A Multidimensional Approach to Precarious Employment Among Young Workers in EU-28 Countries

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Abstract

This article uses a new multidimensional indicator to measure precariousness among young workers across all EU-28 countries. This indicator measures both the incidence and intensity of precariousness. The analysis has involved five dimensions: wages, type of contract, type of working day, disempowerment, and job insecurity. Our database is the European Union Labour Force Survey for the period 2009–2016. The main indication of precariousness is low wages. We find high rates of precariousness for Mediterranean countries (because of low wages and temporary contracts), Denmark (low wages), and the Netherlands (expansion of involuntary part-time jobs). Central European countries have moderate rates, and most Continental and Eastern countries have low rates. We also find that a higher level of education is related to a lower probability of having a precarious job. Finally, we find a greater probability of having a precarious job among women in most countries, and non-statistically significant differences by country of birth.

Keywords Precariousness · Adjusted multidimensional precariousness rate · Young workers · European countries · Flexibilisation

1 Introduction

The objective here is to analyse the evolution of precariousness among young workers in all EU-28 countries between 2009 and 2016, the aftermath of the economic crisis. The flexibilisation policies adopted in recent years have increased both part-time and temporary work in European countries (European Commission, 2009). At the same time, this contract flexibilisation has been associated with precariousness, particularly among young workers

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because of their greater vulnerability when entering the labour market. This precariousness at a young age (15–35) partially reflects the use of flexible contracts as a screening device (Faccini, 2014). In this context, the Organisation for Economic Co-operation and Development (OECD) has recently focused on the quality of jobs (OECD, 2015), stressing the importance of the study of precariousness and its impact on an individual's welfare.

A characteristic of precarious employment is that it is defined in comparison to a reference job, which is usually referred to as standard employment (Rodgers, 1989). There are some studies that have focused on the influence of precariousness among the young population (Kretsos, 2010), and there are also previous studies that compare precariousness in EU-15 countries (Gutiérrez-Barbarrusa, 2016; Kretsos & Livanos, 2015). However, there is no consensus in the literature on how to measure precariousness, and the number of dimensions that should be included when so doing. Furthermore, and to the best of our knowledge, no study has compared precariousness among the young population at EU-28 level, and certainly not in recent years.

This study focuses on precariousness among young workers, and proposes using the adjusted multidimensional precariousness rate developed by García-Pérez et al. (2017). This indicator allows breaking down the relative contribution different dimensions make to overall precariousness. Five dimensions of precariousness have been included in the analysis: wages, type of contract, type of working day, disempowerment, and job insecurity. The inclusion of all these dimensions, besides being novel, is crucial when analysing young workers because precariousness may affect them all. The adjusted multidimensional precariousness rate allows us to measure both the incidence and intensity of precariousness. We may therefore analyse not only the number of young workers it affects, but also the degree to which it does so. In addition to comparing precariousness across countries, we study the influence that level of education, gender and country of birth have on the probability of precarious employment among young individuals. The study of these socioeconomic characteristics provides relevant information about how precariousness affects young workers in European labour markets.

The analysis is based on data from the European Union Labour Force Survey (EU-LFS) provided by Eurostat, comparing all EU-28 countries using a large-scale dataset that ensures harmonisation and sample homogeneity. Furthermore, the use of this database allows comparing our results with previous studies on EU-15 countries. The main contribution here is the use of a novel multidimensional indicator to measure precariousness among the young population at EU-28 level in recent years. A further contribution this article makes through the database is the inclusion of the voluntary acceptance of a job when measuring precariousness, due to its relationship with insecurity.

2 Literature Review

Flexibilisation may be understood as the capacity businesses have to adapt to the economic cycle by adjusting their labour force faster and at a lower cost through different measures, such as reducing hiring and firing costs, adjusting the hours worked, etc. Flexibilisation has therefore followed different paths in each European country, as some have encouraged temporary jobs (Mediterranean countries), others part-time jobs (Nordic countries), and others have even rolled out a combination of different measures including a shorter working-day (Germany and Austria). The abundance of flexible contracts in Mediterranean countries partially reflects employment protection legislation that dualises the labour market (Cahuc

et al., 2016). Some of these measures have had a negative impact on workers' welfare, whereby some countries, such as the Netherlands and Denmark, have developed a combination of flexibilisation and security practices, leading to what is known as flexicurity. It is important to remember that flexibility does not generate precariousness in itself, although its involuntary nature does (Gutiérrez-Barbarrusa, 2016).

Precariousness has grown in European labour markets due to the increase in flexibilisation in recent years (Kretsos & Livanos, 2015; Rubery et al., 2016). Although precariousness began to receive much more attention after the onset of the economic crisis in 2007, there are previous studies in the economic literature that have sought to measure precariousness and how it affects different segments of the labour force (Rodgers, 1989; Rubery, 1989). A characteristic of precarious employment is that it is measured against a yardstick, a vector with parameters of what we consider to be standard employment (Fudge et al., 2002; Rodgers, 1989; Vosko, 2002, 2006). The problem with measuring precariousness is that there is no consensus on its dimensions (Laparra, 2006).

According to the International Labour Organization (ILO), four of these dimensions are as follows: (1) low wages, (2) poor protection from termination of employment, (3) lack of access to social protection/benefits (usually associated with full-time standard employment), and (4) limited access to rights at work (ILO, 2012; ILO, 2016a, 2016b). Several authors have focused on measuring these dimensions (García-Pérez et al., 2017; Kretsos & Livanos, 2015; Vives et al., 2010).

The ILO stresses that precariousness is characterised by the heterogeneity of the forms it can take (ILO, 2012). We should therefore consider those dimensions that may be the key determinants of precariousness. Temporary contracts are associated with a higher probability of redundancy than open-ended contracts (Holmlund & Storrie, 2002), increasing the risk of insecurity for employees. Temporary contracts are also related to lower wages, another key determinant of precariousness (Davia & Hernanz, 2004; De la Rica, 2004; Guadalupe, 2003; Hernanz & Toharia, 2006). These factors make temporary jobs a nonstandard form of employment that can be considered precarious, which is reinforced by the fact that most workers in these jobs are not there out of choice, as they would prefer a permanent job, particularly in Mediterranean countries (ILO, 2016b). Another form of nonstandard employment involves a part-time job, as it is associated with fewer opportunities for advancement (Russo & Hassink, 2008), lower social benefits (Houseman & Machiko, 1998; O'Connell & Gash, 2003), lower job stability (Fernández-Kranz et al., 2015), and lower wages (Hirsch, 2005).

A further key determinant of precariousness involves employment relationships (Scott, 2004), as a dimension that has been included by some scholars (Jonsson et al., 2019; Vives et al., 2010). Employment relationships may be included in the dimension of disempowerment, which may be observed, for example, in such variables as unpaid overtime. Another crucial dimension is the level of income associated with wages. The payment of low wages has been widely studied by different scholars (Olsthoorn, 2014), and especially its influence on precariousness (Rodgers & Rodgers, 1989). These four determinants of precariousness are particularly important for young workers, as they have little or no experience in the labour market and are more likely to accept jobs with these characteristics.

Fullerton et al. (2011) suggest that flexible practices do not necessarily make workers feel insecure in their jobs. Some scholars have included the involuntary nature of a job as an important factor when determining precariousness among non-standard forms of employment (Kretsos & Livanos, 2015; Gutiérrez-Barbarrusa, 2016). Other scholars have studied how the need to take a temporary job may restrict the chances of climbing up the career ladder (Amuedo-Dorantes, 2000).

This article's purpose is to measure precariousness among young workers across EU-28 countries. The literature stresses that several groups of individuals have higher levels of precariousness (Mckay et al., 2012); these groups are young workers (Bradley & van Hoof, 2005; Kretsos, 2010), migrants (Bhalla & McCormick, 2009; Porthé et al., 2009; Pradella & Cillo, 2015), older workers (D'Amours, 2009), and women (Fudge & Owens, 2006; Jonsson et al., 2009).

Another aspect to be considered is the importance of the economic and political context of precariousness (Fullerton et al., 2011). Accordingly, Gutiérrez-Barbarrusa (2016) suggests that the different degrees of precariousness in European countries are determined by insecurity and poverty levels. Precariousness therefore depends on the degree of "flexibilisation" and the level of social protection. Differences across groups of European countries depend on the different implementation strategies involving flexicurity policies. Particularly, precariousness is the outcome of a partial implementation of flexicurity policies, resulting in a labour market characterised more by contract flexibility and less by job and labour income security. Our analysis of the evolution of precariousness in EU-28 will take into account certain studies on EU-15 (Kretsos, 2010; Kretsos & Livanos, 2015; Gutiérrez-Barbarrusa, 2016) as a reference for comparing the results, studying five dimensions that determine precariousness: wages (low wages), type of contract (temporary jobs), type of working day (part-time), disempowerment (unpaid overtime), and job insecurity (looking for another job because of the risk or certainty of redundancy or looking for better working conditions). There are differences between the methodology used and contractual flexibility indices already proposed in the literature (Gialis & Taylor, 2016; Grekousis & Gialis, 2019).

