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PRECARIOUSNESS IN EMPLOYMENT MEDIATED
BY DIGITAL PLATFORMS. EVIDENCE FROM EUROPE

*PRECARIEDAD EN EL EMPLEO MEDIADO POR
PLATAFORMAS DIGITALES. EVIDENCIAS DE EUROPA*

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ABSTRACT

Is precarity inherent to employment when it is mediated by a digital platform, or does employment precarity have other causes? Using the first wave of the European survey on collaborative economy and employment (COLLEEM, hereinafter), we identify different types of precarity among platform workers by using different operationalizations of this phenomenon. Our results indicate that i) the probability of precarity in on-demand platform work varies according to the type of employment and to certain sociodemographic characteristics; ii) findings are sensitive to the dimension of precarity that we address; and iii) self-employed individuals and those workers who access digital platform jobs as last resort have a more positive perception of working conditions in the sector than salaried employees and those whose reason for entry was not the lack of alternative employment. The study provides guidelines for the effective design of mitigation policies to protect workers in the digitalized EU labour market.

Keywords: Platforms, gig economy, precarity, contingent work, self-employment, underemployment.

RESUMEN

¿Es la precariedad una característica inherente al empleo mediado por plataformas digitales u obedece a otras causas? Utilizando la primera oleada de la Encuesta Europea sobre Economía Colaborativa y Empleo (COLLEEM, en adelante), este trabajo identifica los empleos precarios en plataformas

mediante diferentes operacionalizaciones de este fenómeno. Nuestros resultados indican que i) la probabilidad de encontrarse en situación de precariedad en el empleo bajo demanda varía según el tipo de empleo y ciertas características sociodemográficas; ii) los hallazgos son sensibles a la dimensión de precariedad que consideremos; y iii) los trabajadores autónomos y aquellos que acceden a empleos en plataformas digitales como último recurso tienen una percepción más positiva de las condiciones laborales en el sector que los empleados asalariados y aquellos cuya razón de ingreso no fue la falta de empleo alternativo. El estudio proporciona pautas para el diseño efectivo de políticas de mitigación orientadas a proteger a los trabajadores en el mercado laboral digitalizado de la UE.

Palabras clave: Plataformas; economía colaborativa; precariedad; trabajo contingente; trabajo autónomo; subempleo.

JEL Classification / Clasificación JEL: J08 J23 J81 D20 O35.

1. INTRODUCTION

The chronification of underemployment after the Great Recession (Bell and Blanchflower 2017, 2018; Borowczyk-Martins and Lalé 2020, Valleta et al. 2020, Congregado et al. 2024) and the progressive substitution of regular employer-employee relationships into contractual relationships (Drahokoupil and Fabo 2018) are two of the most salient features of today's labour markets. Some scholars associate the upsurge of gig work with the resurgence of precarious work¹ (Abraham et al. 2017; Stanford 2017; Coyle 2017; Montgomery and Baglioni 2020; Kilhoffer et al. 2020), and others argue that the penetration of platform-mediated labour has been particularly intense in countries where employment protection legislation is more stringent (Fabo et al. 2017; Congregado et al. 2019). From this perspective, employers would have found, in on-demand digital work, a way to evade some elements of labour legislation and devise more flexible forms of employment, including dependent forms of self-employment (Muehlberger 2007; Eichhorst et al. 2013; Roman et al. 2013; Stewart and Stanford 2017; Graham et al. 2017). As a result, the power imbalance in the relationship between platforms and digital workers, which is inherent in the very architecture of platforms, has called into question the effectiveness of labour legislation, while it is seen as eroding social contracts and workers' rights (De Stefano and Aloisi 2019).

However, we cannot ignore that platform-mediated employment has also fostered the emergence of new forms of employment that cannot be linked to precarity. These new forms include those professionals and *freelancers* whom digital platforms have allowed to expand their client network or become a hybrid entrepreneur, combining his/her salaried job with a second job as a self-employed worker (Kenney and Zysman 2016; Malo 2018; Kässi and Lehdonvirta 2018).

In the same way, we cannot ignore the fact that the perception of precarity depends on the starting situation. For some platform workers, the decision to participate is a voluntary decision, which they value more highly than those who

1 Although there is no consensus definition on the concept and dimensions of precariousness, the conventional wisdom considers that the insufficiency of income and employment instability are the two vectors that determine the precariousness of a job (Kalleberg, 2009, 2011; Olsthoorn, 2014). On this basis, with the term precariousness, in this study, we refer not only to the overlap of uncertainty, instability and underemployment, but also to the development of forms of dependent self-employment. Section 2.2. present a more detailed discussion about this concept.

have previously held regular jobs. These platform workers include those who have accessed platform-mediated employment out of necessity because their low employability meant that they did not receive employment opportunities in the conventional labour market and for whom platform employment became the only way to leave unemployment or inactivity.

