance. Motorcycle ridesharing service remained an informal, unregulated service. <i>Results.</i> Protests by drivers and traditional transportation suppliers (e.g., ojek, taxi, and minivan drivers) to government occurred frequently in this period. Local governments implemented different policy on ridesharing services.
Third-parties	<i>Activities.</i> Protests from traditional ojek drivers, taxi drivers, and other informal transportation service providers occurred frequently in this period. Cooperation between platforms and other companies was established in this period. For example, Gojek cooperated with Transjakarta (Bus rapid transit operators in Jakarta) and Bluebird taxi company. Grab cooperated with Semarang-based Atlas Taxi, and with Singapore airline. Funding was obtained by platforms. <i>Results.</i> Conflicts between traditional transportation service providers and ridesharing suppliers occurred several times. Platforms cooperated with other companies to promote their services. New investment enabled platforms to continue its expansion and to attract consumers using price promotion.

Note: The information in this table is a summary of news articles published by CNN Indonesia ([www.cnnindonesia.com](http://www.cnnindonesia.com)) based on the search terms "Gojek", "Grab", and "Uber" in the period of January 1, 2015 to December 31, 2017.

**Table 4**  
Summary of Indonesian transportation and ridesharing platform development.

Category	Explanation
Infrastructure	Inadequate public transportation services and low density road network. Bus rapid transit service is only present in Jakarta.
Transportation modes	Significant portion of people use private vehicles. In Greater Jakarta, only 15% of commuters use public transportation ( <a href="http://kompas.com/">http://kompas.com/ Kompas.com, 2017</a> ).
Private vehicles	Approximately 105 million motorcycles and 14 million cars are in operation by 2016 (Badan Pusat Statistik, 2018).
Informal transportation	Informal transportation services are mainly comprised of ojek. To a limited extent there are also informal taxis, Bajaj, and minivans.
Ridesharing services development	Ridesharing services started from the introduction of Gojek's Go-Ride service (Motorcycle) in January 2015. In the period of 2015–2017, there were three major ridesharing services: Gojek, Grab, and Uber. Uber started with the UberX services also in January 2015, and only later on with UberMotor. Grab started as taxi-sharing service and started with Grabbike in May 2015.
Ridesharing drivers demographic	Motorcycle ridesharing: 33% ojek driver, 26% private sector workers, 14% part-time workers, 12% self-employed, 5% factory workers, 4% unemployed. Car ridesharing: 32% private sector workers, 22% self-employed, 12% taxi drivers, 12% freelancers, 10% private drivers, 4% unemployed. 72% is still paying for purchase for cars, 19% rent it from others (Primaldhi and Rakhmani, 2017).
Ridesharing users demographic	Mainly women in their 20–30s. 83% uses motorcycle ridesharing services vs. 50% for car ridesharing (Primaldhi and Rakhmani, 2017).
Initial development of Ridesharing	Mainly start with motorcycle ridesharing services. Price war between Gojek and Grab was presence in the early days.

standard errors are used throughout. Table 5 summarizes the estimation results, where model (1) excludes user online behavior and trend, model (2) excludes the linear trend, and model (3) reflects the complete model; fixed effects are present in all estimated models, but have been left from the table. The inclusion of province-specific time trends is motivated by prior research that demonstrated the need to account for trended increases of the number of new vehicle registrations (cf., Gong et al., 2017).

A comparison of the estimated models shows that the results for platform entry are relatively robust against the inclusion of online user behavior and a time trend. The second platform entry comes with a significant increase of new vehicle registrations of about 21% ( $\beta_2 = 0.21, p = 0.042$ ), and the fourth entry with an increase of around 26% ( $\beta_4 = 0.26, p = 0.012$ ). The first entry leads to a decrease of new registrations for all models, but significantly so in model (3), which gives

an entry related decrease of about 14% ( $\beta_1 = -0.14, p = 0.05$ ). These results hint at the existence of a cannibalization effect at initial entry, while in later entries a value enhancement effect is observed. This is consistent with the findings of the qualitative analysis.

User online behavior, as a reflection of platform popularity in society, is considered a proxy of the social factor that may moderate the impact of platform entry on new vehicle registrations. It is measured by Google Trends indices of search volume for the three ridesharing platforms. The results in Table 5 again show that the estimated effects are robust against the inclusion of province-specific time trends. The effect on new registrations of online search for Gojek, the largest and most popular platform based on search volume, is significantly positive ( $\beta_7 = 0.003, p = 0.029$ ), while that of its challenger Grab is negative ( $\beta_8 = -.008, p = 0.008$ ). Online search for Uber has no effect on car registrations.

