

ANALYSIS OF THE STRUCTURE AND DYNAMICS OF LABOR PRODUCTIVITY ON THE EXAMPLE OF VISEGRAD GROUP COUNTRIES

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Abstract

Striving for sustainable economic growth is the goal of states, and often also of the international organizations established for this purpose. The implementation of this objective requires not only defining the concept of sustainable growth, but above all providing appropriate measures. One of the reliable economic indicators is the labor productivity index used in the article, which reflects the relation between GDP and wages in whole economy. The economic goal of the governments should be the systematic increase of this indicator. The index allows to calculate labor productivity for the whole country, as well as for individual regions or industries. This index, due to its dimensionless value, ensures full comparability in time and space between the obtained results.

The policy of increase labor productivity in the country, can be decomposed into individual sectors what allows monitoring of the productivity of each of them. This will allow to determine how particular sector contributes to whole country performance and take corrective action if adverse changes occur. The research covered the countries of the Visegrad Group. The industry division follows the Statistical Classification of Economic Activities in the European Community NACE rev. 2.

Key words: Labor productivity index, economic growth, GDP, industry performance.

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Introduction

Economic cohesion, sustainable growth and economic development are very broad concepts that overlap to a certain extent. From the perspective of the sustainable development paradigm, a level of country's development is not only reflected by a GDP and a standard of living, but also social and economic cohesion of a given country. In addition to some issues with definitions, these concepts are primarily related to the problem of their measurement. Economic and social cohesion is an interdisciplinary concept. It integrates goals aimed at

reducing market inefficiencies, sustainable growth, endogenous growth and well-being. These goals are implemented with the institutions, instruments, procedures that harmonize economic efficiency and social justice, they protect against the domination of the economic calculation over other criteria appropriate for individual spheres of human existence (Woźniak 2012).

The popular index of GDP dynamics has been created to measure the pace of economic growth or economic activity of the country. It does not take into account other aspects. This indicator is often equated with the level of development of a given country. In the literature and practice, many measures have been developed describing the state and rate of development of the socio-economic system. These indicators are largely based on the evaluation of selected institutions or effects to which they lead. Still they are unsatisfactory and indicate the need to develop more reliable and useful indicators (Costanza, Hart, Posner, & Talbert, 2009). One of the leading research trends is the search for life quality measures (Beslerova & Dziurickova, 2014). Also interesting is modern concept of inclusive growth, which means that it would focus on high productivity growth that can lead to productive jobs, social inclusion that can ensure equality of opportunity, and a social safety net that can reduce risk and act as a cushion for the most vulnerable groups (Xiaodi, Zengwen & Hetzler 2017).

The article presents the labor productivity index (LPI) as an alternative proposal of the cohesion measure. The research covered The Visegrad Group countries due to the fact that analysis shows that close integration, including the integrative currency area, is a good solution for countries with similar economic potential (Dobija, 2014).

A stable increase in labor productivity should be the goal of each country. The construction of the indicator allows its disaggregation. Thanks to this, there is the possibility of monitoring labor productivity in individual areas of the economy and, if possible, take appropriate activities to increase labor productivity or reduce dysfunctions.

1 LPI as a measure of economic and social cohesion

The useful result of the measurement of economic potential and efficiency should reflect the relationship between the output and the input. This remark also applies to the macroeconomic aspect (Klečka, 2014). Commonly practiced assessment of the country's economic condition on the basis of the size and dynamics of GDP is incomplete. It is limited to the analysis of economic effects while it ignores the aspect of input. GDP per capita indicators also do not meet this condition, as only part of the population contributes to GDP growth. The value, including GDP, is ultimately the effect of human work performed in a given institutional

environment. The relation between GDP and labor input, measured by the amount of remuneration received by employees, is the index of institutional potential assessment. It is worth citing interesting research (Nedomlelová & Kocourek, 2016) on the measurement of labor productivity using the GDP per employee indicator. The observed increase in labor productivity can largely be the result of an increase in the level of employees education. However, an increase in the level of education leads not only to an increase in employee productivity, but also results in an increase of wages. The question here is whether wage growth goes hand in hand with appropriate macroeconomic effects.

