# Structural changes and wage inequality in the Bulgarian economy

Svilena MIHAYLOVA[*], Silviya BRATOEVA-MANOLEVA[**]

**Abstract**

*In light of the growing concern about the economic and social costs of high income inequality, the paper analyses wage inequality in Bulgaria in the context of the structural changes taking place in the economy. For this purpose, we first estimate wage inequality in the country over the period 2000-2016 by using the inequality decomposition method proposed by Pyatt, Chen and Fei (1980). Then, we analyse the differences in wages depending on economic activity, region and educational attainment. The results show that wages are the most significant source of income inequality in Bulgaria and that their contribution to overall inequality increases significantly during the analysed period. Furthermore, the growing role of the service sector at the expense of agriculture and industry is associated with increasing wage differences across economic sectors, regions and levels of education, which together shape the magnitude and the dynamics of wage inequality.*

*Keywords:* wage inequality, structural change, deindustrialization

## Introduction

Rising income disparities within many advanced and developing countries have become one of the most debated issues among policy makers and researchers in the years following the last global economic crisis. Some authors regard widening inequality as one of the principal causes of the crisis (Wade, 2009; Rajan, 2010), others focus on the recent changes in income inequality and its determinants (Jenkins *et al*., 2013; Alvaredo *et al*., 2017) and another group of studies aims at proposing measures in order to prevent growing income disparities (Atkinson, 2015; Stiglitz, 2015). The widespread concern about the social and economic costs of high income inequality has also revived the interest in the long-run relationship between income

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distribution and the structural changes accompanying economic growth, which is at the core of the well-known hypothesis of Kuznets (1955).

Growing income inequality has been a marked feature of the development of post socialist countries in Central and Eastern Europe (CEE) during their transition from centrally planned to market economies. This trend has been taking place against the backdrop of profound structural changes, namely deindustrialization and the increasing role of the service sector in the economy. With regard to these processes, Bulgaria stands out as the country which experienced one of the steepest declines in the share of industry during the first years of transition and which has one of the most uneven income distributions in the region at the same time (according to Eurostat, in 2016 Bulgaria had the largest Gini coefficient in the European Union). Taking this into account, the paper aims at exploring wage inequality as one of the drivers of overall income inequality in the context of the structural changes in the economy of Bulgaria. For this purpose, we first estimate wage inequality by using the inequality decomposition method proposed by Pyatt e*t al*. (1980) and then, we analyse the differences in wages and employment depending on the economic activity, region and educational attainment.

The rest of the paper is organized as follows: section 1 provides a brief theoretical background on the relationship between inequality and economic development. Section 2 summarizes the structural changes in the Bulgarian economy and its implications for wage inequality. Section 3 presents the methodology used. Section 4 discusses the empirical results and the last section concludes.

## 1. Distributional effects of structural changes: theoretical background

The evolution of income distribution along the course of economic development has spurred the interest of researchers for a long time. A central place in the literature on this topic is occupied by the seminal contribution of Kuznets (1955), who was the first to use formidable statistical apparatus in exploring income inequality. Using available data from the industrialization period for the United States, England and Germany, Kuznets formulated the idea that inequality follows an inverted "U" shape as it rises and then falls again with the increase of income per-capita. According to Kuznets, the explanation for this dynamics of income inequality lies in the process of structural transformation - from agricultural-based economy to one dominated by the industrial sector. In the earlier stages of industrialization, when resources flow from the traditional (rural/agricultural) sector, characterized by lower incomes and narrower inequality, to the more highly paid modern (urban/industrial) sector, pronounced urban income inequalities sharpen the countrywide income inequality. However, the rise over time in the relative weight of the industrial sector eventually leads to a decrease in overall inequality. The latter is explained by the interplay of a variety of forces: first, as economic development proceeds, the sectoral shift enables more individuals to benefit from the opportunities of the relatively rich

industrial sector; second, the resulting reduction in the labour supply in agriculture leads to an increase in the relative wage rate in the rural sector; third, when a certain level of the average income is reached, the processes associated with industrialization, such as democratization and the development of a welfare state, allow for the trickle-down of the benefits from growth and thus, inequality declines.

Despite the great influence that the Kuznets hypothesis enjoyed in the 1980s and 1990s, in trying to test its validity, the existing empirical studies produce mixed results.[1] Furthermore, the sustained rise in income inequality that started in the late 1970s in practically all developed countries contradicts Kuznets's prediction of low inequality in rich nations, which is why his theory gradually fell out of favour. In his book, "Capital in the 21st century" (2014), Piketty argues that the empirical underpinnings of the Kuznets theory are extremely fragile. According to him, the sharp decline in income inequality observed in almost all rich countries between 1914 and 1945 was not due to the natural process of inter-sectoral mobility described by Kuznets. It was, instead, mainly a result of the world wars and the violent economic and political shocks they entailed.

In another recent contribution, "Global inequality: a new approach for the age of globalization" (2016), one of the world's leading economists of income distribution – Milanovic - takes a different approach and instead of dismissing the Kuznets hypothesis, he builds on it. Milanovic views the level of inequality as a series of waves rather than a single curve, which he refers to as the "Kuznets waves". According to him, the beginning of the first Kuznets wave is marked by a structural change (transition from agriculture to industry) and urbanization, which, as proposed by Kuznets, increased inequality starting from the time of the Industrial Revolution to a peak in the rich countries, which occurred at the end of the nineteenth century or the beginning of the twentieth. After that point, inequality started to decline due to the interplay of benign forces (increase in the supply of more educated labour and in the demand for redistribution and decrease in the return on capital) and malign forces (World War I). The second wave, which Milanovic believes advanced countries are currently on, starts in the 1980s and the upswing in inequality is driven by the remarkable progress in information technology, inter-sectoral reallocation of labour, globalization, and pro-rich policies. However, in contrast to the first wave, the structural change that increases inequality in the second wave is the transition from the more homogenous manufacturing into services, where jobs are skill-heterogeneous – some use less-qualified and rather poorly paid labour but others, as in finance, use skilled labour and are extremely highly paid.

[1] As noted by Jovanovic (2015), early cross-country studies generally support the hypothesis, but this is entirely due to the Latin American countries, which happen to be middle-income and have high inequality for historical reasons. Panel studies, which control for fixed effects in general, refute the hypothesis while time-series studies focusing on specific countries find that it holds only sometimes.

