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# IS THE POLISH LABOUR MARKET HEADING TOWARDS POLARISATION?*

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Abstract

The paper discusses the nature of technical change in the Polish labour market, referring to two dominant hypotheses: Skill-Biased Technical Change and Routinisation-Biased Technical Change. The goal of the study is to test the hypothesis of the polarisation of the Polish labour market. The empirical analysis revealed that the Polish labour market does not follow the typical polarisation path identified in developed countries. It appeared that the biggest decline in labour demand has not been observed in the middle of skills/wage distribution. Technical change has led to skills upgrading, however, employment and wages in the group of low-skilled workers have not deteriorated much. Moreover, major changes in the task content of jobs have occurred in Poland. These changes are consistent with patterns of the developed countries with the exception of routine cognitive tasks, for which demand has increased in the last decade. The results of the analysis are ambiguous – shifts in the structure of employment and wages in Poland seem to be stuck between scenarios offered by SBTC and RBTC hypotheses.

## CZY POLSKI RYNEK PRACY ZMIERZA KU POLARYZACJI?

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Słowa kluczowe: zmiana technologiczna faworyzująca wysokie kwalifikacje, postęp techniczny ukierunkowany na rutynizację, polaryzacja rynku pracy.

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Abstrakt

W artykule podjęto problematykę charakteru zmiany technologicznej na polskim rynku pracy, skupiając się na dwóch dominujących obecnie w literaturze przedmiotu koncepcjach: zmiany technologicznej faworyzującej wysokie kwalifikacje (SBTC) i postępu technicznego ukierunkowanego na rutynizację (RBTC). Celem była weryfikacja hipotezy o polaryzacji polskiego rynku pracy. W przedstawionej w artykule analizie empirycznej wykazano, że zmiany na polskim rynku pracy odbiegają od ścieżki polaryzacji charakterystycznej dla krajów rozwiniętych. Okazuje się bowiem, że największy spadek popytu na pracę nie wystąpił w grupach zawodów zlokalizowanych w środkowej części rozkładu kwalifikacji/płac. Zmiana technologiczna spowodowała ogólny wzrost zapotrzebowania na wysokie kwalifikacje, jednocześnie zatrudnienie i płace w grupie pracowników o niskich kwalifikacjach istotnie się nie pogorszyły. Doszło również do znacznych zmian w strukturze zadań wykonywanych na poszczególnych stanowiskach pracy. Kierunek tych zmian jest podobny do trendów zidentyfikowanych w krajach rozwiniętych, z wyjątkiem popytu na rutynowe zadania kognitywne, na które w Polsce w ciągu ostatniej dekady zapotrzebowanie wzrosło. Wyniki analizy są niejednoznaczne – zmiany w strukturze zatrudnienia i wynagrodzeń w Polsce lokują się między scenariuszami wynikającymi z hipotez SBTC i RBTC.

## Introduction

Labour markets in the developed economies have recently witnessed profound changes in occupational structure and wage distribution, manifested by growing disparities between skilled and unskilled workers. The conceptual model to explain these changes is usually based on the supply-demand-institution approach proposed by FREEMAN and KATZ (1994), and KATZ and AUTOR (1999). The supply-side drivers include changes in educational attainment, training schemes, skill obsolescence and migrations. The institutional setting usually encompasses unionization, minim wage regulations and flexibility of the labour market. Finally, demand-driven factors are related to technological changes and international trade. While the impact of supply-side and institutional factors is prevalent in the short to medium run, there is a consensus that technology is a main driver of occupational change in the long run. However, both theory and empirical studies have not yet provided a clear answer to the question concerning the direction of this change. Two points of view are dominant: skill upgrading and labour market polarisation. They are described theoretically by two hypotheses: Skill-biased Technical Change (SBTC) and Routinisation-Biased Technical Change (RBTC).

