

## Platform work and economic insecurity in Italy

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### ABSTRACT

Using representative survey data from Italy, this study investigates the levels and sources of economic security amongst platform workers relative to other labour force participants. Platform workers face greater economic insecurity relative to all other occupation groups, and a rate of economic insecurity that is not significantly different from that of unemployed adults. Higher levels of insecurity are not primarily channelled through lower incomes; instead, higher rates of insecurity persist when accounting for family incomes, suggesting that other dimensions of precarity associated with platform work matter as much as income differences in shaping economic insecurity.

### 1. Introduction

The emergence of the platform economy has served as a defining feature of increasing fragmented labour markets in modern economies. New forms of platform-based work – from Amazon Mechanical Turk crowdworkers to Deliveroo food carriers – have become more prevalent, albeit at varying growth rates, across high-income countries in recent years. Starting as a phenomenon involving a relatively small number of workers (Katz and Krueger, 2019), early evidence suggests that the COVID-19 pandemic has accelerated the expansion of platform work (Eurofound, 2020). amongst the respondents of an ETUI survey (Piasna et al., 2022) carried out in 2021 in 14 EU countries, 30 per cent declared having ever tried to earn money by finding work or connecting with clients through online platforms, apps or websites. The growing size of platform work mirrors a broader process of structural change that includes the digitization (and fragmentation) of both low and high-knowledge services; and the parallel increase in the share of non-standard and precarious work, since platform workers are often exposed to a stronger uncertainty and worse economic conditions vis-a-vis the rest of the workforce. This is particularly true in the case of platforms operating in low value-added ‘labour-intensive’ industries such as transports, accommodation and restaurants (Bogliacino et al., 2019).

However, recent research on platform work has offered mixed evidence as to whether workers in such jobs prefer the flexibility that the jobs tend to offer (Berg et al., 2018), the characteristics of adults who

enter platform work (Pesole et al., 2018), whether platform workers face greater economic insecurity relative to unemployed adults or workers in other lower-pay jobs (Drahokoupil and Piasna, 2017), and Anwar and Graham (2020) the primary sources of platform workers’ economic insecurity. Several limitations in these prior studies, however, have prevented a more thorough accounting of the economic conditions of platform workers.

First, existing sources of survey data have struggled to distinguish platform workers from other survey respondents (O’Farrell and Montagnier, 2020). Contemporary occupation and industry codes used in large-scale surveys such as the EU labour Force Survey, for example, do not feature unique labelling schemes for platform jobs. In turn, the data are ill-equipped to identify the characteristics of platform workers (Riso, 2019).

Second, studies have demonstrated that workers in platform jobs face precarious working conditions, tend to have low incomes (e.g. Urzi et al., 2020), and face high levels of uncertainty (e.g. ; Gregory 2020; Vallas and Schor 2020). Less clear, however, is how the economic conditions of platform workers compare to workers in other low-pay jobs and to unemployed individuals, as most studies on the topic sample exclusively on the dependant variable (i.e. they only sample platform workers, though see Urzi Brancati et al. (2020) as one exception). The cross-occupation comparisons are critical for understanding whether platform work offers improved economic conditions for jobless workers, or whether the jobs do little to advance beyond the conditions in unemployment.

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Third, prior empirical literature on the topic has had less to say on whether the disadvantages that platform workers face are primarily due to lower incomes or other characteristics of their employment (e.g. less consistent hours, less autonomy, and reduced access to social insurance). If platform workers face more economic insecurity, but this were not channelled through the incomes associated with platform work, then such findings would suggest that increasing incomes alone, without attention to other dimensions of job quality and employment precarity, may be insufficient to increase well-being.

The inability of prior literature to sufficiently address these questions has important implications for industrial relations and economic perspectives of the sources and dimensions of labour market inequality. While studies of inequality in the labour market predominantly focus on earnings (or, at times, income), our comparison of *monetary* and *non-monetary* disadvantages for platform workers is poised to emphasize the limitations of focusing on monetary differences alone when conceptualizing inequality. Studies on the precarity of work, meanwhile, have largely recognized the non-monetary contributors to workers' well-being, but have not yet been able to investigate whether factors beyond earnings and income contribute to greater economic insecurity amongst platform workers relative to workers from other occupation groups.

Single-country studies are common in the literature on economic insecurity and the platform economy; most of these studies focus exclusively on the United States (e.g., Hall and Krueger, 2018; Katz and Krueger, 2019). This study also focuses on a single country, but shifts the focus to Italy due to its high-quality, representative survey data featuring the characteristics and economic conditions of platform workers. We focus specifically on adults who offer works and services through intermediate platforms ('platform work', hereafter). Unique from many of the non-probability studies specifically targeting platform workers (e.g., Huws, 2017), our data source also includes workers in standard occupations (and the jobless), allowing us to make direct, within-sample comparisons of platform workers to a representative sample of other individuals.

We find that platform workers have lower incomes, and face greater economic insecurity, relative to all other occupation groups. Strikingly, platform workers feature a rate of economic insecurity that is not significantly different from that of unemployed adults. Moreover, we find that the higher levels of insecurity are not primarily channelled through lower incomes; instead, higher rates of insecurity persist even when taking family incomes into account, suggesting that other dimensions of precarity associated with platform work matter as much as, or more than, income differences in shaping economic insecurity.

## 2. Prior research on platform work

### 2.1. Defining platform work

Consistent with prior research (e.g., Bogliacino et al., 2019) this study broadly defines 'platform work' as jobs that involve service-based tasks coordinated through a digital platform (phone application or website) through which customers can place requests. Common examples are Uber drivers or Deliveroo food carriers.<sup>1</sup> Investigations of the size of platform work have offered competing accounts on how prevalent this type of work is in modern labour markets.

Initial estimates in the U.S., for example, ranged from 0.5 percent of the labour market (Katz and Krueger, 2019) to 1 percent (BLS, 2018) to 4.3 percent (Robles and McGee, 2016). Estimates from the European

<sup>1</sup> In our definition of platform work, we include both online, often referred to as 'crowd-workers' (a typical example is that of those performing tasks via online platforms as 'Amazon Mechanical Turk), and offline platform workers (e.g., Uber drivers), referred to as 'gig-workers'. For a discussion on this point, see De Stefano (2015).

Union likewise produce heterogeneous findings. The European Commission's COLLEEM web-survey (Pesole et al., 2018; Urzi Brancati et al., 2020), which measures service provision via digital platforms and is administered to respondents in 14 European countries, reports that about the 1.4% of European internet users earn at least 50% of their income providing services on platforms.<sup>2</sup> Those declaring to provide services via platforms only *occasionally* amount to an estimated 4.1% of the population, with notable variation across countries (Pesole et al., 2018). These studies find that platform workers tend to be younger, more educated, more likely to live in a larger household, and more likely to have dependant children.

Other studies, however, provide different perspectives on the size and composition of platform workers. Huws et al. (2017), for example, suggest that platform work may be more widespread in Europe. Though levels of platform work are disputed, there is little doubt about the direction of the trends.<sup>3</sup> Platform work appears to be growing in size in most high-income countries and may continue to expand as stable economic opportunities become scarcer (Huws et al., 2017).

### 2.2. Dimensions of precarity in platform work

The rise of platform work coincides with rising concerns regarding the 'precarization' of jobs (Alberti et al., 2018; Kalleberg Arne, 2018). Kalleberg and Vallas (2018):(1) define precarious work as being "uncertain, unstable, and insecure and in which employees bear the risks of work and receive limited social benefits and statutory protections." This definition broadly aligns with similar perspectives from Kalleberg (2009), Anwar and Graham (2020), Schor, (2020), Vallas and Schor (2020), and others. From this definition, we emphasize three common and overlapping features of platform work that are likely to lead to greater economic insecurity amongst platform workers: (1) low pay, (2) volatility in working hours and wages, and (3) privatization of risks.

