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Acta academica karviniensia, 2024 Volume XXIV(1): 5-17
DOI: 10.25142/aak.2024.001

Polarization in the Labour Market or Upgrading? A Review of Explanations of Structural Changes in the Employment and Their Consequences

[Polarizace na trhu práce nebo upgrading? Přehled vysvětlení strukturálních změn v zaměstnanosti a jejich důsledky]

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Abstract: The submitted paper is a literature review responding to the still existing controversy in the literature regarding the net result of structural changes in employment. These are caused by factors affecting labour demand and supply and can take either the form of polarized employment structure or professional upgrading. The objective of the paper is to explain the impacts of these incentives on individual skill groups of workers. These incentives act in mutual interaction and in a given institutional context. The polarized structure of employment can be rather seen in countries, which intensively trade with newly industrialized countries and invest in them then in countries with a lagging pace of growth in the supply of skilled workers, significant inflow of migrants, and finally, countries with more flexible labour markets.

Keywords: employment structure, globalisation, institutions, labour market, skills, technical change.

JEL classification: F16, J21, J23, J51, O33

Introduction

Since the late 1980s, significant changes have occurred in the employment structure of advanced economies. These changes manifest in a declining share of jobs in the secondary sector and a concurrent increase in employment within the service sector. These shifts are closely tied to changes in the qualification structure of employment, a focal point of this paper. The literature shows that technological changes, growth of international trade and deepened internationalization aroused interest in the explanation of the changes in the structure of labour demand. All "traditional" explanations predicted an increase in demand for high-skilled workers and a relative decrease in demand for workers with lower skills. However, a noteworthy trend has emerged since the late 1990s, revealing an increased demand not only for high-skilled workers but also for those at the lower end of the skill distribution. Empirical papers have documented this phenomenon, highlighting a decline in the employment share of workers with middle skills. However, the view of *polarization* of the labour market as a universal phenomenon, which describes changes in the employment structure, is not consensual. This is because different explanations still consider the ongoing professional *upgrading* in the labour market as a basic trend when (consistent with traditional explanations) the demand for high skilled workers is relatively increasing at the expense of workers with middle or low skills.[1] Several questions emerge in this context. Must structural changes in the labour market necessarily be polarizing? Why do empirical findings vary? What mechanisms

[1] This discrepancy is pointed out, for example, by the papers of Oesch and Menés (2011), Berglund et al. (2019), Henning, and Ericsson (2021), Martinák (2020) on the example of V4 countries or Gimpelson and Kapeliushnikov (2023) for Russia.

underlie the main factors causing shifts in the qualification structure of employment? This paper aims to explore the impacts of these factors on specific skill groups of workers and provide a plausible explanation for the diverse nature of structural changes across different countries. A precise interpretation of these changes holds importance for appropriately targeting policies toward the labour market and education system.

The transformation of the employment structure always takes place in the context of the interaction of job demand and supply within a given institutional background. These interactions make it challenging to assess the significance with which individual factors contribute to changes in the employment structure, thereby explaining the ambiguity often observed in the results of empirical papers. Different skill groups of workers can be considered imperfect substitutes in terms of inputs into the production process, and then any relative changes in the supply or demand for these inputs trigger changes in employment and wages. The structure of the paper is as follows: in the first part, potentially important sources of structural changes in the relative demand for specific skill groups of workers will be explained. These stem mainly from ongoing technological changes, advancing globalization, and other incentives (see Table 1 for a summary). In the second part, the influence of factors which affect the structure of the job supply is explained. The third chapter summarizes the impact of labour market institutions on the employment structure.

