Between a rock and a hard place: Negotiating Dependencies and Precarity in the On-Demand Economy[1]

Srihari Hulikal Muralidhar (corresponding author)[1], Claus Bossen[2] & Jacki O'Neill[3]

[1]Aarhus University, Denmark; [2]Microsoft Africa Research Institute

[1](srihari@cc.au.dk); [2]clausbossen@cc.au.dk, [3]jacki.oneill@microsoft.com

Abstract. There is growing evidence of ride-hailing platforms' adverse impact on drivers. Nonetheless, hundreds of thousands of drivers continue to work on these platforms. Why? What considerations propel their continued usage over time? By drawing upon a qualitative study with auto-rickshaw drivers using Ola, a ride-hailing platform similar to Uber in India, we show how Ola over time shapes relations between itself, customers and drivers. The platform adds to the drivers' precarity and provides little benefit, and the platform's customer-centric design often leads to tensions with drivers. We illustrate how this has come about through the impact of ride-hailing platforms on the market: The duopolistic (Uber vs Ola) nature of the urban taxi market in India, paralleled by a shift of more and more customers from street-hailing to app-based hailing over time, has forged new dependencies for drivers on these platforms, which leaves drivers with little choice but to accept them. Thus, drivers continue to work for the platform, not because of any benefits, but because of the 'new dependencies' created by the infrastructuralization of ride-hailing platforms like Ola in the urban transport market. Our findings also reveal some ancillary benefits for drivers from their use of ride-hailing applications as first-time internet/smartphone users. The paper concludes with key implications for regulation as well as platform design that can improve customer-driver interaction as well as make the marketplace fairer, more equitable, and protect drivers' welfare.

1   Introduction

The peer-to-peer (P2P) exchange of goods, services and labour have received much attention in CSCW and HCI. Prior research has identified certain core issues with digital labour platforms, including the following: a) the modelling of workers as 'independent contractors' or as 'consumers of the platforms' technological services' (Rosenblat, 2018; Gray and Suri, 2019); b) precarious work conditions requiring 'part-time' workers to work on multiple platforms to make ends meet (Ma and Hanrahan, 2019); c) a neglect of workers' personal safety (Almoqbel and Wohn, 2019); and d) problems with evaluation mechanisms, which often create

---

[1] This version corresponds to the accepted manuscript with the Journal of Computer-Supported Cooperative Work (19 April 2022). For citation, please see https://dl.eusset.eu/handle/20.500.12015/4246.

power imbalances (Lee et al., 2015; Rosenblat and Stark, 2016). The information asymmetries around critical aspects of work such as task assignment coupled with a lack of control over wage determination and lack of adequate grievance redressal mechanisms have been shown to disenfranchise workers (Gupta et al., 2014; Ahmed et al., 2016; Hanrahan, Ma, and Yuan, 2017; Rosenblat, 2018). This labour market can be characterized as a 'revolving door' of one-off, repetitive tasks that offer little stability or support (Gray and Suri, 2019). The potential for exploitation because of the availability of a 'reserve army of labour' willing to take on these precarious jobs for low pay has been a recurrent theme across contexts (Martin et al., 2016; Raval and Dourish, 2016; Rosenblat, 2018). Nonetheless, as Ma and Hanrahan (2019) point out from their recent study of ridesharing drivers in the US, millions of workers continue to join or work on one or more of these digital labour platforms. The question is *why?*

In this paper, we answer this question by providing an analysis of how labour platforms create 'new dependencies' for drivers that shape their continued use, despite exacerbating their precarity and providing little additional benefit. We conducted a qualitative study in 2018-19 to examine the continued use of the ride-hailing platform Ola by auto-rickshaw drivers in India notwithstanding the challenges mentioned above. In 2015, we had conducted an ethnographic study with auto-rickshaw drivers in Bengaluru to understand how adoption of Ola had impacted their work. With the follow-up study in 2018, we wanted to know what had changed for drivers at work over time and how?

In 2015, ride-hailing platforms were new to India. 90 percent of the taxi business in the country was decentralized, run by local operators, and made minimal use of digital technology (Singh, 2016). Taxis operated through a dispatch service like elsewhere in the world and auto-rickshaws were mostly hired through street-hailing. Ola was a start-up operating in select metropolitan cities like Bengaluru, Mumbai and Delhi. Uber, even though already popular in North America, was a new entrant as well and did not include auto rickshaws in its offering. Even then, app-based ride-hailing was estimated to cost 15-25 percent less than traditional taxi providers on average (ibid). Auto-rickshaw drivers also exhibited some interesting characteristics: 1) Ola was typically their first use of smartphones, the internet and GPS-navigation; 2) they picked up customers from the street. Thus, Ola was not strictly 'necessary' for them to connect with customers. At the time, there was no algorithmic pricing and drivers got the same government-mandated 'meter fare' for app-rides as they did with street customers, plus an additional 10 INR convenience charge. One of the core findings of the 2015-study was that the adoption of ride-hailing technologies did not reduce the perennial uncertainty of drivers' income. Further, it raised concerns about how the platform impacted drivers' autonomy and control. At that time, however, the study found that drivers were largely able to maintain their independence by being able to connect with both street and app-

customers, often preferring the former over the latter, and not having to depend on the platform for their livelihoods (Ahmed et al., 2016).

By 2018-19, ride-hailing platforms had significantly transformed India's urban transportation landscape. Ola was operating in more than 110 cities across India (Bhattacharya, 2019) and Uber in 36 (Shrivastava, 2019). This expansion was spurred by factors like massive unmet demand for affordable, convenient transportation, along with changing attitudes about vehicle ownership due to issues like traffic congestion and inadequate parking spaces. For instance, Bengaluru, a city of more than nine million, had a mere 6500 city buses (Kidiyoor, 2019) and the worst traffic congestion in the world (Dash, 2020a). Against this backdrop, a recent Deloitte study found that fifty-seven percent of those surveyed preferred ride-hailing over driving their own vehicle (Economic Times Auto, 2020; see also Jagannathan, 2016), a percentage much higher than even the United States and China. Amongst millennials, seventy-four percent preferred app-based ride-hailing over traditional taxis, due to the convenience of booking and lower ride refusal rates by drivers (Economic Times Auto 2020). These preferences are reflected in the number of rides that Ola and Uber serve in the country, which is around 11 million per week (ibid).

Given the lack of obvious advantages of ride-hailing for auto-rickshaw drivers (unlike customers) and the current duopoly of ride-hailing platforms in the urban taxi market, we wished to examine how these macro trends play out on an everyday level for drivers. What has changed for drivers over time and how? Have the platforms' increased market dominance resulted in more rides and higher incomes for drivers? What are the consequences for their autonomy and control? As our findings increasingly pointed to the lack of improvement of drivers' working conditions using Ola, and indeed towards the platform creating 'new dependencies' for drivers, the question arose - 'why do drivers continue to use it?' Most prior studies have sought to delineate the motivations that drive workers towards 'on-demand' labour platforms in the first place or the experiences in the aftermath of adoption. In contrast, we were also interested in answering why it is that, despite mounting evidence that ride-hailing platforms do not work for drivers' benefit, they do not move away from them. What are the exit barriers or costs involved? What considerations propel them to continue using them? As we will argue, the answer is to be found in the 'new dependencies' that the platform has created, which is reflected in the fact that getting customers from the street exclusively in the absence of using the platform for work is not an economically sustainable option for drivers anymore.

Our study reveals that 'work' has certainly changed for drivers since early-2015. On the positive side, working on ride-hailing platforms has led to increased digital literacies for this marginalized population. However, the uncertainty around earning a living wage for most drivers has, if anything, increased. This is largely because of platform design and market transformation. The contributions from this

paper are twofold. Firstly, we shed light on the multifarious ways in which the platform situates the drivers in a precarious position. We do this by describing a number of changes in how Ola operates which are perceived as unfair (because of opacity and/or unilateral control exercised by the platform) and which the drivers believe makes their interactions and relationship with customers adversarial, exacerbating tensions between them. We add to the existing literature on ride-hailing by showing how, through a variety of opaque, questionable practices such as 'regulatory arbitrage' (Rosenblat, 2018), the conditions of already-precarious labour markets are further destabilized and the welfare measures put in place to protect workers' interests circumvented by platforms. Drivers' work and financial lives consequently become even more precarious. Secondly, the paper argues that the disruption of the Indian transportation ecosystem by ride-hailing platforms into a duopolistic market has forged 'new dependencies' for drivers on these platforms to sustain their livelihoods, despite little benefit. Whilst drivers engaged in 'hope labour' (Kuehn and Corrigan 2013) in the early adoption of the platform in 2015, this has since morphed into a dependency as ride-hailing platforms have assumed a dominant position in the market and become an integral part of the transport infrastructure. We highlight both implications for design as well as regulation that need to be taken into consideration if the wellbeing of these workers are to be safeguarded.

2 Related Work

Networked information and communication technologies have enabled new business models[2] and ways of organizing labour. The new possibilities and challenges they offer have led to growing interest in the platform economy. The term 'platform' denotes support to those who stand upon it as well as opportunity to interact and exchange ideas, goods, services, capital, and labour (Gillespie, 2010). Economics and management science literature has focused on how these new business models create value, bring 'more efficiencies', and enable quicker scaling (e.g. see Parker, Van Alstyne, and Choudary, 2016; Walker Smith, 2016). In comparison, CSCW and HCI research has focused on the end-users of these platforms (both customer/client and worker/service provider), their motivations, experiences and challenges. It is important to understand that platforms are fundamentally match-making intermediaries who are in the business of mediating between the supply and demand sides of the market (Gillespie 2017). In the context of this paper, this could be drivers who sell labour and commuters who want it to get from point A to B. What is central to all these 'lean' platforms is their offer of organising, scheduling and routing services at scale without having to 'own' either physical assets (such as a fleet of cars) or 'employ' labour (Casilli and Posada

---

[2] For a discussion of how 'platforms' differ from traditional 'pipeline' businesses, see (Parker, Van Alstyne and Choudary 2016).

2019). They facilitate interaction between the supply (of labour) and demand sides of the market and importantly, in this process, make critical choices about this interaction and exchange: what is being sold and bought and by whom, how the two sides of the market will connect and how to mediate their interactions, the terms and conditions underpinning transactions in this context and so on (Gillespie 2017).

Prior research on ride-hailing from customers' perspective has made important contributions. Ride-hailing has been shown to support customers' mobility and enhance their wellbeing (Dillahunt et al., 2017). The lower costs (Cohen et al., 2016), along with ease-of-use (Cramer and Krueger, 2016), and greater accessibility compared to other modes of transportation (Kameswaran et al., 2018) have been shown to greatly benefit customers as well. Although, by and large, customers have immensely benefited from ride-hailing platforms, this is not to claim that their experiences have been consistently positive or without challenges. For instance, Shah et al. (2019) found that Uber's ETAs in Delhi are unreliable, lacking correspondence with both Google Maps' ETAs and actual cab arrival times for picking up customers. They argue that, in contrast to expectations that ride-hailing services entail shorter waiting times (Cramer and Krueger, 2016), unrealistic ETAs cause stress amongst customers, leading to roughly 30 percent cancellation of all booked rides in their sample. Whilst their interest is with the impact on customers (in terms of bearing direct costs of cancellation as well as sunk costs resulting from wasted time/effort), we analyse the implications of problems like unreliable ETAs for drivers and their interaction with customers in the Discussion section. Importantly, we show how certain fundamental aspects of platform design manifest on either side of the two-sided market, causing problems and frustration to both parties, ultimately resulting in hostile interactions, blame game, and risk/cost-transference whilst the platform remains unscathed itself. We now turn to prior research on ride-hailing platforms from workers' perspective.

2.1   Working for ride-hailing platforms

The rise of 'on-demand' labour platforms is indicative of the allure of using APIs to efficiently organize, schedule and allocate work at scale. The term 'algorithmic management' has been used to highlight how platforms like Amazon Mechanical Turk and Uber have fundamentally transformed the way work is organized for workers by automating core aspects of it such as work allocation, wage determination and evaluation systems, the algorithms underlying which have been critiqued for being opaque and unfair (Lee et al., 2015; Rosenblat and Stark, 2016; Gray and Suri, 2019). Emphasizing the importance of understanding how technology mediates labour relations, Gloss, McGregor and Brown (2016) argue that, although ride-hailing platforms like Uber have increased flexibility for drivers, they have simultaneously led to work intensification, made new skills necessary or

more salient (e.g. ability to use smartphones) and created new expectations from customers.

Their advent has dramatically lowered the barriers to entry for participation in these labour markets and thus enabled job opportunities for all, albeit arguably at the expense of undermining the interests of full-timers (Rosenblat, 2018). In their study of 'part-time' ride-hailing drivers in the USA, Ma and Hanrahan (2019), however, argue that 'full-time' or 'part-time' classifications cannot be made merely based on the number of hours drivers spend working on a platform, but on how dependent they are on the earnings from it. Their study found that gig workers work for multiple platforms 'part-time' to make ends meet. The cruel irony here is that the more dependent, full-time drivers who have more at stake are also in a worse position to escape the platform's control, surveillance and customer-bias.