*Low Pay:* A focus on earnings is dominant in the broader literature on social inequality. With respect to platform workers, several studies have documented relatively low pay (Gregory 2020), albeit with important heterogeneity by specific type of platform work (Schor 2020; Ravenelle 2019). amongst a sample of 25 bike couriers in Edinburgh, for example, Gregory (2020) finds that none had the capacity to save and put aside money in case of an accident. Similarly, Goods et al. (2019) and Ravenelle (2019), amongst others, find that low pay is common challenge amongst their samples of platform workers, in part due to lack of consistently available work and high rates of unpaid work time to paid labour. Given that income is directly related to economic security, the low pay of many platform jobs may drive higher rates of economic insecurity for platform workers relative to other occupations.

*Volatility in Working Hours and Wages:* Beyond levels of wages, however, several studies have also documented the importance of *predictability* in wages and working hours (Gregory 2020; Ravenelle 2019). Unpredictable work schedules lead to challenges relating to care arrangements and child development (Harknett et al., 2020), difficulty in meeting basic expenses (Lambert et al., 2019), more volatility in earnings (Presser 2005), and consequences for health and well-being (Kalleberg and Vallas 2018). amongst platform workers, in particular, volatility in working hours and unpredictable wages are common concerns (Gregory 2020). Though digital platforms often promote flexibility

<sup>2</sup> The COLLEEM 2018 gathered a total of 38,022 responses from internet users aged between 16 and 74 years old in 16 EU Member States: Croatia, Czech Republic, Finland, France, Germany, Hungary, Ireland, Italy, Lithuania, the Netherlands, Portugal, Spain, Sweden, Slovakia, Romania, and the United Kingdom.

<sup>3</sup> Hall and Krueger (2018), for example, focus on a paradigmatic case: Uber. Between 2012 and 2015, Uber drivers in the US increased from 0 to approximately 460,000. At present, Uber claims to have more than 3.9 million drivers operating in 63 countries.

and autonomy in scheduling as favourable characteristics of platform work, several studies have demonstrated that this often cuts the other way: workers often were unable to calculate how much they would earn in a given week (Gregory, 2020; Schor, 2020; Ravnelle, 2019). For workers not combining their platform jobs with more standard forms of employment, the uncertainty regarding hours and wages may outweigh the autonomy that the flexible scheduling can provide (Schor, 2020; Ravnelle, 2019). Moreover, the lack of transparency and consistency in the algorithmic procedures that assign tasks often exacerbates workers' uncertainty and undermines their actual autonomy on the job (Wood et al., 2019).

*Privatization of risks:* Another defining feature of precarious work more broadly, and most platform jobs in particular, is the privatization of risks. This is especially true with respect to health and safety risks incurred in offline platform work, such as on-bike food delivery. Legally, platform workers are mostly classified as independent contractor depriving them of most social protection instruments (e.g., sick and maternity pay). Similarly, the lack of a proper occupational status minimises the chances for platform workers' unionization and collective bargaining risking to deprive them from the protection against discrimination, since many jurisdictions reserve these fundamental rights to employees (Drahokoupil and Piasna, 2017; Gyulavári, 2020; De Stefano, 2015; Adams-Prassl, 2019; De Stefano and Aloisi, 2019; Griesbach et al., 2019; Wood and Lehtonvirta, 2021).<sup>4</sup>

The lack of social protection is associated to higher occupational health and safety risks to which platform workers are exposed as compared to standard workers (EU-OSHA, 2017). Indeed, Gregory's (2020) interviews of food couriers in Edinburgh reveals widespread concern of, and often direct experience with, bike accidents that render them unable to continue working and earning income. As Goods et al. (2019) describe, the risk of workplace injuries and general health challenges is directly related to economic security of platform workers.

Each of these different dimensions of precarity can contribute directly to greater likelihood of *economic insecurity*. As Western et al. (2012) discuss, economic insecurity can be defined as "the risk of economic loss faced by workers and households as they encounter the unpredictable events of social life." Adverse events, such as unemployment or health challenges, can lead directly to income losses, particularly when state- or family-provided social assistance is unavailable. Platform workers may be much less likely to be able to financially cope with a trigger event, such as a health concern, relative to other types of workers; if so, this would provide evidence that platform workers face higher levels of economic insecurity (Western et al., 2012, DiPrete, 2002).

To be sure, precarious working conditions and economic insecurity extend well beyond platform work, and the heterogeneity of platform work suggests that not all platform workers may experience precarity or insecurity in the same way (Schor, 2020). Moreover, measures of job *quality* – which are not the direct focus of this analysis – can of course extend beyond the dimensions of job precarity identified above and are conceptually distinct from economic insecurity (Gallie et al., 2017). This study, however, is focused on core dimensions of precarity and how they may affect economic insecurity for platform workers relative to other types of occupations.

The vast majority of studies focusing on economic insecurity amongst platform workers are small-sample, qualitative studies that sample on the dependant variable (all respondents are platform workers, limiting direct comparison to other types of workers). These studies are useful in informing us of the conditions of platform workers. Nonetheless, these studies leave several questions for greater investigation, such

as *how* the economic insecurity of platform workers compares to other service-sector jobs or even jobless individuals and *the primary sources* of such variation. An investigation of these questions, as detailed before, carry important implications for the broader industrial relations literature on the sources and dimensions of labour market inequalities.

### 2.3. Research questions

Overall, the available evidence on the economic conditions of platform workers, as well as the primary sources of those economic conditions, is influenced by the absence of high-quality, representative survey data and within-sample comparisons to other types of workers. Given these limitations, we propose three research questions to improve the field's understanding of workers in the platform economy and the precarization of work more broadly.

First, we ask, (RQ1) to what extent do platform workers face income disadvantages relative to the rest of the workforce? Specifically, we seek to understand how the incomes of platform workers compare to other occupations, independent of the basic demographic characteristics of workers.

Importantly, though, earnings are only one measure of disadvantage. Thus, we also ask, (RQ2) to what extent are platform workers exposed to greater economic insecurity relative to the rest of the workforce? Building on the definition of economic insecurity discussed earlier, we operationalize the concept in our study as the need to postpone medical treatment for financial reasons in the prior year (Lusardi et al., 2011; Schneider and Harknett, 2019). We also test a second concept – the financial ability to cope with sudden expenses without borrowing from family or friends – as a supplement to our primary measure of economic insecurity. The first concept – postponing medical treatment for financial reasons – has three primary advantages over the alternative concept. First, it represents *realized* insecurity as opposed to *hypothetical* insecurity and thus more directly measures economic insecurity. Second, it connects directly to the third dimension of precarity discussed before, namely the privatization of risks and reduced access to health services for platform workers. Third, it avoids using arbitrary monetary thresholds that carry different meaning for individuals with different family sizes and local living costs, as applied in our alternative concept (which asks if the respondent can cope with sudden expenses of 300 EUR, between 300 and 800 EUR, between 800 and 2000 EUR, and so on).

Third, we ask (RQ3): to what extent is variation in economic insecurity amongst platform workers compared to other workers channelled through the income disadvantages posited in RQ1? If incomes are lower for platform workers relative to others, we can likely expect their level of economic insecurity to be greater. However, the other dimensions of precarity associated with platform, such as volatility in work schedules, may act independently (i.e. not channelled through income alone) to affect the economic insecurity of platform workers relative to other occupation types.

*Analytical Scope:* We investigate our research questions on a sample of employed adults from Italy for two primary reasons. First, Italy features high-quality, representative survey data on the characteristics and economic conditions of workers in platform jobs. Second, Italy is broadly representative of the rise of platform work seen in many high-income countries. Moreover, the country is facing economic challenges shared in many other high-income countries: labour markets are increasingly polarized and composed of precarious jobs, union membership is declining while non-standard work is rising, and the threats of offshoring and automation have increased the risk of unemployment for those with low-skill and low wages (Cirillo et al., 2017). The rise of platform work thus threatens to exacerbate inequality within Italy, a concern within many high-income countries.

At the same time, several institutional features of Italy may affect whether our findings will translate to similar findings in other contexts. First, Italy has weak minimum income protections and social insurance

<sup>4</sup> The lack of labour rights and recognition of worker status to those working via platforms is also related to the inappropriate use of the term 'sharing economy' to, at least initially, define many digital platforms (e.g. Codagnone and Martens 2016; De Stefano and Aloisi 2019).

schemes that are largely connected to one's prior occupation and industry; as a result, the composition and economic insecurity of platform workers may be different in countries with more inclusive and generous welfare states. Second, the country's dualized labour markets may contribute to more young workers entering platform work than in countries with fewer barriers to employment for new labour market entrants.

