

Space-time variations in job types: A tale of “three Europes”

Abstract

This article, which draws on three waves (2005, 2010, 2015) of the European Working Conditions Survey, examines the nature and prevalence of different job types in a representative sample of employees in 30 European countries (N= 59,839) and investigates their change over time. Using self-organizing map, sampled employees were first grouped into seven job types, based on similar job features in the following dimensions: physical environment, work intensity, working time quality, social environment, skill and discretion, and earnings and prospects. Subsequently, the resulting job types were validated by linear regression models on outcomes that are indicative of job quality, such as well-being and job satisfaction. Finally, space-time variations in the distribution of job types were explored using a two-stage formulation model that contrasted universalistic and institutional explanations of change. Results indicate that three clusters of countries could be distinguished, which only partially fit into existing regime classifications: *i*) the Northern cluster (Scandinavian countries); *ii*) the Central and Western cluster (Belgium, the Netherlands, Luxembourg, France, Germany, Austria, Slovenia, Estonia, but also the UK, Ireland and Malta); and *iii*) the Southern and Eastern cluster (Mediterranean countries including Cyprus and Turkey, the former socialist EU member states, Latvia, and Lithuania). These clusters present specific patterns of change in the distribution of job types that are more closely related to the change in the national economic situation and the employment structure than to institutional variation.

Keywords: job types; job quality; self-organizing map; well-being; job satisfaction; European countries

1. Introduction

Building on the work of Muñoz de Bustillo et al. (2011: 2), which is adopted as the frame of reference in this study, job quality refers to “those aspects of a job that have a clear and direct impact on the well-being of workers” (Munoz de Bustillo et al., 2011, p.2). These aspects include the objective characteristics of the job, the work environment, and the features of the employment relationship (Holman, 2013; Warhurst et al., 2017). In the EU and beyond, promoting and improving job quality is a key policy issue: job quality contributes to making work more meaningful, productive, and sustainable, in the interest of individuals, enterprises, and society as a whole (Eurofound, 2021).

Current research on job quality conveys a few concerns (Findlay et al., 2013; Kalleberg, 2016). The first regards the operationalization of the concept. Available literature has not agreed on a comprehensive measure yet; thus, no definite conclusion can still be drawn regarding what constitutes a good or bad job (Burchell et al., 2014; Kalleberg, 2016; Muñoz de Bustillo et al., 2011; Warhurst et al., 2017). The recent approach of using multiple work and employment-related indicators to measure job quality has resulted in two different methodological approaches. On the one hand, job quality has been investigated by collapsing a set of variables assessing multiple job features into a few underlying indices, one for each of the different

dimensions or domains of job quality (Eurofound, 2012; Green et al., 2013), or, less frequently, into a single overarching index (Leschke and Watt, 2008). On the other hand, profiles of job quality have been examined in the form of job types. Job types, which are usually detected by using clustering techniques, identify groups of workers with similar jobs (Eurofound, 2017; Holman, 2013). These jobs may contain factors indicative of low and/or high job quality, which potentially balance out or double up. While indices may lead to the loss of information on the underlying distributions, patterns, and relationships between the input data (that is job attributes), job types may more adequately capture the complexity and multidimensionality of job quality. Hence, the latter approach is preferable if the intent is to inform scholars, managers and policymakers on which and how job characteristics combine and the potential influence of the multiple interactions of job characteristics on health, well-being and job attitudes (e.g., Holman, 2013). However, previous research still has not found an agreed taxonomy of job types, which may be due to the different techniques and datasets used or to the different time periods investigated (for a review see, e.g., Holman, 2013; Széker et al., 2017).

Another concern in current literature is to understand trends in job quality (Hauff and Kirchner, 2014; Kalleberg, 2016). A few studies have examined variations in job quality across countries and/or over time and much uncertainty still exists about the general direction (upward or downward) and cross-national patterns (convergence or divergence) of change (e.g., Eurofound, 2015; Felstead et al., 2015; Holman and Rafferty, 2018). In brief, there is evidence pointing to a general trend of improving job quality across European countries; however, other studies found no clear patterns of convergence or divergence in Europe (e.g., Eurofound, 2015). Therefore, further research is needed, which could also address the determinants of change in job quality (Carr et al., 2012). In this regard, the different theoretical frameworks available (e.g., Gallie, 2007) have just started being tested, once again using different methodologies. Empirical work on trends in job quality, as operationalized with summary indices or job types, has investigated separately the influence of national-level institutional arrangements and national public policy (Carr et al., 2012; Green et al., 2013; Eurofound, 2021; Kalleberg, 2011; Le et al., 2021; Lehndorff, 2015), technological advancement (Fernandez-Macias, 2012), economic factors and the so-called “Great Recession” (Eurofound, 2013; Gallie, 2013), and business strategies and management practices (Burgess and Connell, 2008). However, job quality and its trajectories of change may result from intertwined determinants, which have distinct natures and refer to different levels of analysis (Carr et al., 2012; Eurofound, 2015; Warhurst et al., 2017; Wilkinson et al., 2014).