Thus, we would argue that previous research seems to have overlooked the differences between different types of digital platform workers. Professionals, hybrid entrepreneurs and people with low employability who decide to become platform workers due to the lack of job opportunities in the traditional labour market belong to a distinct group that could exhibit different perceptions about the pros- and cons- of the on-demand work offered on digital platforms. This heterogeneity suggests that precarity, in its different manifestations, may not be a phenomenon that occurs simultaneously with the fact that the match between provider and job seeker is carried out through a platform. Rather, it may be associated with the prevalence of certain employment sectors and activities that predominate on platforms² and with the population groups with lower employability that accept such on-demand jobs as a last resort, even when these positions are unstable, hinder them from reaching certain salary standards, or prevent them from having sufficient coverage by employment protection legislation (Amuedo- Dorantes 2000; Vosko et al. 2010).

Research on the precarity in digital platform work should thus deepen the identification of the existing heterogeneity mentioned above because of two important reasons. It is important to combat practices that inhibit the effects of labour legislation, and it is equally important that the policies against precarious forms of employment on digital platforms do not become an obstacle to the articulation of flexible forms of professional employment or to access to the labour market for groups with lower labour participation rates and greater risk of exclusion.

Contributing to a better understanding of precarity in the platform economy seems crucial to improve the accuracy of the so-called mitigation policies, i.e., the effectiveness of those measures aimed at protecting this sensitive group of workers. However, the number of related empirical studies has been rather low to date, despite this topic being a hot political issue. The multifaceted nature of precarity (Bell and Blanchard 2013, 2018; Borowczyk-Martins and Lalé 2020; Valletta et al. 2020; Roman et al. 2011; Williams and Horodnic 2018; Pantea 2021), the heterogeneity of situations involved in digital platform work (Pesole et al. 2018; Congregado et al. 2019, 2022; Brancati et al. 2020), the lack of a satellite account for measuring the digital economy (Ahmad & Ribarsky, 2019) and, ultimately, the lack of reliable data are seen as probable causes of this research gap (Huws et al. 2017, 2019; Pesole et al. 2018; Congregado et al. 2019; Brancati et al. 2020). Furthermore, most studies focus on a single

2 Currently, platform-mediated employment has nearly monopolized some activities, e.g., “delivery”, where temporary contracts, subcontracting, forms of dependent self-employment and fixed-term contracts are common practices

country or are based on semistructured interviews among stakeholders or platform workers (e.g., Kilhoffer et al. 2020; Schor et al. 2020). However, to the best of our knowledge, an empirical analysis that characterizes the precarity in on-demand platform work in a comparable cross-country setting does not exist to date.

Filling this research gap is precisely the main aim of this article, shedding some new light on the precarity in platform work by using alternative operationalizations of the underemployment concept. Our main hypothesis is that platform-mediated employment is heterogeneous, and underemployment is not intrinsic to it but rather is confined to certain types of employment where the workforce is more abundant and less qualified.

In doing so, we perform a cross-country analysis of the precarity in on-demand platform work with European data. Europe is a suitable case study because European authorities have carried out direct interventions to prevent the incorrect use of nonconventional working arrangements in digital platform work to evade employment protection legislation. Furthermore, European countries are those with more regulated labour markets and in which these types of practices are more prevalent than in other countries where flexibility and rotation are common features of traditional contractual relationships.

Finally, although it would be interesting to apply this type of comparative analysis to a larger number of countries, as it would allow us to analyse the effects of the penetration of this type of labour relation in different institutional frameworks, there is no internationally comparable database other than the one used in this paper—the COLLEEM—and the one constructed by Huws et al. (2017, 2019). The advantages of the sampling design in COLLEEM make it preferable for use to the database constructed by Huws et al. (Kilhoffer, 2021).

The present paper relates to two types of literature. Firstly, to the general literature on the determinants of precarity. (Büchtemany and Quack 1990; Kretsos and Livanos 2016). Secondly, to the literature on platform labour (Drahokoupil and Piasna 2017; Malo 2018; Congregado et al. 2019; Bogliacino et al. 2019).

