



Gig Workers during the COVID-19 Crisis in France: Financial Precarity and Mental Well-Being

Bénédicte Apouey · Alexandra Roulet · Isabelle Solal · Mark Stabile

Accepted: 28 August 2020 / Published online: 22 September 2020
© The New York Academy of Medicine 2020

Abstract We set out to explore how precarious workers, particularly those employed in the gig economy, balance financial uncertainty, health risks, and mental well-being. We surveyed and interviewed precarious workers in France during the COVID-19 crisis, in March and April 2020. We oversampled gig economy workers, in particular in driving and food delivery occupations (hereafter drivers and bikers), residing in metropolitan areas. These workers cannot rely on stable incomes and are excluded from the labor protections offered to employees, features which have been exacerbated by the crisis. We analyzed outcomes for precarious workers during the mandatory lockdown in France as an extreme case to better understand how financial precarity relates to health risks and mental well-being. Our analysis revealed that 3 weeks into the lockdown, 56% of our overall sample had stopped working and respondents had experienced a 28% income drop on average. Gig economy drivers reported a significant 20 percentage point larger income decrease than other workers in our sample. Bikers were significantly more likely to have continued working outside the home during the lockdown. Yet our quantitative analysis also

revealed that stress and anxiety levels were not higher for these groups and that bikers in fact reported significantly lower stress levels during the lockdown. While this positive association between being a biker and mental health may be interpreted in different ways, our qualitative data led to a nuanced understanding of the effect of gig work on mental well-being in this population group.

Keywords Gig economy · Financial precarity · Health and well-being · COVID-19

Introduction

The on-demand or “gig” economy has grown significantly in recent years and attracts a growing number of workers who may have few other options or who may be looking for a sense of autonomy. This is especially the case in the dense, urban areas of the developing world. Gig work comes with few or no labor protections however, and as such is synonymous with financial uncertainty and sparks concerns for worker health and welfare. These concerns become especially acute in times of crisis, where financial uncertainty can suddenly escalate to extreme precarity. We exploited data from workers during the COVID-19 crisis in France to investigate the financial and health consequences for gig workers.

Our paper relates to the literature on gig work and its implications for workers’ economic conditions and health status [1, 2]. Platform workers, defined as

B. Apouey
Paris School of Economics-CNRS, Paris, France

A. Roulet · M. Stabile (✉)
INSEAD and CEPR, Fontainebleau, France
e-mail: mark.stabile@insead.edu

I. Solal
ESSEC Business School, Cergy, France

individuals “who use an app (such as Uber) or a website (such as Amazon Turk) to match themselves with customers, in order to provide a service in return for money,”¹ represent a small but growing share of total employment, estimated around 1% of total employment in France.² This estimate includes workers who use platforms as their main income source as well as those who do so only occasionally (see [3] for a description of Uber drivers in France as of 2015). In the UK, primary or partial platform work amounts to a share of 3%. Moreover, according to the Department for Business, Energy and Industrial Strategy (BEIS) in the UK [4, 5], which analyzed survey data on 11,825 people in 2017, 4.4% of the population had worked in the gig economy in the 12 months preceding the survey.³ Providing services through Uber was the most common type of gig economy activity (18%). However, income earned in the gig economy reflected a small share of total income for gig workers, since only 8% individuals considered this money as their main source of income. Overall, workers report being satisfied with their gig economy work (53%), mainly because of the independence and flexibility aspects of their job. Berger et al. [6] explored mental health outcomes of Uber “driver-partners” in London. Their study revealed that Uber drivers reported both higher levels of life satisfaction and higher levels of anxiety than other workers. Building on this article, Apouey and Stabile [7] used longitudinal data to explore the effect of the spatial diffusion of Uber across the UK on mental health for self-employed drivers and found consistent results.

We extend these studies by examining the working conditions, financial situation, and well-being of gig workers during the COVID-19 crisis in France. This health crisis, and its associated economic consequences, presents us with an extreme case where financial precarity was heightened for gig economy workers in particular and where health hazards were especially acute for those workers in dense urban areas who

continued to work in close contact with the general population. This allows us to explore how these workers balance financial uncertainty, health risks, and mental well-being under these conditions.

The spread of COVID-19 represents a global public health challenge. According to the European Centre for Disease Prevention and Control, 136,320 deaths were reported worldwide between December 31, 2019, and April 16, 2020. Lockdowns have been imposed in many countries in order to reduce the transmission of the virus. These imply that essential workers in the health care sector, as well as those in grocery stores and warehouses, or those in charge of front-line delivery, continue working outside their home. Meanwhile, the rest of the population is working remotely or has stopped working, due to either layoffs or partial employment schemes, or because their activity has been banned for public health reasons.

While this months-long reduction in economic activity will most likely trigger deep recessions, lockdowns are already deepening social inequalities. Those able to work from home and retain a stable income are in a privileged position relative to those who have no option but to continue working outside and putting their health at risk. Low socioeconomic status individuals are hit harder by the virus, with increased infection and mortality rates. In particular, recent statistics for France, the USA, and other countries have revealed excess mortality in poorer urban areas with a higher proportion of essential workers and poorer housing conditions [8, 9].

We exploit original data from a survey that we carried out in France between March 9 and April 9, 2020, that is, just prior to and during the national lockdown which began on March 17. We collected baseline information on these workers before the lockdown, including data on their working conditions, income, general health, and mental well-being. We then collected additional data on their experience pre-lockdown, as well as on their work status, income change, stress level, and COVID-19 symptoms at two different points in time during the lockdown.

We oversampled gig economy workers who worked as drivers or in food delivery services at the time of our sample recruitment (end of February). These workers were concentrated in the Paris region as well as in other metropolitan areas and are part of that population of workers who can either continue to work outside the home during the crisis, facing increased health hazards (and potentially reduced demand), or stop working

¹ See <https://www.oecd.org/going-digital/mdt-roadmap-platform-workers.pdf>.

² See <https://www.oecd-ilibrary.org/docserver/fdb0570b-en.pdf?expires=1587559507&id=id&accname=guest&checksum=24F362B382D2141470F7CEE122BA653E>.

³ The Department for Business, Energy and Industrial Strategy in the UK (2018) uses the following definition of the gig economy: “the gig economy involves the exchange of labour for money between individuals or companies via digital platforms that actively facilitate matching between providers and customers, on a short-term and payment-by-task basis” (page 8).

without any income compensation. We also surveyed other types of gig economy workers (albeit fewer of them) including individuals who perform on-demand tasks online (e.g., data work on platforms such as Upwork) or people who provide cleaning or care services at other people's homes through an online platform. Gig workers are excluded from the labor protections offered to employees, and their precarious status has been increasingly made evident by the COVID-19 crisis. Indeed, despite recent lawsuits stating that gig workers should be considered employees,⁴ their legal status in France is still that of independent contractors (self-employed or freelancers), as is the case in many other countries. This status goes hand in hand with lower labor protections, even in a country like France characterized by a strong social safety net: in particular, gig workers are unable to claim unemployment benefits or take advantage of the "partial unemployment" scheme instituted in France during the COVID-19 lockdown (although some may be eligible for other support offered to the self-employed). Their status also means that platforms are unlikely to take responsibility for their health to the extent that an employer would. In addition to gig workers, our sample includes precarious workers who were not employed in the gig economy at baseline but were otherwise comparable to gig economy workers, including those who had engaged in gig economy work in the preceding 12 months, those who anticipated doing so, and others working in non-traditional wage jobs but not through any online platform. Some of the workers in our sample worked as freelance IT support, graphic designers, or tutors, as well as nannies, artists, or warehouse staff.

Three weeks into the lockdown, 56% of our overall sample had stopped working and respondents had experienced a 28% income drop on average. We find that gig economy food delivery workers, whom we refer to as "bikers" (food delivery in urban areas in France is mostly done by bicycle), were much more likely than other precarious workers to have kept working and thus to be working outside the home during the lockdown. Gig economy drivers, by contrast, had stopped working in the same proportion as other precarious workers. However, these drivers reported a much larger income drop (but starting from a higher baseline income).

