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**The evaluation of economic development index:
theory and research**

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The evaluation of economic development index: theory and research

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Abstract: The purpose of this research is to characterize and evaluate the results of economic development. In order to analyze the changes of economic development in different countries the index of economic development as share of sustainable development is used. The research characterizes economic development of two neighborhood countries – Lithuania and Poland. Empirical analysis of satisfactory cases of Lithuania and Poland during the period of the years 2005-2012 are examined. The point of this research – to analyze a country's main macroeconomic development indicators and unify them creating an economical development index. The year 2005 was taken as the base year.

Introduction

Lithuania and Poland, as neighboring countries, present satisfactory cases of their economic development. The historical, economical, political and cultural development of Lithuania and Poland shares some similarities, but also is different. When comparing the economical development of these countries and determining the advantages of each country, it would be appropriate to analyze their economical policies. In 2004 Lithuania and Poland joined the European Union (together with other 9 Central and Eastern Europe countries). Membership in the EU is an important factor for the cohesion of these countries' economies. Motivation for writing the paper is the situation, that many indicators are used when describing economic development of the individual country. A number of economic researches (Krugman, Wells, 2006, pp. 1-488), (Blanchard, Hoarau, 2011) describe economic development measurement possibilities. Scientific researches show that some indicators which are used seeking to determine the status of the country's development exist. For this reason the most significant economic indicators, such as gross domestic product (GDP),

GDP per capita (GDPpc), gross national income (GNI), gross national income per capita (GNIpc), genuine progress indicator (GPI), human development index (HDI), foreign direct investment (FDI), expenditure for research and development (R&D), saving, investment, asset prices, employment, unemployment, inflation interest rate and others indicators or their groups are examined. The position that GDP or GDPpc are incomplete to measure economic performance is broadly characterized by eminent economic scientists Stiglitz, Sen and Fitoussi (Commission on the Measurement of Economic Performance and Social Progress, 2009, pp. 1-292). They conclude, that the committee does not recommend creating a new super-index, which could integrate more economic, social, political, cultural and environmental indicators. The scientists notice that it is best of all to correct shortcomings of GDP, evaluating for example leisure, income inequality.

HDI is created by Sen and Ul-Haq in 1990 and fitted in United Nations Development Programme (Ul-Haq, 1995, pp. 1-288). This determine annually evaluates HDI for each country as members' of the United Nations Organization. The HDI expresses the basic elements of human development (healthy and long life index, adult literacy rate index and standard of living as GDPpc at purchasing power parity (PPP) terms in US dollars), but it does not give full results of economic development (Selim, 2015, p.1-2). The discussions about the possibility to use HDI for the human development comparison between countries enlarges and this indicator was renewed from the year 2010, clarifying firstly, education index and secondly, the standard of living calculating as GNIpc at purchasing power parity (PPP) terms in US dollars. The analysis of scientific literature (Radovanovic, 2011, pp. 193-208) shows, that human development is broader than HDI, due to this reason the level of the country development is described best by the combination of different indicators. Moreover, HDI is criticized for the lack of technological development changes values in it (Wolff et al., 2011, pp.843-870).

Another indicator – Self –Organizing Maps (SOM) is based on the HDI components. Rende & Donduran (2011, p. 989-1003) SOMs characterizes as exclusive type of the countries grouped into the clusters, according to their similarities in their development. SOMs creates favorable conditions to analyze the results of neighbor countries clusters development, its causes and the applied economical policies. In this case human development is based on the precondition of the possibility to chose economic policy from the adopted potential neighborhoods in the same cluster. Such behavior of the government institutions of separate countries can help to improve and to increase the structural elements of the index and the total amount of them, calculating SOM.

In the scientific literature the effects of international trade on quality of life and economical development are discussed. Besides the evaluation that the quality of life is deteriorating due to international trade, some authors (Davies, Quinlivan, 2006, pp. 868-876) positively evaluate the increase of international trade, international competitiveness, economic development, which lead to the increase of employment level and social welfare.