In this context, our paper contributes to the emerging field within the labour economics literature focusing on precarity in digital platforms, being one of the few contributions examining precarity on digital work platforms with empirical data. In contrast to fragmentary or partial approaches, here, precarity is addressed as a multidimensional phenomenon, comprising job instability, underemployment, the perception of protection, rights and bargaining power. Some of these terms are alternative demarcation criteria defining precarity. Finally, our results should also assess whether further EU action on platform work is merited or whether some elements should be rethought.

The remainder of the article is structured as follows. In Section 2, we conduct a brief literature review to establish the potential links between the emergence of all atypical work models associated with digital labour platforms. Chronic underemployment situations and the loss of workers' autonomy and rights are analysed as the main outcomes of platform work precarity. We also

derive hypotheses regarding the integration of work and precarity into the platform. We then test these hypotheses using the data from *COLLEEM*. After justifying the use of this source of data, the variables that we employ from it and the methods applied are discussed in Section 3. Section 4 describes the empirical results, and finally, Section 5 summarizes the main conclusions and limitations and provides an outlook for further developments.

2. RELATED LITERATURE

In this section, we try to determine the intersections between the attempts to characterize nonstandard forms of employment on digital platforms and to discuss how the phenomenon of precarity has been defined in the previous literature. Accordingly, this review provides us with the opportunity to effectively frame our analysis.

2.1. WORK MEDIATED BY DIGITAL PLATFORMS

Employment mediated by digital platforms refers to the provision of services where both employer–employee matching and payment are carried out through a digital platform. Here, a digital platform is specifically commissioned to mediate between the solicitor of a service and the platform worker. In addition, it fulfils this role regardless of how a service is provided—*online, on location or mixed*—or whether a salient employment activity is part-time or occasional or if, in contrast, it constitutes an employee’s principal activity. While this definition suits so-called *crowd workers* (Lepanjuuri et al. 2018), some researchers prefer to reserve the term *crowd work* for jobs that are completely *online or location independent* (De Stefano 2016), using *gig work* to refer to activities that are provided in person (Brancati et al. 2020).³

However, regardless of the tradable nature of a service, workers whose services are mediated through digital platforms clearly constitute an extremely heterogeneous group with variations in the following: their specializations and required qualifications (De Groen et al. 2017); their motivations, e.g., flexibility, work-life balance or lack of opportunities; their level of dedication or intensity of employment (Pesole et al. 2018); or their particular work situation (Todoli-Signes 2017).

These platforms have shaped a new unit of division of labour, i.e., the task, which has contributed to the *outsourcing* of numerous processes to make demand more flexible and to avoid signalling problems with productivity, reducing many costs associated with the protection of regular employment (Larsson and Teigland, 2020).

As a result, there has been a profound change in the labour relations system and the generalization of certain forms of precarity. On the one hand,

3 For more on these terminological issues, see O’Farrell and Montagnier (2019); or Koutsimpogiorgos et al. (2020), among others.

the generalization of false self-employment (Drahokoupil and Fabo 2016), the replacement of traditional labour relations by atypical forms of employment and the use of these to avoid rigidities and costs due to labour legislation (Standford 2017) are at the centre of the debate on the value of these new forms of (nonstandard) employment. On the other hand, digital platforms have led to forms of precarity that are associated with uncertainty and job instability due to the very nature of these jobs/tasks (Webster 2016; Kuhn and Maleki 2017; Lehdonvirta 2018; Berg and Rani 2018; Sutherland et al. 2019; Schor et al. 2020).

In short, although the growing importance of platform-mediated employment can be understood in a more general context of decreased transaction costs for employers via the fragmentation of tasks and activities, the disruption it produces changes the costs and risks for different actors in the labour market. Thus, this process has increased the transaction costs for workers, who have to acquire skills and invest time in their search process. Furthermore, as the bulk of the employment mediated by these digital work platforms has been associated with activities that require low skill levels, these jobs have been carried out by less specialized groups of workers, whose potential for substitution is greater. For these less-skilled workers, platform-mediated employment has therefore entailed a loss of bargaining power and, to a large extent, a loss of the protections that certain labour market institutions grant to traditional forms of employment (Drahokoupil and Piasna 2017).

Accordingly, a solid characterization of the phenomenon of precarity in work mediated by digital platforms is needed to guide the search for and design of corrective instruments, given that such analyses are scarce, incomplete, and limited to national contexts. This literature is reviewed in the following section.

2.2. THE DIFFERENT DIMENSIONS OF PRECARITY

Precarity is a multidimensional concept associated with jobs where uncertainty, instability⁴ and other conditions place a worker in a situation of vulnerability (Rodgers and Rodgers 1989; Kalleberg 2009). This includes any manifestation of the phenomenon of underemployment (Feldman 1996), situations in which a worker's bargaining power or level of work protection is below those that accompany a traditional job (García-Pérez et al. 2020) or cases where salaried employment is disguised as (dependent) self-employment (Roman et al. 2011).