Part of the problem can be traced to platforms effectively 'outsourcing' worker-evaluation to customers. Drivers are required, in consequence, to perform 'emotional labour' in exchange for good ratings that are necessary for getting enough rides in the future (Raval and Dourish, 2016). Such uncompensated 'invisible labour', which is critical to ensuring a standardized experience for the customers has been documented in other 'on-demand' work settings as well (e.g. Martin et al., 2014; Jarrahi et al., 2019). M-Turk workers, for example, engage in 'interpretative labour' i.e. the non-trivial work involved in understanding and accommodating the needs and expectations of customers, and in being 'non-confrontational in their dealings' with the latter (Martin et al., 2016). This form of labour is itself a product of and occasioned by the power asymmetries between the workers and their customers, and is, in fact, emblematic of a larger shift that the 'on-demand' economy has ushered from 'go to' to 'come to' (Walker Smith, 2016). Instead of consumers seeking out producers, it is the latter who now come to the former, which raises questions about who bears the costs. These costs are further exacerbated in the 'on-demand' economy due to information asymmetries that workers experience (Rosenblat and Stark, 2016). These tensions stem from the fundamental paradox between workers' need for autonomy and platforms' need for control over the workers (Möhlmann and Zalmanson, 2017). This paradox itself is a result of platforms' desire to exercise maximum control over labour whilst stopping short of acknowledging them as 'employees' (Shapiro 2017).

Ride-hailing has been less extensively studied from a workers' perspective in the Global South (Ahmed et al., 2016; Kasera, O'Neill, and Bidwell, 2016; Kumar, JafarNaimi, and Morshed 2018; Prabhat, Nanavati, and Rangaswamy 2019; Fleitoukh and Toyama, 2020). In one of the earliest studies, Kasera, O'Neill, and Bidwell (2016) noted that the design of P2P platforms like Uber did not fit into the work practices and temporal rhythms of drivers operating shared taxis in Namibia and was therefore not viable for them. In India, Ahmed et al. (2016) showed how drivers using Ola had little information on or understanding of central features of their work such as ride allocation, pricing, and evaluation. They argued that the

platform did little to mitigate drivers' anxiety with finding enough rides to earn decent incomes for the day. More recently, Fleitoukh and Toyama (2020) found little evidence of drivers financially benefiting from using ride-hailing platforms. They found any income gains drivers obtained to be due to longer working hours. Furthermore, ride-hailing can have differential impacts on different social groups. For instance, Kumar, JafarNaimi and Morshed (2018) found that the same ratings system led to feelings of powerlessness amongst drivers whilst enhancing perceptions of safety amongst women passengers. Similarly, Almoqbel and Wohn (2019) highlight how ride-hailing platforms' safety-enhancement efforts are customer-centric, neglecting drivers. Technology is, therefore, argued to reinforce or even amplify pre-existing socio-economic and infrastructural disparities.

If workers, unlike customers, do not avail substantial benefits from using digital labour platforms, why do they do it in the first place?

2.2   Why do workers work on digital labour platforms at all?

The 'on-demand' labour market, whether or not mediated by technology, is characterized by a 'revolving door of temporary jobs' and a 'standing army of workers' willing to perform them (Gray and Suri, 2019). Prior research has highlighted several key motivations that drive workers toward 'on-demand' platform work in different contexts. Martin et al. (2014) found that workers' primary goal with working on Amazon Mechanical Turk in both USA and India is to earn money. Any 'fun' and 'enjoyment' workers experience is actually 'job satisfaction', as opposed to seeing microtasking itself as a pursuit of fun done in spare time (Gupta et al., 2014). Other studies have reported motivations besides money such as not wanting to be confined to an office or place (location-freedom), a need to control one's schedule (flexibility), and lack of viable alternative offline or online opportunities (Gray and Suri, 2019). Studies of digital labour (particularly unpaid labour such as online content-writing and creation) have also said that 'hope labour' often underpins people's decisions to undertake work in the present, 'often for experience or exposure', with the hope that it can improve their future employment prospects (Kuehn and Corrigan 2013). 'Hope labour' is conceptualized as a form of coping strategy that workers undertake when navigating the vagaries of contemporary labour markets. Kuehn and Corrigan (2013) argue that what distinguishes 'hope labour' from other forms of labour is the high degree of uncertainty involved when people 'hope' for a more desirable state of affairs i.e. whether a certain investment (of money, time, effort) "will pay off down the road" might be fundamentally beyond their control. Together, these factors play important roles in shaping people's *choices* to do this form of work.

However, what sets the ride-hailing context in countries like India apart from other 'on-demand' work contexts is that the taxi and rickshaw drivers are engaged in driving on a full-time basis and see it as a means of livelihood. They do not see

driving as a stopgap, nor is it a 'side-gig' in addition to some other source of livelihood. With low levels of formal education and high levels of unemployment in the country, alternative job opportunities are scarce. As a result, driving (whether it is a car or an auto rickshaw), once chosen, often remains the only source of livelihood for a vast majority of workers in Indian cities. At the same time, this does not necessarily translate into drivers' continued use of ride-hailing platforms like Uber or Ola. They do have a 'choice', after all, to continue with driving as an occupation without using the platforms (as they have done for several years prior to their entry in the marketplace).

In response, one argument offered by prior research is that ride-hailing platforms are vehicles of 'micro-entrepreneurship and ownership' for low-skilled, low-income workers in emerging economies (Prabhat, Nanavati and Rangaswamy, 2019). These platforms, with few entry barriers, represent a 'conduit to fill the gaps on unemployment' in countries with large populations like India (ibid). This is emblematic of the dominant narrative also found in the Global North that the 'sharing economy' has created the necessary digital infrastructure to provide simple, repetitive jobs to a decentralized, flexible workforce at scale. However, the precarity that accompanies this type of work coupled with the vast evidence available about poor working conditions and worker-protests across countries throws this argument into question (Rosenblat, 2018; Muralidhar, Bossen, and O'Neill, 2019). A second argument offered is that drivers adopt ride-hailing apps so as not to be 'left behind' (Fleitoukh and Toyama, 2020). Drawing from a mixed-methods study of taxi and rickshaw drivers using Ola/Uber in Delhi, they further state that drivers do complain about a consequent loss of autonomy post-adoption. However, their study does not enquire into, nor explain, why drivers continue to use these platforms, particularly over extended periods of time.

In sum, prior studies from workers' perspective have made important contributions towards building our understanding of why workers choose to do 'on-demand' platform work in the first place, what the barriers to adoption are in different contexts, and what the experiences in the aftermath are. However, what remains less addressed in the ride-hailing context is why workers do not exit the app-mediated marketplace as and when conditions deteriorate. What are the exit barriers or costs that prevent them from discontinuing use of platforms for work? In this paper, we describe the 'new dependencies' that arise through the platform, which shapes their continued use these platforms for work, despite exacerbating their precarious working conditions and offering little improvement. We also point to the key implications that could help improve drivers' position vis-à-vis the platform and customers, as well as regulations of the transport market that likewise would positively impact their welfare.

3 Methodology

We present the findings from a qualitative study involving 13 in-depth, semi-structured interviews conducted with auto-rickshaw drivers in Bengaluru and Mysuru, India, during June-July 2018. This study was conducted as a follow-up study to an initial ethnographic study conducted during May-July 2015. The initial study had been conducted with auto-rickshaw drivers in Bengaluru to understand participants' motivations and adoption of the ride-hailing platform, Ola, as well as their initial experiences with it. Three years later, we conducted the follow-up interviews during June-July 2018 in Mysuru as well as Bengaluru (Ola had expanded to smaller cities in India beyond just the metropolitan cities by this time). The overarching goal of the follow-up study was to investigate how work and use of ridehailing platforms as a whole had evolved for drivers over time. This study was conducted as part of a wider, long-term engagement with auto-rickshaw drivers in Karnataka and some of the organisations which work to support and represent these auto-drivers. The broad themes of the wider engagement were to understand the impact of platform work and digital money on this population, and to support the organisations working with these drivers [e.g. Mehra et al. 2018, Muralidhar et al. 2018]. This long-term community engagement and partnership enabled us to conduct the follow-up study reported here.

The first author conducted semi-structured interviews with 13 drivers in total – seven in Mysuru (a tier-two city) and six in Bengaluru (a metropolitan city, the state capital of Karnataka). Participants were recruited through snowball sampling in Mysuru and from Peace Auto in Bengaluru. Peace Auto is an organisation that seeks to 'bring dignity to the profession and improve the quality of auto-rickshaw service'. In case of both sites, the sampling strategy was purposive. The idea was to interview participants who had been using Ola for at least a year (preferably longer). Three out of six drivers from Bengaluru had participated in the 2015 interviews (although not observations). Since drivers are constantly on the move owing to the very nature of their occupation, there is considerable difficulty in locating drivers who would be available at specific times of the day or on specific days to participate in interviews, even if or when they are interested in participating in the study. Therefore, a certain level of convenience sampling was involved in the sampling strategy. Interviews were chosen to be the method of data collection to achieve richness of data, as the idea was to elicit responses from participants based on reflection and for them to elaborate upon how their experiences had evolved (possibly in conjunction with changes made to the platform) over time.

Recruitment was thus based on the availability and willingness of drivers to participate in the study and their use of Ola. Participants had been using Ola for a year and a half to three years, which enabled us to investigate their experiences over time. The interviews typically lasted around 40 minutes, ranging from 30 to 90 minutes. All interviews were conducted in Kannada, the official state language

of Karnataka. Interviews were recorded, translated and transcribed into English by the first author. Interviews topics included: demographic information, technology-use, financial circumstances, management of household finances, use of bank accounts, auto-driving experience, adoption and continued use of Ola, and use of cash and digital payments. The objective was to understand drivers' motivations prior to adoption of ride-hailing platforms, their initial post-adoption experiences, and the challenges they encountered over time.

Informed, verbal consent was obtained from all participants prior to the commencement of the interviews, with separate consent for audio recording and collecting photographs. Prior to the interviews, drivers were first informed in Kannada about the study and why it was being conducted. Drivers were informed that their participation in the interviews was entirely voluntary and they had the choice to stop participation at any time. In case of Bengaluru, participants were further informed that their choice to participate or not would have no bearing on their relationship with Peace Auto. All participants were informed that the data would be anonymised so that their responses could not be traced back to them individually. They were also informed that, whilst the results of the study might be used in publications, none of the reports or papers published would use any personally identifiable information such as their name or photos that would enable their identification. Given that the rickshaw drivers' inflows and outflows mostly occurred via cash, upon consultation with drivers themselves (who helped us connect with other drivers for interviews in Mysuru) and Peace Auto, we decided to compensate the drivers for their participation and time in the interviews (as they took place during their working hours) through a cash payment of 200 INR (approx. 2.60 USD or 2.39 EUR).

In conducting the study and analysing the data, the findings reported in Ahmed et al. (2016) from the initial ethnographic study served as a baseline against which comparisons from the present follow-up study were made. Change was a key focus of analysis (for instance, in terms of changes to the app design, changes to the platform's policies such as pricing, changes to the marketplace such as customer-base, drivers' evolving digital literacies as well as smartphone ownership and use patterns and so on). Thus, we sought to provide a detailed understanding of such changes over time (how and why things evolve) and the intervening social and contextual processes that interacted to produce specific outcomes. The comparative analysis enabled a qualitative evaluation of whether drivers' working conditions had improved or deteriorated over time as per their own perceptions and experiences and the underlying reasons. Thus, interview transcripts were analyzed collaboratively in order to identify relevant themes around which comparative analyses could be made between the 2015-study's findings and the present set of findings in terms of similarities, contrasts, and any other changes over time. These were around how Ola's impact on their work and financial practices evolved with changes made to the platform, difficulties they experienced, as well as ancillary

benefits that emerged from use of internet-based technologies over time. Our analysis took a broadly ethnomethodological perspective. Ethnomethodological ethnographies reveal the knowledgeable, artful manner in which workers orient to their work and the ways in which technologies and other artefacts are used as part of accomplishing that work (Randall, Harper and Rouncefield, 2007). Before describing the findings, we will first briefly introduce the participants' socio-economic background.

4 The auto-rickshaw sector in India

The auto-rickshaw sector in India is male-dominated. The three-wheeled vehicles play a critical role in the country's transport ecosystem. They account for roughly ten percent of all trips in India, although in cities with poor public transport systems their share is much higher (WSA, 2008). Last-mile connectivity, affordability (in comparison to traditional taxis) and ready availability 'on-demand' (on the streets as opposed to hiring through a dispatch service or buses which operate according to schedules and on specific routes) are three major advantages that they offer commuters compared to other modes of transportation. Consequently, they are used regularly by both high and low-income groups.

Prior studies indicate that 60-70 percent of drivers are sole earners (Reynolds, Kandlikar and Badami, 2011; Chanchani and Rajkotia, 2012). Although some regional variations might exist in terms of the economics of auto-rickshaw driving, the overall picture is grim: they work long hours and earn low, uncertain incomes. The uncertainty on top of not earning enough heightens their precarity. For instance, Mani and Pant (2011) found that, on average, up to 25 percent of the total distance that drivers cover in day accounts for 'empty running' i.e. driving empty in search of customers. Similarly, 30-50 percent of a typical working day (which averages at roughly 12 hours) is spent in waiting for customers and queues at fuel stations (Harding et al., 2016). Only a fraction of a driver' time, effort and fuel costs is, therefore, income-generating.