Against this background, this article, which draws on three waves (2005, 2010, 2015) of the European Working Conditions Survey (EWCS) (Eurofound, 2017a), has a twofold aim: *i*) to build and visualise an empirically sound typology of job types and validate it by testing its association with outcomes that are indicative of job quality, such as well-being and job satisfaction (Eurofound, 2012; Holman, 2013), and *ii*) to document and investigate space-time variations in the distribution of employees among different job types. Findings will advance literature in the field as follows. First, this study employs a prominent and relatively novel clustering method: self-organizing map (SOM) (Kohonen, 1995, 2014). Literature on data reduction techniques suggests that SOM, which can be used for analysing mixed (both categorical and continuous) variables, is more stable than, and at least as accurate as, k-means clustering (Waller et al., 1998). Besides, SOM is better than k-means or other clustering

methods in detecting and representing the manifold nature of job quality as it produces a low-dimensional and topographic map in which associations and patterns among the input data (for the scope of this study items assessing job characteristics) are displayed in an easy-to-understand fashion (Bäck et al., 2012). Therefore, this article may provide a methodological contribution to the inductive definition of how a wide set of job characteristics empirically combine, in the form of job types, and lead to positive or negative outcomes for the employees. Second, this article complements current research by considering the nature and predictors of space-time variations in job types in Europe. This is a crucial issue in the job quality field of study. However, comparative studies have generally investigated either single indicators or specific dimensions of job quality (Eurofound, 2019; Holman and Rafferty, 2018), and not a summary measure of job quality or job types (some notable exceptions are Fernandez-Macias, 2012; Széker et al., 2017). Besides, most analyses are limited in their scope, as they have focused either on specific groups of workers (Fan et al., 2019; Igit et al., 2017) or on specific time periods (e.g., Holman, 2013). Finally, current research has mainly analysed the change in job quality or in the distribution of job types using deductive reasoning aimed at testing the validity of welfare, industrial relations, and employment regimes (e.g., Eurofound, 2017, 2019; Holman, 2013; Piasna, 2017). This may be a limit, given that established institutional theories may fail to offer a compelling explanation of cross-national differences in the changing nature of work (Holman and Rafferty, 2018: 640). Hence, the importance and originality of this study are also that it explores variation in the distribution of the different job types using a two-stage formulation model (Rabe-Hesketh and Skrondal, 2012) that was adjusted to distinguish economically and institutionally driven changes in job quality. Accordingly, results are expected to generate new insights into this growing area of research.

2. Literature background and research propositions

There is still much debate about what characteristics and/or dimensions should be employed to assess the quality of the job and how these should be treated. Drawing from different theoretical perspectives, previous studies identified and used specific sets of indicators, organised along different dimensions, of the multiple attributes of a job and the psychosocial factors of the employment experience that have been found to elicit or impair employee well-being (Findlay et al., 2013; Gallie, 2007; Kalleberg, 2016; Muñoz de Bustillo, et al. 2011; Warhurst et al., 2017). For instance, Eurofound (2012) initially included indicators covering the four dimensions of earnings, prospects, intrinsic job quality (e.g., decision latitude and work intensity) and working time quality. Holman (2013) and Holman and McClelland (2011) used indicators of job attributes in five dimensions: work organisation (e.g., job discretion, social support, task complexity, workload, psycho-physical demands), wages and payment system, security and working time flexibility, skills and development, engagement (e.g. consultation and voice).

Building on sociological and psychological theory on occupational stress (Demerouti et al., 2001; Johnson and Hall, 1988; Karasek et al., 1998; Siegrist, 1996), we adopted the more recent job quality framework developed by Eurofound (2017, 2019) and selected a very broad range of items covering the following domains: physical environment, work intensity, working time quality, social environment, skill and discretion, earnings, and prospects. The selected items

refer to the job demands and resources or to the background processes, such as training or team working, that develop job resources or affect job demands (Karasek and Theorell, 1998; Demerouti et al., 2001). Within this theoretical and analytical framework, we assumed that job demands, or negative job attributes are not harmful in themselves, but it is rather the specific interplay of job demands and resources that predicts positive or negative outcomes for the employees. This assumption led us to examine - and this is the first research proposition - the way in which multiple positive and negative job attributes empirically coalesce in different job types and investigate, rather than assuming from the descriptive analysis of working conditions (Eurofound, 2017; Holman, 2013), what empirical combination of job characteristics could result in better or worse employee outcomes. In this regard, previous research based on the job types approach showed some consistency as regards the number and distinctive features of the different typologies. Specifically, a few job types have emerged regularly, regardless of the clustering method adopted or the indicators employed (for a review see: Holman, 2013; Szecker, 2017). These differently combine psychophysical demands with control and autonomy and properly fit within the job demands-control model (Karasek and Theorell 1990). Examples are those variously termed as “active” or “high-flying” or “discretionary learning”, “high strain” and “saturated”, “passive” or “passive independent”, and “low-strain” or “smooth-running” jobs (Eurofound, 2017; Holman, 2013; Valeyre et al., 2009). However, in current literature, there is still no consensus on how some peculiar job features such as emotional, social demands, social support, and job insecurity contribute to distinguishing job types, in combination with other job demands and resources. Research has confirmed that these characteristics identify certain job types; nonetheless, job types with apparent similar features, such as those labelled “insecure”, “indecent” or “low-quality” or those defined as “under pressure” or “emotionally demanding”, or even “lean production” and “team-based” jobs (Holman, 2013; Eurofound, 2017; Széker et al., 2017) only partially overlap. Thus, there is still room for investigating how constellations of job characteristics combine along the high-quality/low-quality continuum in the form of job types to confirm or amend available typologies or taxonomies.