⁴ For instance, a top court in France ("Cour de Cassation") ruled that an ex Uber driver should be considered an employee of the company, rather than an independent contractor, on 4 March 2020.

Several bikers and drivers in our sample also reported COVID-19 symptoms. However, our quantitative data also reveals that neither group reported experiencing higher stress levels compared with other precarious workers and that bikers actually reported significantly lower stress levels than other workers in the sample (even when controlling for age, family situation, housing conditions, the income drop experienced, and whether or not they were working outside the home). While this positive correlation between being a biker and mental health may capture a beneficial effect of food delivery occupation on mental well-being, it could also be due to the selection of comparatively healthier individuals into this type of occupation. Our qualitative analysis (using data collected at baseline) allows us to better understand our quantitative results and provides a nuanced view of the influence of gig work on mental health, even for bikers. While some bikers derived mental well-being from their work, other bikers emphasized the detrimental effect of gig work on their psychological health.

Data

Data come from an online survey that was carried out by a polling institute (Respondi) in France during the months of March and April 2020, designed to explore both qualitatively and quantitatively the working conditions and health of gig economy workers. As the scope of the COVID-19 crisis became apparent, we chose to focus specifically on the crisis and its consequences for the respondents in our sample, allowing us to investigate financial precarity and well-being outcomes under extreme conditions where gig workers were especially likely to be negatively affected. The survey was launched on Monday March 9, 8 days before the start of the national lockdown, and ended on April 9, just over 3 weeks into the lockdown. The phases of the survey that specifically deal with COVID-19 include between 94 and 137 individuals.

Sample

As noted above, we oversampled gig economy workers working as drivers or in food delivery services. The information used to classify people based on their occupations was recorded during the recruitment of our sample which occurred at the end of February, before

any European country had considered implementing a lockdown. The classification of respondents is therefore unaffected by the crisis itself. Gig drivers and bikers constitute a well-identified type of worker, for whom the crisis may raise concerns both because of the contact with customers their work requires and the absence of a social safety net should they stop working. The platforms these workers used are either global or national. Specifically, in our sample, drivers reported working for Uber, Allocab, Bolt (previously known as Txfy), Bookmi, Heetch, Kapten, Le Cab, Marcel, My Sam, and/or Snapcar. Bikers delivering food worked for Uber Eats, Deliveroo, Just Eat (previously known as Allo Resto), Nestor, and Stuart. Most of the gig workers in our sample worked for several platforms at the same time. Some also reported engaging in other types of platform work, including data work (e.g., on Upwork) or domestic services (such as cleaning, babysitting, and personal care on platforms like Wecasa.fr, Helping.fr, Ouihelp, Youpjob).

The remainder of the sample is composed of other precarious workers. This group includes (i) previous gig workers, that is, individuals who had engaged in gig economy work in the previous 6 to 12 months but were no longer doing so; (ii) future gig workers, that is individuals who were considering joining the gig economy workforce in the near future; (iii) gig economy workers who did not work for driving or food delivery platforms, but instead performed data work or provided personal services through other platforms; and (iv) workers who were not in traditional wage jobs but engaged in freelance work, without using an online platform. We thought of these workers as comparable to current gig drivers and bikers. In the Appendix (Tables 9 to 11), we reported results where instead of focusing on drivers and bikers, we compared all workers using an online platform (drivers and bikers as well as those working for data work or personal service platforms) with the rest of the sample.⁵

The sampling process was set up to ensure variation in sex, age group (18–24, 25–34, 35–49, and 50+), and geographical zone (Paris area, west or north-west, north and east, south-west, and south-east). Respondents were compensated for their participation at the end of the survey.

⁵ The group of all gig workers is much more diverse, which complicates the interpretation of any effect in this group. For instance, some were able to work from home, whereas others were not able to work at all.

Timing of the Survey

We collected data in four phases. In each phase, we added new questions to the online survey, and respondents were free to answer the questions whenever they were ready, before a certain deadline.

During the baseline phase (between March 9 and 17), we collected information on employment conditions, health, and sociodemographic characteristics. In particular, we asked respondents about their individual (net) income level⁶ and general health status.⁷ We also collected qualitative data on workers' views regarding their working conditions and the relationship between work and mental well-being, in particular.

We started collecting information regarding the COVID-19 crisis immediately prior to the lockdown (which began on March 17). Specifically, we first collected qualitative data on March 16 and 17 (the qualitative phase).⁸ We then collected quantitative data at two points during the lockdown (phases 1 and 2). Phase 1 data was collected during the week following the start of the lockdown (on March 19 to 22), and phase 2 three weeks into the lockdown (on April 3 to 9).

Our data are longitudinal. The sample of respondents was constituted before the start of the baseline survey (i.e., before the lockdown), and no respondent was added during the qualitative stage or the two quantitative phases. Some respondents decided not to participate in some survey stages (attrition). As a result, the number of observations changed over time, from 94 respondents during the qualitative phase to 107 respondents during

⁶ Monthly income is provided in 12 brackets. We used the middle of each bracket in our analyses.

⁷ Workers reported whether their health was very good, good, fair, poor, or very poor. Our good health variable is a dummy that is equal to 1 if the individual reported that their health was good or very good, and 0 otherwise.

⁸ We started collecting information regarding the COVID-19 crisis in our qualitative phase, on Monday 16 and Tuesday 17 March. Right before this date, Prime Minister Edouard Philippe announced that restaurants (as well as bars and nonessential shops) would shut down starting Saturday 15 March at midnight. However, food delivery was prohibited neither at this stage nor later during the lockdown. The qualitative phase started on Monday 16 March (in the morning) and ended on Tuesday 17 March (until 9:30 am approximately). On the Monday evening, President Emmanuel Macron announced that a national lockdown would start the next day at noon. Because some respondents answered our questions before this announcement while others answered later, there are obvious differences in information levels between respondents in this phase. However, all workers who participated in this qualitative phase provided their answers before the actual start of the lockdown.

phase 1 and 137 respondents during phase 2. Table 1 summarizes the different steps of the survey.

Questions

We collected both qualitative and quantitative data. The qualitative data specific to the COVID-19 crisis contains individual responses to a series of open-ended questions, whereas the quantitative data relate to answers to questions with pre-set answers from which to choose. Appendix 1 provides the list of questions related to the COVID-19 crisis in each phase.

The purpose of the qualitative data was to elicit respondents' general reactions to the crisis (and the imminent lockdown) as precarious workers and their primary areas of concern, without limiting the scope of their comments. Respondents were therefore given a single prompt, which consisted of a series of open-ended questions related to their understanding and appreciation of the measures being put in place, the impact the pandemic had already had on their activity, and their predictions for the future. In total, we were able to collect approximately seven single-spaced pages of text from 94 individual respondents. The text was translated into English and coded independently by two of the authors to identify the principal themes raised by respondents. Coding discrepancies were resolved jointly between the same two authors.

We also used qualitative data collected at baseline to inform our analyses and interpretation of results obtained. In particular, we exploited responses to a prompt asking whether work played a significant role in respondents' mental well-being and on their emotions, and whether they felt that they were more likely to experience stress than other workers.

We collected quantitative survey data from respondents at two different points during the national lockdown: we asked questions in phase 1, which were repeated in phase 2 along with eight additional questions. In both phases 1 and 2, respondents reported whether they still worked, whether they worked remotely, whether they experienced COVID-19 symptoms, and, if so, whether they were able to stop working and self-isolate. The additional questions in phase 2 concern workers' financial situation, potential compensation, mental health, housing conditions, and the presence of children at home during the lockdown. These data allowed us to explore the relationship between financial

circumstances as well as working and housing conditions and well-being.