Table 1: Incentives for changes in the employment structure

Demand factors	**Supply factors**

• New technologies
  ○ *Skill-biased technological change*
  ○ *Routine biased technological change*
• Globalisation
  ○ *Stolper-Samuelson effect*
  ○ Competition of newly industrialized countries
  ○ Offshoring
• Other factors
  ○ Income inequalities
  ○ Economic cycle
	• Educational structure of labour supply
	• Demographic changes
	• Immigration

Impact of institutions	

Source: own processing

1 Demand Factors

(i) New Technologies

A considerable body of literature (for a closer look see Katz and Autor 1999, Acemoglu 2002, Autor et al. 2006) documents significant changes in the wage structure and the increase in wage inequality in the USA and several other OECD countries in the late 1970s. The recent wave of technological changes in the form of the IT revolution is considered one of the key factors contributing to this trend in the development of the wage distribution. In the labour market, this is reflected in an increase in demand for high-skilled workers and a relative growth in their wages. This type of technological change is referred to as *skill-based technological change* (SBTC). The SBTC hypothesis was a predominant explanation for the increase in wage inequality (see Katz and Autor 1999 for more detail). Autor et al. (2003) state that many empirical studies have documented the significant correlation between the use of computer technologies and employing high-skilled workers and this correlation was interpreted as an empirical verification of the SBTC hypothesis. This hypothesis implies that technological change causes qualification *upgrading*, i.e., increasing the ratio of employment in highly

qualified occupations compared to the less qualified ones. However, in this interpretation, there is a lack of explanation of the causation on how specifically the use of computer technology causes the relative growth of demand for skilled workers.

Since the late 1990s, authors have begun to point out that the relative growth of employment in highly qualified occupations is also accompanied by an increase in employment at the opposite end of the qualification distribution. Therefore, the structural changes in the labour market have a polarizing character. The theoretical explanation of this tendency is offered by the RBTC hypothesis (*routine-biased technological change*), first formulated in the paper of Autor et al. (2003).[2] The explanation of the impact of technologies on the demand for different skill groups of workers is much more precise here. The authors describe how the quick spread of computer technologies, followed by a decrease in their real prices, changes the character of tasks performed by workers and subsequently the structure of job demand in terms of qualification and required skills. They argue that (1) computer technologies replace workers in performing a limited, well-defined set of cognitive and manual activities that can be performed based on explicit programmable rules; they started to describe these tasks as *routine* tasks, and (2) computer technologies complement the staff in activities requiring flexibility, creativity in problem solutions, and in complex communication activities, described as *abstract* tasks. These are performed by high-skilled workers in the upper levels of the distribution. The part of non-routine tasks consists of *manual* tasks referred to as unqualified. These jobs are directly influenced by technologies but the influence of technologies in other parts of the economy leads to the growth of jobs within these unqualified occupations (Goos and Manning 2007). To properly understand the consequences of structural changes in employment, it is necessary to take into account the changes in terms of the general balance, when the change affecting the demand for one type of job is turning into changes in demand for other types of jobs.

The nature of the *RBTC* hypothesis is that the key factor determining the substitutability of job tasks by computers and machines is not the skills required for these jobs but the range of routines contained in these tasks. The phenomenon of substituting repetitive tasks with a machine is nothing new; this trend was already the driving force of technological change during the Industrial Revolution. Computerization has simply accelerated this long-lasting trend. Autor et al. (2003) point out that the previous generation of information technologies (*high-tech* capital) has increased the demand for routine tasks based on information processing, resulting in a sharp rise in the clerical professions. Modern computer technologies have allowed mass automatization of tasks within these occupations, and, at the same time, they have increased the demand for tasks based on problem-solving, communication, coordination, and managing the activities of others.