As Kalleberg underlines (2016: 115), the lack of an agreed single measure of job quality or taxonomy of job types has hindered the analysis and comprehension of space-time variations (Kalleberg, 2016: 115). A few studies have investigated general trajectories or direction of change in job quality and its variability in European countries and mixed findings have been produced. For instance, Green and colleagues (2013) considered cross-national differences in job quality indices and their change from 1995 to 2010 and found evidence of increasing similarity in work intensity, the physical environment and working time quality. Comparable research on specific dimensions of job quality, such as discretion (Holman and Rafferty, 2018), showed that institutional differences predict divergence in working conditions between countries. Eurofound (2019) has recently concluded that upward convergence in most dimensions of job quality across the European Member states occurred in the past two decades. Erhel and colleagues (2012), who used a synthetic index of overall job quality, indicated increasing differentiation across countries or groups of countries, but their analyses referred only to the 2007-2009 timespan. Thus, there is still abundant room for further progress in understanding space-time variations in job quality.

As for the determinants of change in job quality, two main arguments can be distinguished (Gallie, 2007; Green et al., 2013). Universalistic theorists predict that country differences in job quality could decline and converge over time as a consequence of employee exposure to extensive phenomena such as technological change, economic development, or restructuring, increased competitive pressure, and precarization of work (Felstead et al., 2013; Gallie, 2013). Conversely, neo-institutional theories propose that social, economic, and political factors still shape national contexts in distinct ways (e.g., Fernandez-Macias, 2012; Kalleberg, 2011; 2016), so that country differences in job quality are expected to be preserved and eventually further increase. Within this general frame, established institutional theories may fail to offer a compelling explanation of cross-national differences in the changing nature of work (Holman and Rafferty, 2018: 640). Therefore, we will use a two-stage formulation model (Rabe-Hesketh and Skrondal, 2012) to explain space-time variations in the prevalence of job types and contrast institutional and universalistic (economic) drivers of change. Namely, based on the universalistic approach, the national economic situation – here proxied by Gross Domestic Product (GDP) per capita – is expected to predict the direction and type of change in the prevalence of job types similarly across European countries. In particular, building on the Preston curve model (Becker et al., 2005; Mackenbach and Looman, 2013), the relationship between GDP per capita and job quality, as measured by the distribution of job types, is expected to be positive and log-linear. Said differently, after a certain threshold, any further increase in GDP per capita is expected to be associated with diminishing returns in terms of job quality and the curve is predicted to flatten out. Hence, the increase in the prevalence of better-quality job types is expected to be greatest in the poorest countries. No assumptions will be made on the direction of the causality: the national economic situation may promote improvements in job quality, and the other way around. Furthermore, within the two-stage model, the influence of the institutional variation will also be tested. Under the neo-institutional conceptual framework, a great deal of variation as regards changes in the prevalence of different job types could be anticipated, despite similar economic trends (Fernandez-Macias, 2012; Gallie, 2007; Piasna, 2007).

3. Methodology

3.1 Data

Analyses draw on pooled data from three waves (2005, 2010, 2015) of the European Working Conditions Survey (EWCS), which is among the most detailed sources of information about working conditions and the quality of work and employment internationally. Conducted by the European Foundation for the Improvement of Living and Working Conditions (Eurofound), the EWCS has collected, every five years since 1990 using face-to-face interviews, comparable information on large and nationally representative samples of employees and self-employed aged 15 or older (16 or older in Bulgaria, Spain, and the UK) across European countries. Themes include physical and psychosocial risk factors at work, working time, work organisation, learning and training, earnings and career opportunities, employment contract, health, safety, and well-being (for more details on sampling, fieldwork, questionnaire development and translation, and interviewing see: Eurofound 2017a). Analyses were limited

to the latest three waves as these provide the largest number of comparable items assessing job characteristics. In addition, due to the geographical coverage of the survey across the three waves, the original sample was restricted to workers in the EU-27 member states, Norway, Turkey, and the UK. Several questions assessing working conditions were asked to employees only; hence, the self-employed were excluded from the analysis. Observations with missing data on any of the constituent items were eliminated from the dataset. The resulting sample consists of N=59,839 employees. The sample profile is presented in Table 1.

Insert Table 1 about here

3.2 Variables

Building on previous research (Eurofound 2012, 2017, 2019; Holman, 2013; Kalleberg, 2016; Muñoz de Bustillo et al., 2011; Warhurst et al., 2017), we selected 54 questions measuring relevant job characteristics. All variables were recoded where necessary so that higher scores generally corresponded to positive job attributes. Eight questions are related to the physical risks that employees encounter in their workplace. Eight questions focus on work intensity. Seven questions measure working time quality. Seven questions capture the quality of the social environment. Concerning skills and discretion, four questions measure cognitive demands, one question assesses the use of technology at work, seven questions capture decision authority, a question measure semi-autonomous teamwork, and three questions investigate skill use and access to training. As for earnings and prospects, eight questions measure employment status, perceived job security and career prospects, perceived adequacy of pay, and salary components (see Table 3).

