Comparing Precarious Employment Across Countries – Measurement Invariance of the Employment Precariousness Scale for Europe (EPRES-E)

Eva Padrosa*[1,2] (0000-0001-6367-4860), Mireia Bolíbar[1,2,3] (0000-0001-9525-0907), Mireia Julià[1,2] (0000-0002-7432-0942), Joan Benach[1,2,4] (0000-0003-2285-742X)

1. Research Group on Health Inequalities, Environment, Employment Conditions Network (GREDS-EMCONET), Department of Political and Social Sciences, Universitat Pompeu Fabra, Barcelona, Spain.
2. Johns Hopkins University – Universitat Pompeu Fabra Public Policy Centre (JHU-UPF PPC), Department of Political and Social Sciences, Universitat Pompeu Fabra, Barcelona, Spain.
3. Department of Sociology, Universitat de Barcelona, Barcelona, Spain
4. Transdisciplinary Research Group on Socioecological Transitions (GinTRANS), Universidad Autónoma de Madrid, Madrid, Spain.

*Corresponding Author: 25-27 Ramon Trias Fargas Street, Universitat Pompeu Fabra, Ciutadella Campus, Mercè Rodoreda Building, Room 24.418 (08005, Barcelona, Spain) Tel: +34 93 542 2831 | e-mail: eva.padrosa@upf.edu

ABSTRACT

Comparing precarious employment (PE) across countries is essential in order to deepen understanding of the phenomenon and to learn from country-specific experiences. However, this is hampered by the lack of internationally meaningful measures of PE. We aim to address this point by assessing the measurement invariance (MI) of the Employment Precariousness Scale for Europe (EPRES-E), an adaptation of the EPRES construct in the European Working Conditions Survey (EWCS). EPRES-E consists of thirteen proxy indicators sorted into six dimensions: temporariness, disempowerment, vulnerability, wages, exercise of rights and unpredictable working times. Drawing on EWCS-2015, the MI of the second-order factor model was tested in a sample of 31,340 formal employees by means of a) multi-group confirmatory factor analyses, and b) the substantive exploration of EPRES-E mean scores in each country. The results demonstrate that threshold invariance holds for the first-order structure (dimensions) of 22 countries (Austria, Belgium, Croatia, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Lithuania, Luxembourg, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and the UK), but only metric invariance is attained by the second-order structure. The latter is supported by exploration of the mean scores, where we found that different score patterns in each dimension lead to similar overall EPRES-E scores, suggesting that PE is configured by different sources within the six dimensions in each country according to their broader socio-political trajectories. We conclude that, although EPRES-E can be used for comparative purposes in 22 European countries, the scores of each dimension must be reported alongside the overall EPRES-E score.

Keywords: Precarious Employment, Europe, Measurement Invariance, Multi-Group Confirmatory Factor Analysis, Comparative Research

1. INTRODUCTION

Post-industrial societies have experienced a set of pivotal processes in recent decades, including the globalization of their economies, far-reaching technological innovations prompting the so-called fourth industrial revolution, the development of neoliberal macroeconomic policies, periodic economic downturns and demographic changes. Among other consequences, these have triggered a structural transformation of labor markets. Broadly, the unprecedented post-WWII socioeconomic order that gave rise to the Standard Employment Relationship (SER) – permanent full-time employment with social protection and benefits (Bosch, 2004) – is gearing towards a more flexible and individualized paradigm where collective bargaining schemes and social protection networks provided by welfare states are progressively being retrenched (Arnold & Bongiovi, 2013; Kalleberg, 2018). As a result, social, academic and political actors have drawn attention to the precarization of employment and the potential impact it may have on critical aspects such the health and well-being of workers (Benach, et al. 2013). However, little effective progress has been made in articulating precarious employment (PE) in public policy. A fundamental obstacle to doing so has been the lack of an internationally shared definition and operationalization of PE, engendering conceptual confusion and impeding proper monitoring of the phenomenon within and across countries that would sensitively inform both researchers and policy-makers. Hence, developing a theoretically sound measure of PE that transcends the singularities of territory is essential if decent and sustainable labor markets are to be successfully introduced locally, nationally and globally (Benach, et al. 2012).

In this article, we add to this strand of research by examining the extent to which the Employment Precariousness Scale for Europe (EPRES-E), a multidimensional and theory-based instrument to measure PE that has been empirically validated in Spain (Padrosa, et al. 2021), can be used for comparative research in 35 European countries. Specifically, we explore the degree of measurement invariance (MI) for EPRES-E to determine whether the underlying concept (i.e. PE) is measured the same way in the countries in the study. This is both crucial in obtaining results that are meaningfully comparable across territories and a key challenge to understanding further how the precariousness of employment arrangements is made manifest in each national context.

The structure of the article is as follows. In the next section, we scrutinize current discussions of the conceptualization and operationalization of PE internationally and the challenges to conducting comparative research in this field, reporting the gaps in the literature that justify our approach from the theoretical and methodological points of view. Then we present our data along with a detailed commentary on the statistical analyses we use. Thereafter, the results are described and interpreted, revealing the potential reasons for the invariance or non-invariance of the

instrument in each country. Lastly, we conclude with some observations on the implications of these findings for further research and policy-making.

2. BACKGROUND

As briefly stated above, delineating what defines PE is an open source of debate among scholars in a variety of disciplines, as well as international institutions. To begin with, a distinction should be made between the three main sets of features that characterize jobs: the nature of the tasks in each job and their associated working conditions, employment conditions, and employment relations (Benach, et al. 2013). The former include the physical and psychosocial aspects of employment. Employment conditions denote the circumstances in which a person is engaged in a job or occupation while employment relations refer to the power relations between employers and employees as both collective and individual actors. Because a detrimental employment experience can stem from any of these sources, some authors incorporate aspects of all three in their theorizations (e.g. Livanos & Papadopoulos, 2019). Nonetheless, the precariousness of employment arrangements results from the broader configuration of employment relationships that shape the extent to which workers are immersed in their jobs, regardless of their precise content (Benach, et al. 2016; Bodin, et al. 2020). Indeed, as PE taps a concept that goes deeper than job-specific working conditions, its conceptualization should focus on employment conditions and relations. Accordingly, departing from the definition proposed by Rodgers (1989), a dominant strand of research treats PE as a combination of the adverse characteristics of the employment relationship that differ from those manifested in the SER, mainly employment insecurity, low or inadequate wages, and reduced social protection and workplace rights (see Kreshpaj, et al. 2020 for a review). As such, PE is commonly theorized as representing a continuum, with the SER lying at the upper end and the most de-standardized jobs at the lower end. However, it has been argued that this approach obscures the asymmetry of interpersonal power relations between employers and employees (Amable, 2006; Korpi, 2006; Benach, et al. 2013), a crucial aspect of the experience of PE that might be present even in the SER (Julià, et al. 2017). Additionally, an increasing number of commentators have politically and culturally criticized the idealization of the SER-like career-long contract with standardized working schedules and being bound to a specific workplace. They prefer to advocate flexible, worker-led working times, part-time employment or remote working as ways of emancipating workers from this disciplined and production-based model of the organization of work and life, which is sustained by the premises of Fordist accumulation regimes (Weeks, 2011; Fleming, 2014). On account of these positions, it can be concluded that not only is there a wide range of definitions of PE, some of them are contradictory. Nonetheless the concept is acknowledged globally as having two attributes in particular: first, its objective nature, since subjective perceptions and expectations might relate to circumstances other than the employment relationship (ILO, 2012);

and second, its multidimensionality, in the sense that multiple aspects of the employment relationship, which do not need to occur simultaneously, combine in providing the overall experience of PE (Campbell & Burgess, 2018). The latter is particularly important in order to comprehend the vast array of nuances that make different employment situations precarious and to identify the sources of this precariousness in each situation. This in turn is essential if effective tailored policies to minimize PE are to be designed. Therefore, the challenge in defining and measuring PE lays in determining the dimensions that frame it and whether these dimensions apply equally to different populations.

Another key issue underlying the absence of a consensus in conceptualizing PE is the socio-historical, economic, political and cultural particularities of the territories in which people experience their jobs. To elaborate, employment arrangements are embedded in the wider intersection between welfare states, labor markets and family models, which in turn are dynamically shaped by changing power relations between the main political and economic actors in society, namely institutions and political parties, unions, corporations and civil-society organizations (Esping-Andersen, 1999; Hall & Soskice, 2001; Benach, et al. 2016). Consequently, the mechanisms by which these intersections unfold into different types of employment arrangement are context-specific and determine what is considered precarious in each territorial reality (Duell, 2004; Muñoz-Bustillo, et al. 2009). Examples are zero-hour contracts, which are heavily restricted in Germany and the Netherlands but whose use is increasing in liberal countries such the UK (Farina, et al. 2019). On the other hand, Denmark and Greece have a similar share of fixed-term contracts (OECD, 2020), but the former's flexicurity model provides temporary workers with levels of social protection, career prospects and working conditions that resemble those of their permanent counterparts, while this is quite the opposite in Greece (Frade, et al. 2004). For this reason, contextualized theoretical frameworks of PE that allow comparative research are rather scarce, let alone their methodological operationalization and empirical validation. Indeed, the majority of studies or reports that adopt a cross-national perspective rely on one-dimensional indicators such as temporary employment, perceived job insecurity or low salaries, which oversimplify both the all-embracing aspects that contour PE (Benach, et al. 2013) and the contrasting experiences that such workers may face in each country (Frade, et al. 2004; Muñoz-Bustillo, et al. 2009). This is a huge obstacle to achieving understanding of the phenomenon and of the implications that different policies and institutional frameworks might have for its deployment. Therefore, not only is a multidimensional and objective measure of PE that incorporates the different national contexts substantially needed, so also is the empirical assessment of its comparability in order to draw meaningful conclusions internationally.

EPRES-E was developed to fill this gap in the literature, (Anonymized, forthcoming). This measure consists of an adaptation of the Employment Precariousness Scale (EPRES) construct in the sixth wave of the European Working Conditions Survey (EWCS-2015). The original version of EPRES takes the form of a multidimensional scale that encompasses the following six dimensions: temporariness (contract duration), disempowerment (level of negotiation of employment conditions), vulnerability (being defenseless against workplace authoritarianism), low wages, workplace rights, and the capacity to exercise them. These dimensions are both theoretically and methodologically sound, as they stem from a long-term interdisciplinary research project that involved, in the first place, an extensive literature review, followed by interviews with twelve key informants who were experts in various fields, such sociology, the labor economy or social epidemiology, and finally six focus-group discussions with temporary and permanent workers and trade union representatives (Amable, 2006; Vives, et al. 2010). The EPRES instrument is also unique in being empirically validated for use in countries with substantially different labor markets and institutional contexts, namely Spain (Vives, et al. 2010; Vives, et al. 2015), Chile (Vives, et al. 2017) and Sweden (Jonsson, et al. 2019); and is currently being tested in Belgium and Finland. Despite all these assets, use of EPRES in comparative research is not straightforward, since, to achieve this purpose, primary data that is cross-nationally homogenized ought to be fielded. In this scenario, the EWCS stands out as a great source of information, given that it is conducted periodically, permitting the availability of data over time and the study of trends at an aggregate level, and moreover it covers a large number of countries, thus providing a unique opportunity to perform Europe-wide comparative analyses. Therefore, the adaptation of a theoretically strong PE construct (i.e. EPRES) in a powerful international survey (i.e. EWCS) has potential as an insightful solution to the problem of assessing the phenomenon across countries.

Accordingly, EPRES-E was first developed using the EWCS-2015 subsample from Spain in order to ensure that the representativeness of the original construct, which had been engendered in the Spanish context, prevailed. Due to the closed nature of the questionnaire, the rights dimension was omitted because of the unavailability of items (see Padrosa, et al. 2021 for further details), but a social component designed to capture precarious workers' lack of control over their own time was incorporated (Cano, 2004; Porthé, et al. 2010). That is, EPRES-E's dimensions are: (a) temporariness; (b) disempowerment; (c) low wages; (d) exercise of rights; (e) vulnerability; and (f) unpredictability of working times (uni-directionally led by employers). The instrument demonstrated good psychometric properties, construct validity and internal consistency reliability in the EWCS-2015 Spanish subsample (Anonymized, forthcoming). Taking this into account, and given the absence of theoretical support to employing PE measures across territories without further cautiousness mentioned earlier, the obvious next step in measuring PE from a comparative

perspective is to examine the MIs of EPRES-E in the 35 European countries covered by the EWCS-2015 empirically.

