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Enrique Fernández-Macías

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What is This?

Job Polarization in Europe? Changes in the Employment Structure and Job Quality, 1995-2007

Enrique Fernández-Macías[1]

Abstract

In recent years, a number of academic papers have argued that over the last couple of decades, technical change has had a polarizing impact on the employment structure of advanced capitalist economies with a relative expansion of jobs occupying the top and bottom of the wage/skills hierarchy and the middle shrinking. In this article, we present alternative evidence on the nature of change in European employment structures between 1995 and 2007, arguing that rather than a pervasive process of polarization there was a plurality of patterns of structural employment change across Europe. The broader theoretical implications of such findings are discussed.

In recent years, several influential papers have argued that the last wave of technical change (more specifically, the application in the 90s of innovations derived from the IT Revolution of the late 70s and 80s) is having a strong polarizing impact on the employment structures of most advanced capitalist economies (see Acemoglu & Autor, 2010; Autor, Katz, & Karney, 2006;

[1]University of Salamanca, Salamanca, Spain

Corresponding Author:
Enrique Fernández-Macías, University of Salamanca, Salamanca 37007, Spain
Email: efm@usal.es

Goos & Manning, 2007; Goos, Manning, & Salomons, 2009). In a nutshell, these papers argue that the application of these new information technologies to production tends to substitute labor in the middle of the skills/wage structure, while simultaneously expanding demand for labor at the top and bottom. Although these papers have a sound theory to back their claims (a derivation of the arguments of Skill-Biased Technical Change [SBTC]; see Autor, Levy, & Murnane, 2003), their main support is empirical, provided by the striking regularity of a polarizing pattern of change in the structure of labor markets of the United States, the United Kingdom, and Continental Europe since the 1990s (Goos et al., 2009). The implications of these claims are substantial, for social theory and policy: on the one hand, such a pervasive pattern of technology-induced polarization would be a powerful evidence of the primacy of technology in the evolution of socioeconomic structures; on the other hand, it would lead to rather pessimistic conclusions with respect to the potential of policy for redirecting labor-market developments in more socially desirable ways. It must be emphasized that such pervasive technology-induced polarization would be taking place despite the very important differences that exist across advanced capitalist economies in terms of other factors such as the institutional framework or the degree of openness to trade.

In this article, we will discuss the empirical support of such claims, presenting alternative evidence to defend that there was a plurality of patterns of structural change in European labor markets over the 1990s and 2000s, rather than a single pervasive pattern of polarization. We will argue that such plurality can be better understood by a more open approximation to structural employment change, in which not only technology, but also institutions shape the structure of employment and how it changes over time. For defending this argument, we will follow the same approach as the papers discussed applying it to the evolution of employment across the European Union (EU) since the 1990s. This approach, which we call the "jobs approach," represents an innovation in labor market structural analysis: it is based on constructing a synthetic and comparable representation of the structure of each national labor market, crossing the classifications of sector and occupation at a relatively detailed level, and using external information on wages and education within each combination of occupation and sector to classify jobs in terms of their quality (previous examples of this method include U.S. Council of Economic Advisors, 1996; Ilg, 1996; OECD, 2001; Wright & Dwyer, 2003).

The structure of this article will be as follows. First, we will briefly present the main arguments of the technology-induced polarization hypothesis. Second, we will discuss the theoretical foundations of such hypothesis, putting it in relation to the sociological theories of occupational structure and change.

Third, we will briefly discuss the concept of job quality which underlies this approach. Fourth, we will present the methodology followed in this article, including a detailed comparison with previous papers arguing for a pervasive polarization. Fifth, we will present our own evidence for 15 European countries (EU15). Finally, we will conclude with a discussion of the wider implications of our findings.

A Technology-Driven Job Polarization Argument: The Routinization Hypothesis

The routinization argument is a derivation of the theories of SBTC, which linked the expansion of inequalities experienced by most developed societies since the 1980s to the IT revolution (Violante, 2008). The original SBTC theories, nevertheless, predicted upgrading rather than polarization of employment: they used dichotomous models of the labor market, in which the demand for skilled labor was boosted, and the demand for unskilled labor depressed, by the introduction of information technologies (see Acemoglu, 2002, for a review of the main SBTC arguments). In a 2003 paper, Autor et al. presented a task-based reformulation of the SBTC arguments in an attempt to refine the predictions of this theory with respect to the demand for different types of jobs (we will call this argument the *routinization* hypothesis). Rather than speaking about just two types of tasks (skilled and unskilled), Autor et al. proposed a two-dimensional typology (routine vs. nonroutine, manual vs. cognitive), identifying four categories of tasks in terms of the impact IT would have on them:

> *Routine manual tasks*—repetitive labor of a physical nature. Typically, traditional industrial unskilled and semiskilled jobs involve such routine manual tasks. Since the Industrial Revolution, this type of labor input has been increasingly substituted by machines, as such tasks are easily mechanized. Computerization takes the possibility of substitution even further, as programmable machines are much more flexible in their functioning.
>
> *Routine cognitive tasks*—repetitive labor involving the processing of information. Typically, traditional clerical jobs involve this type of routine cognitive tasks. Until the IT revolution, it was very difficult to perform such tasks with machines: this, together with the increasing needs of information processing of managerial capitalism, led to a massive expansion of this type of jobs up to the 1970s. The IT revolution of the 1980s meant for this type of jobs what mechanization

had meant for routine manual jobs a century earlier: as such tasks can be easily performed by computers, the demand for this type of employment has dropped dramatically.

*Nonroutine cognitive tasks—*nonrepetitive or noncodifiable labor involving the production, processing, and manipulation of information. Typically, managerial, scientific, and professional jobs involve this type of activities. For the moment, machines are incapable of performing these tasks, so demand for these jobs have been unaffected by mechanization or computerization. Following the SBTC tradition, Autor et al. (2003) argue that in fact, the demand for these jobs are affected positively by the IT revolution: nonroutine cognitive tasks are complementary to routine manual and cognitive tasks, and as the cost of the latter falls because of the competition of machines, the demand for the former expands (Autor et al., 2003, p. 1285).