The validity of both job quality indices and job quality profiles or job types is commonly tested by assessing their association with items measuring well-being, such as World Health Organisation Five Well-Being Index (WHO-5) (WHO, 1998), and job satisfaction (e.g. Holman, 2013; Muñoz de Bustillo et al., 2011). The WHO-5 index is a widely used short self-reported measure of current mental well-being (Topp et al., 2015). Hence, we used the WHO-5 items, appraised on a 6-point Likert scale and reverse coded (0=all of the time; 5=at no time), to measure current mental well-being. The total row score, ranging from 0 to 25, was multiplied by 4 to give the final well-being score, with 0 representing the worst possible well-being and 100 representing the best possible well-being. The WHO-5 items were only available for the 2010 and 2015 waves of the EWCS. To measure the level of job satisfaction we used one item, ranked on a 4-point scale (1=not at all satisfied; 2=not very satisfied; 3=satisfied; 4=very satisfied).

The national economic situation was measured using the real GDP per capita in 2010 prices, as computed based on Eurostat figures from the national accounts and official demographical data, for the three survey wave years (2005, 2010, 2015). Using real GDP removes potential time correlations due to steady inflation rates. For robustness checks, OECD data on family benefits, social spending on households, and employment protection legislation were used. Unfortunately, these are not available for Bulgaria, Croatia, Cyprus, Malta and Romania.

3.3 Methods

Three sets of analyses were performed. First, employees were clustered using the SOM toolbox for MATLAB 5 (Kohonen, 1995; Vesanto et al., 2000). SOM is an artificial neural network, based on unsupervised competitive learning, that projects high-dimensional data onto a two-dimensional discrete hexagonal grid in which nodes (map units) are connected to adjacent nodes in a topologically ordered fashion. In the aggregation process, SOM does not require assigning weights to the different items and/or dimensions¹, which is quite helpful when, as in this study, the number of indicators and/or clusters to be considered is quite large (Kohonen, 2014). In the process of mapping, employees with similar job attributes were mapped close to each other in the output space, while employees with dissimilar job attributes were located farther apart, in opposite regions of the map (Vesanto and Alhoniemi, 2000). This produced a continuous and smooth transition of similar employees to dissimilar employees over the map and helped draw conclusions about which items or components were the most relevant for clustering. Euclidean distance was used as a similarity or dissimilarity metric. Subsequently, we run separate regression models to estimate the association between different job types and well-being and job satisfaction scores. These models were weighted (Eurofound, 2017a) and adjusted for the following control variables: gender, age, education (ISCED), occupation (1-digit ISCO-88), workplace size, public sector, industry (NACE Rev.1), country and survey wave. Second, we performed ordinary hierarchical clustering based on complete linkage and Euclidean distance to detect the general trends in the prevalence of job types over time and across countries.

Third, we used a two-stage formulation model to understand space-time variations (Rabe-Hesketh and Skrondal, 2012). In the first stage, the prevalence of each job type was predicted for any combination of country and survey wave based on individual-level logit regressions, using recommended weights (Eurofound, 2017a). To contrast institutional and universalistic (economic) explanations of change, we used two sets of variables: gender, age, age squared, education and industry (NACE Rev.1), which covered the economic structure and its change; country-time dummies, which covered institutional variation in the broadest sense, that is country and time-specific laws, institutions, and norms that were not captured by the variables covering the employment structure. Three aggregate figures were predicted (see Equation 1 in the Annex), corresponding to the models displayed in Table 2. Model A is based on the observed prevalence, or simply the unconditional mean, of each job type by country and time. Model B uses the counterfactual prevalence, capturing only differences in the employment structure, as the country and time effects are fixed but the employment structure varies by time and country. Model C, in turn, fixes the employment structure for all countries and maintains only the institutional variation in the outcome variables at the country level. In the second stage, the macro-level variation in each model (i.e., the observed or counterfactual relative frequencies) was regressed on GDP per capita and its square as a standard measure of the national economic situation, mimicking a Preston-curve specification (Becker et al., 2005;

¹ When measuring job quality using dimensionality reduction techniques, different approaches have been employed. For instance, Leschke and Watt (2008) assigned normative weights: each indicator of job attributes was given a weight which was related to its relative importance in the description of job quality. However, Eurofound (2012) constructed an overall job quality index with equal weights assigned to the different indices covering the different job quality dimensions.

Mackenbach and Looman, 2013). Because the prevalence of each job type was measured as a percentage between 0 and 100, ordinary least squares regression was not appropriate. Thus, a set of generalised linear models with a logit link and a binomial distribution (Baum, 2008; Papke and Wooldridge, 1996) were estimated. Using the association found in Model A as the baseline, the effect of GDP per capita was expected to be stronger in Model B with only variation due to the employment structure, but no institutional variation, and weaker in Model C if only variation due to country-time differences, representing the institutional context, was maintained. The effect should not be absent, as the national economic situation may bring about institutional change and the other way around; however, if the national economic situation improves and correlates with changes in the job quality through a changing employment structure, the effects on the counterfactual that takes employment structure into account should be stronger.

Insert Table 2 about here

The relationship between the national economic situation and job quality, as measured by the prevalence of better job types, could be cross-sectional (i.e., more affluent countries may have better job quality) but also longitudinal (i.e., increasing wealth may go together with increasing job quality). To test that, two specifications were estimated, as follows. The within OLS estimation covered the longitudinal effect. It only used within-country variation over time in the prevalence of job types and the economic situation as measured by GDP per capita. This specification included country fixed-effects to account for country-specific differences in the prevalence of job types. Robust standard errors accounted for serial correlation of the error term. The random OLS specification covered both longitudinal and cross-sectional effects. It used time dummies to control for changes in the prevalence of job types over time that could affect all countries equally (e.g., technological advances). Thus, differences in the national economic situation may explain only within-country time variation, as in the within-model specification, and cross-sectional variation between countries. If the results of the two specifications were similar, changes in the economic situation within countries over time would be the main driver of change in the distribution of job types. Conversely, if the results differed between the two specifications, the additional cross-sectional variation covered by GDP per capita in the random specification may be thought of as capturing the past association between affluence and the incidence of different job types, which may have been institutionally anchored (e.g., extensive social protection and labour law). To check the robustness of the findings, the analysis was repeated with controls for potentially confounding institutional variables: individual and collective employment protection legislation, family policy spending, and social benefits for households (data source OECD).