Changes in the employment structure are not equal within the national economy. As stated above, modern technologies substitute routine tasks, and are complementary to high-skilled jobs, within which however, significant regional differences exist. From the studies of Davis and Dingel (2013), Michaels et al. (2013) or Dauth (2014) it follows that the polarizing character of the structural changes is limited mainly to urban areas. Michaels et al. (2013) have monitored higher employment growth in interactive types of occupations within metropolitan areas explained by lower transport costs. Similarly, Davis and Dingel (2013) claim that workers employed in knowledge-intensive professions benefit from agglomeration externalities, making

[2] The employment polarization was further empirically confirmed e.g., in papers of Autor et al. (2006, 2008), Lemieux (2008), Acemoglu and Autor (2010), Autor and Dorn (2013) for the USA, Goos and Manning (2007) for the United Kingdom, Spitz-Oener (2006), Dustmann et al. (2009) for Germany, Green and Sand (2015) for Canada, Adermon and Gustavsson (2015) for Sweden and Michaels et al. (2014) for selected European countries.

them more concentrated in cities. Dauth (2014) has found great disparities in the structural changes in the labour market in Germany, where only half of the local labour markets show the U-shape of the employment distribution according to the qualification level and the wage distribution, while in other markets, the polarization was not present or even the inverse course of structural changes was observed. "Rural" labour markets are therefore, influenced by technological change to a much lesser extent. Another driving force of polarization is the local sectoral structure, since urban areas with export-oriented industries have more polarized labour markets. The papers of Terzidis et al. (2017) focusing on the regional nature of job polarization in the Netherlands, Consoli and Barrioluengo (2016) for Spanish regions, Kaplanis (2007) for the United Kingdom and Autor and Dorn (2013) for the USA come to similar conclusions.

Eventual time delays in the spread of technology and subsequent changes in the employment structure, which can vary between individual countries, pose a specific problem. According to Dustman et al. (2009) and Spitz-Oener (2006), continental European countries experience a delay of one decade in structural changes in the labour market compared to Anglo-Saxon countries. Lower labour costs in some less advanced European countries may limit the potential profit from substituting workers with machines. Additionally, the potential benefits of complementarity between technologies and workers are diminished by relatively low capital stocks, especially when combined with a relatively low supply of high-skilled workers.

(ii) Globalization

Another incentive causing changes in the employment structure is globalization. The increasing intensity of the international trade is connected to globalization. According to the standard theories (*Samuelson-Stolper theorem*, see e. g. Krugman et al. 2018), globalization increases the demand for the production factor with which a given country is equipped more abundantly. Therefore, in advanced countries, internationalization increases the demand for highly-skilled workers and their wage premium at the expense of the demand for workers with lower skills.

In the last few decades, competition from developing countries in *low-tech* and *middle-tech* sectors has been growing, putting pressure on middle-skilled jobs in developed countries. This pressure has been intensified, particularly after China acceded to the WTO in 2001. For instance, Autor et al. (2013) estimate that roughly a quarter of the overall decline in employment in the American industry was caused by import from China. Other papers (Donoso et al. 2014, Dauth et al. 2014, Balsvik et al. 2015) confirm the decline in employment in local labour markets in Spain, Germany and Norway in the production sector under direct competition from China's import. Keller and Utar (2016) find a link between the increase in imports from China and the decline in the number of middle-skilled jobs in Denmark, with the subsequent impact on the strengthened polarization of employment. Their estimates suggest that Chinese import competition explains one-fifth of the overall decline of middle-paid jobs in the Danish labour market. Workers pushed out of the middle-paid jobs from the industry are relocating to a low-paid sector of services or filling more qualified positions with higher wages. This implies that growing competition from China can be an alternative driving force of the polarization in the labour market. Similarly, Breemersch et al. (2012) find that the Chinese import competition has a one-fifth share of the overall decline in employment in manufacturing in advanced countries. The service sector, characterized by generally higher polarization than the manufacturing, secured the higher dynamics of the job creation. Within this sector, pressure from Chinese imports damaged more jobs in areas that were less polarized. Through this channel, deindustrialization and growth of the service sector in the economy contribute to overall higher polarization of the labour market.