For the purpose of this paper was used labour productivity index, calculated as the quotient of GDP and wages paid in the whole economy (W):

$$LPI = \frac{GDP}{W}$$

Labor productivity is a function of technical equipment of work, asset turnover, profitability of assets, level of work remuneration. More about the information structure of LPI is presented in paper (Koziol & Koziol 2018). The idea of LPI corresponds to the structure of gross domestic product calculated with the income method (called also cost method). This is because both the calculation of labour productivity and the income calculation of GDP are methods compatible with the principles of the accounting system. According to this method, GDP is the sum of incomes of all the owners of production factors, i.e:

- income of human capital owners, i.e. the sum of salaries (including social insurances etc.) (GDPR(W)),
- income of traditional capital owners in the form of profits, interest, rental income, etc. (GDPR(C)),
- state revenues, i.e. taxes adjusted for subsidies (GDPR(G)),
- depreciation (GDPR(D)).

The starting point for the interpretation of the LPI is the following equation presenting the structure of gross domestic product calculated using the income method:

$$GDP = GDP(W) + GDP(C) + GDP(G) + GDP(D)$$

$$GDP = W \times LPI = W + (LPI - 1) \times W = GDP(W) + GDP(A)$$

Where: $GDP(A) = GDP(C) + GDP(G) + GDP(D)$

The above analysis show that the real (GDP) can be divided into two main components, the part financing wages (GDP(W)) and the part financing non-wages expenditures (GDP(A)). Thus, the higher the level of the labour productivity, the greater part of the GDP is devoted to financing non-wage benefits for country, such as public product, capital income and

infrastructure in general. A higher level of LPI means a higher level of development of the country and a higher standard of living for inhabitants. This observation largely coincides with the concept and objectives of the economic and social cohesion policy, thanks to which LPI may constitute an alternative to numerous indicators used in practice to measure economic and social cohesion. Moreover, the extension of the analysis of LPI by the regional dimension allows for the evaluation of territorial cohesion. The above analyses indicate that labour productivity may be a basic indicator of economic development and effectiveness of the national economy.

Tab. 1. Labour productivity index in European countries in 2017 year.

Western Europe				Central – East Europe			
3,51	Austria	3,24	Luxembourg	1,86	Albania	2,27	Romania
3,20	Belgium	3,56	Malta	1,95	Belarus	2,20	Slovakia
2,54	Cyprus	3,73	Netherlands	2,32	Czech Republic	2,43	Slovenia
3,25	Denmark	2,62	Portugal	2,30	Bulgaria	1,79	Macedonia
2,67	Finland	2,50	Spain	2,35	Croatia	1,61	Moldova
2,99	France	3,40	Sweden	2,22	Estonia	2,47	Montenegro
3,42	Germany	3,27	United Kingdom	2,15	Hungary	2,27	Russia
2,40	Greece	3,09	Iceland	2,41	Latvia	2,01	Serbia
4,09	Ireland	3,22	Norway	2,25	Lithuania	2,11	Turkey
2,99	Italy	3,60	Switzerland	2,19	Poland	1,68	Ukraine

Own calculation based on national statistical offices.

The results of calculating LPI given in Table 1 confirm the possibility of comparative analysis between countries. There is some regularity that well developed countries have a LPI above 3 and economically poor countries score below 2. For example, LPI obtained by Moldova (1.61) means that about 2/3 of GDP is spent on wages and 1/3 on other purposes, such as public product or infrastructure. This results in a low standard of living. In contrast, the value for Austria for the same year was 3.51, which means that only 30% of the country's GDP is spent on wages and 70% on capital income, public product and infrastructure. One can meet economic negative comments about the fact that the share of wages in the GDP decreases with the increase in LPI. However, if the wages received by the employees of a given country are adequate to the value of human capital (Koziol et al. 2014), which is usually the case in highly developed countries, then a reduction cost of labour share in GDP should be considered a natural phenomenon. Increasing the cost of labour share in GDP would be associated with a decrease in LPI, which would mainly require a reduction in the value of fixed assets (to decrease of the depreciation component of GDP), i.e. worse infrastructure and living conditions.