### 3. Data and methods

#### 3.1. Data source

The empirical investigation relies on the VIII *Participation, Labour, Unemployment, Survey* (hereafter PLUS) developed and administered by the National Institute for the Analysis of Public Policies (INAPP) in Italy. The main aim of the PLUS survey is to provide reliable estimates of labour market characteristics that other surveys only marginally explore. In doing so, the survey is able to provide more direct evidence on aspects such as non-standard work. The survey was collected in 2018 on a sample of 45,000 interviewees. We elaborate on the survey's sampling strategy in [Appendix 1](#). In this article we focus on labour force participants (employed, unemployed and platform workers).

The VIII wave of the INAPP-PLUS survey includes an ad-hoc module on the 'Gig economy'<sup>5</sup> collecting information on individuals participating in several ways to digital platforms by: (i) selling on-line goods and/or services; (ii) offering works and services through platforms intermediating work; (iii) providing lucrative sharing (leasing) of real estate (so called capital platform). This study focuses on digital labour markets and specifically on those individuals that have declared in 2018 to offer their own work in exchange of money through platforms. More specifically, we focus on online (e.g., performing online activities such as completing surveys or data entry) and offline platforms workers (e.g., individuals working for food-delivery, cleaning or Uber-type platforms), the latter being the component of platform work that has grown the most in Italy and about which more information is available.<sup>6</sup>

The data include a prompt asking whether the respondent had to postpone medical treatment for financial reasons in the past year. This is our primary indicator of economic insecurity. The likelihood of postponing medical treatment may, of course, be dependant on whether a given individual actually faces health challenges. Given that we can also measure an individual's health status in the dataset, however, we interpret the conditional likelihood of postponing medical treatment for financial reasons (while accounting for health) as an appropriate proxy for economic insecurity.<sup>7</sup>

As a secondary measure of economic insecurity, we evaluate an

<sup>5</sup> Despite its name, the module includes information on both online and offline platform work as well as on individuals relying on platforms to rent and sell their own goods.

<sup>6</sup> The overall number of individuals in the PLUS survey declaring to work for a digital platform is 222. They are distributed in several types of tasks/activities: (i) driving for Uber or similar (56); (ii) purchasing or delivering of household items (13); (iii) delivering meals (34); (iv) execution of online activities such as completing surveys or data entry (18); (v) cleaning households (50); (vi) other type of tasks (59); (vii) don't answer (11). Of course, multiple jobs are allowed, and the same worker can be affiliated to more than one platform and perform more than one task. Although we acknowledge the importance of investigating thoroughly heterogeneity and composition of platform workers, in this study we consider platform workers as a unique group. This is due to the low number of observations.

<sup>7</sup> Measures of economic, material, or financial hardship capture the difficulties - general or domain specific (e.g., food, housing) - in meeting financial obligations with current financial resources. Researchers have a long tradition of using social indicators to measure economic hardship relying on direct measures of deprivation, such as lack of food, heat, or access to health care ([Mayer and Jencks, 1993](#)).

indicator capturing the amount of sudden expenses that the individual would be able to meet with her own resources, without borrowing money or getting help from other relatives/friends. This question refers to a potential (counterfactual) scenario of sudden expenses and the individual is asked which amount of expenses would be able to incur.<sup>8</sup>

#### 3.2. Methods

Our methodological approach first presents broad descriptive findings related to each of our RQs, then applies a series of regression models to understand the conditional association of platform work with the incomes association with such jobs (RQ1), the economic insecurity associated with platform work (RQ2), and whether variation in economic insecurity is primarily channelled through variation in incomes (RQ3). In [Appendix 3](#), we also apply a propensity score matching estimate to assess the robustness of our results when accounting for possible selection into platform work.

In [Eq. \(1\)](#), we estimate the extent to which participation in platform work is associated with higher or lower levels of income or economic insecurity.

$$Prob(Y_i) = \alpha + \beta PW_i + \gamma M_i + \delta W_i + \lambda H_i + \pi L_i + \varepsilon_i \quad (1)$$

Economic insecurity is measured through a dichotomous variable taking value of 1 if the individual declares to have postponed medical treatment due to financial concerns during the last year. [Eq. \(1\)](#) includes a dummy variable, ( $PW_i$ ), that indicates whether the individual  $i$  has engaged in platform work in the past year, as well as a vector of demographic characteristics ( $M_i$ ,  $W_i$ ,  $H_i$ ) referring to: (i) individual characteristics ( $M_i$ ) such as age measured in age classes (18–24, 25–29, 30–39, 40–49, 50–64, more than 64), gender, nationality, family status (single or in a couple); (ii) socio-economic features ( $W_i$ ) such as education (primary, high school, university or post-university background), living with people with disabilities, living with children, living in large cities (more than 250 thousands inhabitants); (iii) a set of controls ( $H_i$ ) referring to average household income, employment status (being employed versus inactive, unemployed, retired or student), whether the individual has health problems, and the number of earners in the household; (iv)  $L_i$  that is the log of net monthly income from employment, which accounts for both earnings and earnings-related taxes/contributions paid.

In [Eq. \(1\)](#),  $\beta$  is the coefficient of interest and informs us about the conditional association of platform work and economic insecurity.

One may be concerned that selection effects into platform work bias our estimates. Put differently, if we find a conditional relationship between platform work and economic insecurity, this may be due to positive selection into platform work amongst the economically insecure, rather than platform work being the source of economic insecurity. We address this in [Appendix 3](#).

## 4. Findings

### 4.1. Descriptive characteristics of platform workers

We first discuss descriptive findings related to the size and characteristics of platform work in Italy. In 2018, 0.5 percent of all residents of Italy, around 213,000 individuals, claimed to provide online or offline services via digital platforms. In contrast to those relying on digital

<sup>8</sup> According to [Mayer and Jencks \(1993\)](#), direct measures of material hardship might offer a useful indication of poverty because: (i) each household's need is imperfectly measured by an income or consumption threshold, therefore many households with incomes above the thresholds may still experience hardships ([Smeeding, 2001](#), pp. 11928–11932); (ii) individual members of a household may suffer hardship because of unequal sharing of incomes within the household.

**Table 1**  
Descriptive statistics by platform status (sample weights applied)<sup>15</sup>.

	Working on a platform		Not working on a platform		Difference (Rob. St. Errors)	
	Mean	Sd	Mean	Sd	Coeff <sup>16</sup>	Sd
Age class (18–24)	0,189	0,392	0,072	0,259	–0,117	0,025
Age class (25 –29)	0,256	0,437	0,089	0,285	–0,162	0,030
Age class (30–39)	0,205	0,405	0,222	0,416	0,003	0,027
Age class (40–49)	0,242	0,429	0,286	0,452	0,038	0,026
Age class (50–64)	0,092	0,289	0,304	0,460	0,224	0,022
Women	0,456	0,499	0,436	0,496	0,062	0,033
Living in a couple	0,313	0,465	0,512	0,500	0,289	0,028
Living with children	0,267	0,444	0,304	0,460	0,102	0,026
Italian	0,976	0,154	0,977	0,151	0,011	0,011
Living with people with disabilities	0,093	0,291	0,069	0,254	–0,024	0,020
Elementary school	0,374	0,485	0,339	0,473	–0,026	0,025
High school	0,468	0,500	0,454	0,498	–0,045	0,033
Degree and post-graduated studies	0,158	0,366	0,207	0,405	0,072	0,031
Net work income (log)	1544	2903	4471	3488	2579	0,195
Permanent contract	0,263	0,442	0,619	0,486	0,359	0,040
Living in large cities (>250.000)	0,171	0,377	0,137	0,344	–0,075	0,028
Number of earners in the household	1590	0,803	1,80	0,837	0,171	0,057
Bad health	0,027	0,163	0,011	0,103	–0,017	0,010
Living in a property	0,818	0,387	0,872	0,334	0,074	0,026
Employed	0,393	0,490	0,810	0,392	0,389	0,032
Unemployed	0,238	0,427	0,161	0,367	–0,104	0,032
Less than 1000€	0,153	0,360	0,087	0,282	–0,082	0,024
Family income 1001–1500€	0,233	0,424	0,159	0,366	–0,075	0,027
Family income 1501–2000€	0,146	0,354	0,171	0,377	0,001	0,024
Family income 2001–3000€	0,254	0,436	0,230	0,421	0,036	0,026
Family income 3001–5000€	0,058	0,233	0,135	0,341	0,064	0,020
Family income More than 5000€	0,039	0,194	0,036	0,186	–0,002	0,014
Don't know–don't want to answer	0,117	0,322	0,182	0,385	0,058	0,021
N observations	222		27,253		27,475	

Source: authors' elaboration on PLUS data.