Both hypotheses have been tested extensively in the developed countries, while studies on SBTC/RBTC in emerging economies, e.g. Poland, are rather scarce. We may assume that the Polish labour market may experience an upgrading or polarisation processes with some delay, as Poland is lagging behind developed economies in terms of technological advancements (which are clearly noticeable by various measures of an information society)[1]. The paper refers

[1] Short-run deviations from the common trend may be explained by institutional differences between countries, while in the long-run we may expect convergence in technology leading to convergence in occupational trends.

to this issue – the main focus is put on technical change as the key driver of occupational shifts. The main goal of this study is to test the hypothesis of the polarisation of the Polish labour market. If the Polish labour market exhibits a typical trend of polarisation, we shall see a U-shaped pattern of changes in the occupational structure – with growing employment at both ends of the skills/wages distribution and shrinking employment in the medium-skilled occupations. The analysis is of a descriptive nature and is based on Labour Force Survey employment data, data on wages from the Survey on Structure of Earnings by Occupations data, and employment data available in the forecasting tool at www.prognozowaniezatrudnienia.pl.

## Labour market polarisation – synthetic literature review

The most popular explanation of ICT-driven occupational changes is based on SBTC and RBTC hypotheses. SBTC argues that technical progress favours highly qualified labour and substitutes low-skilled workers. For many years it seemed the SBTC hypothesis was a good explanation for growing wage inequalities between skilled and low-skilled labour in the situation of long-lasting increases in the demand for skilled workers[2]. Although the SBTC hypothesis focused mainly on skilled labour, the endogenous/directed SBTC hypothesis was convincing enough to explain even past technology-driven labour market developments favouring low-skilled labour (ACEMOGLU 2002)[3]. However, as WICKHAM (2011) argues, even nowadays in developed countries we may see an expansion of low-skilled manufacturing, which would lead to technological regression instead of progress. His argument is based on the observation that the companies' choice of technology is determined not only by the availability of the technology itself, but also by the supply of the labour force. When the low-skilled and relatively cheap labour force is in abundance, companies may switch to "simpler" technologies, and thus reduce the pressure on new technological innovations. This process may be strengthened by the inflow of low-skilled migrants[4], who

[2] For empirical findings confirming SBTC in developed countries (mainly in the U.S.) (see: ACEMOGLU 2002, BLANKENAU, CASSOU 2011, CARD, DINARDO 2002). However, RICHTER (2014) showed that if the assumption of equal capital shares (in the two-sector model) is removed, increase in the skill premium in the U.S. may be explained by reallocation of capital and neutral or unskilled-biased technical change, instead of SBTC hypothesis.

[3] Acemoglu used endogenous SBTC hypothesis to explain changes in labour demand that took place in the Great Britain in 19th century, and was triggered by the industrial revolution that favoured low-skilled labour. However, GOOS and MANNING (2007) argued that SBTC hypothesis explains changes taking place only in the upper end of the wage distribution, while it is not capable to predict changes in the lower end.

[4] This hypothesis was tested by OESCH and RODRIGUEZ MENES (2010), who showed that in case of Great Britain and Spain occupational change and wage distribution was influenced to some extent by inflow of low-skilled immigrants, who filled the jobs in the lower tail of occupational/wage distribution.

would fill the "lousy" jobs[5] – a term coined by GOOS and MANNING (2007), who showed polarisation of the labour market towards lovely (in the upper end of skill distribution) and lousy (in the lower end of skill distribution) jobs in Great Britain. However, OESCH (2014) argued that even if we take into account the fact that Britain and, to a smaller extent, Switzerland recorded job losses in the medium part of occupational distribution (which may point to possible polarisation) between 1989 and 2008, the occupational structure in these countries (as well as in Denmark, Germany and Spain) did not polarise but rather upgraded.

Recently, the RBTC hypothesis has gained momentum. It refers to the seminal work of AUTOR et al. (2003), who argued ICT capital substitutes routine tasks and complements non-routine tasks (the so-called ALM hypothesis). Thus, the RBTC approach shifted the attention from skills to the tasks (routine vs. non-routine) performed by the workers. As routine tasks tend to be concentrated in the middle of the skills distribution (covering mainly clerical and manufacturing/assembly line jobs), we shall see a relatively high share of high- and low-paid jobs (high-skilled and elementary jobs) and the polarisation of the labour market.