We assume that precariousness is a structural process that depends on each country's specific characteristics. Furthermore, we assume that those countries where the economic crisis has had a bigger impact will record a higher rate of precariousness. This effect will appear after the crisis, as the first jobs to be destroyed are usually the precarious ones, which may reduce the prevailing rate. Considering the results obtained for EU-15 countries by Kretsos and Livanos (2015), on the one hand we expect Mediterranean countries to have higher rates of precariousness among young workers. At the same time, high rates are expected for the Netherlands and Denmark due to the flexibilisation of their labour markets. Furthermore, an upward trend in the rate of precariousness is expected in these countries, particularly Mediterranean ones, as a consequence of the impact of the crisis. On the other hand, we also expect Nordic, Anglo-Saxon and Continental countries to record low rates among young workers. We adopt the conclusions of Laužadytė-Tutlienė et al. (2018) as a reference for our analysis. We therefore expect an increasing rise in the rate for Central European countries, especially after the crisis, as they are more like Mediterranean countries. In the case of Eastern European countries, we expect a different trend, as they have a completely different model of welfare state. Furthermore, when comparing precariousness by level of education and gender, we expect higher rates among young workers with lower levels of education, and among women, respectively (Fudge & Owens, 2006; Jonsson & Nyberg, 2009). According to country of birth, we expect a higher probability of precarious employment among those individuals from outside EU-28 compared to those born within it.

3 Methodology

This section describes the methodology used to identify precariousness across EU-28 countries. The adjusted multidimensional precariousness rate developed by García-Pérez et al. (2017) has been taken as the benchmark, with some adjustments to analyse the EU-LFS data used. This indicator is calculated on a counting basis and has several advantages, such as the possibility of breaking down the relative contribution to total precariousness made by different dimensions. Using this adjusted multidimensional precariousness rate, we can analyse both the intensity and the incidence of precariousness across European countries.

We use a double threshold to measure precariousness. First, a threshold needs to be established for each dimension, identifying the type of job that can be considered precarious in a particular dimension. We then define a second threshold for a new variable, P, summarising the five dimensions used.

If we consider X_{ij} to be the observation of dimension j for individual i, where $j = 1, …, 5$ and Z_j is the threshold established for dimension j, we will consider that employee i is facing precariousness in dimension j when $X_{ij} \leq Z_j$. In this case, the five dimensions analysed are, as already noted: wages, type of contract, type of working day, disempowerment, and job insecurity.

We take low wages to be those under 60% of the median, using as our reference the study by García-Pérez et al. (2017) and bearing in mind that Eurostat considers low wages to be those amounting to less than two thirds of the national median. Temporary and part-time jobs are considered precarious for type of contract and type of working day, respectively, but only those jobs chosen on an involuntary basis have been included, as done before by Green and Livanos (2017). As regards disempowerment and job insecurity, we have focused on disempowerment within the labour market and on the risk of unemployment, respectively. Jacobs (2007) suggests that economic insecurity may be understood as the intersection between perceived and actual risk. In order to measure these dimensions, we have used two variables from the EU-LFS database: the number of unpaid hours worked per week and job-seeking, respectively. In terms of the number of unpaid weekly hours, the threshold established is one hour. The threshold for job-seeking is related to the risk of unemployment perceived by young workers. A job is therefore considered to be precarious if the reasons include the risk or certainty of redundancy and seeking better working conditions. This second condition has been included because we assume that if an individual is looking for another job with better conditions, it means they are not matched with their optimal job. It is worth mentioning that the unemployment benefit in terms of the probability of being a recipient and the amount of the subsidy were considered as proxy for disempowerment, but the results show few variations.

Once the threshold has been defined for each dimension, a new variable P has been created to measure which job can be considered precarious by taking into account the number of dimensions in which that job exceeds each threshold. For individual i, this variable is calculated as follows:

$$P_i = \sum_{j=1}^{5} w_j I_{\{X_{ij} \leq Z_j\}} \quad i = 1, …, n$$

where $I_{\{B\}}$ is the indicator function of set B, w_j is the weight assigned to each dimension, and n is the total number of individuals. In this case, we have assigned the same weight to

each dimension, assuming that they all have the same influence on precariousness, as we cannot affirm that one dimension has more influence than another.[1] This variable will have values between 0 and 5, where 0 means that an individual's job is not precarious in any dimension, and 5 identifies a precarious job in all five dimensions being measured.

The second threshold allows us to classify a precarious job depending on the value of variable P for each individual i. In this case, we have considered a job as precarious if $P_i \geq 1$, which means it reflects precariousness in at least one dimension.

After these two thresholds have been defined, we are going to measure both the incidence and the intensity of job precariousness among young people. It is interesting to analyse intensity, as we assume that the situation of young workers is qualitatively different as the number of precarious dimensions increases. This is reflected by the fact that when the number of precarious dimensions increases, the risk of being in poverty or socially excluded also increases (Malo & Moreno, 2018). The rate of precariousness allows us to measure its incidence among young workers using the information from variable P. In this case, we have defined this rate as H, where,

$$H = \frac{\sum_{i=1}^{n} I_{\{P_i \geq 1\}}}{n} = \frac{q}{n}$$

q reflects the number of jobs we have considered precarious with the established threshold ($P_i \geq 1$). Intensity has been measured by first calculating the average value of P among precarious jobs, and then standardising this value with the number of dimensions we have included, obtaining what we have called value A,

$$A = \frac{\mu_p^q}{D} \quad \text{where} \quad \mu_p^q = \frac{\sum_{i=1}^{n} P_i \, I_{\{P_i \geq 1\}}}{\sum_{i=1}^{n} I_{\{P_i \geq 1\}}}$$

Value A allows us to measure intensity, but for measuring both intensity and incidence at the same time, we are going to use the adjusted multidimensional precariousness rate developed by García-Pérez et al. (2017). This measure is defined as M_0,

$$M_0 = \frac{\sum_{i=1}^{n} P_i I_{\{P_i \geq 1\}}}{nD} = H \times A$$

The adjusted multidimensional precariousness rate allows us to compare both the incidence and intensity of precariousness among young workers in EU-28 countries. This comparison is made in a standardised way, as we consider the number of dimensions we have included when measuring precariousness.

In order to complement this analysis, each country's social protection system is compared using guaranteed minimum income (GMI) as reference. These data are obtained from the Mutual Information System on Social Protection (MISSOC) database, which allows us to compare European countries. In addition, a logit model has been estimated to analyse the influence of level of education, gender and country of birth over precariousness. As a

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[1] Different weights have been tested for all the dimensions to analyse non-uniform weighting schemes. As each dimension's individual contribution can be analysed, if a higher weight is given to the dimensions with a higher contribution, M_0 will be higher, and vice versa for the dimensions with a lower contribution. However, the results obtained in non-uniform weighting schemes have fewer variations compared to those presented in the analysis. These results are available upon request.

robustness check, an analysis has been made of the influence of the age profile of young workers by five-year age brackets and the number of working hours over precariousness.

4 Data

The database used for the analysis is the EU-LFS, provided by Eurostat. This article analyses the trend in precariousness among young workers from 2009 to 2016 for all EU-28 countries. The database contains only those individuals aged between 15 and 35. The database has different groups of variables, including demographic background, labour status, employment characteristics of the main job, hours worked per week, and job-seeking. These groups provide us with a wide range of possibilities for measuring precariousness both rigorously and accurately. The main advantage of using this database is that the information available is harmonised for all European countries, with a broad sample for each year and country. Its only disadvantage is that there is no information available on wages for Slovenia and Sweden. Furthermore, data on wages are missing for some years in several countries.

The analysis of each country's social context has involved the use of the MISSOC database, which contains detailed information on the GMI system each country has used. Furthermore, this database provides harmonised information on all European countries.

