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Analysis of delivery fee of instant delivery apps and the remuneration of couriers in Brazilian cities

Análise da taxa de entrega de aplicativos de entrega instantânea e a remuneração dos entregadores em cidades brasileiras

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ABSTRACT
This paper aims to identify the relationship between the delivery fee of instant deliveries application and the remuneration of couriers in Brazilian cities. Data concerning delivery fees and the distance travelled were obtained from the main delivery applications for eight Brazilian cities: five capitals and three countryside cities. Linear regression was used to identify a relationship between the delivery fee and distance. The results showed a difference in the fixed-rate and the variable delivery fee between the cities. To obtain a basic remuneration, i.e. the minimum wage, the courier must work 44 hours a week, making at least one delivery per hour at 3 km. However, this workday can be strenuous if deliveries are made by non-motorised transport.

RESUMO
Este artigo tem por objetivo identificar a relação da taxa de entrega e da remuneração dos entregadores de aplicativos em cidades brasileiras. Os dados referentes à taxa de entrega e à distância percorrida foram obtidos nos principais aplicativos de entrega para oito cidades brasileiras, dentre elas cinco capitais e 3 cidades do interior. Foi utilizado regressão linear para identificar uma relação entre a taxa de entrega e a distância. Os resultados mostraram diferença na taxa fixa e na taxa variável de entrega entre as cidades consideradas na análise. Para obtenção de uma remuneração básica, isto é, o salário-mínimo, o entregador precisa trabalhar mais de 44 horas semanais, realizando pelo menos uma entrega por hora a uma distância de 3km. Contudo, esta jornada de trabalho pode ser extenuante se as entregas forem realizadas por modos não motorizados.

1. INTRODUCTION

Urban freight transport is being remodelled by digital platforms (Guo *et al.*, 2021). The digital platforms or apps are designed for online transactions for consumer goods or services (Castro-Schez *et al.*, 2010). The widespread use of online transactions is mainly due to their low cost, convenience and rapid growth of e-commerce (Kang *et al.*, 2021), mainly offered by digital

platforms or apps (Castro-Schez *et al.*, 2010; Yeo, Goh and Rezaei, 2017; Bjørgen, Bjerkan and Hjelkrem, 2021).

In this context, instant delivery is a fast-growing market that emphasises short delivery time (Dablanc *et al.*, 2017; Guo *et al.*, 2021). Instant delivery services have been defined by Dablanc *et al.* (2017) as those that provide on-demand delivery within two hours by individuals, independent contractors or employees. The connection of consumers, couriers and businesses is provided by digital platforms (Dablanc *et al.*, 2017). Instant delivery imposes a strict deadline on couriers after customers order in digital platforms (Zhang *et al.*, 2019). Instant delivery services can be performed by retailers themselves or by service providers that serve a wide variety of businesses (Yeo, Goh and Rezaei, 2017). Moreover, instant delivery by peer-to-peer applications is a consequence of the sharing economy (Buldeo Rai, Verlinde and Macharis, 2018; Tavasszy, 2020; Seghezzi *et al.*, 2021) and a subcategory of crowd shipping (Dablanc *et al.*, 2017). Crowd shipping, in turn, is part of the shared economy trend with the addition of technological resources, where the people offer their available time and vehicle to perform delivery (Buldeo Rai, Verlinde and Macharis, 2018). Thus, crowd shipping is a network of people with the time and resources available for urban deliveries (Buldeo Rai, Verlinde and Macharis, 2018). Furthermore, the sharing economy contributes to workforce exchanges by using online apps or platforms (Belanche *et al.*, 2021). From an extensive review of the literature on sharing economy for logistics services and crowd shipping, Saglietto (2021) showed that the literature focus on the optimal allocation of costs, prices and supplier relationships. Moreover, the author lists the international practices and reports the environmental impact of urban freight transport and crowd shipping.

Couriers are among the stakeholders involved in urban deliveries who, according to Dablanc *et al.* (2017), perform the deliveries in the shortest time possible, using their vehicle (bicycle, motorcycle or own car) and assuming all delivery costs and the risks associated with the activity. The authors also draw attention to the lack of information about the couriers and their working conditions, the latter being among the most controversial issues of this delivery service. Digital platforms transform employees into self-employed workers, increasing the uberization of jobs (Dablanc *et al.*, 2017). Abílio (2020), in turn, conceptualises the uberization of jobs as informal work with changes in their definition, which can be understood as another process of flexibilisation of the job. The working conditions of the couriers, which were already precarious, were aggravated by the Covid-19 pandemic, with a reduction in remuneration and an increase in the working hours (Abílio *et al.*, 2020).

