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The sharing economy and the job market: the case of ride-hailing drivers in Chile

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Abstract
Ride-hailing (ridesourcing) companies such as Uber, Lyft, and Didi Chuxing have been a disruptive force in the urban mobility landscape around the world during the past decade. In this paper, we analyse the working conditions, earnings, and job satisfaction of ride-hailing drivers. We begin by discussing the regulatory, labour, financial, and urban mobility effects of ride-hailing companies. Then, we present the results of a self-administered survey to ride-hailing drivers in Chile, which is complemented with the use of online tools for the estimation of driving earnings. Our findings show that the flexibility to choose work times is the most appreciated attribute of this job, even though most drivers follow a somewhat fixed routine each week. By contrast, the level of transparency with which ride-hailing apps determine driver pay is the attribute with the lowest satisfaction score. A large number of respondents drive for long daily and weekly periods, which is a health and safety hazard. Current drivers are not concerned about the future deployment of driverless vehicles for on-demand mobility services. Ordered probit models for job satisfaction show that ride-hailing was better evaluated by drivers who use it as a complement to another part-time job, by those who earn more money per week, and by those who have not experienced undesirable situations while working, such as harassment or traffic crashes.

Keywords Sharing economy · Job satisfaction · Ridesourcing · Driving job · Transportation network companies

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Introduction

Ride-hailing is defined as an on-demand mobility service in which drivers of personal vehicles are connected with riders that request a specific trip. The platform for this service is a digital application, commonly known as an app, that is installed on a smartphone or tablet and provides options for booking, electronic payment, and ratings of passengers and drivers (Shaheen et al. 2016). Ride-hailing platforms determine trip fares, which are known in advance and are accepted by passengers and drivers. Once a trip is completed and payment is processed, the ride-hailing platform retains a percentage of the total fare as its commission and the rest is transferred to the driver.[1] Ride-hailing is also known as ridesourcing in the academic literature, and service providers are usually called transportation network companies (TNCs).

Ride-hailing has expanded quickly in many countries over the past decade and several TNCs have emerged, including Uber, Lyft, Didi Chuxing, Ola, and Cabify, to name a few. This new industry has posed several challenges to policymakers: on the one hand, riders have been using these new mobility services due to several advantages they offer for specific types of trips. The advantages of this form of door-to-door, car-based mobility, as reported by users, include short travel time and waiting time, ease of payment, fare transparency, no need of finding or paying for parking, no need to drive after drinking alcohol, and increased comfort (Rayle et al. 2016; Henao 2017; Tang et al. 2019; Tirachini and del Río 2019). On the other hand, even though ride-hailing has the potential to reduce car ownership, this does not straightforwardly translate into a reduction of traffic levels and traffic-related externalities. In fact, recent studies have estimated that motorised traffic has increased due to ride-hailing in several cities (Agarwal et al. 2019; Erhardt et al. 2019; Wenzel et al. 2019; Tirachini and Gomez-Lobo 2020). Moreover, whilst evidence concerning the effect of ride-hailing on car ownership remains limited, there are clear indications of drivers purchasing or leasing cars to become ride-hailing drivers (Agarwal et al. 2019; Tirachini 2019), oftentimes incentivised by companies like Uber, which arrange partnerships with local car dealers in countries such as Mexico and India.[2]

Beyond the mobility effects of ride-hailing (Surveyed in Jin et al. 2018; Tirachini 2019), a crucial issue to analyse and understand is the impact of the ride-hailing industry on the labour market and associated labour regulations. Ride-hailing platforms constitute one of the most recognisable examples of the so-called *sharing economy*, given that a ride-hailing company does not hire workers, but each driver decides when and where to use his or her own vehicle to work. Companies such as Uber, which has an estimated 3.9 million drivers worldwide,[3] rest upon a novel approach to labour relationships that is at the core of the ride-hailing business model: drivers are not employees but partners. This assertion has also been a noticeable source of conflict between ride-hailing companies and regulators in several countries. While the number of drivers and cities in which ride-hailing companies operate continues to grow, regulators struggle to find appropriate ways to balance all of the interests involved when deciding to accept (or ban) ride-hailing companies (Flores and Rayle 2017). For instance, between December 2018 and September 2019:

[1] Although in some countries, such as Chile, there are ride-hailing platforms that accept cash payments from passengers to drivers.

[2] https://www.uber.com/es-MX/drive/vehicle-solutions/new-car-discounts/, https://www.uber.com/en-IN/drive/vehicle-solutions/car-loans/, accessed 02/10/2019.

[3] https://www.businessofapps.com/data/uber-statistics/, accessed 02/10/2019.

- In the United Kingdom, Uber announced that it would fight a decision by the Court of Appeal that would force the company to acknowledge its drivers as regular workers.[4]
- In Argentina, workers from Uber, Glovo, and Rappi decided to form their own workers' union.[5]
- In California, lawmakers were in talks about passing a new law that would require Uber and Lyft to treat contract workers as employees.[6]
- In India, Uber and Ola drivers, who had been staging large strikes since 2017, continued their protests. These drivers had bought new vehicles on loan thinking these companies would follow through on their promise of helping them generate high income as ride-hailing drivers. Instead, these drivers found themselves incapable of paying back these loans due to the reduction of fares and fees that these companies paid to drivers, which severely affected their income expectations (Agarwal et al. 2019).

These legal struggles in the relationship between ride-hailing companies, drivers, and regulators are the centrepiece of the ride-hailing business. Having a large number of drivers available is key to the success of ride-hailing in a city, where the service works best if the necessary supply scale is reached, which happens when a car that a user requests is available within a few minutes (Castillo et al. 2018; Tirachini 2019). In this context, a deeper understanding of the ride-hailing driver's work environment is relevant to the current debate on ride-hailing regulation.

In this paper, we present and analyse the results of a survey administered to ride-hailing drivers in Chile in 2018. The survey was applied to both current and former ride-hailing drivers and included questions about sociodemographic characteristics, estimated earnings and costs, and job satisfaction, among other topics. In our study, we begin by analysing several issues not previously studied in the emerging literature[7] on ride-hailing drivers, including an examination of risk situations faced by drivers, satisfaction levels with specific attributes of this job (e.g., earnings, transparency of information, flexibility), driving routines, reasons to quit, and opinions concerning the future deployment of automated (driverless) vehicles as a threat toward their jobs. We then provide an estimation of earnings and costs for ride-hailing drivers that is independent of the platforms themselves, and that, to the best of our knowledge, is the first of its kind in a country outside the United States. Even though the scientific literature on job satisfaction is rich (see, e.g., Freeman 1978; Clark 1997; Gazioglu and Tansel 2006; Origo and Pagani 2009), there are no econometric studies on job satisfaction for drivers who work under sharing economy platforms. In the paper, we estimate ordered probit models to uncover the variables that are statistically significant in determining the level of satisfaction with the ride-hailing driving job. Such enquiry is helpful to understand the effect of this new form of job on the labour market.

The second section of this paper synthesizes past research on the sharing economy concept and the impact of ride-hailing platforms over transport systems and the labour market.

[4] See, https://www.telegraph.co.uk/technology/2018/12/19/uber-heads-supreme-court-losing-appeal-worker-rights/ accessed 02/10/2019.

[5] See, https://www.perfil.com/noticias/sociedad/trabajadores-de-uber-glovo-y-rappi-crearon-su-propio-sindicato.phtml accessed 02/10/2019.

[6] See, https://www.nytimes.com/2019/09/11/technology/california-gig-economy-bill.html accessed 02/10/2019.

[7] Bansal et al. (2020) also analyze a survey applied to drivers but focused on their willingness to own a car and to switch to more efficient vehicles.

The third section describes the survey and data collection process. In the fourth section, we show and discuss findings on the drivers' earnings based on the survey data, earning-and-cost estimations, the drivers' work routines, risks faced, job satisfaction (including the estimation of ordered probit models to explain it), and the drivers' opinions concerning different aspects regarding the present and future of this job. Finally, in the closing section, we synthesize our findings and discuss directions for further research.

Literature review: driving for a ride-hailing platform in the sharing economy paradigm

Definition of sharing economy

A sharing (or collaborative) economy is usually defined as the exchange of capital, assets, and services between individuals through internet-based platforms for the sharing of underutilised resources at a low transaction cost (Avital et al. 2014; Hamari et al. 2016). The sharing economy paradigm promises an increase in economic efficiency, environmental benefits, and economic growth. Digital applications, or apps, in the areas of mobility (e.g., ride-hailing, carpooling) and housing are amongst the forerunners of the sharing economy revolution. Even though the role of information and communication technologies on changing traditional employment relationships (from rigid to more flexible and contingent structures) has been long recognised (Neumark and Reed 2004), the recent emergence and wide adoption of sharing economy platforms have posed new challenges that are being intensely debated in the past few years. Schor (2016), for instance, distinguishes between for-profit and non-profit innovations, arguing that the former might induce low-quality labour conditions if not properly regulated, while Graham and Woodcock (2018) claim that activities that used to be formal are now casualised and that their workers have no bargaining power with the platform itself.