Sample Description

We provide details on the composition of the sample in Table 2. Two-thirds of our sample consisted of men. Around 40% of our respondents were gig economy workers who worked as drivers or food delivery workers. Among the 52 drivers or bikers who participated in phase 2, 21 reported at baseline that this was their main occupation, 22 that it was an important source of income, and 9 that gig activity only represented a minor source of additional revenue.

Approximately one-third of the sample reported a net individual income of less than 1000 euros per month. This indicates that the poverty rate in our sample is probably high.⁹ Drivers stood out as having a higher income than the rest of the sample. Their average monthly income (taking the midpoint of income brackets) was 2750 euros, relative to 1758 for the whole sample and only 923 for bikers. However, there is some heterogeneity within drivers. A total of 40% reported that gig work just provided them with supplemental income ("juste un extra"), and these drivers were, on average, high-income earners: 4000 euros per month at baseline (combining all their sources of income). In contrast, for drivers for whom gig work is their main source of income (40% of them, while for the remaining 20% of drivers, it is an important, but not the main, source of income), monthly income is 1700 euros on average at baseline. The sample was concentrated in metropolitan areas. Indeed, less than 5% of the sample lived in a rural area (in both phases 1 and 2). The vast majority of bikers and drivers (more than 85%) lived in large metropolitan areas with populations of more than 100,000.

Qualitative Reactions Pre-lockdown

Before discussing our quantitative findings on financial precarity and health for gig economy workers, we reported on some of the qualitative reactions on both issues recorded at the start of the COVID-19 crisis, but prior to the lockdown.

⁹ Note that the European Union defines poverty as living below the threshold of 60% median disposable income, which corresponded to 1065 euros in France in 2018. The poverty rate in France was 14.7% that year, according to INSEE.

Table 1 Timeline of data collection

	Dates (in 2020)	Context	Data type	Number of individuals
Baseline	March 9th–17th		Quantitative and qualitative data; no data on COVID-19	-
Qualitative	March 15th (midnight)	Restaurants shutdown		
	March 16th and March 17th (morning only)	Before or after the announcement of the start of the lockdown, but before the actual lockdown	Qualitative data on COVID-19	94
	March 17th (noon)	Start of the lockdown		
Phase 1	March 19th–22nd	During the lockdown	Quantitative data on COVID-19	107
Phase 2	April 3rd–9th	During the lockdown	Quantitative data on COVID-19	137

Table 2 Description of the sample in phases 1 and 2

	Phase 1	Phase 2	Phase 2	Phase 2
Sample	All	All	Drivers	Bikers
Number of individuals	<i>N</i> = 107	<i>N</i> = 137	<i>N</i> = 22	<i>N</i> = 30
Male	65.4%	68.6%	100.0%	93.3%
Age group				
Age 18–24	21.5%	21.9%	0%	67.7%
Age 25–34	20.6%	18.3%	31.8%	12.9%
Age 35–49	35.5%	29.9%	18.2%	16.1%
Age 50 +	22.4%	29.9%	50%	3.2%
Income at baseline (monthly net individual income, in euros)	1700.8 (1148.38)	1758.1 (1139.6)	2750 (1292.1)	923.4 (787.7)
Less than 1000 euros per month at baseline	32.4%	30.8%	0.0%	68.0%
Gig work is their main occupation (as recorded at baseline)	-	-	36.4%	38.7%
Gig work is an important income source (as recorded at baseline)	-	-	22.7%	58.1%
Gig is to make some extra money (as recorded at baseline)	-	-	40.9%	3.2%
Good health at baseline	74.5%	74.5%	90.0%	88.9%
Region				
Paris area	30.8%	26.3%	54.6%	29%
West or north-west	20.6%	22.6%	18.2%	12.9%
North and east	17.8%	16.8%	13.6%	19.4%
South-west	11.2%	12.4%	0.0%	19.4%
South-east	19.6%	21.9%	13.6%	19.4%
Type of urban area, by population size				
Paris metropolitan area	28.9%	25.4%	50.0%	25.9%
More than 100,000 people	46.2%	46.3%	40.0%	59.3%
20,001–100,000 people	10.6%	11.2%	5.0%	3.7%
2001–20,000 people	10.6%	12.7%	5.0%	11.1%
Rural area (less than 2000 people)	3.9%	4.5%	0.0%	0.0%

Standard errors of continuous variables are shown in parentheses. Workers reported whether their health was very good, good, fair, poor, or very poor. Our "good health" (at baseline) variable is a dummy that is equal to 1 if the individual reported that their health was good or very good, and 0 otherwise

Financial Precarity

The respondents in our sample were hit hard, and early, by the COVID-19 crisis and its impact on employment in France. Even before the lockdown which forced most economic activity to grind to a halt across the country, some of our respondents explained that they had experienced a significant slowdown in their business:

We clearly feel the slowdown in activity, it's Sunday every day these days. (F, 25–34, freelance designer)

In other cases, respondents had stopped working altogether ($N=20$), often due to a drop in demand or to the specific nature of the work to be performed. This abrupt cessation of activity affected drivers in particular, but other precarious workers who did not have the luxury of being able to work from home were impacted as well:

Being a driver and working with regular clients, they have all canceled their trips, and the lockdown measures that will be announced in the coming hours will not help. (M, 25–34, driver)

I have not worked for 2 weeks and I know that it won't pick up before 1 month so it will be very hard to hold on over the course of the year. (M, 35–49, accountant and driver)

For my part, there's no more work since it's performed in people's homes, so no more income. (F, 18–24, babysitter)

It's a disaster, I work at night mainly with people going out. With the closing of bars and clubs I no longer work. Forced unemployment. The phone no longer rings via the platforms. The few remaining clients are very nervous and so am I. (M, 25–34, driver)

Awareness of Health Risk

The early negative impact on employment was accompanied, for our sample, with heightened concerns for the health risks involved, especially for those workers who were working outside the home and in close contact with their clients. For most of our respondents, therefore, working during the COVID-19 crisis meant putting their safety,

and the safety of their loved ones, at risk. Our qualitative data shows that this concern was front of mind for many, who chose to stop working even before the lockdown went into effect in order to minimize health risks, despite the damaging economic consequences of this decision:

For my part, I quit working as an Uber driver since yesterday. No protection, and no solution with regard to our safety. I'm in contact all day with customers. I have 3 children at home, I can't afford to get sick. (M, 35–49, driver)

To tell you the truth as soon as I knew there was the first case in Lorraine and given the chaotic situation in Italy I decided to stop working a week ago. (M, 18–24, biker)

The Stuart platform has for the moment recommended no contact deliveries but has not suspended work, but to be safe I have stopped working. (M, 18–24, biker)

I do not want to connect to Uber, the platform does nothing for our safety, and I do not want to take any risks. (M, 25–34, driver)

For those who nonetheless continued working, the public health crisis meant taking certain precautions, or adapting the nature of their activity, to protect their own health as well as that of the people they came into contact with:

The platforms I work for have repeatedly sent instructions about measures we need to take to reduce risk ("no contact" deliveries with both restaurants and clients). But I will make sure to be as careful as possible in my daily activities (disinfecting the delivery bag, my hands, the handlebar of my bicycle after each delivery). (M, 35–49, biker)

Driver: mask and gloves are mandatory. I wash my hands as often as possible. I wipe down the inside of the vehicle with a sanitizing wipe every day. I open the windows as much as possible. No physical contact with clients. I keep my distances. (M, 25–34, driver)

So I figured out a fall-back option. I called all the parents and offered to do my classes on Skype or WhatsApp. Everybody is reassured and I can

work. But I can only count on myself. (F, 35–49, freelance tutor)

Anxiety about the Future

Given the early onset of lost and reduced work among our respondents—whether imposed by the nature of the job or chosen due to safety concerns—as well as the need to radically change their working practices, it is unsurprising that our qualitative data reveal very high levels of anxiety concerning their financial future already at this early stage of the crisis. Recall that the individuals in our sample subsist on low baseline incomes, so that any decline in income can be especially consequential. Moreover, as independent workers, it was unclear to what extent financial support would be available, either from the government or from the platforms they worked with. These fears were vividly expressed by our respondents:

Today we the self-employed are in a difficult situation and in a great crisis. If we find no solution we will perish without money. (M, 18–24, biker)

It's going to get complicated financially for me, for my family, and for everyone, the economy of France and of the world. I am worried. (F, 50+, domestic services worker)

Unfortunately our status as independent workers is precarious, that's our daily lot. No unemployment benefits or sick leave. (M, 50+, driver)

Simply put, no more work, no help because self-employed, there is nothing to say except that the state doesn't give a crap about us. (M, 35–49, driver)

The crisis also prompted hunger fears, in the pre-lockdown phase, for two of the bikers, consistent with global reports of increased reliance on food banks among the under-privileged during the lockdown:¹⁰

¹⁰ For instance, for France, see “L'aide alimentaire au temps du confinement: « Des étudiants viennent nous donner un coup de main, mais aussi s'approvisionner »” available at: https://www.lemonde.fr/societe/article/2020/04/22/coronavirus-l-aide-alimentaire-confrontee-a-l-arrivee-de-nouveaux-publics_6037362_3224.html, and for the UK, see “UK food banks face record demand in coronavirus crisis,” available at <https://www.theguardian.com/society/2020/may/01/uk-food-banks-face-record-demand-in-coronavirus-crisis>.

I am sure that when restaurants will close, there will no longer be any work, and I am going to starve. (M, 18–24, biker)

I am afraid that the government won't help us and we will starve. (M, 18–24, biker)

Work, Income, and Health during the Lockdown

Working Conditions

A few days after the start of the lockdown (phase 1), just over half of the sample (52%) had stopped working (Table 3). The rest of the sample was either working remotely (29%) or working outside the home (19%). The proportion of individuals not working or working remotely increased slightly between phases 1 and 2.

Those who were working remotely had a much higher income level at baseline than those who had stopped working or were continuing to work, highlighting a social divide in the population. Similarly, income at baseline was much higher for respondents for whom working remotely was possible (more than 2050 euros) than for those for whom it was not (between 1370 and 1580 euros). A total of 37% of the sample reported that working remotely was a possibility for them (across both phases 1 and 2).

We estimate regression models for the probability to be working outside the home, working remotely at home, or not working, to test for differences between bikers, drivers, and the rest of our sample. Panel A of Table 4 examines the probability of working outside the home versus either working at home or not working, panel B the probability of working remotely at home versus either not working or working outside the home, and panel C the probability of not working versus either working outside the home or at home. These models are estimated using a probit specification, and Table 4 reports coefficients.

For the occupation variable, workers who were neither bikers nor drivers (hereafter “other workers”) serve as the reference category. Models include a number of control variables (i.e., gender, age, income, good health, presence of children at home during the lockdown, small home, cannot pay the rent or mortgage). Importantly, our right-hand side variables (biker, driver, gender, age, income, good health) are measured at baseline

Table 3 Labor market status during the lockdown

	Phase 1, March 19th–22nd		Phase 2, April 3rd–9th	
	<i>N</i> = 107		<i>N</i> = 137	
	Average income at baseline in the different categories (in Euros)		Average income at baseline in the different categories (in Euros)	
Not working	52.3%	1424.6	56.2%	1646.8
Working remotely from home	28.7%	2320.5	29.2%	2124.6
Working outside the home	18.7%	1530.8	14.6%	1430.8
Working remotely is possible	36.5%	2289.1	36.5%	2060.9
Working remotely is not possible	63.6%	1367.1	63.5%	1581.4

Income is the net individual monthly income reported at baseline. Respondents could choose between 12 brackets, and we took the midpoint of each bracket

and thus remain stable between phases 1 and 2. Because these measures do not vary over time, we decided to estimate our regressions for phases 1 and 2 separately (rather than for the two phases taken together, which would be equivalent to artificially increasing sample size). The remaining explanatory variables (presence of children at home during the lockdown, small home, cannot pay the rent or mortgage) were only measured in phase 2 and are only included in models that specifically concern phase 2.

We find that bikers were significantly more likely to be working outside the home than the reference category of “other workers” (panel A), especially at the beginning of the lockdown (columns (1) and (2)). The partial effect (at the mean) suggests that, in the first period of analysis, controlling for the longer list of covariates in column (2) (i.e., gender, age, and baseline income and health), bikers were 38 percentage points more likely to be working outside relative to a mean of 10% for other workers.

Panel B reveals that income at baseline is a very significant predictor of working remotely during the lockdown. Higher-income individuals were more likely to be working from home whether in phase 1 or 2. There was no clear significant difference between drivers, bikers, and the rest of our sample in remote work.

For not working (panel C), the coefficients on biker are negative and significant, suggesting that bikers were more likely to be working (than other respondents excluding drivers). We find some (albeit weaker) evidence that drivers were more likely to work than other respondents (excluding bikers). Of our other explanatory variables, being over age 50 and living in cramped housing

were both significant predictors of not working 3 weeks into the lockdown.

Table 4 reports probit model estimates. However, we verify that our results are robust to the use of other link functions (namely linear probability and logit models, available upon request).

Income Loss

Before the lockdown, respondents were split between the majority who predicted that the crisis would have a negative impact on their income and a minority of respondents who were more optimistic, hopeful that the crisis might provide them with an opportunity to take on more work, even if it also meant taking on more risk. This flexibility, of course, is a key feature of gig economy employment, and some of the workers we surveyed were keen to exploit it. This was primarily the case for some food delivery workers, who anticipated an increase in demand for their services and possibly a decrease in supply as some workers would stop working:

A lot of delivery people are scared and so have stopped working but I don't plan on stopping as long as Deliveroo hasn't shut down. People might be on lockdown at home, orders will therefore increase knowing that people won't be able to go grocery shopping because of the number of people in the stores. So there will be fewer delivery workers and more clients so I think I will be able to work whenever I want and at my maximum if the platform doesn't shut down and I will be able

Table 4 Working during the lockdown (coefficients from probit models)

	(1) Phase 1, March 19th– 22nd	(2) Phase 1, March 19th– 22nd	(3) Phase 2, April 3rd– 9th	(4) Phase 2, April 3rd– 9th	(5) Phase 2, April 3rd– 9th
Panel A: working outside					
Driver	−0.159 (0.469)	−0.16 (0.457)	0.210 (0.446)	0.221 (0.484)	0.719 (0.490)
Biker	1.359*** (0.408)	1.328*** (0.468)	0.859** (0.396)	0.613 (0.452)	0.794 (0.510)
Female	−0.195 (0.378)	0.105 (0.417)	−0.115 (0.339)	0.123 (0.364)	−0.044 (0.408)
Age 15–24	−0.720* (0.423)	−0.282 (0.457)	−0.575 (0.455)	−0.271 (0.492)	−0.392 (0.571)
Age 50+	0.170 (0.392)	−0.151 (0.385)	−0.726* (0.388)	−0.638 (0.467)	−0.967* (0.532)
Income (baseline)		0.148 (0.125)		−0.111 (0.147)	−0.262 (0.175)
Good health (baseline)		0.269 (0.439)		0.395 (0.428)	0.452 (0.443)
Children (phase 2)					0.586 (0.395)
Home small (phase 2)					−1.373*** (0.520)
Home cannot pay (phase 2)					0.021 (0.599)
Panel B: working remotely					
Driver	0.194 (0.378)	−0.188 (0.439)	0.641* (0.359)	0.495 (0.398)	0.454 (0.435)
Biker	0.054 (0.395)	0.549 (0.475)	0.161 (0.350)	0.808* (0.439)	0.771* (0.450)
Female	0.316 (0.316)	0.510 (0.394)	0.316 (0.271)	0.723* (0.372)	0.699* (0.379)
Age 15–24	−0.437 (0.393)	−0.380 (0.521)	−0.253 (0.344)	0.0876 (0.436)	0.155 (0.457)
Age 50+	−0.002 (0.315)	−0.307 (0.413)	−0.621** (0.272)	−0.783** (0.347)	−0.705* (0.391)
Income (baseline)		0.526*** (0.144)		0.489*** (0.134)	0.456*** (0.141)
Good health (baseline)		0.721* (0.397)		0.250 (0.349)	0.259 (0.352)
Children (phase 2)					0.252 (0.334)
Home small (phase 2)					−0.179 (0.387)
Home cannot pay (phase 2)					0.366 (0.486)
Panel C: not working					
Driver	−0.078 (0.367)	0.223 (0.425)	−0.676* (0.376)	−0.541 (0.412)	−0.622 (0.447)
Biker	−1.158*** (0.428)	−1.707*** (0.632)	−0.814** (0.363)	−1.188** (0.478)	−1.286** (0.522)
Female	−0.187 (0.322)	−0.538 (0.441)	−0.239 (0.275)	−0.723* (0.384)	−0.628 (0.393)
Age 15–24	0.857** (0.412)	0.605 (0.575)	0.667* (0.355)	0.151 (0.430)	0.135 (0.466)
Age 50+	−0.073 (0.314)	0.322 (0.408)	0.900*** (0.273)	0.966*** (0.353)	0.966** (0.405)
Income (baseline)		−0.614*** (0.179)		−0.404*** (0.137)	−0.305** (0.150)
Good health (baseline)		−0.763** (0.383)		−0.404 (0.329)	−0.394 (0.339)
Children (phase 2)					−0.547* (0.311)
Home small (phase 2)					0.773** (0.389)
Home cannot pay (phase 2)					−0.371 (0.489)
<i>N</i>	107	85	137		96