In addition to the daily costs of operating an auto-rickshaw, there are also fixed costs that drivers incur such as daily rent (in the absence of vehicle ownership), maintenance/servicing, vehicle insurance and so on. Most drivers rent their rickshaws, with the proportion varying from 60 (for Bengaluru) to 80 percent (for Delhi) (Chanchani and Rajkotia, 2012; Harding et al., 2016). Therefore, a majority of drivers in the country take home whatever is left of their gross earnings after deducting fuel costs (which differs depending on the distance travelled on a given day) and daily rental rate (which is usually around 200-300 INR or 2,2-3,3 EUR) (Civitas 2010; Chanchani and Rajkotia, 2012; Ahmed et al., 2016). The costs of owning and operating an auto-rickshaw are, therefore, quite high in relation to the incomes earned. Thus, drivers are stuck between a rock and a hard place: on the one hand, they have little certainty of earning sufficient incomes to meet their

operational costs and household expenses; on the other, alternative job opportunities or streams of income that can enable upward economic mobility are severely limited. We analyse its significance in relation to our research question in the findings and discussion sections.

4.1 Participants' Demographics

All participants in our study were male and between 28 and 51 years old. For all except one, driving auto-rickshaws was their only job, the one exception working part-time as a caterer[3]. All participants had attended school - nine had completed primary school, three secondary school, and one had a degree. All could read or write in at least one language, typically Kannada, speak at least one other regional language and understand some English. All participants owned an Android smartphone, which they had been using for more than a year and a half.

Five of the participants owned the auto-rickshaw they drove. Of the remaining eight, three leased their rickshaws for a daily rental rate of 200-250 INR (approx. 2,2-2,7 EUR), whereas the other five had purchased their auto rickshaws on a bank loan, whose repayment was in progress. A typical working day entailed driving in a city with heavy traffic, pollution and noise for 14-16 hours on average. Only two participants reported working for less than ten hours a day, whereas the rest reported working for 15-16 hours a day, excluding short lunch and chai breaks. Most participants had been driving for more than ten years, with only one driver having taken it up more recently (since 2015). Two of the oldest drivers (aged 50-51) had been driving auto rickshaws for nearly three decades. Nearly half the participants took one day off weekly. The rest took a holiday only during festivals or emergencies.

The participants from Bengaluru and Mysuru had been using Ola right from the time the platform started its operations in their city (i.e. since late-2014 and 2016 respectively). All drivers had experiences with digital payments via Ola Money (the embedded mobile wallet on the Ola app) as well as third-party payment applications like PayTM, PhonePe and Google Pay. However, outside of the platform ecosystem, only half the drivers used digital payments for personal, micro-transactions. All drivers earned small, daily incomes primarily in cash. Seven participants reported that their daily earnings fluctuated so much that they found it impossible to ballpark how much they earned on average; three estimated they earned more than 1000 INR (approx. 11EUR) per day (*although not consistently*); the rest estimated that they earned between 500 INR and 1000 INR (approx. 5,5-11EUR). All figures were quoted after essential deductions like fuel, food and so on. Eight of our participants were sole earners and rented the house in which they lived. Demographic conditions in terms of dependents, paying rent, school fees, and so on shaped drivers' work hours as well as financial needs and practices.

---

[3] Even this participant described auto-driving as his primary 'job' and considered his catering contracts as occasional 'gigs'.

5 Findings

In this section, we examine how the ride-hailing landscape has changed since the introduction of Ola in late-2014 and how this has impacted auto-rickshaw drivers. In sections 5.1.1 and 5.1.2, we describe drivers' acquisition of digital literacies from their use of Ola over time and their collective sense-making of how the ride-hailing market works. In 5.2.1, we focus on the changes that Ola has introduced since 2015, two of which have resulted in mixed outcomes (i.e., perceived as neither beneficial nor harmful), whilst the others are perceived as unfair and deleterious in impact. In 5.2.2, we discuss how these changes have also made drivers' interactions with customers more hostile and adversarial, causing the former to juggle between adhering to customers' wishes versus platform's diktat. 5.2.3 extends this to the case of payments and discusses how the lack of flexibility in design results in tensions between drivers customers.

5.1 Changing technology landscape and digital literacies

When Ola Auto was first introduced in late-2014, auto-rickshaw drivers rarely owned smartphones or used the internet, and for most drivers, adopting Ola was their first experience of using a smartphone and accessing the internet (Ahmed et al., 2016). Indeed, to reduce the barriers to entry, Ola provided drivers with a locked smartphone on which they could use the ride-hailing app and covered data costs. Since then, the smartphone and mobile data market in India has changed dramatically. This is illustrated by the fact that the number of smartphone users in the country increased from 117 million to roughly 500 million between 2014 and 2019 (Rai, 2014; techARC, 2020). This growth is primarily fuelled by the costs of smartphones and data going through the floor. For example, plans of unlimited calls, SMS and 1GB of data per day cost as little as 150 INR per month (around 1,7 EUR) and smartphones for as little as 2000 INR (around 22 EUR). Whilst this is not a trivial amount for auto-rickshaw drivers, it has definitely made it easier for them and low-income populations in general to own smartphones and access the internet.

Of the 13 drivers interviewed in mid-2018, six were using Ola on their personal smartphone and seven had purchased a smartphone through Ola on EMI (equated monthly installment). Some even had two smartphones (the one obtained through Ola and the other purchased for personal use) and, over time, got the Ola application installed on their personal phone, because the inferior quality of the phone purchased through Ola negatively impacted their app use and thereby work. As P12 explained,

"The phone had some issues and I was not getting any rides So, I returned it to them and bought a new Samsung phone and started using Ola on it.".

The twin phenomena of drivers upgrading their phones to those with superior specifications and changing their network provider to one with higher bandwidths for mobile data after encountering problems with getting rides are a powerful illustration of the key ancillary benefit that Ola usage has resulted in, namely: the acquisition of digital literacies and capabilities. As P7 describes,

"What I really like about (Ola) is how they helped drivers learn to use technology. Before Ola, drivers did not really know how to use mobile phones properly. They also had only basic, feature phones. Ola was the one to introduce smartphones for us. They taught us how to use technology."

With Ola, Google Maps and digital payments have become integral to their everyday work and drivers were adept at using the app to look up information about rides, payments and so on. As P1, who has studied up to primary school says,

"The app shows all the necessary information – how much of my earnings are in Ola Money, how much was earned in cash, how many rides etc. See, today, I have done 8 Ola rides. Two of them paid by Ola Money".

In addition to purchasing their own phones, they also now pay for their own data as Ola no longer covers these costs. We can arguably see this as a trend of cost-transference, causing a shift away from Ola being responsible for providing the 'tools of trade' to drivers towards them buying and taking care of the maintenance of their own devices and technologies. Initially the platform provided scaffolding – in terms of devices and data – to onboard drivers then unfamiliar with the technology. By 2018, they had removed this scaffolding, in line with other changing work conditions, such as reduced incentives. It should be noted that whilst drivers have become adept at using the Ola application, this does not necessarily imply that they fully understand the workings of the platform. As P1 explained,

"Suddenly I stopped getting rides. I spent a lot of time at the Ola office trying to sort out the matter - half a day or more. They told me, "These rides are not manually allocated by the office to the drivers. It is, therefore, a network/connectivity issue. […] you better change the SIM.' I changed to Jio (a different telecom service provider) and now it's good."

As the above quote illustrates, drivers often think that the platform deliberately does not allocate them rides i.e. they believe that Ola manually dispatches ride requests to drivers. This can be contrasted with drivers in the USA, for example, who have been reported to game the algorithms in an attempt to achieve the best working conditions (Liu, Brynjolfsson, and Dowalatabadi, 2015). In the following section, we examine how understanding of the app and the marketplace varies across drivers.

5.1.1 Making sense of the app-mediated workplace

In using Ola over time (from 1.5-3 years), not only have drivers moved from using a basic phone without data to a smartphone and become adept at using Ola for work, they have also started using a range of other applications. Whilst the

number and frequency of apps they use varies, only two of the drivers use their phones exclusively for calls and Ola. WhatsApp (10 drivers), YouTube (9) and Facebook (8) are the most commonly used applications, with several drivers also using one of more digital payment apps, such as PhonePe (4), Google Pay (4), BHIM (3) or PayTM (3). Thus, their digital capabilities have significantly expanded from simply calling on their feature phones to using applications for work, personal micro-transactions, consuming news and entertainment on a regular basis. This is in stark contrast to 2015, where drivers' only smartphone and internet access was through the locked smartphone given by Ola, and they could only use Ola. Hence, a first important finding of the follow-up study is that drivers' move from using a basic phone without data to a smartphone has resulted in acquisition of digital literacies and skills, and their use of digital payments and social media has considerably expanded.

Part of the digital literacies acquired involves developing more sophisticated understandings and reasonings of both the workings of the app and the marketplace by drivers. They do not, however, discuss the algorithms' workings separately from the functioning of the marketplace. For instance, P12 said,

"It's almost like – 'Whom should the ride be allocated to?' – has become the main question. Just calculate. If each driver requires 20 bookings a day (to earn a decent income) and Ola has 15,000 drivers, then… how many customers you need to book the rides?!"

These calculations and reasonings are something they have developed over time from first-hand experience of working in a hypercompetitive environment. As P14 explained when talking about a problem with the way distance calculation is done on the app,

"I have been using Ola for more than a year. I know the app inside out. Whatever training videos they send, I watch them. I understand the settings and everything. If their (back-end) system is not working properly, how can it show correctly on the app? It should get updated on the system. Otherwise, it won't on the app."

Sense-making processes are often collaboratively accomplished through online and offline discussions with other drivers. Their increased digital literacies certainly confers certain advantages upon them in this regard. For instance, in 2015, drivers had to meet in person to discuss the workings of the app and troubleshoot one another's problems. Now, just as with drivers in the Global North, they have the potential to form digital collectives alongside or perhaps even instead of the traditional collectives, as illustrated by P11 in relation to the problem of fares,

"In our union alone, there are more than 500 Ola drivers. We have a WhatsApp group. We have raised this issue [the problem of fares] and shared it on the group with everybody. The group consensus is that we should start using the government-mandated meter even when we take Ola rides so that customers become aware of the gap between the meter fare and the fare calculated by Ola."

Whether the more sophisticated understandings are because of digital means of collectivization or have co-evolved with it is of secondary importance. What is critical is that simple chat-based tools that enable workers to communicate in groups and foster online collective presence can facilitate workers with their sensemaking practices, encourage dialogue, debate, and consensus formation around vital workplace issues, none of which was happening or even possible for this community in 2015.

5.2 Drivers' experiences with Ola

As in 2015, participants' overarching goals with using Ola are to achieve: 1) increase in the number of rides and their daily earnings, and 2) minimize their idle time and chances of 'dead-heading' i.e. having to travel back empty after dropping off a customer (Gloss, McGregor, and Brown, 2016). The 2015 study, which was conducted in the early days of ride-hailing in India, showed that adoption of Ola had not resulted in drivers getting more rides and had, in fact, introduced new elements of uncertainty, and their experiences reveal concerns that revolve around the deterioration of working conditions and income-destabilization over time. In the rest of this section and the next (5.2.1-5.2.4), we examine the reasons for drivers' experiences.

Whether or not drivers earn more is the primary criterion by which they evaluate their experiences with Ola as being positive or otherwise. Almost all drivers reported that their earnings increased initially but have either stagnated or even decreased over time. By and large, this is attributed to over-saturation of the market (with too many drivers on-boarded compared to growth in customer numbers), as well as recent hikes in fares unilaterally determined by the platform that deter price-sensitive customers, as well as the reduction of promotional incentives offered to drivers over time. The latter has been reported in other contexts as well. For instance, Rosenblat (2018) argues,

"Uber floods the market with new drivers and often lowers the rates at which drivers earn their income. By creating a job for everyone, Uber undermines the interests of dedicated full-timers" (p. 184).

Anyone with a car can, in principle, drive for Uber or Ola, and in the USA, this has led to a large number of people driving part-time for Uber, which can adversely impact full-time drivers. Although this is not the case with auto-rickshaws as one needs a special permit, platforms can and do often increase the number of drivers onboarded onto the ride-hailing platform as a whole and blur the pricing differences between different market segments (like taxis vs rickshaws). When drivers are fewer in number, those on the platform naturally get more rides and earn more. When thousands of drivers are on-boarded in a relatively short time, their incomes plummet and remain just as uncertain as in the pre-adoption phase. The consequences of 'excess supply' are particularly harsh in India, a country with high

levels of unemployment and few sources of viable job opportunities for those with low levels of education.

Crucially, the majority of these drivers reported that, when they started there were consistently enough rides per day to earn a good and reliable income, but this has become increasingly unpredictable over time, as P3 states,

"Earlier, I used to have a target and there was a certain confidence that I could earn a certain amount. Now, I no longer have that confidence."

Thus, driving for Ola has not reduced the uncertainty of auto-rickshaw drivers' working day, where getting enough rides to make a living wage is a constant struggle compounded by the unpredictable rhythms of the ride-hailing marketplace.

5.2.1   Changes to work and workplace

Ola has implemented several changes since 2015, two of which have resulted in mixed outcomes for drivers whilst the other three are perceived as patently unfair. First change is the introduction of 'bookings in advance' feature to the app, wherein a new ride request is allocated to drivers before they finish an ongoing one. P7 summarized it as follows:

"We are now getting more requests in advance […] So, as soon as I drop the current customer, I move to the new pickup location."

In principle, this reduces the idle time between two rides and increases the number of rides that drivers complete (albeit at the expense of intensifying their work). In practice, however, drivers lament that it leads to more ride-cancellations, if customers are unwilling or unable to wait. Cancellations are a top concern for drivers as they entail sunk costs in terms of time, effort and fuel spent upfront in travelling towards the pick-up location that go uncompensated.