Structural change has been recognized as a driver of income inequality in some of the cross-country empirical studies on transition economies, where economic liberalization led to profound sectoral shifts in employment and output (Ivaschenko, 2002; Bhandari, 2007; Franco and Gerussi, 2013). They suggest that the diminishing importance of industry and the substantial expansion of the service sector, which is typically characterized by higher wage differentials, is one of the key factors behind the rise in income inequality in post socialist economies. The next section describes briefly the changes in the sectoral composition of the Bulgarian economy and their implications for wage inequality.

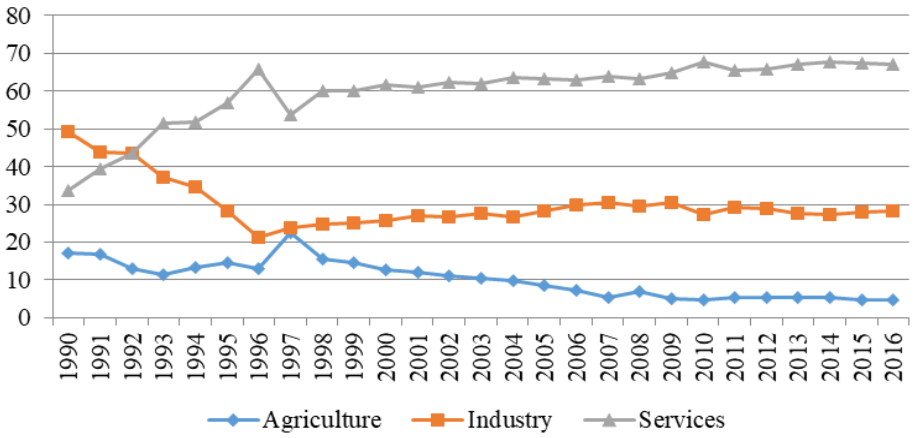
## 2. Structural changes in the Bulgarian economy and their implications for wage inequality

The trend for deindustrialization and dominance of the service sector, which started in the 1990s in the Bulgarian economy, is also common for the other CEE countries. As key drivers of deindustrialization in the first decade of market transition in these countries, several authors point out the following: excessive industrialization in the pre-transition period, economic and political disintegration, slow restructuring of enterprises, late integration in regional, European and global economic and political associations etc. (Landesmann, 2005; Damiani and Uvalić, 2014; Bartlett, 2014; Bruno *et al*., 2014; Stojcic and Aralica, 2015). In Bulgaria, in addition to the undertaken market reforms, deindustrialization was also related to the deep economic recession in the first half of the 1990s, as well as the chosen methods for market transition and privatization. As noted by Rangelova (2009), a number of factors exerted a negative influence on the industrial sector: the lack of strategy for the transition, the way reforms were carried out, the reluctance to preserve what had been accomplished in the industry, the delay and the lack of transparency in the privatization process etc. Since deindustrialization in Bulgaria in the first decade of transition was primarily a result of these factors, instead of the development of the service sector or the increase in labour productivity, it is regarded as being driven rather by political than economic considerations. Because of the rapid structural change, which did not follow an evolutionary path, this kind of deindustrialization is defined as "premature" (Rodrik, 2015).

The process of deindustrialization in the second decade of transition was largely driven by the liberalization of trade and capital flows (Bartlett, 2014; Damiani and Uvalić, 2014). The sustained inflow of massive foreign direct investment (FDI) in Bulgaria in the period 2003-2007 was concentrated mainly in the service sector (real estate activities, financial intermediation and trade), while the share of FDI in manufacturing was diminishing. These processes led to the significant expansion of the non-tradable sector at the expense of the tradable sector, as well as sectoral changes in employment.

The largest drop in the Bulgarian industry was in the first six years of transition, when the share of the value added in this sector fell from 49 % to 21 % of GDP (Figure 1). In the following years, there was a slight increase in the share of the industrial sector, reaching 28.3% of GDP in 2016. Although this figure is above the EU average (24.5%) and well above the shares of the industry in some of the old EU members (20.2% in the UK, 19.6% in France, 20% in the Netherlands), one has to take into account that the Bulgarian industry is still dominated by low value added economic activities. The share of agricultural value added also declined, especially since 1997. In 2016, it constituted 4.7% of GDP. On the contrary, starting from 33.8% in 1990, the share of services value added doubled in the first six years of transition and in 2016, it reached 67% of GDP. With regard to the structure of the service sector, 67.3% of its value added in 2016 was created by the following economic activities: trade, transport, hotels and restaurants with a total share of 33% in the services value added; real estate activities; financial and insurance activities; information and communication (ICT), which respectively accounted for 14.3%, 10.8% and 9.2% of the services value added.

**Figure 1. Value added (% of GDP) by sectors of the economy in Bulgaria**

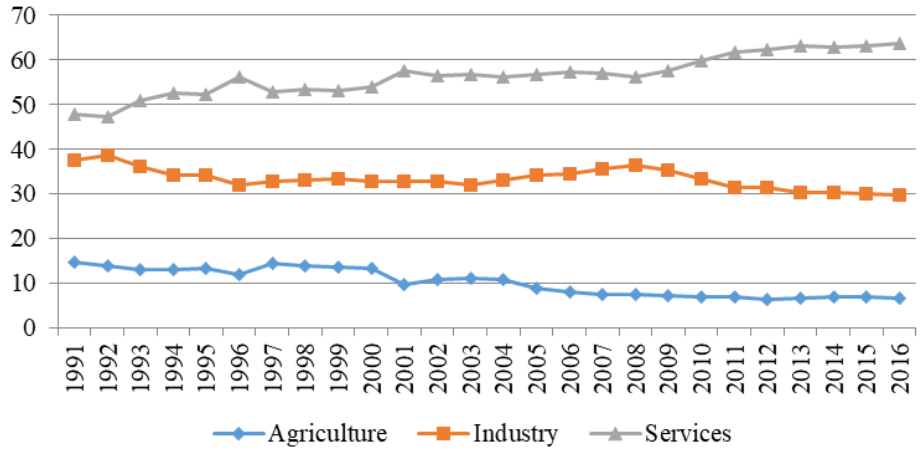



*Source*: World Development Indicators, the World Bank

The decline in the shares of the value added in agriculture and industry at the expense of the growing role of the tertiary sector in Bulgaria led to significant structural changes in employment. As shown in Figure 2, the employment share of agriculture experienced a double decrease during the analysed period. In 2016 it accounted for 6.7% of total employment, compared to 14.7% in 1991. The share of employment in the industrial sector decreased significantly in the first six years of transition (from 37.5% in 1991 to 32.1% in 1996), followed by a seven-year period of stability. In the period of high economic growth between 2003 and 2008, the

employment share in the industrial sector increased but since the onset of the economic recession, it started to decline and in 2016, it accounted for 29.7% of total employment. The employment share of the service sector experienced its steepest increase in the first six years of transition, as well as in the period after the country was hit by the global economic crisis. In 2016, the employment share of the this sector was 63.6%.