<sup>15</sup> “Not working on a platform” population includes: (i) employed; (ii) people declaring to have worked over the last week although not officially classified as employed; (iii) unemployed. “Platform workers” include all individuals declaring to offer their labour force through a digital platform independently from their employment status.

<sup>16</sup> Coefficients and standard errors do not include weights.

platforms to rent or sell products online (internet-enabled transactions not included in our definition of platform work here), platform workers are more likely to rely on platforms as their primary source of income. According to the PLUS survey, less than 40% of platform workers have another formal occupation.

Table 1 provides summary statistics related the composition of platform workers relative to non-platform workers. Relative to individuals not working on a platform (middle panel of Table 2), those who are in platform work are around twice as likely to be between the age of 18 and 24 (18.9 percent of platform workers compared to 7.2 percent of all others), three times as likely to be between age 25–29 (25.6 percent to 8.9 percent), and slightly more likely to be between age 30–49. In contrast, platform workers are much less likely to be between the ages of 50–64.

4.1.1. Income disadvantages of platform workers (RQ1)

We now investigate the extent to which platform workers have lower incomes than other types of workers (RQ1). Fig. 1 presents the share of workers in each monthly household income bin, that is how platform workers and non-platform workers are distributed according to their

**Table 2**  
Marginal effects of economic insecurity (need to postpone medical treatment in the last year for financial reasons).

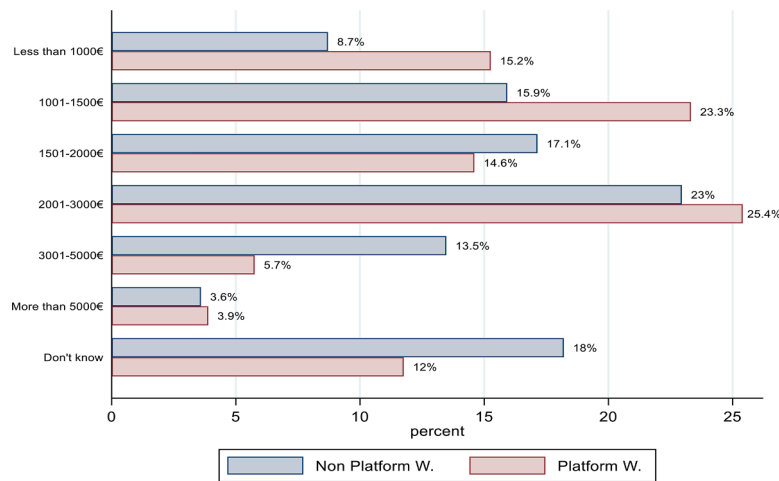
	(1)	(2)
	Labour Force b/se	(15–74 years old) b/se
<b>Working on a platform</b>	<b>0.106**</b>	<b>0.100**</b>
	<b>(0.04)</b>	<b>(0.04)</b>
Number of earners in the household	–0.035***	–0.003
	(0.00)	(0.01)
Bad health	0.146***	0.127***
	(0.03)	(0.03)
Living in a property	–0.118***	–0.104***
	(0.01)	(0.01)
Living with children	0.028***	0.034***
	(0.01)	(0.01)
Living with people with disabilities	0.064***	0.060***
	(0.01)	(0.01)
Italian	–0.024	–0.006
	(0.02)	(0.02)
Age class (18–24)	–0.114***	–0.111***
	(0.03)	(0.03)
Age class (25 –29)	0.005	–0.001
	(0.02)	(0.02)
Age class (30–39)	0.024	0.011
	(0.02)	(0.02)
Age class (40–49)	0.026	0.015
	(0.02)	(0.02)
Age class (50–64)	0.03	0.021
	(0.02)	(0.02)
Women	0.078***	0.070***
	(0.01)	(0.01)
Living in a couple	0.018*	0.037***
	(0.01)	(0.01)
Employed	–0.01	–0.008
	(0.03)	(0.03)
Unemployed	0.110***	0.099***
	(0.03)	(0.03)
Retired	–0.072	–0.069
	(0.04)	(0.04)
Inactive	0.035	0.039
	(0.04)	(0.04)
Living in large cities (>250.000)	0.015	0.018*
	(0.01)	(0.01)
High school	–0.058***	–0.038***
	(0.01)	(0.01)
Degree and post-graduated studies	–0.128***	–0.090***
	(0.01)	(0.01)
Net work income (log)	–0.002	–0.002
	0	0
Family income 1001–1500€		–0.062***
		(0.02)
Family income 1501–2000€		–0.133***
		(0.02)
Family income 2001–3000€		–0.176***
		(0.02)
Family income 3001–5000€		–0.229***
		(0.02)
Family income More than 5000€		–0.279***
		(0.02)
Don't know–don't want to answer		–0.182***
		(0.02)
N	27,475	27,475
Wald chi2(24)	1558.65	1882.52
Prob>chi2	0.0000	0.0000
Pseudo R2	0.0815	0.1028

Significance level: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

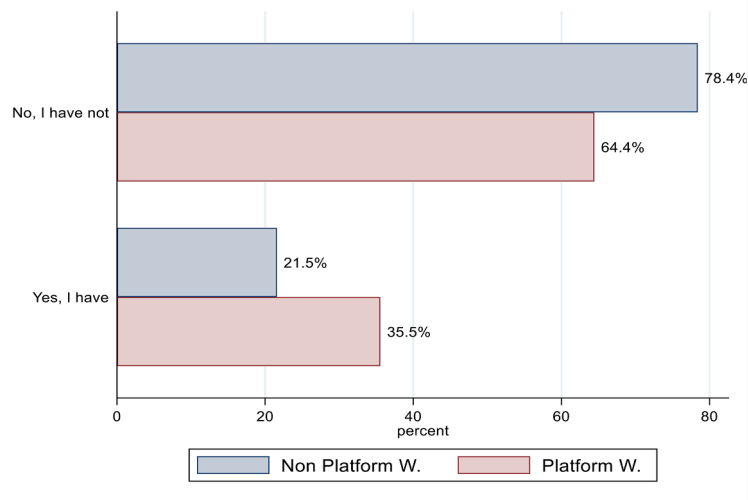
Base categories: More than 64 years old; Elementary and no title of education; Less than 1000 euros

average monthly net household income. The blue bars represent the distribution of non-platform workers amongst household income bin; the red bars represent the same distribution for platform workers.

The top row demonstrates that platform workers have a higher likelihood to live in households whose monthly income is less than 1000 EUR per month relative to non-platform workers. Amongst all platform



**Fig. 1.** Mean Monthly Family Incomes amongst Platform and non-Platform Workers  
 Source: Authors' elaboration on PLUS data. Population weights have been applied. Sample size: 27,475 respondents.



**Fig. 2.** Have you had to postpone medical treatment for financial reasons?  
 Source: authors' elaboration on PLUS data. Population weights have been applied. Sample size: 27,475 respondents.

workers between ages 18 to 74, 15.3 percent have monthly (household) incomes below this level, compared to 8.7 percent of non-platform workers.

The over-representation of platform workers persists throughout the bottom half of the income distribution. Specifically, platform workers are more likely to have (household) incomes below 3000 EUR/month relative to non-platform workers, and are much less likely to have incomes between 3000 and 5000 EUR/month or more than 5000 EUR/month relative to non-platform workers.