**Table 5**  
Estimation results for the difference-in-difference analysis.

Dependent variable	(1) Model without user online behavior and linear time trend LnReg	(2) Model without linear time trend LnReg	(3) Model with linear time trend LnReg
First	−0.03 (0.09)	−0.10 (0.08)	−0.14 (0.07)**
Second	0.25 (0.12)**	0.21 (0.11)*	0.21 (0.10)**
Third	−0.02 (0.08)	−0.05 (0.08)	−0.07 (0.08)
Fourth	0.21 (0.12)*	0.27 (0.13)**	0.26 (0.10)**
Fifth	−0.05 (0.07)	0.03 (0.08)	−0.04 (0.07)
Sixth	0.27 (0.26)	0.24 (0.22)	0.27 (0.21)
Google (Gojek)		0.005 (0.002)***	0.003 (0.001)**
Google (Grab)		−0.01 (0.004)**	−0.008 (0.003)***
Google (Uber)		−0.001 (0.003)	−0.001 (0.004)
LnPopulation	−7.63 (3.84)**	−7.03 (3.07)**	−18.67 (8.17)**
LnIncome	0.14 (0.64)	0.44 (0.61)	−2.30 (1.05)**
Unemployment	0.13 (0.09)	0.12 (0.08)	0.11 (0.07)*
Fuel Price changed	0.002 (0.001)	0.001 (0.001)	0.002 (0.001)*
Province FE <sup>1</sup>	YES	YES	YES
Month of year FE <sup>2</sup>	YES	YES	YES
Linear time trend <sup>3</sup>	NO	NO	YES
Observations	417	417	417
R-squared	0.23	0.27	0.31
Residual Sum of Square	30.6	28.9	27.5

Note: \* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ . Robust standard errors clustered at province level in parentheses. <sup>1</sup> Province fixed effect (FE) refers to the fixed effect for each of the seven provinces. <sup>2</sup> Month of year fixed effect (FE) refers to the fixed effect for each of the twelve months. <sup>3</sup> Linear time trend allows for different time trends in these provinces.

Subsequent sections present the results of additional analyses that explain the potentially different effects of platform entries for motorcycles and cars, and the existence of geographical differences.

#### 4.2.2. Entries by service types (motorcycle and car)

At the outset, the introduction of motorcycle ridesharing services was expected to have a larger impact on new vehicle registrations than car ridesharing services, as the former services are cheaper and more widely used in the country. However, the qualitative findings revealed that many ojek drivers registered their motorcycle services on the ridesharing platforms without the need to invest in new vehicles, and that many consumers delayed new vehicle purchases in view of the attractiveness of the new platform services. By contrast, the number of informal car services suppliers was relatively limited, suggesting that those who registered on car ridesharing platforms would be new suppliers in need of vehicles. To account for this, model (1) was re-estimated after distinguishing between platform entry by type of service, giving three motorcycle and three car ridesharing service entries.

The results show that the first platform entry for motorcycles and cars ridesharing services have significant, albeit opposite, impacts on the number of new vehicle registrations ( $\beta_{\text{motorcycle\_first}} = -0.14$ ,  $p = 0.056$  and  $\beta_{\text{car\_first}} = 0.20$ ,  $p = 0.047$ , respectively); the third car platform entry ( $\beta_{\text{car\_third}} = 0.22$ ,  $p = 0.017$ ) has a positive influence. These findings confirm that the supply of motorcycle ridesharing initially came from ojek drivers joining the platforms, who already had their own vehicles. By contrast, the car ridesharing platforms attracted prospective drivers who did have to invest in new cars.

#### 4.2.3. Entries by geographical split (java and sumatera)

Additionally, different platform entry effects may occur in different geographic areas, even within a single country (cf., Jha and Bose, 2016), for instance due to varying numbers of suppliers and consumers, or a heterogeneous public interest in platform-based services. For Indonesia, platform entry in different provinces occurred at different times, see Table 1. The majority of ridesharing services started in Java, followed by entries in Sumatera. In order to

explore the existence of location effects, model (1) was re-estimated for these two larger provinces.

For Java, the second and fourth platform entries are again seen to have a positive effect of new car registrations ( $\beta_2 = 0.31$ ,  $p = 0.086$ , and  $\beta_4 = 0.22$ ,  $p = 0.06$ , respectively), which suggests that a substantial number of new suppliers joined these platforms (value enhancement). In Sumatera, however, platform effects on new vehicle registrations are only observed for the first entry ( $\beta_1 = -0.105$ ,  $p < 0.001$ ) and the second entry ( $\beta_2 = 0.18$ ,  $p = 0.002$ ). Different from Java, platform entry on Sumatera initially led to cannibalization of new vehicle purchases, later followed by new vehicle purchases.

