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# ► Solo self-employment and lack of paid employment: an occupational perspective across EU countries

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## ► Abstract

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This study provides some novel evidence on the relationship between solo self-employment and paid employment opportunities across 28 European countries and 8 occupations for the period 2012-19. Adding the occupational dimension allows us to investigate this relationship at a more disaggregated level than previous cross-country studies. The adoption of a cross-country cross-occupation analytical framework makes it possible to consider that both the solo self-employment rate and the availability of jobs in the wage and salary sector vary across occupations, as well as across countries within occupations. Findings suggest that the share of solo self-employed in total employment, as well as its prevalence among new job starters, in each occupation-country pair is higher (lower) when there are poor (better) paid employment prospects within the same pair. This finding holds across different subsets of occupations, including those which typically require higher education attainment. This could reflect that highly educated individuals who do not find adequate jobs in the wage and salary sector have a higher opportunity cost of switching to other occupations where paid employment opportunities are more abundant, and hence they may opt to work as solo self-employed within their preferred occupation. Finally, we do not find any correlation between the extent of paid employment opportunities and the prevalence of self-employed with employees, which is consistent with the idea that employers and solo self-employed are possibly two distinct groups with different motivations for entering in such activity.

Keywords: Solo self-employment, Wage and salary employment, European countries, Unemployment-push

JEL: J24, J31, J64

## 1. Introduction

Solo self-employment has become an increasingly prominent feature of the labour market in several European countries. In 2019, there were close to 23 million solo self-employed in the EU - 15 per cent more than in 2002 - accounting for around 72 per cent of all self-employed workers and for about 10 per cent of total employment.<sup>1</sup> Meanwhile, the occupational composition of solo self-employment has also changed, with many of the newly solo self-employed entering high-skilled occupations providing specialised intellectual or technical services. For instance, the share of solo self-employed in technical, professional and managerial occupations in the EU went from 34 per cent in 2002 to 42 per cent in 2019, with the bulk of this increase occurring after 2012 when this share was at just 36 per cent. For some, these trends reflect workers' growing entrepreneurial drive, expectations of higher income from self-employment, and greater preferences for work autonomy and flexibility. According to this view, workers make a voluntary occupational choice whether to work on their own or to be in paid employment, depending on their monetary incentives, ability, preference for autonomy, and degree of risk aversion. Yet, some, especially solo, self-employed may not be necessarily motivated by a profitable business opportunity or by the desire of greater work autonomy but, rather, they may enter this type of activity because they cannot find a decent job in the traditional wage sector (Boeri et al. 2020). This view is coherent with the "unemployment-push" hypothesis which states that a growing self-employment rate could be expected in periods of high unemployment, as more individuals are "forced" to start their own business out of necessity to avoid unemployment and loss of income (Parker and Robson 2004, Parker 2018). Macro-level studies have typically tried to investigate this hypothesis by looking at the over-time relationship between the aggregate self-employment rate and the unemployment rate, which is used as an indicator of wage employment opportunities across countries. Evidence on the direction of this relationship is however rather mixed, depending on the country sample considered, the period of analysis, the estimation methodology, and the model specification used (Parker and Robson 2004, Saridakis et al. 2016).<sup>2</sup>

Part of the explanation for the mixed empirical evidence also reflects some long-standing concerns on how the relationship between self-employment and paid employment opportunities has been typically investigated in cross-country settings (Meager, 1992). First, most of existing studies do not distinguish between solo self-employed and self-employed with employees, despite these are two distinct groups with very different motivations for entering in this type of activity (Levine & Rubinstein, 2017, Boeri et al., 2020). Second, macro-level studies typically focus on the stock of self-employed in total employment (i.e. the self-employment rate) despite the lack of paid employment prospects at a given point time is more likely to be visible in the flows into self-employment rather than in its prevalence in total employment (Meager, 1992). Third, most of existing studies use the unemployment rate to measure how difficult is to find wage employment. Yet, this is problematic as the unemployment rate computed as a fraction of the labour force captures the prevalence of unemployment, but it does not accurately reflect the incidence of failed job search for paid employment, especially in contexts where the prevalence of self-employment is high (Poshke, 2018). Moreover, the total unemployment rate as a measure of the availability of paid jobs relies on the assumption of a non-segmented labour markets, in which individuals in different occupations or with different qualifications might easily move across occupations and all compete for the same job. However, since individuals rarely change occupation (Bachmann et al. 2020) and the extent and type of viable jobs depend on one's qualification and experience, the unemployment rate can hardly capture the relevant employment prospects on which individuals base their occupational choice (Sorgner and Fritsch, 2018). In a context of limited occupational mobility and segmented labour markets, it seems instead more plausible that workers' decision to enter (or remain) solo self-employed is more affected by the paid employment prospects in one's occupation than by the aggregate unemployment rate (Sorgner and Fritsch, 2018),

This study tries to address some of these limitations, contributing to the macro-level literature on self-employment in several ways. The original and most important aspect of our analysis is that we explicitly take into account the occupational dimension. To the best of our knowledge, there is no study that explores the association between paid employment opportunities and self-employment across countries and occupations.<sup>3</sup> There are a number of good reasons for filling this

<sup>1</sup> Following Eurostat definition, self-employed persons without employees are persons who work in their own business, professional practice or farm for the purpose of earning a profit, and who do not employ any other person.

<sup>2</sup> For instance, Blanchower (2000) finds a negative relationship between the unemployment rate and the rate of self-employment for a sample of OECD countries. Parker & Robson (2004) find a U-shaped relationship between self-employment and unemployment rates over a similar sample. Saridakis et al. (2016) find a positive and statistically significant long-run association between self-employment and unemployment for more than half of the EU countries included in their sample, whereas they report a negative or statistically insignificant association for the rest of the countries. Baker et al. (2018) find a positive relationship in the short-term, and a non-significant one in the long-term across a group of EU countries.

<sup>3</sup> In fact, while some cross-country studies have focused on differences in self-employment across industries (Torrini, 2005), the substantial differences in self-employment rates both across occupations and within occupations across countries have received little attention (Barany, 2017).

gap. First, controlling for the occupational dimension can help capturing other third factors, such as contractual incentives, the nature of work, legal restrictions, and educational credentials, which may influence the prevalence of solo self-employment beyond the availability of paid employment. Moreover, the adoption of a cross-country cross-occupation analytical framework makes it possible to consider the highly heterogeneous nature of solo self-employment across occupations as well as the fact that the availability of paid jobs differs across occupations, and within occupation across countries. This allows us to analyse whether the lack of jobs in the wage and salary sector is associated with solo self-employment at a more disaggregated level than previous macro-level studies which use the aggregate country-level unemployment rate as a proxy of paid employment opportunities. We expect that, keeping everything else constant, occupation-country pairs where wage employment opportunities are scarcer should show higher solo self-employment rates and flows in comparison to those where these opportunities are more abundant.

We test this prediction by considering a model of ‘occupational labour markets’ defined by different cells at the country-occupation-year level. Our assumption is that workers cannot easily move across occupations in the short term, and therefore they are bounded by paid employment opportunities in their own occupation when evaluating the opportunity cost of entering or remaining in solo self-employment. Our sample is composed by observations for 8 occupations defined at ISCO-08 1-digit level, across 28 European countries for each year between 2012 and 2019. We restricted our analysis to this time period because there is a break in the ISCO classification in 2011, and because we aim at focusing on a recent period of relative economic stability.