Regulation of ride-hailing companies

The rise of ride-hailing has raised several regulation issues in the transport sector, concerning a wide range of topics such as taxation, competition with the taxi industry, worker rights, accountability, and competition/complementarity with existing public transport services (Harding et al. 2016; Dudley et al. 2017; Flores and Rayle 2017). In most U.S. cities, the same ride-hailing companies that flourished in the past decade, such as Uber and Lyft, have also violated existing laws and put pressure on regulators (Flores and Rayle 2017). The literature includes analyses of specific company-related and driver-related regulations for ride-hailing (Beer et al. 2017), as well as discussions concerning the convenience of having supply controls for ride-hailing (e.g., to fix the number of ride-hailing licences, to allocate a fixed number of kilometre credits to ride-hailing companies, to apply a tax per kilometre or per trip, or to regulate the commission charged by the platform) (e.g., Zha et al. 2016; Alonso Ferreira et al. 2018; Tirachini and del Río 2019).

The analyses become much more complex if the competition between ride-hailing services and the (usually highly-regulated) taxi industry is considered. Harding et al. (2016) synthesize the historical regulations of the taxi industry to show that new platforms present different problems that do not fit well in previous regulations. Dudley et al. (2017) focus on the emergence of Uber in London, showing that its disruptiveness was key to the company's rapid expansion and the cause of many problems regarding regulation, working conditions, and the city's identity due to the iconic status of London's black-cab taxis. The case of San Francisco, the cradle of ride-hailing in the United States, is studied by Flores and Rayle (2017), who conclude that the eventual acceptance and legalisation of ride-hailing in the city is explained not only by the push from private entrepreneurs using the support of riders and drivers to lobby for legalisation but also by the role played by some government authorities who welcomed ride-hailing in the city. This scheme, after its success in San Francisco, was pursued by ride-hailing companies in other cities and countries. A further discussion regarding the path of regulation and ride-hailing in San Francisco, Mexico City, and Paris is provided by Goletz and Bahamonde-Birke (2019).

Characteristics of the drivers' job

Another body of literature focuses on the tension between economic efficiency and labour conditions in the ride-hailing job market, as recognized by Rogers (2015) when synthesizing the social effects of Uber. Calo and Rosenblat (2017) suggest that the problems regarding labour conditions might be increased by asymmetries in information and power, which is confirmed by Wells et al. (2018), who interviewed 40 Uber drivers in Washington, D.C. and showed that these drivers (1) do not know the full details surrounding their earnings, (2) are encouraged to take debts, and (3) are exposed to health and injury risks, yet half of them said they would recommend this job to a friend. In this context, ride-hailing users have stressed the relevance of regulating the working conditions of drivers (Tirachini and del Río 2019).

Concerning desirable attributes of the ride-hailing driving job, Chen et al. (2017) claim that the flexibility of deciding when to work improves the attitude that drivers have towards this job because they can earn more than twice the surplus they would obtain in less flexible arrangements. Hall and Krueger (2017) report that this flexibility is particularly valued by Uber drivers because, among other things, it offers drivers an opportunity to complement the income they earn through other part-time or full-time jobs.

Studies on the estimation of ride-hailing drivers' wages are seminal and different results have been reported in the United States. In a study commissioned by Uber, Hall and Krueger (2017) estimate that hourly earnings in 2015 were between \$16.20 and \$23.70 in six U.S. cities (specifically, Boston, Chicago, Washington, D.C., Los Angeles, San Francisco, and New York) and hourly costs to be between \$2.90 and \$6.50. Henao and Marshall (2019a) estimate that ride-hailing (Uber and Lyft) drivers' wage (earnings minus cost) is between \$5.70 and \$10.50 per hour in Denver, suggesting that most drivers in this city not only earn less than ride-hailing drivers in others states but also earn less than the minimum wage in the State of Colorado.

The differences between ride-hailing and taxi driving

Some studies have analysed the differences between the job of driving for a ride-hailing company and driving for a taxi company. The technology used by ride-hailing apps to match riders and drivers offers some advantages over traditional taxi street-hailing. The fact that drivers have a smartphone app that attempts to optimise the assignment of riders in real-time provides drivers and passengers with a technology-driven efficiency gain relative to the case of street-hailing. With ride-hailing, there is an increase in the time in which drivers are with passengers relative to the time in which they drive empty, as compared to taxis that cruise city streets in search of passengers (Cramer and Krueger 2016). Such gains in efficiency are also available for taxi drivers if they adopt the use of e-hailing apps.

Beyond technology-driven differences concerning smartphone-enabled platforms, there are other distinctions between the job of taxi drivers and ride-hailing drivers, as exposed by previous driver surveys. Glöss et al. (2016) interviewed taxi and Uber drivers in London and San Francisco to study the differences in their jobs, finding that for Uber drivers, it is easier to start working but that they have more risks; they also show that some driving skills (like the knowledge to navigate the city) have become less relevant. Similarly, Chen and Sheldon (2015) compare the rules of taxi and Uber drivers to decide how long to drive: while the former quit driving when they make their usual daily wage, the latter drive longer when surge pricing appears (surge pricing, which increased standard fares, is applied by Uber in periods of low driving supply relative to trip requests, see Castillo et al. 2018). In terms of labour impact, Berger et al. (2018) do not find solid evidence to suggest that Uber has caused unemployment in the taxi driving sector in the United States. The authors did, however, estimate that Uber has decreased the earnings of wage-employed drivers while simultaneously increasing the earnings of self-employed drivers and that Uber has mostly encouraged non-taxi drivers to become self-employed drivers (Berger et al. (2018).

Data description

Context

In Chile, ride-hailing started with the arrival of the platform Cabify in 2012, followed by Uber in 2014. Uber's rapid expansion throughout the country and strong popularity among users quickly attracted media attention, as well as opposition in the form of protests from taxi drivers against ride-hailing platforms (Tirachini and del Río 2019). More recently, in the capital city of Santiago, two other international ride-hailing companies have also launched operations: Beat in 2017 and Didi Chuxing in 2019. The lack of proper regulation of ride-hailing platforms in Chile and poor law enforcement partly explains why both ride-hailing companies have continued to grow, further escalating the tensions that ride-sharing services created with the regulated taxi industry. While a bill to regulate ride-hailing platforms is still under discussion in the Chilean Parliament at the time of writing (discussions about legalising ride-hailing started in 2016), the National Productivity Commission from the Ministry of Economics has published a report (in Spanish) about the activity of ride-hailing companies in Chile, which includes the results of surveys taken by Uber and Beat drivers (CNP 2019). The report offers insight into the description of age groups, education levels, and job status (part-time or full-time) of ride-hailing drivers. The CNP surveys were administered through the Uber and Beat platforms.

The survey

Our analysis of the working conditions of ride-hailing drivers in Chile is based on an online survey, distributed between January and August 2018. The survey was applied to both current and former ride-hailing drivers, and it targeted the two largest ride-hailing companies that had operations in Chile at the time of the survey: Uber and Cabify. Five groups of questions were asked:

(a) Sociodemographic characteristics: age, gender, area of residence, education level, and occupation.
(b) Driver routines: days working as a driver (weekday or weekend), period of work (morning, afternoon, evening, night), number of working hours per day both as a driver and in other jobs, driving strategy.
(c) Characterisation of the ride-hailing driving job: time since starting to work as ride-hailing driver, estimated earnings and costs per week, working hours per week, percentage of driving time with and without passengers, risk situations faced, and satisfaction level with the ride-hailing driving job in general and with specific elements of the job (such as earnings and transparency in the information provided by the platform).
(d) Other questions: opinion about how the regulation of ride-hailing services should be, opinion about the adoption of automated vehicles for ride-hailing, and opinion about the traffic externalities of ride-hailing platforms.
(e) For former ride-hailing drivers, we asked for the reasons why they stopped working as a driver.

