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REGIONAL DISPARITIES IN LABOUR PRODUCTIVITY OF SMALL AND MEDIUM-SIZED ENTERPRISES IN MANUFACTURING

Regionální odlišnosti v produktivitě práce u malých a středních podniků ve zpracovatelském průmyslu

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Annotation
The article aims at regional differences in the efficiency of the use of human work in small and medium-sized enterprises in manufacturing. The analysis was focused on differences in high technology and low technology SMEs in regions of the Czech Republic. Regional disparities were assessed using measure of variability. An analysis of 1,068 enterprises showed greater variability between regions in labour productivity of high technology enterprises than in low technology enterprises but these regional disparities significantly decreased over the monitored period. The level of labour productivity in high technology enterprises declined (except for 3 regions) as a result of an inadequate growth in personal costs. Also, for low technology enterprises in almost all regions, there was a decline in labour productivity and the corresponding steady state. High wage growth in the regions can lead to higher regional disparities in labour productivity, and the risk of losing competitiveness for businesses in the future.

Key words
labour productivity, SMEs, manufacturing, technological intensity

Anotace
Článek se zabývá regionálními rozdíly v efektivnosti využívání lidské práce v malých a středních podnicích ve zpracovatelském průmyslu. Analýza byla zaměřena na odlišnosti u high-tech a low-tech malých a středních podniků v regionech České republiky. Regionální disparity byly hodnoceny pomocí měr variability. Z provedené analýzy 1068 podniků byla zjištěna větší variabilita mezi regiony u produktivity práce high-tech podniků než u low-tech podniků, ale tyto regionální disparity se za sledované období významně snížily. Úroveň produktivity práce u podniků high- tech klesla (vyjma 3 regionů) důsledkem neadekvátního růstu osobních nákladů. Rovněž u podniků low-tech u téměř všech regionů byl zaznamenán pokles produktivity práce vlivem růstu osobních nákladů. Vysoký růst mezd v regionech může vést k vyšším regionálním disparitám v produktivitě práce a pro podniky do budoucna znamená riziko ve ztrátě konkurenceschopnosti.

Klíčová slova
produktivita práce, MSP, zpracovatelský průmysl, technologická intenzita

JEL classification: *D24, M21, R11*

1. Introduction

Effectiveness of the use of human work is one of the major factors in the competitiveness of small and medium-sized enterprises in manufacturing. This efficiency, measured by labour productivity, is not identical in the individual regions and, on the contrary, may lead to an increase in regional disparities. At the same time an important role in efficiency is played by technological intensity of enterprises. The aim of the paper is to evaluate the regional differences in the efficiency of the use of human work by small and medium enterprises in the processing industry, taking into account their technological intensity.

Regional disparities can be defined as inequalities in the economic or socio-economic growth of the regions (Dusek, 2013). The economic growth of individual regions is clearly linked to the concept of competitiveness as a basic indicator of long-term success in market economies. An important role have the factors (resources) of the region's competitiveness, what this competitive advantage is predominantly based on. We can include in these competitive advantages the technological level, innovation (Melecky, 2015) or the efficiency of using factors of production (Gonzalez-Pernia, et al., 2012). The prerequisite of regional competitiveness is the competitiveness of enterprises that are active in the region and create jobs. Small and medium-sized enterprises are the engine of economy (Mura et. al., 2015) and generator of development regions. The efficiency (productivity) of SME is influenced by many factors: human capital, organization capital (Leitao, Franco, 2011) or business process (Hajduova, Andrejkovic, Mura, 2014). Kislingerová (2008) says that the competitiveness of enterprises as the ability of firms to constantly increase productivity.

Measurement of regional disparities can be done on the basis of objective indicators. One of these indicators are indicators of productivity (Filippetti, Peyrache, 2013). Productivity measures how efficiently production inputs are being used in an economy to produce a given level of output. There are many different productivity measures. The simplest and the most frequently-encountered measure is labour productivity. Labour productivity can be measured at the firm, sector and regional or national level. Labour productivity is defined as value added per worker (Broersma, Oosterhaven, 2009), worker-hour or personal cost. Using personal costs for measuring labour productivity reflects the costs that enterprises has to spend on employees. Labour productivity is influenced by many factors. The important factors of labour productivity are the flexibility of the labour market (Pavelka, Loester, 2013) and business cycle (Mayer et al. 2016). The size and dynamics of labour productivity in the regions is one of indicators of regional competitiveness.

