How does the ride-hailing systems demand affect individual transport regulation?

Laize Andréa de Souza Silva[a*], **Maurício Oliveira de Andrade**[a] and Maria Leonor Alves Maia[a]

[a] *Centro de Tecnologia e Geociências, Universidade Federal de Pernambuco, Cidade Universitária, Recife - PE, 50740-550, Brazil*

* Corresponding author: Centro de Tecnologia e Geociências, Universidade Federal de Pernambuco, Cidade Universitária, Recife - PE, 50740-550, Brazil +55 (81) 9 9502 0374 laize.civil.upe@gmail.com

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ABSTRACT

This paper analyses, on the light of the Brazilian legislation, the individual transport legal issues derived by the entrance of the ride-hailing companies into the market. The legal problem of ridesourcing services revolves around determining its nature as public or private. Regarding this, changes in the current legislation have being proposed to characterize the service as illegal or legal and to force the delimitations of its operation before the transport network of each municipality. In addition, this paper analyses socio demographic and travel characteristics of the Brazilian ridesourcing demand. Based on this demand point of view, a logistic regression model was generated to predict the probability of riderspliting system use. The results show that the majority of ridesourcing trips is replacing taxi and public transport trips. According to the logistic regression model, safety is the main reason that influences the decision of sharing trips via ridespliting. The other relevant factors are directly or indirectly related to service cost. The use of larger vehicles for sharing trips can become a competitive mode for public transport and generate a greater clash between public transport and ridesourcing companies than the one between the taxi industry and technology companies.

1. Introduction

Shared Economy was described by Felson and Spaeth (1978) as “those events in which one or more persons consume economic goods or services in the process of engaging in joint activities with one or more others”. These arrangements aim urban sustainability (Wu and Zhi, 2016) and are seen as alternatives for some infrastructure problems witnessed in large cities, such as mobility issues caused by the increase in travel (Banister and Marshall, 2000; Kapoor, 2014; Kriston, Szabó, and Inzelt, 2010). In this context, technological advances open up a range of economic development opportunities, including the sector of individual transport. Since 2010, some ridesourcing companies have been born to promote a door-to-door transport service. This service has become a direct substitute for private car or pre-booking taxis.

Since being innovative, the entry of ridesourcing companies in the market has being controversy due to accusation of provoking unfair competition with the market of taxi services and not attending the legislation. The general complaint is actually about the lack of clear regulation for this new service (Silva and Andrade, 2013). As the provision of this service faces legal and corporate barriers it has been banned in several cities (Craggs, 2017). In Brazil, different interpretations of the national legislation are given. As a result, while some cities have regulated the service others have banned or imposed conditions that strongly restrict this form of service provision. The issue focuses on the interpretation either as individual public transport, when public regulation is necessary, or as private service protected by the free consumer's choice and by the free exercise of economic activity (Silva and Andrade, 2013). Into this latter interpretation, Esteves (2015) states that there are no economic arguments that justify a ban on new providers of individual transport, since they raise competition and have been positively valued by consumers.

In spite of this, it is possible that the entry of ride-hailing companies would increase the deterioration of sustainable urban mobility from the point of view of capturing the demand for public transportation and transferring it to individual ones, which generates several negative externalities. This problem of partial capture of the public transport market can be worsen by new modes of this service, such as the sharing of trips by numerous users, named ridespliting (Gray, 2015; Lindsay, 2017).

Therefore, a better understanding of the entrance of new transportation modes consequences and their impact on urban mobility is necessary. In order to evaluate these possible effects, it is important to understand the ridesourcing demand characteristics before several interventions are made (such as the ban of this new mobility option). Are the users of ride-hailing systems previous users of taxi services or this new service meets a repressed public transportation demand? What is the impact of ridespliting over the public transport? What would be the real impact of this modality over the public and private individual transport?

To answer these questions, this study aims both to evaluate the characteristics of the Brazilian demand for ridesourcing services and to estimate the potential market for ridespliting. For this, an *online* questionnaire was applied and the data obtained was analysed by logistic regression.

2. Ridesourcing companies as Shared Economy

Although the idea of Shared Economy comes from the late 70s (Felson and Spaeth, 1978), the XXI Century technology and the new consumer's generation based on sharing, rather than on owning everything, is what makes this model works (Posen, 2015). Thus, companies have developed platforms to help the connection of those interested in sharing excess resources (e.g. houses and cars) (Gardner, 2013). As Kapoor (2014) mentions, enough "pain" is necessary to make people change the standard consumption habits to sharing, meaning that a sharing economy business works best when consumers wish to get rid of a bothering problem.