As dependent variable, we use two measures of the prevalence of solo self-employment within each country-occupation-year cell, namely: i) The share of solo self-employed in total employment within each country-occupation-year cell (i.e. solo self-employment rate), and; ii) The share of newly solo self-employed in the same cell (i.e. those who started working as solo self-employment by 12 months or less) among all newly employed (i.e. those who started in their current occupation by 12 months or less).

To measure how difficult it is to find paid employment at the occupation-country-year level, we define the variable *WageEmploymentScarcity* as the ratio between the number of unemployed people who were previously working in a given occupation-country pair and lost their job over the previous 12 months, and the number of newly employed in the wage and salary sector, namely those who started their paid job over the previous 12 months within the same occupation-country pair. Higher levels of this ratio should be indicative of poor paid employment opportunities, higher unemployment risk, stronger job competition, and more generally, unfavourable labour market prospects within any given country-occupation environment.

Regression results show that, even after controlling for country, occupations, and year fixed effects as well as for their interactions, this ratio is positively associated with both the solo self-employment rate and the prevalence of solo self-employment among new job starters. This result is consistent with the argument that solo self-employment in a given occupation-country pair is higher (lower) when there are poor (abundant) employment prospects in traditional paid employment in the same pair. Interestingly, and somehow contrary to the expectations, it appears that this finding holds across groups of occupations which typically require high levels of education. This could reflect the fact that highly educated individuals who do not find adequate paid employment opportunities in their own occupation might have a higher opportunity cost of switching to other occupations where paid employment opportunities are more abundant, and hence they are more likely to opt for solo self-employment within their preferred occupation. Finally, we do not find any correlation between our measures of scarcity of paid employment opportunities and the self-employment with employees rate, which is coherent with idea that the choice to become an entrepreneur is more dependent on having a structured business idea and entrepreneurial attitude rather than on the difficulty in finding paid employment.

The remainder of this paper is structured as follows. In the next section, we first provide some descriptive evidence on solo self-employment rate across countries and occupations. Here we also present and discuss our measure of occupation-specific employment opportunities in the wage and salary sector, and give a first visual inspection of its relationship with the solo self-employment rate across occupations and countries. On this basis, we then present our empirical model. Section 3 presents and discusses the results. Section 4 presents a battery of robustness tests, and section 5 concludes providing some directions for future research.

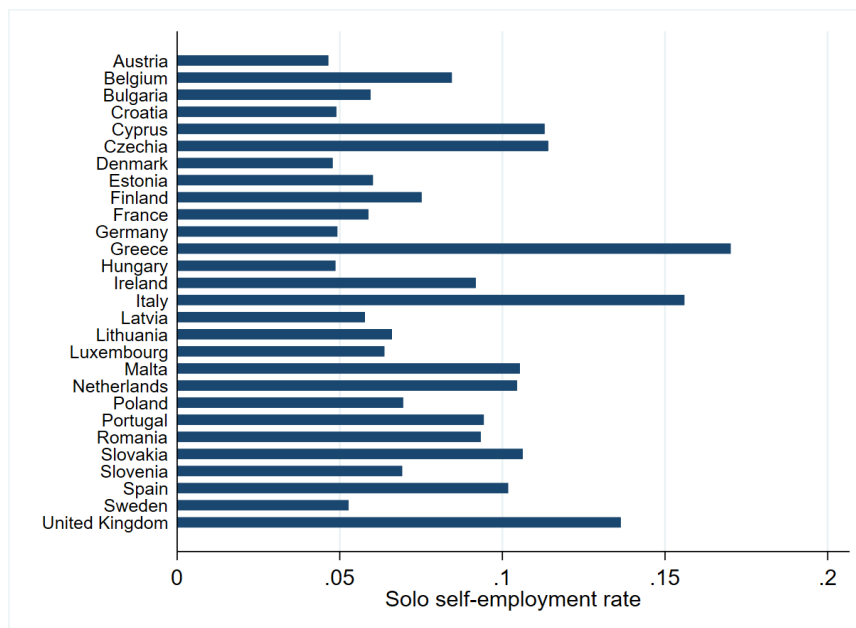
## 2. Data and Method

### 2.1. Solo self-employment across occupations

We use data from Eurostat and the European Union Labour Force Survey (EU-LFS) with information on the employment distribution across professional status and occupation. We restrict our observations to 16-64 years' old working individuals, and all persons whose status in employment is self-employed without employee for all occupations, except "armed forces" and "skilled agricultural and fishery workers".

Figure 1 shows the solo self-employment rate – i.e. the share of self-employed without employees in total employment – across all 28 European countries averaged over the period 2012-19. The graph highlights how solo self-employment is a widespread phenomenon with relevant heterogeneity across countries. Southern and Eastern European countries show the highest rates of solo self-employment, but this fraction is also substantial in several other countries including the UK, the Netherlands, Ireland, and to a lesser extent Belgium. This variation reflects different demographic, cultural, policy and institutional characteristics, but also differences in the sectoral and occupational distribution of employment across countries (Torrini 2005). In what follows we focus on differences in solo self-employment rate across and within countries and occupations which, as pointed out in the introduction, have received little attention by previous studies.

**Figure 1. Solo self-employment rate by country (2012-2019)**

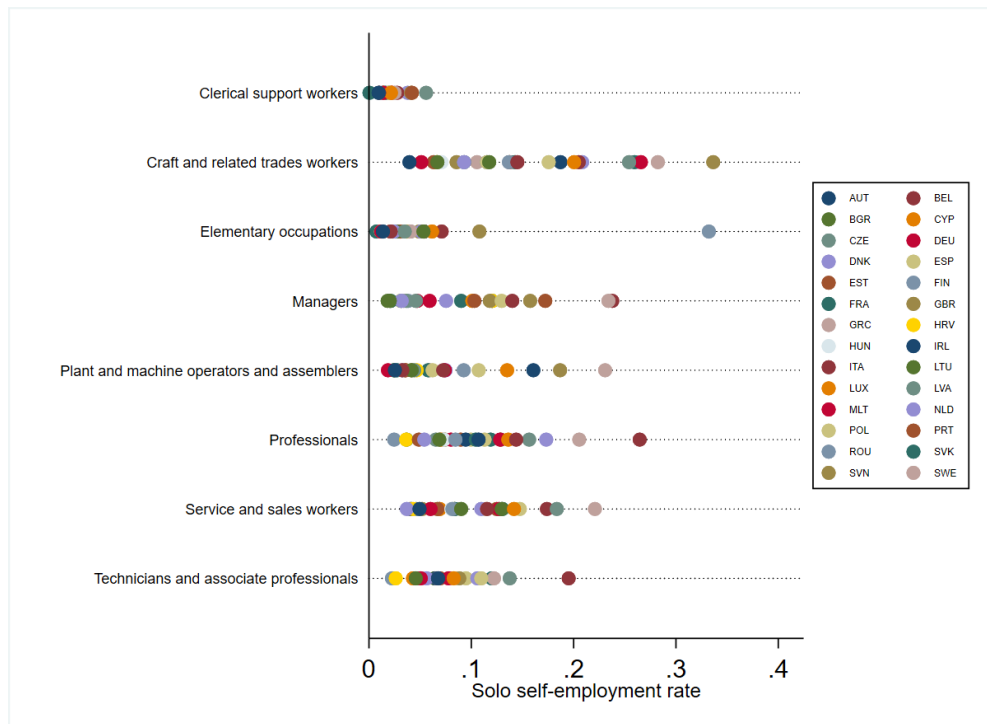


Note: The bar graph shows the mean of solo self-employment rate for each country, averaged over occupation and time dimension. Self-employment rate is measured as the share of solo self-employed in total employment in each of the country-occupation-year cell.  
Source: Authors' calculations based on EU-LFS data.