The point of this article is to show the results of economical development in Lithuania and Poland in the period of 2005-2012. The analyzed period includes the period before the 2007-2008 global financial crisis, the period of the crisis. The economical development results are analyzed in the article by comparing main macroeconomic indexes. Judging on these indexes, Lithuania and Poland are given an economic development index. The analysis of paper is based on World Bank data statistics, the Statistical Office of Lithuania and the Central Statistical Office of Poland. The point of this article – to analyze a country's main macroeconomic development indexes, characterizes economic development indexes and unifies them creating an economical development index. The goals of the article: to analyze and compare Lithuania's and Poland's main macroeconomic development indexes; to describe indexes that are used to evaluate a country's economical development and create an economical development index and characterize its change in the period of 2005-2012 in the context of the European Union Member States (EU). The research shows the changes of economic development indicators in Lithuania and Poland, seeking cohesion with the EU economic development the level in average and in the perspective – to align to the counties' higher economic development level.

Methodology of the research

A number of economic researches describe different economic development measurement possibilities. Due to this reason it is important to determine and to evaluate the changes of economic development using the index of economic development of Lithuania and to compare it with the economic development index of the neighboring country and international cooperation partner from the West – Poland and the EU-28. It is significant to characterize the similarities and the main diversities of the economic development factors in the years 2005-2013 in Lithuania and Poland.

One of the most commonly used methods for the analysis of economic development is the evaluation of main macroeconomic indicators and their changes. In order to describe the changes of economic development the economic development index as part of sustainable development in these countries was count up, also absolute and relative values are given in

parallel. The method of the base indexes comparison is applied, whereas the first year of the analyses period is chosen as base year.

The priorities of economic development in Lithuania and Poland are based on the European Commission Strategy “A Strategy for Smart, Sustainable and Inclusive Growth” is significant important. The priorities of the Strategy are: smart development, related to the development based on knowledge and innovation development; sustainable development – substantiated on economical use of resources and competitiveness; and inclusive growth well-grounded on high level of employment, high level of social cohesion among regions and countries. The coordination of the main economic development indicators leads to higher results of economic development. The scientific literature gives some alternatives for the evaluation of economics aspects of sustainable development.

This article seeks to compare economic development among Lithuania and Poland in the context of the EU-28 data such as: GNIpc, foreign direct investment per capita (FDIpc) and employment (E), using World Bank data is analyzed. Based on the given analysis of main macroeconomic indicators, it is determined what is achieved in economic development in analyzed countries. Year 2005 was chosen as a base year for the evaluation of the economic development index in Lithuania, Poland and the EU-28 in the period of 2005-2012 (the index of economic development in year 2005 is equal to 100.0%). This index of economic development characterizes economic development of country, evaluating the changes of three described macroeconomic indicators: 1) GNIpc based on PPP, 2) FDIpc and 3) E. Due to lack of information it is problematic to define the share of each economic indicator included in this index so the method of equal base weights is used. While evaluating the economic development, only such indicators are taken into calculation, which increase would have a positive effect on economic development (GNIpc, FDIpc and E).

The economic development index (I_{EDV}) is evaluated according to the (1) formula:

$$I_{EDV} = \sum_{i=1}^n ai \times Ii, \quad (1)$$

where ai – is the weight of separate element of economic development indicator;

Ii – is the separate element, indicator involved into index of economic development.

The sum of all three weight separate elements (formula 2) of the economic development indicators is:

$$\sum_{i=1}^n a_i = a_1 + a_2 + a_3 = 1. \quad (2)$$

Three indicators are used: indicator of GNIpc (I_{GNIpc}), indicator of FDIpc (I_{FDIpc}) and indicator of employment (I_E). Three indicators take the weighting expression, described in the (3) formula:

$$I_{EDV} = a_1 \times I_{GNIpc} + a_2 \times I_{FDIpc} + a_3 \times I_E, \quad (3)$$

The increase of these indicators means positive effects of economic development; and the decrease of these indicators means negative changes in the economy, related with recession of the economy described.