AUTOR and DORN (2013) argued labour market polarisation may be driven by two factors: consumer preferences and biased technological change. In this approach, falling prices of ICT cause a complementary effect between ICT and non-routine abstract tasks performed by highly qualified workers, a substitution effect between ICT and low-skilled workers performing routine tasks in the production of goods, and an ambiguous effect as for the low-skilled service jobs which rely on manual tasks. As wages for low-skilled workers performing routine tasks fall relatively to these low-skilled workers performing manuals tasks, low-skilled labour flows from the production to the service sector, while high-skilled professionals remain in the production sector[6]. ACCETTURO et al. (2014) showed that polarisation explains the urban effects of computerisation – demand for a highly qualified workforce performing managerial and professional jobs in cities tends to grow, at the same time this growing "professional" class creates demand for services provided by low-skilled workers. This leads to the emergence of "fat tails" in the upper and lower ends of the skill distribution. TUZEMEN and WILLIS (2013) argued that polarisation processes tended to accelerate during recessions (at least in the U.S.), and the response of the labour force to these changes is determined by gender and age. The increasing complexity of tasks within occupations in West Germany, especially the growing importance of non-routine cognitive tasks, and the decline of demand for manual and cognitive routine tasks was revealed by SPITZ-OENER (2006). The rising demand for high skills was recorded mostly within occupations

[5] In general, Wickham's argument is consistent with endogenous SBTC hypothesis.

[6] AUTOR and DORN (2013) argue this model explains developments on the U.S. labour market in 1980–2005, when the growth of share of hours worked by non-college workers in the service occupations coincided with high increase of real wages in these jobs, which exceeded significantly wage growth in other low-skilled occupations. Similar results were reported by MANDELMAN (2013).

affected to a large extent by the development of ICT, and at the lower end of the skill distribution, while a significant fall in employment was identified in the third decile of skill distribution (encompassing such occupations as office clerks or machine operators). GREEN and SAND (2015) showed that the Canadian labour market followed the pattern of the U.S. and European (mainly UK) labour markets in terms of employment structure, revealing the polarisation. However, they argued that while technical progress may explain changes in the middle and upper end of the skill distribution in Canada, other factors – e.g. the upward supply shift – drove changes in the lower-end-jobs. ASPLUND et al. (2011) tested the RBTC hypothesis in the Nordic countries (Finland, Norway and Sweden), arguing these countries moved from the SBTC to the RBTC, or even to a combination of these two phenomena, and this process was not hampered by compressed wage structures, typical of the Nordic countries.

## Different dimensions of structural change in the Polish labour market

There is no doubt that development of Information and Communication Technologies[7], along with other drivers (globalisation and offshoring processes, migrations, changes in the institutional milieu) has played an important role in the processes of occupational change in Poland.

## Employment structure and demand for skills

A popular approach of analysing the employment structure by skill level is based on the methodology proposed by the International Labour Organisation. This methodology defines four skill levels within the ISCO-08 classification (these levels are linked to major occupational groups[8]), consistent with respective levels of educational attainment (ISCED-2011 classification). If we aggregate occupational Polish data (historical as well as forecasted) according to the ILO approach, we shall notice that employment in the occupations at skill level 1

[7] In 2004–2016 the average growth of ICT-capital in Poland amounted to 14.0% (compared to 11.5% in the EU-15), and the contribution of ICT-capital to economic growth was estimated at 0.45p.p. (compared to 0.36 p.p. in the EU-15).