Precarity is commonly associated with fixed-term contracts, involuntary part-time employment or below-standard earnings (Olsthoorn 2014). However, these are not the only dimensions explored. Precarity has also been associated

4 Job insecurity does not always mean precarity. However, the perception of the insecurity depends on the expected duration of the spell of unemployment. From a European perspective, and in particular, from countries with rigid labour markets, the perception of insecurity is usually associated with precarious forms of work.

with subjective perceptions of job satisfaction, poverty thresholds, vulnerability and other workplace aspects, such as the extension of the workday or the existence of controls and flexibility (Arranz et al. 2018). Therefore, we believe that an adequate definition of the concept of precarity should establish its complexity by defining it according to its different dimensions. This is the approach we adopt in this work.

Thus, our first approach to the phenomenon entails identifying precarity with the different forms of underemployment. Labour statistics characterize underemployment as work that involves involuntarily performing a job with a shorter duration than normal and searching for or being willing to accept more hours or another job until a workday is complete (Hussmanns et al. 1990). This definition, however, omits some forms of underemployment. Thus, a broader definition of underemployment encompasses work that involves, at least i) performing, involuntarily, a type of work that requires a lower level of qualification, skills or experience than those available to a worker (Feldman 1996); ii) work that is not adjusted to the professional or study field of a worker (Feldman 1996); iii) involuntary, part-time, temporary or discontinuous work (Findeis et al. 2000); iv) earnings that are below the standard or below 80% of a worker's pay in his or her previous employment (Findeis et al. 2000); and v) sufficiently low levels of worker satisfaction to leave a worker open to job changes (Bell and Blanchflower 2019).

Hence, the literature on underemployment has focused on analysing its determinants and countercyclical nature. Its findings clarify that there is a certain concentration of underemployment among population groups with lower employability. Thus, precarity seems to have a greater prevalence among women (Hakim 1997; Wilkins 2006; Jefferson and Preston 2010; Weststar 2011), elderly individuals (Bell and Blanchflower 2013), and young people without experience or with a low educational level (Wilkins 2006). However, the results concerning the pure effect of educational level on the probability of being underemployed are not conclusive (Wilkins 2006; Weststar 2009). With respect to job attributes, the literature indicates that underemployment is more prevalent in sales and service work, in sectors where there are higher proportions of part-time and temporary jobs (Weststar 2011; Wilkins et al. Wooden 2011; Tam 2010) and in professional categories that do not require high levels of qualification (Tam 2010). Empirical evidence has also linked the incidence of underemployment with self-employment (Bell and Blanchflower 2013 and Wilkins 2006), a link that is reinforced by the notion that some people use self-employment as a last resort amid job scarcity or a lack of other job opportunities (Moore and Mueller. 2002). Finally, regarding working life, the literature suggests that workers who have been laid off, who have long been unemployed or who are stuck in their career are more likely to be underemployed (Feldman 1996; Wilkins 2006).

As we noted above, many analyses have focused on underemployment behaviour during different phases of the employment cycle. Therefore, it seems that the anticyclical nature of underemployment largely reflects company

responses to shocks in demand (at least those of a temporary nature, such as those during the COVID-19 pandemic). During recessions, reductions in working hours—for companies, these are arbitrated through temporary employment regulations—become a way to avoid layoffs and make adjustments to the intensive margin. This flexibility helps, to a large extent, smooth unemployment rates and has been very effective for addressing temporary or short-term shocks (Bell and Blanchflower 2013, 2018; Jefferson and Preston 2010; Sum and Khatiwada 2010). However, chronic underemployment following the Great Recession, i.e., the emergence of its anticyclical nature, has led analysts to question whether digitization and the emergence of new forms of employment have become structural phenomena, maintaining underemployment's central role in both research and political action agendas (Valleta et al. 2020; Borowczyk-Martins and Lalé 2020).

Accordingly, in our analysis, we attempt to provide novel evidence on these issues in the context of platform-mediated employment.