Ridesourcing companies fit into this economy model, since they are based on the use of one's private cars to offer an alternative travel mode. It can be said that the "pain" that triggers this service success are the flaws of the current large cities' transport network, especially the ones related to the taxi services (Kapoor, 2014). According to Posen (2015), "taxis technically fit within the access-based focus of the sharing economy" but this industry did not change enough over years to follow the consumer cultural changes neither the technology. Therefore, taxi services have become somehow obsolete, although the importance of an accessible door-to-door transportation mode is undeniable (European Transport Safety Concil [ETSC], 2016; Qian and Ukkusuri, 2017; Silva and Andrade, 2015).

The main start-ups in the ridesourcing industry are Uber and Lyft. While the first one is worldly consolidated, the second acts as Uber's front concurrent in the United States of America. Both companies launched in 2014 the categories UberPool and Lyft Line, which enable the clients to split a ride and fare with other passengers in a ridesourcing vehicle (Lyft, 2016; Uber, 2016). These categories are named ridesplitting (Chen, Zahiri, & Zhang, 2017). Basically, these services work as carpooling dynamic systems, which are travel sharing online platforms used to connect passengers and drivers in real time, aiming the increase of car occupancy rate (Agatz et al., 2011, 2012; Créno, 2014; Gargiulo et al., 2015). However, they work as a pro-profit service conducted by a driver previously registered in a company.

The carpooling concept of travel sharing with multiple passengers is important for the ridesourcing companies because they sell the idea of sustainability, attracting more clients, as well as raising the transport efficiency and opening up the possibility of higher profits for the companies (Kokalitcheva, 2016). However, this model intensifies questions about the legitimacy of the ride-hailing platforms into the current transport legislation of several municipalities around the world. In 2014, for example, California Public Utilities Commission (CPUC) stated the carpooling operated by the start-ups as illegal. Therefore, changes in the local legislation were necessary in order to provide more safety to users and turn the service legal (Kerr, 2014; Kokalitcheva, 2016).

Due to the taxi industry strength, the relation between taxis' companies, ridesourcing start-ups and government has being in many cases aggressive and hostile (Brasil, 2015; Lee and Kelion, 2014; Ruvolo, 2015; Westcott, 2015). However, meanwhile cities fight to organize the transportation legislation in order to control possible market failures and to fit the technology advances, some are already seeing the ride-hailing industry as a plausible alternative for some public transport flaws. This situation was experienced in Tampa (U.S.A.), where the government substituted two bus lines for Uber and Lyft rides, claiming to be of better cost-benefit (Brustein, 2016).

In this scenario, that changes frequently and quickly, understanding where the ride-hailing industry fits into the market gets each time more complicated. Can the start-ups yet be stated simply as technology companies, as they say (Uber Technologies INC., 2015), or they are beyond the basic idea of shared economy and have become transportation businesses aiming for more room into this market?

3. Regulatory issues in Brazil

Vehicle-for-hire industry, including taxi service, has a worldwide history in regulations. This tendency is due to the need of turning this service public, aiming to minimize externalities arising from its use (public takeover), or due to the requirement of deregulate with the objective of self-market equilibrium (Cairns and Liston-heyes, 1996; Cetin and Eryigit, 2013; Schaller, 2007; The Transport Committee, 2004). Recently, the ride-hailing platforms boosted the need of regulation adjustments (European Transport Safety Concil [ETSC], 2016; Farren, Koopman, and Mitchell, 2016; Rienstra, Bakker, and Visser, 2015).

In Brazil, taxis work in accordance to the National Law nº 12.468 (Brazil, 2011) and are classified **as individual public transport**, which is defined by the National Mobility Policy (Law nº 12.587/2012) as a “paid passengers transportation service open to public, through vehicles-for-hire, for individual travels” (Brasil, 2012). However, there are some nuances that disfigure taxi as public service (Silva and Andrade, 2013), such as the authorization to transferring taxi granting to heirs, according to the Law nº 12.865/2013 (Brazil, 2013). Thus, its legal nature is sometimes questioned (Nasser, 2014; Sarmento, n.d.). Neverthless, the taxi service works in accordance to the National Law nº 12.468 (Brazil, 2011).