Furthermore, online search activity related to the three platforms has no notable impact on vehicle registrations in Java, but is strongly associated with vehicle registrations in Sumatera for Gojek ( $\beta_{\text{Google}(\text{gojek})} = 0.008$ ,  $p < 0.001$ ), Grab ( $\beta_{\text{Google}(\text{grab})} = -0.001$ ,  $p < 0.001$ ), and Uber ( $\beta_{\text{Google}(\text{uber})} = -0.006$ ,  $p = 0.014$ ). This shows that people within Indonesia responded differently to the promises and perils of ridesharing platforms. Unlike people in Java, people in Sumatera clearly recognized and seized a business opportunity, and actively explored the options of each platform in online search behavior. This again, indicates how user online behavior and its impact on vehicle registrations are contextually bound.

The separate analysis of platform entry effects for the two Indonesian islands showed that an initial cannibalization effect occurred in Sumatera, but not in Java. Value enhancement effects were present on both islands. In the absence of an adequate transportation infrastructure — and considering that Java is much more developed than Sumatera in this respect — people rely more heavily on informal transportation services. The existence of a substantial market of informal transportation services prior to platform entry seems to serve as a basis for the cannibalization effect of ridesharing platform entry on new vehicle registrations.

## 5. Discussion and conclusion

The present study reconstructed the case of ridesharing platform entry in Indonesia to identify its effects on ownership-based



consumption, and to identify what local (economic, social and environmental) conditions play a role in the process. Ridesharing platform introductions initially caused a decrease in new vehicle registrations (access replaced ownership), but later produced an increase in new vehicle registrations (access induced ownership). The positive environmental impact of ridesharing platforms thus evaporated when more people realized the business value of ridesharing services, and economic deliberations became more prominent. The theoretical and practical contributions of this study are elaborated below.

### 5.1. Contributions to research

The uniqueness of our study lies in the detailed qualitative and quantitative reconstruction of the influence of three respective sharing economy platforms on vehicle ownership after market introduction. This offered rich insights into how and when local (economic, social, environmental) conditions obstruct environmental sustainability of sharing economy platforms. It also provided in-depth knowledge on the role of local conditions in the diffusion trajectories of ICT platform innovations (Yuana et al., 2019; Xiao et al., 2013).

Theoretically, these findings contribute to a growing research questioning both the existence of a general environmental sustainability of sharing economy platforms, and the underlying idea that access to under-used assets invariably leads to more efficient use of resources (cf., Martin et al., 2017; Ma et al., 2018; Retamal, 2017; Ciulli and Kolk, 2019). The case of ridesharing platform entry effects in Indonesia clearly shows that local (economic and social) conditions often stand in the way of such a traditional conceptualization. Actors involved (i.e., informal motor and car sharing drivers) were not driven by notions of efficient use, but focused on monetary gains. This had negative environmental consequences when the platforms grew bigger, and more drivers began to purchase vehicles so as to offer ridesharing services. This resembles similar observations of the detrimental environmental effects of sharing economy platforms in developed European countries (cf., Geissinger et al., 2019).

This work offers a theoretical refinement of the motivations of stakeholder's engagement in access-based consumption. Especially in developing countries, platform introductions allow people to pragmatically access offerings without the need for purchase (Retamal, 2017; Li et al., 2019). Such a cannibalization effect was observed in the present study in the initial stages of ridesharing platform entry. However, access-based consumption stimulated ownership-based consumption at later stages — when societal and market conditions promise monetary success (Belk, 2014). The notion of value enhancement, tested and found in the present study, accurately explains why people involved in sharing economy platforms may ignore the environmental sustainability aspect of access-based consumption (Geissinger et al., 2019). This extends the literature on the impact of ridesharing platform entries on new vehicle purchase in developed countries (Rayle et al., 2014) and emerging economies (Gong et al., 2017; Guo et al., 2018), and shows that cannibalization and value enhancement effects can be used for prediction.