Figure 2 shows that the solo self-employment rate varies substantially across occupations. On average, the highest rates are found among craft and related workers, as well as among professionals and managers, whereas the lowest among clerical and elementary occupations. The ranking of the occupations in terms of the observed prevalence of solo self-employment is quite common to all countries. This largely reflects the fact that, regardless of the country, working as a solo self-employed is more a viable option for certain liberal occupations in craft and professional activities, than for others, such as clerical workers or machine operators which generally operate within less autonomous work arrangements. However, with few exceptions such as clerical and elementary occupations, there is quite some variation in the occupation-specific solo self-employment rate across countries. For instance, the share of professionals working as solo self-employed ranges from around 8 per cent in Portugal, Denmark, to around 12-17 per cent in Germany, Czechia, and the Netherlands, to over 20 per cent in Greece and Spain. Barany (2017) reports similar findings by using data on total self-employment from the Luxembourg Income Study on the overall self-employment rate across occupations. Differences across countries within each broad occupation group may again reflect cross-country differences in institutional factors, such as the features of the tax and benefit system, the degree of employment protection legislation, or the stringency of

the legal requirements and educational credentials needed to operate in a certain profession (Barany, 2017). As later shown in section 3.3, the empirical framework of this study tries to control for such occupation- and country-specific factors by including in the regressions a generous set of fixed effects. This should allow to better detect whether differences in the evolution of solo self-employment rates across countries-occupations pairs may be partly driven by differences in wage employment opportunities within the same pair.

**Figure 2. Solo self-employment rate heterogeneity by country-occupation (2012-2019)**



Note: Dotplot by country and occupation, mean over the time dimension (2012-2019) Self-employment rate is measured as the share of solo self-employed in total employment in each of the country-occupation-year cell.

Source: Authors' calculations based on EU-LFS data.

## 2.2. Measuring wage employment scarcity at the occupational level

A central part of this article is to develop an indicator of how difficult it is for workers to find (new) paid employment if they quit or are fired at the country-occupation-year level. Ideally, an indicator which takes into account both demand and supply factors would be given by the ratio between the number of individuals seeking wage employment in an occupation and the number of available vacancies in the wage sector in the same occupation. Unfortunately, data for both the numerator and the denominator of such a ratio are not directly available in standard LFS, at least at the occupational level. Acknowledging these data limitations, we use available information at the occupational level from the EU LFS to develop an indicator of the wage employment opportunities (*WageEmploymentScarcity*) across 28 European countries and 8 occupations at the ISCO-08 1-digit level for each year from 2012 to 2019.

We define the variable *WageEmploymentScarcity* as the ratio between the number of unemployed people who were previously working in each occupation-country pair and lost their job over the previous 12 months, and the number of newly employed in the wage sector, namely those who started their job over the previous 12 months within the same occupation-country pair. Therefore, this ratio should provide a first approximation of the wage employment prospects within each occupation and country. Higher levels of this ratio should signal a growing unemployment risk, higher levels of job competition and, more generally, greater difficulties in finding wage employment. Of course, it is important to keep in mind that our measure of wage employment scarcity has several limitations. First, the numerator of our ratio does not consider that some of the people who are laid-off may enter into inactivity, rather than unemployment. Meanwhile, it assumes that only the unemployed people look for a job neglecting that some employed workers, being dissatisfied with their current job, may engage in on-the-job search for new employment. This could imply that we are under-measuring the extent of competition for paid job in any given occupation-country pair, although employed jobseekers typically account for only a small fraction of all jobseekers. Moreover, the denominator of our ratio may over-measure the extent

of job vacancies in each occupation-country pair. In fact we cannot exclude that some of the workers who started their current job in the previous 12 months only moved internally within the same employer who did not actually open a job vacancy to candidates outside the enterprise.<sup>4</sup>

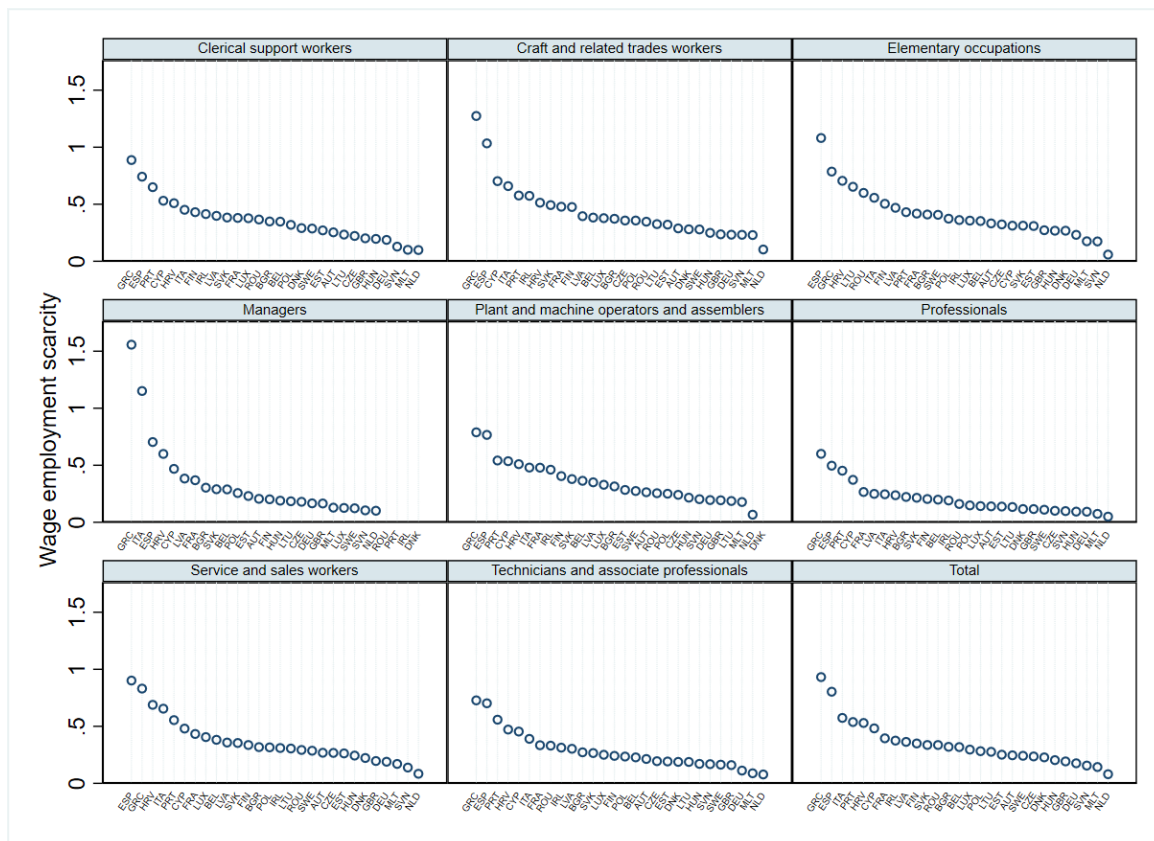
Despite these limitations, we believe that our ratio well captures the relative availability of paid employment opportunities across countries, years, and occupations. In fact, it is reassuring to see that Eurostat (2021) uses a similar indicator to track aggregate labour market dynamics in the light of the COVID-19 pandemic. Figure 3 plots our measure of wage employment scarcity by occupation across countries. On average our ratio, across all countries, occupation and years in our sample, is around the value of 0.34. This indicates that, overall, the number of people who turned to unemployment from a given occupation in the previous 12 months is about one third of the people who started working as dependent employee in the same occupation over the same period. Beyond aggregate figures, Figure 3 shows that our measure of scarcity of wage employment opportunities vary considerably across occupations, as well as across countries within occupations and over time. In particular, the scarcity of wage employment opportunities, as measured in this paper, is generally greater for some manual occupations than for others. On average, this ratio is the highest (around the value 0.40) for "Elementary occupations" and "Craft and related trades workers", and the lowest for "Professionals" (0.20) and "Technicians and associate professionals" (0.28). This is consistent with the fact that manual occupations typically face a higher risk of unemployment because they are often composed of routine tasks that are particularly susceptible to automation or offshoring (Acemoglu and Autor 2011, Frey and Osborne 2017). Meanwhile, cross-occupations differences in our measure of *WageEmploymentScarcity* can also reflect the fact that some occupations have access to a broader range of employment opportunities across industries than others. For instance, an ICT professional can be employed in virtually all sectors, whereas a machine operator will be in demand mostly in some manufacturing industries (Tristao 2007). Another explanation for these differences relates to the long-term structural shift towards the service economy observed in many advanced economies, which might increase the demand for labour in some intellectual and knowledge-based occupations relative to others.