2. Methodology

The aim of the paper was to assess the regional differences in the efficiency of utilization of the labour factor in the processing industry for small and medium enterprises. The goal was also to find a change in this efficiency in 2016 compared to 2012 (change after five years) in regions of Czech Republic (NUTS2). The analysis was performed in 1068 SMEs, through their financial statements drawn from the Albertina database. The same enterprises were under review in both of the years. We used the classification by Commission Recommendation 2003/361/ESES based on number of employees, turnover and balance sheet total. Attention was focused on enterprises in the manufacturing industry, which were divided according to economic activity or technological demands. The enterprises were sorted into two categories. Eurostat uses the aggregation of the manufacturing industry according to technological intensity and based on NACE Rev. 2 at 2-digit level. The first category of HT includes high-technology and medium-high-technology, while the second category includes medium-low-technology and low-tech economic activities.

HT category includes mainly the enterprises in the following fields: 21 Manufacture of basic pharmaceutical products and pharmaceutical products; chemical products; 27 to 30 Manufacture of electrical equipment; Manufacture of motor vehicles, trailers and semi-trailers, category LT includes in particular these fields of activity (especially those related to industries): 19 Manufacture of coke and refined petroleum products; 22 to 25 Manufacture of rubber and plastic products; 33 Repair and installation of machinery and equipment; 10 to 18 Manufacture of food products, beverages, tobacco products, textile, wearing apparel, leather and related products, wood and of products of wood, paper and paper products, printing and reproduction of recorded media; 31 to 32 Manufacture of furniture; Other manufacturing.

It was evaluated not only the efficiency of the labour factor but also the company's performance. Efficiency of work was measured through indicators: Labour productivity (Sales - S/personal costs - PC), Labour intensity (Personal costs -PC/ total costs - TC), Capital-Labour ratio (fixed assets/personal costs). Business performance was evaluated using ROA, ie the ratio of EBIT and Assets a Return on Equity (ROE) – ratio EAT and Equity, at the same time it was detected also Material and energy intensity (consumption of material and energy / firm

performance). One way to increase business competitiveness is to increase labour productivity, which can be formally registered as

$$\frac{S_0}{PC_0} < \frac{S_1}{PC_1},$$

where PC represents personal costs and sales revenue from goods, products and services
After simple algebraic treatment we get

$$\frac{PC_1}{PC_0} < \frac{S_1}{S_0}, \text{ tj.} \qquad I_{PC} < I_S$$

which can be interpreted as a requirement for a slower growth in personal costs compared to a change in sales for goods, products and services. Therefore, it is actually a declaration of a requirement that average wages for employees grow more slowly than average labour productivity.

All the indicators were first identified for the whole set of enterprises and subsequently the regional disparity of selected indicators was determined. All indicators were first identified for a whole set of enterprises and then a regional disparity in labour productivity was determined by means of standard deviation and variation coefficient, with the simultaneous use of both variability measures being recommended. The standard deviation ($s_x = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \overline{x})^2}$) is not a dimensionless number and depends on the overall level of the phenomenon, on the contrary the variation coefficient ($v_x = \frac{s_x}{\overline{x}}$) is a dimensionless number and shows only the size of variability (Kutscherauer et al., 2010).

3. Results

Small and medium-sized enterprises play an important role in the endogenous growth of individual regions in the Czech Republic. The share of small and medium-sized enterprises in the total value added of the business sector in the Czech Republic is around 54% (2015). In the case of economic problems or the economic slowdown of small medium-sized enterprises, this effect is immediately reflected in the economic growth and development of the regions. The slowing or acceleration of economic growth or productivity of SMEs can thus be a significant factor in creating regional disparities. The analysis carried out first divided the small and medium-sized enterprises (SMEs) according to their economic activity into high-technology and low-technology. The economic performance of MSEs is illustrated in Table 1. The table shows the level of selected ratios between 2016 and 2012. The level of indicators monitored does not show significant differences between HT and LT. The most striking difference is between technology-intensive businesses and enterprises with less demanding ROA (Return on Assets) and ROE (Return on Equity) indicators. Firms in the HT category achieve significantly lower return on equity in 2012.