Goos et al. (2010) state that in the 80s and 90s, the main point of interest was the transfer of jobs in the industrial sector as a whole to countries with lower labour costs. Later, the attention shifted to *offshoring,* the relocation of entire parts of the production process (usually specific professions in the service sector) to developing countries. The significance of offshoring as an important source of changes within the employment structure is increasing with advancing globalization (see e.g., Blinder 2007, Ottaviano et al. 2012, Autor et al. 2013, Mandelman and Zlate 2016). From this perspective, the most significant factor is currently the "job tasks" trade rather than standard goods trade. As Mandelman and Zlate (2016) state, offshoring impacts job tasks carried out by middle-skilled workers (production line operators, assembly of final products, data processing, and help desk workers). Companies can quickly and at low costs transfer production components, allowing them to hire labour inputs allocated in different countries. This results in a relative decline in the employment of middle-skilled workers at the expense of highly qualified professionals who can only supply their services in the global market space.

Whether these explanations indicate polarization in the employment structure will depend on how the employment of workers with low skills will be affected. On the one hand, these workers are protected against the offshoring wave by performing tasks valuable for consumers only if they are bound to the location of providing (e.g., caretakers, gardeners, social care, child care, etc.). With the growth of the incomes of high-skilled workers, the demand for these type of services is complementarily increasing, which improves the position of domestic workers with a lower qualification. On the other hand, their jobs are threatened by foreign labour immigration (see below).

(iii) Other Forces

A potential source of polarization may also result from the increasing demand for high-skilled workers. The relative increase of their wages increases the costs of leisure time activities, boosting the demand for low-skilled workers. This applies to jobs in the field of catering or personal services (Autor and Dorn 2013, Mazzolari and Ragusa 2013). The increase in demand for workers in the field of social services is significant, mainly in countries most affected by population aging.

The impact of demand factors on changes in the employment structure is mutually connected, as noted by Cozzi and Impullitti (2016). The increasing intensity of competition due to globalization forces companies to introduce technological innovation to be successful in the global market. All this contributes to increasing demands for high-skilled workers and, as stated above, indirectly, to an increase in demand for low-skilled workers.

Structural changes in the labour market may also be accelerated by economic cycles. Jaimovich and Siu (2012) found out that the demise of most middle-skilled jobs takes place during economic downturns. The polarization in the labour market intensified after the Great Recession due to the decline in employment of middle-skilled workers in many cyclically sensitive areas (e.g., construction, automotive). These jobs are not being restored in times of recovery because employers use the recession for a permanent change in production methods. In contrast, high- and low-skilled jobs were restored after the recession, consistent with the increase in output during the upturn, strengthening the polarizing structure of employment. This is consistent with the findings of Pérez et al. (2023). The authors explored employment shifts in eight EU countries (Czech Republic, Germany, Spain, France, Ireland, Italy, Romania and Sweden) in the period 1997-2021. The authors confirmed widespread job upgrading during expansion (1997-2007) and in some cases job polarization in the following period.

2 Supply Factors

While demand factors trigger similar pressure on changes in the employment structure in advanced countries, changes in job supply are more specific. Some literature explaining the causes of the change in the employment structure emphasizes supply factors. For instance, Salvatori (2018) questions the key role of technologies and justifies the crucial importance of the structure of labour supply. Crucial changes are related to the development of the educational attainment of workers and immigration (Goldin and Katz 2007, Salvatori 2018, Montresor 2019). Improving education, in the form of an increased number of graduates with tertiary education allows professional *upgrading* and an increase in the share of high-skilled workers in relation to middle and low-skilled workers. The structural changes in employment should not have a polarizing character, as confirmed by some papers (e.g., Eurofound 2015, Fernández-Marcías 2012).

However, as Autor (2015) or Sparreboom and Tarvid (2016) point out, the supply of educated workers has an upward trend in many countries, yet it is not accompanied by an appropriate growth in the share of high-skilled workers. Thus, there is a qualification discrepancy that manifests itself as overqualification when skilled workers occupy jobs which were initially held by workers with a lower level of education. Sarkar (2017) found out that the level of education is lower in countries where technological change is more *skill-biased* and causes professional *upgrading.* In countries where the technological change is rather *task-biased*, due to the substitutability of routine job tasks by technologies, there is a higher incidence of overeducation. According to Sarkar (2017), a higher incidence of overeducation is observed in low-skilled and non-routine jobs in countries with a polarizing structure of employment, such as the United Kingdom.