4. Findings

4.1 Clustering of employees in job types

The EWCS was used to train a SOM of 165 (15x11) nodes. Each node can be understood as a micro-cluster of employees, and its position on the plane respects the multi-dimensional proximity between nodes. The SOM toolbox allowed visualising job quality components on

separate planes (Figure 1), which helped explore underlying patterns and relationships among work and employment attributes and detect the convergent and discriminant validity of the selected items. The colour-scale coding of the map nodes was set so that the hexagons in red indicate high component values, hexagons in yellow with moderate component values, and hexagons in blue with low component values. Hot spots indicate high component values, which generally means better job quality. The colour scale is displayed near each component plane and the numbers specify the values of u-matrix elements and the distances between neighbouring nodes.

Insert Figure 1 about here

Visual inspection of component planes suggests that employees mapped to the upper left-hand corner report the highest exposure to physical risks, the highest work intensity (in terms of both quantitative demands and pace determinants), and the highest prevalence of discrimination and harassment. However, employees in the lower right-hand corner work in the best physical environment, have the lowest work intensity and are the least subject to unwanted social behaviour; besides, they also report regular working schedules. Employees mapped to the bottom left corner of the grid register the highest levels of decision latitude, social support, earnings, and prospects; on the contrary, employees in the upper right-hand corner have the lowest scores in the skills and discretion dimension, the lowest working time flexibility, and the worst terms and conditions of employment. Only a few other job features seem not to fit into such an analytical scheme built on the two diagonals. More in detail, the visualisation of similarity relations indicates that the perception of fairness of wages and task repetitiveness change positively from the top to the bottom of the map. Duration of the workday reduces moving from the left to the right side of the map. Items measuring atypical working time follow an irregular path, with employees positioned in the lower left-hand corner reporting the best scores.

A hierarchical agglomerative cluster analysis was performed for further data reduction. Using the average linkage measure, the original 165 nodes were merged into 7 clusters. The optimal number of clusters was determined by using direct and statistical testing methods and it was also supported by experience (Authors, 2010). Figure 2 shows that Cluster 1 stands out as opposed to Cluster 7, while Cluster 4 is mapped relatively distant from Cluster 6. Cluster 3 is characterised by intermediate scores on the different dimensions or subdimensions of job quality that contribute most to the clustering process.

Insert Figure 2 about here

4.2 Ranking (and labelling) of job types

Table 3 reports the mean scores and conditional probabilities of each job characteristic. These results illustrate the different ways in which positive and negative job features combine across job types and contribute to interpreting and labelling different job types. The main features of each job type are presented and discussed below, in ranked order on job quality. The predicted well-being and job satisfaction scores for employees in different clusters, holding all other

covariates at their actual observed values, are reported in the text (see also Table 1A and Figure 1A in Annex).

Insert Table 3 about here

Active jobs (cluster 4). This is the largest group, making up 26.5% of sampled employees. It stands out for the highest scores on indicators measuring skills and discretion, social support, and earnings and prospects. As for work intensity, employees in this group are confronted with some degree of time pressure and the prevalence of long workdays is higher than average. However, the working time quality benefits from the lowest incidence of atypical work schedules and the highest discretion over working time arrangements. Borrowing from previous studies (Karasek and Theorell 1990; Holman 2013), we may contend that the combination of these conditions is typical of “active” jobs, and, indeed, these employees report the best scores on both well-being (46.05, SE .175) and job satisfaction (3.24; SE .007). Active jobs are prevalent among the following occupations (2-digit ISCO-88): corporate managers (75.9%), physical, mathematical, and engineering science professionals (72.1%), legislators and senior officials (64.2%), general managers (58.9%).

Low-strain self-paced jobs (cluster 7). This cluster, comprising 25.7% of the sample, scores best on items measuring physical demands, work intensity, adverse social behaviour, working time and atypical work schedules; most scores measuring job quality in the skills and discretion, and career prospects dimensions are slightly below average. On the whole, these are employees who generally work individually, at their own pace, for a shorter number of hours and only occasionally on atypical work schedules in jobs associated with not very challenging tasks and low prospects. Borrowing on previous research, this combination of work and employment features – which results in the best scores on well-being (46.21; SE .169) and the second-best scores (3.17, SE .007) on job satisfaction – identifies what may be termed as “low-strain self-paced” jobs (Karasek et al. 1998). Occupations with comparatively high proportions of this type of job are teaching professionals (49.0%) and associate professionals (46.1%), sales and services elementary occupations (42.4%), models, salespersons, and demonstrators (37.0%), and office clerks (34.9%).