The analysis has been simplified by classifying European countries into six different groups according to geographical location and the nature of the welfare state (Bonoli, 1997), as done previously for EU-15 countries by Kretsos and Livanos (2015) and Sapir (2006), and for new EU member states by Laužadytė-Tutlienė et al. (2018). These groups are as follows: the Anglo-Saxon (United Kingdom and Ireland), Continental (Austria, Belgium, France, Germany and Luxembourg), Mediterranean (Spain, Portugal, Italy and Greece), Nordic (Denmark, the Netherlands, Finland and Sweden), Central European (Czech Republic, Croatia, Poland, Slovenia, Slovakia and Hungary), and Eastern European (Lithuania, Latvia, Estonia, Bulgaria and Romania). Although each country has its own characteristics and there are differences between the countries in each group, there are certain similarities across neighbouring countries, such as the state of the labour market, the economy, and the institutional context. The Anglo-Saxon model relies on active policies aiming to improve the employability of the unemployed, wage disparities, and weak trade unions. Continental countries pay considerable attention to old-age pensions and unemployment benefits. The Mediterranean model relies on old-age pensions and a poor redistribution of income. The Nordic model focuses on high social protection and an active policy of reducing unemployment. The Central European welfare model is similar to the Mediterranean one. Finally, the Eastern European welfare model is characterised by low labour market flexibility and high gender inequality in terms of unemployment (Esping-Andersen, 1990; Kretsos & Livanos, 2015; Sapir, 2006). Malta and Cyprus have not been included in this classification because of their specific characteristics, whereby they should be analysed separately.

5 Results

This section groups the analysis into three subsections: rate of precariousness, adjusted multidimensional precariousness rate, and logit model. The first subsection analyses the incidence of precariousness among young workers across all EU-28 countries. The second subsection compares the adjusted multidimensional precariousness rate, the influence
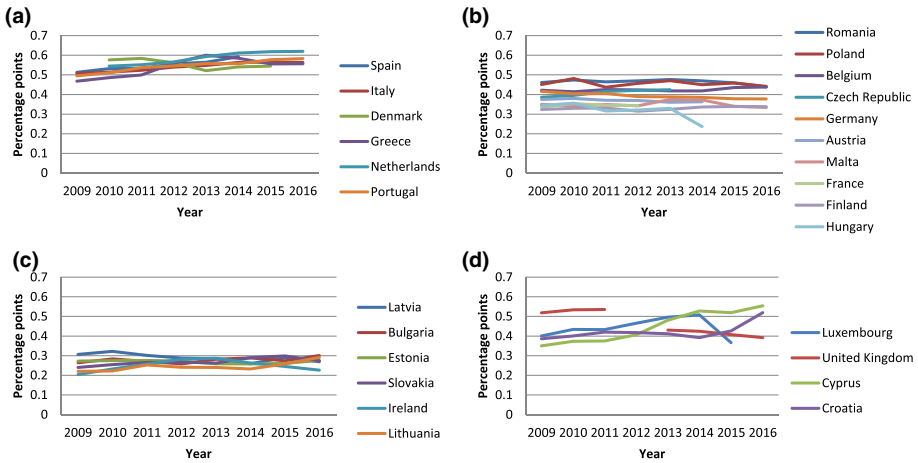
Fig. 1 Evolution of the precariousness ratio (H) per group of countries measured as percentage points (2009–2016). Panel **a** contains the countries with higher rates, panel **b** the countries with moderate rates, panel **c** the countries with lower rates, and panel **d** shows the countries with different rate trends. *Source*: Authors' calculations using EU-LFS data

of the five dimensions included in the analysis, and each country's social welfare system. Finally, the third and last subsection uses a logit model to analyse the influence on the rate of certain socio-economic characteristics, such as level of education, gender and country of birth.[2]

5.1 Rate of Precariousness

This section compares the rate of precariousness for all EU countries over the period from 2009 to 2016. The analysis allows us to compare precariousness in a first stage when the countries face an economic crisis, and in a second stage of economic growth or recovery after the crisis. Furthermore, this helps us identify the quality of the new jobs created in the wake of the crisis.

We have classified the countries into three different groups to analyse the results obtained after applying the methodology explained above, identifying those jobs that can be considered precarious according to the five dimensions included in our analysis (Fig. 1). First of all, there are some countries with a rate of precariousness of over 50% for young workers. This group contains all the Mediterranean countries, in addition to two Nordic countries characterised by their flexicurity practices, namely, the Netherlands and Denmark. These countries record very high rates that are maintained throughout the period, and even increase after the economic crisis, with the exception of Denmark, where the precariousness rate decreased considerably. This shows that the new jobs created after the crisis were mostly precarious in the Netherlands and Mediterranean countries. The prior literature evidences the high rates of precariousness among Mediterranean countries (Kretsos & Livanos, 2015). Therefore, the high rates of precariousness among young workers

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[2] Results at country-group level are shown in the "Appendix".

suggest that it is a structural process. The high rate of precariousness in Mediterranean countries is informed by low wages and the high number of temporary jobs. The case of the Netherlands is very peculiar, as the high rate is due to the large number of part-time contracts among the young; this evidence has also been reported in the literature (Kretsos, 2010). We should note that we apply the term precarious solely to those part-time jobs accepted out of necessity. Flexibilisation in the Netherlands has therefore been accompanied by an increase in the rate of precariousness among the young, a population that needs more full-time jobs. In Denmark, low wages are the main cause of the high rate of precariousness.

The second group consists of a wide variety of countries that have a rate of precariousness of between 30 and 50%. On the one hand, there are Continental countries with a moderate rate of precariousness that remains constant throughout the period analysed. These countries, therefore, were only slightly impacted by the crisis in terms of precariousness among the young, with low wages being the main factor involved. In turn, most Central European countries and others such as Malta and Finland follow a different trend. With a figure very close to 30%, Finland has a low rate that remains constant throughout the period. The major influence of low wages on these moderate rates of precariousness may be due to the age factor, as young workers lack experience and may not yet have had the opportunity to advance in their careers.

The third group includes those countries with a low rate of precariousness among young workers, recording a figure under 30%. This group contains most of the Eastern European countries (Bulgaria, Latvia, Lithuania and Estonia), as well as Ireland and Slovakia. Despite the low rates in this group, it is important to highlight the growing dynamic for most of the Central and Eastern European countries after the crisis. The trend is quite different for Ireland, as the rate of precariousness among young workers decreased after the crisis to 22.6% in 2016, reflecting the good situation of young workers there compared to other European countries. It is also important to mention that Ireland has one of the highest youth employment rates in Europe (Kretsos, 2010). The evidence therefore shows that those countries in which the labour market depends more on the economic cycle and where the economic crisis had a higher impact seem to record an upward trend in the rate of precariousness after the crisis. This is not the case for either Ireland or Continental countries because of their economic or welfare models.

Apart from these three groups, it is worth mentioning the evolution of four countries that have varied considerably during the period analysed, namely, the UK, Croatia, Cyprus and Luxembourg, where the rates of precariousness have altered significantly during the period in question due to several political and legislative changes (Fig. 1).

5.2 Adjusted Multidimensional Precariousness Rate

The following studies the incidence and intensity of precariousness at the same time by comparing the adjusted multidimensional precariousness rate (M_0) that takes values between 0 and 1. Before conducting the comparison, it is important to note that a value for this multidimensional rate under 0.09 can be considered low, while a value over 0.12 may be considered high. This classification reveals that countries with low values of incidence ($H < 0.3$) and intensity ($A < 0.25$) will score under 0.09, while countries with high values ($H > 0.5$ and $A > 0.25$) will score over 0.12 for M_0. A greater intensity means jobs that are precarious in more dimensions at the same time.
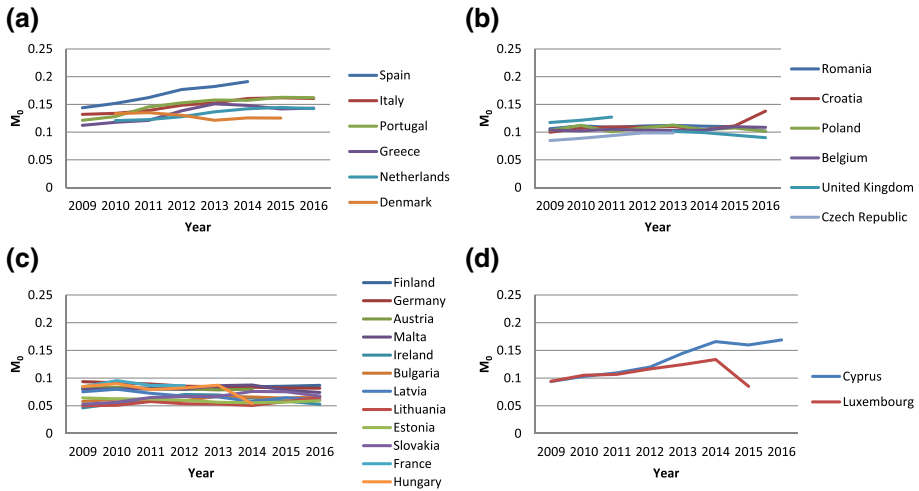
(a)