Given that the universe of ride-hailing drivers is not known and not reachable, a random sampling strategy is not possible. For our research, drivers were contacted mainly through the Facebook groups for ride-hailing drivers that exist in Chile, created by the drivers themselves to share information. We also contacted one association of ride-hailing drivers, which distributed the survey to its members. Given that this is not a random sample, the statistical properties of this sample are not known. However, when we compared the sociodemographic characteristics of our sample to that of the CNP (2019) survey, we found several similarities in sociodemographic indicators. We will also show that the relative choice of platform (Uber or Cabify) by drivers in our sample matches the relative choice of users in Santiago, taken from Tirachini and del Río (2019), and that the working periods as drivers, declared by respondents in our sample, match the actual weekly timing of Uber trips in Santiago ("Characteristics of the ride-hailing driving job" section). No monetary reward was provided to survey respondents. The survey was implemented in the platform Qualtrics. No IP (Internet Protocol) address could complete the survey more than once. In total, we obtained 308 surveys (although some respondents did not answer all the questions).

The socioeconomic characteristics of the sample and ride-hailing driving status are shown in Table 1. The figures in Table 1 are directly comparable to those of the driver survey from the CNP (2019), regarding age, gender, and studies. Table 1 shows that 70.6% of current drivers work exclusively with Uber, 21.7% work with Uber and Cabify, and 7.7% work exclusively with Cabify. These figures are in agreement with the results from the survey on ride-hailing users in Santiago presented by Tirachini and del Río (2019), who found that 96.6% of riders use Uber and 7.7% use Cabify.[8] This is a highly masculine job—84% of drivers in our sample are men, which is comparable to the U.S. market. It is also in line with Hall and Krueger (2017) findings, which report that 86% of Uber drivers are men. Nevertheless, the percentage of women drivers is likely to be larger in ride-hailing than in the taxi industry, as indicated by Hall and Krueger (2017) for the United States and by the CNP (2019) for Chile. Regarding age, three out of four drivers in our sample are between the ages of 25 and 50, with around 40% age 35 or younger. The age profile presented in

[8] The subsample of Cabify drivers is too small to make a statistical analysis of Cabify alone.

Table 1 is very similar to that of Uber drivers in Santiago (CNP 2019).[9] The education levels are particularly surprising, as more than 60% of the drivers have completed postsecondary studies (e.g., technical school, colleges, and universities), the same as reported in CNP (2019), revealing that these jobs have been relevant to compensate for the lack of convenient job positions for skilled workers. All in all, the socioeconomics of our sample is indeed comparable to that of other surveys on ride-hailing drivers. Regarding vehicle ownership, 82.7% of the drivers are owners, 5.9% use a car borrowed for free from someone that they know, and 11.4% rented a car to work as ride-hailing drivers. The survey was also open for former drivers, whose answers are analysed separately in "Reasons to quit" section.

Findings

Characteristics of the ride-hailing driving job

The survey questions shed light on many aspects that expose the characteristics of the ride-hailing driving job in Chile. How does the tension between flexibility and the informal conditions that have been discussed in sharing economy jobs emerge in the drivers' daily routines? How comfortable, satisfactory, and secure is it to drive for ride-hailing companies? First, we asked questions about drivers' working routines, displayed in Fig. 1. We analyse the length of drivers' working periods per week and per day, which is a relevant indicator of the quality of this job. Figure 1a shows the number of driving hours per week and its heterogeneity confirms that there are different ways of being a driver. Of the drivers surveyed, 41% work less than 30 h a week, and 20% work more than 50 h a week (as a reference, 44 is the standard number of hours worked per week in Chile for full-time jobs). Working hours depend on car ownership status, as the average, weekly ride-hailing drive time is 31 h for car owners, 33 h for drivers that borrow a car for free, and 45 h for drivers that rent a car. This information is relevant as an informal market of car rentals[10] for ride-hailing and informal loans for car purchases[11] have emerged.

Figure 1b shows the number of hours driven during the latest day worked, prior to responding to the survey. Because the answer in Fig. 1b can be obtained directly from the app (drivers get a daily summary when they finish a workday), this information is highly reliable as it is not dependant on perception. Besides confirming the same heterogeneity announced before, a concerning fact shows up in Fig. 1b: the extremely long working periods that some drivers endure. Almost one-third of the drivers were on route 10 or more hours during the latest day, including 4.7% of drivers who said they typically worked 16 h or more. This is way beyond a regular full day of work in Chile, and it is also a very risky situation as tired drivers are more prone to cause crashes or near misses (Fell and Black 1997; Phillips and Sagberg 2013). In the European Union, nine

[9] In the CNP (2019)'s sample, 27% of drivers are age 20–29 and 57% of drivers are age 30–49.

[10] For instance, searching for "Arriendo auto Uber" (in English "Rent Uber car") in www.mercadolibre.cl (an e-commerce Chilean website) yields several offers for daily car rental offers. Similar proposals abound in the Facebook drivers' groups that were joined by the researchers during this investigation. Irregular rental of drivers' ride-hailing accounts has also been reported, but this aspect cannot be analysed with our data.

[11] See https://www.ahoranoticias.cl/programas/reportajes/227071-autos-sin-marcha-atras-pierden-ahorro-por-credito-automotriz.html (in Spanish, accessed 02/10/2019.), or www.carcero.cl (in Spanish, accessed 16/04/2020).

Table 1 Descriptive statistics sample

Category	Count	Percentage
Sex		
Male	259	
Female	49	15.9
Age		
18–20	1	0.3
21–25	25	8.1
26–30	47	15.3
31–35	52	16.9
36–40	59	19.2
41–50	72	23.4
51–60	36	11.7
60+	16	5.2
Location		
Santiago	286	92.9
Other cities	22	7.1
Driving status		
Present drivers	272	88.3
Only Uber	192	
Only Cabify	21	
Uber-Cabify	59	
Former drivers	36	11.7
Only Uber	30	
Only Cabify	0	
Uber-Cabify	5	
Studies		
Secondary school—incomplete	2	0.6
Secondary school—complete	22	7.1
Technical studies—incomplete	30	9.7
Technical studies—complete	57	18.5
University—incomplete	60	19.5
University—complete	108	35.1
Postgraduate—incomplete	9	2.9
Postgraduate—complete	20	6.5
Total sample	308	100.0

hours is the maximum time that drivers can work daily and 56 h is the weekly maximum (Department for Transport 2015)

Figure 1c shows the total number of hours worked per week, which includes time spent working as a ride-hailing driver and time spent at other jobs. Again, results are concerning as several drivers are working much more than the standard work time per week in Chile (44 h), although the average (46.2 h) is just slightly larger than the standard work time for a full-time employee. In our sample, 42% of respondents report working more than 50 h per week. Some respondents work as ride-hailing drivers to