2. METHODS

2.1. Data and study population

As already noted, data used for the analyses were derived from the sixth phase of the EWCS, a cross-sectional European survey conducted quinquennially that is representative of the population in employment residing in private households in the countries covered. In this specific phase, which was administered in 2015, were included the European Union (EU's) 27 member states, the five EU-candidate countries (i.e. Albania, Republic of North Macedonia, Montenegro, Serbia and Turkey), Norway, Switzerland and the UK. The overall response rate was 42.5%, ranging from 10.9% in Sweden to 78% in Albania (Eurofound, 2017). A total of 43,850 individuals aged fifteen and over (except for Bulgaria, Norway, Spain and the UK, where the specified age was sixteen or over due to the minimum legal working age being higher in these countries, were interviewed. For the purposes of this study, however, respondents in self-employment (n=9,245), without an employment contract (n=2,478), serving in the armed forces (n=149) or with unknown or non-eligible ages, i.e. 65 or over (n=638), were excluded. Thus, the final sample under analysis consisted of 31,340 individuals.

2.2. Measures

The main variable was EPRES-E, which was operationalized by thirteen proxy indicators sorted in the six dimensions already described above, that is, two items in "temporariness", two in "disempowerment", two in "wages", two in "exercise of rights", two in "vulnerability" and three in "unpredictability of working times". All six items were measured using frequency or ordinal scales, recoded so that the higher values correspond to the more precarious situations (Supplementary Material 1). A more detailed description of these indicators can be found in Table 1. Dimension scores were simple averages of the items transformed into a 0-100 scale, while the overarching EPRES-E score was the arithmetic mean of the six dimension scores (Supplementary Material 1).

Other variables used to describe the sample were gender (women, men), age (nine-year age groups), place of birth (country of residence or other), occupational social class (non-manual, manual), educational attainment according to the International Standard Classification of Education 2011 (high, medium, low) and country of residence.

2.3. Statistical analyses

EPRES-E comparability across countries was tested by means of multi-group confirmatory factor analysis (MGCFA) (Chen, 2008; Kim & Yoon, 2011). The EPRES-E-tested model was composed of the six latent dimensions as first-order factors that were, in turn, reflected by the overarching PE construct, which was modeled as a second-order factor (Figure 1). According to this configuration, to identify the covariance structure part of the model one factor loading for each first- and second-order factor was fixed at 1, since this is considered to be the best means of identification in MI models (Rudnev, et al. 2018). Besides, because of the ordinal nature of the observed variables, the MGCFAs were run with the mean- and variance-adjusted weighted least squares estimator (WLSMV) and polychoric correlations (Beauducel & Herzberg, 2006).

As regards the assessment of MI, briefly the basis of the MGCFA approach consists of investigating the invariance of the relations between underlying latent constructs and observed variables by imposing constraints on the measurement parameters of the model for every specified group and then comparing the model to more or less restricted ones (Davidov, et al. 2014): the stricter the parameter equality constraints, the higher the degree of invariance (Meredith, 1993; Steenkamp & Baumgartner, 1998). Furthermore, to establish MI in second-order factor models, this must first be done by the first-order factors (Rudnev, et al. 2018). For this reason, we examined EPRES-E's MIs in five steps following a bottom-up approach (Figure 2). First of all, the configural invariance of the overall (first- and second-order factors) model was tested for all 35 countries. This level of invariance is encountered when the factor structures, and thus the latent constructs, are equal in all groups, that is, when those in the different groups respond to the items with the same construct in mind (Chen, 2008). The output of this model was explored in detail to check for negative latent variances, low omega reliability coefficients – that is, an estimator of the homogeneity of the items that takes into account the structure of the model (Raykov, 2001) – or other sources of misspecification in any of the countries studied. Individual CFAs were then run for countries displaying these characteristics, if any, to determine in addition whether the EPRES-E construct was applicable to that particular territorial context. If the individual model fitted the data poorly (see below), the country concerned was excluded from the analyses. Subsequently, configural invariance of the remaining countries was addressed, followed by metric invariance of the first-order factors. In this case, invariance requires factor loadings between the observed and latent variables to be equal, meaning that a unit increase on the measurement scale (i.e. latent variable) has the same implications in each group. In a fourth step, we examined threshold (or scalar) invariance of the first-order factors (Millsap & Yun-Tein, 2004; Pendergast, et al. 2017). This indicates whether mean differences in the latent variables are tied in with the same shifts between the response options of the ordinal observed variables, making the raw scores of the latent variable comparable or non-comparable. Finally, the same procedure, namely threshold invariance, was performed in the second-order factor model. All the steps were

conducted conditionally on the basis of the results of the preceding one. Note that residual invariance is the last and strictest level of MI, which is attained when residual variances (i.e. the sum of uniqueness and measurement error variances) are equal as well. However, examination of this degree of invariance in the context of the ordinal data is limited, and the literature disagrees over its requirement to uphold latent mean comparability (Vandenberg & Lance, 2000) because the residuals are not part of the latent variable, so it was not tested in this article.

Nor is there a consensus among scholars regarding which strategy is best at discerning whether the above equality constraints are violated (Vandenberg & Lance, 2000; Chen, et al. 2005). In this study, we evaluated the following models' goodness-of-fit indices according to their proposed cut-off values for acceptance (Hooper, et al. 2008; Kline, 2010): the chi-squared test (χ^2) and the associated degrees of freedom and p-value (the smaller the value of the statistic, the better the fit), the comparative fit index (CFI) (>0.90), the Tucker-Lewis index (TLI) (>0.90) and the root mean square error of approximation (RMSEA), along with its 90% confidence interval (CI) (<0.080 with the upper bound of its confidence interval <0.100). Nonetheless, this practice relies on the rather uncertain assumption that invariance constraints have a sufficient impact on the global fit of the model to allow it to transcend the cut-off value of acceptability (Davidov, et al. 2014). Therefore, we combined this strategy with an assessment of the difference between these indices in the nested and increasingly constrained models (Cheung & Rensvold, 2002; Chen, 2007). Based on simulation studies, Chen (2007) formulated cut-off values for these differences in CFI and RMSEA (<–0.010 and <0.015, respectively), but when it comes to large-scale group comparisons, these criteria are unsuitable (Rutkowski & Svetina, 2014). Accordingly, they were only adopted to test for threshold invariance, while a more sensible cut-off of 0.030 for ΔRMSEA and of 0.020 for ΔCFA were adopted to test for metric invariance (Rutkowski & Svetina, 2014). Nonetheless, as Brown has argued (2015), the logic of comparisons requires not necessarily choosing the best-fitting model, but selecting the most parsimonious model that still fits well, so these cut-off values were used more as a reference than as a strict condition in deciding whether to accept or reject the models.

In a final stage of analysis, the EPRES-E mean scores and those of their dimensions were explored in each of the countries included in order to scrutinize the proposed EPRES-E structure in a more substantive manner. Note that, as stated above, we applied equal weights to every component of EPRES-E to compute these scores, regardless of the loadings retrieved from MGCFAs, because the weights obtained from MGCFAs might be unsuitable for other samples. Given that one of the strengths, and aims, of using the EWCS data is to be able to measure and compare PE in further cross-sectional samples, this data-driven weighting technique would represent a serious drawback. Accordingly, in the absence of a methodological gold standard in the allocation of more specific weights, equal weighting is recommended as the most cautious option (Nardo, et

al. 2008). Nevertheless, this issue should be explored in more detail when other data containing EPRES-E are available.

3. RESULTS

The characteristics of the sample are shown in Table 2. In sum, 52.23% of the sample were women, half were middle-aged, i.e. 36 to 55 years old, 91.04% had been born in the country where they were residing, 28.58% had a manual job and 14.20% had low levels of education.

As for the models examined (Table 3), no solution was found for Model 1, which included configural constraints among the 35 countries studied. After further exploring the output of the model (not shown), we observed that up to thirteen countries either displayed a negative variance for the dimension "temporariness" (Cyprus), a low omega reliability coefficient (Latvia, Malta, Montenegro, Hungary, Estonia, Czech Republic, Bulgaria, Romania, Republic of North Macedonia, Serbia and Turkey) or non-computable results (Albania). Besides, the model displayed a fit below the acceptable level when run individually for these countries (not shown). Therefore, Model 2 was conducted without them, resulting this time in a good fit (χ^2 [df]=7097.326 [1276], p-value<0.001; CFI=0.945; TLI=0.926; RMSEA (90% CI)=0.074 (0.072-0.075)). This indicates that the latent second-ordered structure was measured by the same items in the remaining 22 countries. Consequently, the following models were only performed in this set of countries. Model 3 produced an even better fit (χ^2 [df]=3611.558 [1247], p-value<0.001; CFI=0.978; TLI=0.969; RMSEA (90% CI)=0.048 (0.046-0.049)), so the first-order factors, or the dimensions, could be regarded as metrically invariant across countries. In the case of Model 4, with its threshold invariance for the first-order factors, it presented a good fit (χ^2 [df]=8304.920 [1646], p-value<0.001; CFI=0.937; TLI=0.934; RMSEA (90% CI)=0.069 (0.068-0.071)), but, in comparison with the previous model, ΔCFA exceeded the cut-off value of -0.030. Nevertheless, given both the good overall fit and the ΔRMSEA being really close to the proposed cut-off value (0.021), we assumed threshold invariance (albeit borderline) for the dimensions in the 22 examined countries. Accordingly, we analyzed Models 5 and 6 of the second-order factor, testing for metric and threshold invariance respectively. Regarding the former, both its good fit (χ^2 [df]=9007.871 [1528], p-value<0.001; CFI=0.929; TLI=0.921; RMSEA (90% CI)=0.076 (0.075-0.078)) and the absence of any significant deterioration of CFI and RMSEA indicated that metric invariance holds for the EPRES-E construct as a whole. That is, the underlying multidimensional PE construct had the same meaning in all the countries studied. This was not the case for Model 6, where a poor overall fit with the data (χ^2 [df]=13821.964 [1906], p-value<0.001; CFI=0.887; TLI=0.899; RMSEA (90% CI)=0.086 (0.085-0.088)) and a reduction in the CFI higher than -0.030 were obtained.

In light of these results, threshold invariance of the first-order factor model and metric invariance of the second-order factor model could be assumed. Therefore, only the means of the dimensions should be compared across the 22 countries according to MI standards. However, we also delved into the means of EPRES-E for each country to interpret the above-mentioned findings more intuitively (Table 4). As observed, an interesting finding was that countries showing similar EPRES-E scores showed different score patterns to the dimensions. For instance, the Nordic countries had the lowest overall scores (24.09 for Finland, 24.48 for Sweden, 26.26 for Denmark, and 27.24 for Norway), alongside Luxembourg (25.73) and the Netherlands (27.12). This is potentially underpinned by their shared social-democratic traditions, or evolution towards them in the case of the Netherlands (Swank, 2000), characterized by high labor-market standards, collective bargaining schemes and sensible social protection benefits not overwhelmingly based on employment contributions (Esping-Andersen, 1999). Nonetheless, it appears that each country endorses this social and economic system through particular labor-market dynamics, leading to different scores for the six dimensions: the flexicurity Danish and Dutch model resulted in a higher degree of "temporariness" (23.82 for Denmark and 24.45 for the Netherlands, in contrast with 18.33 for Finland, 22.22 for Sweden and 22.93 for Norway), whereas the Rehn-Meidner Swedish model, based on the strong involvement of social partners through collective bargaining, showed an exceptionally low degree of "disempowerment" (10.81 against 15.61 for Denmark, 15.98 for Norway and 16.71 for Finland). Contrastingly, Norway showed the poorest score in "wages" (58.67), followed by Germany (52.18). Given how the indicator was constructed to include monthly and hourly wages so as to encompass both the overall wage-incomes that workers receive to live on and the relative amount they receive for their human capital, we argue that this might relate to their high shares of part-time employees (OECD, 2020), most of whom were potentially low paid (Pfau-Effinger & Reimer, 2019). On the other side of the balance, we found mostly Central and East-European countries displaying the worst EPRES-E scores (33.93 for Poland, 32.93 for Slovakia, 31.54 for Croatia and 31.03 for Slovenia), but again differences in the source of this poor score were detected. This is probably related to variations in their transition to market capitalism and in the changes they had to make to enter the EU (along with some previous differences) that led to noticeable divergences between them in terms of their respective labor markets (Rys, 2001). Whereas Slovenia's welfare state development, degree of social partnership and public expenditure levels very much resemble those of many old EU member states (Fenger, 2007), Poland has gone through three phases of neoliberal labor-market reforms and the privatization of public companies since the 1990s, entailing extensive use of temporary employment contracts, the creeping deregulation and decentralization of the social security system, and a collapse in trade union density (Czarzasty & Mrozowicki, 2014; Maciejewska, et al. 2016). This empirically translates into its poor(est) scores in "temporariness" (29.97 versus 21.74 for Slovakia, 21.45 for Croatia and 16.64 for Slovenia) and "disempowerment" (35.36

versus 28.74 for Croatia, 28.69 for Slovakia and 22.64 for Slovenia). Furthermore, even though the strictness of employment protection legislation and the strength of social dialogue appeared to be higher in some of these countries, such as Slovenia or Slovakia (Farkas, 2017), as captured by the dimensions "temporariness" and "disempowerment", their levels of unequal power relations demonstrated by the dimensions "vulnerability" (30.72 for Slovakia against 26.02 for Poland, 24.13 for Croatia and 20.34 for Slovenia) and "exercise of rights" (55.28 for Slovakia and 55.00 for Slovenia against 52.76 for Croatia and 48.27 for Poland) were prominently high, which might be linked to differences between legislated and actual practices in the workplace (Kovtun, et al. 2014).