(b)

(c)

(d)

Fig. 2 Evolution of the adjusted multidimensional precariousness rate (M_0) by groups of countries, (2009–2016). Panel **a** contains the countries with higher rates, panel **b** the countries with moderate rates, panel **c** the countries with lower rates, and panel **d** shows the countries with different rate trends. *Source*: Authors' calculations using EU-LFS data

When analysing the adjusted multidimensional precariousness rate for European countries, we can identify three groups: a first group with high rates over 0.12, a second with moderate rates between 0.12 and 0.09, and a third one with low rates under 0.09 (Fig. 2). The first group consists of the same countries that had a higher rate of precariousness. Nevertheless, there are major differences in this group because the inside distribution is quite different. First of all, it is important to mention that there is an increasing trend across all the Mediterranean countries, as well as in the Netherlands, which was not clear in the analysis of the rate of precariousness. This means intensity has increased sharply between 2009 and 2016, particularly after 2013, in part due to the decrease in terms of employment protection. The strictness of employment protection index elaborated by the OECD reflects a continuous decrease in terms of employment protection in all Mediterranean countries during this period, and particularly in 2013. Despite this trend, the evidence shows that the adjusted multidimensional precariousness rate in the Netherlands is below the Mediterranean countries, which means that intensity is lower in the Netherlands. In turn, Mediterranean countries have a high incidence and intensity due to their presence in all the dimensions analysed. It is important to highlight the case of Spain, where the rate is clearly higher than elsewhere, reflecting the high rate of precariousness. Even without information for the last two years, the rising trend reflects the effects of the economic crisis that have not yet been resolved. The last country in this group is Denmark, where the rate decreases slightly after the crisis, recording a value of 0.1254, which means that despite a high rate of precariousness, its intensity is quite low. The situation of young workers in Mediterranean countries, therefore, is clearly worse, as they are affected by precariousness in more dimensions.

The second group of countries with a moderate adjusted multidimensional precariousness rate has also varied slightly compared to the results obtained for the rate of precariousness. This group consists of Central European countries (Poland, Croatia and the Czech Republic), as well as Belgium and Romania. The UK is another country that may be

included in this group that has evolved differently. In turn, the situation is similar to the rate of precariousness for Belgium, Romania and Central European countries, with low variations during the period analysed, which means that the economic crisis has not had a high impact in terms of precariousness. The rates among young workers are still high, reflecting the problems this population faces when entering the labour market. The UK records the opposite trend, as the rate fell from 0.118 in 2009 to 0.09 in 2016, as the transition to regular employments is supported by the labour institutions, as in Ireland (Sapir, 2006). However, there are major wage differences among young workers in these countries, with low wages constituting the main reason for precariousness. It is therefore important to note that the low rate of precariousness in some of these countries is due to the few cases of involuntary part-time and temporary jobs.

The third and final group also has a different composition when measuring the adjusted multidimensional precariousness rate, and two subgroups can be identified. On the one hand, there are most of the Continental countries, together with Finland, Hungary and Malta, and on the other hand, we encounter most of the Eastern European countries, along with Ireland and Slovakia. Although the first subgroup is defined by moderate levels of precariousness, their intensity of precariousness is very low. It is also important to note that the main reason for precariousness among young workers in these labour markets is the existence of low wages, something that may reasonably be expected because we are analysing young workers. In these countries, therefore, public institutions should focus on reducing the prevalence of low wages among young workers in order to decrease precariousness. On the other hand, the second group is characterised by having both a low incidence and intensity, which reflects the good situation of young workers. Although there are changes in the evolution of some of these countries, the economic crisis has had no noticeable effect on the adjusted multidimensional precariousness rate.

To conclude the analysis of the adjusted multidimensional precariousness rate in European countries, it is important to highlight the situations of Cyprus and Luxembourg (Fig. 2). In the case of Cyprus, the evidence shows a continuous increase in this rate throughout the period analysed, reaching one of the highest values of 0.169 in 2016, outpacing Portugal, Greece, Italy and the Netherlands. This reflects the high intensity of precariousness among young workers and the bad conditions they have to face. The intensity of precariousness is low in Luxembourg, and the evolution of the adjusted multidimensional precariousness rate is marked by a significant decrease after 2014, influenced mainly by the incidence rate.

Once the adjusted multidimensional precariousness rates of EU-28 countries have been compared, it is interesting to check whether or not these differences are correlated with some type of national GMI. Those countries with higher rates of precariousness might have implemented more robust GMI systems to deal with the problems related to precariousness. However, it may also be the case that those countries with stronger GMI systems give young workers more opportunities to choose between different jobs, reducing the incidence of precariousness. We therefore want to discover whether there is any relation between these two factors.

In order to compare each country's GMI, incomes have been transformed into units of purchasing power parity. GMI has been correlated as a percentage of the guaranteed minimum wage with the adjusted multidimensional precariousness rate for 2016.

The relationship between GMI and the adjusted multidimensional precariousness rate has been studied by estimating a linear model and Pearson`s correlation test considering a 95 percent confidence interval. The results show that there is no linear relation between these two variables (Fig. 3). However, we can classify several groups of countries that
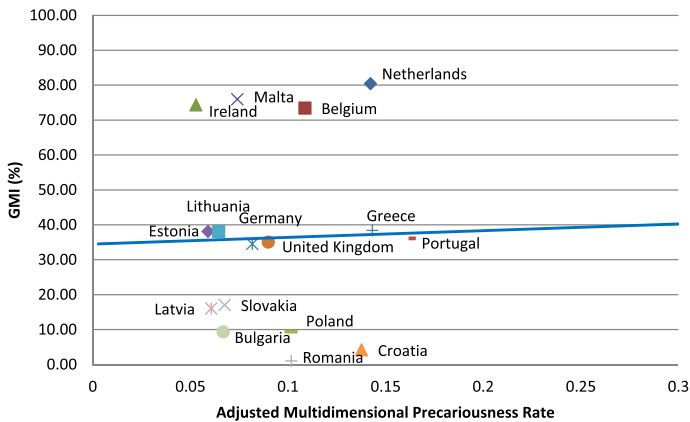
Fig. 3 Relationship between GMI as a percentage of the minimum wage and the adjusted multidimensional precariousness rate by country for 2016. *Source*: Authors' calculations using the data from Eurostat (Minimum wages), MISSOC (GMI), and the adjusted multidimensional precariousness rates. The calculations related to the rates of precariousness are similar to the ones presented for the adjusted multidimensional precariousness rates

seem to have different characteristics. Firstly, some Nordic, Anglo-Saxon and Continental countries provide a high coverage through their GMI systems, which gives the young unemployed security. These countries record low rates of precariousness, with the exception of the Netherlands, where the adjusted multidimensional precariousness rate is particularly high, which may be due to the flexicurity practices put in place. Secondly, some Continental countries and all the Mediterranean ones provide a moderate coverage in terms of GMI. However, the rates of precariousness are higher for Mediterranean countries than for Continental ones. Thirdly, although the incidence of precariousness is low in most Central and Eastern European countries, their GMI systems provide little coverage, which may generate insecurity among young people. In this case, there are different degrees of coverage between each country, and we encounter very different rates of precariousness.

5.3 Logit Model: Precariousness Among Young Workers According to Their Level of Education, Gender and Country of Birth

Following this comparison of the incidence and intensity of precariousness across European countries, the next step involves analysing whether there are differences among young workers according to certain socioeconomic characteristics, such as their level of education, gender and country of birth. On the one hand, it is expedient to study the influence of level of education, as we assume that more education helps workers to find better jobs. On the other hand, it is also interesting to analyse whether there is a gap between young workers according to gender or country of birth, as we assume that these variables should not generate differences in terms of precariousness.