Beyond structural factors, our indicator well captures the prevailing business cycle dynamics. In fact, consistently with the marked improvement in the labour market conditions observed in Europe over this study's sample, the average value of *WageEmploymentScarcity* decreases from 0.48 in 2012 to 0.23 in 2019. Over this period, our indicator virtually decreased across all occupations and countries, although with significant differences. Moreover, it is noteworthy that our measure of scarcity of wage employment opportunities vary across countries and time even within occupations, which supports the argument that, in the short-term, differences in solo self-employment rates across countries may be partly driven by cross-country differences in wage employment opportunities within occupations.

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<sup>4</sup> According to Eurostat definition, a job vacancy is as a paid post (newly created, unoccupied or about to become vacant) for which the employer is taking active steps to find a suitable candidate from outside the enterprise concerned and is prepared to take more steps and which the employer intends to fill either immediately or in the near future. Under this definition, a job vacancy should be open to candidates from outside an enterprise. However, this does not exclude the possibility of the employer recruiting an internal candidate for the post. A vacant post that is open only to internal candidates should not be treated as a job vacancy.

**Figure 3. Heterogeneity in wage employment scarcity by country-occupation (2012-2019)**

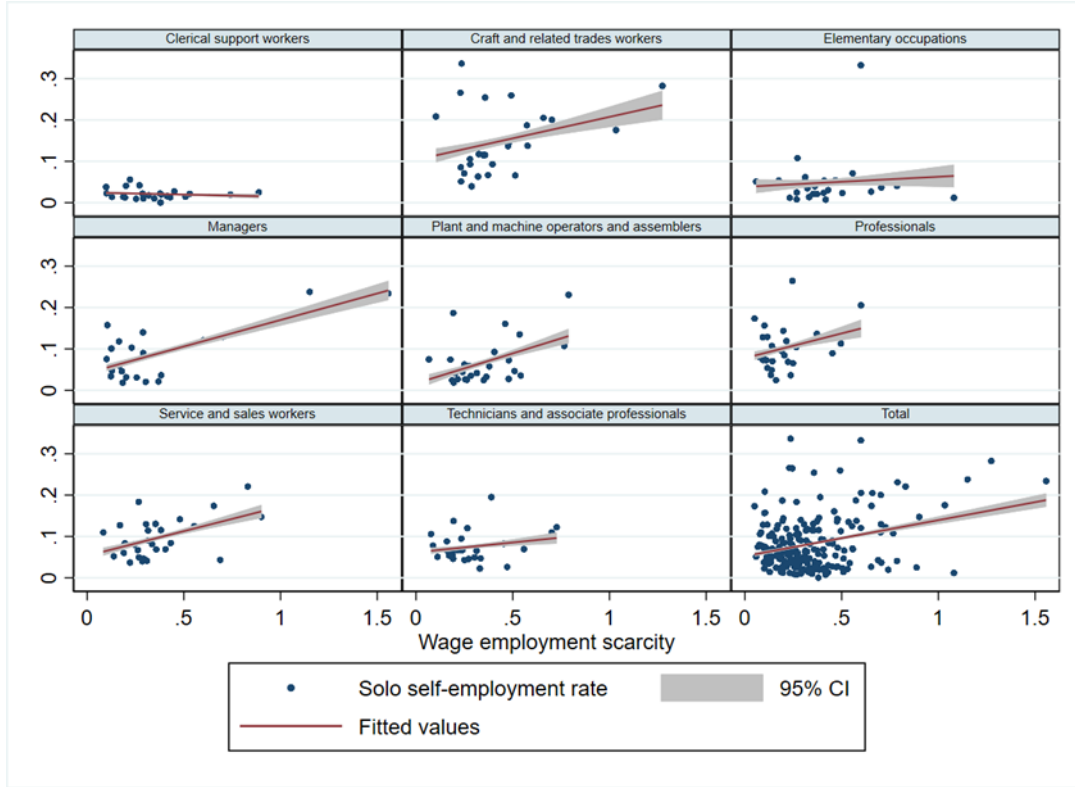


Note: Dotplot of scarcity in wage employment measures by country and occupation, mean over the time dimension (2012-2019).

Source: Authors' calculations based on EU-LFS data.

Finally, Figure 4 gives a first graphical representation of the relationship between solo self-employment rate and scarcity of wage employment across occupations and European countries over the period 2012-19. Looking at the various scatter-plots, it can be seen that countries where there is more scarcity of wage employment opportunities in a given occupation also show a larger share of solo self-employed in the same occupation. This relationship appears to be stronger in those occupations, such as professionals, managers, and to some extent, technicians and associate professionals, where workers can more easily opt for self-employment as a response to poor wage employment opportunities in their own occupation. Occupations such as sales and service occupations, and craft and related trade workers also show a positive relationship. Conversely, there is no association for occupations where, because of their nature, working as solo self-employment is rarely an option (e.g. clerical workers), or where the opportunity cost of switching to other occupations within wage employment is generally low (e.g. elementary occupations). This visual inspection provides some first suggestive evidence of a positive relationship between the solo self-employment rate and the extent of wage employment opportunities across country-occupations. In what follows we check whether this relationship holds in a more elaborate empirical framework.

**Figure 4. Solo self-employment rate and wage employment scatter-plot by occupation (2012-2019)**



Note: Scatter-plot of country-occupation specific observations on self-employment rate and labour market tightness, observations averaged over the time dimension (2012-2019). Each data-point represents the solo self-employment rate and labour market tightness of a specific country in a specific occupation, averaged over the 2012-2019 period. Solo self-employment rate is measured as the share of solo self-employed in total employment in each of the country-occupation-year cell.