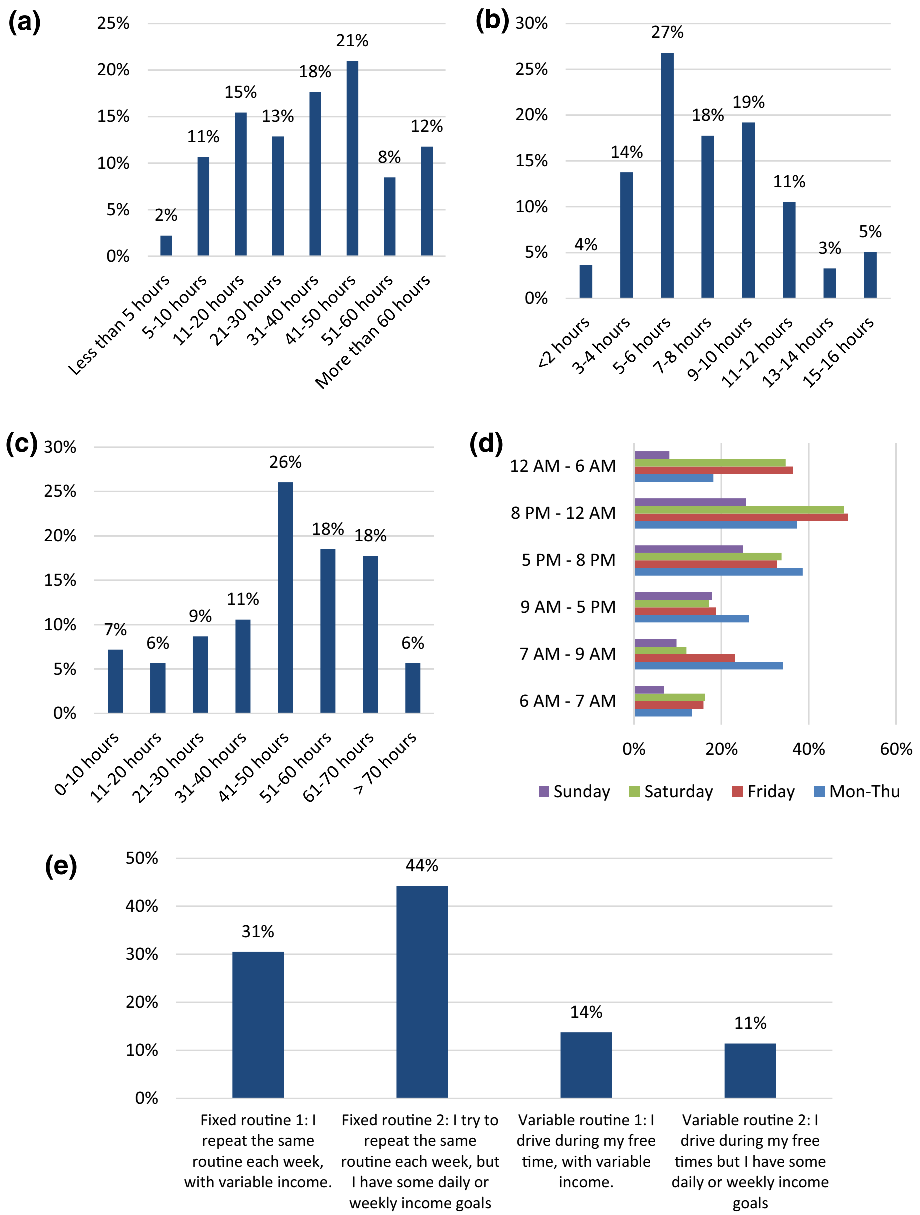

Fig. 1 Drivers' work routines: **a** The number of driving hours in a usual week (n = 272), **b** the number of hours driven during the latest day worked (n = 276), **c** total hours worked per week (n = 265), **d** working periods per week (n = 268), and **d** variable or fixed routines (n = 272)

complement a non-work-related activity: 21% of them work less than 30 h a week, which is in line with the fact that 18% of drivers are also students

Figure 1d describes the days and periods in which respondents work as ride-hailing drivers. On regular working days (Monday through Thursday), they work mostly from 7 a.m. to midnight—the most preferred driving period is from 5 PM to midnight. This pattern changes on Fridays and Saturdays when most of the work is during the night, specifically from 8 p.m. to 6 a.m. On these two days, peak time in ride-hailing driving is 8 p.m. to midnight. This finding corresponds with actual data on Uber use in Santiago as published by local newspaper *El Mercurio*, which shows that the weekly peak of Uber trips in the city occurs on Fridays and Saturdays between 8 p.m. and 2 a.m. (Tirachini and del Río 2019).[12] Finally, Fig. 1d shows that on Sundays, drivers work mostly during the day and in lower numbers

To understand the relevance of having flexible working conditions, we asked drivers about their work routines. Results are shown in Fig. 1e, with each of the four categories presented as an alternative. Considering current drivers of all companies, 74% of respondents follow fixed or stable weekly routines, although 44% incorporate some flexibility in order to obtain a target income per week. The rest of the drivers (25%) work mainly in their free time, earning variable incomes (14%) or adjusting their routines to reach a target weekly income (11%). These figures should be complemented with the fact that, when asked for the reasons to work as drivers, flexibility was by far the most selected reason (as shown in "Satisfaction with the ride-hailing job" section). These numbers reveal that flexibility is indeed something that drivers value, but that the work routines are not so different from traditional jobs, and many drivers do have a weekly income target to which their work time is adjusted. Regarding job expectations, 55% of the drivers in our sample said they plan to work in this role indefinitely, whereas the rest have some expectation to switch jobs when, for example, they find a job related to their professional training.

Table 2 synthesizes drivers' perceptions regarding the distribution of their time while working in ride-hailing. Waiting for a request can be done while either parked or cruising around, and drivers have different strategies about what to do while waiting for a request in order to maximize their income, depending on personal preferences and location. On average, drivers report spending 53% of their work time travelling with passengers, 18% driving while waiting for a new request, 15% driving on their way to pick up a new passenger, and 14% parked. Time spent driving with passengers coincides with the calculations by Cramer and Krueger (2016), who estimate that the time with passengers for Uber drivers in Boston, Los Angeles, New York, San Francisco, and Seattle was between 43 and 55% of their total driving time. The analysis of the efficiency in the use of time by drivers is relevant from a traffic sustainability viewpoint, as the time in which ride-hailing vehicles drive without passengers (on average, 33% as shown in our sample) has been analysed as a significant contributor to traffic and congestion in cities (Henao and Marshall 2019b; Tirachini and Gomez-Lobo 2020)

Figure 2 deals with risky situations that drivers face when working in ride-hailing. Although some of these situations can occur in any job, analysing them in a sharing economy scheme is relevant because workers are less protected (or not protected at all if their jobs are not legally regulated). Taking this into account, the results are disturbing: less than 3% of the drivers report having experienced no risky situation. The most common dangerous situation is driving in places perceived as insecure. The lack of regulation has enhanced the tension between taxi and ride-hailing drivers, which is also dangerous, with two out of five drivers in our sample report having been victims of attacks or threats from taxi drivers. The rest of the risky situations (e.g., assault, harassment from passengers, and crashes) are

[12] In the United States, similar evidence regarding a large concentration of ride-hailing trips on Friday and Saturday night is presented by Brown (2018) and Wenzel et al. (2019).

not so common, but the figures are still high.[13] We cannot rule out having a selection bias in our sample: drivers that have faced risks might be more likely to respond to this type of survey if they want their situation to be known. But even assuming the possibility of such bias, these figures are very concerning and reveal the need for increased job security. It is worth mentioning that being controlled by the police was reported by several of the open answers classified in "Other", but it was not an explicit alternative, so it is likely to be another relevant risky situation given that ride-hailing remains an illegal activity in Chile. This situation that can lead to temporary car retention should be solved with proper regulation of the ride-hailing activity. Currently, ride-hailing companies pay the fine needed to get the car back but do not compensate for the days in which the driver was unable to work

Estimation of driver income and expenses

One of the most relevant aspects discussed in the ride-hailing literature and media involves driver earnings (Henao 2017; Wells et al. 2018). In this section, we estimate income and expense focusing only on the largest group in our sample: Uber drivers in Santiago.

Estimation of Uber trip fares and driver wage (by the authors)

In order to estimate how much money drivers earn by working in ride-hailing, we performed 160 "virtual trips" in Uber. This sample size is chosen because it provides a narrow width for the 95% confidence interval (C.I.) of the mean income value (per kilometre or per minute), as seen below (the C.I. width is between 5% and 8% of the mean income value). A virtual trip consists of defining an origin and destination at some moment of the day, and registering the fare for the users, the distance, and the time needed to complete that trip at that moment using two online tools: Uber's fare estimator[14] and Google Maps. Origins, destinations, time, and day were chosen to replicate as well as possible the ride-hailing usage information collected by the CNP (2019) and used by Tirachini and del Río (2019), which provided a distribution of ride-hailing trips in Santiago according to length, zone of origin, zone of destination, time of day, and day of the week. From this database, approximately 64% of riders use ride-hailing on Friday or Saturday and 59% travel between 5:01 pm and 11:59 pm. Trip lengths (estimated using Google Maps) were chosen to replicate the trip length distribution of 1,474 surveyed Uber trips in Santiago as presented in Tirachini and Gomez-Lobo (2020): 18% of trips are shorter than 3 km, 40% of trips are between 3 and 6 km, 26% of trips are between 6 and 10 km, and 16% of trips are longer than 10 km. For all 160 virtual trips, the fare P per trip was calculated in two ways, in both cases using Uber's fare estimator. None of the methods include surge pricing.

- *Method 1* This method uses Uber's fare estimator exclusively. Once an origin and destination for a trip are provided, Uber's fare estimator does not provide a unique fare estimation, but rather it provides a range $\left[P_{min}, P_{max}\right]$ for the final fare. We then compute the fare as the average value of that range, $P = \left(P_{max} - P_{min}\right)/2$.

[13] Wells et al. (2018) describe harassment and other types of risky situations faced by Uber drivers in Washington D.C.

[14] https://www.uber.com/us/en/price-estimate/, accessed 04/10/2019.