In Appendix Table A4, we demonstrate that the income disadvantages of platform workers strongly persist when examined in the multivariate regression framework outlined in Eq. (1).

4.1.2. Economic insecurity amongst platform workers (RQ2 & RQ3)

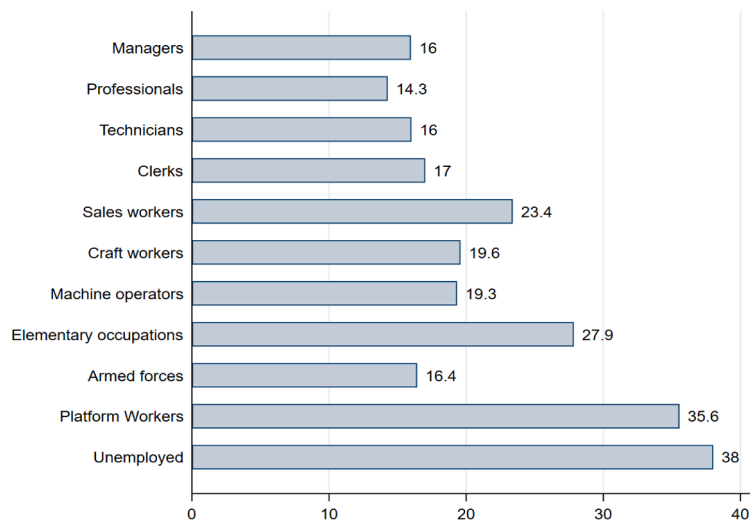
We now turn to evidence of economic insecurity amongst platform workers relative to others (related to RQ2). Fig. 2 provides the unconditional means of insecurity amongst the full 18–74 year-old labour force population. An estimated 35.5 percent of platform workers report that they had to postpone medical treatment for financial reasons. In contrast, an estimated 21.5 percent of non-platform workers in the labour force population report having to postpone medical treatment for financial reasons. We present findings for our alternative measure of

economic insecurity in Appendix 2.

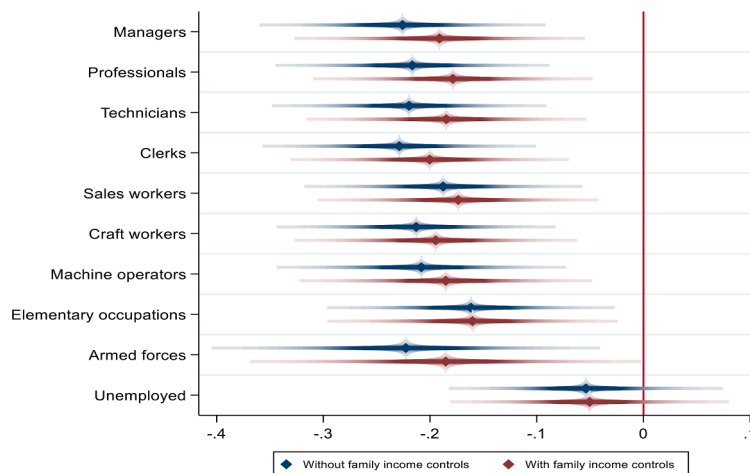
To further disaggregate rates of economic insecurity across sub-populations, Fig. 3 presents unconditional means across several broad (and mutually exclusive) occupation classifications ranging from Managers to Elementary Occupations (ISCO 1-digit major groups). Here, we also include platform workers and unemployed adults as their own respective categories. The findings show large heterogeneity in the extent to which individuals in different groups report postponing medical treatment for financial reasons.

Professionals, technicians, and members of the armed forces face the lowest rates of economic insecurity (between 14.3 percent and 16.4 percent). Meanwhile, clerks, craft workers, and machine operators make up a middle group with means ranging from 17 percent to 19.6 percent. Behind them are sales workers and elementary occupations (23.4 and 27.9 percent, respectively). Platform workers and unemployed adults feature much higher rates of economic insecurity; in fact, there is very little difference between the rates for platform workers (35.6 percent) and for the unemployed (38 percent).

Table 2 moves beyond the descriptive means and presents the regression results from Equation (2). Recall that the outcome variable is a binary indicator of whether the respondent had to postpone medical treatment for financial reasons. Models (1) and (2) looks at the labour



**Fig. 3.** Economic Insecurity by Occupation Classification (percent) – Share who have postponed medical treatment due to financial reasons by occupational group. Source: authors’ elaboration on PLUS data. Population weights have been applied. Sample size: 27,475 (employed, unemployed and platform workers) respondents.



**Fig. 4.** Marginal effects of economic insecurity (postponed medical treatment for financial reasons) with respect to Platform Workers. Source: authors’ elaboration on PLUS data. Population weights have been applied. Sample size: 27,475 (employed, unemployed and platform workers) respondents.

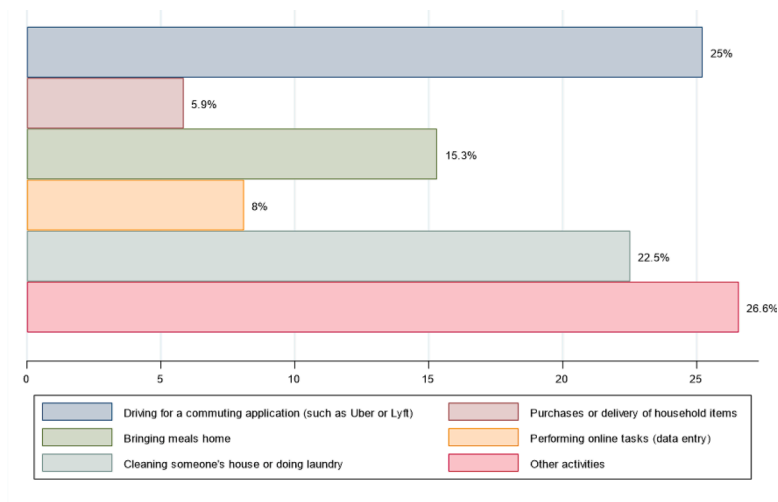
force participants. Our primary coefficient of interest is whether the individual is engaged in platform work. Model (1) includes the demographic characteristics but excludes family income. The results suggest that working in a platform job is associated with a 9 percentage point increase in the likelihood of economic insecurity.

Model (2) brings in family income. If the economic insecurity were driven primarily through family income (the focus of RQ3), the coefficient on platform work may be reduced to zero. Strikingly, though, the association of platform work and economic insecurity is hardly changed. Platform workers remain about 8 percentage points more likely to face economic insecurity after accounting for income and all other characteristics. Thus, the low incomes associated with platform work are not the only factor driving insecurity; instead, other dimensions of precarity likely contribute to greater uncertainty beyond levels of income.

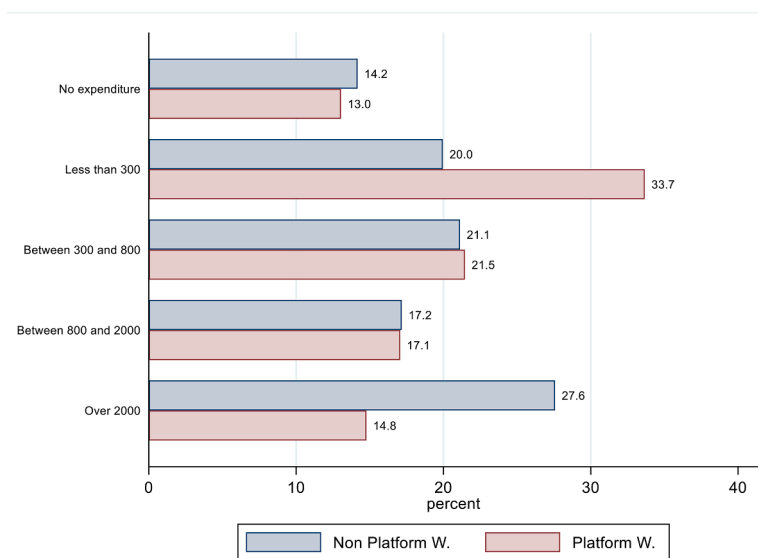
We now investigate the relative likelihood of economic insecurity by broad occupation groups. Similar to Fig. 3, we include the unemployed as their own category. Our broader aim is to understand where in the occupation distribution platform workers are placed with respect to their level of economic insecurity. Fig. 4 presents the results visually and summarizes the key findings. Platform work is the reference occupation

group (excluded from the models) and all occupation categories are exclusive; thus, the coefficients for each occupation group reflect the relative likelihood of economic insecurity for that group relative to platform workers. We present the corresponding regression results in Appendix 4 (Table A5).