Another striking case is Germany, which has the third poorest EPRES-E score (32.06), despite its good performance in respect of traditional labor-market indicators, such as unemployment rates, temporary employment, etc. (OECD, 2020). Concretely, as mentioned earlier, the country presented really high scores in "wages" and "exercise of rights" (53.61). We argue that this might be related to the rise of unprotected and low-paid (part-time) jobs generated as a consequence of the Hartz reforms – that is, a set of policy measures aimed at improving employment services and policy measures by activating the unemployed and fostering employment demand by deregulating the labor market (Jacobi & Kluve, 2006) – and the popularization of the so-called minijobs (Pfau-Effinger & Reimer, 2019). To end with other disruptive dimension scores that sum up rather similar EPRES-E scores, we discuss the neighboring countries of Portugal (28.80) and Spain (30.08). Even though commonalities in their respective labor-market structures and socio-political models have been extensively reported (e.g. Hall & Soskice, 2001), in Spain PE appeared to stem from "temporariness" (29.25 in contrast to 19.36 in Portugal), while in Portugal it was more an issue of "disempowerment" (36.13 in contrast to 28.23 in Spain). Unsurprisingly, Spain's PE matches the country's traditionally high share of temporary employment (OECD, 2020), which was exacerbated after the major labor-market reform enacted in 2012 that introduced new ways of temporarily employing workers (Livanos & Papadopoulos, 2019). Portugal, on the other hand, saw its collective bargaining schemes particularly affected by the structural reforms sought by the Troika in the aftermath of the Great Recession (Cruces, et al. 2015). Although this was also experienced by other EU member states facing similar situations, such as Spain, Greece and Ireland, the changes in Portugal represented rather the continuation of a process that was already in motion, resulting in almost a million workers not being covered by a collective agreement since 2010 (Távora & González, 2016).

4. DISCUSSION AND CONCLUSIONS

The purpose of this article has been to examine the MI of EPRES-E, an instrument to measure PE that consists of an adaptation of the EPRES construct in the EWCS in 35 European countries. The

main rationale for this approach was the need to come up with a multidimensional and objective instrument that is able to measure PE in a meaningful manner beyond territorial characteristics. This is essential both to obtain the full or a more complete picture of the phenomenon in Europe and to conduct comparative research providing researchers and policy-makers with sensible information about each country's reality and allowing lessons to be learned from this. However, given the vast heterogeneity of the Eurozone in terms of labor-market regulations and institutions, industrial relations and welfare-state regimes (Korpi, 1983; Esping-Andersen, 1999; Hall & Soskice, 2001), which decisively determine the ever-changing nature of precarious employment arrangements in each country (Duell, 2004; Benach, et al. 2016), MIs of the proposed instrument ought to be empirically assessed. To our knowledge, this is the first study to do this using a multidimensional approach with a sound theoretical basis. Consequently, the article makes an insightful contribution to a pivotal gap in the literature.

Accounting for the second-order factor structure of EPRES-E with its first-order dimensions (i.e. temporariness, disempowerment, vulnerability, exercise of rights, unpredictability of working times and wages), our results indicate that the metric invariance of the overall instrument holds for 22 out of the 35 countries studied, i.e. Austria, Belgium, Croatia, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Lithuania, Luxembourg, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and the UK. However, threshold invariance could only be assumed for the dimensions. In more operational terms, while the raw scores of the dimensions proved to be suitable for comparative research across these countries, this was not the case for the overall EPRES-E score, which only reached a degree of invariance that allowed us to compare its covariances and unstandardized regression coefficients.

Strictly speaking, this should prevent us from comparing the overall EPRES-E raw scores (Chen, et al. 2005). Nonetheless it should be noted that from a methodological perspective, and in the realm of higher-order factor models, the latent nature of the first-order factors (i.e. the dimensions), as opposed to the observed variables, sets up structural rather than measurement relationships with the second-order latent factor (i.e. EPRES-E). Correspondingly, the relative importance of each dimension may vary in the countries studied without changing the essence of the PE concept they are tackling, which is not the case for the first-order factor models and the observed variables composing them (Van de Vijver & Leung, 1997; Rudnev, et al. 2018). Instead, this variation of the structural parameters in the second-order EPRES-E factor points to divergence in the content and connotations of the underlying concept across groups, an interesting finding in itself (Rudnev, et al. 2018). As such, MGCFAs suggest that PE contouring emanates from different sources within the six dimensions identified for each country. This aligns with the results derived from the exploration of the mean scores outlined above, where different patterns of dimension mean scores led to similar EPRES-E mean scores. Therefore, we can conclude that

the country-specific contexts that articulate the different institutional frameworks for work and employment (e.g. macro-level policies, labor-market reforms, social dialogue and welfare-state regimes) stand out as key factors in the configuration of PE.

From a substantive point of view, these findings provide empirical reasons for approaching PE from a multidimensional perspective, especially when performing comparative research, since they make visible the fact that different dimensions have different magnitudes in different countries. Accordingly, focusing only on one of them might produce misleading conclusions. A highly illustrative example of this is the case of Germany, which was found to be the third worst-performing country in terms of its overall EPRES-E score, despite it usually being portrayed as one of the countries to demonstrate successful labor-market outcomes when only unemployment rates or temporary employment are considered (e.g. ILO, 2019). On the other hand, the results stemming from this study also constitute a step forward towards validating EPRES-E. That is, the dimension scores fruitfully captured the situation that labor markets in the analyzed countries were experimenting at the time, as we have described in the previous section. Therefore, this narrative reinforces use of EPRES-E in 22 European countries for comparative purposes provided it is displayed in conjunction with the scores of each dimension.

Moving to the thirteen European countries where the construct does not hold, namely Albania, Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Malta, Montenegro, Republic of North Macedonia, Romania, Serbia and Turkey, further research should specifically delve into their labor-market structures in order to arrive at a more comprehensive understanding of how employment precariousness is shaped in these countries. A potential interpretation for their non-invariance lies in the institutional framework of these countries, which is characterized by their delayed transition from almost half a century of communist rule to market capitalism, making their labor markets substantially different from those of the older EU member states. Accordingly, their welfare states and social protection networks present a lagged development, a marked dual structure between the public and private sectors, and a vastly expanded informal sector (Fenger, 2007). Indeed, the share of informal salaried workers in these countries is substantially higher compared to the 22 countries to which EPRES-E applies (Supplementary Material 2). This widens the array of forms that PE can take, which go beyond the dimensions captured in EPRES-E. To elaborate, PE measurement instruments tailored for these countries ought to encompass other aspects such the range of social risks that workers have covered and whether they are compulsorily or voluntarily entitled to such insurance schemes, the absence of formal contracts, or their irregularities in terms of the detailed number of working hours (Farkas, 2017). Finally, note that the instrument does indeed work for some post-communist countries, namely Croatia, Lithuania, Poland, Slovakia and Slovenia, but these happen to share a higher number of confluent points with West European countries (Fenger, 2007; Bohle & Greskovits, 2012; Farkas,

2017). This prompts the conclusion that EPRES-E is only applicable to post-industrial societies in the West, suggesting that the theoretical construct on which the instrument is grounded is limited in its ability to encapsulate the realities that stem from other socio-political trajectories. Future studies should nevertheless ask whether EPRES-E is suitable for groups of workers in these countries that resemble their West European counterparts, such those working in the public sector (Fenger, 2007), in order to increase the scope of the instrument.

This study has some limitations that need to be acknowledged. First, the secondary nature of the survey prevents us from tackling specific issues, detailed in the foregoing, which would enhance our capacity to measure PE in a higher number of countries. Nevertheless, the advantages gained by using this source of information are enormously superior to this drawback in the sense that the EWCS puts out homogenized information from a substantial sample in almost all European countries every five years. This permits not only the study of PE in further phases of the survey, which will allow the monitoring of a social phenomenon that is has increasingly attracted international concern down the years, but also the unique opportunity to do so on a Europe-wide scale. Second, EPRES-E is restricted to formal employees and does not tap other forms of employment that might also show signs of precariousness, such as self-employment, informal salaried employment, informal entrepreneurs, etc. (Benach, et al. 2013; Ruiz, 2018). Approaching these forms of employment would be greatly relevant for a set of countries where they are highly prevalent, mainly those in southern, Central and Eastern Europe (Supplementary Material 2). However, the precariousness of these forms of employment encompasses a wide set of aspects in addition to or different from those captured in both the EPRES and the EPRES-E constructs, and some of them (as mentioned earlier in this section) are not included in the EWCS, such the social protection rights to which workers are entitled (Gevaert, et al. 2018; Ruiz, 2018; ILO, 2020). Future research should therefore explore how to tackle these features in the EWCS as well.

Nevertheless EPRES-E demonstrates both the theoretical and the empirical properties of invariance that provide support for its use in up to 22 European countries. This is unprecedented in the field of PE research, particularly from a multidimensional perspective. Hence this article constitutes a significant contribution to establishing the comparability of PE in Europe, which is fundamental to deepening our understanding of the phenomenon and to working towards establishing decent and sustainable labor markets internationally in an era framed by globalization. At the same time, it also stresses the importance of directing further efforts towards the incorporation of questions related to employment conditions and relations in more frequent or longitudinal international surveys such as the Labor Force Survey (LFS) or the European Union Survey of Income and Living Conditions (EU-SILC), as well as conserving the EPRES-E items in further phases of the EWCS.

Our findings are also informative for the future conceptualization and operationalization of PE from a cross-national perspective. On the one hand, they enable the inference that the precariousness of employment arrangements is unequally contoured by a number of sources that in turn emerge from individual countries' broader socio-historical, political and cultural particularities. On the other hand, more conceptual and practical work is needed to identify what additional or different aspects delineate PE in societies other than those in the post-industrial West.

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FIGURES AND TABLES

Figure 1. Factor structure of the EPRES-E (European Working Conditions Survey 2015)
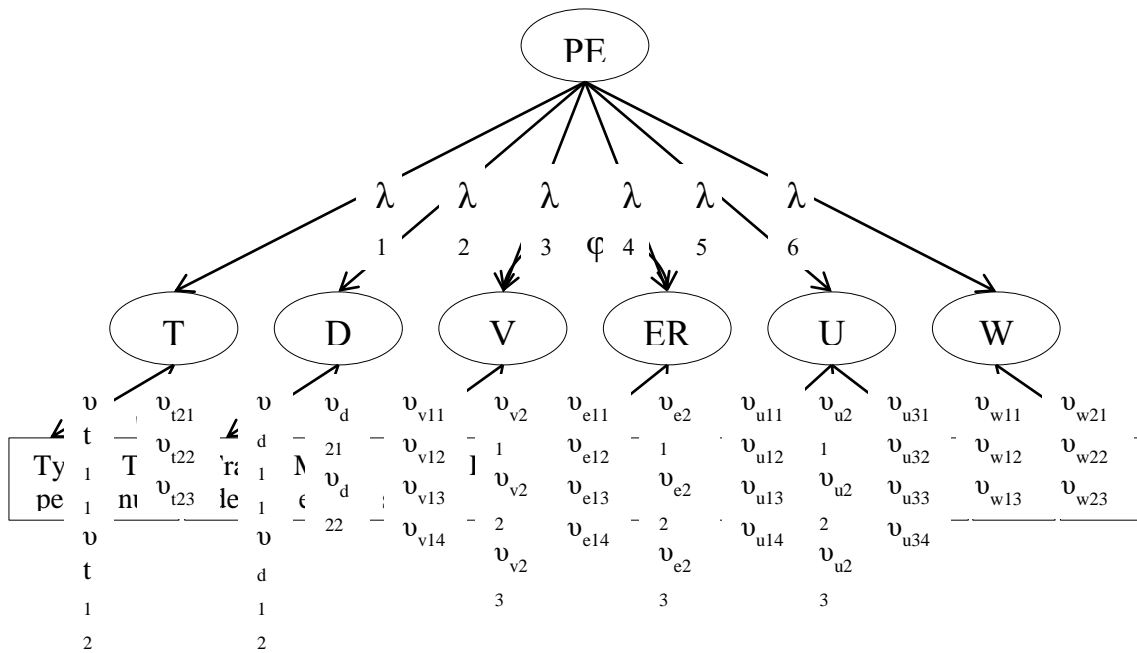
EPRES-E: Employment Precariousness Scale for Europe; PE: Precarious Employment; T: Temporariness; D: Disempowerment; V: Vulnerability; ER: Exercise of rights; UWT: Uncertain Working Times; W: Wages; Fair treat: fair treatment; Sched. unpred.: schedule unpredictability; WT: working times; λ factor loading; φ factor covariance; υ threshold.