Source: Authors' calculations based on EU-LFS data.

## 2.3. Methodology

We implement our empirical analysis by considering a model of 'occupational labour markets' defined by different cells at country-occupation-year level. Our sample is composed by observations for 8 occupations defined at ISCO 1-digit level, across 28 European countries over the period 2012-19. The main hypothesis is that the scarcity of wage employment opportunities in a specific cell increases the prevalence of solo self-employed in the same cell. In order to test this, we estimate a set of panel regressions using ordinary least squares (OLS) for the following model:

$$SoloSE_{(rate/flow)_{c,o,t}} = \alpha_{c,o,t} + \beta WageEmploymentScarcity_{c,o,t} + \delta X_{c,o,t} + \varepsilon_{c,o,t} \quad (1)$$

We use two different definitions for our dependent variable. The first one is the stock of solo self-employed in total employment ( $SoloSE_{rate_{c,o,t}}$ ) in country "c" for the occupation category "o" in the year "t". The second one ( $SoloSE_{flow_{c,o,t}}$ ) measures the prevalence of solo self-employment among the newly employed, namely the fraction of people who entered into solo self-employed over the previous 12 months or less, relative to all the all the people who started their current job over the same time span.<sup>5</sup> Therefore, this second variable measures, albeit imperfectly, the importance of the flows into solo self-employment relative to all flows in new jobs within each country-occupation-year cell. Analysing the effect of paid employment opportunities on some measures of both the stock and the flow of solo self-employed is important. One can expect that the effect of poor wage employment opportunities should affect more directly the flows into solo self-

<sup>5</sup> Instead of focusing on the change in raw number of solo self-employed, both of our dependent variables are defined in such a way that they capture the prevalence solo self-employed either relative to total employment, for the ( $SoloSE_{rate}$ ), or among the newly employed ( $SoloSE_{flow}$ ). We believe this is important to the extent of dependent variables need to contain information about how the balance of the European labour market is shifting towards solo self-employment.

employment rather than its rate in total employment, which being more persistent over time is more likely to reflect policy and institutional factors rather than cyclical labour market conditions. Yet, since a significant share of the solo self-employed move to dependent employment in the short-term (Boeri et al. 2020, Fondeville et al. 2015) – so suggesting that some of the solo self-employment voluntarily move to dependent employment once a viable job opportunity arises – it seems relevant to also investigate whether the availability of paid employment opportunity affect the persistency of the solo self-employment rate over time. Moreover, looking at the stock of solo-employed allows comparing in a more direct way this study's findings with those from previous literature which typically only look at the fraction of self-employed in total employment.

The main explanatory variable of interest is *WageEmploymentScarcity*. As explained in the data section, we define this variable as the ratio between the number of unemployed people who were previously working in each occupation-country pair and lost their job over the previous 12 months, and the number of newly employed in the wage sector, namely those who started their job over the previous 12 months within the same occupation-country pair. This ratio provides a first approximation of the wage employment prospects (unemployment risk) within each occupation, country, and year.

To the extent the lack of wage employment opportunities in a given occupation-country "pushes" more individuals to start working as solo self-employment in the same occupation, we expect a positive coefficient on  $\beta$ . Meanwhile, a positive coefficient on  $\beta$  could also signal that few people will start a business out of necessity when job opportunities in the wage sector become more abundant. It is important to note that  $\beta$  will only capture the within occupation-country effects, ignoring the fact that jobseekers might respond to the lack of paid employment in their own occupation by moving to another different occupations. In fact, one key assumption of our empirical framework is that that each cell represents a differentiated 'local' labour market characterized by specific occupational skills that limit workers' movement between occupations. As hinted in section 2.2, we expect this assumption to hold well for occupations for which changing occupation is costly and occupation-specific human capital cannot easily be transferred (Nedelkoska and Neffke 2010, Gathmann and Schonberg 2010). For instance, a jobseeker in an occupation that requires specific human-capital, such as ICT technician, lawyer or accountant, who does not find new wage employment in the same occupation, is more likely become a solo self-employment within that occupation than to move to paid employment in a different occupational domain. Conversely, this assumption might be more problematic for workers in occupations requiring lower levels of human-capital for which the cost of switching to a less similar occupation in the wage sector is typically lower. For instance, an unemployed individual who was previously working as a cleaner should face a relatively lower opportunity cost of starting to work as a delivery person. Whilst the case that workers respond to the lack of paid employment opportunities by moving to other occupation cannot be ruled out and needs to be carefully considered when interpreting our results, recent evidence shows that the observed occupational mobility is overall limited (Bachmann et al. 2020). This is particularly so when mobility across broad occupational groups at the 1-digit level is considered, as in our case. Therefore, it seems plausible to rely on the assumption that the unemployed search for jobs within their past (broad) occupational domain, and hence they are bounded by the employment opportunities in this domain when valuing the opportunity cost of becoming or remaining self-employed.

It is important to notice that equation (1) may still suffer from endogeneity or inverse causality. We try reduce such eventuality with a very generous set of fixed effects controlling for constant unobserved heterogeneity across countries, occupations, years and their interactions, as captured by  $\alpha_{c,o,t}$ .  $X_{c,o,t}$  is a list of labour market controls such as share of older workers, share of highly educated workers and share of women workers that are occupation-specific and supposed to affect the observed prevalence of solo self-employed within each cell. Finally, since there may be unobserved components in outcomes for units within country-occupation clusters that are correlated within the clusters and over time, we cluster the standard error at country-occupation level. We also try to investigate for the existence of inverse causality in the robustness test section, with reassuring results. Table 1 provides detailed descriptive statistics of the solo self-employed variables, alternatives in wage employment variables and labour market characteristics for the entire sample.

**Table 1 – Descriptive Statistics**

|                                                          | Observations | Mean  | SD    | Min   | Max   |
|----------------------------------------------------------|--------------|-------|-------|-------|-------|
| <b>Solo self-employed variables</b>                      |              |       |       |       |       |
| Solo self-employment rate                                | 1605.000     | 0.085 | 0.066 | 0.000 | 0.447 |
| Solo self-employment flow                                | 878.000      | 0.105 | 0.089 | 0.005 | 0.685 |
| <b>Alternatives in wage employment variable</b>          |              |       |       |       |       |
| Wage employment scarcity                                 | 1652.000     | 0.344 | 0.273 | 0.014 | 3.105 |
| <b>Labour market controls</b>                            |              |       |       |       |       |
| share of total employed aged 50+                         | 1792.000     | 0.278 | 0.053 | 0.138 | 0.471 |
| share of total employed with primary education or less   | 1569.000     | 0.210 | 0.202 | 0.001 | 0.933 |
| share of total employed with tertiary education or above | 1758.000     | 0.330 | 0.298 | 0.008 | 0.999 |
| share of female employment in total employment           | 1786.000     | 0.429 | 0.204 | 0.037 | 0.785 |

Note: The Table shows the descriptive statistics for all observations at country-occupation-year level, from 2012 to 2019.  
Source: Authors' calculations based on EU-LFS data.