**Figure 2. Employment by economic sectors in Bulgaria (% of total employment)**




*Source*: World Development Indicators, the World Bank

The above described shifts in the sectoral composition of the Bulgarian economy were associated with significant changes in the geographical distribution of economic activity. The latter contributed to rising disparities between regions in terms of economic and social development and resulted in the accumulation of "core-periphery" problems, especially with regard to income levels. Moreover, the expansion of the service sector and the diminishing importance of agriculture and industry induced changes in labour demand with respect to skills and education, with important consequences for wages and their distribution. We are particularly interested in wage inequality because wages constitute above 50% of total income and given the fact that the following analysis is based on data about the differences in wages depending on economic activity, region and education. The next section describes the methodology and the data used.

## 3. Methodology

The data used for the empirical research are drawn from the Household budget surveys compiled by the National Statistical Institute. We use average per capita total household income by sources and decile groups for the period 2000-2016.

The methodology is based on Pyatt, Chen and Fei (1980), who proposed one of the most extensively used methods for income inequality decomposition by factor components. As illustrated by the authors, overall inequality depends on the differentiation of each income source, the extent of correlation between the income of each source and total income and the share of each income source in total income. In order to estimate the wage inequality, we calculate concentration coefficients using the following formula:

$$C(z/t) = \frac{2cov(z, r(t))}{n\bar{z}}$$

where $C(z/t)$ is the concentration coefficient, $z$ is the amount of a certain type of income (in this case wages), $\bar{z}$ is its mean, $t$ is total income, *cov(z,r(t))* is the covariance between *z* and the ranking of the recipient according to total income (*r(t))* and *n* is the number of observations.

The concentration coefficient shows how evenly wages are distributed over total income. It ranges from -1, when all wages are received by the poorest individual to 0, when all individuals receive the same wage, to 1, when all wages are received by the richest individual. When the concentration coefficient is lower than the Gini coefficient, wages reduce income inequality. Conversely, when the concentration coefficient of wages is larger than the Gini coefficient, it has an inequality-increasing effect.

Next, by using the concentration coefficients, we calculate the elasticity of the Gini coefficient with respect to a proportional change in wages:

$$E_i = S_i . g_i - S_i$$

where $E_i$ is the elasticity of the Gini coefficient with respect to a certain type of income $i$ (in this case wages), $S_i$ is the share of wages in total income, $g_i$ is the relative concentration coefficient of wages. The latter is calculated as a ratio between the concentration coefficient of wages and the overall Gini coefficient. If elasticity is greater than zero, an increase in wages is associated with an increase in income inequality. If elasticity is lower than zero, wages mitigate income inequality.

In order to calculate the contribution of wages to overall income inequality we use the following formula:

$$D_i = (C_i . S_i)/G$$

where $D_i$ is the contribution of a certain type of income $i$ (in this case wages) to overall income inequality, $S_i$ is the share of wages in total income, $C_i$ is the concentration coefficient of wages and G is the Gini coefficient. The contribution shows what part of the overall income inequality is due to wage inequality.

Next, to analyse wage inequality in more detail and relate its dynamics to the above described structural changes in the Bulgarian economy, we focus on the differences in wages and employment depending on several criteria – economic activity, region and educational attainment. The data source for all of them is the National Statistical Institute.

## 4. Results

In this section, we first present the results from the decomposition of income inequality and then we discuss wage differences depending on economic activity, region and educational attainment.

### 4.1. Estimation of wage inequality in Bulgaria

The results from the decomposition of income inequality are shown in Table 1. Throughout the whole period, with the exception of year 2002, the concentration coefficient of wages is higher than the Gini coefficient, which suggests that wages represent a factor contributing to the increase of overall income inequality. Furthermore, the elasticity of the Gini coefficient with respect to wages is positive for almost the whole period, which means that an increase in wages is associated with an increase in income inequality. For example, in 2016 the coefficient of elasticity is 0.21, meaning that a 10% rise in wages would lead to an increase in income inequality by 2.1%. The only exception is 2002, when elasticity is negative, suggesting an inequality-mitigating effect of wages in this year. It can also be noticed that between 2004 and 2016, the elasticity of the Gini coefficient with respect to wages has been rising. This suggests that the inequality-increasing effect of wages has become more pronounced over time.

Table 1 shows that the contribution of wages to overall income inequality increases significantly over the period 2000-2016. This indicator takes into account the combined effect of the uneven wage distribution and the share of wages in total household income. 45.1% of overall income inequality in 2000 can be explained by wage inequality and in 2016 this figure rises to 75.3%. This means that at the end of the analysed period, wages have become the most significant source of income inequality and its dynamics. The reason for this is twofold: the increasing concentration coefficient of wages and the large and constantly rising share of wages in total income (in 2000 wages constituted 39% of household income and in 2016 their share reached 54.3%).

**Table 1. Wage inequality in Bulgaria**

| Indicator | 2000 | 2002 | 2004 | 2006 | 2008 | 2010 | 2012 | 2014 | 2016 |
|---|---|---|---|---|---|---|---|---|---|
| Concentration coefficient of wages | 0.359 | 0.334 | 0.349 | 0.335 | 0.378 | 0.374 | 0.404 | 0.399 | 0.409 |
| Contribution | 0.451 | 0.367 | 0.414 | 0.507 | 0.664 | 0.654 | 0.682 | 0.711 | 0.753 |
| Elasticity of Gini coefficient with respect to wages | 0.062 | -0007 | 0.012 | 0.047 | 0.145 | 0.145 | 0.155 | 0.169 | 0.210 |
| **Gini coefficient** | 0.310 | 0.342 | 0.339 | 0.304 | 0.295 | 0.291 | 0.312 | 0.304 | 0.295 |

*Source*: own calculations based on data from "Household budgets in the Republic of Bulgaria" (2000-2016), National Statistical Institute

To analyse wage inequality in more detail, we next focus on the differences in wages and employment depending on economic activity, region and education.