[8] According to the ILO (2012) methodology, the first skill level includes "Elementary Occupations" (9); the second skill level: "Clerical Support Workers" (4), "Service and Sales Workers" (5), "Skilled Agricultural, Forestry and Fishery Workers" (6), "Craft and Related Trades Workers" (7), and "Plant Machine Operators, and Assemblers" (8); the third skill level: "Technicians and Associate Professionals" (3) and "Hospitality, Retail and Other Services Managers" (14); while the fourth skill level encompasses "Professionals" (2) and "Managers" (1), excluding "Hospitality, Retail and Other Services Managers" (14). The major group "Armed Forces Occupations" was excluded from the analysis.

has been relatively stable – it declined by 1% between 1995 and 2015, and this stance should be maintained until 2022. The number of people working in occupations classified at skill level 2 has dropped significantly (by 8.8% in 1995–2015, and according to the forecast by 13.7% in 1995–2022). At the same time employment has risen in occupations at skill level 3, and especially at skill level 4 (between 1995 and 2015 by 26.2% and 73.9% respectively). Moreover, it is forecasted that employment at the 4 skill level will continuously grow until 2022 – it is going to be two times higher in 2022 compared with 1995. It should also be noted that during the last economic slowdown in Poland (2008–2012/13), employment decreased in this period, except at the 4th skill level. This points to the fact that even during an unfavourable economic situation, demand for highly skilled employees is stable, or growing.

This analysis shows that the employment structure has been biased towards the skilled labour force – the growing share of employees at the 3rd and 4th skill level has coincided with a falling share of people performing medium-skilled jobs, while the drop in the share of elementary jobs accounted for only 0.7 percentage points (Fig. 1).

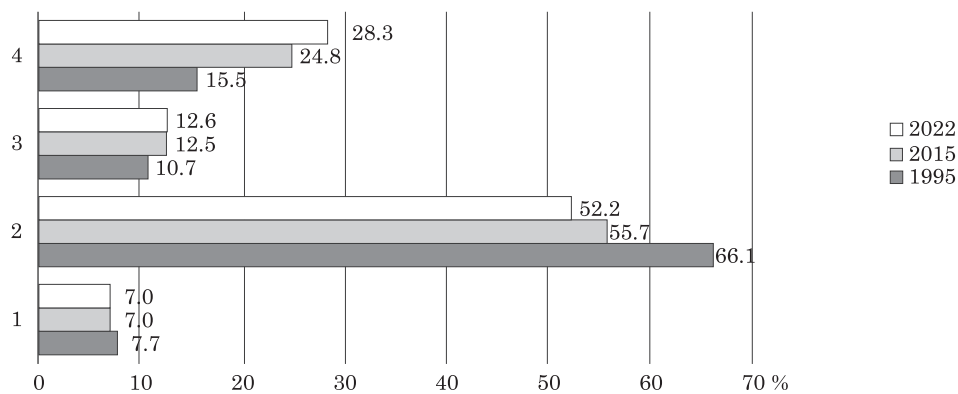


Fig. 1. Employment structure by skill levels in Poland in 1995, 2015 and 2022 (historical data for 1995 and 2015, forecast for 2022)

Source: own elaboration based on data retrieved from Prognozowanie zatrudnienia (online, http://np.prognozowaniezatrudnienia.pl/).

These patterns provide rather ambiguous conclusions as to the nature of occupational change in the Polish labour market. It is evident that demand is growing at the high end of the skill distribution and decreasing in the medium-skill jobs, while employment decline at the low end of the skill distribution is rather negligible.

## Task content of jobs

An analysis of the task content of jobs, usually used to test the polarisation hypothesis, also does not bring a clear picture. In a recent study HARDY et al. (2016) combined methodology presented by ACEMOGLU and AUTOR (2011) with EU-LFS and O-NET data to analyse the evolution of the task content of jobs in Central and Eastern European countries[9]. Interestingly, their results revealed that in six CEE countries (including Poland[10]) demand for routine cognitive tasks has been growing, especially since 2006, as a joint effect of changes in the employment structure (between-occupation effect) and changes in task content intensities over time (within-occupation effect). Research studies which analyse the task content of jobs in developed economies provide opposite results (see e.g. AUTOR and PRICE (2013)). The reasons why the Polish labour market has not followed a typical polarisation path in terms of changes in the task content of jobs may be attributed to both demand and supply-driven factors.

