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Evidence from Representative Italian Survey Data**
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Abstract: The emergence of the platform economy has served as a defining feature of increasingly fragmented labour markets. Recent research on platform work, however, has struggled to quantify the economic conditions of platform workers relative to other occupations and to determine whether the economic disadvantages of platform workers are primarily channelled through lower incomes or other dimensions of precarity. This study uses representative survey data of platform workers in Italy to investigate their size, composition, and economic insecurity. We find that platform workers face greater economic insecurity relative to all other occupation classes, 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. Moreover, early evidence suggests that the COVID-19 pandemic has accelerated the expansion of platform work (Eurofound, 2020a). 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), and whether such workers tend to face adverse economic consequences relative to unemployed adults or workers in other lower-pay jobs (Drahokoupil and Piasna, 2017). Several limitations in these prior studies, however, have prevented a more thorough accounting of the demographic characteristics and 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 Labor 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. Several studies have turned to non-probability sampling techniques instead, though with limitations related to representativeness and selection. As a result, the available empirical evidence concerning the size and composition of platform work is still relatively small (notable exceptions are, among others, Berg et al., 2018; Pesole et al., 2018) and affected by the lack of higher-quality survey or administrative data (e.g. Riso, 2019).

Second, studies have convincingly demonstrated that workers in platform jobs face precarious working conditions, tend to have low incomes, and face high levels of uncertainty

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(e.g. Anward and Graham 2020; 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. These distinctions are critical for understanding whether platform work offers a pathway toward improved economic conditions for jobless workers, or whether the jobs do little to advance beyond the conditions in unemployment. Relatedly, more research is needed on whether the disadvantages that platform workers face is 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 employment precarity, may be insufficient to increase well-being.

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. Specifically, this study employs the ad-hoc "Gig Economy" module of the Survey on Labour Participation and Unemployment (PLUS) conducted by the National Institute for the Analysis of Public Policies (INAPP). 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. Italy represents a relevant case to study the relationship between platform work and economic insecurity, given its large and rising share of non-standard work, as well as high inactivity and youth unemployment rates

(Tassinari and Maccarone, 2020). As we discuss within, however, these same characteristics have implications for the relatability of our findings to other economic and labour market contexts.

This study's findings produce three major contributions to the literature on the platform economy. First, we provide updated and detailed evidence concerning size and composition of platform work in Italy. Platform workers in Italy tend to be students and younger, but notable differences in sex, education, and native-born status do not emerge. Second, we assess the extent to which platform workers receive lower incomes relative to the rest of the Italian workforce, confirming that platform workers tend to be concentrated in the bottom half of the income distribution. Third, we investigate levels of economic insecurity among platforms workers relative to other occupation classes. Strikingly, we find that platform workers face greater economic insecurity relative to all other occupation classes and 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 channeled 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

Consistent with prior research (e.g., Bogliacino et al., 2019b) 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.[1] Platform work has expanded across higher- and lower-income countries alike in the past decade (for a thorough review, see, among

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[1] 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).

others, Kenney and Zysman, 2016, 2019). In turn, social scientists have dedicated increasing attention to these new forms of employment. Below, we distil central findings from prior research related to platform workers. First, we review the analyses focusing on the size and composition of labour platforms in different countries. Second, we discuss economic insecurity among platform workers. Third, we focus on our case selection, Italy. Fourth, we discuss our primary research questions.

2.1. Size and Characteristics of Platform work

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 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.[2] Those declaring to provide services via platforms only *occasionally* amount to an estimated 4.1% of the population, with notable variation across country (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 dependent children.

Other studies, however, provide different perspectives on the size and composition of platform workers. Huws et al. (2017) suggest that platform work may be more widespread in Europe. Estimating the share of working age population that has ever provided paid services via platforms (both as main or secondary activity), the authors find rates of 9% for Netherlands

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[2] 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.

and the UK, 10% for Sweden, 12% for Germany, 18% for Switzerland, 19% for Austria and 22% for Italy. Though levels of platform work are disputed, there is little doubt about the direction of the trends.[3] 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 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 et al (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 among platform workers: (1) low pay, (2) volatility in working hours and wages, and (3) privatization of risks. We discuss these dimensions of precarity in turn.

Low Pay: Several studies have documented the low pay of platform workers (Gregory 2020), albeit with important heterogeneity by specific type of platform work (Schor 2020; Ravenelle 2019). Among 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, Veen, and Barratt (2019) and Ravenelle (2019), among others, find that low pay is common challenge among 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

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[3] 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.

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, Schneider, and Luhr 2020), difficulty in meeting basic expenses (Lambert, Henly, and Kim 2019), more volatility in earnings (Presser 2005), and consequences for health and well-being (Kalleberg and Vallas 2018). Among platform workers, in particular, volatility in working hours and unpredictable wages are common concerns (Gregory 2020). Though digital platforms often promote flexibility 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 et al 2020; Ravenelle 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; Gyulav´ari, 2020; De Stefano, 2015; Adams-Prassl, 2019; De Stefano and Aloisi, 2019; Griesbach et al., 2019; Wood and Lehdonvirta, 2021).[4]

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, Veen, and Barratt (2019) describe, the risk of workplace injuries and general health challenges is directly related to economic security of platform workers.

Indeed, 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. In the case of platform workers, the combination of low incomes, high volatility in hours and earnings, and the privatization of risk may lead to higher levels of economic insecurity relative to other types of occupations, and perhaps even relative to jobless individuals. Put differently, 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).

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[4] 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).

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 et al 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 among platform workers are small-sample, qualitative studies that sample on the dependent variable (all respondents are platform workers, limiting direct comparison to other types of workers). These studies are remarkably 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.

2.3. The Italian Context

This study focuses specifically on platform work in Italy for two primary reasons. The first is practical: 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.

Specifically, platform work in Italy has quickly expanded throughout the past decade, especially in the sectors of food delivery, intermediating supply, tourism, real estate, and retail (Guarascio and Sacchi, 2018; Guarascio, 2018). Italy is also 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 social inequality within Italy, a concern presents within many high-income countries where platform work is expanding.

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 schemes that are largely connected to one's prior occupation and industry; as a result, the size, 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. We emphasize, however, that the extent to which the results from Italy are transferable to other countries is an empirical question that we can only investigate further if and when similar, representative data are made available for other countries.

2.4. Research Questions

Overall, the available evidence on the size, composition, and economic conditions of platform workers in Europe and Italy particularly 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. First, we ask, (RQ1) what are the demographic characteristics of platform workers in Italy? In using high-quality, representative survey data, we can directly compare the characteristics of platform workers to other workers across Italy.

Second, we ask, (RQ2) 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. In doing so, we can provide useful evidence related to the extent of economic disadvantage that platform workers face.

Importantly, though, earnings are only one measure of disadvantage. Thus, we also ask, (RQ3) 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 our 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).

Finally, we investigate the extent to which variation in economic insecurity is channeled through the earnings disadvantages posited in RQ2. 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 channeled through income alone) to affect the economic insecurity of platform workers relative to other occupation types.

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). 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. Individuals 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), age (five classes), sex and the employment status of the individual (employed, unemployed, student, retired, other inactive).[5] 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 probability of attrition based on surveyed characteristics.[6]

The VIII wave of the INAPP-PLUS survey includes an ad-hoc module on the 'Gig economy'[7] 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

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[5] 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.

[6] Both descriptive statistics and estimates have been weighted applying survey weights.

[7] 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.

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.[8]

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).

As discussed previously, 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 dependent 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.[9]

As a secondary measure of economic insecurity, we evaluate an 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

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[8] 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.

[9] 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).

a potential (counterfactual) scenario of sudden expenses and the individual is asked which amount of expenses would be able to incur.[10]

3.2. Methods

Our methodological approach relies on three steps. First, we will present broad descriptive findings related to each of our RQs. Second, we will use a series of Probit regression models to understand the conditional association of platform work with demographic characteristics of individuals in such jobs (RQ1) and the incomes and economic insecurity associated with such jobs (RQs 2 and 3). Third, we will apply a propensity score matching estimate to assess the robustness of our results when accounting for possible selection into platform work.

Our regression estimates follow Equations (1) and (2). In Equation (1), we estimate a Probit model that identifies the conditional likelihood that an individual i with a vector of demographic characteristics (M_i, W_i, H_i) participates in platform work (PW). This allows us to answer RQ1.

$$Prob(PW_i) = \alpha + \gamma M_i + \delta W_i + \lambda H_i + \varepsilon_i \ (1)$$

In Equation (2), we estimate the extent to which participation in platform work is associated with economic insecurity (RQs 2 and 3). 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. Equation (2) includes a dummy variable, (PW_i), that indicates whether the individual i has engaged in platform work in the past year. Thus, β is the coefficient of interest and informs us about the conditional association of platform work and economic insecurity.