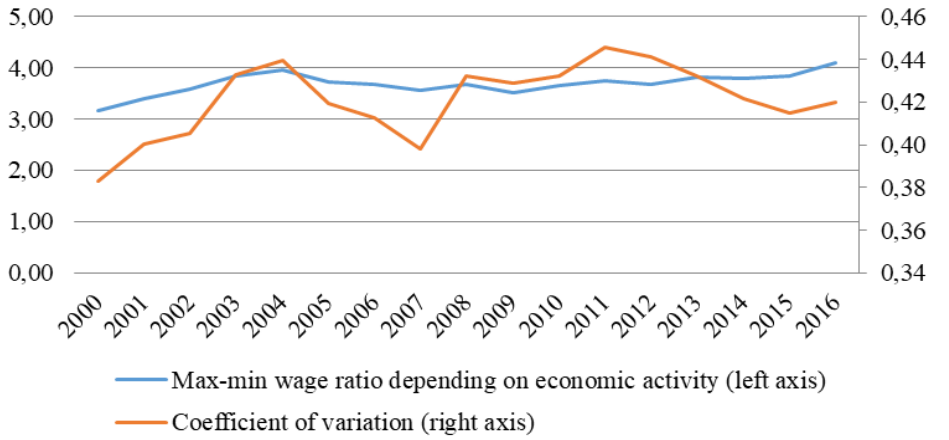
### 4.2. Differences in wages and employment across economic activities

Over the entire period, the lowest paid economic activity is "Accommodation and food service", whereas the highest paid activities vary with time. Until 2008, "Finance and insurance" offered the highest wages, in 2009, they were outpaced by "Electricity, gas, steam and air conditioning supply" while in the period 2010-2016, ICT was the highest paid sector. As shown in Figure 3, the ratio between the highest and the lowest wage depending on economic activity rose from 3.16 in 2000 to 4.09 in 2016, which indicates growing inter-sectoral disparities. A similar trend can be observed in the increasing values of the coefficient of variation in the periods 2000 – 2004 and 2007 – 2011.

In order to analyse wage differences across economic activities in more detail, we focus on the dynamics of the ratios between the average wages in the highest/lowest paid economic activities and the average country wage. As Figure 4 shows, during the period of high economic growth before the crisis, the average wage in the financial sector was over twice as high as the average wage in the country. After 2008, there was a significant rise of the wages in two other economic activities relative to the country average. These are "Electricity, gas, steam and air conditioning supply" and "Information and communication", which in 2016 exceeded the average country wage with 76% and 142% respectively.[2] Wages in "Mining and quarrying" are slightly lower than the ones in the above-mentioned sectors and, over the entire period they exceeded the average country wage by around 60%.

[2] The ICT sector is not shown in Figure 4 because the data about it is available only after 2008.

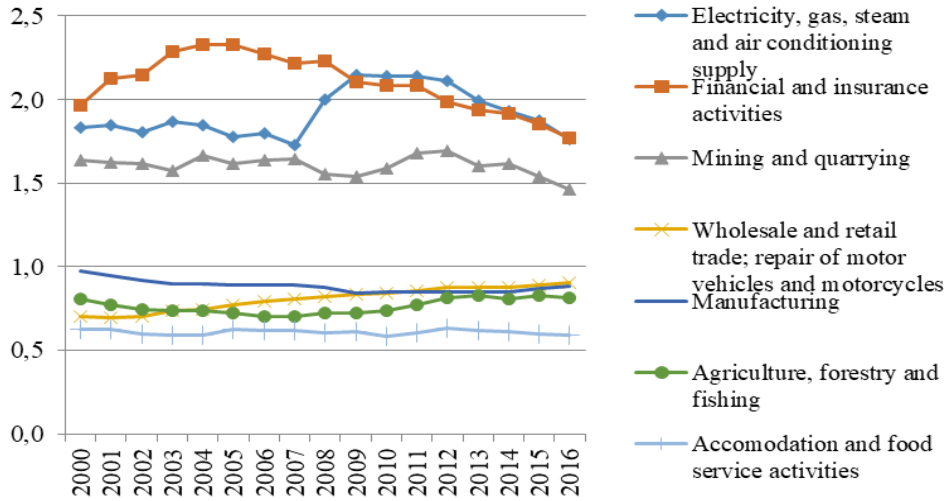
**Figure 3. Max-min ratio and coefficient of variation of wages depending on economic activity**




*Source*: own calculations based on data from the National Statistical Institute

The economic activities with the lowest average wages during the analysed period are "Accommodation and food service activities", "Agriculture, forestry and fishing", "Wholesale and retail trade; repair of motor vehicles and motorcycles" and "Manufacturing". Over the entire period, the wages in these sectors were below the country average and constituted respectively 61%, 76%, 81% and 88% of its level.

**Figure 4. Ratios between the average annual wages in selected economic activities and the average annual country wage**




*Source*: own calculations based on data from the National Statistical Institute

Beside the level and the dynamics of wage differences across economic activities, the contributions of the latter to total employment have important implications for wage inequality. For this purpose, we calculate the employment shares of the highest and the lowest paid economic activities. As Table 2 shows, 47.3% of the employees in the country in 2016 worked in the four lowest paid sectors. The employment shares of trade and manufacturing were 16.6% and 22.7% respectively and they were also the sectors with the highest shares in total employment. On the contrary, the combined employment share of the four highest paid economic activities was significantly lower and, although it increased slightly between 2000 and 2016, it remained below 10%.