Table 2 Distribution of time while driving (n=272)

Status	Min	Max	Mean	Median	SD
Driving with passengers	10	100	53.1	50	19.5
Driving, waiting for a request	0	60	17.6	20	11.6
On the way to pick up a passenger	0	50	15.3	15	8.8
Parked	0	70	14.1	10	12.5

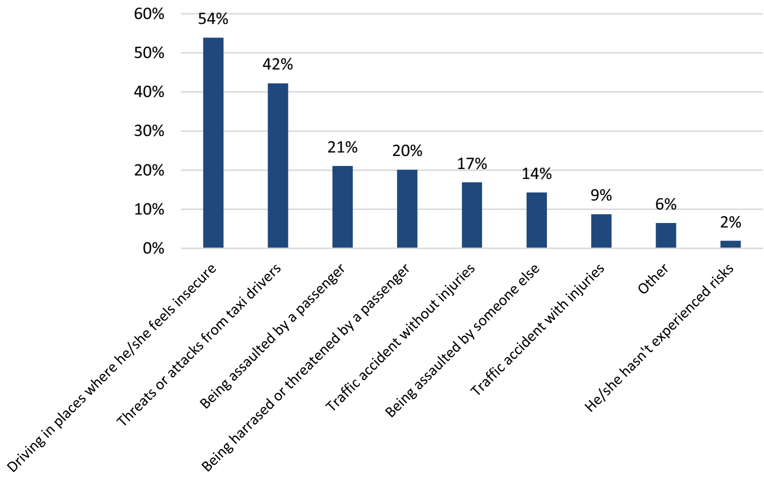

Fig. 2 Percentage of drivers having experienced risky situations (n = 309)

- *Method 2* We use Uber's formula for fare calculation, which is also provided on Uber's website:

$$P = \max\{P_{base}, a_0 + a_1 T + a_2 D\} \tag{1}$$

where P_{base} is the minimum fare as set by Uber, T is the duration of the trip in minutes, D is the length of the trip in kilometres, and a_0, a_1, and a_2 are parameters. At the time of the survey, parameters were P_{base} = 1200 CLP, a_0 = 450 CLP, a_1 = 80 CLP/min, and a_2 = 220 CLP/km (CLP: Chilean Peso), which are equivalent to $ (USD) 1.93, 0.72, 0.13, and 0.35, respectively. The $ symbol is used for US Dollar (USD) in the paper.[15] In order to use (1), distance and travel time per trip are estimated using Google Maps simultaneously to the request of price range $[P_{min}, P_{max}]$ from Uber's fare estimator in Method 1.

Results indicate that average fares per minute are ($ cent) 38.8 with Method 1 (95% Confidence Interval C.I. 37.6, 40.0) and 34.9 with Method 2 (95% C.I. 34.0, 35.9). Figure 3 presents the fare for all 160 trips, in $ cents per kilometre, as calculated with both methods; trips are sorted from largest to smallest fare per kilometre, using Method (1) Average fares are 86.6 (95% C.I. 83.3,89.9) and 78.2 (95% C.I. 75.3, 81.2) for Methods

[15] The exchange rate used is USD 1 = CLP 622, which is the average exchange rate for the period of application of the survey (January through August 2018) as informed by the Central Bank of Chile.

1 and 2, respectively. Thus, we find that there is a statistically significant difference in the mean fare estimated with both methods; on average, Method 1 estimates a fare that is 10% larger than Method (2) Moreover, in 91% of cases, the fare from Method 1 is larger than the fare from Method 2 (Fig. 3). Longer trips have a lower price per kilometre (Eq. 1). A number of reasons might explain the discrepancies observed in Fig. 3. First, for Method 1, the average value between P_{min} and P_{max} was chosen, however, we do not know how Uber estimates the range $\left[P_{min}, P_{max}\right]$ and, in particular, how close to reality the average value is within that range. Second, the optimal route suggested by Google Maps and the Uber app may differ and, in reality, we do not know which route drivers actually follow. Given these uncertainties, we will provide estimations of earnings using these two alternative methods.

Estimating the drivers' hourly income requires assuming a value for the drive time with passengers. We assume that drivers travel with riders on average 53% of their working time (Table 2) and that the commission discounted by Uber is 25% (as reported by drivers). With these assumptions, we obtain an average hourly income of $9.30 with Method 1 and $8.30 with Method 2.

Estimation of driver costs (by the authors)

First, we estimate average gasoline consumption, which depends on the consumption efficiency of cars. In a previous cost study for taxis and ride-hailing in Santiago, Bennett and Zahler (2018) use an empirical U-shape function that relates gasoline consumption to average car speed based on research from the Department for Transport from the United Kingdom. Computing Bennet and Zahler's curve with the average speed of our sample of Uber trips as estimated with Google Maps (26 km/h), we obtain an average fuel efficiency of 12.5 km/litre, which we assume as representative of the fleet used by Uber drivers in Santiago.[16] Gasoline price during the period observed is $1.2 per litre; therefore, we estimate fuel cost to be $2.4 per hour for an average hour of driving. For the estimation of other costs associated with maintenance (e.g., periodic car controls, change of parts), we rely on Bennett and Zahler (2018), who estimate these costs to be 3 cents per kilometre, equivalent to 81 cents per hour, which is 34% of average fuel cost. Therefore, we estimate the total driving cost to be $3.2 per hour. This calculation assumes that drivers are always driving, however, it is common that drivers also spend time parked while waiting for a new request. Average parking time, as reported by drivers, is 14% (Table 2). Using this value, we obtain the adjusted cost to be $2.80 per hour.

All these estimations assume that drivers own their vehicles, which is the case for approximately 80% of the drivers, according to our survey and the CNP (2019). For drivers who want to work in ride-hailing and do not own a car, there is already an informal market in Chile in which drivers rent cars on a weekly basis. In this case, drivers are only responsible for fuel costs because the cost of maintenance (81 cents per hour in our estimation) is assumed by the owner. Renting a car in this informal market costs between $130 and $190 USD per week (based on a Google search of online ads), depending on the car type.

16 A sample of vehicles used for Uber service in Santiago, as reported by drivers, includes the following models: Chevrolet Spark, Hyundai Elantra, Changan CV1, and the Nissan Versa. These vehicles have fuel efficiency ratios between 11.4 and 13.6 km per litre in cities, as reported by manufacturers.

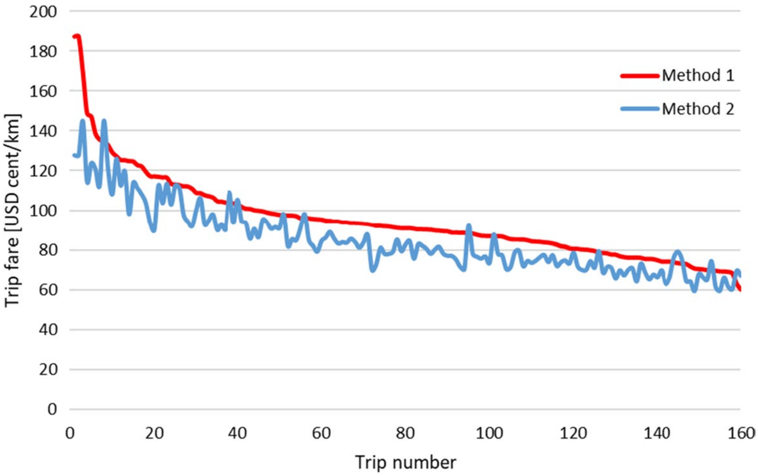

Fig. 3 Estimated Uber fare per kilometre. The set of 160 trips is sorted in descending order (using Method 1)

Driver wage estimation

In this section, we present an estimation of income and cost as reported by the drivers we surveyed. Three aspects of the survey have been analysed so far: (1) how much money drivers make monthly (e.g., how much money they receive from the ride-hailing company, after discounting the commission charged by the company but without considering their spending in terms of costs), (2) how many hours drivers work weekly, and (3) the percentage of total income drivers spend on fuel, maintenance, and all other relevant expenses. Although these figures should provide a direct estimation of the hourly wage of the drivers, some basic statistical processing was needed. On the one hand, answers were given in intervals: intermediate values were assumed but in the extreme cases (intervals containing zero or infinity) in which the positive finite value was assumed. On the other hand, the "large extreme" interval for the number of hours worked in a week (60 h or more) had almost 10% of the answers, which is why we subdivided it into two categories: between 60 and 70 h, and 70 h or more. Interpolating with a normal distribution from the previous time brackets, we estimate 17 answers to be in the "60 to 70" category and nine answers in the "70 or more" one. Under these assumptions, we estimate an average income of $5.90 per hour and average costs of $1.70 per hour.

Uber's estimation

Finally, we compare our figures with the income promise made by Uber. In 2016, Uber's general manager in Chile publicly assured drivers that if they work between seven and 10 h per day, they can make 450,000 CLP (or $723 USD) per week.[17] Using this figure, and assuming one free day per week (therefore, a work time that's somewhere between 42 and

[17] See https://www.radiozero.cl/noticias/actualidad/2016/04/cuanto-gana-un-chofer-de-uber-doblan-el-salario-de-los-taxistas/, accessed 30/09/2019.

60 h per week), we obtain income rates between $12.10 and $17.20 per week (discounting the fee kept by Uber but without discounting any operational cost).