Tab. 1: Selected MSEs ratios

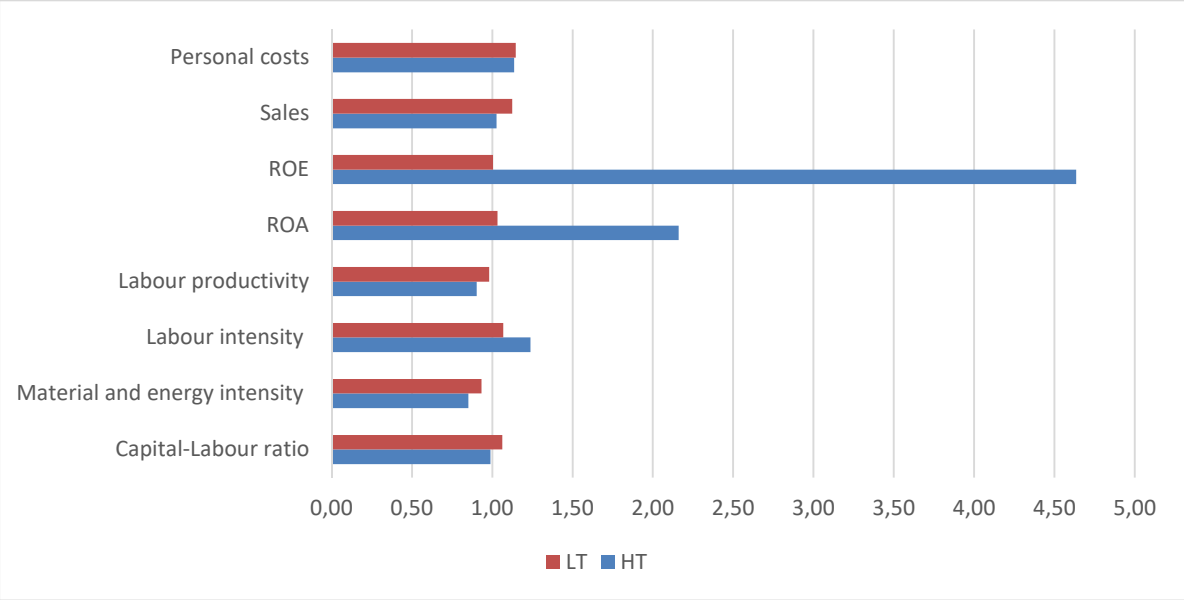
MSEs ratios	2012		2016	
	HT	LT	HT	LT
C-L RATIO in CZK	1.365	1.381	1.350	1.467
Material and energy intensity in CZK	0.499	0.423	0.424	0.395
Labour intensity in CZK	0.207	0.243	0.256	0.259
Labour productivity in CZK	3.907	3.603	3.527	3.536
ROA v CZK	0.027	0.073	0.057	0.075
ROE v CZK	0.021	0.100	0.095	0.100
Number of enterprises	265	803	265	803

Source: authors' calculation

The growth rate of the absolute and relative indicators in 2016 compared to 2012 is shown in Figure 1. It is clear that the sales index for goods, products and services is growing more slowly than the index of personal costs, both for HT and LT. These results in a decline in labour productivity, which is more pronounced in HT businesses. At the same time, labour intensity increased significantly, but material and energy intensity decreased. This can be caused (in keeping with competitiveness) with technologically more demanding investments, which also have an impact on the cost increase. The increase in personal costs can be related both to a change in the structure of

employees in favour of more qualified and to a lack of experts in selected professions, to the development of unemployment and to the pressure of wage growth.

Fig. 1: Indexes of Selected Indicators MSEs in Manufacturing (Year 2016 / Year 2012)



Source: authors' calculation

Next part of the article is devoted to the area of regional disparities in the field of efficiency of labour factor. For the analysis of MSEs within the Cohesion Regions, the labour productivity indicator (Table 2) was selected.