### 5.2. Practical and policy implications

The present research has practical relevance for businesses and policy makers. First, the realization that sharing economy platforms can be an environmental blessing or curse may inspire entrepreneurs to opt for a cause-related business model. Small and novel ridesharing platform start-ups may gain a competitive advantage over dominant — profit-driven — incumbent players (Ciulli and

Kolk, 2019) by choosing an environmentally sustainable business strategy. Governments should support such business initiatives by developing policy, subsidies, grants, and legal support directly aimed at supporting companies (cf., Geissinger et al., 2019). Ridesharing businesses could, for instance, receive financial compensation for investing in green and durable (electric and/or hybrid) motorcycles and vehicles, and as such make an environmentally sustainable contribution to society.

Second, our findings show how difficult it is for entrepreneurs in the ridesharing business not to purchase a vehicle when profit looms large. Yet, reducing vehicle ownership is the key towards positive environmental change. Therefore, businesses and governments together may attempt to make systemic changes to this situation by launching — and incentivizing — ride-pooling services, in which multiple passengers share the same ride. This would in principle counter the negative environmental impact of ridesharing platforms, and reduce vehicle kilometers travelled (cf., Retamal, 2017). Needless to say, such policy measures are never completely 'waterproof' — some people will always seek to bend the rules or otherwise sabotage such ride-pooling services.

Third, businesses and governments should team up to establish easier connections between ridesharing services and the wider public transportation system. From a technological perspective, mobile applications come to mind that facilitate a smoother transit from the shared vehicle to various public modes of transport (Retamal, 2017). Ridesharing platforms can improve transportation systems by increasing transparency and accountability of informal transportation services in cities. Platform entries meet commuters' needs for safe, affordable, and reliable transportation services — but in order to make a positive environmental contribution, the kilometers travelled with the ridesharing vehicle should be minimized. This requires improvements in the transportation system, especially in developing countries, such as Indonesia, that face environmental and mobility challenges related with ongoing urbanization.

Finally, in developing countries, ridesharing platforms bring benefits in terms of value enhancement to informal transportation suppliers — i.e., they increase market access and enable earning of a relatively high income. This primarily concerns the lower income groups in society (Fraiberger and Sundararajan, 2017), which eventually brings about positive societal and economic change. Governments under such circumstances should not aim at stimulating environmental sustainability at the expense of socio-economic benefits, but strive for a 'win-win' situation, in which participation in sustainable/environmental ridesharing businesses leads to innovative solutions that enhance socio-economic value.

### 5.3. Limitations and future research

The proxy of social user online behavior in this study was based solely on Google Trends, which is highly dependent on Google searches. In Indonesia, Google is the main search engine tool used (<http://statcounter.com/>, Statcounter.com, 2019), suggesting that the use of Google Trends to capture user online behavior was appropriate. Furthermore, even in locations with low Internet penetration (as in Indonesia), the Google Trends index potentially works well for the study of economics-related issues (Mellon, 2013). Nevertheless, future work could consider the number of mobile application downloads and active users of each ridesharing platform as alternative indicators for user online behavior. Second, ridesharing platforms constantly introduce new services beyond people's mobility, such as courier and food delivery. By 2018, food delivery services alone contributed around IDR 38.8 trillion (approx. USD 2.7 billion) to the Indonesian economy

(dealstreetAsia, 2019; techinasia, 2019). These services are attractive to (potential) suppliers, but may lead them to invest in new vehicles — which would further limit the environmental contribution of these platforms. These developments should be monitored in future research. Next, due to data availability, this study captured the entries and new vehicle registrations in seven out of 34 provinces in Indonesia, which approximates 157 million or 60% of the total population — i.e., a relatively large sample of the whole population. Many ridesharing platforms introduced services in other provinces after our study period. Future work could examine the role of local conditions on ownership-based consumption also in other Indonesian provinces, or draw comparisons with different developing countries. Finally, future study could explore alternative mobility services, such as car sharing and taxi sharing, to complement the present work.

#### 5.4. Conclusion

A multimethod investigation of ridesharing platform entries in Indonesia showed that access to ridesharing first reduced, but later increased vehicle ownership. When more people recognized the enhanced value of ridesharing and joined business, the initial positive environmental impact of ridesharing turned negative — an effect caused by specific local market and social conditions. Businesses and governments should focus on development and support of innovative solutions that are environmentally sustainable as well as of enhanced value to consumers and producers in the sharing economy.

#### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

#### CRediT authorship contribution statement

**Joshua Paundra:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Data curation, Writing - original draft. **Jan van Dalen:** Conceptualization, Methodology, Formal analysis, Writing - original draft, Writing - review & editing, Supervision. **Laurens Rook:** Conceptualization, Methodology, Formal analysis, Writing - original draft, Writing - review & editing, Supervision. **Wolfgang Ketter:** Conceptualization, Supervision, Project administration, Writing - review & editing.

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