### 3. Results

Table 2 presents the results coming from the regression model in equation (1), using as dependent variable the fraction of solo self-employed in total employment across each cell ( $SoloSErate_{c,o,t}$ ). Each column shows the main regression results using different mix of controls and fixed effects. The first column shows the simplest association, the second column only includes the occupation-specific labour market controls, the third column adds both country and year fixed effects, the fourth column includes the occupation fixed effects, while the fifth and the last columns add to these the interaction of country-year and occupation-year fixed effects respectively. Comparing the first three columns with the fourth shows the importance of including the occupation fixed effects. When these are included the explanatory power of the model increases significantly, even with respect to column 3 where only country- and year- fixed effects are considered. This confirms that occupational dimension is in and of itself an important driver of differences in solo self-employment across countries.

The coefficient on *WageEmploymentScarcity* is always positive and statistically significant, between the 1% and 5% level, which suggests that the prevalence of solo self-employed in each occupation-country pair is higher (lower) when there are poor (better) employment prospects in traditional wage employment within the same pair. This result is consistent with findings from some recent micro-level studies showing that individual's decision to enter in self-employment is affected by the occupation-specific labour market environment, and more specifically by the associated unemployment risk<sup>6</sup>.

Not surprisingly, the magnitude of the coefficient on *WageEmploymentScarcity* decreases as more fixed effects are included in the regression model. Considering the most comprehensive specification in column 6, an increase of 10 percentage points in our measure of scarcity of wage employment opportunities is associated to an increase of around 0.2 percentage points in the solo self-employment rate. Such coefficient, although rather small, is economically significant, as it only considers the within occupation-country effects, ignoring workers' mobility across occupations.

<sup>6</sup> For instance, Sorgner and Fritsch (2018) find for that the probability of switching from paid employment to self-employment in Germany is higher in occupations with a relatively higher occupation-specific unemployment level. Similarly, Fossen and Sorgner (2019) find that, in the US, employees in occupations that are more susceptible to destructive digitalization – and hence more at risk of unemployment – are more likely to become entrepreneurs setting up unincorporated businesses, in comparison to employees facing a lower risk. Kusters and Smits (2020) show that several occupational characteristics are a key determinant of the probability that a worker in the Netherlands is in a false solo self-employed arrangements.

**Table 2 – Solo self-employment rate and scarcity in wage employment (2012-19)**

|                                | Solo self-employment rate |                      |                       |                        |                       |                        |
|--------------------------------|---------------------------|----------------------|-----------------------|------------------------|-----------------------|------------------------|
|                                | (1)                       | (2)                  | (3)                   | (4)                    | (5)                   | (6)                    |
| Wage employment scarcity       | 0.0620***<br>(0.0167)     | 0.0492**<br>(0.0152) | 0.0584***<br>(0.0137) | 0.0358***<br>(0.00933) | 0.0171**<br>(0.00513) | 0.0218***<br>(0.00487) |
| N. observations                | 1495                      | 1318                 | 1318                  | 1318                   | 1306                  | 1306                   |
| N. clusters                    | 206                       | 190                  | 190                   | 190                    | 181                   | 181                    |
| $R^2$                          | 0.069                     | 0.260                | 0.463                 | 0.692                  | 0.988                 | 0.989                  |
| Socio-economic controls        |                           | X                    | X                     | X                      | X                     | X                      |
| Country FE                     |                           |                      | X                     | X                      | X                     | X                      |
| Year FE                        |                           |                      | X                     | X                      | X                     | X                      |
| Occupation FE                  |                           |                      |                       | X                      | X                     | X                      |
| Country $\times$ Occupation FE |                           |                      |                       |                        | X                     | X                      |
| Country $\times$ Year FE       |                           |                      |                       |                        | X                     | X                      |
| Occupation $\times$ Year FE    |                           |                      |                       |                        |                       | X                      |

Note: Significance levels: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Standard errors (in parentheses) are clustered at the country-occupation level. Socio-economic controls include: share of older workers, share of highly educated workers, share of women workers.

Table 3 shows the results coming from the regression model in equation (1), but using  $SoloSEflow_{c,o,t}$  as dependent variable. Consistent with findings in Table 2, results show that the scarcity of wage employment opportunities is positively associated with the fraction of solo self-employment among the newly employed - i.e. those who started working on their current job by less than 12 months. Results are robust to the use of different mixes of control and fixed effects. The coefficient on our main explanatory variable tends to be larger than the one previously shown in Table 2. This may reflect the fact that the extent of wage employment opportunities affects more directly the flows into self-employment rather than the stock of self-employment in each occupation-country.

However, it is important to notice that the number of observations in our estimations drops significantly when flows into solo self-employment, rather than its stock in total employment, is considered. That is because in some country-occupation pairs the number of people entering solo self-employment in a given year as observed in the EU LFS is too small (below 30) to have a statistically significant measure. As a result, when  $SoloSEflow_{c,o,t}$  is used as dependent variable, close to one third of the country-occupation-year cells have missing values. That occurs mainly in small countries (e.g. Malta, Cyprus, Luxembourg) and for occupations, such as clerical support workers, elementary workers, and plant and machine operators and assemblers for which working as solo self-employed is typically a less common career option. However, it appears that these missing values are not driving the main results.<sup>7</sup>

<sup>7</sup> We re-run the estimations in Table 2 over the smaller set of observations used in Table 3. The point estimates remain statistically significant and of a similar magnitude than the ones shown in Table 2 for the full sample. This corroborate the idea that the exclusion of certain country-occupations pair should not be a major concern.

**Table 3 – Solo self-employment entry rate and scarcity in wage employment (2012-19)**

|                          | Solo self-employment entry rate |                      |                     |                      |                    |                      |
|--------------------------|---------------------------------|----------------------|---------------------|----------------------|--------------------|----------------------|
|                          | (1)                             | (2)                  | (3)                 | (4)                  | (5)                | (6)                  |
| Wage employment scarcity | 0.0864**<br>(0.0377)            | 0.0946**<br>(0.0414) | 0.147**<br>(0.0556) | 0.0958**<br>(0.0321) | 0.0439<br>(0.0266) | 0.0621**<br>(0.0273) |
| N.observations           | 843                             | 782                  | 781                 | 781                  | 736                | 736                  |
| N. clusters              | 138                             | 129                  | 128                 | 128                  | 113                | 113                  |
| R <sup>2</sup>           | 0.102                           | 0.225                | 0.599               | 0.723                | 0.965              | 0.972                |
| Socio-economic controls  |                                 | X                    | X                   | X                    | X                  | X                    |
| Country FE               |                                 |                      | X                   | X                    | X                  | X                    |
| Year FE                  |                                 |                      | X                   | X                    | X                  | X                    |
| Occupation FE            |                                 |                      |                     | X                    | X                  | X                    |
| Country × Occupation FE  |                                 |                      |                     |                      | X                  | X                    |
| Country × Year FE        |                                 |                      |                     |                      | X                  | X                    |
| Occupation × Year FE     |                                 |                      |                     |                      |                    | X                    |

Note: Significance levels: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Standard errors (in parentheses) are clustered at the country-occupation level. Socio-economic controls include: share of older workers, share of highly educated workers, share of women workers.

Finally, to check whether the coefficients on *WageEmploymentScarcity* change across subsets of occupations, Table 4 shows the results coming from running the regression model in column 6 of Table 2 and Table 3 for groups of low-medium- and high-skilled occupations separately. By splitting the sample into low-medium and high-skilled occupational groups, it is possible to observe that the estimated coefficients on *WageEmploymentScarcity* remain positive and statistically significant for both groups, although they are larger among the former group than the latter. This is especially the case in column 2, when *SoloSEflow<sub>c,o,t</sub>* is considered as dependent variable. In particular, an increase of 10 percentage points in *WageEmploymentScarcity* across high-skilled occupations is associated with an increase of over 0.3 percentage points in the solo self-employment rate, and to an increase of 1.6 percentage points in the fraction of solo self-employed among new job starters in these occupations.