Frontline jobs (cluster 3). Employees in this cluster (21.1%) face market, commercial or service, rather than organisational or sectoral, constraints. Most work on atypical schedules and without time autonomy, and their work organisation is heavily dependent on direct demands from people such as customers, pupils, and patients. These features identify what may be labelled as “frontline” jobs. Despite some negative attributes, job quality is relatively high: clustered employees report the third-best well-being (44.40, SE 0.023) and job satisfaction (3.01, SE .007) scores. That seems to be pretty much a function of other distinctive job features. In particular, the necessity to meet customers/pupils/patients’ specific and real-time demands and expectations results in rather unsociable but not long working hours, and unavoidable, but bearable, time pressure. Task complexity and variety, learning and training opportunities, social support, perceived job security and career prospects are higher than average. Frontline jobs are relatively common among life science and health professionals (49.8%) and associate

professionals (46.8%), personal and protective services workers (39.4%), armed forces (36.4%), and customer services clerks (31.3%).

Saturated jobs (cluster 2). This cluster (6.6%) is positively characterised by above-average cognitive discretion, decision authority, and social support. Work is mainly organised in teams that have common tasks and a certain degree of autonomy, and it offers a somewhat fair salary, job security and promotion opportunities. On the downside, working time quality is poor, mainly due to the highest proportion of employees working long daily hours and on atypical schedules. Some other peculiar features – such as comparatively higher psycho-physical workloads – were also typical of “saturated” jobs identified by Holman (2013), a label that may be adopted for designating this cluster, which is associated with moderate well-being (42.98; SE .321) and job satisfaction (2.90; SE .013) scores. Occupations with comparatively high proportions of saturated jobs are armed forces (14.9%), drivers and mobile-plant operators (13.7%), extraction and building trades workers (13.5%), and metal, machinery and related trades workers (12.6%).

High-strain jobs (cluster 1). Employees in this cluster (7.6%) are the most exposed to potentially harmful working conditions and face the highest time pressure. Workplace relationships are characterized by the highest incidence of age discrimination, within a context of fair support from co-workers and occasional support from supervisors. Complexity and variety of tasks are below average and so are skill utilisation and learning opportunities. Due to strong and multiple pace constraints, work autonomy is quite low, too. Finally, earnings and prospects are lower than average. The combination of high demands and below-average control – which results in the second-worst well-being (40.42, SE .293) and job satisfaction (2.65, SE .012) scores – is typical of “high-strain” jobs (Karasek and Theorell, 1990). High-strain jobs are relatively more frequent among extraction and building trades workers (30.8%), stationary-plant and related operators (27.4%), and metal, machinery and related trades workers (27.4%).

Taylorist jobs (cluster 5). Clustered employees (6.8%) have the second-worst scores on skill discretion and decision authority, social support, and status control and also report the second-highest exposure to physical risks, work intensity and pace constraints. Work organisation is further characterised by the lowest degree of control over the schedule; however, most of these employees have standard working hours. The combination of hard work, low cognitive discretion, and very low decision latitude result in the second-worst scores on both well-being (39.74, SE .310) and job satisfaction (2.66, SE .012). Based on these features, which are also distinctive of Taylorist forms of work (Valeyre et al., 2009), this cluster may be labelled as made of “Taylorist” jobs. This job type is prevailing among operators and assemblers (26.4%), other craft and related trades workers (26.1%), and labourers in mining, construction, manufacturing, and transport (21.3%).

Passive insecure jobs (cluster 6). Employees in this group (5.6%) have the worst scores on several job features, with particular regard to the skills and discretion dimension and social support. Additionally, they report the poorest rewards: inadequate pay, very limited career prospects and the highest levels of job insecurity, coupled with the highest prevalence of

informal employment. Finally, work, which is performed under several pace constraints, is relatively hard, as physical, and psychological demands are at about an average level. In sum, these employees work in jobs that may be termed as “passive insecure”: they have many attributes of both the “passive-independent” and “insecure” jobs found by Holman (2013). These attributes result in the most detrimental effect on both well-being (2.61, SE .013) and job satisfaction (39.12, SE .334). Passive insecure jobs are frequent among agricultural, fishery and related labourers (22.8%), labourers in mining, construction, manufacturing and transport (17.2%), and sales and services elementary occupations (13.8%).

4.3 Space-time variations

Descriptive statistics indicate that the frequency of active jobs rose between 2005 and 2015 (+4.5 percentage points), while the prevalence of low-quality job types either remained stable - such as for passive insecure and Taylorist (-0.7 percentage points) jobs - or reduced, such as for high-strain jobs (-1,5 percentage points). As for the remaining job types, the incidence of both saturated (+0.5 percentage points) and frontline (+0.8 percentage points) jobs slightly grew, and the share of low-strain self-paced jobs diminished (-3.4 percentage points). Hence, there is evidence that a general increase in job quality - as measured in terms of the rising incidence of job types that combine factors indicative of high job quality - may have occurred over the 2005-2015 timespan across European countries.