Literature concerning instant delivery is recent and still focused on specific aspects. Dablanc et al. (2017) have pioneer research reviewing the precursory works related to this topic. They started a discussion about the growth of the digital market on transport services, proposing the definition of instant deliveries, which differentiates from express deliveries in urban areas. In addition to the investigation of crowd shipping, the literature also addresses pricing strategies of instant deliveries (Guo *et al.*, 2021), routing strategies to improve delivery reliability (Huang *et al.*, 2020), and economic, social and environmental impacts of food delivery apps (Li, Mirosa and Bremer, 2020).

In addition to the work by Dablanc et al. (2017) and the sociological discussions presented by Abilio, Grohmann and Weiss (2021), no studies were identified that addresses the remuneration of the couriers of the instant delivery services. Therefore, this paper addresses the relationship between the delivery fee and distance of instant deliveries and the

remuneration of the couriers in Brazilian cities. In this article, the delivery fee is paid by the consumer who will receive, in a short time, a product or service requested by digital platforms. In this scenario, the delivery fee is related to the distance travelled between the place that offers the product or service and the consumer. According to Oliveira et al. (2021), the delivery workers who work through digital platforms generally have to work long hours to receive a minimum wage.

Based on the above issues, this article is motivated by the following research question: To what extent does the delivery fee of instant delivery affect the remuneration of the couriers? Hence, this paper aims to identify the relationship between the delivery fee and the distance travelled by couriers to assess their remuneration and workday. We considered applications that offer food (prepared food or supermarket goods), beverages and pharmacy products in eight Brazilian cities. Furthermore, we considered as a reference the minimum wage in Brazil in 2020 (BRL 1045) as basic remuneration for 40 weekly hours. We assumed that couriers have strenuous working hours to obtain a minimum remuneration without the social guarantees of formal workers.

The results detailed in this paper showed that: (i) there is a significant difference in the fixed delivery fee and the variable delivery fee between the cities; and (ii) the delivery person must work more than 44 hours a week, making at least one delivery per hour at 3km to obtain a basic remuneration. Both results contribute to the understanding of the working conditions of the couriers and the "uberization" of the job.

We highlighted some limitations regarding access to information. Initially, we restricted the data collection to eight Brazilian cities and three apps that offer food, drinks, and medicines. Therefore, the research did not consider applications with regional coverage and from the restaurants' own app. In addition, the modes of transport used in deliveries (motorcycle, bicycle, car or on foot) were not considered due to the unavailability data in the simulation of the order (explained in detail section 3). Also, we considered that the delivery fee reported by the application is the remuneration of the courier. However, we recognise that the application retains a percentage of the delivery fee for system management; however, this information is unclear and was not considered in the study. Still, other factors, such as the type of product, delivery time, number of couriers, demand for orders, and the city's morphology, were not considered due to the lack of open data. Finally, we have not considered potential tips that the couriers could receive from the consumer. Despite these limitations, the discussion presented in this study is necessary to achieve the economic and social sustainability of urban deliveries, particularly instant deliveries.

This article is organized into five sections. After this introductory section, which also presented the literature review, section 2 presents a brief history of delivery applications and the situation of application delivery providers in Brazil. Next, section 3 describes the method of analysis applied in this paper, of which the results are presented in Section 4. Finally, Section 5 presents the conclusions.

2. A BRIEF HISTORY OF THE MAIN DELIVERY APPLICATIONS AND A PANORAMA OF COURIERS IN BRAZIL

In Brazil, the fast delivery service by the app was launched in 2011 by the company Ifood (iFood, 2020). Since then, this service grew and became an essential activity during the COVID-19 pandemic since it is a general freight transport, storage, delivery, and logistics service (Brasil,

2020a). In the first quarter of 2020, the downloads of delivery applications increase 24%, and the purchases increase 30% in Brazil (Abílio *et al.*, 2020). The Rappi app reported the same trend, increasing 30% in Latin America in March 2020 (CNN, 2020).