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[10] 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.

$$Prob(Y_i) = \alpha + \beta PW_i + \gamma M_i + \delta W_i + \lambda H_i + \theta F_i + \varepsilon_i \quad (2)$$

Both models include a wide set of controls 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) and (iii) a set of controls (H_i) referring to average household income and employment status (being employed versus inactive, unemployed, retired or student).

In equation (2) we include the same set of controls as equation (1) (M_i, W_i, H_i), but also add two more variables capturing whether the individual has health problems and the number of earners in the household (F_i), both potentially influencing our economic insecurity indicator (the need to postpone medical treatments for financial reasons).

In order to account for heterogeneity of drivers for platform participation and heterogeneity of effects with respect to economic insecurity (postpone medical treatment in the last year for financial reasons), we estimate equation (1) and (2) on the whole population of PLUS survey - residents in Italy (18-74 years old) - and on the sub-population of the employed. In the latter case, we include as further controls: (i) the type of employment contract (permanent employee with respect to other type of contracts) and (ii) the log of net monthly income from employment, which accounts for both earnings and earnings-related taxes/contributions paid.

One may be concerned that selection effects into platform work bias the estimates from Equations (1) and (2). Put differently, if we find a conditional relationship between platform work and economic insecurity, this may be due to positive selection into platform work among the economically insecure, rather than platform work being the source of economic insecurity.

Thus, we also implement propensity score matching (PSM) that attempts to account for selection effects.[11]

More formally, Y being our variable of interest (need to postpone medical treatment in the last year for financial reasons) and D the dummy for the platform status, equal to one for platform workers (D=1) and zero otherwise, we can define -- using standard notation from Rubin (1974) and Rubin (1977) -- Y^0 to be the outcome (need to postpone medical treatment in the last year for financial reasons) in absence of platform participation, and Y^1 as the outcome under participation, therefore we can call treatment *the participation in platform work* and control the lack thereof. We are interested in $E[Y^1 - Y^0|D=1]$, i.e. the average difference in the 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. However, we cannot directly observe economic insecurity of platform workers in absence of treatment (i.e. lack of platform status). Therefore, we resort to PSM (Rosenbaum and Rubin, 1983) which entails forming matched sets of treated (platform) and untreated subjects (non-platform workers) who share similar characteristics. More in detail, PSM matches each (treated) individual working on a platform with the most similar individual belonging to the (control) group of non-platform workers (untreated). Each pair is identified on the basis of the propensity scores yielded by a Probit regression, which predicts the probability of working on a platform conditioned on a set of observable characteristics.

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).

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[11] Due to the non-random assignment to treatment, the estimations in equation (2) can be biased because the difference in (Y_i^1, Y_i^0) might be correlated with platform status, meaning that economically insecure individuals are more likely to work on digital labour markets.

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.[12]

4. FINDINGS

4.1. Descriptive Findings

We first discuss descriptive findings related to the size and characteristics of platform work in Italy (RQ1). 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 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 9.6 percent of all others), three times as likely to be between age 25-29 (25.6 percent to 7.3 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.

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[12] 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.

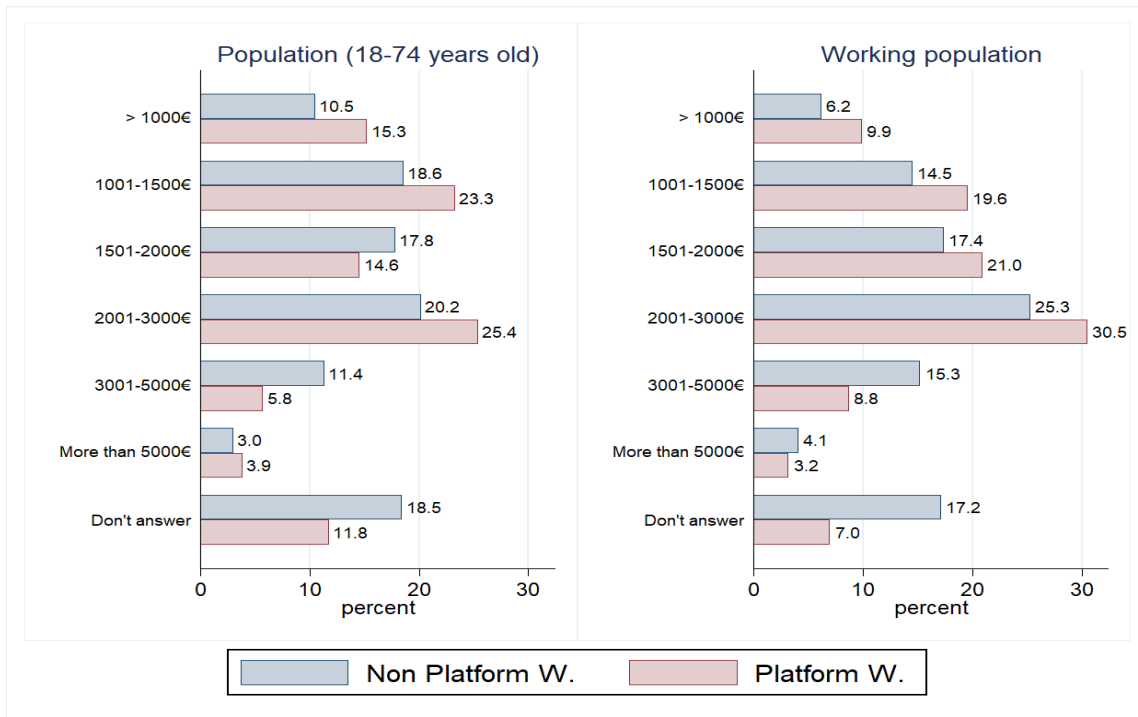**Table 1:** Descriptive statistics by platform status (sample weights applied)

	Working on a platform		Not working on a platform		Difference (Rob.St. Errors)		
	Mean	Sd	Mean	Sd	Coeff	Sd	
Age class (18 - 24)	0.189	0.392	0.096	0.295	0.093	0.034	**
Age class (25 -29)	0.256	0.437	0.073	0.260	0.183	0.046	***
Age class (30 - 39)	0.205	0.405	0.167	0.373	0.038	0.034	
Age class (40 - 49)	0.242	0.429	0.218	0.413	0.024	0.042	
Age class (50 - 64)	0.092	0.289	0.297	0.457	-0.206	0.022	***
Women	0.456	0.499	0.507	0.500	-0.051	0.047	
Living with a partner	0.313	0.465	0.551	0.497	-0.238	0.051	***
Living with children	0.267	0.444	0.237	0.425	0.030	0.052	
Italian	0.976	0.154	0.979	0.144	-0.003	0.010	
Living with people with disabilities	0.093	0.291	0.073	0.261	0.019	0.017	
Elementary school	0.374	0.485	0.426	0.494	-0.052	0.052	
High school	0.468	0.500	0.411	0.492	0.057	0.046	
Degree and post-graduated studies	0.158	0.366	0.163	0.369	-0.005	0.023	
Net work income (log)	1.545	2.904	2.919	3.532	-1.374	0.242	***
Permanent contract	0.263	0.442	0.619	0.486	-0.356	0.051	***
Living in large cities (>250.000)	0.171	0.377	0.131	0.337	0.040	0.028	
Number of earners in the household	1.598	0.803	1.715	0.819	-0.117	0.067	*
Bad health	0.027	0.163	0.020	0.138	0.008	0.014	
Living in a property	0.818	0.387	0.884	0.321	-0.066	0.035	*
Employed	0.393	0.490	0.529	0.499	-0.136	0.046	**
Unemployed	0.238	0.427	0.105	0.307	0.133	0.033	***
Retired	0.018	0.134	0.134	0.341	-0.116	0.010	***
Inactive	0.179	0.384	0.172	0.377	0.007	0.048	
Student	0.171	0.377	0.059	0.237	0.112	0.031	***
Less than 1000€	0.153	0.360	0.105	0.307	0.048	0.031	
Family income 1001-1500€	0.233	0.424	0.186	0.389	0.047	0.039	
Family income 1501-2000€	0.146	0.354	0.178	0.383	-0.032	0.027	
Family income 2001-3000€	0.254	0.436	0.202	0.401	0.052	0.051	
Family income 3001-5000€	0.058	0.233	0.114	0.317	-0.056	0.013	***
Family income More than 5000€	0.039	0.194	0.030	0.172	0.008	0.012	
Don't know - don't want to answer	0.118	0.323	0.185	0.388	-0.067	0.025	**
N observations	222		44,778		45,000		

Source: authors' elaboration on PLUS data.