To inspect space-time variations in the prevalence of the different job types, ordinary hierarchical cluster analysis was performed, and a three-group solution was preferred, based on the Calinski–Harabasz pseudo-F value. Along the north-south and eastern-western lines of divide (Visser, 2009), different clusters could be detected and referred to as: *i*) the Northern cluster, which includes Scandinavian countries; *ii*) the Central and Western cluster, which encompasses Belgium, the Netherlands, Luxembourg, France, Germany, Austria, Slovenia, Estonia, but also the UK, Ireland and Malta; and *iii*) the Southern and Eastern cluster, which comprises Mediterranean countries including Cyprus and Turkey, the former socialist EU member states, Latvia, and Lithuania. The Northern cluster stands out for the highest prevalence of active jobs (50.9%) and the lowest frequency of high-strain (3.2%), Taylorist (2.7%), and passive-insecure (1.3%) job types; conversely, the Southern and Eastern cluster may be distinguished by the highest prevalence of both low-quality – i.e., high-strain (9.5%), Taylorist (9.2%), and passive-insecure (7.9%) – and low-strain self-paced (31.0%) job types. The Central and Western cluster may be placed in between the other groups for all job types, except saturated jobs which are at about equal levels for all country groups. Figure 3 shows that these clusters seem to be pretty much established. The only notable changes that happened over the decade under scrutiny concern Finland and Norway, which in 2010 moved from the Central and Western to join the Northern cluster; Germany, France, and Malta, which in 2010 repositioned, from the Southern and Eastern cluster, in the Central and Western cluster.

Insert Figure 3 about here

Table 4 displays the estimated marginal effects of the two-stage models. These may be interpreted as the effects of a one percentage point change in GDP per capita on the prevalence of the different job types at different degrees of affluence. Indeed, effects are presented as

elasticities for countries with different levels of wealth: the first and last decile (poorest and richest countries), the first and last quartile (low and high-income countries), and the median of the GDP per capita distribution. The Northern cluster stands above the median, the Central and Western cluster corresponds to the median, and the Southern and Eastern clusters are situated below the median. In general, the results of the within and random specifications are pretty similar, in terms of the sign and magnitude of the effects. That said, the within specification (i.e., only time variation) yielded stronger elasticities and the random specification (i.e., time and space variation) yielded more significant estimates.

Model A suggests a positive and significant association between GDP per capita and the prevalence of active jobs, which is stronger in more affluent countries, that is in the Northern cluster. In the within-specification, an elasticity of .897 at the 75th percentile of GDP per capita has been estimated, meaning that for any percentage point increase in GDP per capita a 0.897-point percentage increase in the proportion of active jobs is predicted. In the random specification, the effect at the same level of GDP per capita is smaller (.635), but still positive and significant. In contrast, very strong and negative elasticities have been recorded for high-strain, Taylorist and passive-insecure job types, whose prevalence significantly reduce and virtually disappear in more affluent countries. No significant association with GDP per capita has been detected for middle-ranking job types such as saturated and frontline jobs, while a negative association has been found for low-strain self-paced jobs but only in the random specification and at or above the median of the GDP per capita distribution.

In Model B similar patterns appear in both model specifications. As expected, elasticities are stronger than in Model A, which indicates a significant relationship between GDP per capita and job quality that passes through the employment structure. More in detail, as GDP per capita increases, the prevalence of low-quality job types (i.e., “high-strain”, “Taylorist”, and “passive insecure”) shrinks and the incidence of active jobs increases. Again, the marginal effects are strongest at the highest percentiles of the GDP per capita distribution, that is for high-income countries. Yet, significant, and fairly large negative elasticities for low-quality job types have also been found below the median, that is in less affluent countries, suggesting a general increase in job quality. Concerning the prevalence of “low-strain self-paced” jobs, results indicate no significant increase in the magnitude of the association with GDP per capita. Similarly, no significant results have been obtained for either “saturated” or “frontline” jobs.

In the conditional Model C, the effects of GDP per capita on the prevalence of the different job types are lower than in Model A, as anticipated. However, compared to Model A, the negative effects of GDP per capita are stronger on both “passive insecure” jobs (in the within specification and in the highest percentiles of the GDP per capita distribution) and “low-strain self-paced” jobs (in the random specification), pointing to the existence of institutional effects for change in the prevalence of these job types.

Finally, as confirmed by a separate calculation of first derivative marginal effects, the relationship between GDP per capita and the prevalence of “active” jobs is concave and the relationship between GDP per capita and the incidence of “high-strain”, “Taylorist”, and “low-strain self-paced” jobs is convex. Moreover, for the countries for which the controlled (robust) and uncontrolled estimations could be compared, including additional national-level variables did not change the sign, magnitude, and relative order of the effects.

Table 4 about here

5. Discussion and conclusion

This study employed pooled data from the latest three waves of the European Working Conditions Survey (Eurofound, 2017a), which is the most informative source available on national-level representative samples of workers across European member states, the UK and candidate countries, to address a few research gaps in the field of job quality. The job types approach (Holman, 2013) was used to cluster employees based on the main characteristics of their jobs with a twofold aim: first, to understand the different combinations of job features in the form of job types and investigate which combinations of job features resulted in higher employee well-being and job satisfaction; second, to investigate to what extent the distribution of employees among different job types changed over the 2005-2015 period and which were the main determinants of that change.