Explanations related to the demand-side factors focus mainly on the structural change triggered by the transition from a centrally-planned economy to a market economy. A relatively high share of workers and farmers, and a low share of clerical jobs in the employment structure in Poland, caused technical progress displacing routine cognitive tasks to only have a limited impact on changes in employment by occupation (*Zatrudnienie w Polsce* 2013… 2014). The sectoral structure of employment seems to be of great importance in this case. HARDY et al. (2016) revealed that CEE countries which recorded a high share of employment in agriculture at the beginning of the 1990s, and then witnessed a substantial decline of this share, experienced higher increases in demand for routine cognitive tasks.

However, it should be emphasised that demand-side drivers are related to a large extent to Poland's accession to the European Union in 2004. Becoming a part of the European Single Market and taking advantage of the free movement of goods, capital, services and labour has helped to reduce excess labour in a period of relatively high unemployment though increased migration flows, but at the same time it has created some tensions in the Polish labour market[11]. Membership in the EU has enhanced GDP growth in Poland in recent years and played an important role in the stabilisation of the Polish economy during

[9] The analysis covered the 10 CEE countries: Czech Republic, Croatia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia.

[10] For detailed analysis of changes in the task content of jobs in Poland between 1996 and 2014 see HARDY et al. (2015).

[11] Significant migration flows of Polish labour within the European Union (especially to Great Britain) after accession, which has been estimated at ca. 2 million people, has had a positive effect on unemployment in the macro scale, however it has also led to labour supply shortages in some segments of the labour market (e.g. construction workers, healthcare specialist, bus and lorry drivers).

the last world economic crisis[12]. As a result of greater openness in the Polish economy to EU partners, Poland has become one of the top destinations for offshoring business in the CEE region (KEARNEY 2016). There is a wide range of offshoring centres in Poland – relatively small centres focus on low complexity services (Olsztyn, Lublin, Bydgoszcz, Szczecin, Tricity), while the consolidated and maturing ones (Warsaw, Krakow, Wroclaw, Lodz, Katowice) provide mid to high complex services[13]. Still, many tasks performed by employees (clerical jobs) in 1st–4th generation offshoring centres are of a routine cognitive nature.

Upskilling and the age structure of the labour force are two dominant supply-side factors influencing the distribution of task content of jobs. The massification of higher education, since the early 1990s, has led to a dynamic growth of labour force competences (at least formally), and resulted in a decreasing share of employees with primary education and an increasing share of university graduates in the employment structure. As more educated employees usually perform jobs with a lower intensity of routine tasks, upskilling in Poland (and other CEE countries) "compressed routine cognitive tasks" (HARDY et al. 2016). On the other hand, jobs which are routine-intensive are ageing faster than non-routine intensive – younger employees have switched to more intensive non-routine cognitive tasks much faster than older workers (LEWANDOWSKI et al. 2017). This "accumulation" of routine cognitive tasks in older age groups may cause challenges in the coming years, as technical change will arguably move on, and routine jobs will be more and more substituted by these non-routine intensive jobs.

## Wages

Technical change will also manifest in changes in wages and wage structure. Representative data on wages in Poland, collected by the Polish Central Statistical Office within the Survey on the Structure of Earnings by Occupation, shows that the highest growth of real wages was recorded in high-skilled occupations at the 3rd and 4th skill level – Technicians and Associate Professionals (by 43.6%), Professionals (by 40.2%), and Managers (by 33.7%) (see Tab. 1), as well as in the Elementary Occupations (by 37%), which are at the low end of the skills distribution. At the same time, the growth of real wages in occupations grouped within the 2nd skill level was rather modest (29% on average), ranging from 26.5% in Service and Sales Worker occupations, to 31.9% in the case of Craft and Related Trade Workers.