The final shape of the structural changes is also influenced by the level of education of workers occupying middle-skilled routine jobs threatened by automation and robotization. When examining the role of job polarization in the relocation of workers in Spain, Sebastian (2018) found that workers with completed secondary education relocated to more qualified jobs, while those with incomplete secondary education occupied less skilled jobs. It seems that supply factors help to shape the resulting character of the structural changes in employment; however, the role of incentives from the demand side is crucial.

Jobs that cannot be offshored, are often occupied by immigrants. The share of jobs requiring lower qualifications can grow in some countries but only thanks to the inflow of workers from abroad. As Mandelman and Zlate (2016) point out, the polarization of the employment structure may not occur if only domestic workers are taken into consideration because their employment is concentrated in more qualified professions. For example, as stated by Dustman et al. (2008), immigrants often occupy jobs which do not match their real qualifications, contributing to the increase of over-qualification.

Although immigration increases employment in the sector of low-skilled jobs, it is not followed by a corresponding wage growth. This raises a question about the relationship between the polarization of the employment structure and wage polarization. A high share of labour immigrants in many economies may explain why the polarization of the employment structure (if it occurs) may not always be accompanied by the polarization in the wage distribution. Even if the studies of Goos and Manning (2007) confirm employment polarization in the UK, it is not accompanied by polarization in wages. Just as unconvincing regarding wage polarization are the results of papers by Antoczyk et al. (2010) and Kamplemann and Rycx (2011) for Germany, or Naticchioni et al. (2014) for the European labour market as a whole.

3 Institutional Factors

The mechanism of demand and supply factors in the labour market depends on both the institutional environment of a given country and its institutional history. In countries where labour market institutions compress the wage structure and reduce wage flexibility, the creation of low-skilled jobs becomes very expensive (Krugman 1994, Scharpf 2000). In particular, this is the case in continental Europe, where labour markets are more rigid than in the USA due to the strong influence of trade unions, more complex legislative protection for employees, and the institute of minimum wage, which fosters wage dispersion and negatively affects the creation of new jobs for low-skilled workers (e.g., see Nickell 1997, Di Nardo et al. 1996). Acemoglu (2001) argues that relatively high minimum wages always increase the costs of low-skilled jobs and motivate companies to invest in the increase of the productivity of workers and creating more middle and high-skilled jobs. Technological change and other demand factors should manifest themselves in stronger polarization tendencies in countries with more flexible labour markets.

Trade unions, through their initiatives, bring about a redistribution of benefits favouring low-skilled workers. However, this approach can limit job opportunities for outsiders, particularly low-skilled workers who may find it challenging to find a job due to the implementation of more egalitarian wage structures (Card 1996). Furthermore, unions advocate for stringent legislative employment protections, further complicating the re-entry of outsiders into the workforce. Nellas and Olivieri (2011) investigate the impact of technological change on wages and employment across different parts of the wage distribution, considering the rigidities caused by trade unions. According to their model, technological change results in (i) a reduction of wages and employment in routine job tasks; (ii) wage and employment growth in abstract tasks, which are complementary to computer technologies; and (iii) mixed results in manual professions depending on the objectives of trade unions. If trade unions protect only the interests of current members (insiders), they found a positive impact on the wages of manual workers and no impact on employment. Conversely, a positive influence on employment and an uncertain impact on wages is observed if trade unions consider the entire supply of all manual workers. According to this model, labour market institutions hinder employment growth in the sector of low-paid jobs due to the higher level of wages for manual workers. The behaviour and strength of trade unions, therefore, determine whether employment polarization or professional *upgrading* can be expected in a given country.