According to Woźniak (2012), in the convergence approach, cohesion is assessed by comparing the results obtained for a given country with the results of most developed country or by referring to the average in a given integration group. The author states that the basic barrier to development are too high differences, what justifies intervention policy. Therefore, the political goal of the countries and unions governments, should be the growth of LPI.

Calculating the value of the LPI requires an adequate data on the real GDP and the wages in economy. Data on GDP are usually available, however due to the lack of sufficient standardization of data on wages in the economy published statistical information requires appropriate adjustments to determine the disposable wages income. The starting point for determining wages may be the result of the average wage multiplied by the number of employees in the analyzed period. This amount requires an add-on of social security contributions paid by employers. Part-time and self-employed workers should also be included if the proportion of those people in the labor market is significant. Analysis of the LPI in industries requires data on gross value added (GVA) instead of GDP. GDP and GVA are similar values. Commonly used methodology of GDP measurement is based on summation of GVA in all industries and adjustment by taxes and subsidies.

2 Results

The conducted analysis are pilot and aim to examine the application possibilities of the given research method. On the basis of data from national statistical institutions LPI, GVA share in the last of analyzed years, dynamics of LPI (17/11), relation between LPI of the given industry and national LPI (Ind/nat) and relation between average salary of the given industry and national average salary (W) were calculated. The calculations were conducted both for the whole country and for the industries. Industries has been divided on the basis of the Statistical Classification of Economic Activities in the European Community, commonly referred to as NACE rev.2. The time span of the analysis is 2011 – 2017 year. Due to the limited availability of statistical data, time span for Poland is shorten.

Tab. 2: Structure of labor productivity in Poland in industrial breakdown.

	2011	2012	2013	2014	2015	2016	Ind/Nat [%]	16/11 [%]	GVA share [%]	W[%]
Poland	2,15	2,19	2,14	2,1	2,09	2,01	100,0	93,5	100	100,0
A Agriculture, forestry and fishing									2,6	110,3
B Mining and quarrying									1,4	n.a.

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C Manufacturing	2,68	2,78	2,64	2,63	2,71	2,62	130,3	97,8	22,0	94,5
D Electricity, gas, steam and air-conditioning supply							0,0		2,7	n.a.
E Water supply, sewerage, waste manag. and remediation	2,91	2,8	2,71	2,72			0,0	93,5	1,2	n.a.
F Construction	3,36	3,4	3,43	3,5	3,49	2,99	148,8	89,0	7,2	82,6
G Wholesale and retail trade; repair of motor vehicles and motorcycles	3,17	3,31	3,26	2,96	2,87	2,68	133,3	84,5	17,6	87,5
H Transportation and storage	2,39	2,5	2,52	2,62	2,65	2,54	126,4	106,3	6,1	87,6
I Accommodation and food service activities	2,31	2,2	2,21	2,27	2,19	1,98	98,5	85,7	1,2	64,4
J Information and communication	2,45	2,56	2,37	2,21	2,18	1,96	97,5	80,0	3,9	174,2
K Financial and insurance activities	2,23	2,06	2,13	2,3	2,05	2,25	111,9	100,9	4,4	164,3
L Real estate activities	7,68	7,31	7,02	7,03	6,71	6,54	325,4	85,2	4,9	104,2
M Professional, scientific and technical activities	2,41	2,36	2,29	2,23	2,26	2,04	101,5	84,6	5,5	123,6
N Administrative and support service activities	1,96	1,99	2,09	1,94	1,89	1,77	88,1	90,3	2,3	73,2
O Public administration and defense; compulsory social security	2,19	2,21	2,2	2,15	2,15	2,12	105,5	96,8	5,6	124,4
P Education	1,31	1,3	1,23	1,21	1,21	1,19	59,2	90,8	4,7	103,1
Q Health and social work activities	1,74	1,69	1,76	1,73	1,71	1,64	81,6	94,3	4,4	92,6
R Arts, entertainment and recreation	1,61	1,67	1,63	1,57	1,61	1,62	80,6	100,6	0,7	89,9
S Other service activities	2,74	3,26	2,4	2,42	2,26	2,02	100,5	73,7	1,6	79,9

Source: own calculation using statistical data Polish Central Statistical Office – Local Data Bank.