3. DATA AND METHODS

3.1. DATA

Identifying the characteristics of the workforce involved in digital platform work activities with data from labour force surveys is not straightforward due to data limitations. On the one hand, there are several difficulties in measuring nonstandard employment forms by using Labour Force Statistics.⁵ On the other hand, the lack of a satellite account for measuring the digital economy is an added problem (Ahmad & Ribarsky, 2018). This challenge in the measurement of economic activity has triggered the emergence of new statistical operations carried out by different institutions using government and big data sources for taking inventory, identifying practices and monitoring the digital platform economy, particularly the work mediated by these platforms—see Kilhoffer (2021), Piasna, (2021), O'Farrell y Montagnier (2020), and Abraham et al. (2017) for an overview of data sources. In Europe, after a first attempt to provide an inventory of the population on digital work platforms (Fabo et al., 2017), the European Commission twice conducted a panel survey (2017 and 2018) to estimate the prevalence of platform work while obtaining characteristics of platform workers and their working conditions (Brancati et al., 2018; Pesole et al., 2019; Brancati et al., 2020). This survey, the *COLLaborative Economy*

5 Some exceptions are given by the implementation of special modules. The aim of these modules is to provide users with statistics on a specific topic concerning the labour market by adding a set of variables to supplement the core Labour Force Survey. In Europe, Denmark, France, Finland, and Switzerland have carried out operations for measuring the digital platform work by means of ad hoc modules. For a detailed survey of previous experiences measuring digital platform work, see Kilhoffer (2021). In this survey, the methods, sources, and the advantages and disadvantages of each approach are evaluated. The most widely shared view holds that there is no optimal approach to capture all aspects of digital platform employment. Without challenging this perspective, there are, however, different methods suitable to measure different facets.

and *Employment Survey* (COLLEEM, hereinafter), has allowed us to analyse the expansion of the digital labour market in Europe on the basis of recent empirical work (Pesole et al., 2018; Congregado et al., 2019, 2022; Brancati et al., 2020).⁶

3.2. SAMPLE

The European Commission conducted two panel surveys in 2017 and 2018 to estimate the prevalence of digital platform work and characterize digital platform workers and their working conditions (Brancati et al., 2020). The first wave, known as COLLEEM I, was completed in 2017 and included information from 32,409 internet users aged 16 to 74 in 14 European countries, with 19,811 being workers. It collected socio-demographic and labor market data. The second wave, COLLEEM II, gathered 38,022 responses from 16 EU Member States, with 26,222 corresponding to workers. Both surveys included questions for respondents working in digital labor platforms regarding their characteristics and working conditions. In this work we use only the first wave.⁷

The first wave of this survey, completed in 2017, contained information on a total of 32,409 internet users aged between 16 and 74 years old in 14 European countries⁸, including 19,811 employees and self-employed workers, while collecting sociodemographic and labour market data. In the survey, respondents who have been working on digital labour platforms are questioned about the characteristics and conditions of this platform work.

DEPENDENT VARIABLES

Given that our objective is to identify whether there are personal, sociodemographic or employment characteristics that lead to employment associated with any of the dimensions of precarity, our first step should be to review these potential sources of workplace vulnerability. That is, precarity can be associated with objective reasons, including those that define underemployment.⁹ Given the variables included in our sample, underemployment can therefore be identified as working fewer hours or earning below-standard pay, with instability or with the perception, subjective in some

6 There is another influential survey for studying platform work in Europe. The survey conducted by Huws et al. (2017, 2019) is another important source of data available on platform work. However, this survey seems to overestimate the preponderance of platform workers overall compared to other surveys (Kilhoffer et al., 2020).

7 Regarding the decision to use only one wave instead of merging the two, it should be noted that the questionnaire questions varied, preventing the exploration of different dimensions of precarity, which are the focus of our study.

8 Germany, the Netherlands, Spain, Finland, Slovakia, Hungary, Sweden, the United Kingdom, Croatia, France, Romania, Lithuania, Italy, and Portugal.

9 To identify underemployment in platform-mediated employment, we use two questions: whether workers would prefer to work more hours per week in the digital sector if they had more clients and tasks and whether they feel fairly remunerated for the work they provide through a platform—underemployment due to a lack of hours vs. underemployment due to a lack of profits.

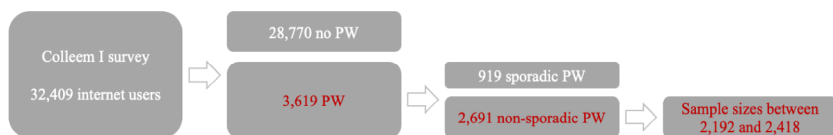
cases, of dependency in working conditions or employment protection.¹⁰ Since these different aspects define precarity, different dichotomous variables are used as dependent variables in the twelve specifications of the estimated discrete choice models, which should allow us to characterize both the population groups and the determinants of precarity in platform-mediated employment.