We now provide descriptive evidence on income differences among platform workers and non-platform workers (related to RQ2). Figure 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 average monthly net household income. The blue bars represent

the distribution of non-platform workers among household income bin; the red bars represent the same distribution for platform workers.

Figure 1: Mean Monthly Family Incomes among Platform and non-Platform Workers

The left panel provides results for the entire population of 18-74 year old individuals, while the right panel provides results specifically for the population of working adults. The top row demonstrates that platform workers have a higher likelihood to live in households whose monthly income is less than 1,000 EUR per month relative to non-platform workers. Among all platform workers between ages 18 to 74, 15.3 percent have monthly (household) incomes below this level, compared to 10.5 percent of non-platform workers. Among the working-age population, 9.9 percent of platform workers live in a household whose income is below 1,000 EUR per month, compared to 6.2 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 3,000 EUR/month relative to non-platform workers, and are much less likely

to have incomes between 3,000-5,000 EUR/month or more than 5,000 EUR/month relative to non-platform workers. Among the working-age population, more than half of platform workers live in a household whose average net income is below 2,000 EUR/month, our estimates suggest. In contrast, an estimated 38 percent of non-platform workers are below this benchmark.[13]

We now turn to descriptive evidence of economic insecurity among platform workers relative to others (related to RQ3). This is the first attempt to test whether, in Italy, platform workers tend to face more economic insecurity than the rest of the workforce. Figure 2 provides the unconditional means of insecurity among the full 18-74 year-old population (left panel) and the working population (right panel). Among the 18-74 year-old group, an estimated 35.6 percent of platform workers report that they had to postpone medical treatment for financial reasons. Among platform workers who are currently employed (right panel), the rate is 32.6 percent. In contrast, an estimated 22.7 percent of non-platform workers in the 18-74 year-old group report having to postpone medical treatment for financial reasons, and 19.1 percent among the working population.

Put simply, platform workers face rates of economic insecurity (defined here as postponed medical treatment in the last year for financial reasons) that are more than 10 percentage points higher than all other individuals. In all, around one-third of platform workers face economic insecurity in Italy.

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[13] On average platform workers live in households composed by a lower number of earners; see Figure A2 in the Appendix.
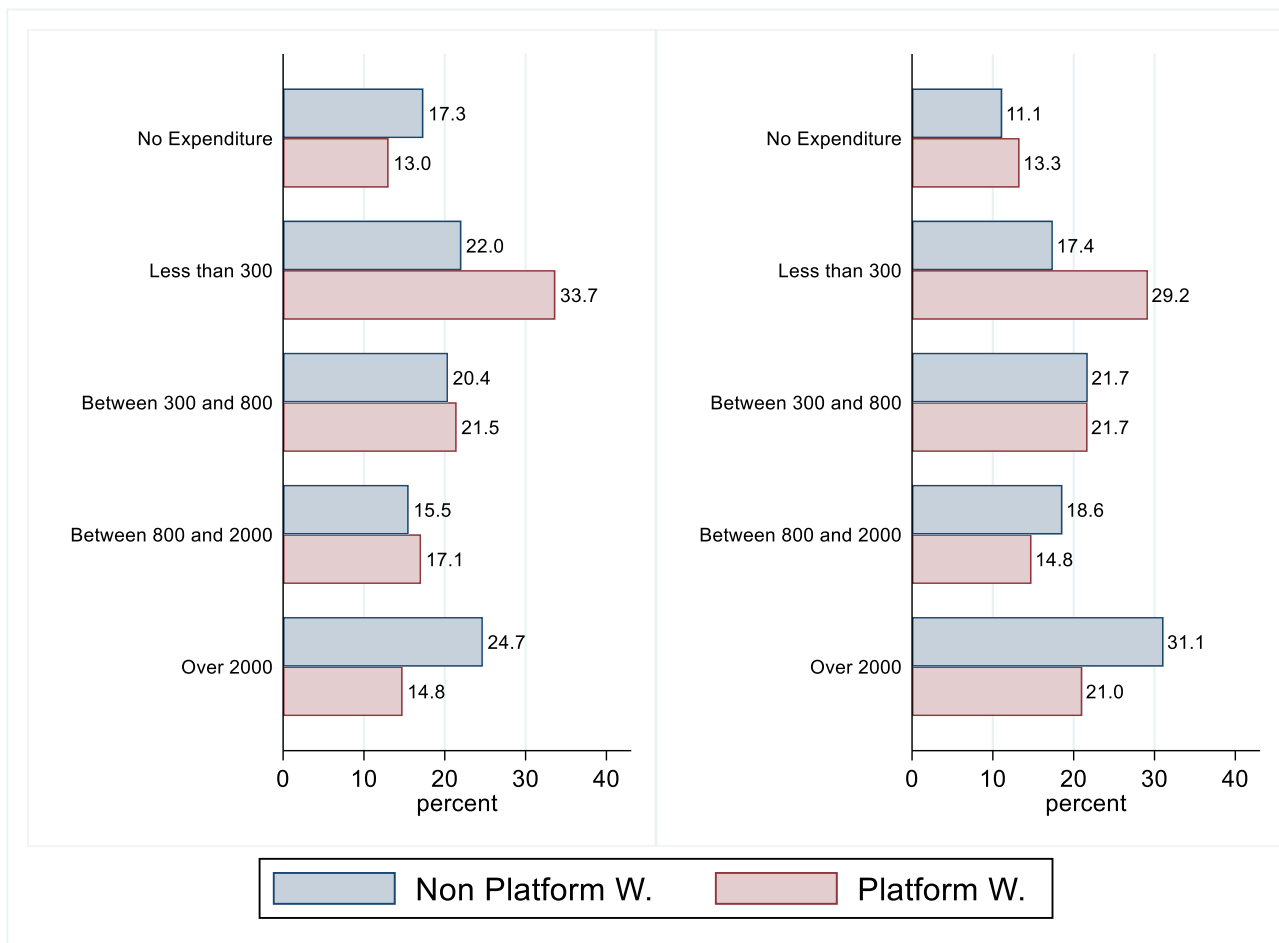
Figure 2: Have you had to postpone medical treatment for financial reasons?
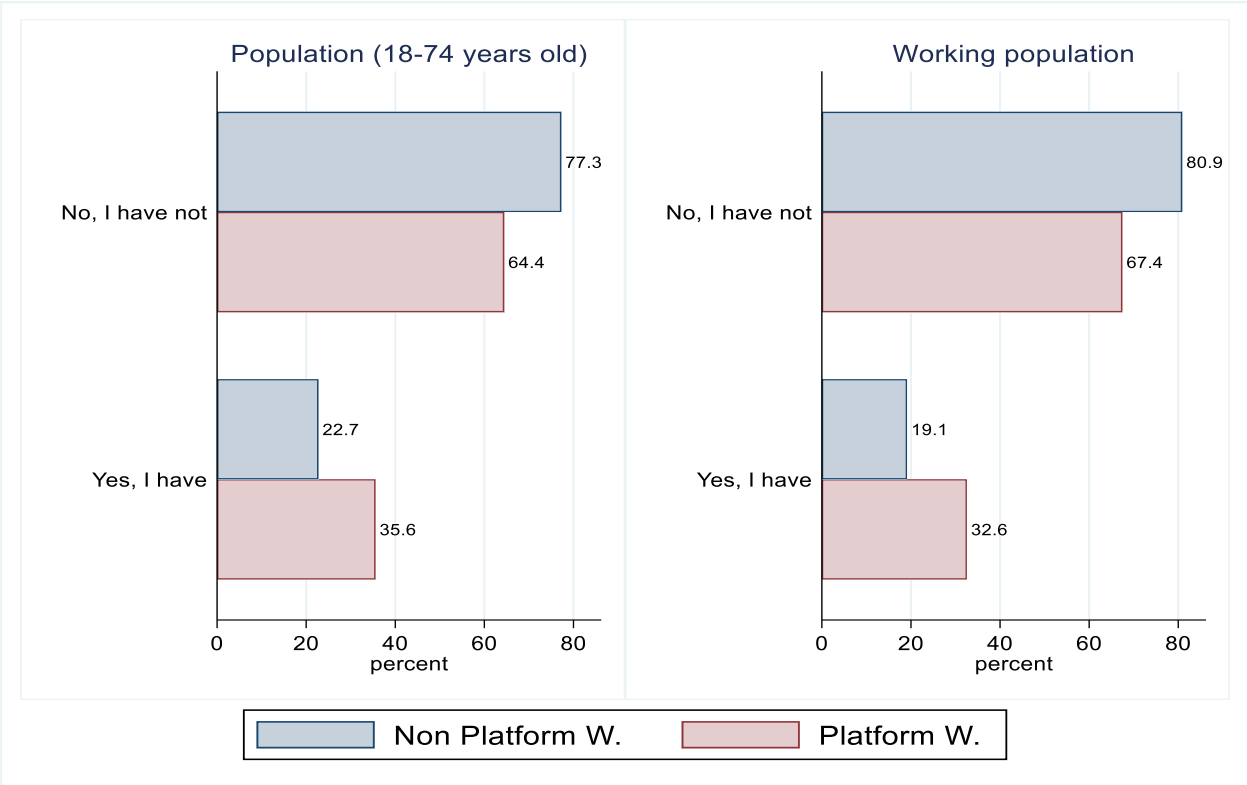
Source: authors' elaboration on PLUS data. Population weights have been applied. Sample size: 45,000 respondents.