This regulation, in turn, defines the prerequisites for the taxi driver profession, delineating quality and safety, in addition to loosely determining the fare regulation, when states that in cities with more than 50,000 inhabitants the vehicles must circulate with taximeter. In spite of this, the fares are determined by each municipality transport agencies in accordance with the local taxi drivers unions (Brazil, 2016c).

On the other hand, the world most influential ride-hailing company, named Uber, arrived in Brazil in 2014, just before the beginning of the World Cup. The population welcomed the ride-hailing app, but the same cannot be said on the part of taxi drivers, who claim that the start-ups like Uber act against the law, as they promote public individual passenger transport without following any regulations applicable to this type of transport (Brazil, 2015b). In contrast, Uber asserts that they are a technology business promoting private individual transport (Brazil, 2015a).This question about what is public and what is private has led to legal clashes.

In April 2015, the justice determined through a precautionary measure the suspension of the Uber app throughout the national territory, declaring that the company provides a clandestine service (TJSP, 2015b). However, a month later, in May 2015, Uber's injunction was dismissed, saying that only the Public Ministry may take such decision (TJSP, 2015a). Afterwards, several Brazilian cities have formulated draft bills for prohibiting the use of private cars registered in mobile applications for individual and paid passenger transportation, aiming to solve the clashes between Uber and the class of taxi drivers (Rio de Janeiro, 2015; São Paulo, 2014). Nonetheless, these sentences were not definitive and preliminary sentences extinguished them subsequently (Ferreira, 2016; Pinho, 2016; Rio de Janeiro, 2016).

As these processes go back and forth, allowing and prohibiting ride-hailing companies to operate, São Paulo city issued the Decree nº 56.981 that regulates the economic activity of

passengers' remunerated transport. This regulation allows the functioning of ride-hailing companies in the city through credits of kilometres, which controls the amount of travels performed by them. Additionally, the companies operate on payment of a grant and must provide information to the City Hall about the trips performed (São Paulo, 2016).

At the national level, a draft bill (nº 5.587/2016) that aims to change the National Mobility Policy (Brasil, 2012) to update the definitions of public and private transport and to insert ride-hailing apps in that context is under way (Brazil, 2016a). The process was initiated in June 2016, and has since then undergone several changes. Initially the objective was to define that individual paid transportation is an activity designated only for taxi drivers (Brazil, 2016b). However, the text was modified and the following definition to **individual private passenger transportation** was given: "paid passenger transport service, private activity, not open, to the public for individual or shared trips, requested exclusively by previously registered users through mobile applications or other networking platforms" (Brazil, 2017a).

Therefore, the service provided by ride-hailing companies would fit this category and would be regulated by the Municipalities and Federal District, as described in the bill nº 5.587/2016. However, the term "private activity" was removed from the final version of the document approved by the National Congress on April 04th 2017 (Brazil, 2017b). Thus, as the Deputy Daniel Coelho states, the activity offered by the companies becomes public, which makes their operation unfeasible (Calgaro, 2017). Uber declares that the approved proposal is a retrograde law and a disguised ban that aims to kill the new mobility model (Uber Blog, 2017). The draft bill now waits for appreciation in the National Senate House.

In the midst of the legal debate, specific determinations about ridesplitting have not been saw, although the legal changes have introduced the shared mode into their definitions (Brazil, 2017a). Currently, UberPool operates only in the cities of São Paulo and Rio de Janeiro. The focus now is on the service framing as private or not, and the carpooling mode has legally been in the background. Moreover, the current regulations changes do not define the type of vehicle to be used to provide individual paid transportation, which leaves room for future legal discussions regarding ridesplitting, in case of the ride-hailing start-ups be legalized.

It is important to mention that among the juridical struggles, the sustainable mobility discussion does not emerges. Still without definition of the ride-hailing demand characteristics, it is not yet known whether these services act by subtracting the demand of passengers from the public transport and encourages, to a certain extent, the use of automobiles. In addition, the possibility for these companies to start using vehicles of greater capacity generates clashes about the sustainability of the urban public transport network (Silva, 2017). Therefore, this paper aims to investigate the social and travel characteristics of Brazilian Uber demand, due to its importance in the understanding of travel behaviour to improve transportation planning (Chen et al., 2017), as well as analyse which variables are influent in the use of UberPool, the only ridesplitting system so far available in Brazil.