Figure 2. Flowchart of multi-group confirmatory factor models analysed to test measurement
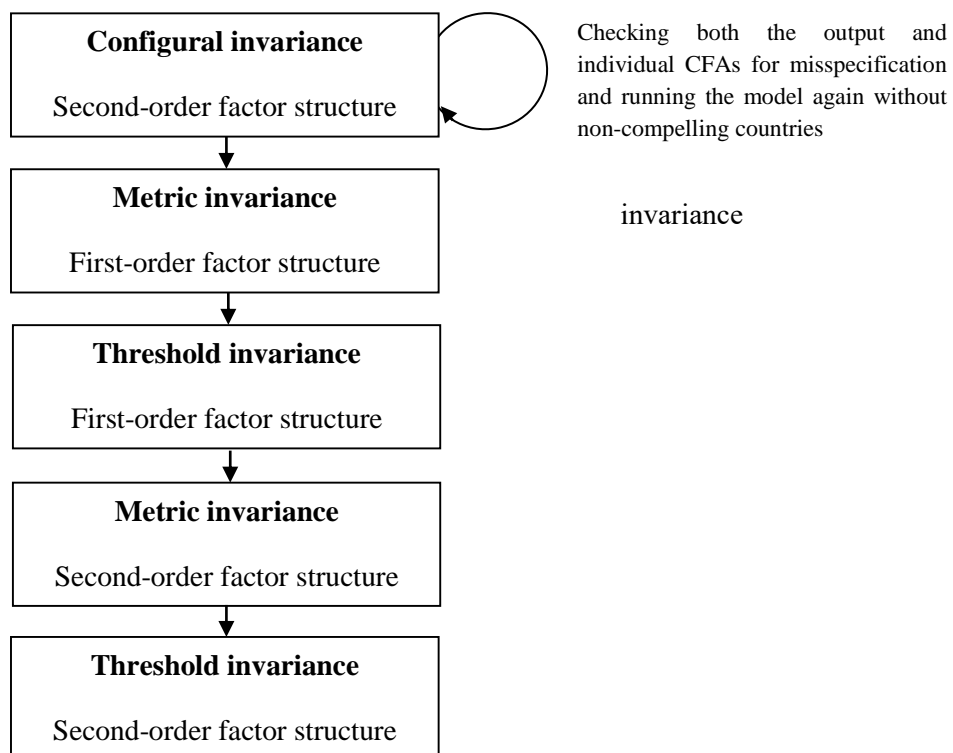
CFA: Confirmatory Factor Analysis

Table 1. Operationalization of the Employment Precariousness Scale for Europe (EPRES-E).

	Indicator	Operationalisation	Response options
Temporariness	Duration of current contract	Combination of: a) what type of contract do you have; b) what is the duration of your current contract?	0. Permanent contract 1. Temporary contract, short duration 2. Temporary contract, long duration
	Tenure	How many years have you been in your company or organization?	0. More than 5 years 1. 3 to 5 years 2. 1 to 3 years 3. Less than 1 year
Disempowerment	Trade unions	Does a trade union, works council or a similar committee representing employees exist at your organization?	0. Yes 1. No 2. Don't know
	Meetings	Does a regular meeting in which employees can express their views about what is happening in the organization exist at your organization?	0. Yes 1. No 2. Don't know
Vulnerability	Respect of boss	Your immediate boss respects you as a person	0. Strongly agree 1. Tend to agree 2. Neither agree nor disagree 3. Tend to disagree 4. Strongly disagree
	Fair treatment	You are treated fairly at your workplace	0. Always 1. Most of the time 2. Sometimes 3. Rarely or never
Exercise of rights	Break when you need it	You can take a break when you wish	0. Always 1. Most of the time 2. Sometimes 3. Rarely 4. Never
	Hours off for personal matters	Would you say that for you arranging to take an hour or two off during working hours to take care of personal or family matters is…	0. Very easy 1. Fairly easy 2. Fairly difficult 3. Very difficult
Unpredictability of	Schedule unpredictability	Do changes to your working time arrangements occur regularly? If yes, how long before are you informed about these changes?	0. No 1. Yes, several weeks in advance 2. Yes, several days in advance 3. Yes, the day before 4. Yes, the same day
	Work at short notice	How often have you been requested to come into work at short notice?	0. Never 1. Less often 2. Several times a month 3. Several times a week or daily

	Working times regularity	Combination of: do you work a) the same number of hours every day; b) the same number of days every week; c) the same number of hours every week; d) fixed starting and finishing times?	0. Very high (yes on all) 1. High (no on at least one) 2. Medium (no on at least two) 3. Low (no on at least three) 4. Very low (no on all)
Wages	Net earnings per month	Net monthly earnings from your main paid job	0. High earnings (above the median) 1. Medium-low earnings (between low earnings and the median) 3. Low earnings (less than 0.6 of the median population)
	Net earnings per hour	Net hourly earnings from your main paid job	0. High earnings (above the median) 1. Medium-low earnings (between low earnings and the median) 3. Low earnings (less than 0.6 of the median population)

Table 2. Sample description (European Working Conditions Survey, 2015).

		N	(%)
Sex	Women	16,365	52.23
	Men	14,969	47.77
Age	15 to 25	2,815	8.98
	26 to 35	7,306	23.31
	36 to 45	8,394	26.78
	46 to 55	8,447	26.95
	56 to 64	4,378	13.97
Place of birth	Country of residence	28,383	91.04
	Other	2,793	8.96
Occupational social class	Non-manual	22,320	71.42
	Manual	8,932	28.58
Educational attainment	High	11,139	35.66
	Medium	15,660	50.13
	Low	4,437	14.20
Country	Austria	781	2.49
	Belgium	2,097	6.69
	Bulgaria	790	2.52
	Croatia	782	2.50
	Cyprus	455	1.45
	Czech Republic	772	2.46
	Denmark	871	2.78
	Estonia	803	2.56
	Finland	743	2.37
	France	1,295	4.13
	Germany	1,717	5.48
	Greece	443	1.41
	Hungary	776	2.48
	Ireland	692	2.21
	Italy	816	2.60
	Latvia	736	2.35
	Lithuania	827	2.64
	Luxembourg	866	2.76
	Malta	640	2.04
	Netherlands	816	2.60
	Poland	832	2.65
	Portugal	613	1.96

Romania	804	2.57
Slovakia	830	2.65
Slovenia	1,298	4.14
Spain	2,444	7.80
Sweden	888	2.83
United Kingdom	1,265	4.04
Montenegro	601	1.92
Republic of North Macedonia	610	1.95
Serbia	584	1.86
Turkey	805	2.57
Norway	885	2.82
Switzerland	814	2.60
Albania	349	1.11

Table 3. Goodness-of-fit indices from multi-group confirmatory factor analyses of the EPRES-E (European Working Conditions Survey, 2015).

	χ^2 [df]	CFI	ΔCFI	TLI	ΔTLI	RMSEA (90% CI)	ΔRMSEA
1. Configural invariance[a]	*Solution not found*						
2. Configural invariance[b]	7097.326 [1276]*	0.945	-	0.926	-	0.074 (0.072-0.075)	-
3. Metric invariance of the first-order factors[b]	3611.558 [1247]*	0.978	0.033	0.969	0.043	0.048 (0.046-0.049)	-0.026
4. Threshold invariance of the first-order factors[b]	8304.920 [1646]*	0.937	-0.041	0.934	-0.035	0.069 (0.068-0.071)	0.021
5. Metric invariance of the first- and second-order factors[b]	9007.871 [1528]*	0.929	-0.008	0.921	-0.013	0.076 (0.075-0.078)	0.007
6. Threshold invariance of the first- and second-order factors[b]	13821.964 [1906]*	0.887	-0.042	0.899	-0.022	0.086 (0.085-0.088)	0.010

EPRES-E: Employment Precariousness Scale for Europe; df: degrees of freedom; CFI: Comparative Fit Index; TLI: Tucker-Lewis Index; RMSEA: Root Mean Square Error of Approximation; CI: Confidence Interval; *Significant at p < 0.001; [a]35 countries included; [b]22 countries included.

Table 4. Means of the EPRES-E and its dimensions by country (European Working Conditions Survey, 2015).

	T	D	V	ER	UWT	W	EPRES-E
Austria	20.33	24.23	15.16	45.03	25.10	50.00	29.84
Belgium	20.61	20.88	19.25	44.73	18.62	45.81	27.95
Croatia	21.45	28.74	24.13	52.76	20.81	38.69	31.54
Denmark	23.82	15.61	15.16	36.49	27.99	39.47	26.26
Finland	18.33	16.71	17.20	33.75	23.76	35.33	24.09
France	21.38	20.42	21.85	42.44	21.30	42.64	27.83
Germany	21.14	25.15	18.36	53.61	22.76	52.18	32.06
Greece	22.31	30.11	20.31	57.34	16.52	38.11	31.33
Ireland	19.16	22.79	17.54	42.28	20.99	45.33	27.73
Italy	18.27	27.14	23.82	48.91	14.88	41.86	27.86
Lithuania	19.80	34.80	24.99	47.16	19.00	26.67	28.53
Luxembourg	16.97	22.23	18.28	40.47	18.85	37.21	25.73
Netherlands	24.45	22.55	14.41	38.09	22.20	42.51	27.12
Norway	22.93	15.98	11.94	32.75	23.12	58.67	27.24
Poland	29.97	35.36	26.02	48.27	19.96	46.56	33.93
Portugal	19.36	36.13	14.67	48.42	17.02	36.04	28.80
Slovakia	21.74	28.69	30.72	55.28	24.41	39.89	32.93
Slovenia	16.64	22.64	20.34	55.00	19.75	51.23	31.03
Spain	29.25	28.23	17.75	45.70	16.71	41.65	30.08
Sweden	22.22	10.81	16.60	36.75	24.92	37.50	24.48
Switzerland	20.20	30.66	17.50	49.03	23.97	33.25	29.36
UK	22.86	23.28	20.01	41.58	21.91	43.41	28.43

EPRES-E: Employment Precariousness Scale for Europe; T: Temporariness; D: Disempowerment; V: Vulnerability; ER: Exercise of Rights; UWT: Unpredictable Working Times; W: Wages; brighter colors correspond to higher means.

SUPPLEMENTARY MATERIAL

Supplementary Material 1. STATA syntax of the Employment Precariousness Scale for Europe (EPRES-E)

Recoding of the EPRES-E variables
/// TEMPORARINESS --
/// Type and length of contract

gen t1 = .
replace t1 = 0 if q11 == 1
replace t1 = 1 if q11 !=1 & q12 > 12 & q12 !=. & q12 != 888 & q12 != 999
replace t1 = 2 if q11 != 1 & q12 <= 12 & q12 != 888 & q12 != 999
replace t1 = 2 if q11 == 4 & q17 == 999
replace t1 = 2 if q11 == 4 & q17 == 1

label variable t1 "Contract duration"

label define t1 0 "Permanent" 1 "Temporary, more than 1 year" 2 "Temporary, no exact
   duration" 3 "Temporary, 7 months to 1 year" 4 "Temporary, 6 months or less"
label values t1 t1

/// Tenure
recode q17 (6/60=0 "More than 5 years") (4/5=1 "3 to 5 years") (1/3=2 "1 to 3 years") (999=3
   "Less than 1 year") (77/max=.), gen(t2)

label variable t2 "Tenure"

/// DISEMPOWERMENT ---
/// Trade unions
recode q71a (1=0 "Yes") (2=1 "No") (8=2 "DK") (9=.), gen(d1)

label variable d1 "Trade unions, work council or similar committee"

/// Meetings
recode q71c (1=0 "Yes") (2=1 "No") (8=2 "DK") (9=.), gen(d2)

label variable d2 "Regular meeting in which employees can express their views about what is
   happening in the organisation?"