[12] Despite this economic success, Poland and other CEE countries are still on the EU periphery, maintaining their initial position as low-price suppliers, and building their competitive advantage mainly on relative low labour costs (GHINARARU 2017).

[13] Warsaw and Krakow was classified as 6th generation offshoring centres, Wroclaw as 5th generation, Lodz and Katowice as 4th generation, and Olsztyn, Lublin, Bydgoszcz, Szczecin, Tricity as 1–3rd generation centres.

Table 1

Average monthly gross earnings by major occupational groups in October (constant prices 1999)

| Major occupational group/ Year | Managers (1) | Professionals (2) | Technicians and Associate Professionals (3) | Clerical Support Workers (4) | Services and Sales Workers (5) | Skilled Agricultural, Forestry and Fishery Workers (6) | Craft and Related Trades Workers (7) | Plant and Machine Operators, and Assemblers (8) | Elementary Occupations (9) |
|---|---|---|---|---|---|---|---|---|---|
| 1999 | 3,975.0 | 2,293.5 | 1,831.4 | 1,635.5 | 1,217.7 | 1,283.8 | 1,585.7 | 1,673.6 | 1,110.6 |
| 2001 | 4,216.9 | 2,470.1 | 1,933.4 | 1,710.3 | 1,270.4 | 1,244.6 | 1,631.2 | 1,706.1 | 1,127.9 |
| 2002 | 4,386.2 | 2,511.2 | 1,922.7 | 1,683.4 | 1,139.2 | 1,258.5 | 1,579.8 | 1,675.6 | 1,102.7 |
| 2004 | 4,439.5 | 2,575.5 | 1,897.0 | 1,636.7 | 1,102.5 | 1,307.8 | 1,494.4 | 1,622.0 | 1,095.5 |
| 2006 | 4,646.9 | 2,604.7 | 2,198.8 | 1,702.8 | 1,162.3 | 1,398.7 | 1,710.4 | 1,748.9 | 1,197.2 |
| 2008 | 5,308.2 | 2,925.7 | 2,457.0 | 1,995.1 | 1,365.4 | 1,455.5 | 1,965.8 | 2,001.5 | 1,394.0 |
| 2010 | 5,085.0 | 2,996.2 | 2,529.2 | 2,062.5 | 1,459.1 | 1,525.6 | 1,919.7 | 2,081.6 | 1,436.2 |
| 2012 | 5,213.0 | 3,054.3 | 2,489.5 | 2,046.8 | 1,451.2 | 1,684.6 | 1,989.9 | 2,069.9 | 1,434.8 |
| 2014 | 5,315.9 | 3,215.3 | 2,630.2 | 2,079.5 | 1,540.4 | 1,689.3 | 2,090.8 | 2,143.9 | 1,521.1 |
| Change 1999–2014 (in %) | 33.7 | 40.2 | 43.6 | 27.2 | 26.5 | 31.6 | 31.9 | 28.1 | 37.0 |

Source: own elaboration based on Structure of Wages and Salaries data.

We may say, from this brief analysis, that changes in real wages in Poland seem to follow the U-shaped pattern – high dynamics were recorded at both ends of the skill distribution, while medium-skilled jobs witnessed relatively low wage increases. Such distribution of wage growth is in line with the RBTC hypothesis, and may support the argument that the Polish labour market is heading towards polarisation.