If institutions play a significant role, technological change may lead to unemployment. In this context, unemployment becomes a European alternative to employment polarization. Nellas and Olivieri (2011) assert that the professional upgrading observed in several European countries is caused by a weaker creation of job opportunities due to more rigid institutions. This trend is also related to tendencies in the development of wage inequality and the unemployment rate, which are the two sides of the same coin in advanced countries. The same factors that, for instance, contribute to increasing wage inequality in the USA, where labour market institutions allow the growth of wage dispersions, result in a higher unemployment rate in other countries with more complex systems of social safety nets (e.g., see Messacar 2014).

In their study, the authors Breemersch et al. (2017) do not conclude that labour market institutions contribute to the heterogeneous polarization of European labour markets. Even according to other authors (e.g., Goos et al. 2010), institutional influences are relatively unimportant when explaining polarization in the labour market. Results of empirical studies are not unanimous on this issue, which can be attributed to the way institutional factors are understood. The results are affected by whether institutional changes are considered more as

exogenous shocks (e.g., like changes in the political climate) or if they rather reflect changes in supply and demand (Katz and Autor 1999). Two empirical approaches are being used to evaluate the influence of institutions on employment and wages. The first approach attempts to estimate the impact of institutional factors and explore wage differences using the supply-demand framework. The second one explains relative wage differences and differences in unemployment using the supply-demand framework and attributes observed "anomalies" to institutional factors or unmeasurable changes in demand or supply.

Conclusion

This comprehensive review aimed to present a thorough understanding of the factors contributing to structural changes in employment and highlight incentives that could shape these changes. The objective of this contribution was not to empirically validate described relationships but to leave the room for future research. Discrepancies in findings among various authors might stem from differences in the considered periods, methodological approaches, or the definition of distinct qualification groups (see Holzer 2015). Notably, much of the cited literature employed an occupation-based approach, which may have inherent limitations. For instance, Hunt and Nunn (2022), using a worker-based approach in the context of the USA, reached conclusions inconsistent with employment polarization.

The impact of structural changes in employment on specific skill groups of workers remains a subject of lively academic debate. When evaluating these changes, it is crucial to consider individual incentives on both sides of job demand and supply, as they all contribute to the final result. Demand factors, particularly technological progress, play a primary role. The character of tasks performed by workers determines their complementarity with new technologies. The current nature of technological change implies the polarization of the employment structure, with the employment of middle-skilled workers decreasing due to ongoing automation and digitalization. Forces within globalization, especially competition from China and other developing economies, further contribute to this trend, negatively affecting jobs in middle-skilled occupations. The polarization of the labour market is considered a significant aspect of growing inequalities with corresponding social and political consequences.

The resulting impact on the employment structure also depends on job supply characteristics and institutional factors. If the growth of the skilled workforce supply matches the demand, there will be professional upgrading. However, if educational improvements lag or there is an increase in immigration, the result may be a more polarized employment structure. Inadequate consideration of changes in job supply may contribute to the differing results in the empirical literature, with variations in how middle-skilled jobs are defined (Holzer 2015). Some authors tend to relate middle-skilled jobs to an average wage and the routine nature of work. However, these two categories are not identical, which affects the results in various periods.

Institutional factors, especially in some rich European states with less flexible labour markets, can obscure potential polarization tendencies. Strong trade unions, high legislative protection for employers, a high minimum wage, and a generous social system contribute to a lower generation of low-skilled jobs and an overall higher unemployment rate. The final shape of the employment structure is influenced by these regulatory labour market environments.

The literature overview suggests that a polarized employment structure is not the only possible outcome. Countries facing import competition or significant investments in newly industrialized countries, along with those at risk of offshoring, may tend towards a polarized employment structure. This tendency is more likely in countries with lagging educational

structures, substantial immigration, and flexible labour markets. However, it is essential to understand these conclusions not as rigid rules but as factors with varying importance in different countries and over different time periods.

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