The economic development indicators

The growth of real GDPpc or economic growth is the most important indicator of economic development, showing living standards in the country. The analysis of real GDP growth is given in Table 1, shows that real GDP was contracted mostly in the year 2009, accordingly in Lithuania it diminished by 14.7%, in the EU – by 4.3% and in the EU euro area – by 4.4%. Real GDP in Poland, unlike in Lithuania, increased during the years 2005-2012. The key factors of economic development in Lithuania and Poland are based, firstly, on the qualified labour force, which is open to new changes and is learning fast. Secondly, economic development is grounded on the efficiency driven factors (as higher education and training; market efficiency; technological readiness) during the years 2005-2007, and from year 2008 to year 2012 – on the economic development factors based on the transition from the efficiency driven to innovation driven factors. As innovation driven factors are evaluated business sophistication and innovation (Shwab, Porter, 2006, pp. 1-598; Schwab, 2012-2013, pp. 1-569).

Table 1. The main indicators of economy and economic activity
in the years 2005-2012

Year	2005	2006	2007	2008	2009	2010	2011	2012
1. Real GDP growth rate (EG), %								
LT	7.8	7.8	9.8	2.9	-14.7	1.3	6.0	3.7
PL	3.5	6.2	7.2	3.9	2.6	3.7	4.8	1.0
EU	2.1	3.3	3.2	0.3	-4.3	2.1	1.8	-0.4
EUea	1.7	3.3	3.0	0.4	-4.4	2.1	1.7	-0.7
2. Agriculture value added, % of GDP								
LT	4.8	4.3	3.9	3.7	3.4	3.5	3.8	4.0
- growth rate, %	100.0	89.6	81.2	77.1	70.8	72.9	79.2	83.3
PL	3.3	3.1	3.4	2.9	2.9	3.0	3.3	3.2
- growth rate, %	100.0	93.4	103.0	95.7	95.7	90.9	100.0	97.0
EU	1.7	1.6	1.6	1.6	1.4	1.6	1.6	1.6
EUea	1.8	1.7	1.7	1.7	1.5	1.6	1.7	1.7
3. Industry value added, % of GDP								
LT	32.9	32.9	32.6	31.6	26.9	28.2	31.2	31.1
- growth rate, %	100.0	100.0	99.1	96.0	81.8	85.7	94.8	94.5
PL	32.1	32.8	32.8	32.9	33.1	32.9	33.7	32.9
- growth rate, %	100.0	102.0	102.2	102.5	103.1	102.5	105.0	102.5
EU	26.3	26.6	26.6	26.1	24.3	25.6	24.8	24.5
EU ea	26.6	26.8	27.0	26.5	24.5	26.3	25.0	24.8
4. Value added in services, % of GDP								
LT	62.3	62.8	63.5	64.7	69.7	68.3	65.0	65.0
- growth rate, %	100.0	100.8	101.9	103.8	111.9	109.6	104.3	104.3
PL	64.6	64.2	63.7	64.2	64.0	64.1	63.0	63.9
- growth rate, %	100.0	99.4	98.6	99.4	99.1	99.2	97.5	98.9
EU	71.9	71.7	71.7	72.2	74.2	72.8	73.6	73.9
EUea	71.5	71.4	71.2	71.8	73.9	72.0	73.3	73.5

Note: LT –Lithuania; PL –Poland; EUea – EU euro area.

Source: author's calculations based on The World Bank Group Data; Statistical Office of Lithuania, 2015; Central Statistical Office of Poland, 2015.

The structure of agriculture, which creates added value, in the country is one of the most important factors for economical development. After Lithuania and Poland became members of the EU, the possibility of emigration arose. Due to emigration and low birth rates the number of Lithuanian population decreased during the years 2005-2012 by 9.9% and fell from 332 million to 2.99 million. The number of population of Poland, in opposite to Lithuania, has increased by 1.0% and has grown from 38.18 million to 38.54 million (or by 380 thousands population). The changes of the number of population in the EU are positive: the number of population has

increased by 1.9% (or by 9.24 million population) in comparison with the base year 2005.