In Brazil, three instant delivery applications stood out in 2020, having the delivery of prepared meals and food products as a central sector: Ifood, UberEats, and Rappi. The iFood app was available in more than 1000 cities and had around 170,000 couriers in 2020 (IFood, 2020). The usual modes of transport are scooters, bicycles, and motorcycles. In some cities, supermarket deliveries are performed by private vehicles. The delivery fee is calculated based on two factors: (1) pick-up of the product by the customer directly from the commercial establishment, with no delivery fee being charged since there is no displacement of courier; and (2) delivery fee based on the distance travelled by the courier pick up the good in the commercial establishment and deliver it to the customer destination. In 2020, the minimum delivery fee was BRL 5 (BRL5.5 ≈ US$1, on December 8, 2021) (iFood, 2020). However, some factors contribute to the variation of the delivery fee, such as the number of simultaneous orders accepted by the couriers (consolidated deliveries), the city, the time and day of the week, the mode of transport, the demand for service and availability of couriers in the locality. Also, in most cities, when the distance exceeds 5km, a variable delivery fee is added to the price. There is an option to tip the courier in the app, varying from BRL 2, BRL 5, or BRL 10 (values in 2020). The couriers preview the remuneration value before accepting the delivery and the monetary transfers occur weekly. The average hour remuneration of the courier is BRL 9.50 by hour online in the app (iFood, 2020).

The UberEats app was launched in Brazil in 2016. In 2020, the application was available in more than 150 Brazilian cities, covering all capitals (UberEats, 2020). In addition to prepared meals and food products, the platform offers pharmaceutical and pet products. Deliveries are carried out by different modes of transport (scooter, bicycle, motorcycle, car). In 2020, the walking mode was available in São Paulo. However, the app's website does not provide information about the delivery fee calculation, the commission charged by the app, or the couriers' remuneration.

The Rappi app was launched in Brazil in 2017 and is available in 118 cities besides the Metropolitan Region of São Paulo. This app offers several products such as food, pharmaceutical, grocery, perfumery, and pet. In 2020, the app launched an entertainment platform (e.g. games and music) (Rappi, 2020). The company has about 200,000 couriers in Latin America, and the press reports that these numbers increased during the COVID-19 pandemic (BBC, 2020). Unfortunately, there is no information on the website about the delivery modes and the delivery fee calculation.

The growing demand for instant delivery and the unemployment contributed to increasing the number of couriers involved in this delivery service (Lameiras *et al.*, 2020). However, the profile of couriers was still unknown until the PNAD-COVID survey (Brasil, 2020b). From the response of 932 couriers, the results of the PNAD-COVID survey showed that most couriers (94%) are male and have between 19 and 25 years old (Figure 1). The age range indicates that the courier may be the first job opportunity for young people (Aliança Bike, 2019). Regarding education level, 87% of couriers had up to high school, with 44% having completed high school.

As mentioned before, it is important to stress that there is no data concerning the courier profile before the COVID-19 pandemic, except those working for bicycle delivery companies. However, Aliança Bike (2019) identified that young men, black, with low education levels, living

in peripheral regions constitute the profile of the bicycle couriers. In addition, these couriers have a long workday (on average, 9 hours and 24 minutes), with monthly remuneration below the current Brazilian minimum wage. Therefore, based on these data, we presume that the COVID-19 pandemic did not alter the profile of instant delivery couriers.