The precise definitions of the discrete dichotomous variables that we used to estimate the different unordered binomial models to analyse the probability of employment are shown in Table A1 of the Appendix.

CONTROL VARIABLES

The objective of this study is to characterize platform workers by attempting to identify whether certain types of employment or certain labour and sociodemographic characteristics make it more likely for employment to become precarious. This assessment is based on the nature of the work, e.g., whether it is face-to-face or not¹¹, and a set of sociodemographic controls, such as i) the sporadic or principal nature of a job; ii) the degree of work specialization; iii) the degree of dependence on a given platform; iv) the employment situation¹²; v) the initial motivation to access this type of employment; and vi) previous experience. These variables and some interactions plus a dummy country – introduced to rule out the existence of idiosyncratic factors – are included as regressors in the twelve specifications of our model. Depending on the specification considered, we work with subsamples that move in a range between 2,192 and 2,418 observations.

FIGURE 1. SAMPLE SELECTION BY DATA AVAILABILITY



Notes: PW - Platform worker; sporadic PW – individuals who work on platforms with a lower frequency than monthly.

10 The COLLEEM includes two items that allow the identification of underemployment by hours or earnings and a series of items that are associated with precarity in terms of decision-making/dependency capacity and safety and health.

11 The survey distinguishes between services provided digitally—online—and those that have to be supplied physically, requiring direct interaction with the service seeker—on location.

12 Regarding the employment situation, the survey covers five different situations: i) *employees* who declare a single activity; (ii) *self-employed persons* who declare themselves to be engaged in a single activity; (iii) *employees* who in addition to their main activity carry out a second activity under some form of *self-employment*; (iv) “*nonemployees*”, a heterogeneous group including the inactive and unemployed; and v) *nonwage earners with occasional self-employment* including unemployed or retired persons, students and housewives who have become self-employed.

3.3. METHODS

Thus, to evaluate our hypotheses, we combine different discrete (binary) choice models to distinguish the characteristics of groups of platform workers whose jobs can be associated with some form of precarity.¹³

For a correct interpretation of the binary model to be estimated, let's interpret it in terms of the utility that any pair of exclusive alternatives provides to an individual, arbitrarily assigning discrete values of 1 and 0 to them. Under this approach, we assume that the utility associated with each of the two possible choices depends on a vector of individual and environmental characteristics, represented by X . Without loss of generality, let's assume it is a linear relationship of the form:

$$\begin{aligned} U_0 &= \alpha_0 + X_0\beta + \varepsilon_0 \\ U_1 &= \alpha_1 + X_1\beta + \varepsilon_1 \end{aligned}$$

In this equation, captures deviations from the average. In this model, an individual will choose option 1 if the utility of that decision exceeds that of option 0 and vice versa. Therefore, the endogenous variable in our model can be defined as,

$$Y = \begin{cases} 1 & \text{if } U_0 < U_1 \\ 0 & \text{if } U_1 < U_0 \end{cases}$$

The baseline model for our estimations can be represented as:

$$Pr(Y = 1) = Pr(U_1 > U_0) = Pr(U_1 - U_0 > 0) = F(X\beta)$$

assuming that the distribution function, F , follows a logistic.

4. RESULTS

The results of the different estimates are shown in Columns I to XII of Tables 1 and 4. Regarding all columns/specifications, we report the marginal effects of the different binomial models where the dependent variable is a dichotomous variable that workers must confront in precarious employment mediated by a digital platform, defining precarity in several of its forms. In any of the specifications, the first row includes the predicted probabilities of having a precarious job, based on the particular aspect used to delimit precarity.

Table A1 shows the specifications that correspond to the two salient definitions of underemployment. Columns I and II correspond to the estimation of the probability that a job may be associated with underemployment when

13 The maximum correlation is 0.403 (between the power of decision about what and how to develop their tasks), and the variance inflation factor values range from 1.03 to 1.625. Hence, multicollinearity does not seem to be a concern given the size of our sample. The results of the correlation matrix and the variance inflation factors are available upon request.

it is defined in terms of hours, while Columns III and IV correspond to the same estimates when underemployment is defined in terms of earnings.¹⁴

Therefore, the first row of Table I indicates that there is a probability over 80% of underemployment in terms of desired work hours in jobs acquired by a platform, a figure that falls below 9% when we define underemployment in terms of income.

Underemployment in collaborative employment is significantly characterized by the form or means used for the provision of a service. Thus, in the first four specifications (I-IV), there is a greater probability of being underemployed, regardless of whether it is defined in terms of hours or earnings, for jobs either fully online or combined with *on-site* activities. In the latter case, this holds only when underemployment is defined by insufficient hours, in contrast to those workers who perform fully *on-site* activities.