The agriculture value added as per cent of GDP in the years 2005-2012 has decreased in Lithuania and Poland, accordingly by 16.7% and 3.0%. The agriculture value added as per cent of GDP in the EU and the EU euro area was stable enough but it both in the EU and both in the EU euro area it was approximately from 3 to 2.4 times less than it was in Lithuania and about 2 times less than it was in Poland.

Industry is very important in the structure of economic activity. Its growth very much depends on open economy and the amount of direct investments into the country from abroad. The industry value added as per cent of GDP has decreased in the years 2005-2012 in Lithuania – by 5.5%; in the EU – by 5.8%; in the EU euro area – by 6.8%. The industry value added in Poland has increased by 2.5% during all analyzed year.

The value added in service sector in the structure of GDP of all analysed countries had the biggest share among other sectors in the countries. The value added in services in Lithuania, calculated as per cent of GDP, has increased mostly, by 4.3%; in the EU – by 2.8%; in the EU euro area – by 2.8%. The service sector value added in Poland, unlike in Lithuania, has slightly decreased year by year, the reduction in compare with the base year 2005 was 1.1%.

Another important indicator – the level of domestic and foreign income, shown as GNIpc indicator is given in PPP (Table 2) terms in US dollars.

The GNIpc in Lithuania and in Poland the year 2005 was less than GNIpc of the EU; and the GNIpc in Lithuania was 53.8 % and in Poland 51.1% from the level of the EU GNIpc. The GNIpc level in Lithuania in the year 2005 was 105.2% from the level of the GNIpc in Poland. The GNIpc in Lithuania has increased faster in comparison with Poland until the year 2008, then the growth was equal until the year 2011. The GNIpc in Lithuania in the year 2012 was 66.5% and in Poland 63.0% from the level of the GNIpc in the EU. It should be noted, that the GNIpc in the EU euro area in the year 2005 was by 8.8% bigger than in the EU and such trend continued until the year 2012.

A significant factor of economic development is the supply side factor, such as FDI. The development of different economic sectors depends from the flows of FDI. The FDIpc in Lithuania in the years 2005-2008 was bigger than in Poland. Economic downfall, which Poland did not experience, was in the year 2009. Poland became more attractive for investments from abroad, this is why FDIpc in the years 2009-2011 significantly increased in Poland in comparison with Lithuania. It is noted that FDIpc before the global financial crisis (in the year 2008) was bigger in the EU than in the EU euro area. The FDIpc in EU euro in the year 2009-

2011 was bigger than in the EU. It is necessary to note that the FDIpc in Lithuania and Poland and in the EU and EU euro area in the years 2005-2012 had diminishing tendency.

Table 2. The changes of GNIpc and economic development factors in the year 2005-2012

Year	2005	2006	2007	2008	2009	2010	2011	2012
1. GNIpc (PPP), USD								
LT	14440	16430	18350	20010	18540	19470	21590	23080
PL	13720	14930	16390	17930	18600	19910	21290	21830
EU	26844	29096	30669	31908	31269	32001	33343	33376
EUea	30187	32762	34537	35801	35188	36126	37620	37633
2. FDIpc, USD								
LT	358.1	621.8	719.9	596.4	6.0	278.3	476.3	192.0
PL	289.6	564.2	670.9	394.2	377.1	447.2	540.5	173.9
EU	1513.9	1420.7	2097.6	1698.7	719.2	630.8	920.4	548.3
EUea	1342.3	1309.5	1925.5	1308.4	1013.4	1495.0	1234.3	517.9
3. Employed persons, millions								
LT	1.435	1.450	1.472	1.452	1.347	2.690	1.304	1.334
PL	14.362	14.942	15.669	16.338	16.403	16.40	16.625	16.655
EU	215.49	219.44	223.70	226.28	222.07	220.76	221.51	220.04
EUea	140.59	143.09	146.02	147.52	144.70	143.85	144.30	143.02

Note: LT –Lithuania; PL –Poland; EUea – EU euro area.