A second change since 2015 that has resulted in a mixed outcome has been the introduction of surge, whereby drivers are notified of areas with high demand. In practice, however, this recreates the same problems that have also been noted elsewhere (Chen, Mislove, and Wilson, 2015; Guda and Subramanian, 2019). A notification about 'surge' in a particular locality, in practice, results in a sudden influx of too many drivers to the same location. By the time drivers arrive, the 'surge' would be over as the customer demand is fulfilled. Thus, the fundamental problem of 'excess supply' in relation to demand remains unsolved.

We now turn to the three significant changes since 2015 that drivers characterize as unfair and have resulted in considerable distrust of the platform. These relate to - a) remuneration, b) regulatory arbitrage, and c) ride-allocation. These changes stem primarily from drivers' comparisons of how their work differs between street and app-mediated customers.

First is the question of remuneration. As reported in 2015, picking up Ola customers changes the dynamics of the ride: with street-hailing, once a potential customer has been found, there is a quick interaction and the ride is accepted or declined. With app-based ride-hailing, once the driver accepts the ride, they must

travel up to two kilometres to pick up the customer. For drivers living on low incomes, the fuel costs incurred can add up to a non-trivial amount and be a real burden if they go uncompensated. In 2015, Ola charged its customers a flat fee of meter rate plus 10 INR per ride to compensate them for the cost of picking up customers, all of which went to the driver. The digital meter is claimed by the transport authorities to be tamper-proof and calibrated in accordance with regulations. This fare is subject to periodic revisions. By 2018, this meter fare plus convenience charge pricing model no longer existed for app-rides, thus becoming a point of contention for several drivers. For instance, P9 explained,

"After joining Ola, our earnings […] have decreased somewhat […] We have to travel like 1.5 kilometers to pick up the customer from the location provided in the app. It is a loss for us. *It is like a deduction made from our own earnings*" (authors' emphasis).

What is particularly frustrating for drivers is that Ola does not necessarily charge the customers less for the ride. It just no longer compensates the driver.

The second change is around regulatory arbitrage (Rosenblat, 2018), in terms of how the route and fare are computed in general. In 2015, the fixed, government-mandated meter fare was guaranteed. Since the minimum fare as well as rate per additional kilometre is known beforehand, the earnings from a given ride were also predictable. Drivers thus historically enjoyed a degree of certainty around how much they would earn from a given ride versus the costs they would incur. This enabled them to make informed decisions on whether or not a particular ride was viable. Being self-employed operators, they also cherished the freedom of rejecting unviable rides.

What has changed since is rather legally ambiguous, as it is unclear how ride-hailing platforms have managed to circumvent the government regulations around meter fare. All interviewees categorically stated that app-based rides do not adhere to meter-based pricing. This is important because meter fares are set so as to ensure fairness to both the customer and driver. However, platforms promise speed and cost-efficiencies for customers by undercutting the market, which necessarily involves underpricing (not to mention predatory pricing as part of a 'winner-takes-all' strategy in their competition with other platforms like Uber). For example, Ola offers a 4-kilometer auto-rickshaw ride for 29 INR (0,25EUR), when the metered fare would be 52 INR (0,6EUR)[4]. During the 'market expansion' phase in 2015, Ola aggressively priced the rides but compensated the drivers for the difference. However, after more than three years in the market, this is no longer the case. Not getting their due is perceived as blatantly unfair by the drivers. As P12 says,

"Earlier, for example, if a customer paid 29 INR for a 4 km ride, we would be paid an additional 30-32 INR by Ola. So, we would get our usual meter fare. Now,

---

[4] A base meter fare of 25 INR for a distance of up to 1.9 kilometers and 13 INR for every additional kilometer.

what happens is, if customer is paying less, it's being subsidized by the deductions made from us".

Whilst this echoes findings from the wider ride-hailing context where reduction of fares and promotional incentives is a bone of contention, it is worth remembering that this is compounded for auto rickshaw drivers, who live on the poverty line and for whom legislations such as meter fares and licensing have been set up to protect their welfare. It is, therefore, not surprising that platforms engage in 'regulatory arbitrage', providing extra offers to customers but subsidizing them at the expense of low-income workers. As P11 argues,

"We don't use meter for Ola rides/customers. We should. So far, we hadn't been cheated or anything. But it's no longer the case. Now they have started cheating us."

Drivers also shared concerns about how the distance is calculated – specifically that it is sometimes under-calculated – with a consequent reduction in fare. The uncertainties caused by - not knowing the exact pick-up location until the ride is accepted and not knowing the drop location until the ride starts - remains, which have been reported for Uber drivers in the US as well (Rosenblat and Stark, 2016).

The third change revolves around ride allocation. Ola has promotional incentives for drivers who complete a certain number of rides in a certain time frame (which changes frequently). However, after unsuccessful attempts to earn incentives time and again, drivers have developed their own reasonings about how rides are allocated. For instance, P3 said,

"You see, the way ride allocation works is… if there are 10 drivers in the vicinity, a ride is allocated to that driver who has completed the least number of rides. This became a contentious issue between auto drivers and the company. We would be on the streets until 10-11 PM at night, hoping that we would get those 2-3 remaining rides sooner or later to earn the incentive. This anticipation also led us to reject customers who hailed us on the streets, because we didn't want to miss any Ola ride."

Thus, drivers initially engaged in what Kuehn and Corrigan (2013) term 'hope labour', which is the effort that drivers put in with the hope of improving their work and financial conditions. They joined the platform, upgraded their phones (so as to ensure hardware-related issues do not impact ride-allocation), changed their network service provider, stayed logged in for as long as possible during their working hours (except during lunch break), as well as spent a lot of time learning how to use the app's various features and functionalities (by first attending the training session during onboarding and later watching self-learning videos on the app in their spare time). Over time, however, their expectations around getting more rides and earning higher incomes have remained largely unfulfilled for reasons discussed above, despite engaging in 'hope labour'. Whilst these reflect drivers' perceptions and are not necessarily indicative of how the ride-allocation algorithm works, they do illustrate drivers' frustrations and a sense of unfairness about the

platform's opaque functioning. The experiences since the early adoption are also indicative of how the expectations underpinning their 'hope labour' have largely not materialized, and their continued use of the platform for 'work' is rather because of the 'new dependencies' emerging with Ola's dominant position in the urban transport market in India (which we discuss in detail in sections 5.2.4 and 6.1).

5.2.2   How platform mediation impacts driver-passenger interaction

Drivers assert that the most significant, lasting impact of the advent of platforms like Ola is that it has changed how customers *connect* with drivers, which also means that the ways in which platform mediation impacts driver-passenger interaction is of vital importance. Whilst a well-known benefit of ride-hailing platforms for customers is that they do away with haggling over fares (Ahmed, Johnson, and Kim, 2018; Kameswaran et al., 2018) since these are determined by the platform, new points of contention arise. In particular, we wish to highlight two interrelated themes that recurrently surfaced in our interviews, which are around: 1) platform-determined routes, and 2) unilaterally determined rates and hidden service charges.

Ride-hailing literature has covered disputes around route, particularly around whether drivers are likely to take a longer route to get a higher fare (Ahmed, Johnson, and Kim, 2018; Liu, Brynjolfsson, and Dowalatabadi, 2015). In response to customer complaints about drivers taking longer routes, Ola changed the basis of fare calculation to the most optimal route computed by Google Maps. It now instructs drivers to adhere to that route and penalizes them in case of deviations. Unfortunately, even in the Global North, Google Maps is not always accurate and in the Global South working around Google Maps' issues is a common occurrence and a practical necessity. For instance, P2 complained,

"There's also the problem of wrong location. Earlier, we would get paid for the actual distance travelled. Now, we have to stop the ride at the exact location entered on the app […] for the past fifteen days, there has been some tension between customers and drivers because of this."

Addresses are often poorly mapped in India, making it hard for customers to specify the precise location on the app (e.g. Kameswaran et al., 2018). Furthermore, customers might not be aware or even agree with the platform's calculation of 'efficient routes' and this too adversely affects the driver-passenger interaction. For example, P11 narrated,

"They (customers) sometimes tell us to follow the directions they provide and not the map. At the same time, we get the blame if the fare goes up (from the initial estimate), because we followed their directions [...] if the route changes, then fare changes. Then, they complain to Ola. Ola people ask us why we charged extra. When we try to explain to them that the app showed a higher amount, they also blame us, telling us that we should follow the map no matter what."

In sum, drivers shoulder the burden of Google Maps' inaccuracies, customers' ad-hoc preferences for routes, and are stuck in the middle between the platform and customers.

Another aspect of fare calculation less discussed in the ride-hailing literature is unilaterally determined rates and non-transparent service charges. For drivers, the problem is that: on the one hand, they have little control over pricing or fees; on the other hand, they feel that these are the aspects that make their interaction with passengers more hostile and adversarial. Drivers are not in a position to justify things like 'surge pricing' or 'peak hour charges', which are algorithmically determined by the platform. Ola has also unilaterally hiked fares over time, which further increases tensions with customers. Finally, there is a disconnect between what customers pay and what drivers earn (which simply did not exist in the pre-platform days). Any fees levied or deductions made are not only determined by the platform, but they are also selectively hidden from the customers, leading them to wrongly assume that drivers pocket the entire amount they pay[5]. For example, P11 explained drivers' helplessness,

"[…] ever since Ola hiked the fares, customers behave very differently […] they think that whatever they are paying is pocketed by me. Like I was telling you earlier… a 25 INR ride if we go by meter costs 50-60 INR by Ola's calculation. Customers, then, think that we are getting the entire 60 INR and behave a bit rudely. We try to explain to them that we are not getting 60 INR, but only 25 INR… anything extra they pay goes to Ola. They curse us, saying we are all the same. It gets very tense sometimes."

Another aspect of how platform-mediation impacts driver-passenger interaction is around the paucity or sometimes unreliability of information on drop location and ETAs. (Ahmed et al., 2016; Rosenblat and Stark, 2016]. Even after accepting a ride request, there remains considerable uncertainty for drivers as to whether or not the customer will wait. It is yet another design aspect that transfers the risks and transaction costs onto drivers (and to a lesser extent customers) whilst leaving the platform unaffected itself. A recent study on Uber in Delhi reported that roughly 30 percent all rides booked in their sample were cancelled (Shah et al., 2019). The lack of reliable ETAs was argued to be the underlying cause, resulting in much frustration and stress amongst customers. Uber and Ola have chosen to use their own ETAs instead of using Google Maps' more accurate ETAs. The authors point out that platforms, in fact, have a financial incentive to provide deflated ETAs because customers in India are charged a fee for cancellations not made within five minutes (Shah et al., 2019). Customer cancellations, however, also entail sunk costs for drivers in terms of wasted time, effort and fuel in travelling the distance to pick up the customer from the location specified on the app that remain uncompensated. Furthermore, drivers have no information on the ETA shared with the customer and

---

[5] Indeed in 2015 the drivers received the entire fare, but it was only a temporary phase when the ride-hailing platforms were trying to attract participants on both sides of the market and expand their market share.

are in no position to judge its reliability. Nor do they know how far the pick-up location is before accepting an incoming ride request. They obtain information on distance only after the ride is allocated to them. They determine the reliability of ETAs shared with customers retrospectively when the latter cancel the ride.

Platforms are deliberately opaque about how their algorithms work and fares are calculated. As a result, neither drivers nor customers have clear-cut understandings of what is going on and this leads to conflict. Together, four important platform design aspects negatively impact driver-passenger interaction and result in confrontations: algorithmically determined fares; lack of clarity on 'peak hour' and 'non-peak hour' charges; hidden platform fees; and unreliable ETAs leading to cancellations. Drivers wish that customers are made aware of these underlying issues to ease their relationship. Unfortunately, given the power asymmetries already inherent in the customer-driver relationship, which are further amplified by the platform's mediation, drivers bear the brunt of problems whilst not being in a position to resolve them.

5.2.3   Cash or Digital: Unpacking Payment Practices

An integral part of driving for ride-hailing platforms like Ola is the acceptance of digital payments (Ola Money, PayTM etc.). Unlike in the Global North, customers in India can pay either digitally or by cash. Most participants reported that Ola Money has been their first experience of transacting by media other than cash. Interestingly, a mix of cash and digital payments is seen as beneficial. Earnings made in cash are used for day-to-day basics whilst digital earnings remain in the bank account for use only when necessary (for e.g. at the time of loan repayment). Earnings exclusively in cash are seen as entailing more effort to 'save' as cash is easily available for spending on one expense or the other, which they feel is unavoidable in the midst of several competing needs. Digital payments by themselves do not pose them any major concerns over safety, trust, or transparency. The problems drivers face rather stem from practicalities around digital payments not fitting well into their payment ecosystems in a largely cash-driven economy.

First, drivers' digital earnings are not 'accessible' in real time, like cash, as they are only transferred to their bank accounts the next day. Second, they find Ola Money impractical to use, for they can use it only at select gas stations and a non-trivial amount is levied as fees for every transaction made. This dis-incentivizes use of Ola Money. For instance, P11 reported,

"We can't use it to pay for our gas either. They make a deduction of 13-15 INR if we use the card Ola has given us to pay for gas. […] Just day before yesterday, I got gas filled up for 300 INR. I used the card to pay. I, later, saw that 12-13 INR had been deducted in addition to 300 INR. Each swipe, therefore, involves a deduction. That is why I use cash."