**Table 2. Employment shares of the lowest and the highest paid economic activities (% of total employment)**

| Economic activity | 2000 | 2002 | 2004 | 2006 | 2008 | 2010 | 2012 | 2014 | 2016 |
|---|---|---|---|---|---|---|---|---|---|
| Employment shares of the lowest paid economic activities | | | | | | | | | |
| Accommodation and food service activities | 2.6 | 3.0 | 3.7 | 4.0 | 4.4 | 4.9 | 5.1 | 4.9 | 5.0 |
| Agriculture, forestry and fishing | 4.7 | 4.1 | 3.3 | 2.9 | 2.7 | 2.9 | 3.1 | 3.2 | 3.1 |
| Wholesale and retail trade; repair of motor vehicles and motorcycles | 11.1 | 12.4 | 14.0 | 14.9 | 16.1 | 17.7 | 16.9 | 16.8 | 16.5 |
| Manufacturing | 29.6 | 29.8 | 28.2 | 27.6 | 24.7 | 22.2 | 22.1 | 22.4 | 22.6 |
| Total | 48.0 | 49.3 | 49.2 | 49.4 | 47.8 | 47.8 | 47.3 | 47.3 | 47.3 |
| Employment shares of the highest paid economic activities | | | | | | | | | |
| Information and communication | - | - | - | - | 2.4 | 2.8 | 3.1 | 3.3 | 3.7 |
| Financial and insurance activities | 1.5 | 1.4 | 1.4 | 1.7 | 2.2 | 2.5 | 2.6 | 2.5 | 2.5 |
| Electricity, gas, steam and air conditioning supply | 3.1 | 3.1 | 2.7 | 2.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.3 |
| Mining and quarrying | 2.1 | 1.8 | 1.4 | 1.3 | 1.2 | 1.1 | 1.1 | 1.1 | 1.0 |
| Total | 6.7 | 6.3 | 5.6 | 5.4 | 7.2 | 7.9 | 8.2 | 8.2 | 8.6 |

*Source*: own calculations based on data from the National Statistical Institute

The above-presented data allow us to state that wage inequality in the Bulgarian economy between 2000 and 2016 was partly driven by the following trends in the development of its sectoral structure. First, some of the activities in the expanding service sector, such as ICT and financial intermediation, are sources of

some of the highest wages in the country but this only benefits a small share of people because of the low employment shares of these sectors in total employment. On the contrary, the development of another activity in the service sector - trade, generates higher and rising employment but its wages are one of the lowest and remain below the country average over the entire period. Second, within the industrial sector, two economic activities ("Electricity, gas, steam and air conditioning supply" and "Mining and quarrying") offer some of the highest wages in the country but their contribution to employment creation is very small and even diminishing over time. The industrial subsector with the largest share in total employment is manufacturing. However, its wage level is not only well below the country average but the gap between them is rising over time. It is worth noting that the observed trends regarding the wages in Bulgarian manufacturing are tightly related with the state of technological advance in this sector, which is dominated by low and medium-low-technology economic activities[3].

**Table 3. Indicators for manufacturing depending on technological intensity**

| Manufacturing according to technological intensity | Share in total gross value added in manufacturing | Share in total number of enterprises in manufacturing | Share in total employment in manufacturing | Labour productivity (gross value added per person employed, thousand euro) |
|---|---|---|---|---|
| High-technology | 5% | 1.4% | 3% | 19.7 |
| Medium-high-technology | 21% | 9.2% | 17% | 16.1 |
| Medium-low-technology | 32% | 30.0% | 21% | 18.1 |
| Low-technology | 42% | 59.3% | 59% | 9,1 |

*Source*: own calculations based on data from Eurostat.

[3] According to Eurostat, manufacturing industries are classified as low-technology (Manufacture of food products; beverages and tobacco products; Manufacture of textiles, wearing apparel, leather and related products; Manufacture of wood, paper, printing and reproduction; Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment); medium-low-technology (Manufacture of coke and refined petroleum products; Manufacture of rubber and plastic products and other non-metallic mineral products; Manufacture of basic metals and fabricated metal products, except machinery and equipment); medium-high-technology (Manufacture of chemicals and chemical products; Manufacture of electrical equipment; Manufacture of machinery and equipment n.e.c.; Manufacture of motor vehicles, trailers, semi-trailers and of other transport equipment); high-technology (Manufacture of basic pharmaceutical products and pharmaceutical preparations; Manufacture of computer, electronic and optical products).

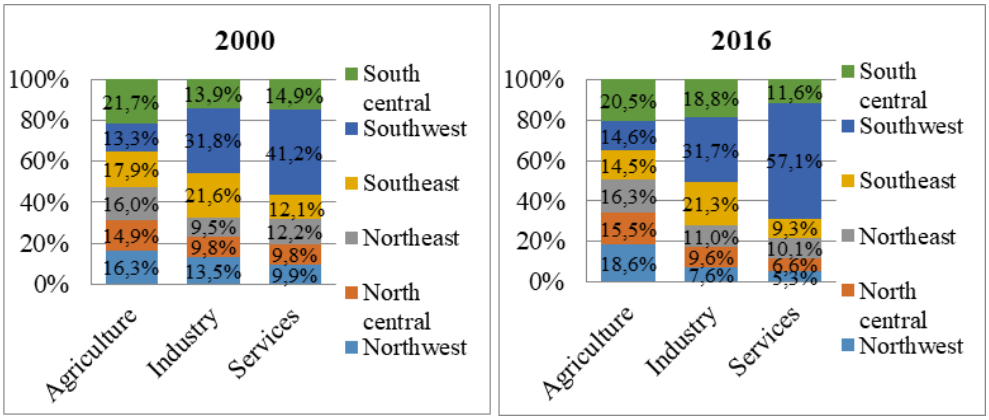
As seen in Table 3, in 2016, the shares of gross value added in low technology and medium-low-technology manufacturing (in total manufacturing gross value added) were 42% and 32% respectively. On the contrary, the share of high-technology manufacturing such as computer, electronic, optical and pharmaceutical products was just 5%. This trend is also evident in the prevailing number of enterprises involved in low-technology manufacturing (59.3% in the total number of enterprises in this sector) and the negligible share of manufacturing enterprises using high technology (1.4%). Other challenges facing Bulgarian manufacturing include the following:

- Bulgarian exports include mainly low-technology products, whereas the share of high technology exports in total exports was just 5% in 2016, which is significantly lower than the EU average (18%). What is more, the internationalization of Bulgarian enterprises is low.
- The contribution of foreign direct investment (FDI) in technology transfer is limited, which is largely due to the unfavourable sectoral composition of FDI stock. During the investment boom until 2007, most of the FDI was concentrated in services and low-value added manufacturing. In 2016, the share of FDI stock in low and medium-low technology manufacturing (in total FDI in manufacturing) was 66%.
- Industrial production is extremely energy intensive and energy inefficient. Energy intensity of the Bulgarian economy is among the highest in the EU (in 2015 it was 448.5 kgoe/1000 Euro, whereas the average EU energy intensity was 120.4 kgoe/1000 Euro). This is mainly due to the industry, which is the highest energy intensive sector.
- Low expenditure on R&D: in 2016, the share of R&D expenditure in GDP was 0.78%, which is much lower than the EU average (2.04%). Government budg*et* allocations for R&D in industrial production and technology were 11% of total R&D government spending. As for the business expenditure on R&D in manufacturing, its share in total business expenditure on R&D was 35% (or 0.2% of GDP).
- Labour productivity in manufacturing is over five times lower than the EU average. Moreover, it is the lowest in the EU. This holds for all types of manufacturing according to the level of technological intensity except for medium low-technology manufacturing, which had the second lowest labour productivity after Romania in 2016. The low labour productivity of manufacturing in combination with its high contribution to total employment leads to low wage levels for a large part of the employed people with significant implications for wage inequality.

### 4.3. Inter-regional differences in wages and employment

The sectoral shifts in the Bulgarian economy have been accompanied by significant changes in the geographical distribution of economic activities. As seen in Figure 5, the expansion of the service sector has favoured mainly the Southwest region, which is the most developed one. With the capital located in it, this region ranks the highest in terms of population, employment, infrastructure, business, education and income levels. In 2000, the Southwest region accounted for 41.2% of the gross value added in the service sector in the country. It also experienced the largest increase in its sectoral gross value added over time: in 2016, the Southwest region's services gross value added reached 57.1%. It is worth mentioning that Sofia – the capital - alone accounted for 51.2% of the total services gross value added in 2016. At the same time, the shares of all the other regions in services gross value added have declined during the analysed period. The most significant decrease is in the Northwest region, which is the least economically developed one (from 9.9% to 5.3%). Compared to the tertiary sector, the changes in the distribution of industry gross value added across regions are not that pronounced.

**Figure 5. Shares of different regions in gross value added by sectors**

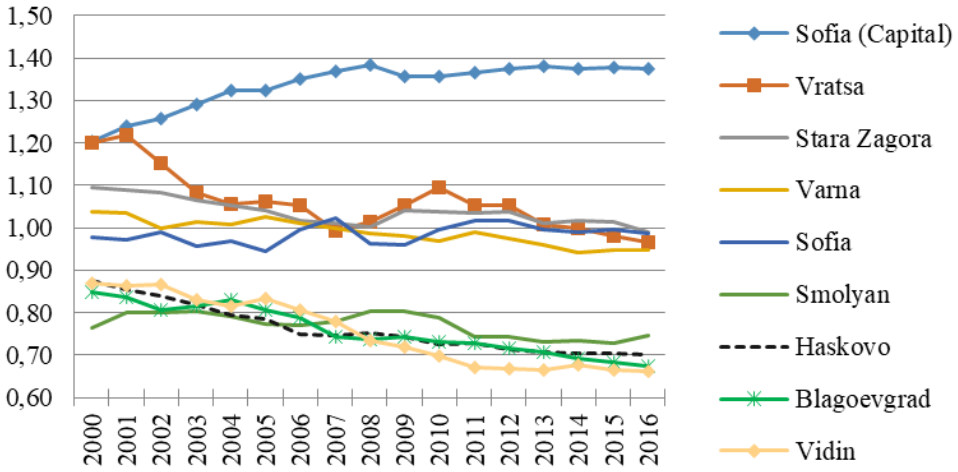



*Source*: own calculations based on data from the National Statistical Institute

The concentration of economic activities of the tertiary sector in the most developed region at the expense of all the others has undoubtedly contributed to the rising regional disparities in the country. The share of the most economically advanced Southwest region in total gross value added increased from 35% in 2000 to 48% in 2016. On the contrary, the gross value added shares of all the other regions have experienced a decline, with the Northwest region being the most seriously affected: its share in total gross value added shrank from 11.6% to 6.6% over the analysed period.

The above described trends have important implications for the magnitude and the dynamics of wage differences across regions. To analyse inter-regional wage differences in more detail, we focus on the dynamics of the ratios between the average wages in the regions with the highest/lowest wages and the average country wage. As shown in Figure 6, during the entire period the average wage in the capital (Sofia) was the highest: in 2016, it was 38% higher than the 20% country average in 2000. The data also reveal that the average wages in four regions (Sofia, Varna, Stara Zagora and Vratsa) were around the average country wage, which is due to the fact that they are among the large and economically advanced regions.

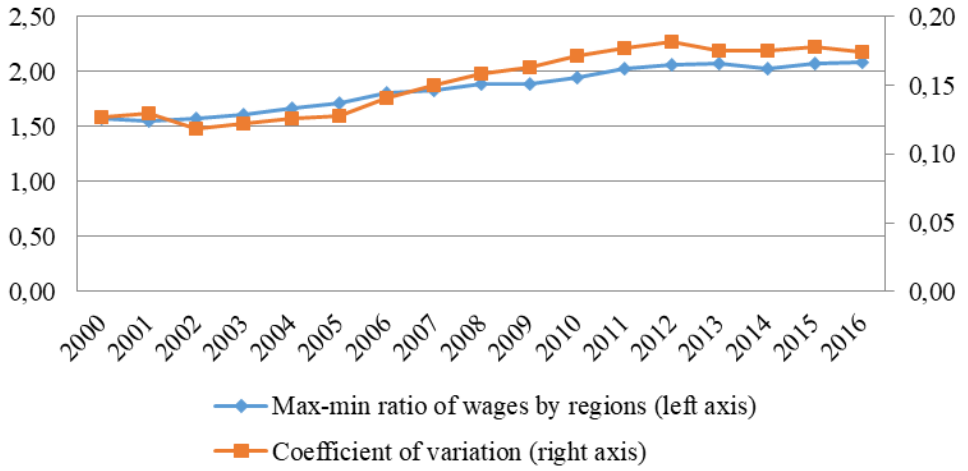
**Figure 6. Ratios between the average annual wages in selected regions and the average annual country wage**




*Source*: own calculations based on data from the National Statistical Institute

Four regions are among the least economically developed in the country (Smolyan, Silistra, Vidin and Haskovo). In 2016, the average wages were between 66% and 75% of the average country wage in these regions. Moreover, during the analysed period, the wage levels in these regions diverged significantly from the average country wage. The rising regional wage disparities are even more visible when looking at the ratio between the highest and the lowest regional wage and the coefficient of variation of wages across regions, which both show an upward trend (Figure 7).