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?". Figure 3 highlights that platform workers are overrepresented in the first category (less than 300 EUR). Overall 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 working population: platform workers are overrepresented in the two extremes groups: (i) less than 300 EUR and (ii) no expenditure.

Figure 3: What sudden expenditure would you be able to meet with your own resources, without borrowing money or getting help from other relatives/friends?

Source: authors' elaboration on PLUS data. Population weights have been applied. Sample size: 45,000 respondents.

To further disaggregate rates of economic insecurity across sub-populations, Figure 4 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.

As expected, managers, 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).

In the Appendix we complement this information showing the incidence of employees facing economic insecurity by sector of work allowing us to compare economic insecurity of platform workers with respect to other sector of activity usually characterized by high level of precarization and fragmentation of work (see Figure A1 in the Appendix). Although "platform sector" shows the highest share of individuals facing economic insecurity, higher percentages – above 20% - characterize also those working as domestic helpers, followed by workers in hotels, trade restaurants and real estate type of activities, probably due to the large diffusion of precarious type of contracts.

Figure 4: Economic Insecurity by Occupation Classification (percent) – Share who have postponed medical treatment due to financial reasons by occupational group
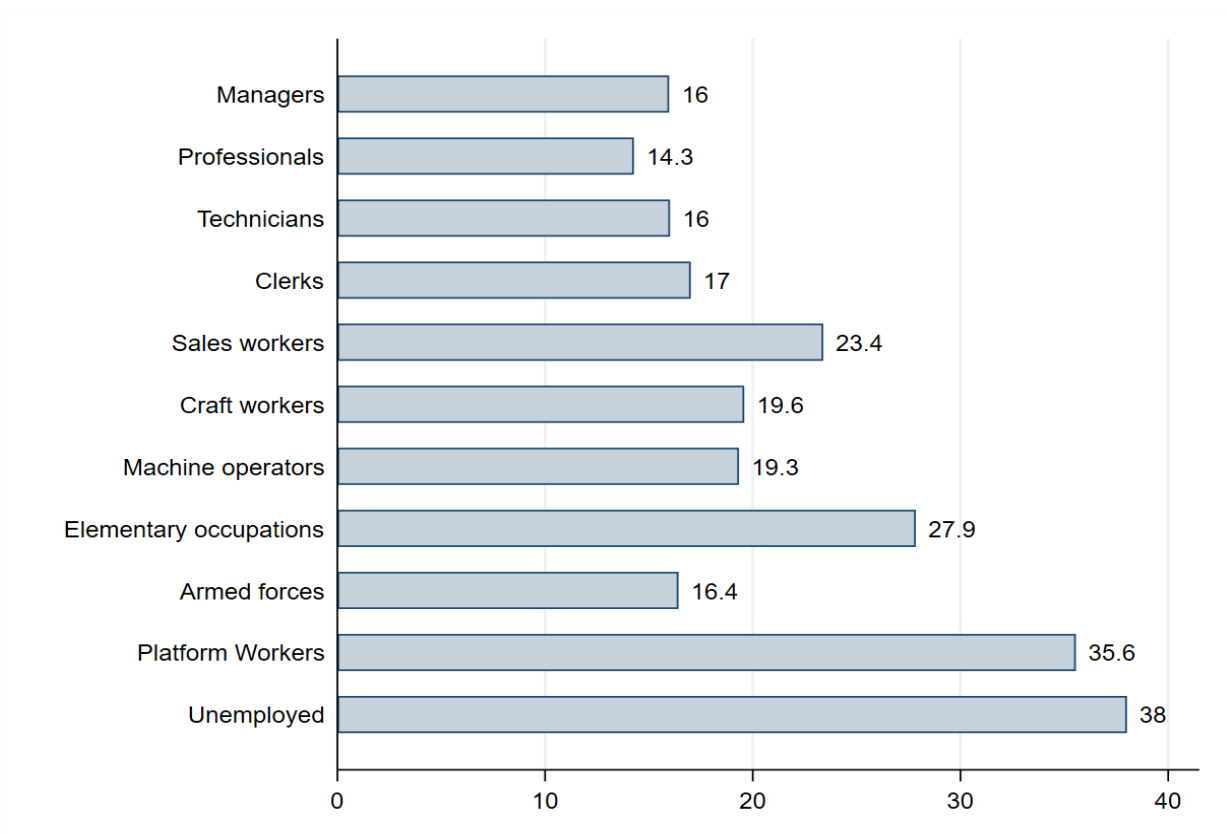
To complement previous evidence, in Figure 5 we show the incidence of our alternative measure of economic insecurity, the amount of sudden expenses the individual can cope without borrowing or help from other relatives/friends, by occupational groups. Considering as economic insecure those individuals able to face up to 800 EUR of sudden expenses, we confirm the comparable patterns from Figure 4.[14] 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.

Figure 5: Economic Insecurity by Occupation Classification (percent) – Inability to deal sudden expenses more than 800 EUR

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[14] As said setting a threshold can be an arbitrary choice in fact each household's need is imperfectly measured by an income or consumption threshold. However, we consider 800 EUR as the amount of money the individual would be able to afford in case of sudden expenses because this is the threshold of poverty for Italy in 2018 (https://www.istat.it/it/dati-analisi-e-prodotti/contenuti-interattivi/soglia-di-poverta).
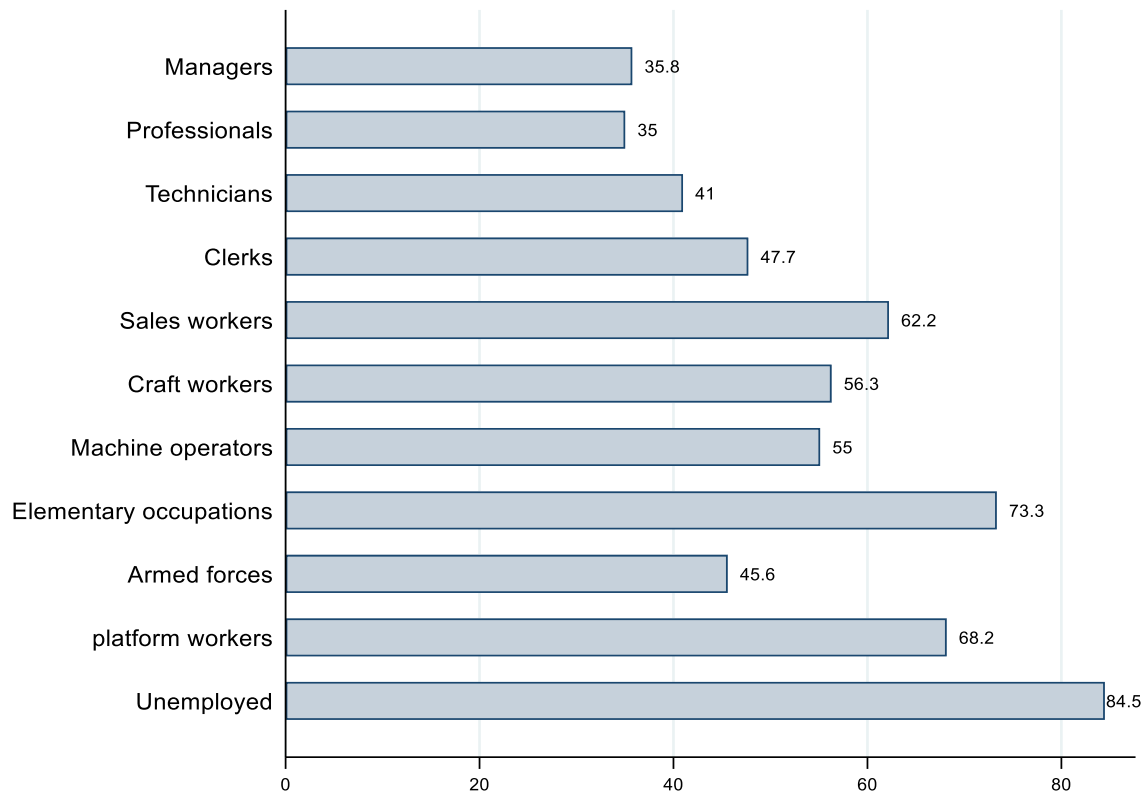
Source: Authors' elaboration on PLUS data. Population weights have been applied. Sample size: 45,000 respondents.