Tab. 3: Structure of labor productivity in Hungary in industrial breakdown.

Period of time	2011	2012	2013	2014	2015	2016	2017	Ind/Nat	17/11	GVA share [%]	W [%]
Hungary	2,11	1,95	1,94	1,90	1,97	1,88	1,75	100,0	83,1	100,0	100,0
A Agriculture, forestry and fishing	2,44	2,03	2,94	2,95	2,49	2,52	1,91	108,8	78,2	4,0	74,7
B Mining and quarrying	1,49	1,45	2,46	1,68	1,39	1,42	1,49	85,0	100,0	0,2	107,8
C Manufacturing	2,16	2,10	1,96	1,99	2,25	2,06	1,83	104,1	84,5	23,5	101,0
D Electricity, gas, steam and air-conditioning supply	3,11	2,80	3,24	2,61	2,95	3,12	2,66	151,4	85,3	1,9	162,4
E Water supply, sewerage, waste manag. and remediation	1,87	1,40	1,45	1,51	1,61	1,58	1,45	82,4	77,3	1,0	91,7
F Construction	1,79	1,71	1,67	1,75	1,72	1,47	1,45	82,6	80,7	4,2	73,7
G Wholesale, retail trade, repair of motor vehicles and motor.	1,63	1,55	1,66	1,66	1,85	1,75	1,65	94,1	101,4	10,4	88,6
H Transportation and storage	1,89	1,97	1,96	2,09	2,14	2,17	1,90	108,3	100,3	6,5	90,6
I Accommodation and Food service activities	1,65	1,36	1,31	1,33	1,29	1,19	1,21	68,7	73,1	1,8	62,2
J Information and communication	2,66	2,25	2,08	2,25	2,36	2,02	2,28	129,7	85,7	5,3	165,2
K Financial and insurance activities	1,92	1,94	1,71	1,58	1,85	1,62	1,60	91,3	83,3	3,5	181,7
L Real estate activities	38,32	29,84	35,37	36,26	40,07	34,45	25,72	1465,8	67,1	8,0	92,9
M Professional, scientific and technical activities	2,43	2,27	2,18	2,11	2,03	2,17	2,11	120,4	87,0	6,1	141,8
N Administrative and support service activities	3,39	2,78	2,54	2,46	2,43	2,29	2,39	136,0	70,4	3,8	81,1
O Public administration and defence, compulsory social security											n.a.
P Education	1,33	1,32	1,37	1,06	1,41	1,46	1,35	76,9	101,5	4,7	83,0
Q Human health and social work activities	1,56	1,39	1,54	1,53	1,50	1,46	1,35	77,1	86,5	4,2	84,2
R Arts, entertainment and	1,63	1,28	1,48	1,38	1,20	1,19	1,29	73,8	79,5	1,3	114,0

recreation											
S Other services	2,55	1,96	1,88	1,80	1,75	1,77	1,67	95,2	65,6	1,5	73,8

Source: own calculation using statistical data Hungarian Central Statistical Office

Tab. 4: Structure of labor productivity in Slovakia in industrial breakdown.