Synthesis and comparison of the estimations

Table 2 synthesizes income and expenses according to the alternative estimation methods presented. For the Uber's estimation column, our own estimation for the expenses is used. First, our estimations (Methods 1 and 2) produce estimate wages between $5.10 and $6.50 per hour, which is larger than the estimation based on the drivers' own assessment: $4.20 per hour. At the same time, we observe that Uber's promise is too far from the other estimations, as the estimation of wage using Uber's promise is (on average) roughly double that of our estimations and more than double that what drivers said in the survey. In the United States, the Federal Trade Commission noted Uber's exaggeration of drivers' earnings as the dissemination of "advertisements that overestimated the likely hours and yearly income of drive" and announced a $20 million settlement with Uber for these actions (Calo and Rosenblat 2017). As stated earlier in this paper, in Denver, Henao and Marshall (2019a) estimate that drivers earn between $5.70 and $10.50 per hour—figures that are below the minimum wage in the State of Colorado in several cases. In the case of Santiago, all of the estimates show that drivers earned more than the minimum legal wage in Chile in 2018 (which is CLP 288,000 per month, or around $2.50 USD per hour). In Chile, median and mean monthly income during 2018 were CLP 400,000 (about $3.50 USD per hour) and CLP 574,000 (about $5 USD per hour). Interestingly, Uber drivers are likely to make a wage that is larger than the median wage in Chile.

It is also interesting to observe that, compared to our estimations, drivers tend to underestimate both their income and their expenses. Their estimation of expenses is similar to our estimation of the expenses in fuel only ($1.70 verses $2.10). This is in line with the findings of Ivehammar and Holmgren (2015), who show that car commuters might underestimate their private monetary cost by considering only those expenses that come "out-of-pocket."

Finally, we highlight two elements that are missing in this discussion: (1) Uber's surge pricing, which is applied in periods of low driving supply relative to trip requests (actual data of surge pricing application is presented by Castillo et al. 2018), and (2) car depreciation costs. In Table 3, surge pricing is included in the drivers´ estimation and Uber´s estimation of income, but it is not included in Methods 1 and 2. As depreciation increases, cost and surge pricing increases income. These two elements push in different directions and (at least partially) cancel out in the calculation of wages with Methods 1 and 2, however, the result of their sum is highly uncertain. On the one hand, dynamic surge pricing applied by ride-hailing companies depends heavily on the city and time period. For instance, data collected by Chen et al. (2015) show that the average surge multiplier is around 1.4 in San Francisco and around 1.1 in Manhattan, while in the database compiled by Henao and Marshall (2019a) in Denver, only 7.2% of ride-hailing trips were subjected to surge pricing, with multipliers between 1.25 and 2.0. On the other hand, depreciation is not included in the estimation of costs as there is no reliable data on depreciation costs per kilometre for cars in Chile, let alone for vehicles used for commercial purposes such as taxis and ride-hailing vehicles. Depreciation varies a lot from driver to driver depending on the value of the car and how many kilometres the car has driven already. In other countries, depreciation costs have been estimated to be substantial. For private cars in the United States, for example, average depreciation cost is estimated to be in the same order of the costs of fuel and maintenance combined on a per kilometre basis (AAA 2019). Such large depreciation cost would result in an overestimation of earnings if the application of surge pricing is not large enough to neutralise it.

Drivers' satisfaction and opinions

Satisfaction with the ride-hailing job

Regarding questions about satisfaction with the job, drivers were first asked to cite specific reasons why they chose to work as a ride-hailing driver. Respondents had to express their assigned level of relevance based on a 1-to-7 ordinal scale, where 1 and 7 are the lowest and highest relevance levels, respectively (1 to 7 is the scale for grading in schools and other educational institutions in Chile, where 4 is the pass mark). Results for the job attributes included in the survey are depicted in Fig. 4a. Flexibility to choose work times stands out as the most important feature of ride-hailing driving, as 76% assign 6 or 7 points to this attribute. The average score for "flexibility" is 6.1 (85% as a rate of the maximum score). The second reason respondants chose to work as ride-hailing drivers is because they say they "enjoy driving", which has 5.3 (72%) as the average mark. The third reason is that it offers "better conditions than alternative jobs", with an average score of 5.0 (67%), and finally, "wage level" with an average score of 4.9 (65%).

Drivers were then asked about their level of satisfaction with specific elements of their job and with the ride-hailing driving job in general, using the same 1-to-7 scale (where 1 and 7 are the lowest and largest level of satisfaction, respectively). Results are shown in Fig. 4b. The average global evaluation is 4.5. The most common global evaluation is 5.0 (30% of the drivers), while 24% of the drivers evaluate with a very good mark (6 or 7), and 23% with a "fail" mark (3 or lower). Concerning specific attributes, transparency in the location of the passengers, the evaluation system by riders through stars given to drivers, and the efficiency in assigning passengers are all evaluated with 4.4 as average score (just above the pass mark 4.0). The wage level is evaluated with 3.8 and the transparency regarding wages with 3.4. Note that the global evaluation is better than each of the specific aspects, suggesting that there are other positive characteristics that were not included in the questionnaire. In total, two out of five respondents are not satisfied with the amount of money that they make as drivers (score 1 to 3), and 53% of drivers are not satisfied with the way their income is calculated by their ride-hailing app, as they do not feel it as "transparent". The latter aspect is relevant as it deals with the core of the discussion regarding sharing economies: that drivers are partners of ride-hailing companies rather than employees. This stated lack of transparency regarding wages takes place in a situation in which drivers have no bargaining power.

Characterising drivers' satisfaction with ordered models

In this section, the satisfaction scores from drivers are used to estimate the specific variables that are statistically significant in determining drivers' satisfaction with their ride-hailing job. An understanding of job satisfaction relies on the relationship between workers' well-being (Green 2010), labour productivity (Böckerman and Ilmakunnas 2012), and the propensity to quit (Freeman 1978; Clark 2001; Green 2010), among other variables. In the case of the transport sector, studies have shown that self-reported levels of driving stress and job insecurity can be positively correlated with traffic crashes from bus and taxi

Table 3 Hourly income, expenses, and wage of Uber drivers in Santiago

	Estimation using Uber's online estimator (Method 1)	Estimation using Uber's fare formula and Google Maps (Method 2)	Uber's estimation	Drivers' estimation
Earnings	\$9.30	\$8.30	\$12.10–\$17.20	\$5.90
Expenses	\$3.20 if driving one hour \$2.80 if parked 14% of the time			\$1.70
Wage	\$ 6–\$6.50	\$5.10–\$5.60	\$8.80–\$14.50	\$4.20

drivers (Useche et al. 2018) and that an imbalance between effort and reward (measured as a combination of salary level, job promotion opportunities, and being treated with respect) increases job strain and health problems of bus drivers (Chung and Wu 2013).

We estimate ordered models to explain ride-hailing job satisfaction. The ordered logit and ordered probit models are the two most common specifications used in the transport literature for analysing ordinal variables. Even though the parallel regressions assumption applies for both ordered logit and probit models (Greene and Hensher 2010), the ordered probit model does not require to meet the proportional odds assumption (Williams 2016). We specify two ordered probit models to explain the general level of satisfaction: one concerning different explanatory variables that describe the drivers (Table 4) and the other concerning the drivers´ evaluations of specific features of this job, as explained in "Satisfaction with the ride-hailing job" section (Table 5). In other words, the former model encompasses objective facts, while the latter model uses subjective opinions as explanatory variables, which is why we split them into two different models—to obtain neater interpretations.[18]

Probit estimators are frequently used to model job satisfaction in the labour economics literature (e.g., Gazioglu and Tansel 2006; Green 2010). The general form of the model is presented in Eq. (2), where X is the global evaluation (job satisfaction) and $\Phi$are the accumulative probability function for a standard normal distribution,z_k are the explanatory variables, and β_k the estimated parameters, shown in Tables 4 and 5.

$$P(X \leq i) = \Phi\left(\gamma_i + \sum_k \beta_k z_k\right) \tag{2}$$

We estimate the models using *mnrfit* function of the Matlab software package.[19] Note that

[18] If a single model with all the explanatory variables was estimated, the same significative attributes would emerge from the objective variables, and no subjective opinion is significant. However, taking into account only subjective opinions, as done in the model in Table 5, allows us to distinguish which opinions are more relevant in explaining general satisfaction. Moreover, in order to make our conclusions more robust, we estimated a linear model and an ordered logit model with the same data, and exactly the same explanatory variables happen to be significant.

[19] See https://www.mathworks.com/help/stats/multinomial-models-for-ordinal-responses.html, accessed 08/10/2019.