Self-organizing map analyses revealed that European employees could be clustered in seven prototypical configurations of job types, which were mainly identified along two orthogonal axes. Building on sociological and psychological theory on occupational stress (Demerouti et al., 2001; Karasek et al., 1998; Siegrist, 1996), the first axis could be associated with key job resources such as skills and discretion, social support, and prospects; the second axis with physical, psychological, and social demands. Working hours (i.e., extensity) and earnings, measured by perceptions of fair pay, did not coalesce along these two main axes, but they rather followed distinct paths, revealing that the interactions between job demands and resources could be more shaded than those described so far (see, e.g., Széker et al., 2017). Hence, based on the interactive effects of multiple demands and multiple resources, along four directrices, analyses provided a more nuanced description of prevailing job types compared to those identified in previous empirical studies. Specifically, on the one hand, results confirmed that, regardless of the methods and techniques employed, a few job types consistently emerge and these undoubtedly approximate “high-strain” and “active” jobs (Karasek et al., 1998). Besides, this study corroborates some empirical research indicating that other recurring profiles include employees in “low-strain” (Eurofound, 2017; Széker et al., 2017) and “passive” jobs (Holman, 2013; Széker et al., 2017), even if it is worth recalling that other analyses, possibly because of the nature of their sample (Fan et al., 2019; Igic et al., 2017), have not distinguished any passive job type at all. On the other hand, some job types that were identified in this article had not been detected or fully described yet. For instance, “Taylorist” jobs, which resemble those already classified by Valerie and colleagues (2019), only partially overlap with manual and tightly controlled jobs found by Eurofound (2017), Holman (2013) or Széker and colleagues (2017). Besides, as the mean features of the “passive-insecure” job type suggest, precariousness is a crucial line of divide between different types of elementary jobs, which has not been detected so far in empirical work offering taxonomies of job types. Furthermore, despite the increasing importance of the service sector, evidence of an identifiable group of employees, here termed “frontline”, whose work is highly dependent on market or service, rather than traditional industrial, constraints had been hardly or just partially observed in earlier research,

in the form of “social demanding and flexible” or (Széker et al., 2017) “under pressure” jobs (Eurofound, 2017).

Even if each of the seven job types properly fitted within the job demands-control conceptual framework (Karasek et al., 1998), this study provided a more nuanced understanding and assessment of the influence that certain combinations of job attributes could have on job satisfaction and well-being. In particular, analyses reveal that quite dissimilar job types were associated with similar well-being and satisfaction scores. For some employees (e.g., those in high-strain or in saturated jobs), comparatively more demanding, challenging and interesting work comes at a price; in fact, it does not necessarily result in significantly better well-being and job satisfaction compared to that reported by employees who either experience more “traditional” working conditions (e.g., those in Taylorist jobs) or have no autonomy and discretion and are also highly exposed to job insecurity and uncertainty (e.g. those in passive-insecure jobs). Moreover, results indicate that even when the most prominent job resources are combined additively, such as for employees in “active” jobs, they do not produce better well-being outcomes than those stemming from the combination, found in “low-strain self-paced” jobs, of low workload and time pressure and relatively high control over the pace of work. In sum, findings confirm that it would be misleading to focus on single job characteristics or specific dimensions of job quality to extract meaningful patterns. Indeed, even when a detailed set of resources as payback for job demands are considered, differences in the way job satisfaction and well-being are shaped could be still unrecognised. Thus, there is reason to believe that, among the mechanisms explaining to what extent job attributes could affect well-being (and functioning), people’s expectations and judgements should be somehow considered (Green, 2006). In these terms, it would also be much easier to understand, for instance, the reasons why employees in the “low-strain self-paced” jobs – who work short weeks, are required very little initiative, and have poor career prospects – perceive their jobs as satisfying and are the least likely to report psychological fatigue. That result could be related to the freedom these employees have to pursue personal goals, which for some people may indeed not be demanding, challenging, intense jobs.

Finally, when investigating space-time variations in the prevalence of job types, this manuscript showed, on the one hand, that three clusters of countries could be identified: the Northern, Central and Western, and Eastern and Southern clusters. These large, recognisable, and quite stable groups of countries only partly match any known welfare, industrial relations, production, or employment regime. On the other hand, analyses revealed that the strength and features of national economies, as measured by GDP per capita, contribute to explaining cross-country variation in the distribution of high and low-quality job types in a Preston-curve fashion. This means that at low levels of GDP per capita, further increases in GDP per capita are associated with a large increase in the prevalence of the active job type and a large decrease in specific low-quality jobs, but at high levels of GDP per capita, increased GDP per capita brings about a little associated change in the prevalence of the different job types. Hence, three different patterns of change in the distribution of job types, that is in overall job quality, could be identified and confirmed, mainly based on the change in the national economic situation and the employment structure. The first, typical of the Southern and Eastern cluster, is characterized by a steep increase in active jobs and a steep reduction in the incidence of several low-quality job types as GDP per capita increases; the second, peculiar to the Central and Western cluster,

is distinguished by a steeper increase in the incidence of active jobs and a steeper decline in the proportion of low-quality job types as GDP per capita increases; the third is characteristic of the Northern cluster and may be identified based on an even steeper decrease in the incidence of specific low-quality job types and a diminishing returns to GDP per capita in terms of the prevalence of active jobs. However, these findings on the functional form of the relationship between the national economic situation and the distribution of job types have not confuted the relevance of institutional factors. The job type approach adopted in this article has exposed deviations from these general trends. In particular, it has shed light on a certain degree of variability in shaping the distribution of job types that could be linked to the peculiarity of the different institutional structures. In particular, findings showed that the proportion of “low-strain self-paced” and “passive insecure” jobs is more strongly related to institutional variation, whereas the incidence of middle-ranking job types such as “saturated” and “frontline” jobs is not significantly associated with the national economic situation. Hence, if the debate on space-time variations in job types and job quality is to be moved forward, further research could explore the explanatory power of specific institutional variables. This could shed a light on variations within the three Europes, deviating from the Preston-curve relation, or shifting the curve based on the transnationally coordinated improvement of job quality.

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