We estimate probit models. The three panels differ by the dependent variables: working outside, working remotely, not working. Columns (1) and (2) focus on the first phase while columns (3) to (5) on the second one. Columns (1) and (3) control for demographics only while column (2) and (4) add income and health at baseline. In the second phase, we asked additional questions about whether respondents had children < 18 at home during the lockdown, whether they felt that their home was too small, or whether they had difficulties paying their rent or mortgage: these controls are added in column (5). All controls are shown in the table. The reference categories are the following: other workers, male, and 25–49.

Robust standard errors in parentheses.

* $p < 0.10$

** $p < 0.05$

*** $p < 0.01$

to get a lot of income in the coming days. (M, 18–24, biker)

I'm not worried because food deliveries will probably do very well during this COVID-19 period, it's a good opportunity for me to get more work. (M, 25–34, biker)

During the lockdown (in phase 2), we asked respondents to estimate by what percentage their income had changed in March compared with the previous month. Recall that the lockdown began on March 17, but several of our respondents had already stopped working or perceived a drop in demand before this date. On average, respondents reported that their income decreased by 28%. Two-thirds of the sample reported that their income had fallen, 3% that it had increased, and 30% that it had remained the same. Conditional on experiencing a drop in income, the reported decrease was on average 44%.

The income change for this population depended in large part on whether they were still working. For those who stopped working, 70% experienced a decrease (of 47% on average) and 30% saw no change, while for those who kept working outside their home, 50% experienced a decrease (of 28% on average), 40% saw no change, and 10% had an increase.

Within gig drivers, on average, the income change was –20% for those for whom driving was just an extra source of income (among this group, 83% of respondents kept working during the lockdown, at any job), while for those for whom gig work was their main source of income, on average, their change in income was –67% (only 30% kept working).

While some bikers in our sample had expressed hopes to increase their earnings (if the supply of delivery workers dropped but the demand for food delivery stayed constant or even increased), we found that for the biker population group, income had decreased by 29% on average by phase 2, with 71% of bikers reporting a decline. These figures are not statistically different from other workers in our sample.

Table 5 shows that gig economy drivers experienced on average a 21–23 percentage point larger income drop compared with other workers in our sample. This is robust to controlling for baseline income and general health (column (2)). In column (3), for the “working outside/working remotely/not working” variable, we use “not working” as the reference category. This

column suggests that the large income drop for drivers is driven by those who stopped working. Moreover, we found that bikers and drivers who continued to work outside the home did not experience a significantly larger increase in income than other workers.

Column (4) of Table 5 explores whether our results differ by whether gig work is the person's main source of income versus supplementary income. We asked our gig workers at baseline whether their gig activity was (i) their main source of income, (ii) an important complement to their main source, or (iii) just extra money. A total of 36% of drivers and 39% of bikers reported it as their main source of income (Table 2). The regression results suggest that these individuals were more negatively affected (Table 5, column (4)). No main effect for “main source” is reported, as this variable is only relevant for bikers and drivers.

Table 10 (in Appendix 2) shows that the income drop is even larger if we consider all platform workers, and this is again driven by those who stopped working but, perhaps surprisingly, also by those who were able to work from home.

The French government, like many around the world, launched a variety of programs to help support workers during the lockdown. Because gig workers are not officially employees, and many may not have large tax obligations as self-employed workers, the amount of relief available for these workers was unclear at the time [10]. The only substantial aid these workers may have been entitled to receive is a one-time payment of €1500 specifically earmarked for micro-entrepreneurs affected by the health crisis and by the lockdown measures in particular. To better understand the impact of the loss of income in our sample, in phase 2, we asked participants whether they were receiving compensation for their income loss or whether they had applied for such compensation. The vast majority (73%) noted that they were neither receiving nor applying for compensation. Drivers were more likely to have received financial compensation (25%) or asked for it (30%) compared with other workers in the sample and compared with bikers in particular. These results are reported in Table 6. This table also shows housing concerns for the various groups.

Physical Health Outcomes

A few days after the start of the lockdown (phase 1), two individuals reported having experienced COVID-19

Table 5 Change in income during the lockdown relative to before the lockdown (OLS models)

	Phase 2 (1)	Phase 2 (2)	Phase 2 (3)	Phase 2 (4)
	Change in income (in %)			
Biker	1.005 (9.128)	5.871 (12.897)		
Driver	-21.074** (9.251)	-22.563** (10.567)		
Driver or biker * working outside			-9.887 (13.663)	
Driver or biker * not working			-28.393*** (8.410)	
Driver or biker * working remotely			-14.095 (11.821)	
Working outside			22.777* (12.236)	
Working remotely			2.248 (8.623)	
Driver or biker				-7.067 (8.384)
Driver or biker * main source				-22.306* (11.296)
Children	4.836 (6.352)	4.553 (8.000)	1.892 (6.119)	-0.381 (6.617)
Female	1.207 (7.139)	9.867 (11.344)	-1.478 (6.669)	-1.935 (7.014)
Age 15–24	-4.459 (10.224)	-1.012 (16.777)	6.801 (8.863)	-0.397 (9.786)
Age 50 +	9.914 (6.902)	-2.890 (10.278)	8.777 (6.283)	0.970 (6.926)
Income (baseline)		7.595 (4.702)		
Good health (baseline)		6.124 (9.058)		
<i>N</i>	137	96	137	137
<i>R</i> ²	0.054	0.113	0.170	0.093

This table reports results from OLS regressions. The dependent variable is the self-reported change in income experienced in March/April 2020 relative to February. This question was asked only in phase 2, i.e., early April. Columns differ by the dependent variables of interest: being a biker or driver v. the interaction of this variable with different working status or different reliance on gig work as a source of income. A constant is included in all columns. All explanatory variables are shown in the table. The reference categories are the following: other workers (all columns), not working (column (3)), male (all columns), and 25–49 (all columns)

Robust standard errors in parentheses

* $p < 0.10$

** $p < 0.05$

*** $p < 0.01$

symptoms, out of 107 respondents. While one of them (a male gig driver) had stopped working, the other one (a female precarious worker) reported that she was not able to do so.