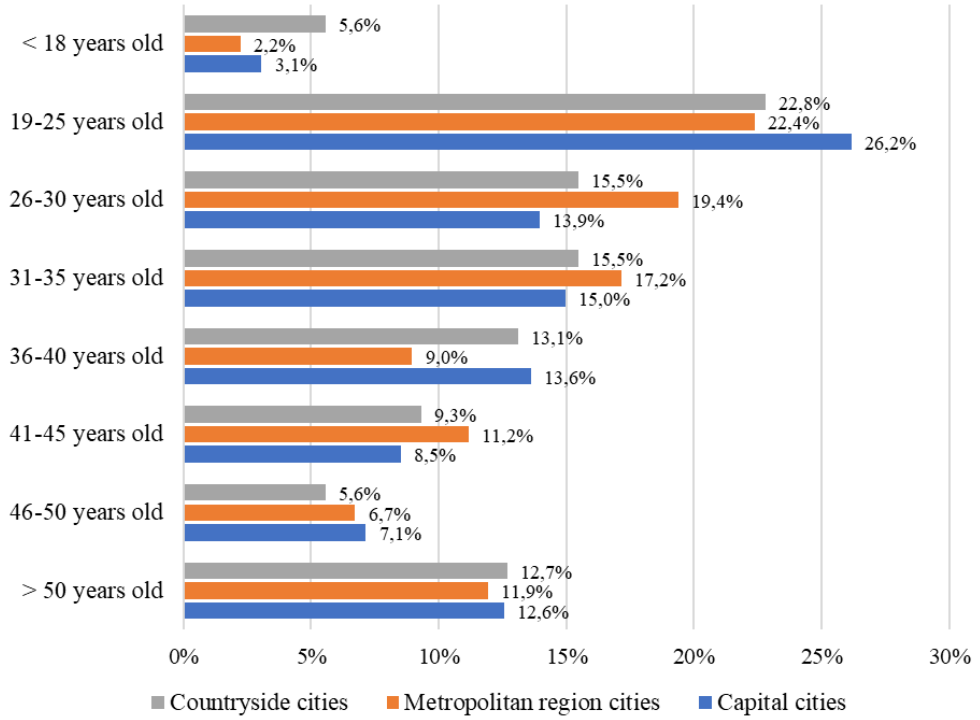

Figure 1. Age of couriers (Brasil, 2020b)

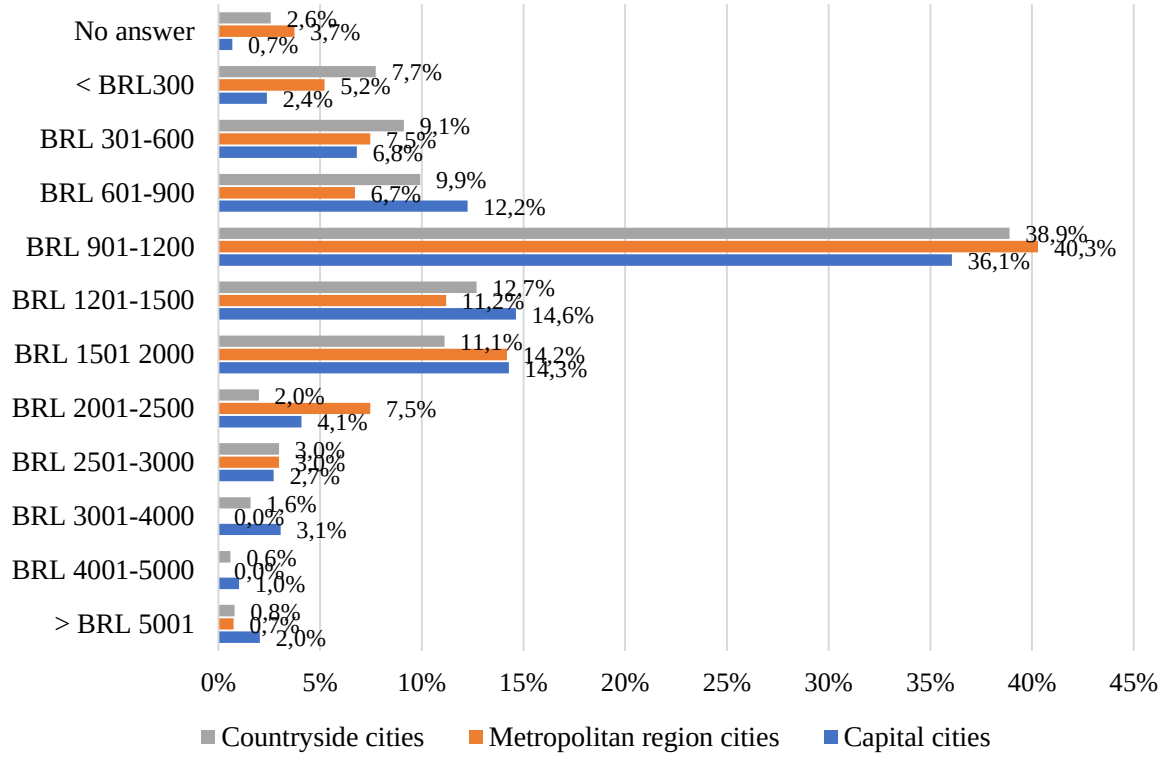

Figure 2. Average income of couriers in Brazil (Brasil, 2020b)

According to data from the PNAD-Covid survey (Brasil, 2020b), 75% of couriers have an average remuneration between BRL 900 and BRL 1200 (Figure 2), regardless of the place of work.

Additionally to the low payment, 62.22% of delivery workers work between 7 and 12 hours a day(Abílio *et al.*, 2020). Moreover, 18.89% work more than 12 hours representing a long workday, as shown in Figure 3.