## Labour market polarisation – an integrated approach

To test the hypothesis of polarisation of the Polish labour market, data on employment and wages was combined in line with the methodology presented by Oesch (2014). Individual Labour Force Survey data on employment (1995–2014 period) was linked to individual data from the 2014 wave of the Survey on Structure of Earnings by Occupations at the 3-digit code level (minor occupational ISCO-08 groups). Data was sorted from low to high-wage minor occupational groups, and then quintile ranking was developed for the employment structure

in 1995, and treated as a point of reference. The first quintile was dominated by Elementary Occupations and Services and Sales Workers. The second quintile covered mostly Skilled Agricultural, Forestry and Fishery Workers, and Elementary Occupations. The third quintile encompassed mainly occupations classified within ILO's 2nd skill level, however there were also such occupations as Nursing and midwifery professionals, Medical and pharmaceutical technicians, Other health associate professionals, Legal, social and religious associate professionals, Sports and fitness workers, and Artistic, cultural and culinary associate professionals, which are classified within, respectively, the 4th and 3rd ILO skill level groups. This means that some jobs requiring a high level of qualifications fall into the medium range of the wage distribution. The fourth quintile covered a mix of occupations from almost all occupational groups (excluding Elementary Occupations, Services and Sales Workers, and Skilled Agricultural, Forestry and Fishery Workers), and was dominated by Professionals and Technicians and Associate Professionals. Finally, in the fifth, highly-paid quintile, we found mainly Managers, Professionals, some minor occupational groups from the "Technicians and Associate Professionals" major group, but also Mining and Mineral Processing Plant Operators, and Locomotive engine drivers and related workers (the major group "Plant and Machine Operators, and Assemblers").

In the next step, the 1995 quintile-reference employment structure was applied to the dataset covering the years 1995–2014. Thus, it was possible to study occupational changes controlled by wages. The analysis revealed, that employment in Poland is biased towards higher-paid occupations (8.0% employment growth in the fifth quintile), however also in the third quintile (medium-paid occupations) employment growth was noticeable (4.9%). Employment in the first and fourth quintile fell by, respectively, 0.8 and 2.7%, while the second quintile witnessed

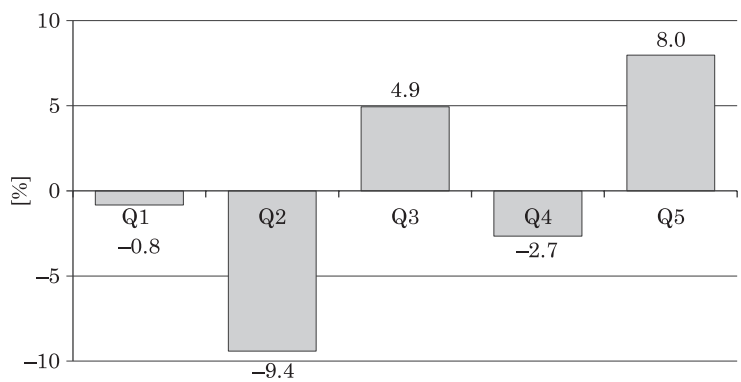


Fig. 2. Change in the quintile share of total employment between 1995 and 2014 (in %) – Scenario 1

Source: own elaboration.

significant employment downsizing (Fig. 2). This picture is surely not in line with the U-shaped pattern suggested within the standard RBTC hypothesis of labour market polarisation. It is also not consistent with the SBTC hypothesis, especially because of the growing demand for employees in the third quintile, and falling demand in the fourth quintile.

These inconsistences may be attributed to a relatively high intensity of routine cognitive tasks in the Polish economy, pointed out by HARDY et al. (2015, 2016), and other possible explanations such as supply and demand-driven factors influencing changes in the distribution of task content in Poland, already presented in the paper. However, having in mind that countries which have had a relatively high share of employment in agriculture at the beginning of the economic transition experienced a higher growth of demand for routine cognitive tasks, it was decided to test whether results would be different if agricultural workers would be excluded from the analysis. When the major occupational group Skilled Agricultural, Forestry and Fishery Workers was extracted from the database, the entire procedure was replicated, bringing "Scenario 2" results (Fig. 3).