On the other hand, it seems that the intensity of dedication (in the sense of Pesole et al. 2019) decreases the probability of being underemployed in terms of earnings. Hence, the probability of developing this form of precarity is lower for those who have employment in the *gig* sector as their main activity than for those who operate in this sector only occasionally or marginally.

The estimates show that less-specialized workers who perform a greater number of different tasks in contractual employment have a greater probability of being underemployed as defined by the number of hours, while those who work for a greater number of platforms also have a greater probability of underemployment by hours than those who work “exclusively” for a single platform. Finally, there is no statistically significant evidence that specialization or exclusivity is linked to a greater probability of underemployment in terms of earnings.

Among motivations, we find that underemployment by hours is more likely to occur among workers who have accessed the digital sector due to a lack of alternatives, a finding that is concentrated in the sample of workers whose job on a digital platform is their main job or represents a significant percentage of their work activity (Pesole et al. 2018).¹⁵

In experience, it seems that for workers whose first work experience is platform-mediated, the passage of time decreases their probability of being underemployed. This effect is especially intense in underemployment by hours, which is in line with the literature on underemployment that suggests workers

14 Specifications II and IV also incorporate the interactions between educational level and type of employment as developed through a platform.

15 In Pesole et al. (2018), digital workers are classified according to the number of hours they work in platform-mediated employment and the income derived from this activity into three categories: 1) platform work is the main activity or a very significant activity, with income at 50% or more of the total income of the worker and/or the work is done online more than 20 hours a week; 2) platform work is significant but not a main job, and income from such employment accounts for more than 25% but less than 50% of the individual's total income and/or work via the platform corresponds to at least 10 hours per week; and 3) work via platform is not significant, and the income from such employment does not reach 25% of the worker's total income.

with less work experience are more likely to experience underemployment. However, this association is usually mediated by the demographic factor of age (Acosta et al. 2017).

Regarding the effect of some demographic controls, we find no statistically significant evidence that supports the existence of differences based on gender or having minor children or the coexistence of the probability of being underemployed in work that is mediated by a platform. Age, however, has only a positive effect on the probability of being underemployed, regardless of whether this is defined by a lack of hours or earnings.

The probability of being underemployed by hours is greater for workers with intermediate and higher education than for workers with only a basic education. However, there is no statistically significant evidence of this effect regarding underemployment in terms of earnings.

On the other hand, the probability of being underemployed in terms of earnings increases significantly for students and unemployed persons who occasionally perform a service through a digital platform, although there are no significant differences concerning such underemployment between self-employed and salaried workers. This result should not be surprising. While part of the literature focuses on the idea that in this sector, the notion of false self-employment or dependent self-employment has spread, these platforms have become the natural means for finding clients and projects among a host of *freelancers* and contractors who actively participate in these platforms' *calls for tenders* (Congregado et al. 2019). Therefore, directly associating self-employment in this sector with precarity or underemployment is at least questionable.

As we noted above, in Specifications II and IV of Table A1 and in Tables 2 and 3, we included interactions to capture the potential relationship between the *online* or *on-site* nature of platform-mediated employment and the level of education, both for underemployment by hours (Table A2) and in terms of earnings (Table A3). This process entails corroborating or refuting the usual association between the precarity of *on-site* platform work—i.e., *uberized* employment—and a low level of qualifications. Thus, the separate presentation of the marginal effects of these interactions should allow us to render a more precise profile of the effects of education and platform-mediated employment type that allow, where appropriate, the design of effective actions to address these sources of precarity.

Accordingly, the higher the level of training of *on-site* workers is, the higher their probability of being underemployed by hours. Moreover, the group of workers with basic and secondary education have a higher probability of being underemployed when they perform *on-site* activities and when they combine *on-site* and *online* jobs. In other words, the probability of being underemployed by hours for those workers with a higher education does not markedly differ according to where they provide their services. However, regarding underemployment in terms of earnings, the available statistical evidence implies that workers with secondary and higher education who provide their services *online* have a greater probability of being underemployed. This result is in line with recent evidence (Attewell and Witteveen, 2023).