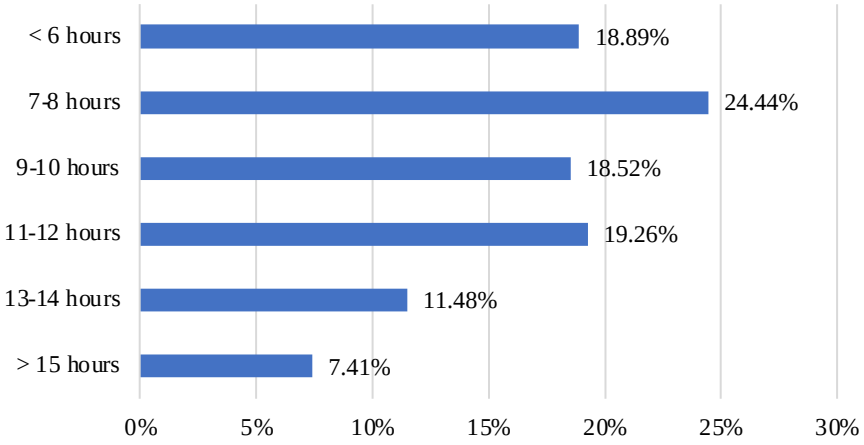

Figure 3. Workday (Abílio *et al.*, 2020)

Despite the advances presented by Abílio (2020) and Abílio et al. (2020), the knowledge concerning the remuneration, the working conditions and the deliveries performed by couriers from the instant delivery's app is still incipient. In this sense, this paper aims to contribute to this issue based on the research method presented in the next section.

3. DATA AND RESEARCH METHOD

3.1. Data

As mentioned previously, this article aims to identify the relationship between the delivery fee of instant deliveries application and the remuneration of couriers in Brazilian cities.

Firstly, we identified the instant delivery applications with national coverage, available for free download from the Google Play store. Then, we selected the IFood, Rappi, and UberEats apps from all identified applications, the most popular and with national coverage during the survey period (July 2020).

After selecting the apps, we identified and chose Brazilian cities in which the mentioned apps offer their services. Five capital cities (Belém-PA, Belo Horizonte-MG, Fortaleza-CE, Recife-PE, and São Paulo-SP) and three countryside cities (Bauru-SP, Caruaru-PE, Juiz de Fora-MG) were selected. The cities' selection criterion was based on the availability of the app services, covering most Brazilian regions and capitals and countryside cities. Therefore, despite the differences in morphological characteristics among these cities (not considered in the study, some of them could be portrayed in the collected data, as the distance travelled by couriers.

In each of the selected cities, a destination delivery place was chosen. Based on the location of this destination delivery, we simulated the order of products in the instant delivery apps. The orders of the following products were considered: (1) prepared food, (2) snack, (3) dessert, (4) supermarket, bakery, and fresh products, (5) pharmacy and (6) beverage.

Data about the product type, the distance between the establishment and destination delivery and the delivery fee were manually retrieved for each order and documented in an electronic spreadsheet, as exemplified in Table 1. The simulations of orders were carried out between 3 to 10 July 2020, during lunch, dinner, and early morning hours. Figure 4 shows the number of simulations per city, totalling 957 simulations of orders.

Table 1 – Example of data obtained from data collection

App code	Address of the establishment	Distance (km)	Delivery fee (BRL)	Product type
1	R. Treze de Maio, 1183, Bauru	0.2	4.99	1
3	R. Ibrahim Nobre, 6-7, Bauru	2.1	5.00	2
2	Travessa 14 de Março, 581, Belém	0.4	4.90	3
3	Av. Rodolfo Chermont, 204, Belém	5.1	6.99	2
1	R. Inglaterra, 84, Belo Horizonte	6.5	11.99	1
3	Av. Mem de Sá 1623, Belo Horizonte	8.6	10.99	6
1	R. Carneiro Viléla, 690, Caruaru	2.2	5.99	4
3	R. Visc. de Inhaúma, 1412, Caruaru	0.4	5.99	1
2	Av. Santos Dumont, 1221, Fortaleza	2.3	8.30	5
3	Av. Rui Barbosa, 947, Fortaleza	1.8	7.19	4
1	R. Antônio Dias, 708, Juiz de Fora	0.2	3.99	3
3	R. Halfeld, 625, Juiz de Fora	0.3	4.90	2
1	R. Padre Carapuceiro, 800, Recife	0.3	0.00	4
2	R. Francisco da Cunha, 919, Recife	0.6	6.30	5
1	R. Sampaio Vidal, 1072, São Paulo	0.3	0.00	1
2	R. dos Pinheiros, 1406, São Paulo	0.3	5.00	2