*Nonroutine manual tasks—*nonrepetitive tasks of a physical nature, sometimes referred to as manual tasks which basically require hand-eye coordination. This type of tasks is typically associated with low-skilled service jobs. Even though in their paper Autor et al. briefly mentioned this fourth category, which is obviously implied by their two-dimensional model, they did not make any specific claim about how the IT Revolution affected it: in fact, in most of the paper they ignore it. "Because our model makes no prediction for how computerizing industries will adjust demand for non-routine manual tasks, we do not include this variable in our industry-level analysis" (Autor et al., 2003, p. 1302). This is surprising, because their model does seem to imply a prediction for this category as well: if this category of tasks is unaffected by computerization, its demand should remain unaffected as well, which in relative terms would imply an expansion vis-à-vis the declining routine manual and cognitive categories (the process would be similar to the one famously described by Baumol [1967]; relative demand tends to expand in industries or occupations with lower productivity growth).

So, although their two-dimensional model of the skill content of technical change did seem to imply some type of polarization, Autor et al., in their 2003 paper, did not pursue this line of reasoning. In fact, this article discusses upgrading rather than polarization, sitting still squarely within the SBTC tradition. The polarizing interpretation of the routinization hypothesis comes, in fact, from a paper by Goos and Manning on the evolution of the U.K. employment structure since the 1970s (Goos & Manning, 2007, first published as a

working paper in 2003). According to these authors, the bottom and top of the U.K. employment structure (lousy and lovely jobs, respectively) expanded relative to the middle consistently since the 1970s: for explaining such development, they use the framework of Autor et al., but developing it further to argue that relative labor demand for nonroutine manual tasks also expands with the computer revolution.

> The non-routine manual tasks that make up many of the most unskilled jobs such as cleaning are not directly affected by technology, but the impact of technology in other parts of the economy is likely to lead to a rise in employment in these unskilled jobs [. . .]. The reason is the general equilibrium effect first identified by Baumol—employment will shift toward jobs in which productivity growth is low (because technology is not applied there) in order to keep the balance of output in different products. (Goos & Manning, 2007, pp. 118-120)

A later paper by Autor et al. (2006) revisited his original model along the lines suggested by Goos and Manning, therefore defending that computerization had a polarizing impact on employment structures and presenting new supporting evidence for the United States (see also Acemoglu & Autor, 2010).

In a more recent paper, Goos et al. (2009) make their point considerably stronger by arguing that the same type of technology-induced polarization that they identified in the United Kingdom in their earlier paper took place elsewhere in Europe (EU15) between 1993 and 2006 (with the partial exceptions of Italy and Portugal). In a later section of this article, we will discuss with some detail the empirical support for their claims, presenting alternative evidence that does not fit such hypothesis. For the moment, what we would like to emphasize is the implications of such claims at the theoretical level: the idea that nearly all European job structures experienced the same type of technology-induced polarization involves assigning an absolute primacy to technological factors in the evolution of employment structures even in the medium term. Yet the supporting evidence for such claim is, in fact, mostly circumstantial. It is the finding of a striking coincidence in the patterns of structural change in European labor markets which sustains the argument to a large extent. In the Goos et al., 2009 paper, there is no direct evidence of the existence of a mechanism linking the IT revolution and the alleged polarization of developed economies' employment structures. Simply, the IT revolution and its task-biased impact on labor demand seems like a plausible explanation for such a pervasive polarization pattern, and the practical absence of any variation suggests that other factors must have played just a

very minor role in the recent evolution of employment structures across Europe.

The Underlying Model of the Employment Structure and Its Change

An important feature of the papers we are discussing here is that they use a very specific approach for constructing their argument: rather than carrying out the analysis at the level of individual workers, they analyze jobs, defining it either as detailed occupations or as combinations of occupation and sector at a relatively detailed level.[1] This contrasts with the usual approach in the analysis of inequality, normally based on studying the distribution of earnings at the individual level. Why analyze jobs rather than individuals? The reason lies in the underlying technological argument: polarization occurs because technology does not equally affect the different types of tasks which are required in production, and such tasks are structured in occupations requiring different skills. The argument explicitly concerns the change in the labor demand for the different types of occupations, and hence, the natural way of testing it is by studying the evolution of employment across them. That is why the crucial variable for most of these papers is occupation, with sector of activity playing in most cases only a secondary role.

The underlying assumption of this approach, therefore, is that labor is not unstructured and uniform as it appears in some crude neoclassical models but structured by technology and the division of labor into different occupations or types of jobs. In this respect, it is similar to the "New Structuralist" approach in the sociology of labor markets, which also argued that employment is stratified in different segments, and also used occupation (sometimes combined with sector as well) as the key variable for studying labor market developments (Kalleberg & Sorensen, 1979). However, although this sociological tradition also took into account technology as a structuring principle for employment, it put, at least, the same emphasis in the structuring effect of *institutions*, something which is almost totally absent in the polarization arguments which we are discussing here. By institutions, we basically mean two things: power relations in work/labor markets and regulation.

On the one hand, as argued by many segmentation theorists, the division of labor that is behind occupational boundaries is not only driven by technology, but also by politics at work, simply because it has important implications in terms of the distribution of power in the workplace and in labor markets (this is the key argument of radical segmentation theories; see Reich, Gordon, & Edwards, 1973; for a review, see Peck, 1996). The division of labor is an

object of struggle: employers use it to strengthen their grip over production, whereas workers explicitly fight to resist such attempts and reshape the division and allocation of labor in their own benefit (Kalleberg, Wallace, & Althauser, 1981). Furthermore, occupational sociology has a long tradition of studying how certain occupational groups have been able to control the boundaries, mechanisms of access, and work organization of their occupations, not only against employers but also against other workers (the old concept of "occupational power," see Kronus, 1976; Weeden, 2002).