The lack of access to digital earnings in real-time, the limited contexts of use and the added costs of digital transactions contribute to their reluctance to being

paid digitally, but this too adversely impacts the driver-passenger interaction. At times, drivers feel like they are being forced to accept digital payments without the passenger or platform being considerate to their needs. P9 articulated the lack of control he felt when paid digitally as follows:

"Sometimes, customers can be quite rude, and, in fact, question me… ask me why I am using Ola if I am not ready to accept Ola Money. This makes me angry. Coz it's not like the customer chose Ola Money after asking me, right?"

Although drivers sometimes resort to cancellations if customers are going to pay digitally, this hurts their own possibilities of getting enough rides in the future. Confrontations over payment modalities also result in passengers lodging complaints or giving poor ratings. For instance, P13 narrated how he was forced to submit a formal apology after a disagreement with a passenger over cash versus digital payments. He said,

"[…] when the ride was complete and it was time to pay, he said, "Ola Money." I felt bad. I was not happy with taking Ola Money payment for that ride. The customer, then, complained about me, citing misbehaviour on my part. That's when Ola barred me from taking any rides. I had to submit a written apology. I had no intention of apologizing, but I gave a written one nonetheless because I just wanted to get it over with. I did not want to waste my time at the Ola office or with their customer support. I couldn't afford to."

Although these experiences do point to the customer-centricity of platforms like Ola, a more fundamental problem here is that neither the passenger nor driver is really in a position to negotiate the modality of payment that is acceptable to both. By design, Ola does not allow the customer to change the mode of payment at the time the ride commences. They can choose it only at the time of booking. Furthermore, for customers, if digital payment is enabled, it becomes the default payment mechanism and customers have to actively change it to cash when booking a ride. The platform cannot retrieve its various fees and charges from thousands of drivers in the absence of digital payments. Digital payments enable Ola to make the necessary deductions before making the bank transfer. Therefore, it encourages customers to pay digitally. The platform's algorithms also allocate rides to drivers based, inter alia, on the mode of payment that the customer has chosen based on their balance sheets[6]. The platform, in other words, actively works to ensure that its ride-allocation system allocates enough digital payment rides to all its drivers and they do not end up taking only cash rides. It is because of this business logic that customers are not allowed to change the mode of payment after interacting with the driver or halfway through the ride.

The implications for our discussion here are that: 1. The platform design does not allow drivers and customers to negotiate mode of payment. 2. The current design, including delayed transfer, disincentivizes digital payments for drivers

---

[6] From a private conversation with an Ola employee.

23

whilst customers remain largely unaffected by the post-payment issues and are exposed mostly to its benefits (such as ease-of-use and convenience; see Kameswaran and Muralidhar 2019 for a discussion of this). Thus, the lack of flexibility in design can often put what is good for customer at odds with what is best (or even necessary) from the driver's perspective.

Participants also reported using mobile payments like Google Pay, PayTM, PhonePe and the government launched BHIM (Bharat Interface for Money) for their private transactions. The key difference between using them at 'work' and for 'personal' transactions is that they choose to use mobile payments in the latter context and have full freedom and flexibility over when they use it, what they use it for, and how often they use it. They use it when it reduces effort and transaction costs for them. Waiting at queues in banks, telecom or utility offices for payments involves spending time and effort. Bank visits also entail fuel costs and loss of earnings. Participants, therefore, appreciate the convenience and ease with which they can now undertake these transactions on their smartphones. However, these transactions are sporadic (once or twice a month) and small by value. In sum, whilst drivers do not object to digital payments per se, they object to being subject to passengers' preferences and platform's business-driven decisions, with their own needs and circumstances being pushed to the periphery.

5.2.4 From hailing on the street to app-based hailing

The predicament of having become more subject to passenger preferences and the platform's business-driven decision is part of a broader change in drivers' work conditions. It is not only the driver-passenger interactions and the question of cash or digital payments that have changed to the worse for drivers', but there has also been an overall change in how drivers get passengers. This is reflected in drivers' narratives about more and more of their customers have migrated from hailing them on the streets to app-based ride-hailing over time. For instance, P5 remarked,

"What has changed is how customers connect with us. For instance, not all customers now come to the street and hail us. They don't mind paying an extra 20 or 30 INR to Ola as service charges. *This, in turn, forces us to use Ola… not because we are earning more, but because customers prefer to hail rides via Ola* (authors' emphasis)."

This holds for smaller cities like Mysuru (143 km from Bengaluru) as well, and it creates a dilemma whereby their preferences and those of customers are at odds, impacting the drivers negatively:

"We are able to earn more in the case of customers picked up on the streets, because we use the meter. With Ola, we earn less per ride because they set the fare. Although 'normal' (street) customers are better in this sense, it is difficult to get them like previously, because almost 80 percent of them have started using Ola. The remaining 20 percent would be those who do not own smartphones…"

Participants were cognizant of some factors that drove customers towards ride-hailing platforms in the first place. For instance, P12 remarked,

"After Ola's entry, the public have benefited a lot. There's no doubt about that. This is because, earlier, they couldn't get autos from their homes. They would have to go near bus stops or auto stands. Customers also had to pay whatever the driver demanded. If auto drivers had behaved properly, nothing would have changed. Drivers would demand 150 INR for a ride that costed 100 INR. They would sometimes rig the meter. That's why customers, who were fed up with all this, started using Ola."

In addition to the shift in customers' preferences from street to app-based ride-hailing, drivers have experienced a loss of regular customers. In part, this is due to the difficulty in accommodating the needs and spatio-temporal rhythms of 'on-demand' rides with 'scheduled rides'. For instance, they would not know the destination of app-based rides until after they have accepted it. This makes it impossible for them to accept rides with customers at scheduled times and locations. Conversely, 'regular' customers have also migrated to ride-hailing platforms. As P7 reported,

"Earlier, I did have regular customers… before the entry of Ola and Uber. Once they entered the market, what happened was… customers started using them."

By making ad-hoc, 'on-demand' bookings convenient and easy via a mobile application, ride-hailing platforms have essentially obviated the need for customers to schedule trips in the first place. The loss of regular customers heightens income uncertainty for drivers because they brought in a much-needed regular stream of income by often paying pre-agreed lump-sum amounts periodically, helping drivers manage their finances. The loss of regular customers thus means a loss of stable, regular income, and greater dependency on income from the platform. This dependency is reinforced, more generally, by previously 'offline' customers shifting from the street to the app for ride-hailing, which offers customers the advantages of not having to look for rickshaws on the streets or haggle with drivers over the fare. Thus, drivers are squeezed by the platform's design and customer choices with little benefit remaining. As P9 stated,

"I do not see any benefit to using Ola. They are giving us our own customers […] they are just routing them through the app. So, what additional benefit is there? None."

6 Discussion

This paper draws upon a qualitative study conducted as a follow-up study that examined how the adoption of ride-hailing platform Ola impacted the work of auto-rickshaw drivers in India. In 2015, ride-hailing was a nascent phenomenon in India and Ola had been operating only for a few months and was restricted to a handful of metropolitan cities. By 2018-19, ride-hailing platforms had become embedded

into India's urban transportation infrastructure in nearly 110 cities, and this paper examines the impact of that shift on auto-rickshaw drivers' work and finances at an everyday level. We have argued that drivers' finances have not improved, several aspects of the platform design end up adversely impacting driver-customer interaction, and yet we see that drivers continue to work for Ola. Below, we first describe the 'new dependencies' that disempower workers, next discuss why drivers do not exit the platform despite disenfranchisement and suggest key implications for redesign of the platform as well as market regulation to protect as well as enhance drivers' well-being.

6.1   How does platform design disempower workers?

Drivers' precarity in relation to both customers as well as the platform-business is seriously exacerbated by various aspects of platform design, which has specific implications for driver-passenger interaction as well as for drivers' working conditions in general. It is thus important to examine the broader implications for the power relations between the platform, drivers and customers. In 2015, Ola Auto drivers got meter fare plus 10 INR per ride, but now algorithmic pricing is in place. Previously, fare setting was a matter of negotiation between the drivers' unions and transport authorities, and determined by considering factors like fuel prices, vehicle purchase and maintenance costs, inflation etc. With the advent of ride-hailing platforms, the pricing is determined unilaterally by the platform based on opaque algorithms and until the ride is complete, the driver does not know the fare (or even a reliable estimate of it). Similarly, customers are kept unaware of the commissions deducted from the fare they pay, which is in contrast to platforms like Airbnb, which clearly show the platform fees they levy at the time of booking. This opacity negatively impacts the passenger-driver interaction whilst amplifying drivers' inability to negotiate the 'fairness' of the fare. Platforms thus engaging in 'regulatory arbitrage' has led to an erosion of drivers' autonomy and financial stability. As Rosenblat (2018) states for cab drivers in North America,

"As drivers do their work, they must continually deal with Uber's shifting pay rates, experimental policies, and incentives. An employment relationship like this, which evolves with iterative features, produces instability for drivers as workers" (p. 198).

The absence of recourse mechanisms to discuss and deliberate on pricing and deductions further aggravates the power imbalance between the platform and the drivers, disenfranchising the latter. The impact of such disempowerment is keenly felt by auto-rickshaw drivers, as part of the urban poor whose working conditions were previously protected to some extent by governmental regulations.

Digital payments provide another example of how platform design confers enormous power to the platform at the expense of drivers. Unlike a cash-exchange, all digital payments are routed through the platform, which unilaterally decides and

implements the commissions per ride as well as 'platform development fees'. 'Platform development fees' is the term used by Ola for the charges it levies on drivers for access to its platform/application. The platform deducts a daily, fixed amount, regardless of whether the driver worked that day at all or not, whether the driver logged into the app and got any rides from the app at all or not. This fee is argued to be unfair by drivers as it is levied based on access and not usage. The unfairness of the commission thus goes beyond the rates charged by the middleman. It raises fundamental ethical questions about what kinds of activities and services are classified as liable for levying fees and deductions and who has the power to decide it.

Whilst digital payments undoubtedly make it more convenient for customers to pay for their rides, the benefits do not translate to drivers as they can only passively accept the fees deducted. Furthermore, and unique to the Global South, platform design also constrains the choices that both customers and drivers can make around payment modalities. Once a ride is booked, the customer cannot change the payment mode, creating tensions with drivers who might need cash to attend to day-to-day needs. Even if a driver requests cash payment at the start of the ride or upon ride completion and the customer is willing to oblige, it is too late (Kameswaran and Muralidhar, 2019; Muralidhar, Bossen, and O'Neill, 2019). It often also leads to complaints with customer support and poor ratings, further affecting the rides that a driver might get in the future. These tensions are symptomatic of the lack of flexibility in platform design that can create tensions between customers and drivers. Even with route-calculation, we saw that customers may not always prefer the Google Map route.

The platform, by design, does not allow the customer to rate the platform (and its policies) and an individual driver (for e.g., safe, professional driving) separately. The root cause of the unfairness of the ratings system lies with the design of what it seeks to capture and evaluate: the 'ride experience'. It is insufficient to list the 'symptoms' of the evaluation system such as widening power asymmetries without identifying and addressing the 'root cause', namely: the 'ride experience' is an amalgamation of aspects that are controlled by the driver and the platform. There are certain ride-aspects for which the individual driver is and can legitimately be held more responsible such as road safety; the platform, on the other hand, unilaterally controls other aspects such as ETA calculation, fare determination, surge pricing, and ride-allocation. Yet, each of these aspects contribute to the 'ride experience', the consequences, risks, and costs of which are disproportionately transferred to the driver. The driver basically ends up paying the 'price' for platform's decisions such as unrealistic ETAs (resulting in ride-cancellations and sunk costs), route-determination (putting it at odds with customer preferences), pricing (resulting in confrontations over surge, complaints to customer support), and payment method (no flexibility to change it, poor ratings).

Taken together, the examples powerfully illustrate that drivers are stuck between 'a rock and a hard place' whereby they face the consequences of conflicts and tensions with customers, which are symptoms of deeper problems with the platform design themselves whilst the platform remains unscathed itself. In other words, the driver is left to bear the costs of problems caused by the platform whilst also bearing the brunt of customer ire manifested through poor ratings. Prior studies have noted how ratings systems are inadequate, unfair, can lead to biases and discrimination, and amplify the power asymmetries between passengers and drivers (Ahmed et al., 2016; Hanrahan, Ma, and Yuan, 2017; Kumar, JafarNaimi, and Morshed, 2018; Rosenblat and Stark, 2016]. Such studies have argued that drivers feel customers need to be better informed about the rating system, how it works and so on. Others have suggested improvements like adding qualitative reviews or verbal descriptions (Lampinen and Cheshire, 2016). However, a more fundamental issue at stake here is the asymmetrical 'impact' of the rating system. Although drivers can also rate customers, the impact of a poor evaluation is highly asymmetrical, given that it is ultimately a matter of livelihood for the drivers and getting a certain minimum number of rides per day is critical to earning sustainable incomes. The already-present power asymmetries between drivers, customers and the platform-business are further exacerbated by the fact that the platform is designed in a such way that it escapes evaluation and scrutiny whilst shifting the risks and costs of the same onto its drivers, who are at the same time not considered its 'employees'.

6.2 Why use Ola for work at all?

In the above context, the question arises why workers remain on the Ola platform? A strong opinion that Ola has not really enabled them to earn more remains amongst drivers (as in 2015), in addition to the frustrations around Ola engaging in questionable practices, whose impact is only heightened by drivers' greater dependencies on the platform for their livelihoods because of the *shift in how customers connect with drivers*.