/// VULNERABILITY --
/// Respect of boss
recode q63a (1=0 "Strongly agree") (2=1 "Tend to agree") (3=2 "Neither agree nor disagree")
   (4=3 "Tend to disagree") (5=4 "Strongly disagree") (7=.) (8=.) (9=.), gen(v1)

/// Fair treatment
recode q61l (1=0 "Always") (2=1 "Most of the time") (3=2 "Sometimes") (4/5=3 "Rarely or
   never") (8=.) (7=.) (9=.), gen(v2)

/// EXERCISE OF RIGHTS ---
/// Hours off for personal or family matters
recode q47 (1=0 "Very easy") (2=1 "Fairly easy") (3=2 "Fairly difficult") (4=3 "Very difficult")
   (8=.) (9=.), gen(er1)

/// Break
recode q61f (1=0 "Always") (2=1 "Most of the time") (3=2 "Sometimes") (4=3 "Rarely") (5=4 "Never") (7=.) (8=.) (9=.), gen(bre)

/// UNPREDICTABLE WORKING TIMES --
/// Schedule unpredictability
recode q43 (.=0 "No") (1=0) (2=4 "Yes, the same day") (3=3 "Yes, the day before") (4=2 "Yes, several days before") (5=1 "Yes, several weeks before") (6=.) (8=.) (9=.), gen(uwt1)

/// Working times irregularity
recode q39a (1=0 "Yes") (2=1 "No") (8=.) (9=.), gen (q39_a)
recode q39b (1=0 "Yes") (2=1 "No") (8=.) (9=.), gen (q39_b)
recode q39c (1=0 "Yes") (2=1 "No") (8=.) (9=.), gen (q39_c)
recode q39d (1=0 "Yes") (2=1 "No") (8=.) (9=.), gen (q39_d)

gen uwt2 = q39_a + q39_b + q39_c + q39_d

label variable uwt2 "Working times regularity"

label define uwt2 0 "Very high (yes on all)" 1 "High (no on at least one)" 2 "Medium (no on at least two)" 3 "Low (no on at least three)" 4 "Very low (no on all)"
label values uwt2 uwt2

/// Requested to work at short notice
recode q40 (5=0 "Never") (4=1 "Less often") (3=2 "Several times a month") (1/2=3 "Several times a week or daily") (7=.) (8=.) (9=.), gen(uwt3)

/// WAGES --

* Impute the missing values in Q104 with the median value of Q105. Check this median value through tabstat. Example: tabstat q104 if q104 < 601 & country == 1, s(p50)

gen inc = q104
replace inc = . if q104 >= 8.8e+07

replace inc = 405.5 if q105==1&country==1
replace inc = 750 if q105==2&country==1
replace inc = 1000 if q105==3&country==1
replace inc = 1150 if q105==4&country==1
replace inc = 1350 if q105==5&country==1
replace inc = 1500 if q105==6&country==1
replace inc = 1750 if q105==7&country==1
replace inc = 2000 if q105==8&country==1
replace inc = 2200 if q105==9&country==1
replace inc = 2500 if q105==10&country==1
replace inc = 2900 if q105==11&country==1
replace inc = 3900 if q105==12&country==1
replace inc = 600 if q105==1&country==2
replace inc = 944 if q105==2&country==2
replace inc = 1200 if q105==3&country==2
replace inc = 1325 if q105==4&country==2
replace inc = 1500 if q105==5&country==2
replace inc = 1719.5 if q105==6&country==2
replace inc = 2000 if q105==7&country==2
replace inc = 2200 if q105==8&country==2

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replace inc = 2400 if q105==9&country==2
replace inc = 2700 if q105==10&country==2
replace inc = 3000 if q105==11&country==2
replace inc = 3600 if q105==12&country==2
replace inc = 165 if q105==1&country==3
replace inc = 230 if q105==2&country==3
replace inc = 300 if q105==3&country==3
replace inc = 350 if q105==4&country==3
replace inc = 400 if q105==5&country==3
replace inc = 500 if q105==6&country==3
replace inc = 600 if q105==7&country==3
replace inc = 700 if q105==8&country==3
replace inc = 800 if q105==9&country==3
replace inc = 1000 if q105==10&country==3
replace inc = 1200 if q105==11&country==3
replace inc = 2000 if q105==12&country==3
replace inc = 1000 if q105==1&country==4
replace inc = 2400 if q105==2&country==4
replace inc = 3000 if q105==3&country==4
replace inc = 3500 if q105==4&country==4
replace inc = 4000 if q105==5&country==4
replace inc = 4500 if q105==6&country==4
replace inc = 5000 if q105==7&country==4
replace inc = 5600 if q105==8&country==4
replace inc = 6700 if q105==9&country==4
replace inc = 8000 if q105==10&country==4
replace inc = 10000 if q105==11&country==4
replace inc = 18175 if q105==12&country==4
replace inc = 685 if q105==1&country==5
replace inc = 900 if q105==2&country==5
replace inc = 1000 if q105==3&country==5
replace inc = 1100 if q105==4&country==5
replace inc = 1200 if q105==5&country==5
replace inc = 1300 if q105==6&country==5
replace inc = 1500 if q105==7&country==5
replace inc = 1800 if q105==8&country==5
replace inc = 2000 if q105==9&country==5
replace inc = 2500 if q105==10&country==5
replace inc = 3000 if q105==11&country==5
replace inc = 6000 if q105==12&country==5
replace inc = 5925 if q105==1&country==6
replace inc = 10800 if q105==2&country==6
replace inc = 13000 if q105==3&country==6
replace inc = 14000 if q105==4&country==6
replace inc = 16000 if q105==5&country==6
replace inc = 18000 if q105==6&country==6
replace inc = 20000 if q105==7&country==6
replace inc = 23000 if q105==8&country==6
replace inc = 27000 if q105==9&country==6
replace inc = 30000 if q105==10&country==6
replace inc = 32000 if q105==11&country==6
replace inc = 36000 if q105==12&country==6
replace inc = 2000 if q105==1&country==7
replace inc = 7250 if q105==2&country==7
replace inc = 12000 if q105==3&country==7
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```
replace inc = 14000 if q105==4&country==7
replace inc = 16000 if q105==5&country==7
replace inc = 18300 if q105==6&country==7
replace inc = 21000 if q105==7&country==7
replace inc = 23000 if q105==8&country==7
replace inc = 27000 if q105==9&country==7
replace inc = 30000 if q105==10&country==7
replace inc = 35000 if q105==11&country==7
replace inc = 40000 if q105==12&country==7
replace inc = 200 if q105==1&country==8
replace inc = 285 if q105==2&country==8
replace inc = 330 if q105==3&country==8
replace inc = 370 if q105==4&country==8
replace inc = 450 if q105==5&country==8
replace inc = 550 if q105==6&country==8
replace inc = 650 if q105==7&country==8
replace inc = 750 if q105==8&country==8
replace inc = 850 if q105==9&country==8
replace inc = 1000 if q105==10&country==8
replace inc = 1200 if q105==11&country==8
replace inc = 1900 if q105==12&country==8
replace inc = 660 if q105==1&country==9
replace inc = 1100 if q105==2&country==9
replace inc = 1300 if q105==3&country==9
replace inc = 1500 if q105==4&country==9
replace inc = 1700 if q105==5&country==9
replace inc = 1900 if q105==6&country==9
replace inc = 2100 if q105==7&country==9
replace inc = 2390 if q105==8&country==9
replace inc = 2700 if q105==9&country==9
replace inc = 3300 if q105==10&country==9
replace inc = 3700 if q105==11&country==9
replace inc = 5000 if q105==12&country==9
replace inc = 600 if q105==1&country==10
replace inc = 900 if q105==2&country==10
replace inc = 1100 if q105==3&country==10
replace inc = 1300 if q105==4&country==10
replace inc = 1500 if q105==5&country==10
replace inc = 1700 if q105==6&country==10
replace inc = 1900 if q105==7&country==10
replace inc = 2100 if q105==8&country==10
replace inc = 2400 if q105==9&country==10
replace inc = 2800 if q105==10&country==10
replace inc = 3200 if q105==11&country==10
replace inc = 4500 if q105==12&country==10
replace inc = 410 if q105==1&country==11
replace inc = 650 if q105==2&country==11
replace inc = 900 if q105==3&country==11
replace inc = 1180 if q105==4&country==11
replace inc = 1300 if q105==5&country==11
replace inc = 1501.5 if q105==6&country==11
replace inc = 1750 if q105==7&country==11
replace inc = 1925 if q105==8&country==11
replace inc = 2300 if q105==9&country==11
replace inc = 2800 if q105==10&country==11
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```
replace inc = 3200 if q105==11&country==11
replace inc = 4000 if q105==12&country==11
replace inc = 645 if q105==1&country==12
replace inc = 980 if q105==2&country==12
replace inc = 1200 if q105==3&country==12
replace inc = 1300 if q105==4&country==12
replace inc = 1500 if q105==5&country==12
replace inc = 1700 if q105==6&country==12
replace inc = 2000 if q105==7&country==12
replace inc = 2100 if q105==8&country==12
replace inc = 2400 if q105==9&country==12
replace inc = 3000 if q105==10&country==12
replace inc = 3250 if q105==11&country==12
replace inc = 5000 if q105==12&country==12
replace inc = 40000 if q105==1&country==13
replace inc = 60000 if q105==2&country==13
replace inc = 70000 if q105==3&country==13
replace inc = 80000 if q105==4&country==13
replace inc = 90000 if q105==5&country==13
replace inc = 100000 if q105==6&country==13
replace inc = 120000 if q105==7&country==13
replace inc = 130000 if q105==8&country==13
replace inc = 160000 if q105==9&country==13
replace inc = 205000 if q105==10&country==13
replace inc = 230000 if q105==11&country==13
replace inc = 320000 if q105==12&country==13
replace inc = 665 if q105==1&country==14
replace inc = 1000 if q105==2&country==14
replace inc = 1300 if q105==3&country==14
replace inc = 1600 if q105==4&country==14
replace inc = 2000 if q105==5&country==14
replace inc = 2200 if q105==6&country==14
replace inc = 2500 if q105==7&country==14
replace inc = 3000 if q105==8&country==14
replace inc = 3350 if q105==9&country==14
replace inc = 4000 if q105==10&country==14
replace inc = 4500 if q105==11&country==14
replace inc = 5000 if q105==12&country==14
replace inc = 600 if q105==1&country==15
replace inc = 900 if q105==2&country==15
replace inc = 1000 if q105==3&country==15
replace inc = 1100 if q105==4&country==15
replace inc = 1200 if q105==5&country==15
replace inc = 1300 if q105==6&country==15
replace inc = 1400 if q105==7&country==15
replace inc = 1600 if q105==8&country==15
replace inc = 1850 if q105==9&country==15
replace inc = 2200 if q105==10&country==15
replace inc = 2400 if q105==11&country==15
replace inc = 3000 if q105==12&country==15
replace inc = 90 if q105==1&country==16
replace inc = 200 if q105==2&country==16
replace inc = 250 if q105==3&country==16
replace inc = 300 if q105==4&country==16
replace inc = 340 if q105==5&country==16
```

replace inc = 400 if q105==6&country==16
replace inc = 450 if q105==7&country==16
replace inc = 500 if q105==8&country==16
replace inc = 600 if q105==9&country==16
replace inc = 750 if q105==10&country==16
replace inc = 900 if q105==11&country==16
replace inc = 1250 if q105==12&country==16
replace inc = 150 if q105==1&country==17
replace inc = 230 if q105==2&country==17
replace inc = 250 if q105==3&country==17
replace inc = 270 if q105==4&country==17
replace inc = 312.5 if q105==5&country==17
replace inc = 400 if q105==6&country==17
replace inc = 450 if q105==7&country==17
replace inc = 500 if q105==8&country==17
replace inc = 610 if q105==9&country==17
replace inc = 800 if q105==10&country==17
replace inc = 900 if q105==11&country==17
replace inc = 1500 if q105==12&country==17
replace inc = 885 if q105==1&country==18
replace inc = 1400 if q105==2&country==18
replace inc = 1711.5 if q105==3&country==18
replace inc = 2000 if q105==4&country==18
replace inc = 2294 if q105==5&country==18
replace inc = 2600 if q105==6&country==18
replace inc = 3000 if q105==7&country==18
replace inc = 3500 if q105==8&country==18
replace inc = 4000 if q105==9&country==18
replace inc = 5000 if q105==10&country==18
replace inc = 6000 if q105==11&country==18
replace inc = 7700 if q105==12&country==18
replace inc = 500 if q105==1&country==19
replace inc = 700 if q105==2&country==19
replace inc = 800 if q105==3&country==19
replace inc = 877 if q105==4&country==19
replace inc = 1000 if q105==5&country==19
replace inc = 1100 if q105==6&country==19
replace inc = 1200 if q105==7&country==19
replace inc = 1300 if q105==8&country==19
replace inc = 1500 if q105==9&country==19
replace inc = 1800 if q105==10&country==19
replace inc = 2000 if q105==11&country==19
replace inc = 2200 if q105==12&country==19
replace inc = 270 if q105==1&country==20
replace inc = 702 if q105==2&country==20
replace inc = 1000 if q105==3&country==20
replace inc = 1250 if q105==4&country==20
replace inc = 1485.5 if q105==5&country==20
replace inc = 1630 if q105==6&country==20
replace inc = 1890 if q105==7&country==20
replace inc = 2200 if q105==8&country==20
replace inc = 2490 if q105==9&country==20
replace inc = 1800 if q105==10&country==20
replace inc = 3500 if q105==11&country==20
replace inc = 4500 if q105==12&country==20

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replace inc = 700 if q105==1&country==21
replace inc = 1000 if q105==2&country==21
replace inc = 1200 if q105==3&country==21
replace inc = 1300 if q105==4&country==21
replace inc = 1600 if q105==5&country==21
replace inc = 1985 if q105==6&country==21
replace inc = 2200 if q105==7&country==21
replace inc = 2500 if q105==8&country==21
replace inc = 3000 if q105==9&country==21
replace inc = 3500 if q105==10&country==21
replace inc = 4000 if q105==11&country==21
replace inc = 5000 if q105==12&country==21
replace inc = 480 if q105==1&country==22
replace inc = 560 if q105==2&country==22
replace inc = 680 if q105==3&country==22
replace inc = 750 if q105==4&country==22
replace inc = 860 if q105==5&country==22
replace inc = 1000 if q105==6&country==22
replace inc = 1100 if q105==7&country==22
replace inc = 1200 if q105==8&country==22
replace inc = 1400 if q105==9&country==22
replace inc = 1700 if q105==10&country==22
replace inc = 2000 if q105==11&country==22
replace inc = 2500 if q105==12&country==22
replace inc = 230 if q105==1&country==23
replace inc = 500 if q105==2&country==23
replace inc = 600 if q105==3&country==23
replace inc = 700 if q105==4&country==23
replace inc = 800 if q105==5&country==23
replace inc = 1000 if q105==6&country==23
replace inc = 1200 if q105==7&country==23
replace inc = 1390 if q105==8&country==23
replace inc = 1500 if q105==9&country==23
replace inc = 2000 if q105==10&country==23
replace inc = 2400 if q105==11&country==23
replace inc = 3000 if q105==12&country==23
replace inc = 210 if q105==1&country==24
replace inc = 380 if q105==2&country==24
replace inc = 460 if q105==3&country==24
replace inc = 560 if q105==4&country==24
replace inc = 650 if q105==5&country==24
replace inc = 800 if q105==6&country==24
replace inc = 850 if q105==7&country==24
replace inc = 985 if q105==8&country==24
replace inc = 1100 if q105==9&country==24
replace inc = 1200 if q105==10&country==24
replace inc = 1300 if q105==11&country==24
replace inc = 1550 if q105==12&country==24
replace inc = 350 if q105==1&country==25
replace inc = 500 if q105==2&country==25
replace inc = 580 if q105==3&country==25
replace inc = 689 if q105==4&country==25
replace inc = 800 if q105==5&country==25
replace inc = 900 if q105==6&country==25
replace inc = 1000 if q105==7&country==25
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replace inc = 1150 if q105==8&country==25
replace inc = 1300 if q105==9&country==25
replace inc = 1500 if q105==10&country==25
replace inc = 1800 if q105==11&country==25
replace inc = 2250 if q105==12&country==25
replace inc = 450 if q105==1&country==26
replace inc = 750 if q105==2&country==26
replace inc = 950 if q105==3&country==26
replace inc = 1197.5 if q105==4&country==26
replace inc = 1300 if q105==5&country==26
replace inc = 1500 if q105==6&country==26
replace inc = 1800 if q105==7&country==26
replace inc = 2000 if q105==8&country==26
replace inc = 2200 if q105==9&country==26
replace inc = 2300 if q105==10&country==26
replace inc = 2500 if q105==11&country==26
replace inc = 3000 if q105==12&country==26
replace inc = 5000 if q105==1&country==27
replace inc = 12000 if q105==2&country==27
replace inc = 15000 if q105==3&country==27
replace inc = 16500 if q105==4&country==27
replace inc = 18000 if q105==5&country==27
replace inc = 20000 if q105==6&country==27
replace inc = 21000 if q105==7&country==27
replace inc = 22000 if q105==8&country==27
replace inc = 25000 if q105==9&country==27
replace inc = 27000 if q105==10&country==27
replace inc = 30000 if q105==11&country==27
replace inc = 40000 if q105==12&country==27
replace inc = 320 if q105==1&country==28
replace inc = 510 if q105==2&country==28
replace inc = 750 if q105==3&country==28
replace inc = 972.5 if q105==4&country==28
replace inc = 1200 if q105==5&country==28
replace inc = 1400 if q105==6&country==28
replace inc = 1700 if q105==7&country==28
replace inc = 2000 if q105==8&country==28
replace inc = 2300 if q105==9&country==28
replace inc = 3000 if q105==10&country==28
replace inc = 3300 if q105==11&country==28
replace inc = 4500 if q105==12&country==28
replace inc = 198.5 if q105==1&country==29
replace inc = 250 if q105==2&country==29
replace inc = 300 if q105==3&country==29
replace inc = 350 if q105==4&country==29
replace inc = 400 if q105==5&country==29
replace inc = 450 if q105==6&country==29
replace inc = 500 if q105==7&country==29
replace inc = 600 if q105==8&country==29
replace inc = 700 if q105==9&country==29
replace inc = 850 if q105==10&country==29
replace inc = 1000 if q105==11&country==29
replace inc = 1300 if q105==12&country==29
replace inc = 6000 if q105==1&country==30
replace inc = 8000 if q105==2&country==30