On the other hand, state regulation also has a direct and important effect on the definition of occupational boundaries and allocation of labor to the different occupations: not only many occupational boundaries are indirectly (for instance, via the skill formation systems; Gallie, 2007) sustained by it, but in fact, some occupations are created by regulation (i.e., many occupations in the public sector, whose function and nature have little to do with technology and a lot to do with the politically defined social needs that they cover: they are "institutionally protected," see Kim & Sakamoto, 2010). State regulation affects the allocation of labor to the different sectors and occupations in many different ways (DiPrete, Goux, Maurin, & Quesnel-Vallee, 2006; Esping-Andersen, 1999): for instance, through effects in the structure of labor costs (minimum wages, health and safety regulation, unemployment protection schemes) which are never identical across occupational levels (obviously, minimum wages have effects mostly in the demand for labor in low-paid occupations).

This is a very important point, because the underlying assumptions with respect to the factors determining the basic structure of employment, whose patterns of change over time is our object of analysis, set the framework of possible explanations. A narrow focus on technology as the (main) factor determining the structure of employment leads to a narrow technological explanation of why such structure changes over time, and because most advanced European nations are experiencing the same type of technological change, they should change in roughly similar (polarizing) ways. However, if we depart from a more encompassing model, including not only technology but also institutions, then the range of possible explanations is widened: as there is an obvious plurality of institutional frameworks across Europe, we should expect plurality rather than homogeneity in the patterns of occupational change.

The technological argument of polarization is very specific in its predictions: in the current round of technological innovation in production, machines are a substitute for labor in the middle of the employment structure, complementary to labor at the top and neutral with respect to labor at the bottom; hence, the expected polarization. What kind of effects on the occupational

structure can we expect if we include institutions in the equation? The most obvious answer in a comparative analysis such as the one we will carry out here is that we should expect diversity in the patterns of structural change across countries, but we can be more specific in two respects. First, the type of diversity we find in the patterns of occupational change should be somehow related to the well-known institutional families of Europe: groups of countries that, for different reasons, are similar in terms of their institutional design and labor regulation (Esping-Andersen, 1999; for a specific application to labor markets, see Gallie, 2007). Second, there should be more diversity in the middle and bottom of the employment structure than in the top, because institutional arrangements have more impact on employment in those segments: on the one hand, traditionally labor regulation is most concerned with protecting those at the bottom (for instance, by establishing minimum wages or unemployment benefits which act as a reservation wage); on the other hand, the strength of organized labor traditionally resides in the middle and mid-low layers of employment. Therefore, differences in employment regulation and in the strength of organized labor should mostly affect the evolution of employment in the middle and lower segments of employment.

The Concept and Measurement of Job Quality

It is now widely accepted in social sciences that job quality is a multidimensional concept that cannot be reduced solely to wages (Green, 2007; Sengupta, Edwards, & Tsai, 2009). Yet the papers we are discussing use wages as the sole indicator to characterize the quality of the jobs whose quantitative evolution is analyzed, and we will follow basically the same approach (although adding a secondary indicator based on the average educational level of workers within each job). How can we justify such an approach? First of all, it has to be acknowledged that the main reason, at least in our case, is purely practical: international surveys with the required level of detail for constructing a multidimensional index at the job level in each country simply do not exist at present.[2] However, it must also be acknowledged that the approach to job quality used here minimizes the potential implications of this problem. The approach consists in ranking and grouping the jobs according to their quality and then studying the change in the number of workers across the tiers of job quality. The underlying concept of job quality, therefore, is purely relative and static in its own terms. Relative, because we do not care about the scale of differences in quality between jobs but only about the relative position of each one against the rest. Static, because we only care

about the relative quality of the jobs that are created and destroyed over time, ignoring any change in job quality that may take place within jobs (in other words, jobs are ranked only once). The dynamic analysis of job quality is, from this perspective, only compositional: the core idea is to evaluate what are the implications for job quality of changes in the structure of employment. In fact, we could say that the real objective of this approach is not so much to study the evolution of job quality, but to evaluate the nature of structural change in employment from the perspective of job quality. Job quality is a tool for evaluating structural change, not the object of analysis on its own.

With these considerations in mind, it is easier to understand why wages can be, in this context, a good approximation to job quality and nothing more than that. It is difficult to deny that besides being one of the main components of job quality in most proposals for measuring such elusive concept (Leschke & Watt, 2008; Muñoz de Bustillo, Fernández-Macías, Esteve, & Antón, 2011), the level of wages is one of the best correlates for the other attributes of work and employment that are part of multidimensional concepts of job quality (Davoine, Erhel, & Guergoat-Lariviere, 2008). The sociology of work and institutional economics even provide theoretical arguments for why this should be the case: in contrast to the idea of compensating differentials which still dominates orthodox labor economics (according to which, other things being equal, wages compensate for unpleasant working conditions), the sociological and institutional traditions have emphasized mechanisms such as segmentation, discrimination, or exploitation that make the different good and bad attributes of jobs to tend to accumulate rather than compensate each other (Muñoz de Bustillo et al., 2011). Poorly paid jobs tend to be bad jobs in other respects too: in practical terms, this makes wages a good proxy for job quality.

Finally, the use of the average educational level of workers in each job as a secondary proxy for job quality in this article should provide further robustness to our results. We can briefly mention three possible justifications for using the average educational level of workers in each job as a proxy for job quality: (a) from a standard economic perspective, it is associated with productivity, which is a direct determinant of pay and working conditions (Muñoz de Bustillo et al., 2011, pp. 29-45); (b) from a credentialist perspective, educational titles provide advantages for workers in their competition for the best jobs (Blaug, 1985); (c) the educational level of workers is obviously associated with the skill requirement of jobs, which, in many perspectives, are a direct component of job quality (Green, 2007).

Methodology: Testing Structural Polarization in Employment With a "Jobs" Approach

As we have already said, the approach that we will use in this article basically consists in shifting the unit of analysis from individuals to jobs, understanding jobs as specific occupations within specific sectors, for studying the evolution of advanced economies' employment structures. Taking advantage of the fact that most advanced capitalist economies have Labour Force Surveys (LFSs) including internationally comparable variables of sector and occupation, this approach permits generating similar synthetic representations of the employment structure within each country, basically very large tables in which all employment is classified into equally-defined jobs (specific occupations within specific sectors). A measure of job quality (based on their median wages or average educational level) is assigned to each of those jobs, which are then grouped into a number of job quality tiers. The evolution in the number of workers in each of those job quality tiers is then studied. The polarization argument is based in the observation of faster growth of the top and bottom tiers with respect to the middle tiers (that is, a relative expansion of the extremes vs. the middle).