Whilst, in 2015, drivers actively chose to use Ola if and when they wished, they now feel that they have little choice but to use it. The broader context of market conditions that the platform has created since 2015 can be summarised as follows: Ola has: 1) rapidly on-boarded drivers creating excess supply in relation to demand, and 2) blurred the existing segmentation of the transportation market. Whilst public transport is affordable, it operates with scheduled routes and hours. Auto-rickshaws have historically been relatively more expensive but offer the advantages of last-mile connectivity and street hailing, whereas cabs have been premium services unaffordable to most and available only through dispatch services. Ride-hailing platforms have transformed the urban taxi market by flooding it with new cabs, exercising unilateral control over fares across different tiers and service segments, offering promotional discounts, cashbacks and low fares making the fare difference

between cabs and auto-rickshaws negligible, not to mention introducing the considerably cheaper shared rides option. This creates a greater equivalence between cabs and auto-rickshaws. Unlike Ma and Hanrahan (2019), who report that drivers' satisfaction with the platform was inversely correlated with their level of dependency on it, the primary determinant of satisfaction for auto rickshaw drivers in our study is getting enough rides consistently, which most of them report they do not. This makes it a problem of market regulation, not just of app design. Although the two are closely linked, the distinction is important, as addressing usability and other problems with the platform requires focusing on implications for app design, whereas addressing problems caused by market structure (duopoly) means addressing problems of market failure and concentration of market power, which typically requires government regulation, which we will return to below.

For auto-rickshaw drivers, the growth of Ola's market share and dominant status has meant increased dependencies on the platform for their livelihood. Unlike cab drivers, auto-rickshaw drivers have historically enjoyed the freedom of serving customers directly through street-hailing and are not, in principle, dependent on a dispatch service or an app. They have historically had two segments of non-app customers: customers who hail them on the streets and regular customers whom they know through personal networks who schedule rides beforehand (e.g. drop and pick up to/from school/college). The availability of these two customer segments was indeed seen as an important bulwark by auto-rickshaw drivers in 2015 that enabled them to retain their autonomy and control against the advent of app-based ride-hailing. Drivers regularly rejected incoming rides on the Ola app in favour of street customers (see Ahmed et al. 2016 for a detailed discussion). However, since 2015, smartphone penetration has increased, and ride-hailing platforms have become infrastructuralized into India's urban transport ecosystem. Further, as described in section 5.2.4, more and more of drivers' customers have migrated from hailing them on the streets to app-based ride-hailing over time, and drivers see little choice but to continue to use Ola, despite its many disadvantages. Thus, drivers continue to use Ola for work precisely because it has become the preferred way for customers to hail rides (which in turn is because it is cheaper than regulated fares, does not require customers to carry cash, and the conveniences of not having to wait on the streets or haggle over fares).

The typology of affordances that Sutherland and Jarrahi (2018) provide in their review of sharing economy literature is helpful in making sense of the how platforms become 'infrastructuralized' that in turn create the 'new dependencies' for workers. They highlight six key affordances of sharing economy platforms in this regard, namely: generating flexibility, matchmaking, extending reach, managing transactions, trust building, and facilitating collectivity (p. 10). For customers, in addition to matching them with available auto-rickshaws or cabs, ride-hailing platforms enable them to 'extend reach' as they can book their rides via a smartphone application and the onus is on the driver to pick them up from

their location. They are no longer restricted or even required to physically search for available auto-rickshaws in their vicinity. Ride-hailing platforms in India also enable matchmaking between customers and drivers and management of transactions, including the generation of flexibility for customers by allowing them to pay via cash, cards, mobile wallets, or the bank-account linked Unified Payment Interface (which works similar to Swish in Sweden and MobilePay in Denmark). The customer also receives an invoice at the end of the ride, rates the driver, and can reach out to a phone or email-based customer support to get grievances redressed.

From a drivers' perspective, although matchmaking, extending reach, and the promise of flexibility are certainly affordances that initially drew them towards adoption of ride-hailing platforms, they have rarely materialized into concrete benefits or positive outcomes in practice for reasons delineated in our Findings section. The way in which ride-hailing platforms alter the ride dynamics (for instance, by first requiring the driver to accept the incoming ride request in the midst of information asymmetries) reduces the freedom and flexibility that drivers enjoy, as opposed to enhancing them. Extending reach (by the way of getting more rides instead of exclusively depending on street rides) is similarly an affordance that is sought, but not fulfilled for drivers in practice because reach is limited by the local economies of scale that the ride-hailing context affords, in contrast to fully online labour platforms such as Upwork and Fiverr. Tasks like ride-hailing, food delivery, and grocery delivery are, by nature, required to be accomplished offline in person within a certain limited duration and in specific geographies. The very nature of tasks in these contexts constrain the reach that platforms can enable for workers, whereas for online freelancers using platforms such as Upwork or Fiverr, their reach is extended well beyond the remits of their offline social and professional networks, time zones, and geographies. If ride-hailing platforms enabled them access to a newer, larger pool of customers in addition to their existing customer base (which was an expectation that fuelled drivers' adoption of Ola), then it would constitute an extension of reach. However, as we saw earlier, such expectations have remained largely unfulfilled and drivers feel that platforms merely re-route existing customers from street hailing to booking rides via their applications. Furthermore, the unilateral control that the platform wields in managing transactions (unilateral determination of pricing and fees, requirement for drivers' strict adherence to app's navigation and so on) is also questioned in relation to transparency, fairness and equity, thus resulting in erosion of trust, as opposed to trust-building (for e.g. customers' payment preferences taking precedence over drivers' needs, unfairness of evaluation system). Similarly, 'facilitating collectivity' is an affordance that is not fulfilled as Ola has no built-in room for worker communication facilitating exchange of information or support.

The reason these issues take on enormous societal and ethical significance is that Ola, along with Uber, now dominates the urban transport market in India and

30

drivers feel that non-use of Ola is no longer an option as they cannot rely only upon street rides for their livelihoods. This is what we mean by the term 'new dependencies': *Workers in digital or technology-mediated labour markets come to be increasingly dependent on the technology-provider in order to connect with the customers. As a consequence, they face exit barriers that, in turn, shape their continued participation in these markets regardless of any benefit.* Job seekers in these markets are no longer dependent only on job creators/providers. They are also increasingly dependent on the 'digital middlemen' who connect them to the latter and are thus susceptible to the impact of various aspects of platform design (such as work allocation, pricing, evaluation systems etc.). In other words, as more and more customers choose to hail rides, order food, and get various online and offline tasks done via intermediary platforms, the latter move towards becoming infrastructures, a process that has been termed 'infrastructuralization of platforms' (Plantin et al. 2018, van Dijck 2021). For workers who perform such tasks for a living, this translates into a growing dependency on these infrastructuralized platforms for their livelihood. This makes it critical for us not to conflate workers' continued use of these platforms with their experiencing benefits or positive outcomes. It also enhances the importance of unpacking how these platforms, via design, can disempower workers, which can, in turn, point us to that the central issues at stake as well as the opportunities for regulation and design to improve workers' interaction with customers as well as protect their wellbeing in the long run.

7   Design Implications

In this section, we outline some key implications for regulation and platform design.

7.1   Implications for Regulation

As with other contexts, ride-hailing platforms contribute to the precarity of working conditions. Why does it matter particularly here? A recent study of Uber drivers in India contends that these gig platforms are actually 'driving micro-entrepreneurship and ownership' amongst low-skilled, low-income workers in the country, by integrating them into the 'formal economy', and facilitating loan provision for drivers to acquire their own cars and auto-rickshaws (Prabhat, Nanavati, and Rangaswamy, 2019). However, such loans do not necessarily translate into ownership[7], for the simple reason that drivers' earnings have plummeted and destabilized, causing them to default on these loans and fall into a debt trap. Many

---

[7] In their mixed-methods study, Fleitoukh and Toyama (2020) found no correlation between vehicle ownership and app usage.

of them have even had their vehicles confiscated, further aggravating their circumstances, as they are dependent on those very vehicles for their livelihoods (Chatterjee, 2019). Such concerns have been raised in the global North as well in relation the financial services that Uber is planning to launch (Dubal, 2019). Furthermore, access to the 'formal economy' does not improve or stabilize income levels in and of itself (Muralidhar, Bossen, and O'Neill, 2019). Indeed, structural factors like excess supply, predatory pricing, and withdrawal of incentives together cause individual drivers' earnings to depress, and ultimately lead to workers falling into debt traps. Consequently, there are structural reforms needed vis-à-vis digital labour platforms in order to prevent tech-businesses from 'creating a global underclass', to borrow from Gray and Suri (2019).

What is different for auto-rickshaw drivers in India is that they are already a part of an underclass. Whilst there is some level of regulation of the market, they are nonetheless considered to be part of the 'informal economy' – earning unpredictable, daily incomes – with all the insecurities that it entails. Into this mix come ride-hailing platforms, and it is clear from our study that they are not making drivers part of the formal economy in a benevolent sense. Rather, they are further marginalizing drivers, as whatever control they enjoyed at work is now superseded by the platform. By engaging in 'regulatory arbitrage' (Rosenblat, 2018), platforms undermine the few regulations that have historically sought to protect drivers and given them a semblance of bargaining power and control over their work conditions.

Furthermore, the platform, through design, exposes drivers to conflicts with customers whilst remaining unscathed itself. In 2015, drivers were able to maintain a degree of control because of the availability of street customers in sizeable numbers. However, as more and more customers switch to app-based ride-hailing, the conditions are only likely to worsen as platforms become more dominant and powerful. We can see how ride-hailing platforms are amplifying the inequalities already inherent in society to the detriment of the disadvantaged and disenfranchised (Toyama, 2011). Uber and Ola now enjoy a duopoly in the urban taxi market in India, a development seen as a threat by the driver community. In contrast to the years before the entry of these platforms, driver unions no longer even demand a periodic fare revision even though the current 'meter fare' in force was set in 2013. This is despite rising LPG (Liquified Petroleum Gas) prices and high rates of inflation. In fact, a recent survey conducted amongst auto-rickshaw drivers in Bengaluru by one of the driver unions found that about 80 percent of the respondents were against hiking the minimum fare, fearing that they will lose their customers to Ola and Uber (Phillip, 2019). When the problems can be traced back to platforms' business model wherein drivers are not considered 'employees', viable solutions, by necessity, must be regulatory.

A first-step in this direction has arguably come to fruition in India in November 2020 when, after a long wait, the Motor Vehicles Aggregator Guidelines was

released by the Transport Ministry in what is the Indian's government first-ever regulatory move in governing ride-hailing platforms (Suresh, 2020a). The guidelines, inter alia, put a cap on 'surge pricing' as well as the commissions platforms can levy from drivers. 'Surge pricing' is now capped at 1.5 times the base fare to ensure customers are not exploited (Rao, 2020). At the same time, the base fare calculation has been revised to include a minimum distance of three kilometers so as to compensate drivers for their fuel costs in picking up the customer. The guidelines also stipulate that platforms can receive a maximum of 20 percent as commission. In other words, at least 80 percent of the fare must go to the driver (Pawariya, 2020). Additionally, in order to promote greater transparency, platforms are now required to share the fare breakdown after each trip so that drivers can verify how much they have earned (as opposed to the gross fare they have historically seen on the app upon ride completion which does not tell them anything about platform deductions). To ensure welfare of drivers and safety of customers and the public at large, the guidelines also mandate a maximum of 12 working hours per day for drivers across platforms (Dash, 2020b). Platforms are further mandated to provide insurance to all drivers of at least 500,000 INR per year (approx. 5500 EUR) that are subject to an annual increase of five percent (Suresh, 2020a).

In response, however, driver unions in Bengaluru have expressed skepticism about whether the national or state governments will really be successful in getting ride-hailing platforms to implement these guidelines effectively in practice (Rao, 2020). They argue that the cap for commission at 20 percent is still far from ideal as their demands have been to lower the rate to 5-10 percent (since they must cover several other costs on their own). At a more general level, driver unions feel that addressing different symptoms by taking a piecemeal approach will hardly prove fruitful in the absence of addressing the root causes, for instance, through governments granting them 'employee status' (ibid). They argue that the benefits that accompany traditional employment such as fixed working hours, fixed salaries, overtime pay, pension and so on are what will make a real, substantive difference to their work and financial wellbeing.

In this context, it is important to mention that the Ministry of Labour and Employment has, in parallel, come up with a draft Code on Social Security that, for the first time, recognizes 'gig workers' and 'platform workers' in relation to eligibility for benefits such as health and accidental insurance, maternity leave etc. (Suresh, 2020b). The draft Code includes a provision for a social security fund that will require platforms to deposit a percentage of their annual turnover for the welfare of these workers. It is not yet clear what the exact percentage will be and if workers will be expected to contribute as well. It remains to be seen when this Code will be enacted as legislation and come into effect. Once it does, as with any regulation, there is also the perennial question of effective implementation.

However, it is pertinent to note these efforts by the Indian government for the first time to bring the platform economy under regulation.

In this regard, it is also important to acknowledge the role played by initiatives such as the Fairwork Foundation that attempt to shame labour platforms into improving their working conditions and ensure that basic worker rights are protected. In a recent report published on digital labour platforms in India, out of a total score of ten, Ola was rated two whilst Uber was at the bottom of the table with a score of one for poor communication channels, inadequate grievance redressal mechanisms, and overall poor working conditions (The News Minute, 2020). Although the report notes that none of the platforms expressed any interest in allowing or recognising worker collectivization, the fact that the ratings and underlying criteria have garnered enough interest from the platforms under scrutiny to warrant official response is noteworthy (ibid)[8].

7.2 Implications for Platform Design

There are implications for platform design as well from our study that could be introduced fairly easily and benefit all the actors involved.