```
replace inc = 10000 if q105==3&country==30
replace inc = 12000 if q105==4&country==30
replace inc = 14000 if q105==5&country==30
replace inc = 18000 if q105==6&country==30
replace inc = 20000 if q105==7&country==30
replace inc = 23700 if q105==8&country==30
replace inc = 30000 if q105==9&country==30
replace inc = 36000 if q105==10&country==30
replace inc = 45000 if q105==11&country==30
replace inc = 60000 if q105==12&country==30
replace inc = 11000 if q105==1&country==31
replace inc = 15500 if q105==2&country==31
replace inc = 20000 if q105==3&country==31
replace inc = 22150 if q105==4&country==31
replace inc = 28000 if q105==5&country==31
replace inc = 35000 if q105==6&country==31
replace inc = 40000 if q105==7&country==31
replace inc = 47500 if q105==8&country==31
replace inc = 60000 if q105==9&country==31
replace inc = 75000 if q105==10&country==31
replace inc = 85000 if q105==11&country==31
replace inc = 117500 if q105==12&country==31
replace inc = 300 if q105==1&country==32
replace inc = 500 if q105==2&country==32
replace inc = 550 if q105==3&country==32
replace inc = 700 if q105==4&country==32
replace inc = 800 if q105==5&country==32
replace inc = 900 if q105==6&country==32
replace inc = 1000 if q105==7&country==32
replace inc = 1100 if q105==8&country==32
replace inc = 1262 if q105==9&country==32
replace inc = 1600 if q105==10&country==32
replace inc = 2000 if q105==11&country==32
replace inc = 2700 if q105==12&country==32
replace inc = 5000 if q105==1&country==33
replace inc = 10000 if q105==2&country==33
replace inc = 14250 if q105==3&country==33
replace inc = 18000 if q105==4&country==33
replace inc = 20000 if q105==5&country==33
replace inc = 22000 if q105==6&country==33
replace inc = 24000 if q105==7&country==33
replace inc = 27000 if q105==8&country==33
replace inc = 30000 if q105==9&country==33
replace inc = 35000 if q105==10&country==33
replace inc = 40000 if q105==11&country==33
replace inc = 47000 if q105==12&country==33
replace inc = 735 if q105==1&country==34
replace inc = 1400 if q105==2&country==34
replace inc = 1800 if q105==3&country==34
replace inc = 2400 if q105==4&country==34
replace inc = 2950 if q105==5&country==34
replace inc = 3400 if q105==6&country==34
replace inc = 3800 if q105==7&country==34
replace inc = 4300 if q105==8&country==34
replace inc = 5000 if q105==9&country==34
```

replace inc = 6000 if q105==10&country==34
replace inc = 7000 if q105==11&country==34
replace inc = 9000 if q105==12&country==34
replace inc = 12000 if q105==1&country==35
replace inc = 16000 if q105==2&country==35
replace inc = 20000 if q105==3&country==35
replace inc = 25000 if q105==4&country==35
replace inc = 30000 if q105==5&country==35
replace inc = 35000 if q105==6&country==35
replace inc = 40000 if q105==7&country==35
replace inc = 45000 if q105==8&country==35
replace inc = 50000 if q105==9&country==35
replace inc = 60000 if q105==10&country==35
replace inc = 80000 if q105==11&country==35
replace inc = 135000 if q105==12&country==35

/// Monthly income
gen w1_4 = .
replace w1_4 = 3 if inc<= 1163 & country == 1
replace w1_4 = 2 if inc > 1163 & inc <= 1938 & country == 1
replace w1_4 = 1 if inc > 1938 & inc <= 2908 & country == 1
replace w1_4 = 0 if inc > 2908 & inc <= 8800000 & country == 1
replace w1_4 = 3 if inc<= 1082 & country == 2
replace w1_4 = 2 if inc > 1082 & inc <= 1804 & country == 2
replace w1_4 = 1 if inc > 1804 & inc <= 2706 & country == 2
replace w1_4 = 0 if inc > 2706 & inc <= 8800000 & country == 2
replace w1_4 = 3 if inc<= 326 & country == 3
replace w1_4 = 2 if inc > 326 & inc <= 543 & country == 3
replace w1_4 = 1 if inc > 543 & inc <= 815 & country == 3
replace w1_4 = 0 if inc > 815 & inc <= 8800000 & country == 3
replace w1_4 = 3 if inc<= 2082 & country == 4
replace w1_4 = 2 if inc > 2082 & inc <= 3469 & country == 4
replace w1_4 = 1 if inc > 3469 & inc <= 5204 & country == 4
replace w1_4 = 0 if inc > 5204 & inc <= 8800000 & country == 4
replace w1_4 = 3 if inc<= 690 & country == 5
replace w1_4 = 2 if inc > 690 & inc <= 1149 & country == 5
replace w1_4 = 1 if inc > 1149 & inc <= 1724 & country == 5
replace w1_4 = 0 if inc > 1724 & inc <= 8800000 & country == 5
replace w1_4 = 3 if inc<= 10220 & country == 6
replace w1_4 = 2 if inc > 10220 & inc <= 17033 & country == 6
replace w1_4 = 1 if inc > 17033 & inc <= 25549 & country == 6
replace w1_4 = 0 if inc > 25549 & inc <= 8800000 & country == 6
replace w1_4 = 3 if inc<= 10573 & country == 7
replace w1_4 = 2 if inc > 10573 & inc <= 17621 & country == 7
replace w1_4 = 1 if inc > 17621 & inc <= 26431 & country == 7
replace w1_4 = 0 if inc > 26431 & inc <= 8800000 & country == 7
replace w1_4 = 3 if inc<= 394 & country == 8
replace w1_4 = 2 if inc > 394 & inc <= 657 & country == 8
replace w1_4 = 1 if inc > 657 & inc <= 986 & country == 8
replace w1_4 = 0 if inc > 986 & inc <= 8800000 & country == 8
replace w1_4 = 3 if inc<= 1188 & country == 9
replace w1_4 = 2 if inc > 1188 & inc <= 1980 & country == 9
replace w1_4 = 1 if inc > 1980 & inc <= 2970 & country == 9
replace w1_4 = 0 if inc > 2970 & inc <= 8800000 & country == 9
replace w1_4 = 3 if inc<= 1071 & country == 10

replace w1_4 = 2 if inc > 1071 & inc <= 1785 & country == 10
replace w1_4 = 1 if inc > 1785 & inc <= 2677 & country == 10
replace w1_4 = 0 if inc > 2677 & inc <= 8800000 & country == 10
replace w1_4 = 3 if inc<= 1033 & country == 11
replace w1_4 = 2 if inc > 1033 & inc <= 1722 & country == 11
replace w1_4 = 1 if inc > 1722 & inc <= 2584 & country == 11
replace w1_4 = 0 if inc > 2584 & inc <= 8800000 & country == 11
replace w1_4 = 3 if inc <= 376 & country == 12
replace w1_4 = 2 if inc > 376 & inc <= 627 & country == 12
replace w1_4 = 1 if inc > 627 & inc <= 940 & country == 12
replace w1_4 = 0 if inc > 940 & inc <= 8800000 & country == 12
replace w1_4 = 3 if inc <= 70328 & country == 13
replace w1_4 = 2 if inc > 70328 & inc <= 117214 & country == 13
replace w1_4 = 1 if inc > 117214 & inc <= 175821 & country == 13
replace w1_4 = 0 if inc > 175281 & inc <= 8800000 & country == 13
replace w1_4 = 3 if inc<= 1081 & country == 14
replace w1_4 = 2 if inc > 1081 & inc <= 1802 & country == 14
replace w1_4 = 1 if inc > 1802 & inc <= 2704 & country == 14
replace w1_4 = 0 if inc > 2704 & inc <= 8800000 & country == 14
replace w1_4 = 3 if inc<= 792 & country == 15
replace w1_4 = 2 if inc > 792 & inc <= 1321 & country == 15
replace w1_4 = 1 if inc > 1321 & inc <= 1981 & country == 15
replace w1_4 = 0 if inc > 1981 & inc <= 8800000 & country == 15
replace w1_4 = 3 if inc<= 2941 & country == 16
replace w1_4 = 2 if inc > 291 & inc <= 486 & country == 16
replace w1_4 = 1 if inc > 486 & inc <= 729 & country == 16
replace w1_4 = 0 if inc > 729 & inc <= 8800000 & country == 16
replace w1_4 = 3 if inc<= 259 & country == 17
replace w1_4 = 2 if inc > 259 & inc <= 432 & country == 17
replace w1_4 = 1 if inc > 432 & inc <= 648 & country == 17
replace w1_4 = 0 if inc > 648 & inc <= 8800000 & country == 17
replace w1_4 = 3 if inc<= 1764 & country == 18
replace w1_4 = 2 if inc > 1764 & inc <= 2939 & country == 18
replace w1_4 = 1 if inc > 2939 & inc <= 4409 & country == 18
replace w1_4 = 0 if inc > 4409 & inc <= 8800000 & country == 18
replace w1_4 = 3 if inc<= 678 & country == 19
replace w1_4 = 2 if inc > 678 & inc <= 1129 & country == 19
replace w1_4 = 1 if inc > 1129 & inc <= 1694 & country == 19
replace w1_4 = 0 if inc > 1694 & inc <= 8800000 & country == 19
replace w1_4 = 3 if inc<= 1065 & country == 20
replace w1_4 = 2 if inc > 1065 & inc <= 1774 & country ==20
replace w1_4 = 1 if inc > 1774 & inc <= 2662 & country == 20
replace w1_4 = 0 if inc > 2662 & inc <= 8800000 & country == 20
replace w1_4 = 3 if inc<= 1162 & country == 21
replace w1_4 = 2 if inc > 1162 & inc <= 1937 & country == 21
replace w1_4 = 1 if inc > 1937 & inc <= 2906 & country == 21
replace w1_4 = 0 if inc > 2906 & inc <= 8800000 & country == 21
replace w1_4 = 3 if inc<= 422 & country == 22
replace w1_4 = 2 if inc > 422 & inc <= 703 & country == 22
replace w1_4 = 1 if inc > 703 & inc <= 1054 & country == 22
replace w1_4 = 0 if inc > 1054 & inc <= 8800000 & country == 22
replace w1_4 = 3 if inc<= 514 & country == 23
replace w1_4 = 2 if inc > 514 & inc <= 857 & country == 23
replace w1_4 = 1 if inc > 857 & inc <= 1286 & country == 23
replace w1_4 = 0 if inc > 1286 & inc <= 8800000 & country == 23