The analysis used in this article draws from a project carried out by the European Foundation for the Improvement of Living and Working Conditions between 2007 and 2009, in which a team of international researchers[3] assembled a data set of employment by occupation and sector at the two-digit level, for 23 European countries and the period 1995-2007, linking external information on wages estimated from different data sources. We will briefly describe the methodology followed for constructing the figures that we will discuss in the next section:

> *Sources:* All the data on quantities of employment by job, country, and year draws from a single source, the European LFS (ELFS). The ELFS is, without any doubt, the best existing European source on employment quantities, and crucially for our purposes, it includes the variables of ISCO and NACE at the two-digit level, with a high degree of international harmonization. The data from the ELFS used in this article is representative of the full working population in the respective countries, without differentiating by part-time or self-employment status. Unfortunately, the ELFS does not include (yet) data on wages, so for constructing the job quality rankings we had to draw from different sources. The 2002 European Earnings Structure Survey was used for estimating median hourly wages at

the job level in each country, but as this survey does not cover the public sector and as it does not provide a two-digit disaggregation of the manufacturing sector, it was complemented with figures obtained from the 2005 European Survey on Income and Living Conditions and the Structural Business Statistics of the EU. The linking of these different sources was carried out at the job level: the wage levels in the jobs which were available in both the EESS and the other source were used for calculating a conversion factor which was then applied to the jobs available only in the other source. [4] To add further consistency to our analysis, a second job quality (proxy) ranking will be used in this article, based on the average educational level of workers in each job, drawn entirely from ELFS data.

Aggregation: A crucial advantage of the jobs approach is that it allows to link information derived from different sources at the job level. Most importantly, using such approach permitted linking quantitative information (on employment numbers by job) and qualitative information (on wage and educational levels by job), constructed through different processes and from different sources, as explained in the previous point.

Construction of the job quality tiers: Then, using the rankings, the job quality tiers were constructed on each country. The allocation of jobs to job quality tiers was done in such a way that each of them contains 20% of total employment in the year 2000 (in each country), ranked by job quality: for this reason, we call them job quality quintiles (even though they are only properly quintiles in the year 2000).[5] This was done separately for the wage and educational rankings.

Representing change: Then, we will simply plot employment growth for the five quintiles, for the period 1995-2007, country by country. This way, we can visually test the polarization hypothesis by simply looking at the patterns of job growth displayed in each country chart.

The method used in this article is very similar to the one used in Goos et al. (2009), the group of countries covered is the same (EU15) and the period almost identical. Yet as we will see immediately, our results are clearly inconsistent with theirs. Most importantly, our results do not provide any support to the claim that there was a pervasive pattern of job polarization across Europe in the last decade and a half. It is, therefore, worth discussing with some detail the possible reasons for such discrepancy. The key differences are three:[6]

The definition of jobs: Although it is based on the jobs approach described earlier, the paper by Goos et al. (2009) does not use a consistent definition of what is a job throughout the paper. In some cases, it uses the same occupation-industry matrix approach that we use here (as in Figure 1 of their 2009 paper, when they analyze the EU patterns); in others, they use only the 21 two-digit occupational codes of ISCO (as in Tables 2 and 3 of their 2009 paper, when they analyze national patterns). This is important, because the key finding of the whole paper (the pervasiveness of job polarization across Europe) is based on the analysis of the change in employment levels across 21 occupational categories ranked by their median wages. The main idea behind the jobs approach is that the full complexity of the labor market can be reduced to a more manageable list of jobs, taking advantage of the fact that the labor market is structured by the principle of the division of labor into relatively stable positions requiring different skills, involving different conditions of work and employment and giving differential access to resources (see Fernández-Macías, 2010, pp. 13-18; Wright & Dwyer, 2003, p. 295). This requires that the definition of jobs takes into account the boundaries of the division of labor, and that the jobs are specific enough as to involve reasonably homogeneous employment situations. Simply put, the list of 21 broad occupational titles used by Goos et al. (2009) does not seem detailed enough. Instead, in this article we use a consistent (two digit) occupation-by-sector definition of jobs across the 15 European countries analyzed (yielding a theoretical maximum of 1,600 jobs per country, which is in practice lower because some combinations of occupations and sectors do not exist or are not covered by the ELFS in many countries, so the actual number of jobs goes from 454 in Luxemburg to 1,192 in Germany).

Job quality rankings: As mentioned earlier, a key component of the jobs approach is that the jobs are ranked by their median hourly wages (for constructing job quality tiers later). Goos et al. (2009) used the median hourly wages of the United Kingdom (calculated with data from the 1994 UK LFS) to rank the jobs in all 15 European countries. This involves the assumption that the wage structure (or more precisely, the wage ranking) is basically the same across Europe, and that therefore using the wage levels of a single country (United Kingdom) to characterize job quality in other countries leads to broadly the same results as using national wage levels. We believe that there is abundant evidence showing that this is not the case, and that therefore it is always preferable to use country-specific wage levels to rank the jobs by their quality (see, for instance, the contributions to

Freeman & Katz, 1995).[7] In this article, we rank the jobs with nationally specific wage estimations (and secondarily, using nationally specific estimations of average educational levels by job).