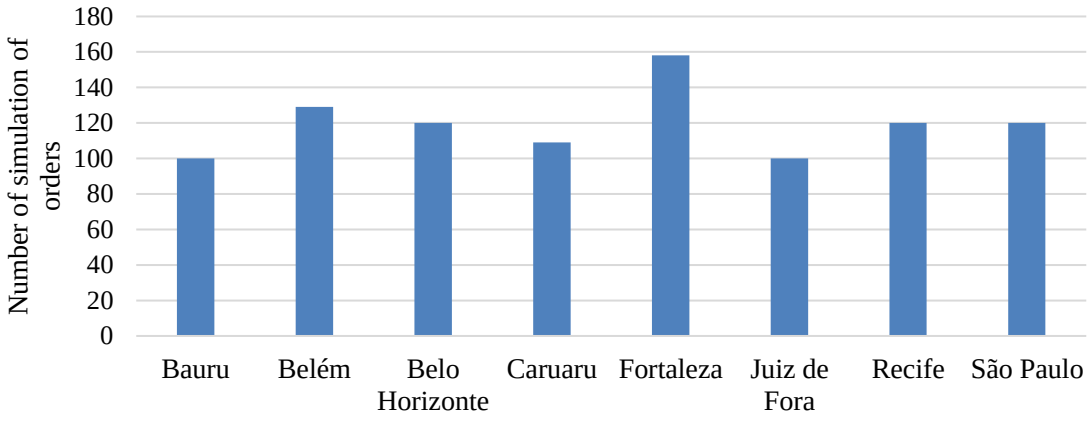

Figure 4. The number of simulations of the orders by city

Additionally, data about the remuneration of couriers were obtained from the PNAD-Covid survey (Brasil, 2020b). Finally, the daily working hours was obtained by Abílio et al. (2020), as presented above.

3.2. Research method

Pearson's correlation analysed the relationship between the delivery rate and the origin-destination distance. We estimated a linear regression model using the data for each city. Delivery fee was considered the dependent variable, and the distance was considered the

independent variable. The t-test verified the validity of the coefficients in the estimated models. The f-test was used to verify the contribution of the explanatory variables to the model. The intercept can be understood as the fixed delivery fee in the estimated model, and the estimated coefficient is the variable delivery fee based on distance.

Based on the premise that the delivery fee is a function of the distance between the establishment (origin) and the customer's location (destination), the fixed delivery fee (intercept value) and the variable delivery fee (model coefficient) were compared for each city.

Using the estimated models, we analysed scenarios that quantify the number and the minimum distance required to obtain a basic remuneration, considering the parameters obtained by Brazil (2020b) and the working hours observed by Abílio et al. (2020). In 2020, the minimum wage was BRL 1045.

4. RESULTS AND DISCUSSION

Table 2 illustrates the descriptive statistics and the correlation results. The minimum distance is similar in the cities, except for Caruaru. The maximum distance varies from 4.6 km in Fortaleza and 9.8 km in Juiz de Fora. The average distance and respective standard deviation are significant. The larger average distances were observed for Belém and Juiz de Fora. Juiz de Fora have the biggest territorial area among the cities considered in this research. No significant difference was observed between the average distances between capitals and countryside cities. Regarding the delivery fee, we identified free deliveries fee in all cities. The highest average delivery fee was observed in Belém and Caruaru, and, on average, countryside cities have a higher delivery fee than in capital cities.

Table 2 – Descriptive statistics of the variables and the correlation

	Minimum		Average		Standard deviation		Maximum		Correlation between distance and delivery fee
City	Distance	Fee	Distance	Fee	Distance	Fee	Distance	Fee	
All cities	0.20	0.00	2.06	5.89	1.15	2.53	4.70	12.00	0.53
São Paulo	0.30	0.00	2.47	6.36	1.58	4.38	8.20	18.50	0.53
Fortaleza	0.20	0.00	1.78	6.44	1.23	2.35	4.60	14.20	0.51
Belo Horizonte	0.20	0.00	2.07	5.94	1.20	1.89	5.80	12.99	0.66
Recife	0.30	0.00	2.47	6.36	1.58	4.38	8.20	18.50	0.65
Belém	0.20	0.00	3.54	7.19	2.29	4.27	9.40	15.20	0.39
Juiz de Fora	0.30	0.00	3.11	7.00	2.33	3.92	9.80	13.99	0.45
Bauru	0.20	0.00	2.32	6.22	1.48	2.83	7.00	12.99	0.24
Caruaru	0.50	0.00	2.86	7.11	1.70	3.11	7.10	13.40	0.66

Table 2 also shows the results of the Pearson correlation between the variables distance and delivery fee. Again, a positive correlation is observed, ranging from weak (0.31 to 0.5) to moderate (0.51 to 0.70) for most cities, except for Bauru, whose correlation is negligible. The correlation is statistically significant (p-value less than 0.001).