4. Methodology

In order to understand ridespliting from the Brazilian demand point of view, data were collected from March to May 2017 through an online research released on Google Forms. The use of the Uber platform was the focus, taking into account that it is the main ridesourcing company operating in Brazil. The questionnaire was divided into two sections: (i) socio-demographic information and (ii) opinions about the ridesourcing service and the possible use of UberPool.

Respondents were asked if they would be interested sharing a trip through ridespliting. This answer originated a dichotomous dependent variable named “Pool” (yes (success) = 1; no (failure) = 0). Additionally, they evaluated using a Likert scale defined at five levels, the variables cost, travel time, travel with unknown passengers, environment and safety. Table 1 presents the variables evaluated in the questionnaire.

Table 1. Variables collected in the applied questionnaire.

Variable code	Description
income	Mean familiar income: 0 - no income; 1 - up to 2 minimum wage (MW)*; 2 - higher than 2 to 5 MW; 3 - higher than 5 to 10 MW; 4 - higher than 10 to 20 MW; 5 - higher than 20 MW
age	Respondent’s age
gender	1 - female; 0 - male
owner	Vehicle ownership: 0 - none; 1 - car; 2 - motorcycle; 3 - car and motorcycle
alternative	Travel alternative for Uber: 1 - by foot; 2 - bicycle; 3 - car; 4 - carpool; 5 - taxi; 6 - public transport; 7 - motorcycle
reason	Tripe purpose: 1 - work; 2 - study; 3 - leisure; 4 - shopping; 5 - services; 6 - back home
score	Mark given to the ridesourcing service: from 0 (poor) to 100 (excellent)
info	Acquaintance with UberPool: 0 - none; 1 - one has heard but has never used it; 2 - one has heard and has used it.
reduction	Acceptable price reduction to the UberPool use: 0 - one would not use the service under any circumstance; 1 - up to 30%; 2 - from 31% to 70%; 3 - from 71% to 100%
group	Acceptable number of passengers to share a trip with: from 0 to 7 (assuming 9 people including the driver as the higher capacity of an automobile)**
cost	Cost importance over the UberPool choice: from 1 (very relevant) to 5 (very irrelevant)
time	Travel time importance over the UberPool choice: from 1 (very relevant) to 5 (very irrelevant)
unknown	Share a trip with unknown passengers importance over the UberPool choice: from 1 (very relevant) to 5 (very irrelevant)
environment	Environment importance over the UberPool choice: from 1 (very relevant) to 5 (very irrelevant)
safety	Safety importance over the UberPool choice: from 1 (very relevant) to 5 (very irrelevant)

* The minimum wage in Brazil is equivalent to US$ 286.54 – rate of R$ 3.27 in June 9th 2017 (BCB, 2017).

** Brazilian Traffic Code (Brazil, 2008a)

The criteria were chosen according to the literature review on factors that influences on ridesplitting and on carpooling decision, due to the similarity between both travel modes and the lack of research that specifically address ridesplitting (Chen et al., 2017; Cools, Tormans, Briers, & Teller, 2013; Correia & Viegas, 2011; Delhomme & Gheorghiu, 2016; Li et al., 2008; Neoh, Chipulu, & Marshall, 2015; Tezcan, 2016; Waerden, Lem, & Schaefer, 2015).

Responses from Uber users from several Brazilian cities were obtained, aiming at a sample of 384 respondents, with the objective of meeting the 95% statistics confidence for 5% error considering an infinite population (Agresti & Finlay, 2012). The outlier Labeling Rule was used to exclude discrepant data in the sample (Hoaglin & Iglewicz, 1987). A logistic regression model (Agresti, 2002) was obtained with explainable variables on the probability of using UberPool. Through Spearman rho (Field, 2009; Göktaş & İşçi, 2011) strong collinearities between ordinal variables were excluded. The statistical software IBM Statistic Package Social Science - SPSS 23 was used.

5. Results and Analyses

Through the online questionnaire, 500 responses were obtained from 16 Brazilian This sample was adjusted so that the number of respondents was proportional to the regional populations of Brazil, taking into account only the cities where Uber operates. 384 responses were validated, taking into account the criterion of 95% statistical to 5% error.

Table 2 shows the sample profile.