Construction of the job quality tiers: In this article, following the earlier approach by Wright and Dwyer (2003), we group the jobs in five equal-sized groups ranked by their median hourly wages (what we call "quintiles"). Instead, Goos et al. (2009) classify the ranked jobs in three categories (good, middling, and bad jobs) which have very uneven sizes in terms of number of occupations (8-9-4) and in terms of employment shares in the first year of the period studied (29%-49%-22%). This has very important implications for the results, especially when the relative rates of growth are the main parameter of the analysis (as is the case). To illustrate this, we have rearranged the job quality tiers proposed by Goos et al. (taking their figures from p. 59 of their 2009 paper), so that they represent more or less the same percentage of employment in the initial year of the period (see Column 2 in Table 1). In Column 1, we also include the rates of change of the original job quality tiers proposed by Goos et al: if we compare such rates of change with the rates we obtain with our evenly sized job quality tiers, we can immediately see that, although the data is exactly the same, there is much less polarization in the second case (in which both middling and bad jobs are decreasing in relative terms, even though the bad jobs are shrinking slightly less rapidly than middling jobs, so there is still some minor degree of polarization). The Goos et al. paper does not provide job-level figures for all countries, and therefore we cannot check the country-level impact of such uneven grouping, but we suspect that the degree of polarization would also be considerably diminished in many countries. The size of the job quality tiers is very important for the results, and therefore it is important to justify the logic used for their construction. In our view, using evenly sized groups as we do here is more useful (the tiers are equivalent in size, so that we know they are comparable) and transparent. The quintiles can be considered as a kind of tabula rasa against which the employment expansion across jobs is projected.[8]

Patterns of Change in European Employment Structures, 1995-2007

Figures 1 and 2 present graphically our alternative test of the polarization hypothesis for Europe (15) between 1995 and 2007. Each figure includes 15

Table 1. Uneven Versus Even Grouping of Jobs in Goos, Manning, and Salomons (2009)

				1. Goos, Manning, & Salomons (GMS) grouping of jobs		2. Alternative grouping of jobs	
Changes in shares of hours worked over 1993-2006 for occupations ranked by their mean 1993 European wage							
Wage ranking	Occupations	Initial share	Relative growth	Initial share	Relative growth	Initial share	Relative growth
1	Corporate managers	4.54	1.25				
2	Physical, mathematical, engineering professionals	2.92	1.02				
3	Life science and health professionals	1.86	−0.14				
4	Other professionals	2.82	0.7	28.78	7.75	34.26	7.58
5	Managers of small enterprises	3.6	1.28				
6	Physics, mathematics, engineering associate professionals	3.99	0.91				
7	Other associate professionals	6.77	2.07				
8	Life science and health associate professionals	2.28	0.66				
9	Drivers and mobile plant operators	5.48	−0.17				
10	Stationary plant and related operators	1.75	−0.39				
11	Metal, machinery, and related trades workers	8.33	−2.33				
12	Precision, handicraft, and related trades workers	1.31	−0.4	48.98	−8.98	33.6	−5.43
13	Office clerks	12.04	−1.98				
14	Customer service clerks	2	0.19				
15	Extraction and building trades workers	8.17	−0.52				
16	Machine operators and assemblers	6.71	−2.01				
17	Other craft and related trades workers	3.19	−1.37				
18	Personal and protective service occupations	6.94	1.15			32.15	−2.15
19	Laborers in construction, manufacturing, transport	4.11	0.48				
20	Models, salespersons, demonstrators	6.73	−1.42	22.25	1.23		
21	Sales and services elementary occupations	4.47	1.02				
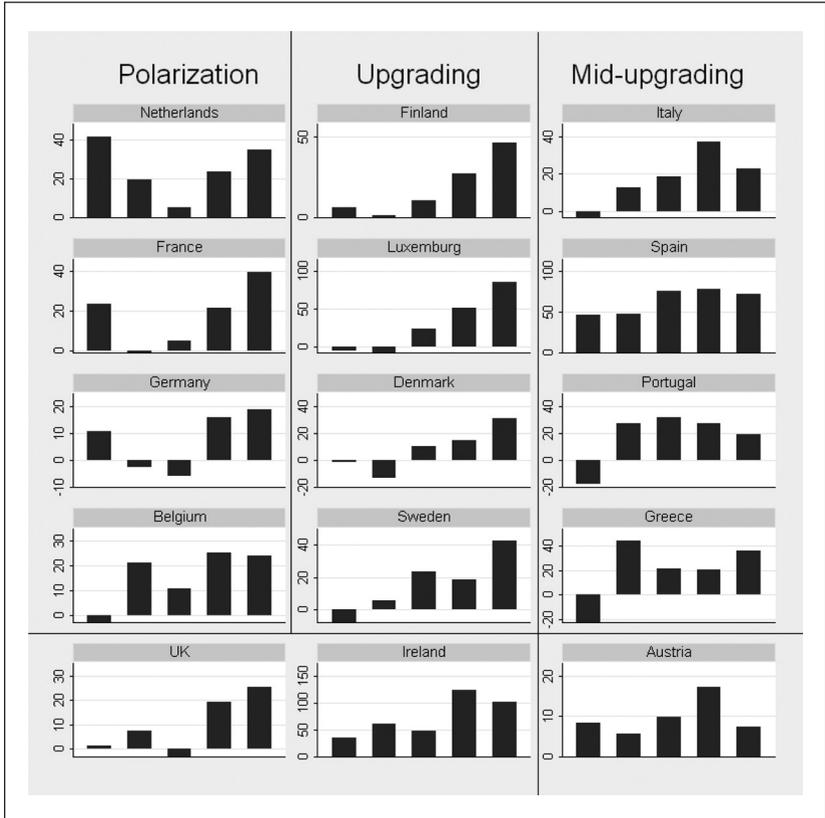
Figure 1. Relative change in employment by wage quintiles, 1995-2007