Tab. 2: Labour productivity of MSEs in NUTS2 regions in 2012, 2016

NUTS 2	2012		2016		Number of enterprises	
	HT	LT	HT	LT	HT	LT
Praha	4.46	4.04	3.19	3.71	29	56
Střední Čechy	3.78	3.89	3.91	3.90	21	66
Jihozápad	3.13	3.43	2.91	3.42	31	95
Severozápad	3.47	3.55	3.00	3.75	22	69
Severovýchod	3.37	3.53	3.65	3.44	46	146
Jihovýchod	3.68	3.86	3.87	3.84	46	175
Střední Morava	3.98	3.21	3.87	3.15	47	115
Moravskoslezsko	6.18	3.53	4.04	3.26	23	81
Total	3.91	3.60	3.53	3.54	265	803
Standard deviation	0.85	0.24	0.40	0.25		
Coefficient of Variation in %	21.30	6.63	11.25	6.92		

Source: authors' calculation

Labour productivity is expected to be highest in Praha and Moravskoslezko, especially in 2012, in the HT category. After five years (2016), in Praha, due to wage growth, it is even lower than other regions; in Moravskoslezsko labour productivity remains still the highest in 2016 in the HT. We can conclude from the calculation of rate variability that greater variability between regions is at the standard deviation of the labour productivity of HT enterprises, but in five years these companies have significantly decreased. The labour productivity of LT enterprises is low in both monitored periods (approximately CZK 0.25 of sales per CZK 1 of personnel costs, which is less than 7%). Labour productivity in all regions and categories of the company is affected mainly by the amount of labour costs i.e. personal costs or the share of these personal costs in the total costs of the enterprise (Table 3).

Tab. 3: Labour intensity in NUTS2 regions in 2012, 2016

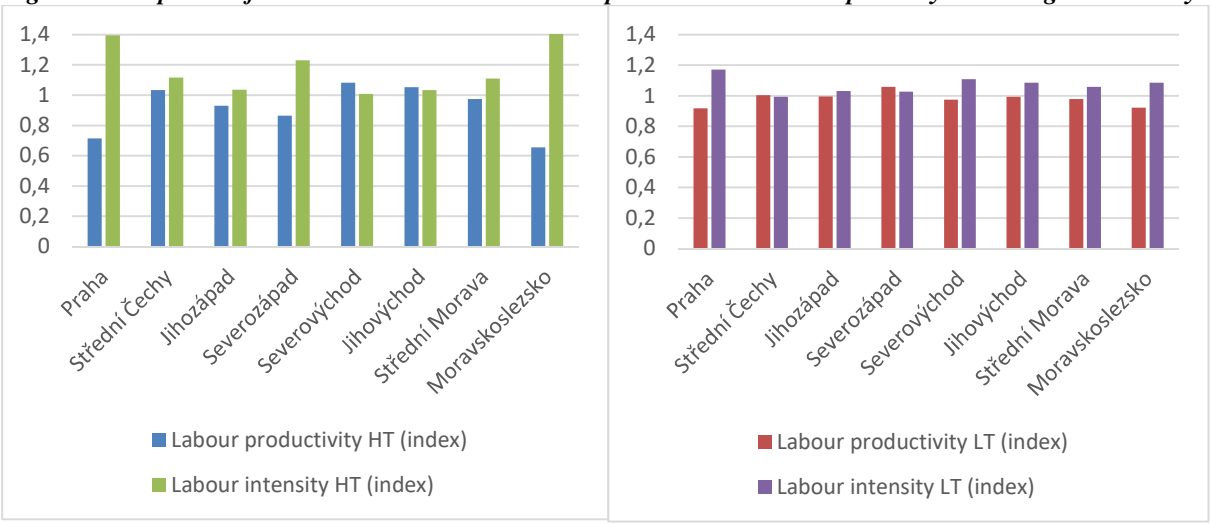
NUTS 2	2012		2016		Number of enterprises	
	HT	LT	HT	LT	HT	LT
Praha	0.1966	0.2125	0.2471	0.2744	29	56
Střední Čechy	0.1845	0.2393	0.2059	0.2379	21	66
Jihozápad	0.3208	0.2759	0.3326	0.2846	31	95
Severozápad	0.2737	0.2245	0.3367	0.2305	22	69
Severovýchod	0.2475	0.2332	0.2493	0.2584	46	146
Jihovýchod	0.2331	0.2340	0.2411	0.2539	46	175
Střední Morava	0.2295	0.2657	0.2544	0.2810	47	115
Moravskoslezsko	0.1523	0.2495	0.2189	0.2706	23	81
Total	0.2073	0.2438	0.2564	0.2594	265	803
Standard deviation	0.0468	0.0185	0.0426	0.0172		
Coefficient of Variation in %	20.36	7.66	16.13	6.65		