**Table 4 – Solo self-employment rate/flow and scarcity in wage employment by main occupational group (2012-19)**

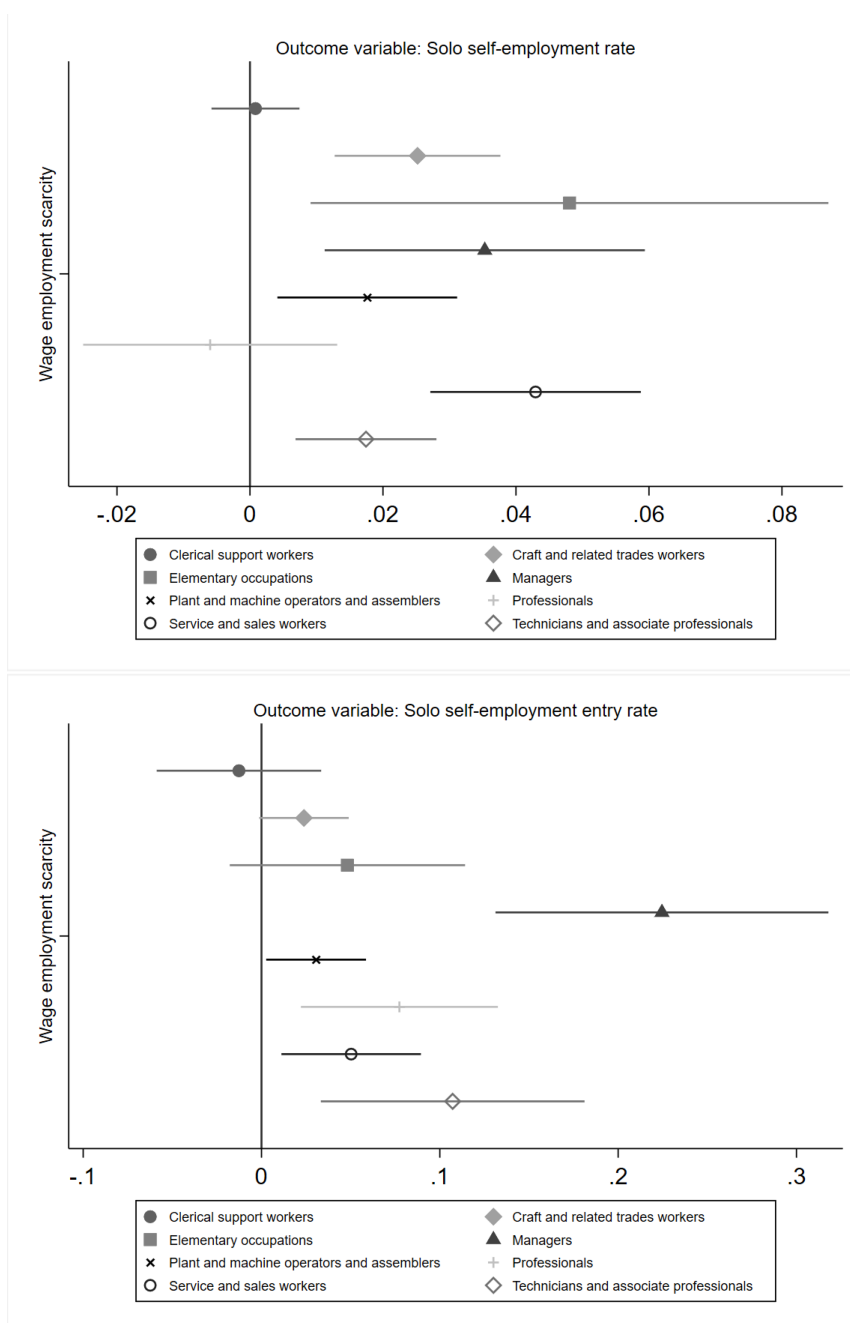
|                                         | (1)                            | (2)                             |
|-----------------------------------------|--------------------------------|---------------------------------|
|                                         | Solo self-employment rate      | Solo self-employment entry rate |
| <b>Panel A: Low- and Medium-skilled</b> |                                |                                 |
| Wage employment scarcity                | 0.0186**<br>(0.00755)<br>[901] | 0.0320**<br>(0.00938)<br>[437]  |
| <b>Panel B: High-skilled</b>            |                                |                                 |
| Wage employment scarcity                | 0.0273**<br>(0.00858)<br>[338] | 0.169***<br>(0.0390)<br>[250]   |

Note: Significance levels: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Standard errors (in parentheses) are clustered at the country-occupation level. The number of observations is in square brackets. All estimates include country, year and occupation fixed effects, as well as country their full interactions as in column (6) of Table 2 and 3. Socio-economic controls included.

To give a closer look at the heterogeneity in the relationship between wage employment opportunities and solo self-employment, Figure 5 plots the coefficients on *WageEmploymentScarcity* obtained by running our main regression models separately for each occupation. Although the sample size is limited - as it only considers the cross-country over-time variation within each occupation - this figure shows that, in most of the cases, a positive relationship between *WageEmploymentScarcity* and our measures of solo self-employment exists within each of the occupations considered.

Once again, it appears that this relationship is stronger for professional, technical, and managerial occupations, and especially so when the flow rather than the stock of solo self-employed in total employment is considered. As previously hinted, larger coefficients on *WageEmploymentScarcity* across high-skilled occupations could reflect the fact that the scarcity of wage employment opportunities works more as a "push" factor towards self-employed across these occupations where workers face a higher opportunity cost of switching to another occupation, than across low- and middle-skilled ones, where workers are more likely to respond to the lack of wage employment opportunities by moving into other different occupations.