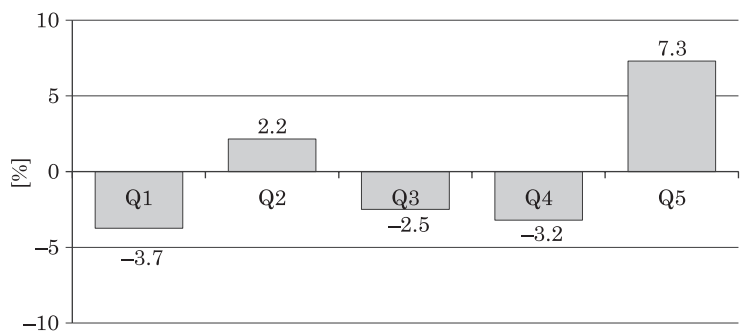


Fig. 3. Change in the quintile share of employment between 1995 and 2014 (in %) – Scenario 2 (excluding agricultural workers)

Source: own elaboration.

Even though this scenario portrays a much different picture, especially in the middle of the skill/wage distribution, still, this pattern is consistent with neither the RBTC nor the SBTC hypotheses. Employment decline in the third quintile was higher than in the fourth one, which means that even in Scenario 2 the demand for routine cognitive tasks is relatively high (these tasks are usually concentrated in the 3rd quintile) while non-routine tasks are performed mainly by highly qualified and highly paid employees from the fifth quintile. It also seems that the "professional" class in Poland is not yet wealthy enough to generate demand for services provided by low-skilled workers, sufficient to trigger employment growth in the first quintile, as ACCETTURO et al. (2014) suggested in their model.

## Conclusions

Noticeable shifts in employment structure have occurred in Poland within the last two decades. These shifts were driven, to a large extent, by technical progress embodied in more productive utilisation of Information and Communication Technologies. Technical change in the Polish labour market has led to skills upgrading – labour demand shifted towards highly skilled workers. This process has been enhanced by a massive educational upgrading in Poland taking place since the beginning of the transition period. At the same time, employment and wages in the group of low-skilled people have not deteriorated much.

In the last 20 years major changes in the task content of jobs has taken place in Poland, following to a large extent the patterns of higher developed countries. HARDY et al. (2015, 2016) reported an increasing intensity of non-routine and routine cognitive tasks, as well as a declining intensity of routine and non-routine manual tasks. The only, but important difference between Poland and developed economies is related to routine cognitive skills, for which demand has increased in Poland during the last decade. Moreover, a perceptible growth in labour demand has been observed in the third quintile of occupational-wage distribution (in the Scenario 1). Interestingly, this quintile includes many occupational groups which require relatively high formal qualifications. This shows that a high level of skills is not always linked to high wages, as theory predicts. Even in the Scenario 2, in which agricultural workers are excluded from the analysis, the revealed trend does not portray a U-shaped pattern.

These observations do not provide a clear answer to the question on the nature of technical change in the Polish labour market. The results of the analysis presented in the paper are ambiguous with regards to both hypotheses: Skill-Biased Technical Change and Routinisation-Biased Technical Change. As VIVARELLI (2014) noted, changes in the structure of employment and wages coinciding with the SBTC hypothesis were "transferred" from developed economies to middle income countries, while low-income countries (e.g. Poland), due to lower absorption capacity may not yet have experienced a technical change that favours high skills. Following this line of argumentation, we can potentially expect an acceleration of the polarisation processes in the Polish labour market. Forthcoming shifts may drive down the role of medium-skilled jobs, with growing demand at both ends of the skill and wage distribution, which would lead to a standard U-shaped pattern of occupational change. With a relatively high intensity of routine cognitive tasks in the job distribution, Poland is vulnerable to RBTC and polarisation in the coming years. However, AUTOR (2015) predicts that the labour market polarisation should not continue in the future. His prediction is based on the assumption that many jobs in the middle of the skill distribution require a wide mix of skills to maintain the quality of service provided, thus they are not susceptible to automation. Even the jobs that are mainly routine-based contain many non-routine tasks in which a human being

is still performing better than a machine. As a result we shall see a growth of demand for "new middle skill jobs" instead of increasing polarisation, which seems to be the case in the Polish labour market. There is no doubt this issue requires further thorough elaboration.

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