```
replace w1_4 = 3 if inc<= 347 & country == 24
replace w1_4 = 2 if inc > 347 & inc <= 578 & country == 24
replace w1_4 = 1 if inc > 578 & inc <= 866 & country == 24
replace w1_4 = 0 if inc > 866 & inc <= 8800000 & country == 24
replace w1_4 = 3 if inc<= 617 & country == 25
replace w1_4 = 2 if inc > 617 & inc <= 1028 & country == 25
replace w1_4 = 1 if inc > 1028 & inc <= 1542 & country == 25
replace w1_4 = 0 if inc > 1542 & inc <= 8800000 & country == 25
replace w1_4 = 3 if inc<= 668 & country == 26
replace w1_4 = 2 if inc > 668 & inc <= 1113 & country == 26
replace w1_4 = 1 if inc > 1113 & inc <= 1669 & country == 26
replace w1_4 = 0 if inc > 1669 & inc <= 8800000 & country == 26
replace w1_4 = 3 if inc<= 11512 & country == 27
replace w1_4 = 2 if inc > 11512 & inc <= 191817 & country == 27
replace w1_4 = 1 if inc > 19187 & inc <= 28781 & country == 27
replace w1_4 = 0 if inc > 28781 & inc <= 8800000 & country == 27
replace w1_4 = 3 if inc<= 848 & country == 28
replace w1_4 = 2 if inc > 848 & inc <= 1413 & country == 28
replace w1_4 = 1 if inc > 1413 & inc <= 2119 & country == 28
replace w1_4 = 0 if inc > 2119 & inc <= 8800000 & country == 28
replace w1_4 = 3 if inc<= 288 & country == 29
replace w1_4 = 2 if inc > 288 & inc <= 480 & country == 29
replace w1_4 = 1 if inc > 480 & inc <= 720 & country == 29
replace w1_4 = 0 if inc > 720 & inc <= 8800000 & country == 29
replace w1_4 = 3 if inc<= 6530 & country == 30
replace w1_4 = 2 if inc > 6530 & inc <= 10884 & country == 30
replace w1_4 = 1 if inc > 10884 & inc <= 16325 & country == 30
replace w1_4 = 0 if inc > 16325 & inc <= 8800000 & country == 30
replace w1_4 = 3 if inc<= 13973 & country == 31
replace w1_4 = 2 if inc > 13973 & inc <= 23289 & country == 31
replace w1_4 = 1 if inc > 23289 & inc <= 34933 & country == 31
replace w1_4 = 0 if inc > 34933 & inc <= 8800000 & country == 31
replace w1_4 = 3 if inc<= 492 & country == 32
replace w1_4 = 2 if inc > 492 & inc <= 820 & country == 32
replace w1_4 = 1 if inc > 820 & inc <= 1230 & country == 32
replace w1_4 = 0 if inc > 1230 & inc <= 8800000 & country == 32
replace w1_4 = 3 if inc<= 17328 & country == 33
replace w1_4 = 2 if inc > 17328 & inc <= 28881 & country == 33
replace w1_4 = 1 if inc > 28881 & inc <= 43321 & country == 33
replace w1_4 = 0 if inc > 43321 & inc <= 8800000 & country == 33
replace w1_4 = 3 if inc<= 2404 & country == 34
replace w1_4 = 2 if inc > 2404 & inc <= 4007 & country == 34
replace w1_4 = 1 if inc > 4007 & inc <= 6010 & country == 34
replace w1_4 = 0 if inc > 6010 & inc <= 8800000 & country == 34
replace w1_4 = 3 if inc<= 23514 & country == 35
replace w1_4 = 2 if inc > 23514 & inc <= 39190 & country == 35
replace w1_4 = 1 if inc > 39190 & inc <= 58785 & country == 35
replace w1_4 = 0 if inc > 58785 & inc <= 8800000 & country == 35
    * According to each country's median income value (EUROSTAT)

label variable w1_4 "Monthly income"