**Figure 1: Coefficient estimates on *WageEmploymentScarcity*, regressions by ISCO 1-digit occupation**

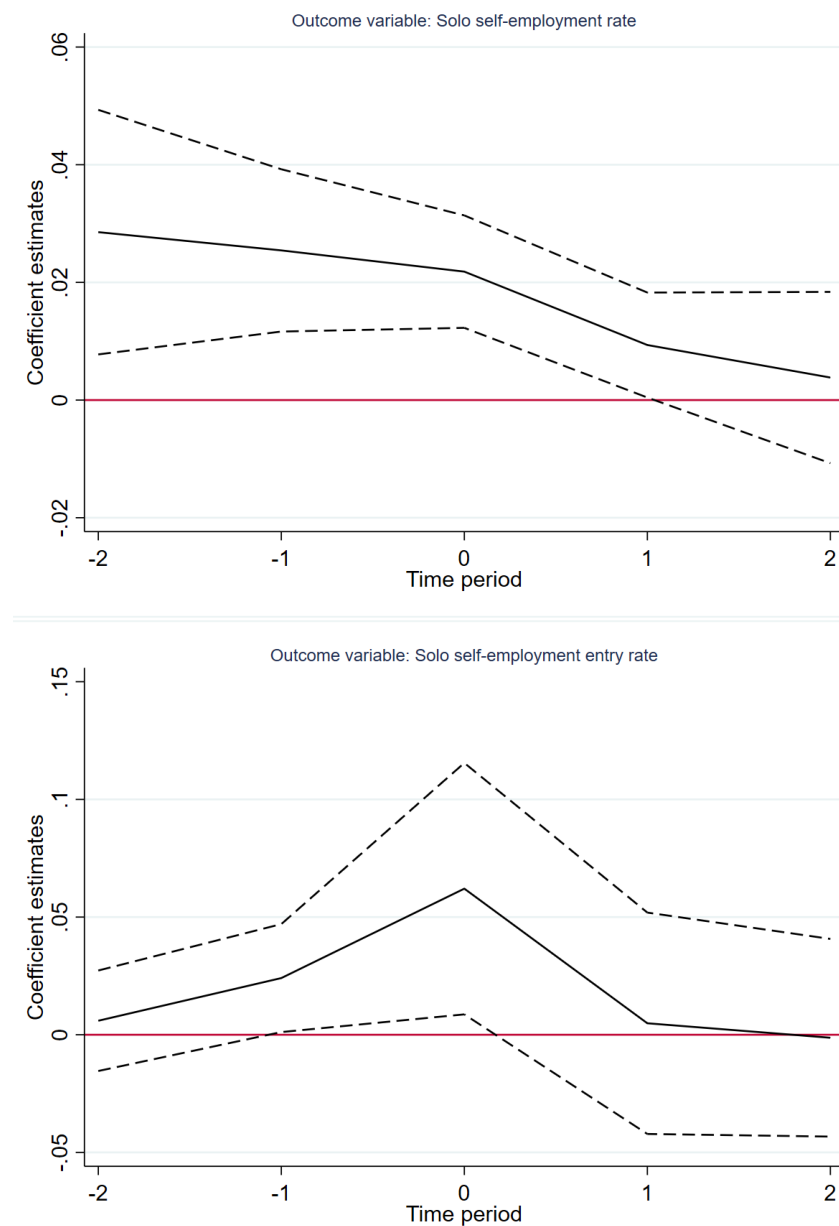


Note: The graph shows the regression estimates of the wage employment scarcity's coefficient using different occupation sub-samples. All estimates includes country and year fixed effects. Socio-economic controls included. Robust standard errors. 95% confidence intervals.

## 4. Robustness tests

A potential threat to our analysis could be inverse causality. To check this does not represent a major concern, Figure 6 plots the coefficient of our main explanatory variable, scarcity in wage employment, moved in time. We can reasonably speculate that in absence of inverse causality, we should not detect any statistically significant coefficients when our main explanatory variable is moved in the future. It is reassuring to see that in all measurement of wage employment opportunities the effect is coming from the past, and not from the future.

**Figure 2: Coefficient estimates using different lags of *WageEmploymentScarcity***



Note: The graph shows the regression estimates using different lags of the independent variable "Wage employment scarcity". All estimates include country and year fixed effects. Socio-economic controls included. Standard errors clustered at the country-occupation level. 95% confidence intervals.

Table 5 presents all previously showed regression results by using the self-employment with employees rate in place of the solo self-employment rate as outcome variable. As discussed in Boeri et al (2020), whilst solo self-employed are more likely to prefer conventional wage employment and only become self-employed to avoid unemployment or because they have been forced to do so by their employers, self-employed with employees may enter this activity to search for flexibility

and seize a business opportunity. Table 5 shows that the association between employment prospects and the self-employed with employee rate is negative and not statistically significant, which support the argument that the lack of employment prospects are more relevant for the latter of group of self-employed than for the former.

**Table 1: Self-employment with employees rate and scarcity in wage employment**

|                             | (1)                                 | (2)                   | (3)                   |
|-----------------------------|-------------------------------------|-----------------------|-----------------------|
|                             | Self-employment with employees rate |                       |                       |
| L1.Wage employment scarcity | -0.00469<br>(0.00461)               |                       |                       |
| Wage employment scarcity    |                                     | -0.00595<br>(0.00563) |                       |
| F1.Wage employment scarcity |                                     |                       | 0.000440<br>(0.00621) |
| N. observations             | 969                                 | 1093                  | 952                   |
| N. clusters                 | 158                                 | 157                   | 155                   |
| R <sup>2</sup>              | 0.995                               | 0.995                 | 0.995                 |

Note: Significance levels: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Standard errors (in parentheses) are clustered at the country-occupation level. Socio-economic controls include: share of older workers, share of highly educated workers, share of women workers.

## 5. Conclusions

This study provides some novel evidence on the relationship between solo self-employment and employment prospects in the wage sector across European countries for the period 2012-19. It does so by using an under-explored empirical approach which takes into account variations in solo self-employment and wage employment opportunities both across and within countries and occupations. This allowed us to consider more precisely the highly heterogeneous nature of solo self-employment and to investigate its relationship with wage employment prospects at a more disaggregated level than previous studies using the aggregate unemployment rate as a measure of the general labour market conditions.

Findings suggest that both the rate of solo self-employed, and their prevalence among new job starters, in a given occupation-country pair is higher (lower) when there are poor (better) employment prospects in traditional wage employment within the same pair. Interestingly we find that the lack of wage employment opportunities is positively associated with the solo self-employment rate across occupations which typically require high education attainment as well as among those that do not. If anything, it even seems that the detected effect is stronger among the former group of occupations than the latter, especially when flows into solo self-employment are considered. Taking into account a number of limitations, this finding is interesting insofar it suggests that entry into solo self-employment out of necessity may not only concerns low-educated workers. Other workers in occupations that require specific human-capital, such as ICT technician, lawyer, architect or accountant, may also turn to self-employment because of lack decent wage employment opportunities in their own occupational specialisation.

In conclusion, one of the main messages of this study is that explaining short to medium-term changes in solo self-employment in the European labour markets could benefit from a better understanding of how different occupational groups react to the availability of wage employment alternatives within their own occupational environment. This article provides a first contribution in this direction, but there is still need for future research. Progress in defining more precise indicators of wage employment opportunities at the occupational level, by for instance using data on actual job vacancies across more detailed occupational classifications, could provide a substantial contribution. Moreover, exploring how the occupation-specific relationship between solo self-employment and wage employment opportunities vary between men and women, as well as across different age groups, could also be a valuable addition. Meanwhile, one could explore how this relationship vary across different categories of occupations, above and beyond the broad differentiation between low-medium- and high-skilled occupations. For instance, as done by studies in other research domains, occupations could be divided according to their work logic (i.e. technical, organizational or interpersonal).

Finally, depending on data availability, it would be interesting to investigate how the extent of wage employment alternatives affect outflows from solo self-employment. As pointed by some previous studies, even if some workers may enter involuntary into self-employment, they may eventually enjoy the non-monetary benefits of such a status. This is corroborated by data showing high degrees of job satisfaction among the solo self-employed, and an overall limited willingness to switch to dependent employment.<sup>8</sup> However, this is at odds with evidence from labour market transitions data showing that a significant fraction of the solo self-employed move to unemployment or to dependent employment once an opportunity presents itself (Boeri et al. 2020, Fondeville et al. 2015). Therefore, a central empirical question is to understand whether the solo self-employed individual, at a given time, would be willing to give up self-employment if they could continue doing the same work in a dependent employment relationship.

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<sup>8</sup> According to the 2017 EU Labour Force Surveys ad-hoc module on self-employment around 16 per cent of solo self-employed would rather work as dependent employee, while the large majority prefers remaining in the self-employment status.

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