country charts, representing relative change in the number of workers for the five job quality tiers between 1995 and 2007[9]. Figure 1 shows the results for the wage ranking and Figure 2 for the educational ranking: in most cases, they tell the same story, although the educational quintiles are marginally more biased upward (they show slightly more upgrading). The comparison between Figures 1 and 2 is in itself a test of the validity of results: the wage and educational rankings were estimated from different sources and through different methods of aggregation, and yet, they yield very similar results, which supports the idea that they are measures of the same underlying characteristic of jobs (both seem to be consistent proxies of job quality). There is only one case in which there is a clear inconsistency between the results obtained with
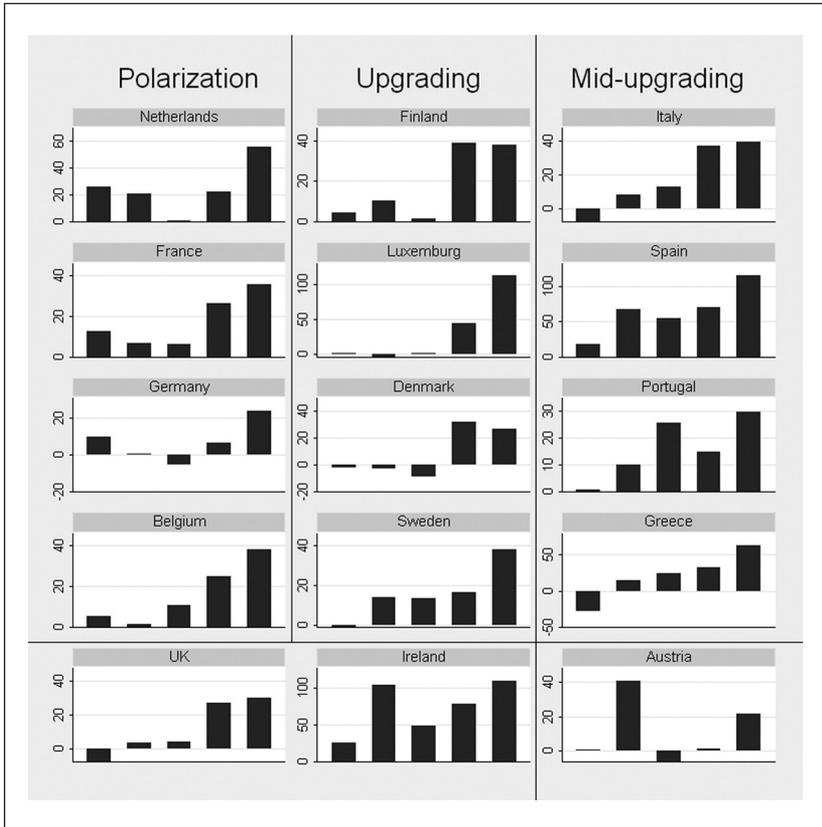
Figure 2. Relative change in employment by education quintiles, 1995-2007

the two rankings (Austria): it seems plausible that there may be some problem with at least one of the two rankings in this country, which, therefore, has to be taken with caution.

The interpretation of Figures 1 and 2 is quite straightforward. For instance, the chart at the top left of Figure 1 represents structural change in the Netherlands and shows that the first and fifth quintiles (that is, the lowest and highest paid jobs) expanded by roughly 40% each (which amounts to more or less half a million workers), the second and fourth quintile expanded by around 20% each (around 300,000 workers), and the middle quintile (jobs with wages around the overall median) hardly expanded at all (around 5%, less than 10,000

workers). Therefore, our results show that the transformation of the employment structure in the Netherlands between 1996 and 2007 followed a nearly symmetric polarized pattern. All country charts represent change in percentages (so they can be directly compared), but it is important to notice that the scale of the vertical axis differs in each country chart, because the scale of the employment expansion (or in a few cases, contraction) varied considerably across Europe between 1995 and 2007. However, using different scales in the vertical axis allows us to see more clearly the patterns of change in the quintiles (i.e., the patterns of transformation of European job quality structures) and visually evaluate whether such change followed a polarized pattern or not.

It is immediately obvious from looking at Figures 1 and 2 that our results do not provide any support to the hypothesis of a pervasive job polarization across Europe—or to any other pervasive development, for that matter. Instead, what we find is a plurality of patterns of change in European employment structures between 1995 and 2007, for which we propose a tentative classification into three main categories (polarization, upgrading, and middling-upgrading), as indicated in the figures.

On the left-hand side, we have the four countries that fit a polarization pattern, though not all to the same extent. The clearest case is the Netherlands, which displays a near symmetric pattern of job polarization for the wage quintiles (not so symmetric for the educational quintiles, but still polarized). France and Germany also experienced a clear polarization, but strongly skewed toward the highest paid jobs: so the polarization trend was simultaneous with a strong process of structural upgrading. The classification of Belgium as a case of polarization is probably more disputable: the lowest quintile did not grow at all, so the left leg of the polarization pattern only concerns the second quintile and the extent of polarization was more limited. The United Kingdom and Ireland show a very similar pattern (though the employment expansion was bigger in Ireland), with a mild polarization (the second lowest quintile expanded in both countries more than the lowest and middle ones) and a strong structural upgrading in employment: for this reason, we have enclosed them in a box in the last row of Figure 1, below the polarization and upgrading columns of charts, reflecting the fact that they could be classified in both categories.

The middle column includes four countries whose patterns of job growth does not fit the polarization hypothesis at all. The patterns of transformation in the employment structures of these countries can be best described as upgrading. The three Nordic countries of the EU, plus Luxemburg, are within this group (as mentioned earlier, the United Kingdom and Ireland could arguably be classified as upgrading cases as well, although with some degree of

simultaneous polarization). The scale of structural upgrading in Finland and Luxemburg in recent years was truly phenomenal: in Finland, employment in the highest paid jobs expanded by nearly 50%, in the second highest quintile of jobs by nearly 30%, and by less than 10% in the three lowest quintiles; in Luxemburg, the top quintile expanded by more than 80%, the second highest quintile by 50%, the middle by 20%, and the two lowest actually contracted. The scale of upgrading in Denmark and Sweden was less spectacular, but quite significant as well (with a small hike in the middle quintile in the case of Sweden).