Source: author's calculations based on The World Bank Group Data; Statistical Office of Lithuania, 2015; Central Statistical Office of Poland, 2015.

The next factor of economic development is the level of employment. The number of employed persons in Poland increased by 16%, in the EU – by 2.7 % and in the EU euro area – by 1.7%. The number of employed persons in Lithuania in years 2005-2008 increased by 2.5%, but since the year 2009 it began to decline and in 2012 it did not reach the employment level of year 2009.

Economic development index and its structure

The economic development index, according to the described method is calculated and given in Table 3. The calculation shows that different countries achieved different situations. Economic growth in Lithuania slowed down a bit in year 2008 and the downfall manifested in year 2009. Calculated economic development index in 2010 shows, that Lithuanian economy has recovered, but slightly, after the economic downfall. The

economic development index in the year 2012 exceed by 2.2% its level in the base year 2005.

The economic development index of Poland in year 2005-2012 was bigger than in the base year value of economic development index. In 2012 economic development index in Poland decreased to its lowest value – 111.7% during the whole period of 2005-2012.

The EU and the EU euro area in year 2012 did not achieve the economic development level of year 2008, because this index was, accordingly, 88.0% and 88.4%. This process was caused by the contraction of FDIpc in these countries. Lithuania and Poland have increased the level of the index in year 2012 and this index was, accordingly, 102.1% and 111.7%.

The analysis of the changes of economic development index in Lithuania and Poland as neighborhoods countries significantly differs. This difference is due to higher employment level in Poland.

Table 3. The changes of economic development index and its structure

Year	2005	2006	2007	2008	2009	2010	2011	2012
1. GNIpc, %								
LT	33.4	38.0	42.5	46.2	42.6	45.0	49.7	53.3
PL	33.4	36.3	39.9	43.6	45.3	48.5	51.8	53.1
EU	33.4	36.2	38.1	39.6	40.0	39.9	41.6	41.7
EUea	33.4	36.2	38.2	39.6	38.9	40.0	41.6	41.6
2. FDIpc, %								
LT	33.3	57.8	66.9	55.6	0.6	25.9	44.3	17.9
PL	33.3	64.9	77.1	45.3	43.4	51.4	62.2	20.0
EU	33.3	31.2	46.1	37.4	15.8	13.9	20.2	12.1
EUea	33.3	32.5	47.9	32.5	25.2	37.1	30.6	12.9
3. Employment index, %								
LT	33.3	33.6	34.1	33.7	31.2	29.4	30.2	31.0
PL	33.3	34.6	36.4	37.9	38.0	38.0	38.6	38.6
EU	33.3	33.9	34.5	34.9	34.3	34.1	34.2	34.2
EUea	33.3	33.9	34.6	34.9	34.3	34.1	34.2	33.9
4. Index of economic development, %								
LT	100.0	132.1	143.5	135.4	74.4	100.3	124.2	102.2
PL	100.0	135.8	153.3	126.8	126.7	137.9	152.6	111.7
EU	100.0	101.3	118.7	111.9	90.1	87.9	96.0	88.0
EUea	100.0	102.6	120.7	107.0	98.4	111.2	106.4	88.4

Note: LT –Lithuania; PL –Poland; EUea – EU euro area.

Source: author's calculations based on The World Bank Group Data; Statistical Office of Lithuania, 2015; Central Statistical Office of Poland, 2015.

Conclusions

It is significant that the analyzes of structural changes of economic development index allows to characterize main problems of economics policy and shows the most important problems, which are necessary to consider in decision making process and in creating of economic policy. The research listed the neighborhoods countries – Lithuania and Poland – according to used method and determined the level of economic development. According to the used method, Poland is first and Lithuania is second. The analyze shows that the biggest problem of Lithuania economic development is decreased level of employment and diminished level of FDIpc. Due to the same reasons – decline of FDIpc during the analyzed period in comparison with the base year 2005 – the EU and EU euro area economic development index was less than 100%.

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