We previously posed the question of where in the occupation distribution platform workers tend to fall with respect to economic insecurity. These descriptive patterns suggest that they belong well at the bottom of the distribution; not only is insecurity more widespread among platform workers relative to all other occupations, but the level of insecurity is essentially no different than that of unemployed adults or very close to that of low paid occupations (if one accounts for the amount of expenses the individual is able to cope).

There may, of course, be many factors influencing these descriptive patterns. Differences in age, education, or health status between platform workers and workers in other types of jobs may contribute to the higher relative rates of insecurity among platform workers. Similarly, selection effects into platform work may bias our findings. To test these possibilities, we now turn toward our econometric analysis.

4.2. Estimation Results

Table 2 presents results from Equation (1) and displays the marginal likelihoods of working in a platform job. Models (1) and (2) look at the full population of 18-74 year old adults, while Models (3) and (4) only look at the employed population. Among the full population, Table 3 largely corroborates what the descriptive statistics suggested: younger adults (25-29 year olds) have a higher likelihood of participating in platform work. Moreover, adults who live alone or who live in a large city are more likely to participate in platform work. In Model (1), there is no statistically significant difference in the likelihood of participating in platform work by sex, nationality, or education. These findings suggest that platform work is not simply restricted to lower-educated men or non-native residents.

When taking family income and self-reported labour market status into account (M2), the findings are mostly stable; however, the conditional likelihood of women participating in platform work does become negative and statistically significant, suggesting that men are slightly more likely to participate in platform work when family income is considered. Again, the results suggest that individuals with family incomes higher than 3,000 EUR/month are less likely to participate in platform work. Moreover, the findings demonstrate that students are particularly likely to participate in platform work.[15]

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[15] This evidence is partly in line with the findings of Urzi Brancati et al. (2020).

Table 2: Marginal effects of probability to be engaged in platform work

	(1)	(2)	(3)	(4)
	All population (18-74 y/o)		Only workers (self-declared)	
Age class (18 - 24)	0.011***	0.009***	0.007**	0.007**
	(0.00)	(0.00)	(0.00)	(0.00)
Age class (25 -29)	0.015***	0.014***	0.011***	0.011***
	(0.00)	(0.00)	(0.00)	(0.00)
Age class (30 - 39)	0.009***	0.009***	0.007**	0.007**
	(0.00)	(0.00)	(0.00)	(0.00)
Age class (40 - 49)	0.009***	0.009***	0.008***	0.008***
	(0.00)	(0.00)	(0.00)	(0.00)
Age class (50 - 64)	0.004	0.004*	0.004	0.004
	(0.00)	(0.00)	(0.00)	(0.00)
Women	-0.001	-0.002*	-0.001	-0.001
	(0.00)	(0.00)	(0.00)	(0.00)
Living with a partner	-0.002**	-0.002*	-0.002	-0.002
	(0.00)	(0.00)	(0.00)	(0.00)
Living with children	0.002	0.002	0.001	0.001
	(0.00)	(0.00)	(0.00)	(0.00)
Italian	0.001	0.001	-0.001	-0.001
	(0.00)	(0.00)	(0.00)	(0.00)
Living with people with disabilities	0.003**	0.002*	0.003	0.002
	(0.00)	(0.00)	(0.00)	(0.00)
High school	-0.001	-0.000	-0.001	-0.001
	(0.00)	(0.00)	(0.00)	(0.00)
Degree and Post-grad studies	-0.002	-0.000	-0.001	-0.000
	(0.00)	(0.00)	(0.00)	(0.00)
Living in large cities (>250.000)	0.002*	0.002*	0.003*	0.003**
	(0.00)	(0.00)	(0.00)	(0.00)
Family income 1001-1500€		-0.000		0.000
		(0.00)		(0.00)
Family income 1501-2000€		-0.002		0.001
		(0.00)		(0.00)
Family income 2001-3000€		0.001		0.001
		(0.00)		(0.00)
Family income 3001-5000€		-0.003**		-0.002
		(0.00)		(0.00)
Family income More than 5000€		-0.000		-0.002
		(0.00)		(0.00)
Don't know - don't want to answer		-0.003**		-0.004*
		(0.00)		(0.00)
Unemployed		0.005***	0.007**	0.007**
		(0.00)	(0.00)	(0.00)
Retired		0.001	0.013*	0.012*
		(0.00)	(0.01)	(0.01)
Inactive		0.004	0.011*	0.011*
		(0.00)	(0.01)	(0.01)
Student		0.006***	0.010**	0.009**
		(0.00)	(0.01)	(0.01)
Net work income (log)			-0.000	-0.000
			(0.00)	(0.00)
Permanent job			-0.003*	-0.003*
			(0.00)	(0.00)
N	45000	45000	21359	21359
Wald chi2(24)	107,61	168,83	290,21	337,58
Prob>chi2	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.0654	0.0873	0.0901	0.1047

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

Similar patterns emerge when focusing specifically on working adults in Models (3) and (4). Among working adults, the 25-29 year old age group is again particularly likely to participate in platform work, as are adults living in large cities. Individuals who have permanent jobs and higher earnings from employment ('net work income') are also less likely to participate in platform work.

In answering RQ1, our results reveal that the composition of platform workers in Italy is a heterogeneous group with respect to sex, education, and native-born status, but is skewed toward younger workers (often students) in high-cost cities in families with lower incomes. In answering RQ2, our results confirm that platform workers in Italy tend to earn less than workers in other jobs, as also demonstrated in Figure 1.

Table 3 returns to the association of platform work and economic insecurity as part of RQ3. Specifically, the results show the marginal effects 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) again look at the full population of 18-74 years old, while Models (3) and (4) only include workers. 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 9.9 percentage point increase in the likelihood of economic insecurity. The remaining characteristics in the model suggest that the likelihood of economic insecurity is also higher for individuals with poorer health, who live with children, who are not Italian, who are women, and who are unemployed or low-educated.

Table 3: Marginal effects of economic insecurity (need to postpone medical treatment in the last year for financial reasons)