Table 3 presents the estimated regression models. All estimated coefficients have statistical significance (t-test), and the models also are statistically significant (f-test). The intercept values, which represent the fixed delivery fee, vary between cities and, even more, between countryside cities and capitals. It is worth noting that the intercept values for countryside cities

are, in general, more higher than for the capital cities. The variable delivery fee presents variability among all estimated models.

Table 3 – Estimated regression model

City model	Variable	Estimated coefficient	t-test	f-test	R^2
All cities	Intercept	3.97	24.87[a]	388.10[a]	0.29
	Distance	1.01	19.70[a]		
São Paulo	Intercept	3.04	4.66[a]	36.12[a]	0.23
	Distance	1.34	6.01[a]		
Fortaleza	Intercept	4.45	10.64[a]	54.59[a]	0.26
	Distance	0.93	7.39[a]		
Belo Horizonte	Intercept	2.87	5.27[a]	89.32[a]	0.43
	Distance	1.22	9.45[a]		
Recife	Intercept	3.61	7.89[a]	84.88[a]	0.42
	Distance	1.09	9.21[a]		
Belém	Intercept	4.48	10.43[a]	22.88[a]	0.15
	Distance	0.75	4.78[a]		
Juiz de Fora	Intercept	4.93	13.19[a]	24.25[a]	0.20
	Distance	0.85	4. 9[a]		
Bauru	Intercept	4.77	9.37[a]	6.24[b]	0.06
	Distance	0.54	2.49[b]		
Caruaru	Intercept	4.17	13.58[a]	44.65[a]	0.29
	Distance	0.86	6.68[a]		

Significance code: a 0.001, b 0.01

Figure 5 illustrates the estimated coefficients for the fixed and variable delivery fees. Regarding the fixed delivery fee, Belo Horizonte (capital of Minas Gerais State) has the lowest fee, and Juiz de Fora (countryside city in Minas Gerais State) has the highest fixed delivery fee. On the other hand, concerning the variable delivery fee per kilometer, Bauru (countryside city in São Paulo State) has the lowest, and São Paulo has the highest delivery fee. In sum, Belo Horizonte and São Paulo have the lowest delivery fee and the other cities (Caruaru, Juiz de Fora, Bauru, Fortaleza, Recife and Belém) have the highest delivery fee. In this sense, we concluded that there is a difference in delivery fees between capital and countryside cities.

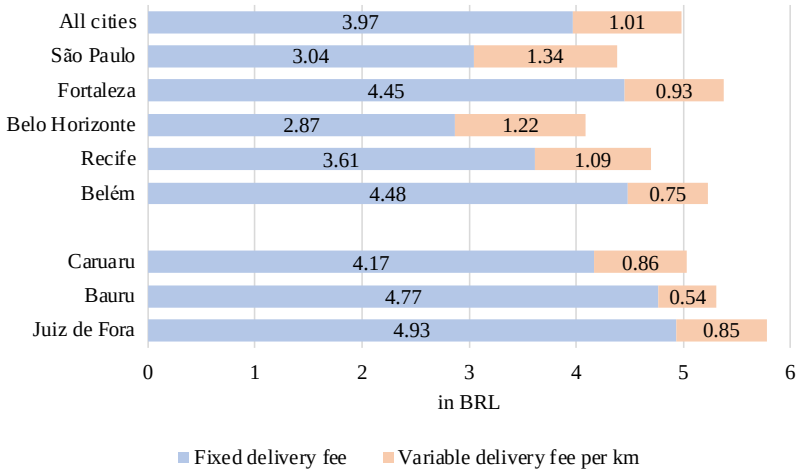

Figure 5. Comparison between fixed and variable delivery fee

Considering the Brazilian minimum wage (BRL 1045), the average salary range of the delivery service (BRL 900 and BRL 1200), and the 44 hour/week (or 176 hours/month)

workday, couriers require a minimum remuneration of (i) BRL 5.13/h to reach the remuneration of BRL 900/month; (ii) BRL 5.93/h to reach the minimum wage remuneration, and (iii) BRL 6.82/h to obtain a remuneration of BRL 1200/month. Based on these estimates and considering the estimated models shown in Table 3, we calculated the minimum hourly wage (R$/hour) based on the minimum distance and the minimum number of deliveries.