Finally, the third column of charts shows four countries that also experienced upgrading in their employment structures, but which differ from the rest because there was an important expansion of employment in the middle of the pay structure. In other words, these countries experienced the opposite of a polarization process (a centripetal development). The clearest cases are Spain (where the fastest growing segments of employment were those in the third and fourth quintile) and Portugal (where the three middle quintiles expanded by nearly 30%, whereas the bottom contracted and the top expanded by less than 20%). Of this group, the strongest upgrading took place in Italy, where the second highest quintile was the one growing fastest. Greece, however, saw a very significant contraction of its lowest paid jobs, whereas the rest of the employment structure followed a mildly polarized pattern. Below these four countries, and enclosed in its own box to reflect its exceptionality, we have included Austria: the discrepancy between the Austrian results when using the educational or wage ranking of jobs means that its classification is ambiguous. The wage quintiles for Austria would make it a case of mid-upgrading (to be classified within the third column), but the educational quintiles show a clearly polarized pattern. As previously mentioned, this suggests some possible data problem with Austria that should be settled before we can classify this country.

We can, therefore, reject the null hypothesis that motivated this article, namely, that there was a more or less uniform polarization of European employment structures. Polarization is just one of at least three distinct patterns of structural change in European employment between 1995 and 2007: a second group of countries experienced an unambiguous process of upgrading in their employment structures, and yet, a third group was characterized by a pattern which is the absolute opposite to polarization, a relative expansion of the middle layers of employment. The substitution of routine middling jobs by machines and the relative expansion of the top and bottom layers of employment was not the single or dominant factor behind structural employment change across Europe as argued by Goos et al. (2009). Of course, we can
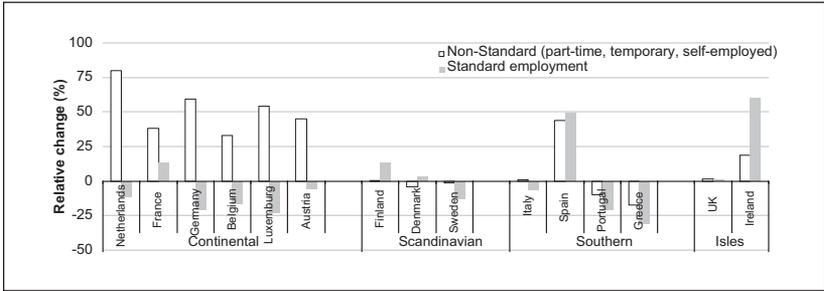
Figure 3. Relative change in nonstandard and standard employment in the lowest wage quintile, 1995-2007

reject the technology-induced polarization hypothesis only in its most deterministic and univocal form: our results would be perfectly compatible with a more moderate version of such hypothesis. It is perfectly plausible that there would be an underlying tendency toward polarization as a result of a U-shaped effect of technology on employment, but what our results show is that if that is the case, then there must be other factors at play that are strong enough as to be able to neutralize such effect in most countries.

As we argued at a more theoretical level in the section on the underlying model of the employment structure and its change, we think that the most important of these other factors are institutions.[10] There are two ways in which the results of Figures 1 and 2 support this claim: the obvious association between different patterns of employment growth and European institutional families, and the fact that most of the difference between countries resides in the bottom and to a lesser extent in the middle of the employment structures, with nearly no differences at the top. Let us discuss these two issues with some more detail.

The observed association between the three main patterns of structural change in employment and the usual European institutional families is quite striking, and of course, it can be no coincidence. First, Continental Europe is clearly associated with the polarization pattern: Netherlands, France, Germany, and Belgium are all within the same category in Figure 1, and the exceptions of Luxemburg and Austria are not surprising (Luxemburg is a natural exception, and we have already mentioned that there seem to be some problems with the Austrian data). This development is likely to be related to the process of labor market deregulation that Continental European countries experienced in the 1990s and early 2000s (DiPrete et al., 2006, p. 317).

Figure 3 shows the relative expansion of jobs with nonstandard and standard contracts in the lowest wage quintile: it is immediately obvious that Continental European countries experienced a very significant process of destandardization of their lowest paid jobs, which was absent elsewhere (in Spain, nonstandard contracts also grew, but less so than standard[11]). Second, the three Nordic countries for which we have data (and Luxemburg) experienced a similar process of unambiguous upgrading in their employment structures, with no growth in the bottom two quintiles and a very significant expansion of the top and second quintiles. This seems hardly surprising either: these countries have the strongest unions and the most compressed wage structures in Europe, which makes low-paid jobs comparatively expensive and tends to shift production toward higher value-added activities (Moene & Wallerstein, 1997). It must also be noted that these countries did not experience the same deregulation process of Continental Europe (DiPrete et al., 2006, p. 324), as shows Figure 3. Third, Southern Europe is associated with a pattern of upgrading with a significant expansion of the middle layers of employment. This is probably the result of a different kind of process: the very fast pace of employment expansion that these countries experienced as a result of the creation of the European Monetary Union and their access to unprecedentedly lax financial conditions. The resulting bubble in the construction sector led to an enormous expansion of jobs in the middle quintiles, especially in Spain but also in Greece and Italy (Fernández-Macías & Hurley, 2008, p. 24). Finally, the mild polarization with a very strong upgrading of the United Kingdom and Ireland also seems consistent with the flexibility of their labor markets and the very large expansion of their financial sectors throughout the 90s and early 2000s. It is interesting to note that, according to our figures, there was more polarization in the "rigid" Continental European countries than in the "flexible" Anglosaxons: but of course, this is not so surprising if we put this in the context of the 90s debate on the "euroesclerosis" of Continental Europe (Siebert, 1997) and the subsequent attempt of these countries to deregulate employment to create more jobs at the low end of the labor market.

The fact that most of the differences between countries lie in the bottom quintiles provides further support for the institutional argument. There was a widespread expansion of better jobs, in absolute and relative terms: if there was any pervasive development, it was one of structural upgrading, which means that in fact our results seem more consistent with the original arguments of SBTC than with the "routinization" hypothesis. Most of the differences across countries are to be found in the middle, and especially in the lowest job quality quintiles. In Continental European countries, a process of

deregulation of the employment relationship seemed to boost the expansion of low-quality jobs, whereas the lack of any expansion of those jobs in Scandinavia is likely to be related to its strong unions and their traditional policy of wage compression.