First would be to redesign the rating system so that the customer can rate the platform and the driver independently of each other. Individual drivers should be evaluated only with respect to criteria that are in their control like safe driving, whereas the platform should be evaluated with respect to pricing, accuracy of ETAs, etc. This would go some way towards ensuring that drivers do not bear the repercussions of platform's choices.

Second, allowing customers to schedule 'regular' commutes with drivers through shortlisting or marking 'favourites' could enhance safety and reliability for customers, whilst bringing in a degree of stability and regularity to drivers' incomes. After all, repeat hiring has been noted to be a common occurrence on platforms like Amazon Mechanical Turk and Upwork as well, because of reduced transaction costs, amongst other things (Gray and Suri, 2019). Another measure, even in the absence of 'scheduled commutes', could be to at least prioritize drivers marked 'favourites' by customers during ride-allocation (assuming they are in the vicinity) for the same reasons.

Third, making the service charges and the fare-breakdown visible to drivers and customers would greatly improve transparency and ease tensions between the driver and customer.

Whilst these three design suggestions are about mitigating the bad, there are also some positive, ancillary impacts that have come about from being part of the platform economy. The next two design implications focus on how to enhance these benefits.

---

[8] The fact that the scores, criteria and reports are available on Fairwork's website in Hindi and Kannada, besides English, also makes it quite inclusive.

Thus, a fourth design implication concerns how digital payments assist drivers with 'earmarking' practices (Zelizer, 1994) and reduce the effort involved in saving, as long as drivers receive a mixture of cash and digital earnings. This clearly illustrates how the same technology can exhibit different affordances in different circumstances because of user appropriation. Whilst in the Global North, digital financial technologies such as credit cards, contactless cards and so on have led to concerns around 'loss of friction' and 'invisible spending' (Mainwaring, March, and Maurer, 2008), our findings indicate that here they have had a very different effect of digital forms of money acting as a 'money guard'[4]. However, the 'earmarking' of cash for mostly attending day-to-day basics and setting aside 'digital money' for specific purposes like loan repayment is contingent on how much they earn on a given day. Platforms could, therefore, assist 'earmarking' practices by setting a threshold for the number of cash-payment rides an individual driver would be assigned, as well as the number of digital-payment rides (e.g., 70 and 30 percent respectively). Thus, they can ensure that the driver has sufficient cashflow for daily needs whilst also ensuring convenience for customers and the platforms' revenue-stream through electronic deductions. This would reduce uncertainty for drivers and at the same time meet platforms' need for adequate digital payments. Thus, platforms like Ola and Uber in the Global South, where economies continue to be cash-driven, could ensure that drivers get the best balance between cash and digital payments.

Furthermore, as previously noted, drivers have significantly expanded their digital skills and capabilities, as exemplified by their use of applications like WhatsApp, YouTube and Google Pay on an everyday basis. Whilst reflective of a larger trend of increasing smartphone penetration in India (Balkrishan et al., 2016), this has clearly been driven by drivers' requirements to optimize their devices for work. These trends are promising and raise novel possibilities in terms of thinking about how mobile-based interventions can be designed around a wide range of services and information for under-served communities. For instance, Uber drivers and M-Turk workers in the Global North participate actively on Facebook groups and online forums to collectively strive for better work conditions (Hanrahan, Ma, and Yuan, 2017; Martin et al., 2016; Rosenblat and Stark, 2016). Our study points to the beginnings of such online communication (with its greater reach and timeliness) in India through WhatsApp groups that are springing up.

Thus, a fifth design implication is to reflect upon how the growing digital capabilities of low- and semi-literate populations due to smartphone use can be leveraged to design smartphone-based tools that can provide a space for drivers to communicate, collaborate, engage in information exchange and mutual learning, and provide various kinds of support to one another, regardless of their education

---

[4] To put this in a broader context, assistance with accumulation of savings has been noted to be one of the primary financial needs of low-income communities across the globe (Muralidhar, Bossen, and O'Neill 2019).

and literacy levels. Since WhatsApp is used a lot more than any other social networking platform by these communities (Balkrishan et al., 2016; McGregor et al., 2019), designing chat-based tools for and with the workers would be a direction to explore. In what can be seen as a step towards enhancing drivers' well-being, Wang (2019) provides an example of a 'local' ride-sharing innovative solution developed by taxi drivers themselves in a resource-constrained setting in China, in response to the dominant DiDi platform catering only to the major urban centers. Future work should examine the possibilities and challenges for such 'local' solutions to be designed and implemented in other contexts.

8 Limitations

Our study has limitations in terms of looking at a single ride-hailing platform, a small sample size, and geographically limited to two main cities in the state of Karnataka, India. Additionally, even though participants did use Uber in addition to Ola, we could not use data on Uber to analyse the overarching research questions that we are interested in answering in this paper. This is primarily because, although Uber Auto was launched as early as March-2016 in India, it was suspended soon after and resumed services only in early-2018. Consequently, participants had not been using Uber, unlike Ola, for more than six months at the time of conducting the study. This prevented us from obtaining rich data on some of the longer-term changes to the platform and experiences over time in the context of Uber like we could for Ola, which had been in continuous use for 1,5-3 years. Geographically, not only must we acknowledge that our results might not necessarily hold for other contexts in the Global South but also for other regions/cities in India which have their own configurations of the transportation ecosystem as well as the rules and regulations governing them. At the same time, because we are investigating drivers who have historically been self-employed, independent local operators across contexts, and the impact of 'digital middlemen' (Isaac, 2014) like Ola on their work and financial lives, we believe that our findings have resonance beyond our immediate context. The myriad experiences and problems faced over time and their continued use of platforms, notwithstanding those problems, by our participants portray a fundamental set of issues and tensions with the 'on-demand' platform economy that have thus far remained less explored. The findings from this study can certainly be a starting point to conduct quantitative studies, generate hypotheses and test them in future research. They could also be used to study and contrast results across different kinds of labour platforms and contexts.

9 Conclusion

In this paper, by examining the changes that have taken place as ride-hailing has become dominant in the Indian urban transportation ecosystem, we have extended the findings from existing research and contributed novel insights on some of the enduring ways in which digital labour platforms create 'new dependencies' and, by design, amplify the precarity of an already marginalized workforce. With more and more consumers moving towards using apps for their mobility, food delivery, and care needs, it forges 'new dependencies' on such platforms for workers to sustain their livelihoods. Such dependencies heighten the uncertainties for workers whilst eroding the autonomy and control they have historically exercised by being self-employed. Both market and platform design aspects contribute to the twin challenges of uncertainty and autonomy. The two positive externalities – acquisition of digital literacies and digital money assisting with 'earmarking' practices – offer promising directions for future research and interventions. Whilst regulatory matters are going to be critical in shaping the future of 'on-demand' labour, our paper shares a few key, platform design suggestions as well that could improve the interactions and experiences for all.

10 Acknowledgements

11 References

Ahmed, Mishal, Erik Barry Johnson, and Byung-Cheol Kim. (2018). The Impact of Uber and Lyft on Taxi Service Quality: Evidence from New York City. Available at *SSRN 3267082*. October 2018.

Ahmed, Syed Ishtiaque, Nicola J Bidwell, Himanshu Zade, Srihari H Muralidhar, Anupama Dhareshwar, Baneen Karachiwala, Cedrick N Tandong, and Jacki O'Neill. (2016). Peer-to-peer in the Workplace: A View from the Road. *In CHI'16: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. New York. ACM. Pp. 5063-75.

Almoqbel, Mashael Yousuf, and Donghee Yvette Wohn. (2019). Individual and Collective Behaviors of Rideshare Drivers in Protecting their Safety. In *Proceedings of the ACM on Human-Computer Interaction (PACMHCI)*. Vol. 3. CSCW. ACM, New York, USA. Article 217.

Balkrishan, Devanuj, Anirudha Joshi, Chandni Rajendran, Nazreen Nizam, Chinmay Parab, and Sujit Devkar. (2016). Making and Breaking the User-Usage Model: WhatsApp Adoption Amongst Emergent Users in India. In *Proceedings of the ACM Conference on Human-Computer Interaction India 2016 (IHCI'16)*. ACM, New York, USA. 52-63.

Bhattacharya, Ananya. (2019). Ola vs Uber: The latest score in the great Indian taxi-app game. *Quartz India*. February 12, 2019. Retrieved from https://qz.com/india/1545042/ola-vs-uber-the-latest-score-in-the-great-indian-taxi-app-game/

Casilli, Antonio, and Julian Posada. (2019). The Platformization of Labor and Society. Mark Graham and William H Dutton (Eds.). *Society and the Internet: How Networks of Information and Communication are Changing Our Lives*. Second Edition. Oxford University Press. pp. 293-306.

Chanchani, Radha, and Fagun Rajkotia (CiSTUP). (2012). *A Study of the Auto-Rickshaw Sector in Bangalore City – Suggestions for Improved Governance*. Retrieved from http://cistup.iisc.ernet.in/pdf/newsandevents/Autorickshaws-Blore_FinalReport_Dec12_Cistup.pdf

Chatterjee, Soumya. (2019). No easy exit as Ola and Uber drivers in India face spiraling debt trap. *The News Minute*. May 28, 2019. Retrieved from https://www.thenewsminute.com/article/no-easy-exit-ola-and-uber-drivers-india-face-spiralling-debt-trap-102558

Chen, Le, Alan Mislove, and Christo Wilson. (2015). Peeking Beneath the Hood of Uber. In *IMC'15 Proceedings of the ACM Internet Measurement Conference*. Pp. 495-508. New York. ACM.

Civitas Consultants Private Limited for City Connect Foundation Chennai. (2010). *Study on the Auto-rickshaw sector in Chennai*. Retrieved from http://chennaicityconnect.com/wpcontent/uploads/2011/03/Auto-Study-Chennai.pdf

Cohen, Peter, Robert Han, Jonathan Hall, Steven Levitt, and Robert Metcalfe. (2016). *Using big data to estimate consumer surplus: The case of Uber*. No. w22627. National Bureau of Economic Research. 8 September 2016.

Cramer, Judd, and Alan B. Krueger. (2016). Disruptive change in the taxi business: The case of Uber. *American Economic Review*. Vol. 106. No. 5. pp. 177-182.

Dash, Dipak K. (2020a). Bengaluru has world's worst traffic congestion, Mumbai at number 4. *The Times of India*. January 2020. Retrieved from https://timesofindia.indiatimes.com/india/bengaluru-has-worlds-worst-traffic-congestion-mumbai-at-number-4/articleshow/73747725.cms

Dash, Dipak K. (2020b). Uber, Ola drivers can work only 12 hours a day. *The Times of India*. 29 November 2020. Retrieved from https://timesofindia.indiatimes.com/business/india-business/uber-ola-drivers-can-work-only-12-hours-a-day/articleshow/79469999.cms

Dillahunt, Tawanna R., Vaishnav Kameswaran, Linfeng Li, and Tanya Rosenblat. (2017). Uncovering the Values and Constraints of Real-Time Ridesharing for Low-resource Populations. In *Proceedings of the 2017 SIGCHI International Conference on Human Factors in Computing Systems (CHI'17)*. ACM, New York, USA. 2757-2769.

Dubal, Veena. (2019). Uber's new loan program could trap drivers in cycles of crushing debt. *The Guardian*. December 5, 2019. Retrieved from https://amp.theguardian.com/commentisfree/2019/dec/05/uber-loan-program-debt

Economic Times Auto. (2020). *57% of Indians prefer ride-hailing over own vehicle*. January 2020. Retrieved from https://auto.economictimes.indiatimes.com/news/aftermarket/57-of-indians-prefer-ride-hailing-over-own-vehicle/73558901

Fleitoukh, Anna, and Kentaro Toyama. (2020). Are Ride-Sharing Platforms Good for Indian Drivers? An Investigation of Taxi and Auto-Rickshaw Drivers in Delhi. In Bandi, R. K., C. R. R., Klein S., Madon S., and Monterio E. (eds.) *The Future of Digital Work: The Challenge of Inequality*. IFIPJWC 2020. IFIP Advances in Information and Communication Technology. Vol. 601. Springer.

Gillespie, Tarleton. (2010). The Politics of Platforms. *New Media and Society*. Vol. 12. No. 3. pp. 347-364. SAGE.

Gillespie, Tarleton. (2017). Governance of and by platforms. Jean Burgess, Thomas Poell, and Alice Marwick (Eds.). *SAGE Handbook of Social Media*. pp. 254-278. SAGE.

Glöss, Mareike, Moira McGregor, and Barry Brown. (2016). Designing for Labour: Uber and the On-Demand Mobile Workforce. *In CHI'16: Proceedings of the International SIGCHI Conference on Human Factors in Computing Systems*. Pp. 1632-43. New York. ACM.

Gray, Mary L., and Siddharth Suri. (2019). *Ghost Work: How to Stop Silicon Valley from Building a New Global Underclass*. Houghton Mifflin Harcourt, Boston, USA.

Guda, Harish, and Upender Subramanian. (2019). Your Uber is Arriving: Managing On-Demand Workers Through Surge Pricing, Forecast Communication, and Worker Incentives. *Management Science*. 65, 5. Institute for Operations Research and the Management Sciences. 1995-2014.

Gupta, Neha, David Martin, Benjamin V. Hanrahan, and Jacki O'Neill. (2014). Turk-Life in India. In *Proceedings of the 18th International Conference on Supporting Group Work (GROUP'14)*. ACM, New York, USA. 1-11.