Analysing the phenomenon of precarity by considering only a single manifestation of underemployment would generate a partial and fragmentary analysis that would define only some of the aspects of vulnerability and uncertainty that compose the actual, more complex manifestation of precarity (Olsthoorn 2014). To try to overcome this potential deficiency, in this section, we present a series of estimates based on alternative definitions of precarity, which are associated with different aspects linked to bargaining power, protection systems and working conditions, allowing us to capture some of the dimensions of the institutional frameworks that are usually associated with precarity. Thus, by exploiting a battery of questions related to some of these dimensions relevant to those workers who perform a platform-mediated job, we have been able to define precarity with new dichotomous variables, accounting for the following: i) the decision-making capacity of an employee on a platform concerning when and how many hours to work (Specifications V and VI); ii) the ability of a worker to choose tasks and how they are carried out (VII and VIII); iii) the safety, hygiene and health conditions (Specifications IX to XI); and iv) the ability to negotiate remuneration (XII).

Columns V to XII of Table A4¹⁶ show the results of the estimates in this complementary model using 8 different specifications of discrete choice models to characterize the determinants of the relatively novel aspects of precarity. Without discussing each of the items separately, there are three particularly noteworthy results. Firstly, self-employed workers have a more positive perception of platform employment than salaried workers, as the former are less likely to experience the causes of precarity in Columns V to XII. Secondly, and compared to *on-site* work, it seems that *online* activities are associated with less negotiating and decision-making power as well as less stressful work situations. Thirdly, workers who engage in platform-mediated employment by necessity, compared to those who engage in it as an opportunity, do not perceive themselves to be affected by most of the dimensions associated with precarity (except in relation to stress and routine tasks). Accordingly, the starting point of the need-based job-seekers, that is, their lack of other employment opportunities, arguably lowers their expectations; the employment perceptions among this group of need-based *crowd workers* thus seem more favourable than those among workers who entered platform-mediated employment for other reasons.

5. CONCLUSIONS

This work addressed the phenomenon of precarity among digital platform workers by using microdata from a cross-country survey conducted across 14 EU member countries. Different manifestations of precarity were examined to

16 Following the same scheme as Table A1, Table A4 presents the estimates of very similar specifications. Different dichotomous dependent variables are used according to alternative definitions based on the aspect of precarity that we consider.

provide a definition that is as exhaustive as possible and to identify whether there are some sociodemographic groups or jobs where the risk or prevalence of vulnerability is higher.

The novelty of this analysis stems from our treatment of precarity; we address its different manifestations, including those based on perceptions, to emphasize the heterogeneity of platform-mediated employment and to verify whether the direct associations that are usually made between platform work and precarity are simply mantras based on surveys of expert opinions. We show that not all forms of precarity show a higher prevalence in the platform work sector; rather, there are specific population groups and jobs where precarity has a higher incidence and conditions where precarity can also occur when employment is mediated by a digital platform.

Furthermore, our results indicate that precarity in this sector might be fundamentally associated with *low-skilled on-site* jobs where there is a relationship of dependence between the applicant and service provider, including the so-called uberized jobs. However, the mediating role of the platform in this relationship is not clear. Accordingly, to combat false self-employment, the correct course of action for political and judicial authorities, as well as the next European regulations, seems to be identifying dependency as the key to determining and addressing situations of precarity in the use of digital platforms for employment.

Our analysis is not exempt from limitations. First, we cannot fully address some issues with the data to hand since our dataset does not allow us to capture some dimensions potentially associated with precarity, such as employment protection, the degree of collective representation, or alternative definitions of underemployment, such as when skilled workers are in low-income jobs or underemployment is defined in terms of job satisfaction. More research is needed to have a complete characterization of precarity in platform work. Second, our sample does not allow for a deep country-by-country analysis. At this point, we must be satisfied with contrasting the presence of heterogeneity by country through dummies. Third, this cross-sectional study would benefit from the availability of longitudinal data, especially from repeated samples with the same observed units. Fourth, the availability of richer datasets—perhaps through special modules of the national labour force surveys—should allow a characterization of precarity in platforms compared with the rest of the workers affected by some cause of precarity. This analysis would help to focus mitigation policies on groups, sectors, and occupations or identify practices that lead to situations of vulnerability and loss of social protection, as some scholars suggest (Aloisi 2022). Finally, a micro look at the duration/survival of individuals in precarious digital platform work and the determinants of transitions/exit routes to regular/decent jobs would be another natural extension of this research. Richer (and longitudinal datasets) will not only allow us to overcome some of the limitations of this work but will also surely fill some gaps in the future research agenda on precarity in platform-mediated employment, including the macrodynamics of this phenomenon.

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ANEXO

Las tablas A1, A2, A3, A4, A5 y A6 se encuentran en formato .pdf y .html en la siguiente dirección:

<https://www.uhu.es/publicaciones/ojs/index.php/REM/article/view/8065/7013>