A logit model has been used to analyse these differences. We have compared three categories for level of education: a low level, which includes lower or compulsory secondary; a medium level, which includes upper secondary or the sixth form, and a third level that corresponds to higher education. As regards country of birth, a comparison will be made between young workers born in each country and those born in other EU-28 countries or elsewhere. The aim of comparing men and women is to discover whether overall gender
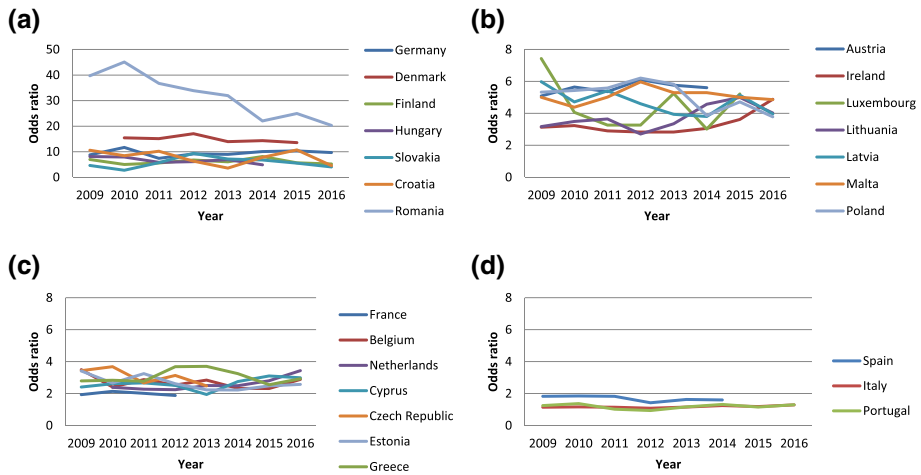
(a)

(b)

(c)

(d)

Fig. 4 Evolution of the odds ratio for young workers with a low level of education by country (reference category: high level of education). Panel **a** contains the countries with very high odds ratios, panel **b** the countries with high odds ratios, panel **c** the countries with moderate odds ratios, and panel **d** shows the countries with low odds ratios. *Source*: Authors' calculations using EU-LFS data

differences in precariousness reported in the literature (Fudge & Owens, 2006; Jonsson & Nyberg, 2009) also hold for young workers. The reference categories are as follows: the highest level of education, those born in the country of study, and men. The results are presented as the odds ratios between the probabilities of a precarious job in the category analysed and the reference category.

In terms of educational level, the results are significantly different between young workers with a high level of education and those with low and medium levels (Figs. 4 and 5, respectively). For individuals with a low level, the odds ratios for most of the countries are very high, especially Romania, Denmark and Germany (Fig. 4). These countries record odds ratios higher than 10, whereby young workers with little education are ten or more times more likely to have a precarious job than young workers with a high level. Some countries, such as Austria, Ireland, Luxembourg and Lithuania, have high odds ratios, albeit with values between 4 and 10. These results indicate that higher education makes a big difference for the young population in these countries.

Another group we have identified comprises countries with moderate ratios, such as Belgium, France, the Netherlands and Greece, where we encounter ratios of between 2 and 4, indicating that the probability of a precarious job between young workers with low and high levels of education is still high, but significantly lower than in other European countries. Finally, Mediterranean countries have lower ratios. It is important to emphasise that these countries have the highest rate of precariousness, with a very small difference between young workers with high and low levels of education. We may therefore anticipate that these countries have a high level of precariousness in the jobs obtained by young workers with high levels of education. Furthermore, we can affirm that higher education does not guarantee young workers quality jobs when entering the labour market. The results have been analysed for the entire period between 2009 and 2016, and the evidence shows that there are no major differences in the trend for all these countries, with the exception of Romania, where there is a sharp drop in the odds ratio.
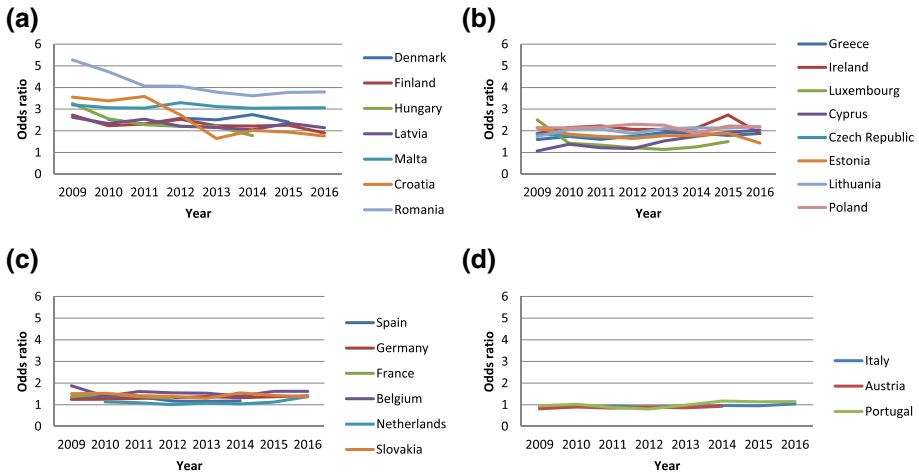
Fig. 5 Evolution of the odds ratio for young workers with a medium level of education by country (reference category: high level of education). Panel **a** contains the countries with higher odds ratios, panel **b** the countries with moderate odds ratios, panel **c** the countries with lower odds ratios, and panel **d** shows the countries with odds ratios below 1. *Source* Authors' calculations using EU-LFS data

Following the previous results, the odds ratios for individuals with a medium level of education are somewhat lower than for individuals with a low level (Fig. 5). First, we can distinguish a group of countries with the highest odds ratios of between 2 and 6 (Romania, Croatia, Hungary and Denmark), with major differences between individuals with medium and high levels of education. These countries are characterised by having the greatest differences between individuals with low and high levels. Young workers in these countries with the highest level of education are scarcer and less likely to have a precarious job. The second group of countries is characterised by moderate odds ratios between 1.5 and 2.5. Among other countries, this group includes Ireland, Greece, Luxembourg, Lithuania and Poland, where there is still a significant difference between medium and high levels of education, with the probability of a precarious job being greater for individuals with a medium level.

Contrasting with the above countries, some Continental countries (Germany, France and Belgium) and Spain have odds ratios of between 2 and 1, evidencing a higher probability of a precarious job among those young workers with a medium level of education compared to those with a high level. It is important to highlight the case of the Netherlands, where the odds ratio for the period analysed is very close to 1, reflecting only small differences between these two groups of young workers. The last three countries that should be mentioned are Italy, Portugal and Austria, where the probability of a precarious job is greater for individuals with a high level of education than for those with a medium level. This situation may be due to the late entry into the labour market of young workers with a higher level, as in other Mediterranean countries where the odds ratios are also low. Young workers with a medium level of education may have had more time to look for a job or have more experience in the labour market, which enables them to find a better job. Nevertheless, the situation of young workers with higher education is difficult in Mediterranean and Continental countries. This evidence makes sense when comparing individuals with high and low levels of education, as Mediterranean countries had the smallest differences.
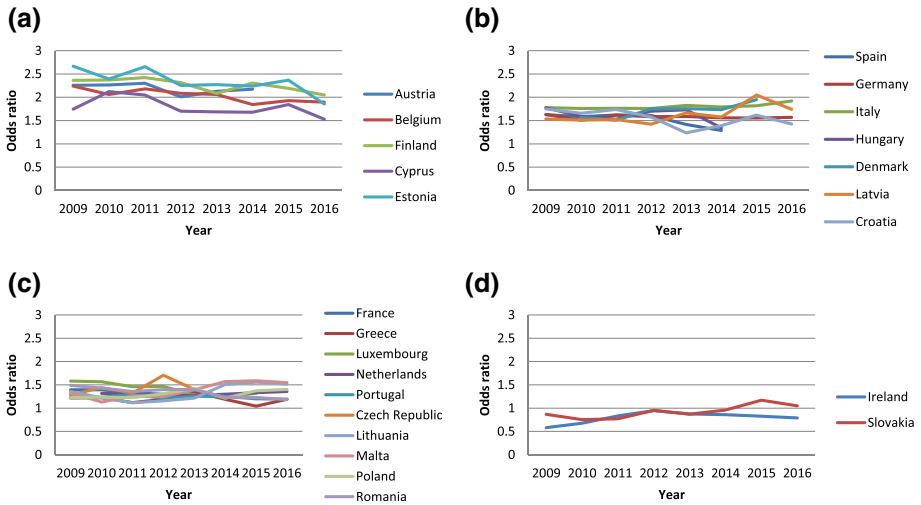
Fig. 6 Evolution of the odds ratio by gender for EU-28 countries (reference category: men). Panel **a** contains the countries with higher odds ratios, panel **b** the countries with moderate odds ratios, panel **c** the countries with lower odds ratios, and panel **d** shows the countries with odds ratios below 1. *Source*: Authors' calculations using EU-LFS data

As regards the gender analysis, it should be noted that the prior literature has emphasised the higher levels of precariousness among women (Fudge & Owens, 2006; Jonsson & Nyberg, 2009). In order to discover whether these gender differences persist among young workers, we have classified the countries into four different groups according to the odds ratios obtained with the aforementioned logit model (Fig. 6).