Results presented in Table 4 indicate that for the basic remuneration (minimum wage), couriers need to make at least one delivery within 2-3 km to receive the minimum hourly remuneration. It is important to note that, except for Bauru, the hourly remuneration is slightly higher in countryside cities than in the capital cities. This result may be related to the high number of couriers available in capital cities than in countryside cities. Another interesting result is that the minimum hourly wage is higher in Caruaru, Juiz de Fora, Recife, and São Paulo. It is worth remembering that this analysis did not consider the courier's mode of transport, the percentage of the delivery fee allocated to the application management, and the tips. Finally, whereas couriers using motorized mode (motorcycle or car) can easily perform deliveries up to 3km, the delivery performed by non-motorized modes (bicycle or on foot) of up to 3km can be arduous one.

Table 3 – Scenarios of minimum hourly remuneration, number of deliveries and minimum distance to obtain monthly remuneration between BRL900 and BRL1200

	Monthly remuneration					
	BRL 900		BRL 1.045		BRL 1.200	
City	Minimum distance	Remuneration (BRL/hour)	Minimum distance	Remuneration (BRL/hour)	Minimum distance	Remuneration (BRL/hour)
All cities	2 km	5.99	2 km	5.99	3 km	7.00
São Paulo	2 km	5.73	3 km	7.07	3 km	7.07
Fortaleza	1 km	5.38	2 km	6.31	3 km	7.24
Belo Horizonte	2 km	5.31	3 km	6.53	4 km	7.75
Recife	2 km	5.79	3 km	6.88	3 km	6.88
Belém	1 km	5.23	2 km	5.98	4 km	7.48
Juiz de Fora	1 km	5.78	2 km	6.63	3 km	7.48
Bauru	1 km	5.31	2 km	5.85	4 km	6.93
Caruaru	2 km	5.88	3 km	6.74	4 km	7.59

4.1. Discussion

Results indicate some interesting trends regarding the impact of the delivery fee on the remuneration of couriers from instant delivery apps. The first evidence came from the correlation between distances and delivery fee, which varied from weak to moderate, indicating the existence of a strategy in defining the delivery fee concerning the consumer market. The number of deliveries and the number of couriers can influence the delivery fee.

Furthermore, the results indicate a variation in the delivery fee among the cities. For example, Belo Horizonte and São Paulo had the lowest delivery fees. The countryside cities (Bauru, Caruaru, Juiz de Fora) had a higher delivery fee per kilometre than in capital cities, except for Fortaleza. This difference may be the consequence of the lower availability of couriers, making necessary to set new strategies involving the remuneration to maintain the service proposed by the applications.

Regarding the remuneration, the findings suggest a positive relationship between hour remuneration and distance, i.e., an increase in the distance implies an increase in the hour

remuneration. Similar results were identified for instant delivery platforms in China (Tong *et al.*, 2020). According to the results, to obtain a basic remuneration in Brazil (the minimum wage), couriers need to perform at least one delivery per hour, covering up to 3km, working 44-hour a week. However, the deliveries come up constantly, requiring the couriers to stay available more hours. Therefore, due to the long workday to obtain basic remuneration, the findings also indicate that the couriers are the primary source of remuneration converging with the results found by Abílio et al. (2020).

5. CONCLUSIONS

This paper analysed the delivery fee of instant delivery applications and its relationship with the remuneration of couriers in Brazil. The results indicated variability in the fixed and variable delivery fees in the studied cities. In addition, the research question is answered showing that as couriers' remuneration is influenced by the number of deliveries and the distance, being necessary to perform at least one delivery per hour of 3km, working more than 44 hours a week, to obtain a basic remuneration in Brazil (the minimum wage). The long workday and low remuneration are the main impacts of the remuneration system adopted by peer-to-peer applications.

For future research, we suggest improving the data by obtaining more details about the time and day of the week and mode of delivery and analysing the differences in remuneration and working hours of couriers of applications with motorcycle couriers. Moreover, identifying the impacts on urban mobility of this delivery service is necessary with a focus on road crashes and exposure to noise and air pollution.

Finally, we highlight that while the instant deliveries application is very convenient for the consumers, this delivery system can accentuate the risk of couriers concerning road crashes due to long workdays in a hostile circulation environment. Thus, to achieve sustainable urban freight mobility, which includes instant deliveries, more knowledge about the effects of e-commerce is needed (Bjørgen, Bjerkan and Hjelkrem, 2021) both in labour relations and in the traffic of cities.

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