Notably, all occupation groups from Managers through Armed Forces feature negative and statistically significant coefficients, suggesting that each of these occupation groups faces a lower likelihood of economic insecurity relative to platform workers (independent of age, sex, health, family structure, and so on). Whether accounting for family income or not, all occupation groups feature a 10 percentage point or greater advantage over platform workers with respect to the likelihood of economic insecurity. Strikingly, the coefficient for unemployed adults is also negative, though statistically insignificant. Thus, the most we can conclude is that there is no statistically significant difference in the conditional likelihood of economic insecurity for platform workers relative to unemployed adults.



**Fig. A1.** Distribution of platform workers by typology of task  
 Source: authors' elaboration on PLUS data. Population weights have been applied.



**Fig. A2.** What sudden expenditure would you be able to meet with your own resources, without borrowing money or getting help from other relatives/friends? Results for labour force population  
 Source: authors' elaboration on PLUS data. Population weights have been applied. Sample size: 27,475 respondents.

**5. Discussion & conclusion**

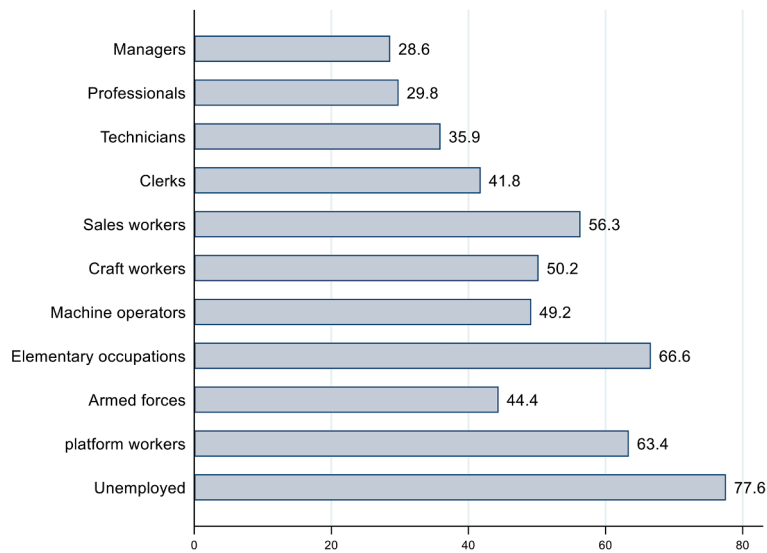
Well before the onset of the COVID-19 pandemic, many European labour markets were becoming increasingly fragmented (Green and Livanos, 2017). The declining share of workers with permanent contracts, insurances against job loss or adverse health, and standard employment protections has widened the gaps between labour market insiders and outsiders (Picot and Menendez, 2019). The rise of platform work across advanced economies throughout the past decade has prompted further concern about the economic conditions of these labour market outsiders. Scholars have, in turn, investigated the working conditions of individuals in platform work; however, standard labour force surveys have struggled to identify adults engaged in platform work. As a result, recent research has struggled to conceptualize the sources and dimensions of economic insecurity for platform workers relative to workers in other occupation groups. This study employs representative survey data from Italy to evaluate (1) the extent to which platform workers have lower incomes than other occupation groups, (2) the extent to which platform workers face greater economic insecurity, and

(3) whether their greater economic insecurity is primarily channelled through their lower incomes.

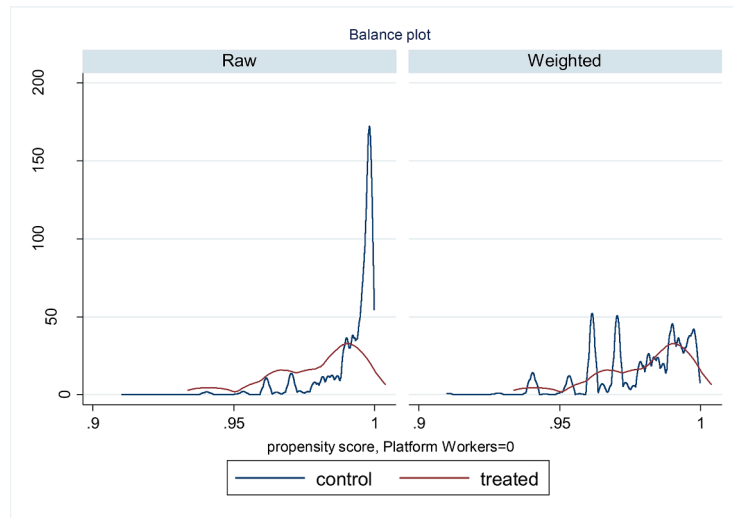
Our findings produce three broad conclusions with several implications for the broader literature on the social inequality, precarious employment, and the platform economy. First, we are able to quantify the relative income disadvantages of individuals engaged in platform work in Italy. We find that about 15% of platform workers have net family incomes below 1000 EUR per month; in contrast, the share is 10% for non-platform workers, including the unemployed. The income disadvantages of platform workers hold even when accounting for selection into platform work (see Appendix 3).

Second, we find that economic insecurity amongst platform workers is greater than in all other occupation groups and, strikingly, is not significantly different from that of unemployed adults. Third, we find that the higher levels of insecurity are not primarily channelled through lower incomes; instead, higher rates of insecurity persist even when taking family incomes into account, suggesting that other dimensions of precarity likely matter as much as, or more than, income differences in shaping economic disadvantage.





**Fig. A3.** Economic Insecurity by Occupation Classification (percent) – Inability to deal sudden expenses more than 800 EUR  
 Source: Authors’ elaboration on PLUS data. Population weights have been applied. Sample size: 27,475 respondents.



**Fig. A4.** Distribution of the propensity score before and after matching.

**Table A1**

Average treatment effects on the treated (ATET) (inverse-probability weighting).

	Need to postpone medical treatment in the last year for financial reasons	Coef.	Rob Std. Err.	z	P>z	[95% Conf.	Interval]
ATET							
	Working on a platform (1 vs 0)	0.1280	0.0311	4.11	0.000	0.0670	0.1891
PO mean	Working on a platform 0	0.2412	0.0089	27.07	0.000	0.2238	0.2587

These empirical findings stem from, and contribute to, broader industrial relations perspectives on the sources and dimensions of labour market inequalities. While studies of inequality in the labour market predominantly focus on earnings or income, our study emphasizes that the non-monetary disadvantages that platform workers face contribute more to economic insecurity than their income disadvantages. Instead, it may be that the less-regular working hours, reduced autonomy, and reduced access to social protections contribute as much, if not more, to economic insecurity than the lower incomes associated with platform

jobs, though we cannot test these alternative sources directly in our analyses. Scholars of employment precarity have recognized these non-monetary dimensions of workers’ well-being (e.g. Kalleberg Arne, 2018), but have generally be unable to evaluate these dimensions amongst platform workers relative to other occupation groups. The present study is able to achieve this, and in doing so, reveals that the average platform worker is no better off than the average unemployed adult in terms of economic insecurity.