The first group consists of Austria, Belgium, Finland, Cyprus and Estonia, with odds ratios over 2, which means that the probability of a precarious job for women is at least twice that for men. These results reveal significant gender differences that need to be reduced, and which may be due to, for example, existing wage gaps. The second group, composed by countries such as Spain, Germany, Denmark and Croatia, is characterised by odds ratios of between 1.5 and 2. This group therefore records major gender differences, albeit slightly less so than for the previous group. Nonetheless, women have a higher probability of a precarious job than men, a situation that needs to be redressed through public policies. The third group also records significant differences between men and women, with the probability of a precarious job being higher for women. This group contains a wide range of countries, such as France, Greece, the Netherlands, Lithuania and Romania, with odds ratios between 1 and 1.5, and smaller but still significant gender differences. The fourth and final group consists of Ireland and Slovakia, two countries with a greater probability of a precarious job for men than for women throughout almost the entire period from 2009 to 2016. The gender differences are therefore small for these two countries.

In relation to the influence of country of birth over precariousness, most countries do not record any statistically significant differences between young host country nationals (HCNs) and EU and non-EU migrants. Regarding the differences between young HCNs and young EU-28 workers, there are two Continental countries (Austria and Belgium) in which the probability of a precarious job is higher for young workers born in other EU-28 countries (Fig. 7). Finally, we should highlight the situation in Ireland because the values
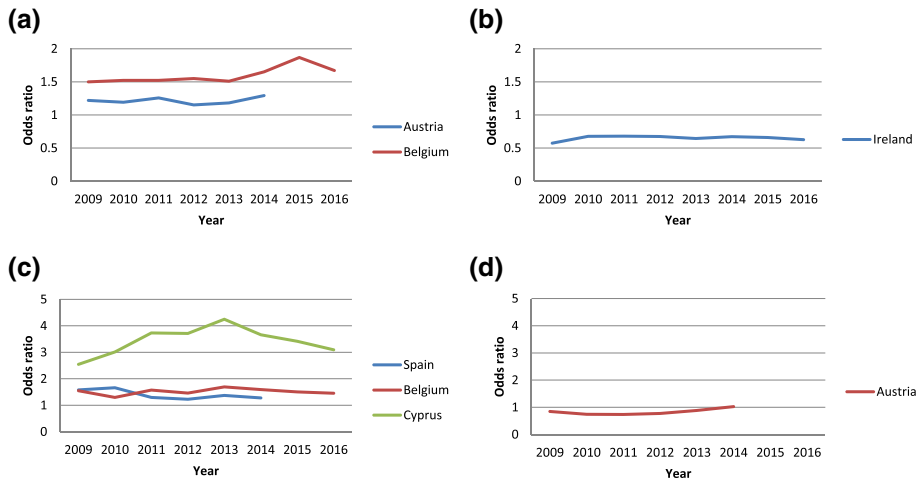
Fig. 7 Evolution of odds ratios according to country of birth for EU-28 and non-EU-28 young workers (reference category: HCNs), 2009–2016. Panel **a** contains the countries with odds ratios above 1 for EU migrants, panel **b** the countries with odds ratios below 1 for EU migrants, panel **c** the countries with odds ratios above 1 for non-EU migrants, and panel **d** the countries with odds ratios below 1 for non-EU migrants. *Source*: Authors' calculations using EU-LFS data

obtained are near 0.5, whereby the probability of a precarious job among young HCNs is higher than for those born in EU-28 countries.

When comparing the probability of having a precarious job between young HCNs and non-EU workers, most countries record statistically non-significant odds ratios. However, the odds ratios in Spain, Belgium and Cyprus are positive for the entire period analysed, with values of close to 1.5 for Spain and Belgium, and between 2.5 and 4.5 for Cyprus, reflecting the higher probability of a precarious job among young non-EU workers compared to HCNs.

Finally, some robustness checks have been made taking into consideration the age profile of the precariousness rate and the number of working hours ("Appendix"). Statistically significant differences are observed by five-year age brackets related to the probability of having a precarious job for all countries. As age increases, the probability of having a precarious job decreases, which is in concordance with the vulnerability of young workers (Bradley & van Hoof, 2005; Kretsos, 2010). Related to the number of working hours, the probability of having a precarious job decreases as the number of working hours increases, showing consistent results for the impact of non-standard forms of employment on the precariousness rate.

6 Discussion and Conclusions

This study aimed at analysing the evolution of precariousness among young workers in EU-28 countries. This has involved using the adjusted multidimensional precariousness rate and a logit model to compare the countries and the influence of different variables during and after the great recession. The analysis has focused on five dimensions in which precariousness is present: wages, type of contract, type of working day, disempowerment, and job insecurity. The following conclusions have been reached:

1. In terms of precariousness, the evidence reveals major differences across all the countries, reflecting the diversity of the labour market conditions that young workers face in each case. The adjusted multidimensional precariousness rate is very high among young workers in Mediterranean countries, Denmark and the Netherlands between 2009 and 2016. The intensity of precariousness is very high for Mediterranean countries due to its high levels in all the dimensions analysed. It is important to note that the high precariousness rate in the Netherlands is due to the large number of involuntary part-time jobs. Furthermore, as regards the Netherlands and Denmark, it is important to stress that the high rates are due to the flexicurity practices implemented in recent years. Compared to these countries, we find moderate rates that remain constant over the period analysed in Central European countries, which have some similarities with their Mediterranean counterparts. Continental, Eastern European and Anglo-Saxon countries record lower rates. However, there are also differences between these groups, as both the intensity and incidence of precariousness is low in Eastern European countries and Ireland, while the incidence is moderate in Continental countries. Despite this classification, it is important to highlight the intra-country differences in each one of these groups. Finally, we should note that the dimension of low wages is the main one that generates precariousness across the board, albeit with some exceptions, such as Mediterranean countries and the Netherlands, where other dimensions have a major impact.

2. The analysis shows that a higher level of education reflects a lower probability of a precarious job for young workers across the cohort analysed, with the exception of Austria, Italy and Portugal. It is important to highlight the major differences in the influence that the level of education has over precariousness between each country. For example, having a high level of education in Romania, Croatia and Denmark considerably reduces the probability of a precarious job, while in other countries, such as Spain, Italy and Portugal, the differences between each educational level are quite small. It is important to mention the major differences between each country within the same group.

3. When differentiating the probability of a precarious job by gender, the results obtained show an important gap, with this probability being higher for women. There are two exceptions: Ireland for the entire period analysed, and Slovakia for just part of it, where this probability is higher for men. This situation reflects major gender differences among young workers that need to be reduced. However, there are no significant differences between each group of countries, and there are no major gender differences in Eastern European countries.

4. Regarding the influence of country of birth over the rate of precariousness, most countries record statistically non-significant differences between young HCNs and EU and non-EU migrant workers. However, there are some differences between young HCNs and migrant workers. On the one hand, in some countries, such as Austria, Belgium, Spain and Cyprus, the evidence shows that EU and non-EU migrants are more likely to have a precarious job than young HCNs. On the other hand, the probability of a precarious job in Ireland is lower for EU migrants than for HCNs. Nevertheless, it would be interesting to conduct a more thorough analysis in the future, as most of the countries do not record statistically significant values, which may be attributed to the diversity of migrant groups or, in other cases, to the small sample size.

5. The differences between EU countries persist in the field of social welfare. A comparison of GMI as a percentage of the minimum wage reveals that Central and Eastern European countries have weaker welfare systems than EU-15 countries, which provide greater protection outside the labour market. This reflects the importance of the context and each country's specific conditions when analysing precariousness. Although Eastern

European countries have low rates of precariousness, social welfare is also very low. The influence of the context is also apparent in those countries in which political and regulatory steps have led to changes in rate over the period analysed.

It is important to bear in mind that the period analysed here is defined by the ongoing flexibilisation of European labour markets. Although flexibilisation does not in itself imply an increase in precarious jobs (Fullerton et al., 2011), we have analysed some countries where it has led to an increase in precariousness among young workers. This increase is due to the involuntary nature of flexibility, which may be considered a negative working condition (Eurofound, 2007). The liberalisation in the Croatian labour market confirms this evidence. Public institutions should therefore focus on how flexibilisation is addressed. For example, precariousness in the Netherlands affects young workers principally because of the high number of involuntary part-time jobs.