**Figure 7. Max-min ratio and coefficient of variation of wages across regions**




*Source*: own calculations based on data from the National Statistical Institute

In order to analyse wage inequality, beside inter-regional wage differences, one also has to take into consideration the disparities between the regions in terms of sectoral employment. Employment in services is much more unevenly distributed between regions than employment in agriculture and industry. What is more, while the employment shares of the primary and secondary sectors are stable over time, services experience a substantial increase of the employment, concentrated in the top five regions with the highest average wage. As shown in Table 4, in 2016, of all people working in the tertiary sector in the country, 62% were employed in the top five highest wage regions (against 44% in 2000), with the sole share of the capital Sofia being 41% (against 29% in 2000). Furthermore, in 2016, between 70 and 90% of the people employed in the highest paid economic activities (ICT and finance) in the country were concentrated in these five economically advanced regions. It is worth mentioning that the capital alone attracted 83% and 75%, respectively, of the employment in these two subsectors. On the contrary, in 2016, the five lowest wage regions attracted only 8% of the people employed in the service sector in the country (against 10% in 2000). What is more, the shares of those employed in the highest paid activities in the service sector (ICT and finance) in these regions were even more negligible: 2% and 3% respectively.

**Table 4. Employment shares of the regions with the highest/lowest wage (% of sectoral employment)**

| Economic sector | Top 5 regions with the highest average wage | | Including: Sofia (capital) | | Bottom 5 regions with the lowest average wage | |
|---|---|---|---|---|---|---|
| | **2000** | **2016** | **2000** | **2016** | **2000** | **2016** |
| 1. Agriculture, forestry and fishing | 21% | 22% | 2% | 3% | 12% | 13% |
| 2. Industry | 35% | 39% | 16% | 17% | 12% | 12% |
| 3. Services | 44% | 62% | 29% | 41% | 10% | 8% |
| Including: 3.1.Information and communication | 49% | 88% | 33% | 83% | 8% | 2% |
| 3.2. Financial and insurance activities | 56% | 83% | 46% | 75% | 8% | 3% |
| 3.3. Professional and scientific activities | 63% | 72% | 49% | 62% | 6% | 4% |

*Source*: own calculations based on data from the National Statistical Institute

The above described data reveal rising inter-regional wage and employment disparities, which have been reinforced by the sectoral shifts taking place in the Bulgarian economy. On the one hand, the development of some activities in the service sector, such as finance and ICT, which require high pay for highly skilled labour, is concentrated in the more economically advanced regions. On the other hand, agriculture and manufacturing using mostly low pay for low-skilled labour are prevalent in less developed regions. The expansion of services at the expense of industry and agriculture has thus contributed to the disparities between the most and the least developed regions in terms of population, employment, GDP and incomes. Other factors that stay behind the increasing regional disparities include: unfavourable demographic structure (ageing and migration, leading to depopulation of the less developed regions), inadequate regional policy, uneven regional distribution of foreign direct investment etc.

### 4.4. Differences in wages and employment depending on the level of educational attainment

Just like in the other CEE countries, market transition in Bulgaria was accompanied by changes in the process of wage setting, which introduced a tighter link between educational attainment and productivity, on the one hand, and wages, on the other (Mitra and Yemtsov, 2006). This led to rising educational premium and higher wage disparities depending on educational attainment.

As shown in Table 5, the wage gap between people with the highest and the lowest level of education increased over time – in 2014, the max-min wage ratio was 3.69 against 2.32 in 2002. The average wage of people with upper secondary and lower education is below the average wage in the country and diverts from it over time. This is especially the case of those with primary or lower education – if in 2002, they received 82% of the average wage in the country, in 2014, this figure fell to 56%. On the contrary, the average wage of people with tertiary education exceeds the average country wage and the gap between them increases over time. Those with a bachelor's and master's degree receive around 50% more than the average country wage while the average wage of people with a PhD is twice as high as the average wage in country.

**Table 5. Ratios between the average wages at different levels of education and the average country wage**

| Level of education | 2002 | 2006 | 2010 | 2014 |
|---|---|---|---|---|
| Primary or lower | 0.82 | 0.71 | 0.64 | 0.56 |
| Lower secondary | 0.77 | 0.74 | 0.67 | 0.63 |
| Upper secondary | 0.85 | 0.79 | 0.76 | 0.75 |
| Higher degree „bachelor"," master" | 1.44 | 1.59 | 1.59 | 1.52 |
| Higher degree „doctor" | 1.89 | 2.26 | 2.12 | 2.07 |
| Max-min wage ratio | 2.32 | 3.16 | 3.29 | 3.69 |

*Source*: own calculations based on data from the National Statistical Institute

The above discussed data suggest that the returns to education in Bulgaria have increased over time. One of the main drivers of this trend is related with the changes in labour demand as a result of the shifts in the sectoral composition of the economy. There is a clearly marked increase in the demand for more highly skilled labour and a decrease in the demand for lower-skilled workers. In 2003, the share of workers with tertiary education was 25.8% in total employment whereas in 2016, this share rose to 32.5%. On the contrary, in 2003, the employment share of people with primary or lower education was 18.2% and in 2016, it fell to 10.4%.

The magnitude and the dynamics of the employment shares of people with different levels of education varies significantly across sectors and has important implications for the structure of wages and their distribution. As shown in Table 6, the employment share of people with primary or lower education is the highest in the agricultural sector (42.9% in the total employment in this sector in 2016) and the lowest in services (5% in 2016). What is more, this share declines over time in all of the three sectors. The employment share of people with secondary education is the highest in the industry (69.5% of the sectoral employment in 2016). Moreover, it increases in agriculture and industry while keeping its level almost unchanged in the service sector. The demand for workers with tertiary education is the highest in

services and increases over time – in 2016, their employment share was 42.8% against 36.7% in 2003. What is more, the agricultural and the industrial sectors also experience a rise in the demand for workers with higher education.