The majority of the respondents is male (53.4%), has family income between 5 and 10 minimum wages (32.3%), has car at home (69.5%), is between 16 and 36 years old (76.3%) and has heard about UberPool but has never used it (51.6%). According to the results, in general, Uber Brazilian demand values the offered service as very good – all respondents scored the service above 50 (in a scale from 0 to 100) and most of them rated between 81 and 90 (41.4%). In relation to the trip propose, the main reasons to ridesourcing choice is leisure (45.6%), followed by return home trips (22.1%).

Most of the respondents stated that they would travel by taxi (49.7%) or public transport (30.2%) whether Uber was not a possible alternative. Thus, it is clear that ridesourcing companies affect directly the taxi demand, what triggers the discussions about individual transport competition. On the other hand, although a significant part of Uber's demand in Brazil derives from public transport, it does not represent an expressive impact on its demand. This is because a very small portion of the population makes use of individual paid transport and the use of public transport is much more expressive (Instituto da Cidade Pelópidas Silveira, 2016; São Paulo, 2015).

Most of the respondents (70.3%) declared to be interested in sharing a trip through ridespliting. However, only 21.4% affirmed they would never use UberPool, despite the fare discount, and 21.6% stated that they would not share a trip with any passenger (group = 0). Thus, it can be said that around 9% of the respondents, although declared do not be

interested in ridespliting, would travel by this mode due to some condition. At first place, 31.0% of the sample would feel comfortable sharing a trip with only two other passengers, but 24.0% would like to ridesplit with the maximum possible number of passengers.

Table 2. Sample characteristics.

Variable	Category	*n*	%	Variable	Category	*n*	%
Gender	Male	205	53.4%	alternative	By foot	3	0.8%
	Female	178	46.4%		Bicycle	1	0.3%
	Not informed	1	0.3%		Car	40	10.4%
income	No income	5	1.3%		Carpooling	31	8.1%
	Up to 2 MW	38	9.9%		Taxi	191	49.7%
	> 2 a 5 MW	79	20.6%		Public Transport	116	30.2%
	> 5 a 10 MW	124	32.3%		Motorcycle	2	0.5%
	> 10 a 20 MW	81	21.1%	reason	Work	58	15.1%
	> 20 MW	57	14.8%		Study	22	5.7%
owner	None	78	20.3%		Leisure	175	45.6%
	Car	267	69.5%		Shopping	5	1.3%
	Motorcycle	8	2.1%		Services	37	9.6%
	Both	31	8.1%		Return home	85	22.1%
age	16 to 26	153	39.8%	score	50 to 60	29	7.6%
	27 to 36	140	36.5%		61 to 70	43	11.2%
	37 to 46	48	12.5%		71 to 80	110	28.6%
	47 to 56	25	6.5%		81 to 90	159	41.4%
	57 to 69	18	4.7%		91 to 100	43	11.2%
info	None	119	31.0%	group	0	83	21.6%
	Never used	198	51.6%		1	51	13.3%
	Used	67	17.4%		2	119	31.0%
reduction	Would never use	82	21.4%		3	39	10.2%
	Up to 30%	88	22.9%		7	92	24.0%
	> 30% to 70%	201	52.3%				
	> 70% to 100%	13	3.4%				

The carpooling proposal is in some way a transport mode of low capacity. It is important to mention that 24% of the respondents declared willing to share a trip with the maximum possible number or passengers (assumed as 7 in this study, considering an automobile capacity according to the Brazilian Traffic Code (Brazil, 2008a)). Thus, if the ridesourcing companies start to use higher capacity vehicles, the trip price may become more competitive with the public transport, allowing a higher modal switch, mainly due to the low quality of Brazilian public transport (Araújo et al., 2011).

Additionally, it was verified that in Brazil women are more resistant to the use of a shared system than men: 59.3% of the female public stated that they had no interest in ridespliting, while 58.9% of the male population declared to be interested. This is possibly related to

Brazilian safety and security issues, and the fact that women end up being the easiest target of violence (Santos, 2017; Silva, 2017).

A logistic regression model was generated in order to understand the variables that affects the probability of using UberPool (or ridespliting in general). The variables *cost*, *time*, *unknown*, *environment* and *safety* are categorical and therefore are fragmented so that x_i = 1 for observations recorded in category *i* and $x_i = 0$ if observations are not recorded (Agresti, 2002). Level 1 of each criterion (very relevant) is assumed as the base level, thus it does not appears in the model.