This article's main contribution is the use of a novel multidimensional indicator to measure both the incidence and intensity of precariousness, taking into account the contribution made by each dimension included in the analysis. A further contribution is the comparison between all EU countries, revealing significant differences among groups of countries, which in part are due to different approaches to flexibilisation. The partial implementation of flexicurity policies in some countries has prompted different levels of precariousness. What's more, almost all the countries record gender differences. There are also differences in educational level in almost all the countries, constituting a good predictor of less precarious work conditions. This means that a higher level of education helps young workers to find a higher quality job. No statistically significant differences between medium and high education were found in Austria, Italy and Portugal, probably because of the small sample sizes. However, these countries have lower differences between low and high education, reflecting that higher education has a small impact on reducing the probability of having a precarious job. There are some limitations to the data, as sample sizes are small for some countries and there are no data on wages for Slovenia and Sweden. Furthermore, the data do not allow making a longitudinal analysis considering, for example, the probability of moving to a permanent job as an outcome of interest.

It is essential to discuss the policy implications of these findings. Within the EU proposal on the push for flexicurity (Bekker & Mailand, 2019; Juncker et al., 2015), all member states should work together to reduce precariousness among young workers, especially in those countries with higher rates. Policies need to be adapted to each situation depending on the country. Furthermore, it is important to highlight the gender gap that needs to be closed, and the importance of quality education, as a higher level reduces the probability of a precarious job. The age-decreasing profile of precariousness (starting from 21 to 25 years old) may reveal the key role of labour market policies aimed at smoothing the transition from the educational system (in this transition, skills mismatch would play a role). As future steps, it would be interesting to analyse whether the skills mismatch is a source of precariousness comparing each occupation and education level.

Appendix

See Tables 1 and 2 and Fig. 8

Table 1 Marginal effects by five-year age brackets over the probability of having a precarious job by country (reference category: 15–20 years old), 2009–2016

Country	Marginal effect								
	Age classes	Year							
		2009	2010	2011	2012	2013	2014	2015	2016
Spain	21–25	−0.133***	−0.162***	−0.18***	−0.169**	−0.062	−0.122	–	–
	26–30	−0.214***	−0.282***	−0.327***	−0.336***	−0.215***	−0.292***	–	–
	31–35	−0.255***	−0.335***	−0.364***	−0.399***	−0.288***	−0.378***	–	–
Germany	21–25	−0.337***	−0.304***	−0.213***	−0.309***	−0.308***	−0.337***	−0.32***	−0.344***
	26–30	−0.471***	−0.419***	−0.344***	−0.424***	−0.438***	−0.468***	−0.456***	−0.481***
	31–35	−0.473***	−0.455***	−0.342***	−0.436***	−0.453***	−0.489***	−0.488***	−0.508***
Italy	21–25	−0.163***	−0.128***	−0.131***	−0.104***	−0.081***	−0.104***	−0.102***	−0.155***
	26–30	−0.246***	−0.217***	−0.23***	−0.215***	−0.185***	−0.214***	−0.2***	−0.248***
	31–35	−0.278***	−0.255***	−0.262***	−0.26***	−0.237***	−0.275***	−0.252***	−0.3***
France	21–25	−0.436***	−0.423***	−0.366***	−0.378***			–	–
	26–30	−0.555***	−0.554***	−0.503***	−0.504***			–	–
	31–35	−0.564***	−0.558***	−0.508***	−0.518***			–	–
Austria	21–25	−0.318***	−0.308***	−0.307***	−0.322***	−0.301***	−0.282***		–
	26–30	−0.328***	−0.332***	−0.331***	−0.349***	−0.345***	−0.333***		–
	31–35	−0.306***	−0.332***	−0.334***	−0.346***	−0.336***	−0.318***		–
Belgium	21–25	−0.268***	−0.251***	−0.266***	−0.251***	−0.274***	−0.257***	−0.226***	−0.233***
	26–30	−0.375***	−0.354***	−0.371***	−0.344***	−0.391***	−0.36***	−0.332***	−0.379***
	31–35	−0.383***	−0.384***	−0.402***	−0.364***	−0.421***	−0.407***	−0.368***	−0.424***
Denmark	21–25		−0.275***	−0.245***	−0.245***	−0.337***	−0.255***	−0.195***	–
	26–30		−0.492***	−0.458***	−0.45***	−0.592***	−0.447***	−0.381***	–
	31–35		−0.522***	−0.512***	−0.507***	−0.687***	−0.497***	−0.443***	–
Finland	21–25	−0.353***	−0.348***	−0.315***	−0.288***	−0.299***	−0.261***	−0.17**	−0.39***
	26–30	−0.47***	−0.507***	−0.479***	−0.44***	−0.418***	−0.376***	−0.319***	−0.518***
	31–35	−0.527***	−0.501***	−0.504***	−0.488***	−0.456***	−0.447***	−0.379***	−0.542***

Table 1 (continued)

Country	Age classes	Year							
		2009	2010	2011	2012	2013	2014	2015	2016
Greece	21–25	−0.261***	−0.268***	−0.264***	−0.328***	−0.3***	−0.235***	−0.117**	−0.27***
	26–30	−0.349***	−0.361***	−0.35***	−0.412***	−0.415***	−0.35***	−0.226***	−0.354***
	31–35	−0.366***	−0.392***	−0.399***	−0.447***	−0.46***	−0.406***	−0.289***	−0.409***
Ireland	21–25	−0.198***	−0.229***	−0.246***	−0.222***	−0.229***	−0.249***	−0.247***	−0.24***
	26–30	−0.249***	−0.319***	−0.342***	−0.346***	−0.338***	−0.3***	−0.262***	−0.29***
	31–35	−0.234***	−0.32***	−0.344***	−0.358***	−0.359***	−0.343***	−0.291***	−0.302***
Luxembourg	21–25	−0.315***	−0.54***	−0.334***	−0.368***	−0.444***	−0.588***	−0.431***	–
	26–30	−0.444***	−0.731***	−0.481***	−0.477***	−0.532***	−0.713***	−0.59***	–
	31–35	−0.531***	−0.801***	−0.543***	−0.537***	−0.583***	−0.752***	−0.638***	–
Netherlands	21–25	–	−0.46***	−0.521***	−0.536***	−0.47***	−0.494***	−0.484***	−0.469***
	26–30	–	−0.578***	−0.645***	−0.658***	−0.596***	−0.632***	−0.62***	−0.582***
	31–35	–	−0.602***	−0.651***	−0.676***	−0.629***	−0.658***	−0.651***	−0.632***
Portugal	21–25	−0.227***	−0.231***	−0.153***	−0.158***	−0.139***	−0.128***	−0.115**	−0.125***
	26–30	−0.357***	−0.388***	−0.303***	−0.309***	−0.304***	−0.293***	−0.273***	−0.238***
	31–35	−0.414***	−0.43***	−0.376***	−0.37***	−0.376***	−0.379***	−0.36***	−0.343***
Cyprus	21–25	−0.169***	−0.158***	−0.296***	−0.342***	−0.383***	−0.317***	−0.451***	0.008
	26–30	−0.218***	−0.258***	−0.363***	−0.462***	−0.529***	−0.47***	−0.604***	−0.276***
	31–35	−0.216***	−0.283***	−0.417***	−0.507***	−0.591***	−0.575***	−0.718***	−0.416***
Czech Republic	21–25	−0.14***	−0.171***	−0.143**	−0.12*	−0.136*	–	–	–
	26–30	−0.219***	−0.255***	−0.227***	−0.229***	−0.237***	–	–	–
	31–35	−0.218***	−0.264***	−0.229***	−0.237***	−0.243***	–	–	–

Table 1 (continued)