Our findings correspond with evidence from the broader labour

**Table A2**  
Covariate balance summary.

	Raw	Weighted		
Number of observations	27,475	27,475		
Treated observations	222	13,726,3		
Control observations	27,253	13,748,7		
	Standardized differences	Variance Ratio	Raw	Weighted
Age class (18–24)	0.3796	0.013	2.9121	1.0238
Age class (25 –29)	0.4085	–0.0145	1.8733	0.9867
Age class (30–39)	–0.0073	0.0013	0.9943	1.0018
Age class (40–49)	–0.0951	–0.0064	0.8729	0.9897
Age class (50–64)	–0.5459	0.0075	0.4861	1.0172
Living in a couple	–0.6236	0.0113	0.7326	1.0141
Living with people with disabilities	0.0882	–0.0063	1.3043	0.9833
Living in large cities (>250.000)	0.1932	0.0009	1.3744	1.001
Women	–0.1249	–0.0076	0.9997	.9988
Employed	–0.8475	0.0118	1.1523	1.008

market literature regarding the role of scheduling practices and intra-year earnings volatility in shaping economic hardship, independent of the level of monthly or annual income (amongst recent works on the US labour market, see Schneider and Harknett, 2020; Finnigan and Meagher, 2019). In turn, our findings suggest that efforts to raise earnings of platform workers is only one step toward reducing their economic insecurity relative to the rest of the labour market. Instead, providing more security and predictably may be necessary to close the gaps in economic insecurity.

Our study does have limitations. First, like many in the labour market literature, we focus on a single country. As such, external validity beyond Italy is not assured. Though Italy shares many high-level features with other advanced economies, variation in demographic composition and national welfare state and labour market institutions may lead to better (or worse) working conditions for platform workers in other countries. As two examples, Italy has relatively high unemployment, especially amongst youth, and a comparatively weak system of social assistance benefits. In countries with more generous social assistance benefits and lower unemployment rates, the labour supply and working conditions of platform workers may vary considerably from the

**Table A3**  
Treatment-effects estimation  
(Outcome model: propensity-score matching; Treatment model: probit).

Propensity score matching (common non replacement)						
Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Postpone medical treatment in the last year for financial reasons	Unmatched	0,3694	0,2106	0,1587	0,0275	5,77
	ATT	0,3694	0,2972	<b>0,0720</b>	0,0447	<b>1,61</b>
Propensity score matching (common non replacement with trimming)						
Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Postpone medical treatment in the last year for financial reasons	Unmatched	0,3694	0,2106	0,1587	0,0275	5,77
	ATT	0,3802	0,2957	<b>0,0845</b>	0,0457	<b>1,85</b>
Propensity score matching (common non replacement kernel)						
Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Postpone medical treatment in the last year for financial reasons	Unmatched	0,3694	0,2106	0,1587	0,0275	5,77
	ATT	0,3694	0,2972	<b>0,0721</b>	0,0447	<b>1,61</b>
Propensity score matching (common non replacement kernel with trimming)						
Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Postpone medical treatment in the last year for financial reasons	Unmatched	0,3694	0,2106	0,1587	0,0275	5,77
	ATT	0,3802	0,2957	<b>0,0845</b>	0,0457	<b>1,85</b>
Propensity score matching (common non replacement radius calliper)						
Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Postpone medical treatment in the last year for financial reasons	Unmatched	0,3693	0,2106	0,1587	0,0275	5,77
	ATT	0,3693	0,2147	<b>0,1546</b>	0,0325	<b>4,75</b>
Propensity score matching (common non replacement radius calliper with trimming)						
Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Postpone medical treatment in the last year for financial reasons	Unmatched	0,3693	0,2106	0,1587	0,0275	5,77
	ATT	0,3802	0,2123	<b>0,1678</b>	0,0334	<b>5,02</b>

Italian case. This points to the need for more cross-national research on the topic, should data allow, to investigate the institutional drivers of economic precarity amongst platform workers.

Second, our data only feature two measures of economic insecurity, a broad concept that could apply to any number of indicators. Future work would benefit from a broader suite of economic insecurity measures than our data allow. Finally, the lack of longitudinal data does not allow to account for the quantitative growth and qualitative change, in terms of workforce composition, characterizing platform work during and after the Covid-19 pandemic. In this respect, we note that investigating heterogeneity in the composition of platform worker is a worthwhile pursuit in future research given findings from Schor (2020) and others. amongst the key aspects deserving further investigation, the ethnic composition of categories of platform work is particularly relevant as migrant workers represent an increasingly important component likely to face significant socio-economic risks.

Despite these limitations, however, our evidence reveals that the levels of economic insecurity amongst platform workers remain high, and that the insecurity is not driven solely through income disparities.

**CRedit authorship contribution statement**

**Valeria Cirillo:** Conceptualization, Writing – review & editing, Data curation, Formal analysis. **Dario Guarascio:** Conceptualization, Writing – review & editing, Data curation, Formal analysis. **Zachary Parolin:** Conceptualization, Writing – review & editing, Data curation, Formal analysis.

**Data availability**

Data will be made available on request.

**Appendix 1. Additional details on sampling strategy**

Individuals in the PLUS survey were contacted through a dynamic computer-assisted telephone interviewing (CATI). The PLUS survey does not include proxy interviews, thus reducing the extent of measurement error and partial non-responses. The questionnaire was submitted to a sample of residents between 18 and 74 years old. The sample design is stratified over the Italian population: strata are defined by region (20 administrative regions), type of city (metropolitan/non-metropolitan),

**Table A4**  
Marginal effects of probability to be engaged in platform work.

	Labour Force (15–74 years old)	
	(1) b/se	(2) b/se
Age class (18–24)	0.009* (0.00)	0.013** (0.00)
Age class (25–29)	0.010* (0.00)	0.018*** (0.00)
Age class (30–39)	0.002 (0.00)	0.013*** (0.00)
Age class (40–49)	0.001 (0.00)	0.013*** (0.00)
Age class (50–64)	-0.006 (0.00)	0.006 (0.00)
Women	0.001 (0.00)	-0.001 (0.00)
Living in a couple	-0.002 (0.00)	-0.002 (0.00)
Living with children	0.002 (0.00)	0.001 (0.00)
Italian	0.002 (0.00)	0.001 (0.00)
Living with people with disabilities	0.004* (0.00)	0.004* (0.00)
High school	-0.003 (0.00)	0.000 (0.00)
Degree and Post-grad studies	-0.004* (0.00)	-0.001 (0.00)
Living in large cities (>250.000)	0.003 (0.00)	0.004* (0.00)
Family income 1001–1500€		0.001 (0.00)
Family income 1501–2000€		-0.001 (0.00)
Family income 2001–3000€		0.001 (0.00)
Family income 3001–5000€		-0.005* (0.00)
Family income More than 5000€		-0.000 (0.00)
Don't know–don't want to answer		-0.005* (0.00)
Unemployed		0.001 (0.00)
Retired		0.051* (0.02)
Inactive		0.075** (0.02)
Student		0.048*** (0.01)
Net work income (log)		-0.001** (0.00)
N	27,475	27,475
Wald chi2(24)	91.24	396.18
Prob>chi2	0,0000	0,0000
Pseudo R2	0.0547	0.1806

Significance level: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$   
Base categories: More than 64 years old; Elementary and no title of education; Less than 1000 euro

**Table A5**  
Marginal effects of economic insecurity (need to postpone medical treatment in the last year for financial reasons) by occupation group (reference group = platform workers).