However, after a few weeks (in phase 2), the number of people reporting symptoms had sizably increased. Indeed, if we restrict the sample to the 101 individuals that we follow between phases 1 and 2, the number of respondents with symptoms increased from two to 10 over the period. There is no evidence that working outside the home during this time was the main cause of the appearance of symptoms: only two (out of 10 symptomatic respondents) were still working outside the home in phase 1, while the remaining eight reported either not working or working remotely.

In the total sample in the second phase, 11 respondents (out of 137) reported symptoms, six women and

five men. All symptomatic male respondents were gig workers: three of them were gig bikers and two gig drivers. We do not observe large differences in income at baseline or in housing conditions between individuals with and without symptoms. All symptomatic individuals had stopped working, except one. This was a male aged 18–24, living with his parents. He was both a student and a gig biker and reported an income of 750–999 euros (the second lowest category) at baseline.

While we do not find differences in income for those who report symptoms, we note (a) that our survey is quite targeted and not meant to be representative of the general population and (b) that we are recording symptoms and not a positive diagnosis. In other analyses, such as an examination of US Medicare patients with COVID-19, men and women were found to be roughly equally diagnosed and those with Medicaid (indicating

Table 6 Compensation and housing conditions in phase 2

	All workers	Drivers	Bikers
Applied for government/employer support or compensation			
No compensation	73.0%	45%	77%
No compensation but asked	18.2%	30%	20%
Compensation	8.8%	25%	3.3%
Housing concerns during lockdown			
No home concern	71.5%	60%	60%
Poor state of repair	5.1%	10%	0%
Small	18.3%	30%	30%
Cannot pay rent or mortgage	8.0%	10%	20%
<i>N</i>	137	20	30

These questions were only asked in phase 2. The exact wording can be found in Table 8. Reporting that one's home is too small or in a poor state, or that one cannot pay the rent is not mutually exclusive answers. No home concern means not reporting facing any of these issues

lower income) were more likely to be diagnosed [11]. While their sample is necessarily older than ours (as it is a Medicare sample), the gender and income balance is potentially more representative of the population than our sample which focuses on gig workers.

Mental Health Outcomes

Our results to this point confirmed that gig economy workers were particularly affected by the COVID-19 crisis. Drivers reported a significant loss of income, while bikers were more likely to continue working outside the home than other workers and also saw their income fall.

A priori, the effect of the COVID-19 crisis and the heightened financial precarity it implies on mental health is unclear. Having to continue to work outside the home, thereby increasing the risk of exposure, may be stress or anxiety producing. In contrast, staying home but losing one's income source may be more or less stress or anxiety producing, relative to the health risks of continuing to work. While our data did not allow us to examine the causal effect of gig work on mental well-being during the crisis, we were able to quantify the correlation between being a gig driver and biker and experiencing stress and anxiety relative to other workers, as the lockdown continued (in phase 2). Table 7 reports the results.

We asked respondents the following question during the second phase of the lockdown: "How would you

evaluate the stress and anxiety you are feeling during the lockdown?" (scale running from 0 (least stressed) to 10 (most stressed)). We found that self-reported stress and anxiety level during the lockdown was not higher for gig economy workers (drivers and bikers) compared with others in the sample. In fact, bikers consistently reported lower levels of stress and anxiety relative to other workers. This was true whether or not we controlled for the change in income experienced (column (2)) and for whether the person was working remotely or outside the home (column (3)).

Once we controlled for baseline general health (column (4)), the coefficient on bikers was smaller and no longer statistically significant, suggesting that bikers experienced better overall health at baseline, accounting for at least part of the difference in stress and anxiety during the lockdown (between bikers and other respondents).¹¹ All specifications controlled for gender, age, family status, and housing conditions, which turned out to be a strong determinant of stress.

While we find a positive correlation between being a biker and mental health, we do not claim that this captured a beneficial causal effect of being a biker on mental health. Indeed, another candidate explanation of the positive association could be the omission of unobserved factors in our regression. Such hidden factors have an influence both on the probability of being a biker and on mental health, creating a spurious correlation between them. These factors may lead to a selection effect, in the sense that respondents in better mental health would be selected into the food delivery occupation. Our quantitative data did not enable us to distinguish between the causal and the selection effects.

Given the specific context in which our question on stress and anxiety was asked (in light of the COVID-19 lockdown), it is difficult to validate the question against other measures of stress and anxiety. However, we assess the sensitivity of measure by creating two threshold models of mental health: one with a threshold based at the median and one at the 75th percentile of the stress and anxiety scale. Our results, showing that bikers report consistently lower levels of stress and anxiety, are robust to these specifications (available upon request). In the

¹¹ Including baseline health resulted in a reduction in our sample size. Estimating the effects on stress with the reduced sample and excluding baseline health yielded a coefficient on bikers that was smaller but still statistically significant.

Table 7 Determinants of stress and anxiety level reported in phase 2 (OLS models)

	(1)	(2)	(3)	(4)	(5)
	Stress and anxiety level during the lockdown				
Driver	0.390 (0.464)	0.098 (0.496)	0.452 (0.452)	0.076 (0.585)	
Biker	-2.065*** (0.652)	-1.972*** (0.641)	-2.114*** (0.655)	-1.296 (0.783)	
Change in income (in %)		-0.016*** (0.005)			
Working outside			0.242 (0.516)		
Working remotely			-0.439 (0.438)		
Good health at baseline				-0.876* (0.504)	
Driver or biker					-0.724 (0.517)
Driver or biker * main source					0.395 (0.689)
Female	0.130 (0.510)	0.099 (0.494)	0.180 (0.519)	-0.046 (0.598)	0.207 (0.509)
Age 15–24	-0.083 (0.687)	-0.202 (0.680)	-0.069 (0.703)	-0.182 (0.779)	-0.896 (0.610)
Age 50 +	-0.764 (0.470)	-0.670 (0.471)	-0.795* (0.473)	0.211 (0.558)	-0.397 (0.479)
Children	-0.118 (0.422)	-0.029 (0.419)	-0.076 (0.432)	0.077 (0.466)	0.181 (0.433)
Home small	1.731*** (0.527)	1.461*** (0.526)	1.741*** (0.544)	1.487** (0.657)	1.730*** (0.565)
Home cannot pay	1.170** (0.572)	0.912 (0.590)	1.248** (0.560)	1.104 (0.730)	0.702 (0.559)
<i>N</i>	137	137	137	100	137
<i>R</i> ²	0.202	0.245	0.212	0.188	0.135

This table reports results from OLS regressions. The dependent variable is the self-reported stress and anxiety on a 0 to 10 scale (exact question in Table 8). This question was asked only in phase 2. Reference categories are the following: other workers (all columns), not working (column (3)), male (all columns), and 25–49 (all columns)

Robust standard errors in parentheses

* $p < 0.10$

** $p < 0.05$

*** $p < 0.01$

case of the 75th percentile threshold, the correlation between being a biker and positive mental health holds even when controlling for baseline health. The negative correlation between size of home and mental health is also robust across these specifications.

Moreover, our qualitative data led to a nuanced view of the effect of gig work on mental health among bikers. Indeed, during the baseline phase of data collection, we asked respondents to reflect on the influence of their work on their mental health, and whether they felt they might be more prone to stress than people in other types of work. Both drivers and bikers perceived their work in terms of both positive and negative psychosocial experiences.