	2011	2012	2013	2014	2015	2016	2017	Ind/Nat [%]	17/11 [%]	GVA share [%]	W [%]
Slovakia	2,35	2,35	2,34	2,23	2,19	2,10	2,03	100,0	86,4	100,0	100
A Agriculture, forestry and fishing	2,97	3,18	3,39	3,67	3,08	3,03	2,78	137,0	93,5	3,4	82,3
B Mining and quarrying	3,32	3,44	3,47	3,21	3,43	3,01	3,18	156,7	95,8	0,4	101,5
C Manufacturing	2,26	2,22	2,14	2,18	2,19	2,08	1,98	97,5	87,5	22,5	103,7
D Electricity, gas, steam and air-condition supply	6,98	6,89	5,93	6,13	5,41	5,32	5,19	255,7	74,3	2,8	152,0
E Water supply, sewerage, waste manag. and remediation	2,17	2,57	2,86	2,39	2,50	2,16	2,06	101,5	95,1	0,9	87,5
F Construction	2,85	2,90	2,64	2,68	2,74	2,54	2,58	127,3	90,8	8,2	90,1
G Wholesale and retail trade; repair of motor vehicles and motorcycles	1,99	2,01	1,92	1,83	1,70	1,56	1,54	75,8	77,4	11,7	94,4
H Transportation and storage	2,55	2,53	2,49	3,11	3,18	2,74	2,68	131,9	105,0	7,1	90,6
I Accommodation and food service activities	1,30	1,42	1,33	1,16	1,25	1,22	1,13	55,9	87,0	1,4	61,5
J Information and communication	2,16	2,32	2,07	1,81	1,81	1,76	1,75	86,4	81,2	4,3	176,2
K Financial and insurance activities	2,95	2,76	2,86	2,70	2,57	2,20	2,03	99,8	68,7	3,1	161,9
L Real estate activities	13,9	14,6	20,3	14,3	14,1	13,7	11,8	582,3	85,5	6,9	102,5
M Professional, scientific and technical activities	1,75	1,62	1,58	1,60	1,68	1,78	1,69	83,1	96,4	6,0	127,9
N Administrative and support service activities	1,76	1,90	2,10	1,77	1,77	1,71	1,82	89,8	103,4	3,1	75,2
O Public administration and defence; compulsory social security	2,31	2,26	2,27	1,93	1,84	2,05	1,97	97,1	85,4	7,0	104,8
P Education	1,30	1,34	1,34	1,29	1,25	1,27	1,23	60,5	94,1	3,8	86,6
Q Health and social work activities	1,58	1,52	1,54	1,40	1,43	1,45	1,42	69,9	90,1	3,9	96,1
R Arts, entertainment and recreation	5,71	6,19	6,02	5,67	5,90	4,95	4,43	218,4	77,6	2,3	79,1
S Other service activities	2,07	2,11	2,17	2,15	2,22	2,00	1,85	91,4	89,6	1,1	71,4

Source: own calculation using statistical data Statistical Office of the Slovak Republic

Tab. 5: Structure of labor productivity in Czech Republic in industrial breakdown.

	2011	2012	2013	2014	2015	2016	2017	Ind/Nat [%]	17/11 [%]	GVA share [%]	W [%]
Czech republic	2,45	2,40	2,44	2,49	2,51	2,45	2,38	100,0	97,2	100	100
Agriculture, forestry and fishing	2,79	2,99	3,04	3,21	3,02	2,81	2,81	117,9	100,7	2,3	80,7
Mining and quarrying	2,79	2,45	1,95	2,58	2,53	2,16	2,47	103,7	88,5	0,7	113,4
Manufacturing	2,19	2,16	2,18	2,37	2,37	2,30	2,24	93,8	102,2	26,8	100,1
Electricity, gas, steam and air conditioning supply	7,43	7,11	7,88	7,06	7,32	7,13	6,37	267,0	85,6	3,1	147,1
Water supply; sewerage, waste manag. and remediation activities	2,24	2,18	2,10	2,17	2,14	2,10	2,12	88,8	94,5	1,0	91,0
Construction	2,56	2,49	2,69	2,77	2,89	2,85	2,81	118,0	110,0	5,3	88,3
Wholesale and retail trade; repair of motor vehicles and motorcycles	2,12	2,10	2,11	2,19	2,32	2,29	2,26	95,0	107,0	11,1	93,8
Transportation and storage	2,31	2,30	2,31	2,34	2,36	2,30	2,23	93,6	96,7	5,7	92,9
Accommodation and food service	3,04	2,92	3,00	2,96	3,06	2,95	2,91	122,2	95,8	2,1	58,9