Source: authors' calculation

It is precisely in the regions where businesses have the lowest share of personal costs in total costs, but also the highest level of labour productivity. Labour intensity is only in some regions dependent on the category of business by technological intensity. Higher share of personal costs in total can be seen especially in the category of HT enterprises in the following regions: Jihozápad, Severozápad (this share is more than 33% in 2016), LT category is the highest proportion of personal costs in Jihozápad, Střední Morava and Moravskoslezsko (about 28%). On the other hand, the lowest share of personal costs in total can be recorded in the category of HT enterprises in 2012, namely in Praha (11.6%) and Moravskoslezsko (15.2%).

If we focus on the growth rate of the monitored indicators (Figure 2), certain differences can be observed in the case of businesses by technological intensity, especially the jump increase in labour intensity for HT enterprises in Praha and Moravskoslezsko. For businesses, regardless of category by technological intensity, labour intensity grow more quickly than labour productivity, except in HT in Severovýchod and LT in Severozápad.

Fig. 2: Development of selected indicators in 2016 compared to 2012 in enterprises by technological intensity

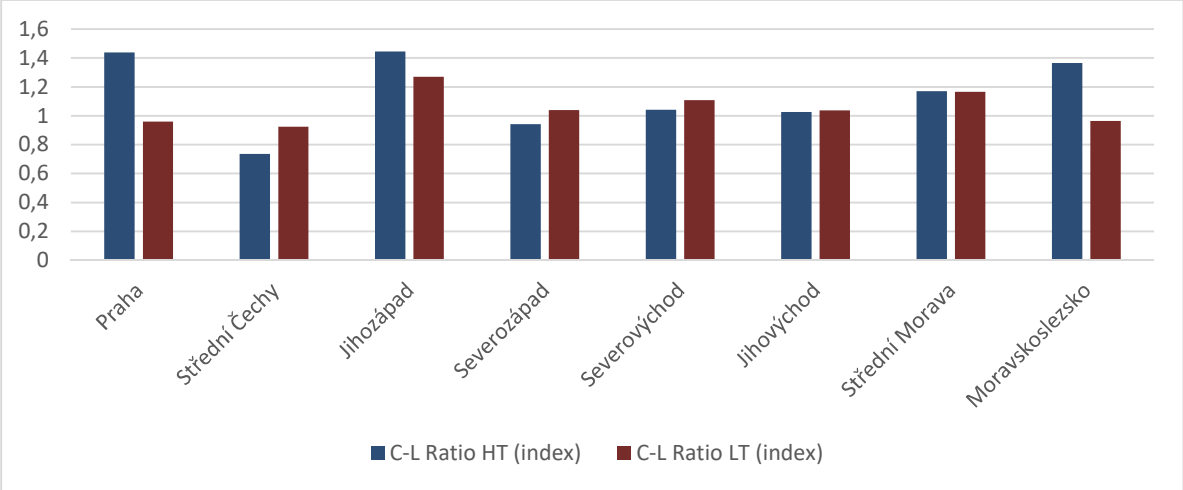


Source: authors' calculation

From the above it can be concluded that in the monitored enterprises in 2016, compared with 2012, personal costs grew faster than labour productivity. One reason for this may be the growth of the Czech economy, the influence of low unemployment, the competition of large enterprises, both on the part of produced products and services and on the demand side of employees (pressure to increase wages). Another reason can be the investment activity of the enterprises, which will mean an increase in labour productivity in future years, or a change in the structure of employees for the benefit of more skilled workers.

Figure 3 illustrates the growth rate of the C-L ratio (share of fixed assets per 1 CZK personal cost) for the monitored enterprises in 2016 compared to 2012. It can be estimated from the development indexes where the regions are more invested in enterprises in the HT category (Jihozápad, Moravskoslezsko), and in enterprises in category LT (Praha, Střední Čechy). In some regions, the differences in the investment activity of LT and HT are not significant (Střední Morava, Jihovýchod, Severovýchod and Severozápad).