The logistic model determination was based on each predictive variable Wald statistic significance, besides the model's prediction accuracy and Nagelkerke R^2 and Spearman correlation coefficient. Table 3 shows the final regression results, in which the variables reduction, group, cost and safety are used.

It was found that the variable *unknown* would be significant in the model, but it is strongly correlated with the variable *safety* (Spearman's rho = .705; ρ = .000), also significant. Among both factors, *safety* showed a better fit, resulting in a higher Nagelkerke R^2. The socioeconomic variables (i.e. gender, age, family income, vehicle ownership) were not significant on the decision to use the ridespliting platform. Four criteria are part of the final model: tariff reduction, number of people sharing a trip, cost and safety evaluation.

Through the model classification table, it can be said that the generated model has predictive accuracy of 91.1%. Moreover, the model Nagelkerke R^2 is equal to 0.650.

Table 3. Logistic Regression Result

Variables	B	S.E.	Wald	Df	Sig.	Exp(β)	95% C.I.for Exp(β)	
							Lower	Upper
reduction	.477	.236	4.081	1	.043	1.612	1.014	2.561
group	.451	.111	16.347	1	.000	1.570	1.261	1.953
cost			24.692	4	.000			
cost(1)	-.569	.421	1.828	1	.176	.566	.248	1.292
cost(2)	-2.905	.689	17.769	1	.000	.055	.014	.211
cost(3)	-3.372	.930	13.162	1	.000	.034	.006	.212
cost(4)	-1.484	.726	4.181	1	.041	.227	.055	.940
safety			19.493	4	.001			
safety(1)	2.076	.515	16.222	1	.000	7.972	2.903	21.894
safety(2)	1.396	.570	5.999	1	.014	4.039	1.322	12.343
safety(3)	1.329	.987	1.814	1	.178	3.777	.546	26.121
safety(4)	.726	.787	.851	1	.356	2.068	.442	9.675
Constant	-.436	.467	.874	1	.350	.646		

According to the model, the most relevant criterion on ridespliting use is safety. The lack of security and safety is current the main reason why citizens switch public transport to car use in some Brazilian cities (Santos, 2017). Thus, this variable is considered extremely important in sharing trips with not acquaintance passengers. Whether one categorizes *safety* as relevant or irrelevant over the decision to UberPool, this factor always raises the probability

of ridespliting. It means that users cherish the use of a safe mode of transport and the company involved must ensure that sharing trips with strangers is a safe choice. When one classifies *safety* as “relevant”, the probability of UberPool use increases about 697% (safety(1) Exp(β) = 7.972). On the other hand, the variable does not show statistical significance (ρ ≤ .05) when classified as "irrelevant" or "very irrelevant”. Therefore, the safer the service is judged and experienced by users, the greater the likelihood of its use.

The other factors present in the model are directly or indirectly related to the cost. The tariff reduction increase raises the ridespliting use probability. At each tariff band (see Table 1) increase (e.g. from up to 30% to 31% until 70%) the ridespliting probability of success increases by 61.2% (Exp(β) = 1.612). Thus, the service cost is essential over the use decision.

On the other hand, people still show some resistance in paying for a shared service, given that the variable *cost* reduces its use probability. When said “relevant”, this factor is not significant at the .05 level. However, when categorized as “irrelevant” in the sharing decision, the variable *cost* reduces the probability in up to 96.6% (cost(3) Exp(β) = .034). Finally, ridespliting success increases 57.0% (Exp(β) = 1.570) for each additional passenger sharing a trip. This criterion is indirectly related to travel cost, since than the journey has reduced individual cost as the number of passenger increases.

This analysis is again directed towards the use of greater capacity vehicles by ridesourcing companies. Given that cost is an appealing criterion in the choice of shared trips and increasing the number of passengers can optimize and reduce individual passenger costs, capacity elevation can be attractive to the demand, as long as the service is safe.

Besides legal issues, a problem faced by the companies is the lack of critical mass, so that the connections among drivers and multiple passengers are fast (attribute required for the platforms dynamicity, Créno, 2014). It is precisely due to this lack that UberPool is only working in two most populous Brazilian cities: São Paulo and Rio de Janeiro. However, the demand could possibly be generated by creating lines with predefined routes, as suggested by the pre-launched Buser (2017) platform that will offer inter-municipal travel by bus. Nevertheless, this would probably fall into a legal clash far greater than that between ridesourcing industry and taxi service, although easier to solve by characterising this new service as illegal transportation straight away.