Hanrahan, Benjamin V., Ning F Ma, and Chien Wen Yuan. (2017). The Roots of Bias on Uber. In *Proceedings of the 15th European Conference on Computer-Supported Cooperative Work – Exploratory Papers, Reports of the European Society for Socially-Embedded Technologies*.

Harding, Simon E., Madhav G. Badami, Conor C. O. Reynolds, and Milind Kandlikar. (2016). Auto-rickshaws in Indian cities: Public perceptions and operational realities. *Transport Policy*. Vol. 52. pp. 143-152.

Isaac, Emily. (2014). Disruptive Innovation: Risk-Shifting and Precarity in the Age of Uber. Roundtable on the International Economy BRIE Working Paper 2014-7. December 7, 2014. Retrieved from brie.berkeley.edu

Jagannathan, R. (2016). Buying A Car No Longer Makes Sense; Car-Makers' Business Models Need Tweaking. *Swarajya*. December 2016. Retrieved from https://swarajyamag.com/ideas/buying-a-car-no-longer-makes-sense-car-makers-business-models-need-tweaking

Jarrahi, Mohammed Hossain, and Will Sutherland. (2019). Algorithmic Management and Algorithmic Competencies: Understanding and Appropriating Algorithms in Gig Work. In Proceedings of the *International Conference on Information*. Springer. 578-589.

Jhaver, Shagun, Yoni Karpfen, and Judd Antin. (2018). Algorithmic Anxiety and Coping Strategies of Airbnb Hosts. In *CHI'18 Proceedings of the International SIGCHI Conference on Human Factors in Computing Systems*. Article 421. New York. ACM.

Kameswaran, Vaishnav, Jatin Gupta, Joyojeet Pal, Sile O'Modhrain, Tiffany C Veinot, Robin Brewer, Aakanksha Parameshwar, Vidhya Y, and Jacki O'Neill. (2018). 'We Can Go Anywhere': Understanding Independence Through a Case-Study of Ride-hailing Use by People with Visual Impairments in Metropolitan India. *Proceedings of ACM on Human-Computer Interaction (PACM-HCI)*. Vol. 2. CSCW. Article 85. Nov. 2018.

Kameswaran, Vaishnav, and Srihari Hulikal Muralidhar. (2019). Cash, Digital Payments and Accessibility: A Case Study from India. *Proceedings of ACM on Human-Computer Interaction (PACM-HCI)*. Vol. 3. CSCW. Article 97. November 2019.

Kasera, Joseph, Jacki O'Neill, and Nicola J Bidwell. (2016). Sociality, Tempo & Flow: Learning from Namibian Ride-sharing. In *Proceedings of the 1st African Conference on Human-Computer Interaction (AFRICHI'16)*. ACM, New York, USA. 36-47.

Kidiyoor, Suchith. (2019). Of Bengaluru's 80 lakh vehicles, BMTC fleet accounts for just 6529. *The Hindu*. May 12, 2019. Retrieved from https://www.thehindu.com/news/cities/bangalore/of-bengalurus-80-lakh-vehicles-bmtc-fleet-accounts-for-just-6529/article27105617.ece/amp/

Kuehn, Kathleen, and Thomas F Corrigan. (2013). Hope labor: The role of employment prospects in online social production. *The Political Economy of Communication* 1, 1. May 2013.

Kumar, Neha, Nassim JafarNaimi, and Mehrab Bin Morshed. (2018). Uber in Bangladesh: The Tangled Web of Mobility and Justice. In *Proceedings of the ACM on Human-Computer Interaction (PACM-HCI)*. Vol. 2. CSCW. ACM, New York, USA. Article 98.

Lampinen, Airi, and Coye Cheshire. (2016). Hosting via Airbnb: Motivations and Financial Assurances in Monetized Network Hospitality. In *Proceedings of the 2016 SIGCHI International Conference on Human Factors in Computing Systems (CHI'16)*. ACM, New York, USA. 1669-1680.

Lee, Min Kyung, Daniel Kusbit, Evan Metsky, and Laura Dabbish. (2015). Working with Machines: The Impact of Algorithmic and Data-Driven Management on Human Workers. In *CHI'15 Proceedings of the International SIGCHI Conference on Human Factors in Computing Systems*. New York. ACM.

Liu, Meng, Erik Brynjolfsson, and Jason Dowalatabadi. (2015). Do Digital Platforms Reduce Moral Hazard? The Case of Uber and Taxis. *National Bureau of Economic Research*. Working Paper 25015. Retrieved from http://www.nber.org/papers/w25015

Ma, Ning F., and Benjamin V Hanrahan. (2019). Part-Time Ride-sharing: Recognizing the Context in which Drivers Ride-share and its Impact on Platform Use. In *Proceedings of the ACM on Human-Computer Interaction (PACM-HCI)*. Vol. 3. GROUP. ACM, New York, USA. Article 247.

Mainwaring, Scott, Wendy March, and Bill Maurer. (2008). From meiwaku to tokushita!: Lessons for digital money design from Japan. In *CHI'08: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. New York. ACM.

Mani, A., and P. Pant. (2011). Review of the Literature in India's Auto-rickshaw sector. EMBARQ India. Mumbai. Retrieved from Mani, A., Pant, P., 2011. "Review of the Literature in

India's Auto-rickshaw sector". EMBARQ India, Mumbai. Retrieved from http://www.embarq.org/sites/default/files/ReviewofLiteratureInIndian%27sUrbanAutoRickshawSectorASynthesisOfFindings.pdf

Martin, David, Benjamin V Hanrahan, Jacki O'Neill, and Neha Gupta. (2014). Being a Turker. In *Proceedings of the 17th ACM International Conference on Computer-Supported Cooperative Work (CSCW'14)*. ACM, New York, USA. 224-235.

Martin, David, Jacki O'Neill, Neha Gupta, and Benjamin V. Hanrahan. (2016). Turking in a global labour market. *Journal of Computer Supported Cooperative Work (CSCW)*. Vol. 25. No. 1. pp. 39-77.

McGregor, Moira, Nicola J Bidwell, Vidya Sarangapani, Jonathan Appavoo, and Jacki O'Neill. (2019). Talking About Chat at Work in the Global South: An Ethnographic Study of Chat Use in India and Kenya. In *Proceedings of the SIGCHI International Conference on Human Factors in Computing Systems (CHI'19)*. ACM, New York, USA. Article 233.

Mehra, Apurv, Srihari Muralidhar, Sambhav Satija, Anupama Dhareshwar, and Jacki O'Neill. (2018). Prayana: Intermediated Financial Management in Resource-Constrained Settings. In *Proceedings of the 2018 SIGCHI International Conference on Human Factors in Computing Systems (CHI'18)*. ACM, New York, USA.

Möhlmann, Mareike, and Lior Zalmanson. Hands on the Wheel: Navigating Algorithmic Management and Uber Drivers' Autonomy. (2017). In *Proceedings of the International Conference on Information Systems (ICIS 2017)*. Seoul, South Korea.

Muralidhar, Srihari Hulikal, Claus Bossen, and Jacki O'Neill. (2019). Rethinking Financial Inclusion: From Access to Autonomy. *Journal of Computer-Supported Cooperative Work (CSCW)*. Vol. 28. Issue 3-4. 511-547.

Parker, Geoffrey G., Marshall W. Van Alstyne, and Sangeet Paul Choudary. (2016). *Platform Revolution: How networked markets are transforming the economy and how to make them work for you*. W. W. Norton & Company, New York, USA.

Pawariya, Arihant. (2020). New Guidelines For Cab Aggregators Like Ola And Uber Are Regressive, Will Hurt All Stakeholders From Consumers To Drivers To Aggregators Themselves. *Swarajya*. 30 November 2020. Retrieved from https://swarajyamag.com/business/new-guidelines-for-cab-aggregators-like-ola-and-uber-are-regressive-will-hurt-all-stakeholders-from-consumers-to-drivers-to-aggregators-themselves

Phillip, Christian Matthew. (2019). Why Bengaluru auto drivers don't want a fare hike. *Times of India*. December 6, 2019. Retrieved from https://m.timesofindia.com/city/bengaluru/fearing-ola-uber-auto-drivers-do-not-want-fares-increased/amp_articleshow/72391003.cms

Prabhat, Shantanu, Sneha Nanavati, and Nimmi Rangaswamy. (2019). India's "Uberwallah": Profiling Uber Drivers in the Gig Economy. In *Proceedings of the ACM International Conference on Information and Communication Technologies and Development (ICTD'19)*. ACM, New York, USA.

Randall, David, Richard Harper, and Mark Rouncefield. (2007). *Fieldwork for Design: Theory and Practice*. New York. Springer.

Rai, Anand. (2014). *India had third largest smartphone base with 117M users in 2013; to grow 45% in 2014: Mary Meeker Report.* 29 May 2014. Retrieved from

https://www.techcircle.in/2014/05/29/india-had-third-largest-smartphone-base-with-117m-users-in-2013-to-grow-45-in-2014-mary-meeker-report

Rao, Shishir. (2020). Bengaluru Ola, Uber drivers say new aggregator rules don't offer real solutions. *The News Minute*. 05 December 2020. Retrieved from https://www.thenewsminute.com/article/bengaluru-ola-uber-drivers-say-new-aggregator-rules-don-t-offer-real-solutions-139067

Raval, Noopur, and Paul Dourish. (2016). Standing Out from the Crowd: Emotional Labour, Body Labour, and Temporal Labour in Ridesharing. In *CSCW'16 Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing*. New York. ACM.

Reynolds, Conor C. O., Milind Kandlikar, and Madhav G. Badami. (2011). Determinants of PM and GHG emissions from natural gas-fuelled autorickshaws in Delhi. *Transportation Research Part D – Transportation and Environment*. Vol. 16. No. 2. pp. 160-165.

Rosenblat, Alex. (2018). *Uberland: How Algorithms Are Rewriting the Rules of Work*. University of California Press.

Rosenblat, Alex, and Luke Stark. (2016). Algorithmic Labour and Information Asymmetries: A Case Study of Uber's Drivers. *International Journal of Communication*. Vol. 10. Pp. 3758-84.

Shah, Daksh, Aravinda Kumaran, Rijurekha Sen, and Ponnurangam Kumaraguru. (2019). Travel time estimation accuracy in developing regions: An empirical case study with Uber data in Delhi-NCR. In *WWW'19 Companion*. International World Wide Web Conference Committee. ACM, New York, USA.

Shapiro, Aaron. (2017). Between autonomy and control: Strategies of arbitrage in the "on-demand" economy. *New Media & Society*. Pp. 1-18.

Shrivastava, Aditi. (2019). Hail no more! Ola, Uber's ride growth slows to a crawl. *Economic Times*. 04 June 2019. Retrieved from https://economictimes.indiatimes.com/small-biz/startups/newsbuzz/hail-no-more-ola-ubers-ride-growth-slows-to-a-crawl/articleshow/69641990.cms?from=mdr

Singh, Sheiley. (2016). Uber vs Ola: Who will end up dominating the streets? *Economic Times*. April 2016. Retrieved from https://economictimes.indiatimes.com/small-biz/startups/uber-vs-ola-who-will-end-up-dominating-the-streets/articleshow/51720396.cms

Suresh, Haripriya. (2020a). Union govt. issues rules for Ola, Uber: All you need to know. *The News Minute*. 28 November 2020. Retrieved from https://www.thenewsminute.com/article/union-govt-issues-rules-ola-uber-all-you-need-know-138576

Suresh, Haripriya. (2020b). Gig workers to get health and maternity benefits under draft rules for Social Security. *The News Minute*. 16 November 2020. Retrieved from https://www.thenewsminute.com/article/gig-workers-get-health-and-maternity-benefits-under-draft-rules-social-security-137762

Sutherland, Will, and Mohammed Hossein Jarrahi. (2018). The sharing economy and digital platforms: A review and research agenda. *International Journal of Information Management*. Vol. 43. pp. 328-341.

techARC. (2020). *Techinsight – At 502.2 million smartphone users, its time for smartphone brands to turn towards services in 2020*. 30 January 2020. Retrieved from

https://techarc.net/techinsight-at-502-2-million-smartphone-users-its-time-for-smartphone-brands-to-turn-towards-services-in-2020/

The News Minute. (2020). *Zomato, Swiggy, Uber score least on fair working conditions for workers among all apps.* 17 December 2020. Retrieved from https://www.thenewsminute.com/article/zomato-swiggy-uber-score-least-fair-working-conditions-workers-among-all-apps-139773

Toyama, Kentaro. (2011). Technology as amplifier in international development. *Proceedings of the 2011 iConference.* February 2011. 75-82.

van Dijck, Jose. (2021). Seeing the forest for the trees: Visualizing platformization and its governance. *New Media and Society.* Vol. 23. No. 9. pp. 2801-2819. SAGE.

Walker Smith, J. (2016). The Uber-All Economy of the Future. *The Independent Review.* Vol. 20. Issue 3. Winter 2016. Independent Institute. 383-390. Retrieved from https://www.jstor.org/stable/245621509

Wang, Yi. (2019). When DiDi Is Not Really A Choice in Small Chinese Cities, Taxi Drivers Build Their Own. In *Proceedings of ACM on Human-Computer Interaction.* 3. CSCW. Article 166. November 2019. Association for Computing Machinery, New York, NY, USA. 30 pages.

WSA. (2008). Study on Traffic and Transportation Policies and Strategies in Urban Areas in India – Final Report. Wilbur Smith Associates.

Zelizer, Viviana. (1995). *The Social Meaning of Money.* Princeton. Princeton University Press.