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activities											
Information and communication	2,72	2,58	2,55	2,56	2,63	2,57	2,50	104,7	91,8	5,3	176,8
Financial and insurance activities	3,17	2,80	3,22	3,05	3,20	3,07	2,97	124,5	93,6	4,0	176,1
Real estate activities	22,16	20,57	20,65	20,91	21,23	21,13	21,13	886,6	95,4	8,5	87,6
Professional, scientific and technical activities	2,31	2,22	2,35	2,30	2,30	2,31	2,27	95,0	98,1	5,0	121,8
Administrative and support service activities	1,58	1,45	1,52	1,39	1,35	1,32	1,31	54,8	82,4	1,8	66,1
Public administration and defence; compulsory social security	1,97	1,99	1,97	1,95	1,90	1,86	1,80	75,6	91,5	6,2	112,0
Education	1,51	1,49	1,50	1,51	1,52	1,51	1,49	62,5	98,6	4,3	96,2
Human health and social work activities	1,46	1,47	1,47	1,50	1,45	1,44	1,41	59,2	96,7	4,5	103,5
Arts, entertainment and recreation	2,58	2,24	2,24	2,30	2,36	2,32	2,19	91,9	84,9	1,0	86,3
Other services activities	3,20	3,25	3,12	3,01	3,09	3,09	2,83	118,7	88,4	1,1	77,3

Source: own calculation using statistical data Czech Statistical Office

The calculations in tables 2-5 are flowing conclusions:

1. The countries analyzed have a similar level of labor productivity and the structure of GVA,
2. In the researched period, in each of the countries, there was a drop in the national index. This observation must be assessed negatively,
3. The manufacturing industry (sec. C) contributes the most to GVA. The highest share in GVA (26.8%) was recorded in Czech Republic, and the lowest in Poland (22%). Labor productivity in these industries is similar, except that in Poland it is the highest among the analyzed countries and the lowest is in the Czech Republic,
4. Higher level of LPI in the manufacturing industry in Poland is partly due to lower wages in this industry. This may suggest wage competitiveness, which is not a positive phenomenon,
5. Despite the nationwide decline in the LPI level in the manufacturing industry in all countries, the level of LPI was maintained or decreased less than the national average,
6. The next industry according to share in GVA is wholesale industry (sec. G). Labor productivity in this industry in the countries studied, with the exception of Poland, is below the national index, but it is regularly growing. Interestingly, in Poland the share of the G sector is significantly higher than in other countries of the V4 group.
7. The highest LPI level was recorded in real estate activities (sec. L). This is due to the character of the real estate market. GVA comprises real estate turnover, which depends on prices and sales volume,
8. The varied level of LPI in “energetic” industry (sec. D) is largely result of the government policy. This sector is to a large extent composed of state-owned enterprises and has monopolistic features,

9. LPI analysis leads to interesting conclusions in the case of tourism (sec. I), which in general opinion is considered an important factor for the development of countries and regions. The results do not confirm this statement. In the V4 countries, tourism creates less than 2% GVA and its labor productivity (except the Czech Republic) is much below the national LPI index. Additionally, in-depth analysis of source data indicates a low level of wages in this sector in relation to the national average.

Conclusion

Measurement of labor productivity can be a research tool that is easy to apply and provides simple to interpret results. The use of the method is limited by certain requirements regarding statistical data. In the case of industrial sections analyzes, reliable data from individual industries of the economy on GVA and remuneration are necessary. Including the measurement of LPI in the national statistics system can give economists and policy makers an easy-to-interpret tool that ensures full comparability in time and space.

The political goal should be to strive for a steady national labor productivity increase. Measurement of labor productivity in industries shows the effectiveness of their use of resources. This allows the establishment of guidelines to optimize the structure of the economy. Sustainable development of the country requires placing resources as much as possible in more productive areas. This remark is particularly important in the case of human resources.

The research carried out indicates that surveyed countries have similar structure and dynamics of labor productivity in industry. Unfortunately, the countries surveyed reported a noticeable decrease in LPI during the period under consideration. This is largely due to the higher wage growth rate compared to economic growth. However, positive trends in the LPI area have been recorded in the dominant industries, such as manufacturing and wholesale industries. LPI analysis of individual industries indicates that much deeper conclusions can be obtained by including data on wages in industries.

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