	Labour Force (15–74 years old)	
	(1) b/se	(2) b/se
Managers	-0.226*** (0.05)	-0.188*** (0.05)
Professionals	-0.217*** (0.05)	-0.172*** (0.05)
Technicians	-0.220*** (0.05)	-0.178*** (0.05)
Clerks	-0.229*** (0.05)	-0.191*** (0.05)
Sales workers	-0.188*** (0.05)	-0.167** (0.05)
Craft workers	-0.213*** (0.05)	-0.189*** (0.05)
Machine operators	-0.208*** (0.05)	-0.176** (0.05)
Elementary occupations	-0.162** (0.05)	-0.151** (0.05)
Armed forces	-0.223** (0.07)	-0.175* (0.07)
<b>Unemployed</b>	<b>-0.054</b> <b>(0.05)</b>	<b>-0.055</b> <b>(0.05)</b>
Number of earners in the household	-0.035*** (0.01)	-0.001 (0.01)
Bad health	0.147*** (0.03)	0.129*** (0.03)
Living in a property	-0.115*** (0.01)	-0.103*** (0.01)
Living with children	0.027** (0.01)	0.033*** (0.01)
Living with people with disabilities	0.063*** (0.01)	0.059*** (0.01)
Italian	-0.020 (0.02)	-0.008 (0.02)
Age class (18–24)	-0.131*** (0.03)	-0.123*** (0.03)
Age class (25–29)	-0.012 (0.02)	-0.014 (0.02)
Age class (30–39)	0.011 (0.02)	0.001 (0.02)
Age class (40–49)	0.013 (0.02)	0.005 (0.02)
Age class (50–64)	0.016 (0.02)	0.009 (0.02)
Women	0.076*** (0.01)	0.070*** (0.01)
Living in a couple	0.020* (0.01)	0.039*** (0.01)
Retired	0.010 (0.17)	-0.002 (0.17)
Inactive	-0.047 (0.12)	-0.042 (0.11)
Student	-0.241*** (0.07)	-0.218** (0.07)
Living in large cities (>250.000)	0.016 (0.01)	0.018* (0.01)
High school	-0.050*** (0.01)	-0.037*** (0.01)
Degree and post-graduated studies	-0.117*** (0.01)	-0.091*** (0.01)
Family income 1001–1500€		-0.059** (0.02)
Family income 1501–2000€		-0.130*** (0.02)
Family income 2001–3000€		-0.175*** (0.02)
Family income 3001–5000€		-0.226*** (0.02)
Family income More than 5000€		-0.279*** (0.02)
Don't know–don't want to answer		-0.182*** (0.02)

(continued on next page)

age (five classes), sex and the employment status of the individual (employed, unemployed, student, retired, other inactive).<sup>9</sup> The reference population is derived from the annual averages of the ISTAT Labour Force Survey and weights are provided in order to account for the

<sup>9</sup> The PLUS survey is designed in line with the standard followed by ISTAT to carry out the Labor Force Survey. Interviews are administered in Italian and this may actually reduce the proportion of non-Italian speaking workers involved in the survey, a potential limitation. Finally, interviews are administered relying on the ISTAT's administrative registers including both mobile and landlines.

Table A5 (continued)

	(1)	(2)
	Labour Force (15–74 years old)	
Log income from work		–0.002 (0.00)
Number of obs	26,403	26,403
Wald chi2(35)	1866.66	1547.69
Prob > chi2	0.0000	0.0000
Pseudo R2	0.1037	0.0826

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

probability of attrition based on surveyed characteristics.<sup>10</sup>

The dataset features a rich set of demographic and employment information. In addition to measuring demographic characteristics such as age, sex, citizenship status, education, and family structure, we can measure an individual's health status, net monthly earnings from employment and net monthly family income (inclusive of taxes and transfers).

To the purpose of this article, we focus on the labour force population including employed, unemployed and platform workers. Specifically, we consider as “employed” individuals that have positively replied to the following questions: (i) “In the week prior to the interview did you work? Consider work from which you have earned or will earn an income or unpaid work only if performed habitually at a family member's business”; (ii) “In the week prior to the interview did you perform at least 1 hour of work? Consider work from which you have earned or will earn an income or unpaid work only if performed regularly at a family member's business”. The decision to focus on labour force participants allows us to depict specific sources of economic security amongst platform workers relative to other labour force participants. Due to the low number of platform workers interviewed (222), we are not able to explore the heterogeneity of effects amongst platform workers related to the specificities of tasks performed. For descriptive purposes only, we show the distribution of digital tasks across platform workers.

## Appendix 2. Alternative measure of economic insecurity

As alternative measure for economic insecurity we consider how individuals in the PLUS survey reply to the following question: “Which sudden expense would you be able to meet with your own resources, without borrowing or help from other relatives/friends?”. Fig. A1 highlights that platform workers are overrepresented in the first category (less than 300 EUR). amongst the full sample (left panel), only 30% of platform workers are able to face unexpected expenses accounting for more than 800 EUR (that is the poverty threshold in Italy for an household composed by a single adult). The picture is even sharper if we focus on the working population (right panel): platform workers are overrepresented in the two extremes groups: (i) less than 300 EUR and (ii) no expenditure.

Fig. A2.

In Fig. A3 we show the incidence of our alternative measure of economic insecurity, the amount of sudden expenses the individual can cope without borrowing or help from other relatives/friends, by occupational groups. Platform workers are in between elementary occupations and the unemployed with more than two-thirds unable to meet a sudden expense of more than 800 EUR.

<sup>10</sup> Both descriptive statistics and estimates have been weighted applying survey weights.

## Appendix 3. Propensity score matching

Despite our main results being robust to the inclusion of a large set of controls, concerns may be raised about a potential ‘selection bias’.<sup>11</sup> That is, individuals who are relatively worse off (e.g., long-term unemployed, low-income individuals, etc.) may be more inclined to offer their services on platforms as way to increase their income (see the discussion in the Methods section). To partly control for some of the selection-related endogeneity, we implement a propensity score matching (PSM) model testing the robustness of the income vulnerability-platform work relationship. The estimation is based on two steps. The first entails the estimation of the propensity score, that is the probability to perform platform work conditioned on a set of selected covariates (gender, age classes, marital status, living in households with disabled people, living in large cities, being employed). The second step implies the estimation of the “average treatment effect on the treated”, (ATET) or the average difference in outcome (need to postpone medical treatment in the last year for financial reasons) as a result of platform participation for those who are currently platform workers.<sup>12</sup>

After the matching, the statistical significance of the difference between the proportion of subjects experiencing economic insecurity in each of the two groups (treated [platform workers] vs. untreated [non-platform workers]) in the matched sample can be tested. This difference represents the Average Treatment Effect on the Treated (ATET) (Austin, 2011).

Therefore, we first create a propensity score selecting the main variables that can affect participation to digital labour markets as well as income status ensuring an adequate balance of propensity score across treatment (platform) and comparison (non-platform work) groups. Second, we evaluate to which extent the two groups of platform and non-platform workers sharing similar values of propensity score differ with respect to our outcome of interest.<sup>13</sup>

Table A1 shows the results of treatment effects estimation performed through inverse-probability weighting for the outcome model. The Abadie-Imbens standard error calculation is performed automatically.

Table A1 confirms main results. Working on a platform increases the probability of economic insecurity. The result of ATET - the mean differences between treated and untreated individuals after the matching - indicates that platform workers have a higher probability of economic insecurity than non-platform workers. The chance of facing income vulnerability of platform workers is about 13 percentage points higher than that of non-platform workers.<sup>14</sup>

<sup>11</sup> We are aware that some endogeneity could still affect our estimations, particularly due to unobservable and omitted variables. However, the large and rich set of controls included in the analysis as well as the stability of our results throughout the adopted specifications lends some support to the relative strength of our key findings.

<sup>12</sup> See Fig. A4 in the Appendix for the distribution of the *pscore* on treated and controls and Table A2 for covariate balance descriptive statistics.

<sup>13</sup> Of course, some endogeneity may continue to affect estimations, particularly because of the inability to consider all omitted variables. However, given the very large number of controls included in the analysis we think the results are reasonably robust. Regarding the potential effect of selection, the PSM seems to provide further support to the evidence.

<sup>14</sup> Very similar results are obtained by performing one-to-one matching without replacement, kernel matching, and a matching within the radius of 5% combined with different techniques to impose common support over the set of covariates such as minmax and trimming (Caliendo and Kopeinig, 2008). Minimax simply drops all treated observation whose propensity score is higher than the maximum or lower than the minimum of that estimated on the controls; trimming exclude a percentage of treated observation for which the propensity score density is the lowest (Bogliacino et al., 2019a). Results in Table A2 in the Appendix show that platform workers face a higher probability of income vulnerability ranging between 7 and 17 percentage points according to trimming measures applied.

Lastly, repeating the PSM on the same set of covariates plus the inclusion of a dummy taking value of one if the individual lives in a household whose income is below 1500 EUR per month and zero otherwise, we estimate an average treatment effects on the treated of 0.11. The chance of facing income vulnerability of platform workers is thus 11 percentage points higher than that of non-platform workers, even when we control for family income. This last step further highlights that platform workers are exposed to greater economic insecurity relative to the rest of the workforce and that this disadvantage is not exclusively channelled through lower earnings.

Table A3

#### Appendix 4. Additional analyses

Tables A4 and A5

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