	(1)	(2)	(3)	(4)
	All population (18-74 y/o)		Only workers (self-declared)	
Working on a platform	0.099**	0.093**	0.094*	0.085*
	(0.04)	(0.04)	(0.04)	(0.05)
Number of earners in the household	-0.035***	-0.003	-0.041***	-0.003
	(0.00)	(0.00)	(0.01)	(0.01)
Bad health	0.144***	0.133***	0.150***	0.130***
	(0.02)	(0.02)	(0.03)	(0.03)
Living in a property	-0.113***	-0.096***	-0.105***	-0.090***
	(0.01)	(0.01)	(0.01)	(0.01)
Living with children	0.031***	0.037***	0.027**	0.034***
	(0.01)	(0.01)	(0.01)	(0.01)
Living with people with disabilities	0.066***	0.066***	0.071***	0.068***
	(0.01)	(0.01)	(0.01)	(0.01)
Italian	-0.037*	-0.025	-0.025	-0.003
	(0.02)	(0.02)	(0.03)	(0.02)
Age class (18 - 24)	-0.138***	-0.113***	-0.062*	-0.071**
	(0.02)	(0.02)	(0.03)	(0.03)
Age class (25 -29)	-0.029*	-0.016	0.037	0.027
	(0.02)	(0.02)	(0.02)	(0.02)
Age class (30 - 39)	-0.005	0.001	0.045*	0.026
	(0.01)	(0.01)	(0.02)	(0.02)
Age class (40 - 49)	0.007	0.015	0.045*	0.030
	(0.01)	(0.01)	(0.02)	(0.02)
Age class (50 - 64)	0.012	0.021**	0.051**	0.039**
	(0.01)	(0.01)	(0.02)	(0.02)
Women	0.069***	0.060***	0.074***	0.064***
	(0.01)	(0.01)	(0.01)	(0.01)
Living in a couple	0.011	0.032***	0.012	0.033***
	(0.01)	(0.01)	(0.01)	(0.01)
Employed	-0.019	-0.023		
	(0.02)	(0.02)		
Unemployed	0.121***	0.096***		
	(0.02)	(0.02)		
Retired	-0.051*	-0.058**		
	(0.02)	(0.02)		
Inactive	0.037*	0.015		
	(0.02)	(0.02)		
Living in large cities (>250.000)	0.012*	0.015**	0.019**	0.022**
	(0.01)	(0.01)	(0.01)	(0.01)
High school	-0.058***	-0.034***	-0.071***	-0.047***
	(0.01)	(0.01)	(0.01)	(0.01)
Degree and post-graduated studies	-0.127***	-0.085***	-0.137***	-0.093***
	(0.01)	(0.01)	(0.01)	(0.01)
Net work income (log)			0.002	0.000
			(0.00)	(0.00)
Permanent contract			-0.055***	-0.040***
			(0.01)	(0.01)
Family income 1001-1500€		-0.072***		-0.080**
		(0.01)		(0.02)
Family income 1501-2000€		-0.141***		-0.163***
		(0.01)		(0.02)
Family income 2001-3000€		-0.186***		-0.200***
		(0.01)		(0.02)
Family income 3001-5000€		-0.242***		-0.257***
		(0.01)		(0.02)
Family income More than 5000€		-0.275***		-0.307***
		(0.02)		(0.02)

Don't know - don't want to answer		-0.170***		-0.220***
		(0.01)		(0.02)
N	45000	45000	21359	21359
Wald chi2(24)	2349.28	2791.97	643.84	935.03
Prob>chi2	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.0822	0.1027	0.0549	0.0813

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

Model (2) brings in family income. If the economic insecurity were driven primarily though family income, 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 9 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.

Looking exclusively among the employed population (excluding the retired, inactive, and jobless) in Models (3) and (4) renders similar findings. In Model (3), working in a platform job is associated with a 9.4 percentage point increase in the likelihood of economic insecurity. Even after taking family income into account in Model (4), we find that platform work is associated with an 8.5 percentage point increase in the likelihood of insecurity. Thus, even among workers, the negative economic effects associated with platform work appear to extend well beyond income.

Table 4: Marginal effects of economic insecurity (need to postpone medical treatment in the last year for financial reasons) by occupation group (reference group = platform workers)

	(1)	(2)
	All population (18-74 years old)	
Managers	-0.226***	-0.191***
	(0.05)	(0.05)
Professionals	-0.217***	-0.179***
	(0.05)	(0.05)
Technicians	-0.220***	-0.185***
	(0.05)	(0.05)
Clerks	-0.229***	-0.200***
	(0.05)	(0.05)
Sales workers	-0.188***	-0.174***
	(0.05)	(0.05)
Craft workers	-0.213***	-0.195***
	(0.05)	(0.05)
Machine operators	-0.208***	-0.185***
	(0.05)	(0.05)
Elementary occupations	-0.162**	-0.160**
	(0.05)	(0.05)
Armed forces	-0.223**	-0.185**
	(0.07)	(0.07)
Unemployed	**-0.054**	**-0.050**
	(0.05)	**(0.05)**
Number of earners in the household	-0.035***	-0.001
	(0.01)	(0.01)
Bad health	0.147***	0.129***
	(0.03)	(0.03)
Living in a property	-0.115***	-0.103***
	(0.01)	(0.01)
Living with children	0.027**	0.033***
	(0.01)	(0.01)
Living with people with disabilities	0.063***	0.059***
	(0.01)	(0.01)
Italian	-0.020	-0.007
	(0.02)	(0.02)
Age class (18 - 24)	-0.131***	-0.126***
	(0.03)	(0.03)
Age class (25 -29)	-0.012	-0.017
	(0.02)	(0.02)
Age class (30 - 39)	0.011	-0.001
	(0.02)	(0.02)
Age class (40 - 49)	0.013	0.003
	(0.02)	(0.02)
Age class (50 - 64)	0.016	0.007
	(0.02)	(0.02)
Women	0.076***	0.069***
	(0.01)	(0.01)
Living with a partner	0.020*	0.039***
	(0.01)	(0.01)
Retired	0.010	-0.000
	(0.17)	(0.17)
Inactive	-0.047	-0.037
	(0.12)	(0.11)
Student	-0.241***	-0.213**
	(0.07)	(0.07)
Living in large cities (>250.000)	0.016	0.018*

	(0.01)	(0.01)
High school	-0.050***	-0.037***
	(0.01)	(0.01)
Degree and post-graduate studies	-0.117***	-0.091***
	(0.01)	(0.01)
Family income 1001-1500€		-0.061***
		(0.02)
Family income 1501-2000€		-0.132***
		(0.02)
Family income 2001-3000€		-0.177***
		(0.02)
Family income 3001-5000€		-0.229***
		(0.02)
Family income More than 5000€		-0.281***
		(0.02)
Don't know - don't want to answer		-0.182***
		(0.02)
Number of obs	26.403	26,403
Wald chi2(35)	1547.69	1865.67
Prob > chi2	0.0000	0.0000
Pseudo R2	0.0826	0.1036
Significance level: * p<0.10, ** p<0.05, *** p<0.01		
Base categories: Platform Workers; More than 64 years old; Elementary and no title of education; Less than 1000 euro		

Table 4 now expands the results to look at the relative likelihood of insecurity by broad occupation groups. Similar to Figure 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. In Table 4, 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.

Model (1) presents results without family income controls. 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). Managers, for example, face a conditional likelihood of insecurity that is 22.6 percentage points lower than that of platform workers. 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.

Model (2) again brings family income into consideration. As before, accounting for family income slightly reduces the magnitude of most the occupation coefficients, but all remain negative and statistically significant. The unemployed coefficient remains negative but insignificant. Thus, even after taking family income into account, platform work is associated with levels of economic insecurity comparable to the effect of being unemployed.

Figure 4 presents the results visually and summarizes the key findings. The coefficients and their confidence intervals are plotted for each occupation grouping in relation to platform workers. 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. As Figure 4 visualizes, however, there is little differences for the unemployed and platform workers.

Figure 4: Marginal effects of economic insecurity (postponed medical treatment for financial reasons) with respect to Platform Workers
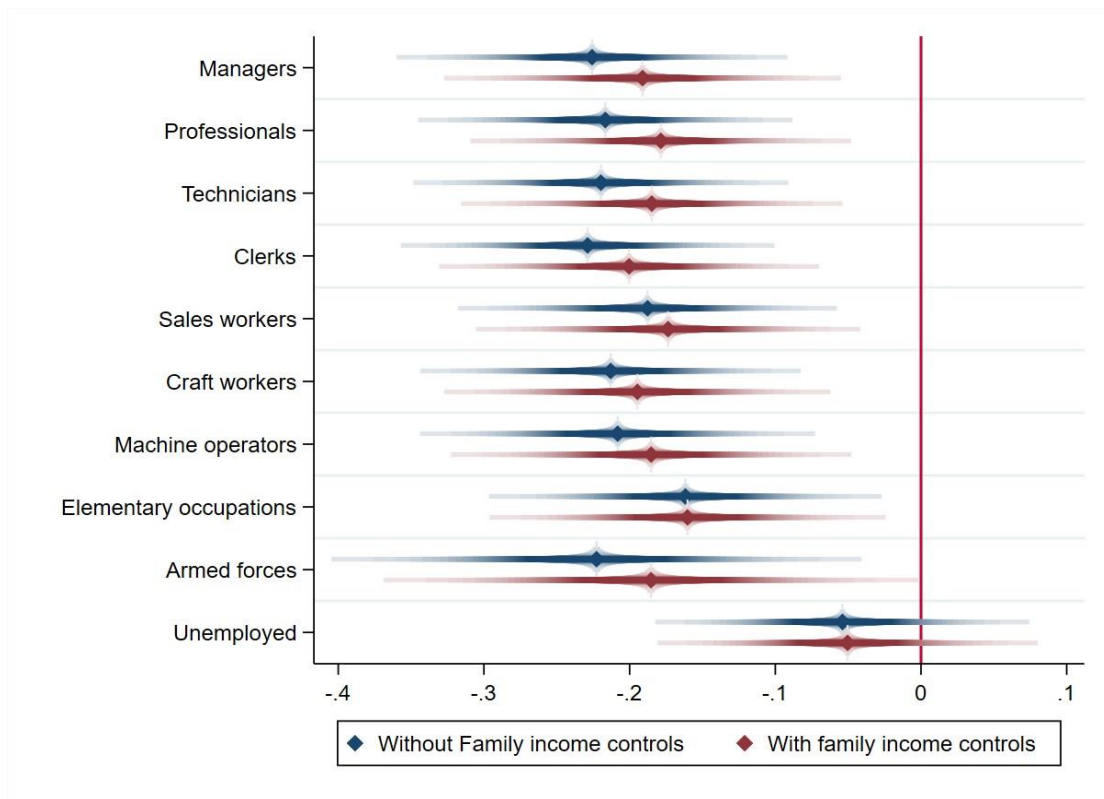
Source: authors' elaboration on PLUS data. Population weights have been applied. Sample size: 45,000 respondents.