label define w1_4 0 "High income" 1 "Medium-high income" 2 "Medium-low income" 3 "Low
    income"
label values w1_4 w1_4
```

recode w1_4 (0=0 "High income") (1=0) (2=1 "Medium-low income") (3=2 "Low income"),
    gen(w1)

/// Hourly income
gen inch = (inc/4)/q24

gen w2 _4= .
replace w2_4 = 3 if inch<= 8.41 & country == 1
replace w2_4 = 2 if inch > 8.41 & inch <= 14.02 & country == 1
replace w2_4 = 1 if inch > 14.02 & inch <= 21.03 & country == 1
replace w2_4 = 0 if inch > 21.03 & inch <= 8800000 & country == 1
replace w2_4 = 3 if inch<= 10.39 & country == 2
replace w2_4 = 2 if inch > 10.39 & inch <= 17.32 & country == 2
replace w2_4 = 1 if inch > 17.32 & inch <= 25.98 & country == 2
replace w2_4 = 0 if inch > 25.98 & inch <= 8800000 & country == 2
replace w2_4 = 3 if inch<= 1.96 & country == 3
replace w2_4 = 2 if inch > 1.96 & inch <= 3.27 & country == 3
replace w2_4 = 1 if inch > 3.27 & inch <= 4.91 & country == 3
replace w2_4 = 0 if inch > 4.91 & inch <= 8800000 & country == 3
replace w2_4 = 3 if inch<= 21.87 & country == 4
replace w2_4 = 2 if inch > 21.87 & inch <= 36.45 & country == 4
replace w2_4 = 1 if inch > 36.45 & inch <= 54.68 & country == 4
replace w2_4 = 0 if inch > 54.68 & inch <= 8800000 & country == 4
replace w2_4 = 3 if inch<= 5.01 & country == 5
replace w2_4 = 2 if inch > 5.01 & inch <= 8.35 & country == 5
replace w2_4 = 1 if inch > 8.35 & inch <= 12.53 & country == 5
replace w2_4 = 0 if inch > 12.53 & inch <= 8800000 & country == 5
replace w2_4 = 3 if inch<= 70.09 & country == 6
replace w2_4 = 2 if inch > 70.09 & inch <= 116.82 & country == 6
replace w2_4 = 1 if inch > 116.82 & inch <= 175.23 & country == 6
replace w2_4 = 0 if inch > 175.23 & inch <= 8800000 & country == 6
replace w2_4 = 3 if inch<= 114.07 & country == 7
replace w2_4 = 2 if inch > 114.07 & inch <= 190.12 & country == 7
replace w2_4 = 1 if inch > 190.12 & inch <= 285.18 & country == 7
replace w2_4 = 0 if inch > 285.18 & inch <= 8800000 & country == 7
replace w2_4 = 3 if inch<= 2.95 & country == 8
replace w2_4 = 2 if inch > 2.95 & inch <= 4.91 & country == 8
replace w2_4 = 1 if inch > 4.91 & inch <= 7.37 & country == 8
replace w2_4 = 0 if inch > 7.37 & inch <= 8800000 & country == 8
replace w2_4 = 3 if inch<= 10.34 & country == 9
replace w2_4 = 2 if inch > 10.34 & inch <= 17.24 & country == 9
replace w2_4 = 1 if inch > 17.24 & inch <= 25.86 & country == 9
replace w2_4 = 0 if inch > 25.86 & inch <= 8800000 & country == 9
replace w2_4 = 3 if inch<= 8.96 & country == 10
replace w2_4 = 2 if inch > 8.96 & inch <= 14.94 & country == 10
replace w2_4 = 1 if inch > 14.94 & inch <= 22.41 & country == 10
replace w2_4 = 0 if inch > 22.41 & inch <= 8800000 & country == 10
replace w2_4 = 3 if inch<= 9.40 & country == 11
replace w2_4 = 2 if inch > 9.40 & inch <= 15.67 & country == 11
replace w2_4 = 1 if inch > 15.67 & inch <= 23.51 & country == 11
replace w2_4 = 0 if inch > 23.51 & inch <= 8800000 & country == 11
replace w2_4 = 3 if inch<= 4.80 & country == 12
replace w2_4 = 2 if inch > 4.80 & inch <= 8 & country == 12
replace w2_4 = 1 if inch > 8 & inch <= 12 & country == 12

replace w2_4 = 0 if inch > 12 & inch <= 8800000 & country == 12
replace w2_4 = 3 if inch<= 715.41 & country == 13
replace w2_4 = 2 if inch > 715.41 & inch <= 1192.35 & country == 13
replace w2_4 = 1 if inch > 1192.35 & inch <= 1788.53 & country == 13
replace w2_4 = 0 if inch > 1788.35 & inch <= 8800000 & country == 13
replace w2_4 = 3 if inch<= 12.10 & country == 14
replace w2_4 = 2 if inch > 12.10 & inch <= 20.16 & country == 14
replace w2_4 = 1 if inch > 20.16 & inch <= 30.24 & country == 14
replace w2_4 = 0 if inch > 30.24 & inch <= 8800000 & country == 14
replace w2_4 = 3 if inch<= 7.49 & country == 15
replace w2_4 = 2 if inch > 7.49 & inch <= 12.49 & country == 15
replace w2_4 = 1 if inch > 12.49 & inch <= 18.74 & country == 15
replace w2_4 = 0 if inch > 18.74 & inch <= 8800000 & country == 15
replace w2_4 = 3 if inch<= 2.01 & country == 16
replace w2_4 = 2 if inch > 2.01 & inch <= 3.35 & country == 16
replace w2_4 = 1 if inch > 3.35 & inch <= 5.03 & country == 16
replace w2_4 = 0 if inch > 5.03 & inch <= 8800000 & country == 16
replace w2_4 = 3 if inch<= 1.87 & country == 17
replace w2_4 = 2 if inch > 1.87 & inch <= 3.11 & country == 17
replace w2_4 = 1 if inch > 3.11 & inch <= 4.67 & country == 17
replace w2_4 = 0 if inch > 4.67 & inch <= 8800000 & country == 17
replace w2_4 = 3 if inch<= 11.03 & country == 18
replace w2_4 = 2 if inch > 11.03 & inch <= 18.38 & country == 18
replace w2_4 = 1 if inch > 18.38 & inch <= 27.57 & country == 18
replace w2_4 = 0 if inch > 27.57 & inch <= 8800000 & country == 18
replace w2_4 = 3 if inch<= 5.09 & country == 19
replace w2_4 = 2 if inch > 5.09 & inch <= 8.48 & country == 19
replace w2_4 = 1 if inch > 8.48 & inch <= 12.72 & country == 19
replace w2_4 = 0 if inch > 12.72 & inch <= 8800000 & country == 19
replace w2_4 = 3 if inch<= 9.60 & country == 20
replace w2_4 = 2 if inch > 9.60 & inch <= 16.00 & country == 20
replace w2_4 = 1 if inch > 16.00 & inch <= 24.00 & country == 20
replace w2_4 = 0 if inch > 24.00 & inch <= 8800000 & country == 20
replace w2_4 = 3 if inch<= 11.03 & country == 21
replace w2_4 = 2 if inch > 11.03 & inch <= 18.38 & country == 21
replace w2_4 = 1 if inch > 18.38 & inch <= 27.57 & country == 21
replace w2_4 = 0 if inch > 27.57 & inch <= 8800000 & country == 21
replace w2_4 = 3 if inch<= 3.07 & country == 22
replace w2_4 = 2 if inch > 3.07 & inch <= 5.12 & country == 22
replace w2_4 = 1 if inch > 5.12 & inch <= 7.68 & country == 22
replace w2_4 = 0 if inch > 7.68 & inch <= 8800000 & country == 22
replace w2_4 = 3 if inch<= 5.82 & country == 23
replace w2_4 = 2 if inch > 5.82 & inch <= 9.70 & country == 23
replace w2_4 = 1 if inch > 9.7 & inch <= 14.55 & country == 23
replace w2_4 = 0 if inch > 14.55 & inch <= 8800000 & country == 23
replace w2_4 = 3 if inch<= 2.64 & country == 24
replace w2_4 = 2 if inch > 2.64 & inch <= 4.4 & country == 24
replace w2_4 = 1 if inch > 4.4 & inch <= 6.6 & country == 24
replace w2_4 = 0 if inch > 6.6 & inch <= 8800000 & country == 24
replace w2_4 = 3 if inch<= 4.39 & country == 25
replace w2_4 = 2 if inch > 4.39 & inch <= 7.32 & country == 25
replace w2_4 = 1 if inch > 7.32 & inch <= 10.98 & country == 25
replace w2_4 = 0 if inch > 10.98 & inch <= 8800000 & country == 25
replace w2_4 = 3 if inch<= 5.63 & country == 26
replace w2_4 = 2 if inch > 5.63 & inch <= 9.38 & country == 26

replace w2_4 = 1 if inch > 9.38 & inch <= 14.07 & country == 26
replace w2_4 = 0 if inch > 14.07 & inch <= 8800000 & country == 26
replace w2_4 = 3 if inch<= 116.47 & country == 27
replace w2_4 = 2 if inch > 116.47 & inch <= 194.12 & country == 27
replace w2_4 = 1 if inch > 194.12 & inch <= 291.18 & country == 27
replace w2_4 = 0 if inch > 291.18 & inch <= 8800000 & country == 27
replace w2_4 = 3 if inch<= 7.61 & country == 28
replace w2_4 = 2 if inch > 7.61 & inch <= 12.69 & country == 28
replace w2_4 = 1 if inch > 12.69 & inch <= 19.04 & country == 28
replace w2_4 = 0 if inch > 19.04 & inch <= 8800000 & country == 28
replace w2_4 = 3 if inch<= 2.05 & country == 29
replace w2_4 = 2 if inch > 2.05 & inch <= 3.42 & country == 29
replace w2_4 = 1 if inch > 3.42 & inch <= 5.13 & country == 29
replace w2_4 = 0 if inch > 5.13 & inch <= 8800000 & country == 29
replace w2_4 = 3 if inch<= 81.18 & country == 30
replace w2_4 = 2 if inch > 81.18 & inch <= 135.3 & country == 30
replace w2_4 = 1 if inch > 135.3 & inch <= 202.95 & country == 30
replace w2_4 = 0 if inch > 202.95 & inch <= 8800000 & country == 30
replace w2_4 = 3 if inch<= 185.48 & country == 31
replace w2_4 = 2 if inch > 185.48 & inch <= 309.14 & country == 31
replace w2_4 = 1 if inch > 309.14 & inch <= 463.71 & country == 31
replace w2_4 = 0 if inch > 463.71 & inch <= 8800000 & country == 31
replace w2_4 = 3 if inch<= 9.20 & country == 32
replace w2_4 = 2 if inch > 9.20 & inch <= 15.33 & country == 32
replace(w2_4 = 1 if inch > 15.33 & inch <= 23 & country == 32
replace w2_4 = 0 if inch > 23 & inch <= 8800000 & country == 32
replace w2_4 = 3 if inch<= 170.36 & country == 33
replace w2_4 = 2 if inch > 170.36 & inch <= 283.93 & country == 33
replace w2_4 = 1 if inch > 283.93 & inch <= 425.90 & country == 33
replace w2_4 = 0 if inch > 425.90 & inch <= 8800000 & country == 33
replace w2_4 = 3 if inch<= 19.44 & country == 34
replace w2_4 = 2 if inch > 19.44 & inch <= 32.40 & country == 34
replace w2_4 = 1 if inch > 32.40 & inch <= 48.60 & country == 34
replace w2_4 = 0 if inch > 48.60 & inch <= 8800000 & country == 34
replace w2_4 = 3 if inc<= 14750 & country == 35
replace w2_4 = 2 if inc > 14750 & inc <= 24583 & country == 35
replace w2_4 = 1 if inc > 24583 & inc <= 36874 & country == 35
replace w2_4 = 0 if inc > 36874 & inc <= 8800000 & country == 35

label variable w2_4 "Hourly income"

label define w2_4 0 "High income" 1 "Medium-high income" 2 "Medium-low income" 3 "Low
    income"
label values w2_4 w2_4
recode w2_4 (0=0 "High income") (1=0) (2=1 "Medium-low income") (3=2 "Low income"),
    gen(w2)

Computing the EPRES-E score
gen t = 100 * (t1 + t2) / 5
gen d = 100 * (d1 + d2) / 4
gen v = 100 * (v1 + v2) / 7
gen er = 100 * (er1 + er2) / 7
gen uwt = 100 * (uwt1 + uwt2 + uwt3) / 11
gen w = 100 * (w1 + w2) / 4

```
gen eprese = (t + d + v + er + wt + w) / 6

label variable t "Temporariness"
label variable d "Disempowerment"
label variable v "Vulnerability"
label variable er "Exercise of rights"
label variable wt "Unpredictable working times"
label variable w "Wages"

label variable eprese "EPRES-E"
```
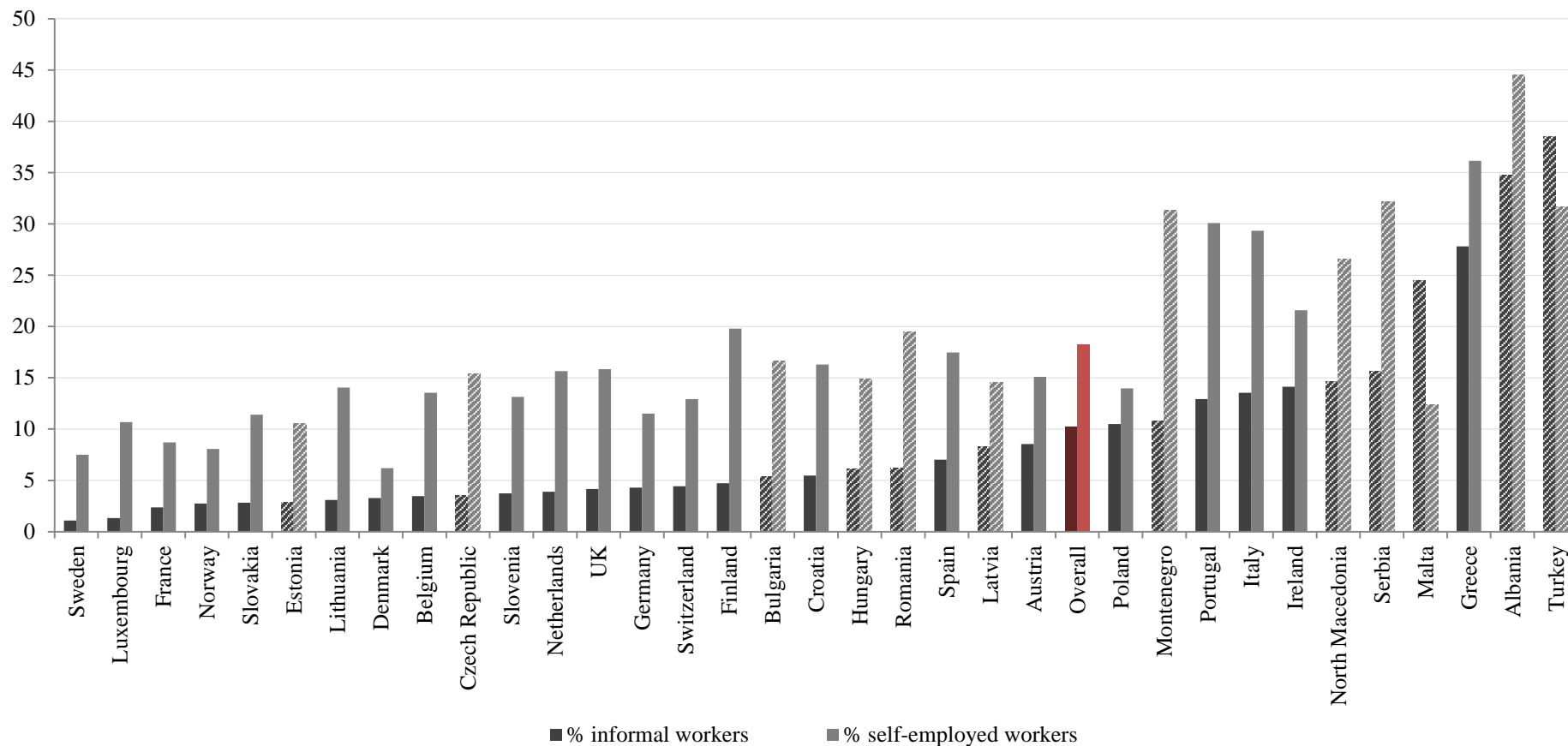
Supplementary Material 2. Share of informal employment and self-employment by country, European Working Conditions Survey, 2015.

■ % informal workers   ■ % self-employed workers

Striped bars correspond to countries where the Employment Precariousness Scale for Europe (EPRES-E) does not apply. According to the structure of the European Working Conditions Survey, the share of informal workers only includes salaried informal workers and does not account for informal entrepreneurs.