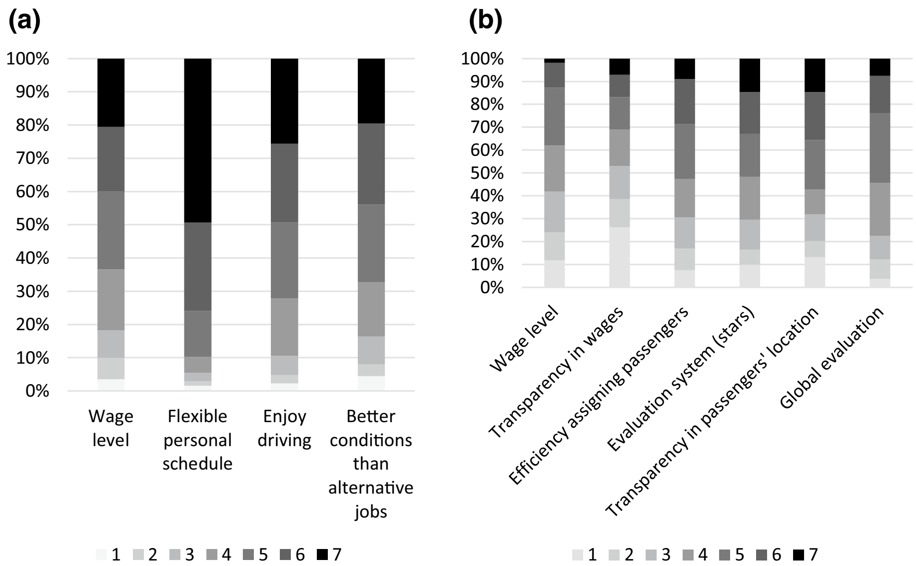

Fig. 4 Satisfaction with the job: **a** relevance of attributes of the ride-hailing driving job (n = 217), **b** satisfaction level with attributes of the ride-hailing driving job (n = 213)

$$\frac{\partial P(X \leq i)}{\partial \beta_k} = z_k \Phi' \left(\gamma_i + \sum_k \beta_k z_k \right) \geq 0 \tag{3}$$

where the inequality holds because all explanatory variables z_k are positive and Φ is a strictly increasing function; therefore, a positive value for β_k means that the larger the value of the explanatory variable z_k, the higher the probability of obtaining a low X(or, put plainly, that the correlation between X and β_k is negative). In particular, using the well-known expression for the expected value of a random variable X that takes natural numbers

$$E(X) = \sum_{i \geq 1} P(X \geq i) \tag{4}$$

we can deduce that

$$\frac{\partial E(X)}{\partial \beta_k} < 0 \tag{5}$$

The intercepts γ_i deal with the cumulative probabilities of each category i (Greene and Hensher 2010) and say nothing about specific explanatory variables z_k .

The descriptive characteristics considered in the first of these models include both personal characteristics (such as gender and age) and attributes of the job that are driver-specific (such as vehicle ownership status and exposure to risk situations). For a significance level $\alpha = 0.05$, Table 4 shows that having experienced a risky situation (either high-risk or mid-risk) is statistically significant to explain job satisfaction; high-risk situations (defined as having been a victim of assaults or having car accidents with injuries) are more relevant as the mean global job satisfaction is 4.1 in the sub-sample of drivers that have faced them, while this value is 4.4 for drivers that have experienced mid-risk situations only. In parallel,

Table 4 Ordered probit model that explains drivers' general satisfaction with respect to specific drivers' attributes

Variable	Coefficient	*p* value
Hourly wage as driver	0.02	0.56
Weekly earnings as driver	– 0.0048	0.029
Gender (0 = female)	0.05	0.82
Age	0.0013	0.88
Is the vehicle of his or her own? (0 = no)	0.52	0.05
Is the vehicle borrowed? (0 = no)	0.25	0.5
Number of months working as a driver	0.009	0.39
Does he or she follow a fixed routine? (0 = no)	– 0.043	0.98
Level of studies	0.054	0.51
Is he or she currently studying? (0 = no)	– 0.32	0.15
Is this his or her only job? (0 = no)	– 0.21	0.29
If he or she has another job, is it part-time? (0 = no)	– 0.65	0.014
If he or she has another job, is it full-time? (0 = no)	– 0.43	0.08
Number of hours driving weekly	0.008	0.32
Has he or she faced a mid-risk situation? (0 = no)	0.61	0.017
Has he or she faced a high-risk situation? (0 = no)	0.39	0.016
Does he or she work only during the day? (0 = no)	0.13	0.53
Does he or she work only at night? (0 = no)	0.34	0.13
γ_1	– 3.46	0
γ_2	– 2.78	0.0001
γ_3	– 2.32	0.001
γ_4	– 1.62	0.02
γ_5	– 0.74	0.28
γ_6	0.048	0.95

Table 5 Ordered probit model that explains drivers' general satisfaction with respect to their evaluations of specific aspects of these jobs

Variable	Coefficient	*p* value
Wage level	– 0.41	0
Wage transparency	– 0.11	0.034
Efficiency assigning passengers	– 0.13	0.039
System of evaluation using stars	– 0.075	0.16
Transparency regarding users location	– 0.067	0.18
γ_1	0.38	0.16
γ_2	1.36	0
γ_3	1.99	0
γ_4	3	0
γ_5	4.22	0
γ_6	5.21	0

those who drive in ride-hailing as a way to complement another part-time job show a statistically significant larger satisfaction than the rest (while having a full-time job is significant only for $\alpha = 0.1$). This is an interesting finding, as the flexibility of driving seems to be more important and satisfying for drivers when it adjusts to another job. As also found in other job satisfaction studies (Gazioglu and Tansel 2006), the level of weekly earnings as a driver is significant in explaining job satisfaction. After controlling for income, job status, and risk situations, respondents that own the vehicles they drive have a lower satisfaction level than others (those who borrow a vehicle for free and those who pay a weekly rent for the vehicle).[20] All the other explanatory variables are not significant, including hourly wages, gender, age, and number of hours driven. Other studies on general job satisfaction across different sectors have found that women experience greater job satisfaction than men (Clark 1997; Gazioglu and Tansel 2006), a finding that is not replicated with our sample of ride-hailing drivers in Chile.

The second model (Table 5) attempts to estimate which specific aspects of the ride-hailing driving job are relevant to explain general job satisfaction. Satisfaction level with each of the attributes shown in Fig. 4b is used as the explanatory variable. By far, given its p-value, satisfaction with the wage level is the most relevant factor. Wage transparency and efficiency assigning passengers to users are also significant for $\alpha = 0.05$. The system of driver evaluation through stars from users and the transparency related to passenger locations are not significant.

Reasons to quit

The survey was completed by 36 former ride-hailing drivers (people who used to be ride-hailing drivers but quit this job), for whom there was a specific question on their reasons to quit. Respondents could select one or more alternative options, results are shown in Fig. 5. The most common reason to quit (more than 25% of choices) is that the money earned was not enough, which is consistent with the discussion from "Characterising drivers' satisfaction with ordered models" section about the relevance of earnings for drivers' satisfaction. Some drivers are not happy with their earnings and the satisfaction (or lack of it) with their wages is the most relevant characteristic that explains general satisfaction with this job. This is consistent with other studies that have found a lack of satisfaction with one's pay and job security as having the strongest influence on the decision to quit a job (Clark 2001). Finding another job is the second most common reason to quit. This suggests that ride-hailing has the potential to be a temporary job alternative during unemployment situations. More than 15% of these drivers said insecurity (e.g., feeling scared of having problems with passengers or taxi drivers) was a reason they quit. The rest of the suggested possible explanations (including stress and problems with the platform or with the police) were selected by less than 10% of respondents.

Automated vehicles for ride-hailing

The analysis of ride-hailing and the job market is conducted in the context of rapid technological changes, as this market is likely to be subject to profound changes in the future brought on by automation and the development of driverless vehicles. The large cost savings that are anticipated due to automation has prompted ride-hailing companies such as Uber, Lyft, and Didi Chuxing to form alliances with car manufacturers for the deployment

[20] Average satisfaction for drivers without another job is 4.5, for drivers with another full-time job is 4.6, for drivers with another part-time job is 4.9, and for drivers with another freelance job is 4.1.

of automated ride-hailing services, such as the pilot started by Waymo (Google´s company for automated vehicles) and Lyft in Phoenix, Arizona, in May 2019.[21] In this context, we asked drivers a question on how they feel about automated vehicles, in particular, the use of driverless vehicles for ride-hailing. Results in Fig. 6 show that most drivers do not worry much about this situation. More than 80% of respondents either do not think that vehicle automation represents a risk to their jobs (either because they think it is too far in the distant future or because they think it is never going to happen in Chile) or because they think that having automated vehicles is good even if they lose their jobs. Only 10% of current drivers show some level of concern about the possibility of losing their jobs due to automation.