4.3. Robustness check and 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'.[16] 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.

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[16] 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.

As discussed, the PSM allows us to control for the presence of confounding factors by comparing individuals that are as similar as possible with respect to a selected set of characteristics (Becker and Ichino, 2002). 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.[17] Table 5 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 5: 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)	0,1643	0,0309	5,31	0,000	0,1036	0,2250
PO mean							
	Working on a platform						
	0	0,2050	0,0073	27,91	0,000	0,1906	0,2194

Table 5 confirms main results shown in Table 3. 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

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[17] See Figure A4 in the Appendix for the distribution of the pscore on treated and controls and Table A1 for descriptive statistics of covariates for the two groups before matching. Furthermore, we test the balance of covariates after matching by implementing the test proposed in Imai and Ratkovic (2014) and we cannot reject the null that IPW model/weights balance covariates.

probability of economic insecurity than non-platform workers. The chance of facing income vulnerability of platform workers is about 16 percentage points higher than that of non-platform workers.[18]

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 1,500 EUR per month and zero otherwise, we estimate an average treatment effects on the treated of 0.14. The chance of facing income vulnerability of platform workers is thus 14 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 channeled through lower earnings.

5. DISCUSSION & CONCLUSION

Well before the onset of the COVID-19 pandemic, many European labor markets were becoming increasingly fragmented (Green and Livanos, 2017). The declining share of workers with permanent contrasts, 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 size, composition, and working conditions of individuals in platform work. Given that standard labour force surveys have struggled to identify adults engaged in platform work, many scholars have turned to web-based

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[18] 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 14 and 17 percentage points.

and/or non-probability sampling techniques to specifically target individuals engaged in platform work (O'Farrell and Montagnier, 2020). While these surveys have proved useful, they carry their own set of limitations related to selection effects, representativeness, and inability to make within-sample comparisons of economic well-being across a broad range of occupation groups. This study, in contrast, employs representative survey data from Italy to provide a more detailed comparison of the economic insecurity of platform workers relative to other occupations.

Our findings produce three broad conclusions with several implications for the broader literature on the platform economy and economic well-being among employed adults. First, our findings corroborate evidence from INPS (2018) that platform work remains relatively small in Italy. Around 0.5 percent of Italians between the ages of 18 and 76 provided work or direct services (e.g., food delivery, taxi rides, or similar) through a platform or phone application in 2018. Platform workers tend to be students and of younger age, but are more diverse with respect to sex, educational attainment, and native-born status. Platform workers are also more prevalent in cities, where demand for their services is higher and more concentrated.

Second, we are able to quantify the relative income disadvantages of individuals engaged in platform work in Italy. Specifically, we find that about 15% of platform workers have net family incomes below 1,000 EUR per month; in contrast, the share is 10% for non-platform workers, including the unemployed.

Third, and most important, we find that economic insecurity among platform workers is greater than in all other occupation groups and, strikingly, is not significantly different from that of unemployed adults. Moreover, we find that the higher levels of insecurity are not primarily channeled 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. Our findings hold under propensity score matching techniques that attempt to account for selection into platform work.

Our findings carry important consequences for our understandings of the intensity and source of economic challenges of individuals engaged in platform work both in general and, more specifically, for the Italian case. While it is generally understood that platform workers face more disadvantage, our study is able to quantify the levels of these disparities in one high-income country and, equally important, identify that disparities in economic insecurity are not solely a product of having lower incomes. 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 claims directly in our analyses.

Our findings correspond with evidence from the broader labour 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 (among 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.

The Italian labour market includes a non-negligible share of young, non-standard and precarious workers facing higher employment, income and safety risks compared to the rest of the workforce (Cetrulo et al. 2021). Because of the lack of recognition of their status as workers, the absence of protections, and the unique organizational conditions to which they are exposed, platform workers appear to be the most fragile within this group of already vulnerable

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individuals. Alongside targeted measures, which have proven to be scarcely effective so far, the condition of these workers could probably be improved if, as it is currently under discussion at the Government level the Italian social protection system is strengthened, with particular reference to income support instruments in favour of autonomous and non-standard workers (Guarascio, 2021). We note that we cannot directly test the external validity of our results beyond the Italian context; it may be that in countries with more inclusive welfare states and more general social assistance benefits, the size, composition, and economic insecurity of platform workers is different than in Italy.

Our study does have limitations. First, like many in the labour market literature, we focus on a single country. Often in single-country studies, scholars investigate conditions in the United States; we instead focus on Italy due to its higher-quality, representative survey data inclusive of platform workers. As with all single-country studies, however, external validity is not assured, as noted above. 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. Second, our data only feature two measures of economic insecurity. Future work would benefit from a broader suite of economic insecurity measures. Future studies would also benefit from the use of longitudinal panel data to investigate whether our findings hold when evaluating changes in employment status among the same individuals over time.

Moreover, advancing from single-country to cross-country comparisons may provide more insight how national welfare state and labour market institutions affect patterns of well-being among platform workers. Additionally, the integration of indicators relating to platform work into broader, cross-national surveys, such as the EU Labour Force Survey, would more readily enable reliable, cross-national comparisons. Investigating heterogeneity in the

composition of platform workers, meanwhile, is a worthwhile pursuit in future research given findings from Schor et al (2020) and others.

Despite these limitations, our evidence reveals that the levels of economic insecurity among platform workers remain high in Italy, and that the insecurity is not driven solely through income disparities. Insofar as the platform economy continues to expand, our findings portend widen disparities between labour market insiders and outsiders.