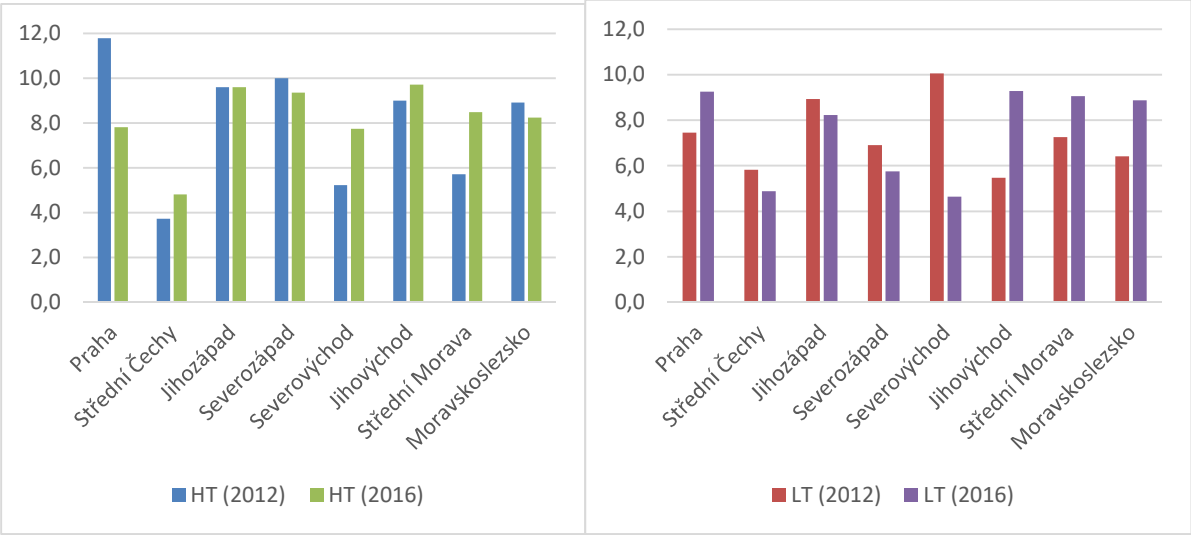
Fig. 3: C-L Ratio (index 2016/2012)



Source: authors' calculation

The profitability of the enterprise was monitored through the ROA indicator for the same companies segmented by technological intensity in 2012 and 2016 (Figure 4). Companies in HT category in Praha had the highest return on assets in 2012, which declined significantly in 2016 and is the second lowest in NUTS2. In Střední Čechy, LT firms are more profitable. The highest profitability in regions of the HT industry is achieved by the regions Jihozápad, Severozápad and Jihovýchod. The greatest improvement occurred in Střední Morava and Severovýchod regions. In the LT, most regions have improved or maintained the same state except in Severovýchod region.

Fig. 4: ROA in the monitored enterprises would be technological intensities in 2012 and 2016



Source: authors' calculation

Conclusion

The paper dealt with the regional differences in the efficiency of the use of human work in SMEs. The analysis was focused on differences in high technology and low technology MSEs. From an analysis of 1068 enterprises in two periods, there were no significant differences in labour productivity between high a low technology firms. The growth rate of labour productivity and labour intensity indicators showed that businesses' sales grew slower

than wages. The increase in labour costs can be related to a change in the structure of employees in favour of more skilled workers, with a shift to greater automation and robotization of production, a lack of free labour (low unemployment) and a pressure to wage growth.

In HT, it was found that only three regions experienced a rise in labour productivity, while labour productivity levels declined in other regions. The main reason is not a drop in overall corporate performance but an inadequate growth in personal costs. This situation poses a risk of lower competitiveness in the future, which can be compensate by higher investments (Dosi et al, 2015).. Higher investment activity was recorded in HT in Praha and Moravskoslezsko. Higher regional differences in labour productivity levels were also found for HT enterprises than LT, but these disparities significantly decreased over the projection horizon (the variation factor decreased by about 10 percentage points).

LT enterprises show a slight decline or steady state of labour productivity in most regions, excluding Severozápad. Even in these sectors, the impact of a high increase in personal costs over the performance of firms is reflected. This situation did not return either high investment activity or the Capital-Labour ratio in some regions (the largest growth was in Jihozápad). For LT, a low regional disparity rate (around 7%) has been demonstrated, which has not changed over the 5 years.

Overall, the current high wage growth in the regions may pose a risk to businesses in the future for a loss of competitiveness at national or international level.

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