Country	Marginal effect								
	Age classes	Year							
		2009	2010	2011	2012	2013	2014	2015	2016
Estonia	21–25	−0.1*	−0.114*	−0.123*	−0.099*	−0.039	−0.132***	−0.09*	−0.072*
	26–30	−0.099*	−0.102	−0.176**	−0.179***	−0.094*	−0.177***	−0.157****	−0.129****
	31–35	−0.068	−0.099	−0.173**	−0.13**	−0.056	−0.152***	−0.135***	−0.114**
Hungary	21–25	−0.105***	−0.091***	−0.015	−0.085***	−0.001	−0.108*	–	–
	26–30	−0.189***	−0.206***	−0.124***	−0.19***	−0.095***	−0.171***	–	–
	31–35	−0.206***	−0.215***	−0.135***	−0.21***	−0.133***	−0.151**	–	–
Lithuania	21–25	−0.18***	−0.156**	0.036	−0.08	−0.138***	−0.084	−0.107*	−0.054
	26–30	−0.21***	−0.207***	−0.003	−0.106*	−0.147***	−0.093	−0.123**	−0.092*
	31–35	−0.161***	−0.157**	0.003	−0.129*	−0.174***	−0.101	−0.11*	−0.072
Latvia	21–25	−0.042	−0.133*	−0.215***	−0.101*	−0.102*	−0.084	−0.082	−0.128**
	26–30	−0.057	−0.197***	−0.252***	−0.14**	−0.144**	−0.112*	−0.153***	−0.159****
	31–35	0.013	−0.17**	−0.253***	−0.115*	−0.132**	−0.122**	−0.13**	−0.153**
Malta	21–25	−0.161***	−0.141***	−0.143***	−0.168***	−0.174***	−0.139***	−0.147***	−0.148***
	26–30	−0.192***	−0.228***	−0.245***	−0.278***	−0.257***	−0.216***	−0.222***	−0.226***
	31–35	−0.208***	−0.18***	−0.183***	−0.259***	−0.29***	−0.24***	−0.206***	−0.173***
Poland	21–25	−0.24***	−0.197***	−0.235***	−0.248***	−0.244***	−0.304***	−0.17***	−0.19***
	26–30	−0.311***	−0.284***	−0.309***	−0.356***	−0.38***	−0.39***	−0.28***	−0.286***
	31–35	−0.361***	−0.327***	−0.354***	−0.405***	−0.434***	−0.435***	−0.322***	−0.31***
Slovakia	21–25	−0.106***	−0.143***	−0.154***	−0.183***	−0.133*	−0.068	−0.109	−0.059
	26–30	−0.144***	−0.219***	−0.212***	−0.248***	−0.182**	−0.159**	−0.178**	−0.077
	31–35	−0.09**	−0.206***	−0.167***	−0.234***	−0.185***	−0.141*	−0.168**	−0.065

Table 1 (continued)

Country	Marginal effect								
	Age classes	Year							
		2009	2010	2011	2012	2013	2014	2015	2016
Croatia	21–25	− 0.131**	− 0.121*	− 0.318***	− 0.138*	− 0.421***	− 0.145*	− 0.059	− 0.065
	26–30	− 0.192***	− 0.161**	− 0.355***	− 0.186**	− 0.563***	− 0.259***	− 0.124*	− 0.139*
	31–35	− 0.238***	− 0.172***	− 0.383***	− 0.206**	− 0.555***	− 0.288***	− 0.198**	− 0.277***
Romania	21–25	− 0.268***	− 0.295***	− 0.266***	− 0.2***	− 0.182***	− 0.194***	− 0.262***	− 0.219***
	26–30	− 0.355***	− 0.387***	− 0.371***	− 0.31***	− 0.295***	− 0.322***	− 0.381***	− 0.327***
	31–35	− 0.383***	− 0.424***	− 0.398***	− 0.33***	− 0.329***	− 0.366***	− 0.397***	− 0.369***

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. Authors' calculations using EU-LFS data

Table 2 Marginal effects of the number of hours worked over the probability of having a precarious job by country, 2009–2016

Country	Marginal effect							
	Year							
	2009	2010	2011	2012	2013	2014	2015	2016
Spain	−0.008***	−0.009***	−0.011***	−0.011***	−0.012***	−0.01***	–	–
Germany	−0.016***	−0.014***	−0.014***	−0.015***	−0.016***	−0.016***	−0.017***	−0.017***
Italy	−0.009***	−0.01***	−0.012***	−0.014***	−0.013***	−0.013***	−0.012***	−0.013***
France	0.003***	0.003***	0.002***	0.003***	–	–	–	–
Austria	−0.014***	−0.016***	−0.015***	−0.017***	−0.02***	−0.019***	–	–
Belgium	−0.007***	−0.007***	−0.006***	−0.007***	−0.006***	−0.006***	−0.007***	−0.007***
Denmark	–	−0.014***	−0.012***	−0.013***	−0.01***	−0.016***	−0.018***	–
Finland	−0.007***	−0.008***	−0.007***	−0.01***	−0.011***	−0.011***	−0.01***	−0.011***
Greece	0.002***	0.003***	0.002***	0	0	0	−0.001**	−0.002***
Ireland	−0.012***	−0.013***	−0.014***	−0.015***	−0.013***	−0.013***	−0.012***	−0.012***
Luxembourg	−0.008***	−0.011***	−0.009***	−0.01***	−0.01***	−0.014***	−0.006***	–
Netherlands	–	−0.01***	−0.011***	−0.009***	−0.01***	−0.01***	−0.009***	−0.009***
Portugal	−0.003***	−0.005***	−0.006***	−0.006***	−0.007***	−0.005***	−0.006***	−0.008***
Cyprus	−0.01***	−0.01***	−0.015***	−0.012***	−0.014***	−0.017***	−0.014***	−0.016***
Czech Republic	0	0	0	−0.004***	−0.005***	–	–	–
Estonia	−0.019***	−0.018***	−0.012***	−0.01***	−0.012***	−0.013***	−0.012***	−0.009***
Hungary	−0.007***	−0.007***	−0.008***	−0.007***	−0.007***	−0.009***	–	–
Lithuania	−0.009***	−0.008***	−0.01***	−0.008***	−0.009***	−0.009***	−0.008***	−0.007***
Latvia	−0.011***	−0.016***	−0.017***	−0.015***	−0.016***	−0.016***	−0.015***	−0.018***
Malta	−0.009***	−0.014***	−0.016***	−0.016***	−0.016***	−0.015***	−0.015***	−0.015***
Poland	−0.001**	−0.001***	−0.001***	−0.001**	0	0	0.001**	0.001*
Slovakia	0.008***	0.008***	0.003***	0.003**	−0.004***	−0.007***	−0.007***	−0.007***
Croatia	−0.006***	−0.005***	−0.005***	−0.008***	−0.1***	−0.01***	−0.01***	−0.007***
Romania	−0.014***	−0.015***	−0.015***	−0.016***	−0.016***	−0.015***	−0.015***	−0.015***

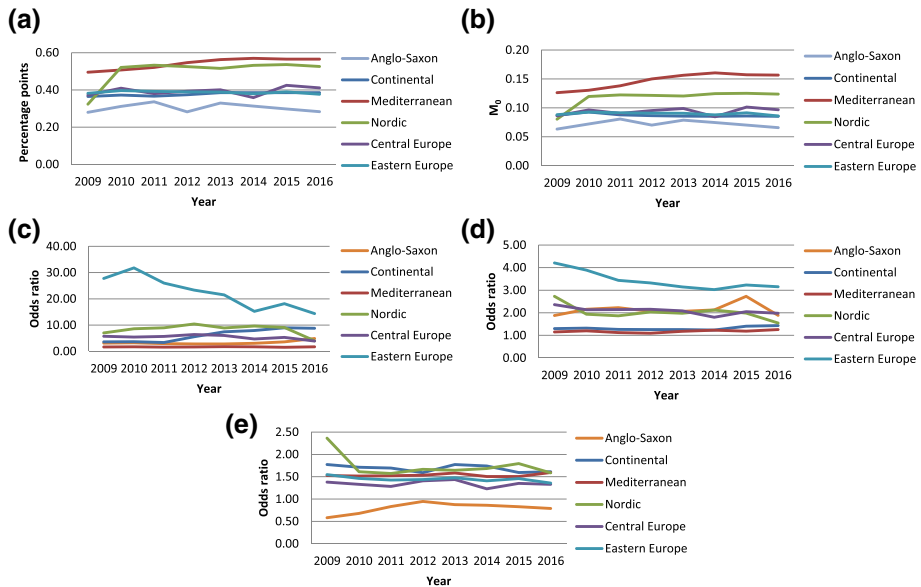*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. Authors' calculations using EU-LFS data

Fig. 8 Results at country-group level. Panel **a** contains the evolution of the precariousness ratio (H), panel **b** the evolution of the adjusted multidimensional precariousness rate (M_0), panel **c** the odds ratios differences between low and high education levels, panel **d** the odds ratios differences between medium and high education levels, and panel **e** the evolution of gender differences as odds ratios. *Source*: Authors' calculations using EU-LFS data. Calculations related to the country of birth are not provided, as no statistically significant differences are found for most countries

Data Availability All data are available upon request.

Declarations

Conflict of interest The authors do not have any conflicts of interest related to this research.

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