First, some gig economy drivers and bikers mentioned that they experienced stress, as a result of employment precarity and financial insecurity, but also certain features of the platform that they worked for (such as optimization of time and rating systems) or the density of urban traffic:

Stress is related to the precarity of the job and especially to the state of Parisian traffic! The work can make you weary and depressed sometimes because you have to keep fulfilling a certain number of rides without thinking (to ensure a minimum income), we become like robot drivers. (M, 50+, driver)

My work as a driver is stressful, and the use of platforms makes it even more anxiety-provoking (rating systems, disrespectful customers, traffic stress and being able to meet revenue targets). (M, 25–34, driver)

Being self-employed [“micro-entrepreneur”] gives you a sense of permanent instability. (M, 18–24, biker)

However, being on the road all the time with all that this implies is indeed very stressful. (M, 25–34, biker)

Personally, I think that my work has a negative effect on my psychological well-being and my emotions, in fact, it brings me stress and both physical and psychological fatigue. I am more stressed than other occupations because I am in a hurry to deliver the food. [...] I am relatively happy to deliver food when the weather is nice. (M, 18–24, biker)

In contrast, some gig workers expressed a strong sense of well-being and satisfaction. This may partly explain their low levels of stress and anxiety highlighted in the quantitative analysis. While respondents mentioned autonomy and responsibility as important aspects of this sense of well-being, bikers also noted that the physical activity the job requires and even the opportunity to enjoy the beauty of their urban environment were positive features of their working conditions:

I think that self-employment is a source of well-being in general, one experiences stress when trying to meet targets for sure, but on average, if one tries really hard, everything goes well. (M, 35–49, driver)

I sometimes have moments of stress related to the imposed deadlines, but most of the time, I don't have any because I have no one above me who tells me what to do or when to do it. I don't think I am subject to burn out because my life is balanced and the work I do has meaning. (M, 18–24, biker)

I think that my work plays an important role [in my mental well-being] because very often when I work, I feel better mentally and physically speaking. Biking and working out physically makes me feel better, sleep better and be less stressed. (F, 25–34, biker)

I find that working as a biker is a stress-free activity, I sometimes have the impression of riding along peacefully on my bicycle in the most beautiful places in my city. Chatting with small restaurant owners and making customers happy makes me smile. (M, 18–24, biker)

Finally, some bikers and drivers mentioned both positive and negative effects of gig work on their mental health and emphasized them equally:

I have never felt both so little stress and so much stress since I started working for myself. We are

masters of everything and so we make all the decisions, in the best just as in the worst moments everything is up to you. (M, 25–34, driver and biker)

On the one hand my job as a biker brings me physical and emotional well-being, and all this despite the negative aspects – pollution and danger – of the road in an urban environment. And I'd say that in my work there is a type of stress induced by certain platforms like Uber by its rating system. (M, 35–49, biker)

These reflections on the impact of gig work on well-being suggest that in spite of the employment precarity and financial insecurity that are characteristic of the gig economy, a subsample of gig workers enjoys some aspects of their work, with beneficial effects on their mental health. This may partly explain why our quantitative analysis showed that, even under extreme circumstances such as those of the COVID-19 crisis that disproportionately impacts gig workers, stress and anxiety levels were not higher for drivers and were lower in the case of bikers, as compared with other precarious workers. However, this quantitative result could also be due to the selection of healthier workers into food delivery activity, as noted earlier. Most importantly, the analysis of qualitative data provides us with a very nuanced view of the relationship between gig work and mental well-being, even for bikers.

Conclusion

The gig economy employs an increasing proportion of the workforce, in particular in dense urban areas, yet the relationship between this type of work and physical and mental health is unclear. We exploit data from a survey of precarious workers before and during the COVID-19 crisis to investigate how extreme conditions of financial precarity and health risks are experienced by gig economy workers.

We find significant heterogeneity among respondents, with gig workers being more affected by the crisis than others, both in terms of financial outcomes and physical health outcomes. A few days after the start of the lockdown resulting from the COVID-19 crisis, approximately half of the workers in our sample had stopped working, 29% were working from home, and 19% were still working outside the home. Bikers were

much more likely to still be working outside during the lockdown, although they still reported an income decrease that was not significantly different from the rest of our sample. Gig economy drivers experienced a larger decrease in income compared with the rest of the sample, driven by those who had stopped working (they stopped working in the same proportion as the rest of the sample but experienced a larger income drop conditional on not working). Several gig workers (drivers and bikers) in our sample had also experienced COVID-19 symptoms. However, drivers did not report higher stress and anxiety levels than other precarious workers, and bikers in fact reported lower levels of stress and anxiety. We discuss the interpretations of this finding and highlight that gig workers, including bikers, present us with a very nuanced view of the link between their occupation and their psychological well-being (in the qualitative data we collected at baseline).

We acknowledge the limitations of our study. First, our sample is small and not necessarily representative of gig economy workers in general. Second, we cannot draw conclusions on the causal relationship between gig work and well-being during the COVID-19 crisis given the underlying heterogeneity and selection in these populations.

Nonetheless, while our results should be interpreted with some caution, they contribute to furthering our understanding of the well-being of individuals employed in the gig economy, particularly in times of extreme financial uncertainty, and may inform public policy initiatives aimed at protecting this population. While salaried employees in France have benefited from extensive support since March 2020, resulting in minimal loss of income, gig economy workers have largely fallen through the cracks of the national safety net. The only substantial aid these workers may have been entitled to receive is a one-time payment of €1500 specifically earmarked for micro-entrepreneurs affected by the health crisis and by the lockdown measures in particular. Although the share of gig sector employment remains small, this discrepancy in the support provided to salaried employees and platform workers during the COVID-19 crisis risks further increasing inequalities between those who are able to secure stable employment and those who increasingly rely on more precarious, informal arrangements in order to make ends meet.

Acknowledgments Respondi carried out the survey. We thank Claire Bouteleux, Xavier Geoffret, and Anne-Sophie Laurin for their suggestions regarding the sample and the questionnaires. We thank Cameron Harries for excellent research assistance.

Appendix 1. COVID-19-related questions

Table 8 Questions in the qualitative and quantitative phases

Data type	Questions
Qualitative phase prompt	<p>In this challenging time of COVID-19, we would like to close this community discussion with this topic.</p> <p>As an on-demand worker, what are your concerns regarding the measures taken by the government? What are you worried about?</p> <p>Did you hear about measures that specifically apply to you, as a self-employed person? If you did, which measures? What are the consequences for you? Are they sufficient?</p> <p>What are the effects on your work today? Are you still working? How?</p> <p>And what are the effects on your income in particular? Are you worried about this? How do you feel about this?</p> <p>For those of you who work using an app: did you receive specific instructions? Which ones?</p>

Table 8 (continued)

Data type	Questions
Phases 1 and 2 quantitative separate questions	<p>Following President's lockdown announcement on Monday 16 March, what is your current labor market status?</p> <p>I do not work/I have been teleworking/I work outside</p> <p>Is teleworking possible for you?</p> <p>Yes/NO</p> <p>Have you had COVID-19 symptoms?</p> <p>Yes/No</p> <p>If the answer is "Yes": Could you stop working and self-isolate?</p> <p>Yes/No</p> <p>Have you received any compensation for reduced economic activity or loss in activity?</p> <p>Yes, I received one/No, but I asked one/No</p>
Additional questions in phase 2, quantitative new separate questions	<p>If yes: Does this come from:</p> <p>Government/Employer/Platform(s), which one(s):... /Other forms, what:...</p> <p>By what percentage would you estimate your income has changed in March compared to the month before?</p> <p>It decreased by approximately... %/It remained the same/It increased by... %</p> <p>How would you evaluate the stress and anxiety you are feeling during the lockdown?</p> <p>(scale running from 0 (least stressed) to 10 (most stressed))</p> <p>Are you doing any activities for mental health (meditation, yoga, exercise, other)?</p> <p>Yes/No</p> <p>During the lockdown, is there any child (your child or your partner's child) under 18 living in the same place as you?</p> <p>Yes/No</p> <p>Regarding your home, do you experience any of the following difficulties during the lockdown? (Several answers)</p> <p>Your home is in a poor state of repair/Your home is too small (given the number of persons living there, if you do not live by yourself)/You cannot pay your rent or mortgage/You do not experience any of these difficulties</p>

Appendix 2. Additional regression results

Table 9 Working during the lockdown (coefficients from a probit models)