**Table 6. Employment shares at different levels of education across sectors**

| Economic sectors | 2003 | | | | 2016 | | | |
|---|---|---|---|---|---|---|---|---|
| | Higher education | Secondary education | Primary or lower education | Total | Higher education | Secondary education | Primary or lower education | Total |
| Agriculture | 4.8% | 38.8% | 56.4% | 100% | 8.3% | 48.8% | 42.9% | 100% |
| Industry | 11.3% | 60.0% | 28.7% | 100% | 16.0% | 69.5% | 14.5% | 100% |
| Services | 36.7% | 52.9% | 10.4% | 100% | 42.8% | 52.3% | 5.0% | 100% |

*Source*: own calculations based on data from the National Statistical Institute

Among the three sectors, services are the most heterogeneous in terms of educational level of the workforce. The economic activities with the highest employment shares of people with a university degree are ICT, "Finance and insurance" and "Professional and scientific activities" (above 70% each in the subsectoral employment in 2016). At the same time, the employment shares of people with primary or lower education in these three subsectors are the lowest – below 1% each in 2016. At the other extreme, "Accommodation and food service activities" is the subsector with the lowest employment share of people with tertiary education (16.5% in the subsectoral employment in 2016) and one of the highest shares of workers with primary or lower education (8% in 2016). In contrast with services, all industrial subsectors predominantly employ workers with secondary education (between 60% and 80%), whereas the shares of those with a university degree are lower than the latter.[4]

The above presented data allow us to conclude that the skill heterogeneity of services in Bulgaria is one of the determinants of the wage disparity within this sector. Given the expanding share of services in the Bulgarian economy, this contributes to the increase of overall wage inequality. As for industry, although skill heterogeneity is less pronounced than in services, we observe significant wage differentials as well. This is due to the specific features of some industrial subsectors such as "Electricity, gas, steam and air conditioning supply" and "Mining and quarrying", which offer some of the highest wages although they predominantly hire secondary education workers. Thus the wage disparity within the industrial sector

[4] For most industrial subsectors, the employment shares of people with university degree are between 11% and 17% in 2016. The only exception is "Electricity, gas, steam and air conditioning supply", where this share is around 35%.

complements the role of services in shaping the overall wage inequality in the country.

Last but not least, it should be noted that the analysed differences in wages depending on the educational attainment are caused not only by the structural changes in the economy but also by some existing problems in the Bulgarian labour market. Despite the improvement in the educational structure of the population, there are persistent weaknesses at the national educational system level. One of the biggest challenges is related with the quality of education and the mismatch between the skills of the graduates and the requirements of the business. This leads to shortage of personnel in the field of engineering and technical sciences, with consequences on wage levels in these sectors. In addition, there is a lag in the provision of education in new jobs needed for the green economy, high-tech and innovative activities.[5] Given their rising importance for the economic development, the lack of enough skilled workers in these activities might create a mismatch between labour demand and supply, which could have possible implications for wage inequality in the future.

## Conclusions

The paper explored wage inequality in the context of the structural changes in the Bulgarian economy. First, we estimated wage inequality in the period 2000-2016, using the inequality decomposition method proposed by Pyatt *at al.* (1980) and found that it rises over time. Moreover, the contribution of wages to overall income inequality increases significantly during the analysed period. Second, we found that wage inequality in Bulgaria is shaped by substantial wage differences across economic activities, regions and educational attainment. The industry level analysis showed that the highest paid economic activities from the expanding service hardly contribute to employment, whereas manufacturing, which has the highest employment share, is one of the poorest paid economic sectors. The latter is related to the level of technological intensity of Bulgarian manufacturing which is dominated by low and medium-low-technology economic activities and has the lowest labour productivity in the EU. The analysis revealed that wage disparities are further reinforced by the concentration of service sector activities, requiring high pay for highly skilled labour in the most developed regions and the prevalence of agriculture and manufacturing by using mostly low pay for low-skilled labour, in the least developed ones. The shifts in the sectoral composition of the economy have also induced changes in labour demand with respect to educational attainment. The growing role of the service sector has been accompanied by an increase in the demand for workers with university degree, which has increased the number of returns to education, as well as wage differences depending on the level of education.

[5] Ministry of Education and Science (2014), Strategy for the development of higher education in the Republic of Bulgaria for the 2014-2020 period, p. 13.

Based on the analysis, we can give some recommendations, which might be relevant in the policy decision-making processes. First, there is a need for enhancing the investment in high-technology manufacturing activities such as machine building, electronics, automotive, medical equipment, computers, optical products, medicines, etc. To facilitate a shift from low and medium-low technology to high technology manufacturing, it is important to enhance the investment in research and innovation infrastructure, continue the development of technological and industrial parks for high-technology industries and implement technological modernization in the manufacturing sector by using resource-efficient and waste-free technologies. The need for national policies aimed at enhancing investment in manufacturing is in line with the goals of the European reindustrialization policy initiated in the aftermath of the last global financial and economic crisis. Given the lower state of technological advance in the Bulgarian manufacturing, such policies will not only stimulate long-run economic growth[6], but will also contribute to solving some social problems related with the income levels and their distribution. Second, for the latter to be accomplished, the industrial policy actions should be accompanied by measures aimed at improving the human capital in the country. Hence, more efforts should be focused on enhancing the scope and the quality of education so that the skills of the labour force would match the needs of business. In particular, the investment in education should be focused on training the personnel necessary for the industry, which requires increasing the number of students studying machine engineering, natural sciences and computer science.

Third, the large regional disparities in the economic and social development in Bulgaria call for further actions in the field of regional policy. For a large part of the analysed period, there was a lack of purposeful, consistent and effective policy in this field, which resulted in the accumulation of significant regional imbalances. It is only in recent years that these problems started to become a priority on the political agenda. Further efforts concentrated in this direction, meant to gradually reduce the gap between the income levels of the less developed regions and the economically advanced ones are crucial.

It has to be noted that a major limitation of the study was the use of aggregated data which mostly allowed for descriptive and comparative analysis. Given the importance of the topic for the Bulgarian economy, future research might utilize micro-datasets on wages and apply econometric methods in order to provide a deeper insight into the relationship between structural changes and wage inequality.

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