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APPENDIX

Figure A1. Economic Insecurity by Sector of activity (percent): "Have you had to postpone medical treatment for financial reasons last year?"
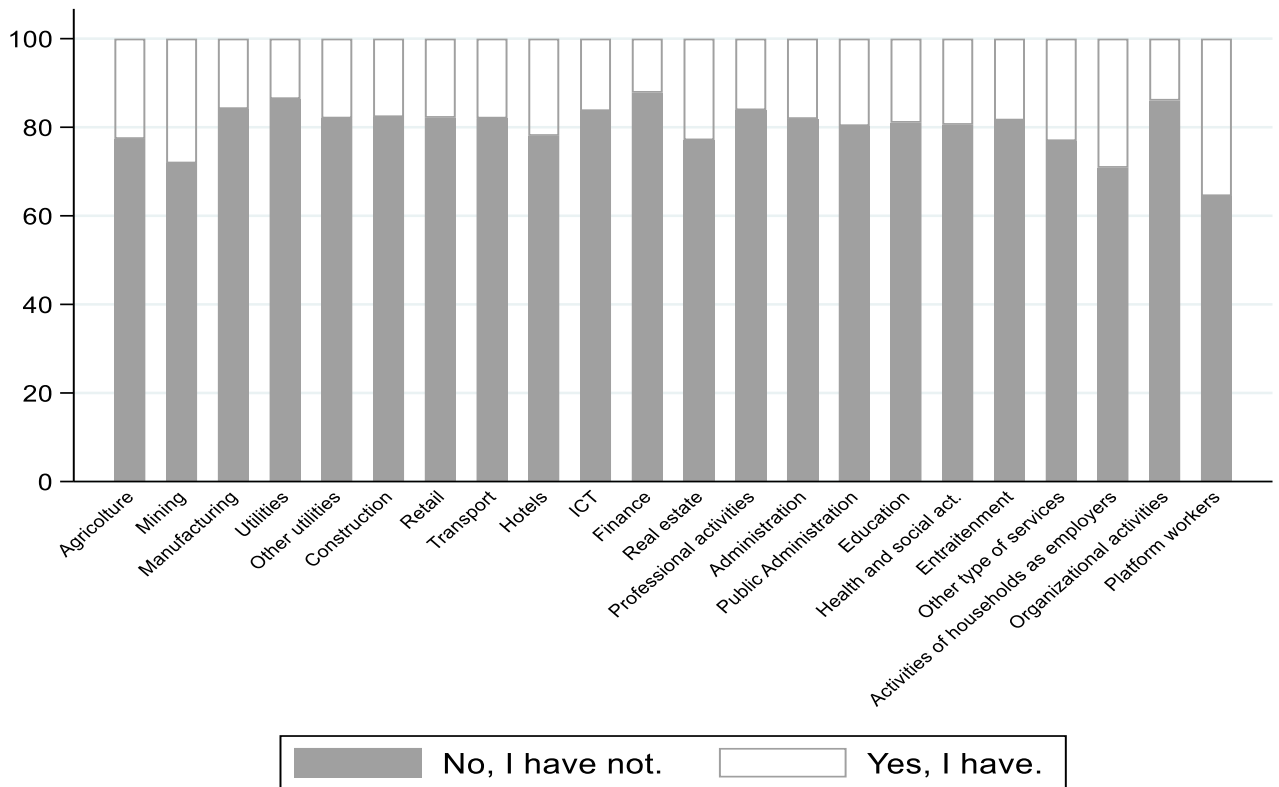
Figure A2. Average number of earners per household
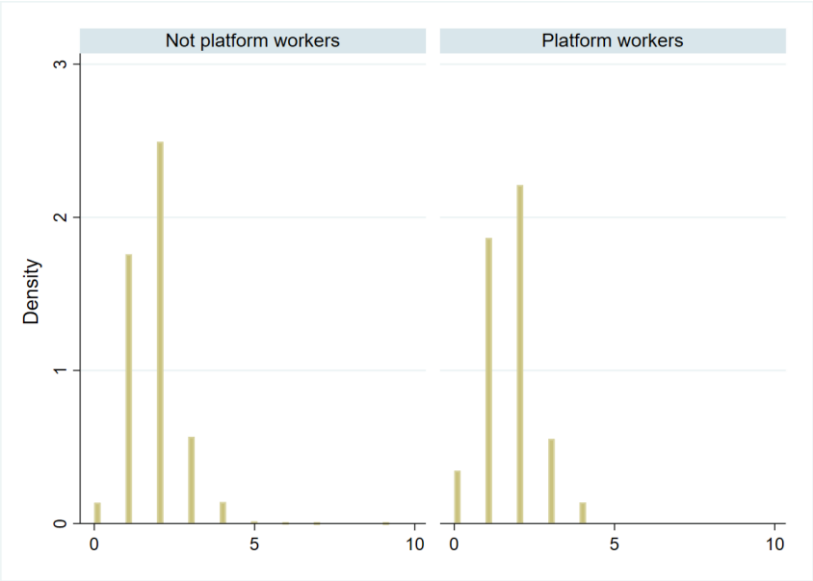
Figure A3: Distribution of the propensity score before matching

Kernel density estimate

kernel = epanechnikov, bandwidth = 0.0200
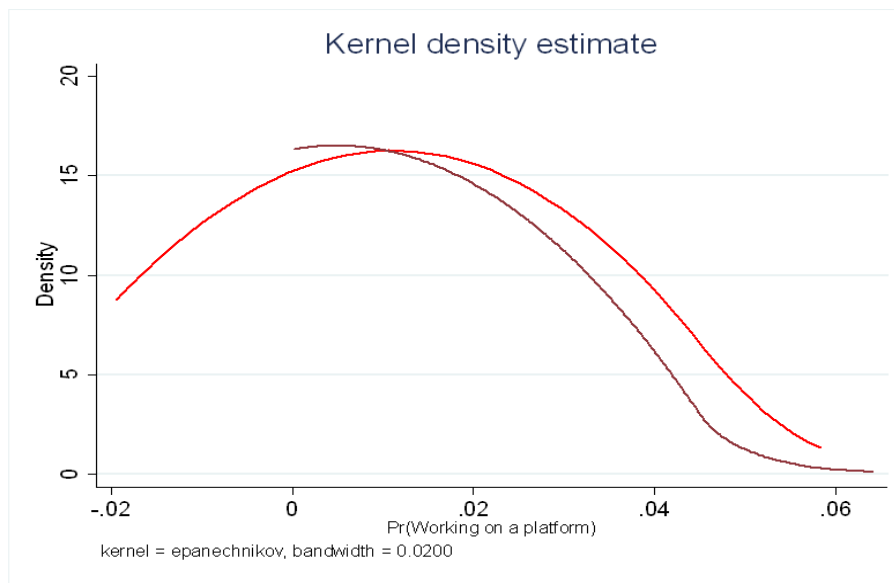
Table A1: Summary statistics of covariates for matched samples (common support) weighted by the propensity score

Variables	Non platform workers			Platform workers		
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
Age class (18 - 24)	42098	0,0831	0,2761	222	0,082	0,275
Age class (25 -29)	42098	0,103	0,304	222	0,1176	0,3228
Age class (30 - 39)	42098	0,1589	0,3656	222	0,1388	0,3465
Age class (40 - 49)	42098	0,1837	0,3872	222	0,1844	0,3887
Age class (50 - 64)	42098	0,3357	0,4722	222	0,3152	0,4656
Living in a couple	42098	0,548	0,4976	222	0,5407	0,4994
Living with people with disabilities	42098	0,0815	0,2736	222	0,0589	0,2359
Living in large cities (>250.000)	42098	0,1526	0,3596	222	0,1793	0,3845
Women	42098	0,5285	0,4991	222	0,5029	0,5011
Employed	42098	0,4595	0,498	222	0,403	0,4916

Figure A4: Distribution of the propensity score after matching
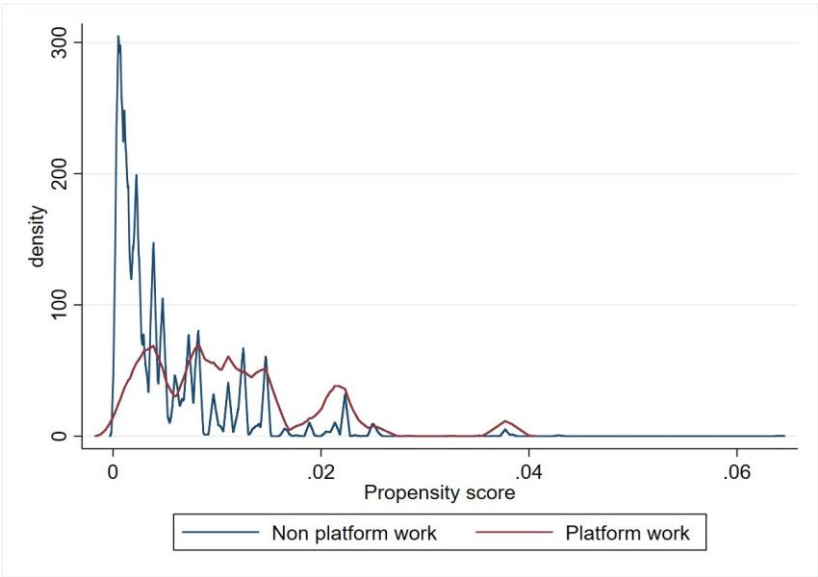
Table A2: Treatment-effects estimation

(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	0,2026	0,1668	0,0271	6,16
	ATT	0,3694	0,2207	**0,1486**	0,0428	3,47

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	0,2026	0,1668	0,0271	6,16
	ATT	0,3791	0,2227	**0,1564**	0,0441	3,55

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	0,2026	0,1668	0,0271	6,16
	ATT	0,3694	0,2207	**0,1486**	0,0428	3,47

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	0,2026	0,1668	0,0271	6,16
	ATT	0,3791	0,2227	**0,1564**	0,0441	3,55

Propensity score matching (common non replacement radius caliper)						
Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Postpone medical treatment in the last year for financial reasons	Unmatched	0,3694	0,2026	0,1668	0,0271	6,16
	ATT	0,3694	0,2026	**0,1668**	0,0325	5,13

Propensity score matching (common non replacement radius caliper with trimming)						
Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Postpone medical treatment in the last year for financial reasons	Unmatched	0,3694	0,2026	0,1668	0,0271	6,16
	ATT	0,3791	0,2026	**0,1766**	0,0335	5,27

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