	Working outside		Working remotely		Not working	
	(1) Phase 1 March 19th– 22nd	(2) Phase 2 April 3rd–9th	(3) Phase 1 March 19th– 22nd	(4) Phase 2 April 3rd–9th	(5) Phase 1 March 19th–22nd	(6) Phase 2 April 3rd–9th
Any app worker	0.298 (0.313)	0.604 (0.385)	0.089 (0.352)	0.574 (0.350)	−0.246 (0.343)	−0.870** (0.351)
Female	−0.158 (0.348)	−0.223 (0.402)	0.434 (0.373)	0.584 (0.359)	−0.232 (0.357)	−0.488 (0.342)
Age 15–24	0.156 (0.421)	−0.387 (0.482)	−0.197 (0.471)	0.209 (0.434)	−0.060 (0.443)	−0.003 (0.441)
Age 50 +	−0.358 (0.407)	−0.862 (0.552)	−0.405 (0.392)	−0.771** (0.375)	0.495 (0.384)	1.068*** (0.393)
Income (baseline)	0.017 (0.124)	−0.260* (0.155)	0.472*** (0.139)	0.433*** (0.139)	−0.440*** (0.158)	−0.256* (0.141)
Good health (baseline)	0.409 (0.429)	0.535 (0.450)	0.759* (0.401)	0.340 (0.346)	−0.874** (0.374)	−0.498 (0.349)
Children (phase 2)		0.541 (0.379)		0.266 (0.326)		−0.519* (0.313)
Home small (phase 2)		−1.244** (0.549)		−0.161 (0.390)		0.760* (0.406)
Home cannot pay (phase 2)		0.096 (0.616)		0.439 (0.467)		−0.540 (0.504)
<i>N</i>	85	96	85	96	85	96

We estimate probit models. Columns differ by the outcome variable and the sample phase. For columns (2), (4), and (6), we added additional controls that we only asked in the second phase. All controls are shown in the table. The explanatory variable of interest is “any app worker” defined as workers who are currently using an app such as delivery apps, driving apps, and small task apps in order to do their job. The reference categories are the following: male and 25–49

Robust standard errors in parentheses

* $p < 0.10$

** $p < 0.05$

*** $p < 0.01$

Table 10 Change in income in March relative to February (OLS models)

	Phase 2 (1)	Phase 2 (2)	Phase 2 (3)	Phase 2 (4)
	Change in income (in %)			
Any app worker	- 23.001*** (5.942)	- 26.027*** (8.224)		- 15.672** (7.445)
Any app worker * working outside			5.106 (11.274)	
Any app worker * working remotely			- 42.500*** (9.319)	
Any app worker * not working			- 27.330*** (7.476)	
Working outside			13.773* (7.936)	
Working remotely			22.041*** (7.582)	
Any app worker * main source				- 14.959 (10.353)
Female	- 1.695 (6.639)	4.333 (10.763)	0.631 (6.229)	- 0.562 (7.150)
Age 15–24	7.929 (8.476)	16.363 (13.192)	12.244 (7.712)	4.641 (9.095)
Age 50 +	7.548 (6.404)	- 5.245 (10.147)	16.473*** (6.103)	3.465 (7.068)
Children	1.177 (5.673)	3.124 (7.784)	- 0.036 (5.226)	- 0.992 (5.773)
Income (baseline)		6.322 (4.309)		
Good health (baseline)		7.325 (8.140)		
<i>N</i>	137	96	137	137
<i>R</i> ²	0.109	0.155	0.267	0.130

This table reports results from OLS regressions. The dependent variable is the self-reported change in income experienced in March 2020 relative to February. This question was asked only in phase 2, i.e., early April. Columns differ by the dependent variables of interest: any app user v. its interaction with different working status or different reliance on gig work. All variables are shown in the table. The reference categories are the following: not working (column (3)), male (all columns), and 25–49 (all columns)

Robust standard errors in parentheses

* $p < 0.10$

** $p < 0.05$

*** $p < 0.01$

Table 11 Determinants of stress and anxiety level during the lockdown (OLS models)

	(1)	(2)	(3)	(4)	(5)
	Stress and anxiety level in phase 2 during the lockdown				
Any app worker	−0.551 (0.418)	−0.980** (0.426)	−0.461 (0.404)	−0.367 (0.543)	−0.764 (0.478)
Change in income (in %)		−0.021*** (0.006)			
Working outside			−0.157 (0.579)		
Working remotely			−0.455 (0.469)		
Any app worker * main source					0.435 (0.597)
Good health (baseline)				−0.949* (0.479)	
Female	0.297 (0.483)	0.193 (0.470)	0.326 (0.492)	0.064 (0.539)	0.264 (0.494)
Age 15–24	−0.939 (0.591)	−0.811 (0.560)	−1.011* (0.591)	−0.696 (0.646)	−0.843 (0.603)
Age 50 +	−0.430 (0.475)	−0.347 (0.464)	−0.523 (0.469)	0.437 (0.541)	−0.311 (0.493)
Children	0.054 (0.414)	0.094 (0.395)	0.118 (0.436)	0.211 (0.451)	0.116 (0.417)
Home small	1.698*** (0.567)	1.361** (0.545)	1.639*** (0.580)	1.494** (0.718)	1.696*** (0.567)
Home cannot pay	0.780 (0.563)	0.573 (0.564)	0.827 (0.567)	0.779 (0.684)	0.786 (0.559)
<i>N</i>	137	137	137	100	137
<i>R</i> ²	0.135	0.209	0.142	0.160	0.139

This table reports results from OLS regressions. The dependent variable is the self-reported stress and anxiety on a 0 to 10 scale (exact question in Table 8). This question was asked only in phase 2. The reference categories are the following: not working (column (3)), male (all columns), and 25–49 (all columns)

Robust standard errors in parentheses

* $p < 0.10$

** $p < 0.05$

*** $p < 0.01$

References

- Rosenblat A, Stark L. Algorithmic labor and information asymmetries: a case study of Uber's drivers. *Int J Commun.* 2016;10:3758–84.
- Abdelnour S, Méda D. Les nouveaux travailleurs des applis. *La vie des Idées.* PUF. 2020.
- Landier A, Szomoru D, Thesmar D. Travailler sur une plateforme internet; Une analyse des chauffeurs utilisant Uber en France. *Working Paper.* 2016.
- Department for Business, Energy and Industrial Strategy (BEIS), HM Government. The characteristics of those in the gig economy. 2018a. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/687553/The_characteristics_of_those_in_the_gig_economy.pdf. Accessed 1 Sep 2020.
- Department for Business, Energy and Industrial Strategy, HM Government. The experiences of individuals in the gig economy. 2018b. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/679987/171107_The_experiences_of_those_in_the_gig_economy.pdf. Accessed 1 Sep 2020.
- Berger T, Frey CB, Levin G, Danda SR. Uber happy? Work and well-being in the gig-economy, *Oxford Martin School Working Paper.* 2018.
- Apouey B, Stabile M. The effects of Uber diffusion on mental health in the UK. *SSRN Working Paper.* 2020.
- Institut National de la Statistique et des Etudes Economiques. Nombre de décès quotidiens par département. 2020. Available at: <https://www.insee.fr/fr/information/4470857>. Accessed 1 Sep 2020.
- Van Dom A, Cooney RE, Sabin ML. COVID-19 exacerbating inequalities in the US. *Lancet.* 2020;395(10232):1243–4.
- Government of France. L'activité de votre entreprise est impactée par le Coronavirus COVID-19. 2020. Available at: <https://www.economie.gouv.fr/files/files/PDF/2020/Coronavirus-MINEFI-10032020.pdf>. Accessed 1 Sep 2020.
- Centers for Medicare and Medicaid Services. Preliminary COVID-19 data snapshot. 2020. July 17, 2020. Available at: <https://www.cms.gov/files/document/medicare-covid-19-data-snapshot-fact-sheet.pdf>. Accessed 1 Sep 2020.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.