6. Conclusions

Based on urban mobility issues and the possibilities derived from technological advances, a business opportunity characterized as shared economy was found. Ridesourcing is a way of individual door-to-door transportation offered in private vehicles by drivers linked to a technology company. This new mode of travel has generated market tensions by affecting the demand of the consolidated taxi industry.

In Brazil, controversies and legal disputes revolve around the classification of the new provided service as public or private. Changes in the current legislation are being proposed to define the legal nature of ridesourcing companies. Once defined as public, it will be up to

the government to define rules for the individual passenger transport operation. Thus, the service will tend to follow the same rules imposed on taxi service, which is categorized as public transport. On the other hand, once described as private transport, it will open competition with individual paid transportation following the constitutional principle of free enterprise. Currently, the legal changes tend to the first situation described and a bill awaits approval of the National Senate House (Brazil, 2017b).

Meanwhile, ride-hailing companies expand the vision of sharing and create the services of ridespliting, which is a form of dynamic carpooling offered by the companies' partner drivers. Beyond the individual transport legal scope in Brazil, this research sought to understand the demand characteristics of the main Brazilian ridesourcing platform, named Uber. Furthermore, based on the studied population evaluations, it aimed to recognize the main significant variables in ridespliting use.

It has been found that leisure is the main reason for traveling by ridesourcing. Return home is second major reason. This may be related to the intensification of the so-called *Lei Seca* supervision, which determines a fine and the drivers' licence suspension of drivers caught with any level of blood alcohol concentration (Brazil, 2008b). Therefore, people do not want to take the risk of drinking and driving, although they still prefer the comfort of a door-to-door transport mode. For both travel reasons, it can be noticed that the ridesourcing use is sporadic instead of daily based. This kind of usage may reflect the users' high valuation of the service. A further analysis of ratting versus Uber's running time by city showed that the more familiar the public is with the service, the more noticeable are its failures and poorer the service is valuated.

Approximately 50% of Uber's demand would be taxi users. The current taxi service is considered outdated in relation to technology. Therefore, it loses a portion of its demand when competition is opened, taking into account that the majority of Uber users is young and the technological appeal attracts this audience. Another disparity between ridesourcing and taxi service is the strength of advertising: while the former heavily invests in marketing, the selling of a positive image of the second is absent. This directly influences the demand capture. Finally, the tariff differences make the competition fiercer, as the trip cost is an important influencer in the modal choice, as seen. This competition between taxi and ridesourcing is economically healthy because it breaks the monopoly of the taxi industry, forcing it to improve its service offer.

Most of the current Uber users accepts ridespliting well. About 79% of them would use UberPool (Uber's ridespliting mode) depending on the fare conditions and the number of passengers sharing the same trip. Through a logistic regression model, it was perceived that safety is the most important factor in sharing. It is implicit that this criterion affects more the female audience, although gender did not show significance in the model and, therefore, was removed. This conclusion derives from previous research on carpooling mode. Silva (2017) concludes that women are more afraid to share trips with strangers, since problems of insecurity in Brazil build a psychological barrier.

Travel cost relates directly or indirectly to the other factors that affect the probability of using ridespliting systems. The studied population still have some resistance over paying for a

shared travel service. Therefore, the cheaper it is, the greater its acceptability. One factor that makes the trip less expensive is the number of passengers who share it: the individual cost is inversely proportional to the number of travellers. Thus, it opens the idea that ride-hailing companies may start using higher capacities vehicles. The sharing systems can become competitive for collective public transport, whether there is sufficient critical mass to execute fast connexions. The competition generated would certainly create greater clashes than the existing ones between the taxi service and the ridesourcing companies.

Thereby, define the legal nature (public or private) of the services provided by these companies is extremely important in order to determine their rights and obligations before the transport network of each municipality, aiming at sustainable mobility as previously determined by the city of São Paulo (2016), for example. Simply allowing or banning the operation of platforms is not enough to solve the issues involving ridesourcing and ridespliting. According to the Brazilian constitution (Brazil, 1988), the government must act in the regulation of essential services (including transportation) in order to expunge market failures in defence of the public. It can be concluded that this new market will hardly regulate itself without the population being negatively impacted and an evidence of this is the fall in the Uber's evaluation over time.

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