Regulation of ride-hailing services

Drivers were also asked about the tension between flexibility and precarity of these jobs as, at the time of the survey and of this writing, ride-hailing remains unregulated in Chile. We asked respondents to choose between a set of options dealing with how to regulate their jobs. Fifty-six percent said they would prefer for the ride-hailing system to be regulated (e.g., ensuring in a contract labour rights such as social security, vacations, and transparent salary, among others) even if that requires drivers to obtain a professional driving license and pay taxes (Fig. 7). Only 10% of the drivers are satisfied with the current unregulated situation. Therefore, even though drivers highly value the time flexibility of ride-hailing as a source of income, there seems to be a general dissatisfaction with the current situation and a clear choice for more regulation and security in their labour situation.

Synthesis and conclusions

In this paper, we have analysed the situation of ride-hailing drivers in Chile by analysing the results of an online survey administered to both current and former drivers. We focus on some relevant aspects that characterise the labour conditions faced by part-time and full-time drivers. We also provide our own estimation of drivers' earnings and costs, using the survey and alternative methods based on the calculation of ride-hailing trip fares using online tools.

We estimate that average driver wages (income minus cost) are between $4.50 and $6.10 USD per hour. This is higher than what drivers estimate but much lower than what the largest ride-hailing platform in the country (Uber) has promised. The analysis of driver routines reveals some interesting facts. First, even though drivers value the flexibility of this job, most have routines that are somewhat fixed. Second, long working periods are not uncommon, which represents a traffic safety risk. Drivers are often exposed to dangerous situations on the streets. In general, driver job satisfaction is regular (the average score is 4.5 on a 1-to-7 scale). Probit regressions show that driver satisfaction, on the one hand, significantly increases for drivers that have another part-time job and use ride-hailing as a way to earn additional income, and for drivers who earn extra money per week working in ride-hailing. On the other hand, satisfaction significantly decreases for drivers who have

[21] https://www.theverge.com/2019/5/7/18536003/waymo-lyft-self-driving-ride-hail-app-phoenix, accessed 04/10/2019. For the case of Uber, see https://www.uber.com/us/en/atg/, accessed 03/10/2019.

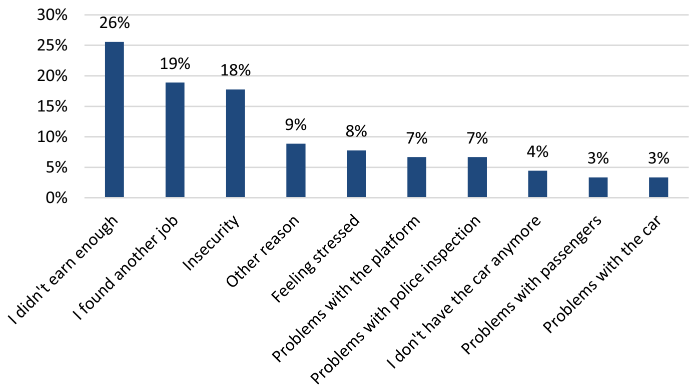

Fig. 5 Reasons to quit working as a driver (n = 36)

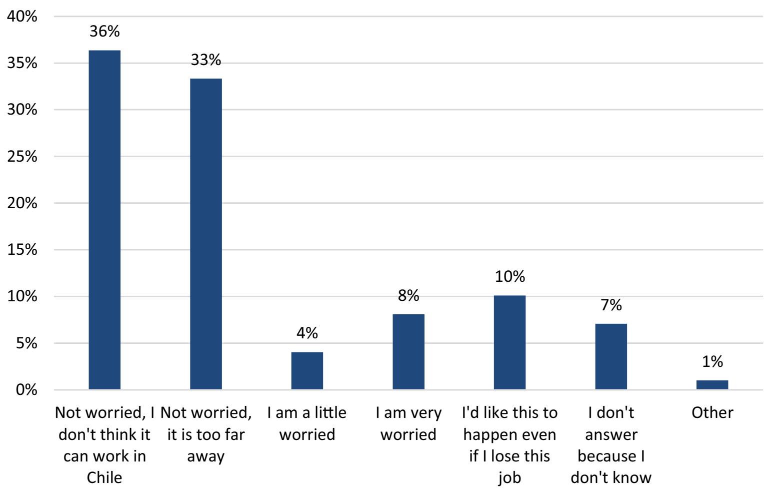

Fig. 6 Uber drivers' responses regarding the chance that their jobs are replaced by automated vehicles (n = 213)

encountered risk situations while working. The job attribute most valued is the flexibility to decide when to work. Regarding the technological attributes of the platforms, most drivers appreciate the level of precision in displaying information on riders' location. By contrast, respondents are least satisfied with the way the platform estimates their income (after discounting the platform fee at the end of a working period) because they feel this approach lacks transparency. Drivers generally do not feel threatened by the possible adoption of automated vehicles and would like to have proper ride-hailing regulations in place, even if that requires them to obtain a professional driving license and pay taxes.

As a source of income, ride-hailing has proved useful for unemployed people who are seeking new jobs and for students and part-timers that want to increase their income. Nevertheless, these cases are not necessarily representative of the broader spectrum of ride-hailing drivers, as we find plenty who are working indefinitely at this job, with work routines that are mostly fixed. In this sense, these jobs are not too different from traditional

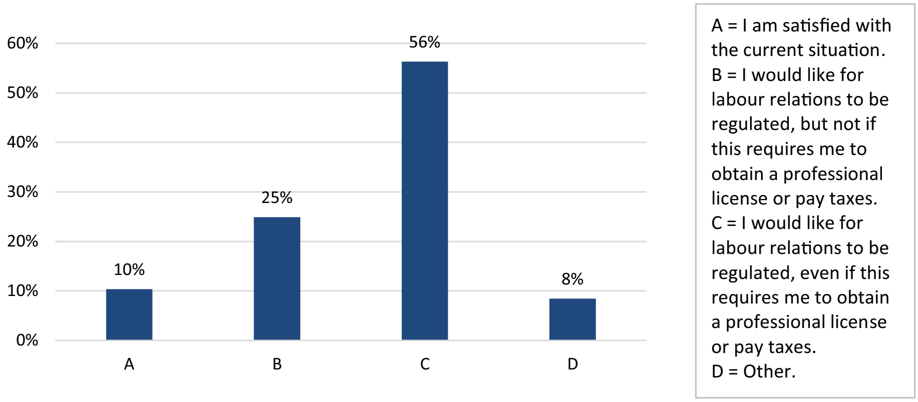

Fig. 7 Uber drivers' opinions regarding the regulation of their jobs (n = 213)

ones, but the absence of fixed schedules is appreciated by the drivers. The challenge for policymakers seems to be creating proper regulations for this industry, with laws that preserve attributes that are favourable to drivers, such as the flexibility of schedules (as done in the places where ride-hailing has been legally regulated) while providing drivers with basic labour rights and duties. Such regulations should take into account that some concerns (such as wages or employment status) can be faced directly, while others (such as facing risky situations) are harder to avoid, so indirect policies (such as insurances) are required. It is worth noting that full driving flexibility implies that ride-hailing cannot play the role of traditional public transport services, which have to cover basic mobility needs even in areas that are not attractive for private on-demand transport providers, such as ride-hailing companies and drivers. Central to the discussion of regulation is the issue of whether drivers are partners (independent contractors) or employees of the ride-hailing companies, which is an ongoing debate in several states and countries. The decision of regulators on this topic will shape the nature of the relationship between drivers and ride-hailing companies in the coming years and will define the future of the sharing economy in the field of on-demand mobility services.

Several aspects related to the job of ride-hailing drivers were not studied in this paper and should be considered in future research. A relevant topic of research involves the number of drivers who own the vehicle that they use compared to those who are renters, as well as the informal market for ride-hailing car rentals that have emerged (see footnote 9). Another key element of the debate is if wages should be regulated, as was done in New York in 2018, and how such regulation should be implemented. For instance, in Chile, there is a new legal initiative that parliament will soon begin to discuss, which would require companies to pay to the drivers when they are connected (hence, working) even if there are no trips to assigned to them.[22] Some cities have decided on charging specific taxes for ride-hailing and placing a cap on the number of ride-hailing licences available. The effect of these measures on the ride-hailing labour market is largely unknown. Finally, an in-depth analysis that also includes drivers working with delivery companies (e.g., Uber Eats and Glovo, among others) with either motorised or non-motorised vehicles would also

[22] See https://web.mijefeesunaapp.cl/ (in English "My boss is an app"). Accessed 03/10/2019.

be necessary to have a fuller picture of the effect of these so-called sharing economy platforms in the labour market.

All in all, this paper confirms that creating a proper regulation for the increasing number of app-based jobs is an urgent matter. In Chile, more than five years have passed since these mobility services started to become popular, and this delay has relevant impacts on the quality of jobs and on the lives of thousands of drivers.

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