Conclusions

The main goal of this article was to test the hypothesis that, over the last couple of decades, all (or most) European countries experienced a polarization in their job quality structures. According to our analysis, such hypothesis can be rejected. There was no single pattern of change in employment structures across all Europe, but a plurality of patterns for which we proposed a threefold categorization. Four countries (or six being generous) fitted more or less the polarization pattern, other four countries fitted an unambiguously upgrading pattern and a final group of four countries showed an upgrading pattern with a larger expansion of the middle layers of employment (that is, a centripetal development which is the complete opposite to the idea of job polarization). These categories coincide broadly with the usual institutional families of Europe: Continental Europe was associated with polarization, Scandinavia with structural upgrading and Southern Europe with the relative expansion of middling jobs (the United Kingdom and Ireland were somewhere between polarization and upgrading). This coincidence between the observed patterns of employment growth and European institutional clusters provides strong support for the idea that the institutional framework and its change over time is an important determinant in the process of structural change in employment. In particular, we argued that institutions have an important impact on what happens in the lower end of the job quality structure: we provided some evidence showing that the significant expansion of low-paid jobs in Continental Europe is associated with a process of deregulation of employment contracts, whereas the (union-backed) wage compression of Scandinavian countries is plausibly related to the anemic growth of low-paid jobs in those countries throughout the period studied. It is interesting to note that the only pervasive development across Europe concerns the expansion of the highest paid segments of employment.

Although we can confidently reject the most deterministic version of the argument that the current round of technical change produces polarization, we certainly cannot reject it completely. It still seems plausible that technology has some kind of polarizing effect as predicted by the routinization hypothesis: but such effect interacts with other factors[12] shaping labor market developments, generating different outcomes. We have defended that the institutional

framework is one of those factors which can neutralize the polarizing impact of the current round of technological change. Thankfully, there is nothing inevitable in the wider employment and social effects of technological change.

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Notes

1. Goos and Manning, in their 2007 paper, say, "it is important to realize that the occupation part of our definition is much more important than the industry part, as one gets very similar results whether a job is defined by occupation alone or by an occupation-industry interaction" (121). In this article, we will use the combination of occupation and sector for defining the "jobs," partly because there are significant country effects on wages (as Goos and Manning acknowledge as well) and partly because there is no European data source which provides occupation at the three-digit level. In this, we follow the same approach as nearly all papers on this issue.
2. Eurofound's European Working Conditions Survey has a very exhaustive coverage of work and employment conditions (see Parent-Thirion, Fernández-Macías, Hurley, & Vermeylen, 2007) but unfortunately, has a sample which is too small to calculate the average levels of job quality in each job and country (for an attempt at using the European Working Conditions Survey doing all the anal-

ysis exclusively at the EU level, see Hurley, Fernández-Macías, & Muñoz de Bustillo, 2012).

3. This team was composed by Terry Ward, Robert Stehrer, Hermine Vidovic, John Hurley, Branislav Miculic, Donald Storrie, and myself. The main publications of this project are Fernández-Macías and Hurley, 2008; Stehrer, Ward, and Fernández-Macías, 2009.

4. The calculation of the wage rankings across the EU was primarily done by Terry Ward and Robert Stehrer (for more details, see Stehrer and Ward, 2008).

5. The use of the year 2000 rather than 1995 for constructing the quintiles makes no difference for the results, and is preferable because 2000 is closer to the base year of the sources used for the wage rankings and closer to the middle of the period. Using the initial, middle, or final year of the period to construct the quintiles is largely irrelevant: what is important is that they are constructed in such a way that they are comparable and consistent across countries.

6. Apart from these three, other possible sources of inconsistencies between our results and those of Goos et al. (2009) would be errors in the data used or in the analysis of any of the parties. In a recent seminar (Jobs Project Research Seminar, Salamanca, Spain, July 2009), we exchanged data sources and we could both replicate our original results, concluding that the differences are entirely the result of differences in the approach and methodology.

7. If we use country-specific wage estimations for ranking the jobs, it may be that the same job is positioned in different job quality tiers in two countries. However, that is fundamentally correct, because it reflects the fact that the same job can be differently remunerated, have different social status, or involve different employment conditions in different countries (the typical example is nursing, a very good job in some countries and a middling-low job in others, in terms of pay or any other job attribute).

8. A final difference between the work of Goos et al. (2009) and our own is that their unit of analysis is hours worked, whereas ours is persons. In our view, the natural unit of analysis for studying the quality of jobs created over a certain period of time is workers and not hrs (because we are speaking about people and positions, not about time or abstract labor input). Nevertheless, this difference has little impact on the overall results.

9. In Finland and Sweden, the period is 1997-2007; in the Netherlands, it is 1996-2007. In Austria, Finland, Ireland, Portugal, Italy, and the United Kingdom, there was a break in the LFS series by occupations (because of changes in the methodology): in such cases, the year-on-year change affected by the methodology has been eliminated from the trend (for more details, see Fernández-Macías, 2010, p. 133).

10. A very recent paper by Oesch and Rodriguez Menes has very similar findings for a smaller sample of countries (four) and also argues that the underlying factor

behind the plurality of structural employment change is the institutional frame-work (see Oesch and Rodriguez Menes, 2011).

11. Spain suffered a dramatic process of destandardization before 1995 (between 1987 and 1993, one third of employment contracts became fixed term; Fernández-Macías, 2003). However, after 1993, the share of fixed term remained stable or even contracted slightly, as shown in Figure 3.

12. There may be other factors, not explored in this article, that generate diversity across Europe: for instance, in the context of EU integration, sheer market forces can lead to specialization, and therefore an increasing diversity in employment structures (I owe this suggestion to an anonymous reviewer). Yet the clear association between broad patterns of structural change and European country clusters prove that institutions are part of the equation, interacting with technology and probably the effects of economic integration.

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Bio

Enrique Fernández-Macías is a lecturer in sociology at the University of Salamanca, Salamanca, Spain and a research manager in Eurofound, Dublin, Ireland. His research interests include economic sociology, occupational structure and change, and job quality. His recent work has appeared in *Socio-Economic Review* and *European Journal of Industrial Relations*.